APPLICATION FOR NEW LICENSE
MAJOR PROJECT – EXISTING DAM

VOLUME II: EXHIBIT E

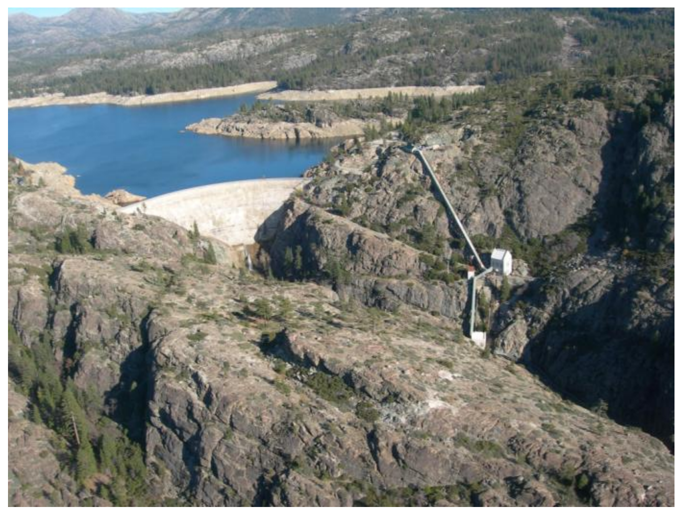
TRANSMITTAL LETTER
EXHIBIT E – ENVIRONMENTAL REPORT

YUBA-BEAR HYDROELECTRIC PROJECT
FERC Project No. 2266-096

DRUM-SPAULDING PROJECT
FERC Project No. 2310-173

SECURITY LEVEL: PUBLIC

Chicago Park Powerhouse



Lake Spaulding Dam and Powerhouses No. 1 and No. 2

Prepared by

Nevada Irrigation District, 1036 West Main Street, Grass Valley, CA 95945

and

Pacific Gas and Electric Company, 245 Market Street, San Francisco, CA 94105

www.nid-relicensing.com

www.drumspauldingrelicensing.com

April 2011

NID

NEVADA IRRIGATION DISTRICT

1036 W. Main Street, Grass Valley, CA 95945-5424 ~ www.nidwater.com
(530) 273-6185 ~ Fax: (530) 477-2646 ~ Toll Free: (800) 222-4102

April 15, 2011

<u>Via Electronic Submittal (eFile)</u>

Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Yuba-Bear Hydroelectric Project**
FERC Project No. 2266-096
Transmittal of Final License Application

Dear Secretary Bose:

Pursuant to 18 CFR § 5.17, Nevada Irrigation District (NID or Licensee), as owner and operator of the Yuba-Bear Hydroelectric Project, FERC No. 2266, (Project) files with the Federal Energy Regulatory Commission (FERC) the attached Application for License for a Major Project – Existing Dam - (FLA). This FLA filing includes five volumes, the contents of which are shown in the Index of Final License Application Materials attached to this transmittal letter.

NID is filing all portions of the FLA following the Commission's e-Filing guidelines. One portion, Appendix E12 to Exhibit E, must be filed by Digital Versatile Discs (DVD) because the size and format of the material included in Appendix E12 preclude uploading it to FERC's e-Library system. Appendix E12 includes the Operations Model (HEC-ResSim) for the Yuba-Bear/Drum-Spaulding Projects, hydrologic information, technical memoranda for relicensing studies, and a helicopter video of Project facilities and stream reaches. NID will file an original and seven copies of Appendix E12 on DVDs.

PROPOSED PROJECT BACKGROUND

The Yuba-Bear Hydroelectric Project is located in northern California in Sierra, Nevada, and Placer counties along the western slope of the Sierra Nevada Range geomorphic provinces. Portions of the Project are on public land managed by either the United States Department of Agriculture (USDA), Forest Service (Forest Service) as part of the Tahoe National Forest (TNF) and by the United States Department of Interior (USDOI), Bureau of Land Management (BLM) as part of the Sierra Resource Management Area. The existing Project consists of four developments - Bowman, Dutch Flat, Chicago Park, and Rollins – which, in total include 13 main dams with a combined usable storage capacity of 210,823 acre-feet of water; four water conduits; four powerhouses and switchyards with a combined authorized installed capacity of 79.32 megawatts (MW); one 9-mile-long, 60-kilovolt transmission line; 17 campgrounds and associated boat launches, trails, and other recreation facilities; and other appurtenant facilities and structures.

NID's proposed Project includes all existing Project facilities and one new powerhouse – the Rollins Upgrade. The new powerhouse would be located within the existing FERC Project Boundary on NID-owned land adjacent to the existing Rollins Powerhouse. NID's proposed Project also includes a slight expansion of the existing FERC Project Boundary to encompass some roads and environmental measures, including proposed minimum flow releases.

NID proposes to operate the proposed Project in the same fashion that it has historically operated the existing Project – first and foremost to meet the growing water supply demand of its District.

COORDINATION WITH PACIFIC GAS AND ELECTRIC COMPANY'S DRUM-SPAULDING PROJECT RELICENSING – JOINT EXHIBIT E

NID has coordinated the relicensing of its Yuba-Bear Hydroelectric Project with Pacific Gas and Electric Company's (PG&E) relicensing of its Drum-Spaulding Project (FERC Project No. 2310). NID and PG&E are cooperating and coordinating with each other on their relicensing efforts for many reasons, including: 1) the hydro projects are operationally interrelated and generally have physical features located in common watersheds; and 2) the two projects have the same license expiration date of April 30, 2013.

To this end, and because FERC declared in its May 22, 2008, Scoping Document 1 that it intended to prepare a multi-project environment impact statement for both projects, NID and PG&E have prepared a joint, two-project, Exhibit E, Environmental Report, and included the Exhibit E in their respective applications for a new license. This joint Exhibit E document is identical in each application. However, some section of Exhibit E and some Exhibit E appendices only address either the Yuba-Bear Hydroelectric Project or the Drum-Spaulding Project. For example, Exhibit E treats the projects separately and distinctly in key areas, such as proposed measures and Project economics. Exhibit E also provides information such as a description of the affected river basins, applicable laws, and affected environment that is generally applicable to both projects.

SECTION 106 COMPLIANCE

With the Notice of Intent to File an Application for a New License (NOI) on April 9, 2008, NID requested, pursuant to 36 CFR § 800.2(c)(4) that FERC authorize NID to initiate consultation, as described in Section 106 of the National Historic Preservation Act, with the California State Historic Preservation Officer (SHPO), tribes, the Forest Service, BLM and others regarding relicensing of the Project. By letter of June 10, 2008, FERC granted the request thereby designating NID the non-federal representative for Section 106 informal consultation.

ENDANGERED SPECIES ACT PROTECTION

With the NOI filing, NID also requested that FERC, pursuant to Section 7 of the Endangered Species Act, designate NID as the non-federal representative for the purpose of informal consultation with the United States Department of Commerce, National Marine Fisheries Service and USDOI, Fish and Wildlife Service for the Project. By letter of June 10, 2008, FERC granted NID's request.

PROPOSED PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

Appendix E3 of Exhibit E of the FLA provides NID's proposed protection, mitigation and enhancement (PM&E) measures. These measures reflect NID's analysis of relicensing study results to date, and in some instances are informed by limited discussions with other Relicensing Participants.

NID affirms its continued commitment to working collaboratively and cooperatively with other interested Relicensing Participants as this Integrated Licensing Process for the Yuba-Bear Hydroelectric Project moves forward. NID is fully committed to working with interested Relicensing Participants to develop approaches, solutions and measures that address as many of the Relicensing Participants' interests as reasonably possible.

FINAL LICENSE APPLICATION DISTRIBUTION

NID will make the information from this FLA (with the exception of Critical Energy Infrastructure Information (CEII) and Privileged materials) available to all interested Relicensing Participants by:

- posting the FLA to the public Project Relicensing website: http://www.nid-relicensing.com/

- making a hardcopy of Volumes I, II and III, the public portions of the FLA, available to the public during regular business hours (8:30 a.m.– 4:30 p.m., Monday through Friday) at NID's place of business:

  Nevada Irrigation District
  1036 West Main Street
  Grass Valley, CA 95945

  The public is instructed to contact Mr. Ron Nelson or his designee by telephone at (530) 273-6185 to make an appointment to review the information.

- making a hardcopy of Volumes I, II and III, the public portions of the FLA, available at the following public libraries in the Project region:

Nevada County Public Library Grass Valley Library - Royce Branch 207 Mill Street	Nevada County Public Library Madelyn Helling Library 980 Helling Way

Grass Valley, CA 95945-6711
Placer County Public Library
350 Nevada Street
Auburn, CA 95603-3720

Nevada City, CA 95959-8619
Yuba County Public Library
303 2nd Street
Marysville, CA 95901-6011

NID will also publish a notice of the availability of the FLA (within 15 days of the date it is filed with FERC) in the following newspapers of general circulation:

The Union
464 Sutton Way
Grass Valley, CA 95945
Tel: (530) 273-9561

Auburn Journal
P.O. Box 5910
Auburn, CA 95604
Tel: (530) 885-5656

Appeal-Democrat
P.O. Box 431
Marysville, CA 95901
Tel: (530) 741-2345

The Mountain Messenger
313 Main
Downieville, CA 95936
Tel: (530) 289-3242

Any party may also request a hard copy of the Public volumes of the FLA by contacting Ron Nelson, General Manager, (530) 273-6185 or by e-mail at nelson@nid.dst.ca.gov.

NID looks forward to working with FERC and other interested parties on the Yuba-Bear Hydroelectric Project relicensing. If you have any questions regarding the FLA, please contact me.

Sincerely,

Ron Nelson
General Manager

cc: Alan Mitchnick, FERC Project Coordinator
FERC Project No. 2266 Relicensing Participants Mailing List (via electronic mail)

Attachment: Yuba-Bear Hydroelectric Project Index of Final License Application Materials

Enclosure: Yuba-Bear Hydroelectric Project Final License Application

INDEX OF FINAL LICENSE APPLICATION FOR THE YUBA-BEAR HYDROELECTRIC PROJECT (FERC PROJECT NO. 2266)

Appendix E6. PG&E's Replies to Comments on the Draft License Application – Drum-Spaulding Project

Appendix E7. PG&E's Proposed Measures and Rationale Statements – Drum-Spaulding Project

Appendix E8. PG&E's Proposed Implementation Plans included in the Proposed Drum-Spaulding Project

- Recreation Facilities Plan
- Transportation Management Plan for Primary Project Roads
- Fire Prevention and Response Plan on Federal Land
- Historic Properties Management Plan (*due to its Privileged content, this plan is located in Vol. IV of PG&E's FLA*)
- Visual Resources Management Plan on Federal Land

Appendix E9. PG&E's Discussion of Wise Powerhouse Operations – Drum-Spaulding Project

Appendix E10. PG&E's Miscellaneous Information Related to Proposed Measures – Drum-Spaulding Project

Appendix E11. PG&E's Background Information on Water Resources – Drum-Spaulding Project

Part 3:

Appendix E12. Operations Model and Technical Memoranda

- HEC-ResSim Operations Model for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project, Including Five Model Scenarios Referenced in Exhibit E Pre-Loaded with Results
- Hydrology and Power Generation DVD for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project
- Technical Memoranda for NID's and PG&E's Relicensing Studies
- Helicopter Video of Yuba-Bear Hydroelectric Project Facilities and Affected River Reaches

Volume III	**Security Level: Public**	
	Transmittal Letter	
	Exhibit F.	List of General Design Drawings
	Exhibit G.	Project Maps
	Exhibit H.	Miscellaneous Filing Materials
Volume IV	**Security Level: Privileged**	
	Transmittal Letter	
	Historic Properties Management Plan	
Volume V	**Security Level: Critical Energy Infrastructure Information (CEII)**	
	Transmittal Letter	
	Exhibit F.	General Design Drawings (CEII Version)

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GLOSSARY - DEFINITION OF TERMS, ACRONYMS AND ABBREVIATIONS

Term	Definition
A	
A	Ampere
ac	acre
ac-ft	acre-feet or acre-foot, the amount of water needed to cover one acre, to a depth of one foot (43,560 cubic feet, or 325,900 gallons).
accretion flow	The incremental flow between two points. Also known as local inflow.
ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
adit	An almost vertical pipe or short horizontal passage, entering a tunnel, either to add water from a conduit, sluice, or other water source, or, as a maintenance access tunnel (also referred to as a portal).
afterbay	A reservoir located immediately downstream from a powerhouse, sometimes used to re-regulate flows to the river or stream.
AGC	Automatic Generation Control, used to support California electric regulation system.
AIR	Additional Information Request, issued by FERC.
anabat	An electronic instrument used to detect and record high frequency vocalization of bats.
annual maintenance	Work performed to maintain serviceability, or repair failures, during the year in which they occur. This includes preventive and/or cyclic maintenance, performed in the year in which it is scheduled to occur. Unscheduled or catastrophic failures of components or assets may need to be repaired as a part of annual maintenance. There are three types of annual maintenance actions: *Repair.* Work to restore a damaged, broken, or worn-out fixed asset, component, or item of equipment, to normal operating condition. Repairs may be done as annual maintenance or deferred maintenance activities *Preventive Maintenance.* Scheduled servicing, repairs, inspections, adjustments, and replacement of parts that result in fewer breakdowns and fewer premature replacements, and help achieve the expected life of the fixed asset. Inspections are a critical part of preventive maintenance, as they provide the information for scheduling maintenance and evaluating its effectiveness. *Cyclic Maintenance.* Preventive maintenance activities that recur on a periodic and scheduled cycle. Typical cyclic maintenance includes re-roofing or repainting buildings, or refinishing signs. Cyclic maintenance schedules are normally adjusted, depending upon the condition of the component or asset. If a roof has reached the scheduled time of replacement, but has remaining useful life, the maintenance may be delayed to utilize additional life.
APE	Area of Potential Effect, as pertaining to Section 106 of the National Historic Preservation Act.
AR	American Rivers
automatic/semi-automatic/manual powerhouses	An automatic powerhouse can be started, stopped, and have its load and voltage changed, from a remote or master station, via supervisory control. A semi-automatic powerhouse, with SCADA, may allow a remote station to change load and/or voltage, and may allow a remote shutdown, but must be started manually. A semi-automatic powerhouse, without SCADA, will send alarms to a remote or master station. A manual powerhouse must have all its functions performed at the powerhouse.
AW	American Whitewater
B	
BA	Biological Assessment
BAOT	Boats at one time
Base-loaded	Generation around-the-clock
Basin Plan	The RWQCB Water Quality Control Plan for the Sacramento and San Joaquin rivers.
BC	Before Christ
BDAC	Bay-Delta Advisory Committee
BEPA	Bald Eagle Protection Act

Glossary. (continued)

Term	Definition
B (continued)	
Black Start Capability	The ability of a unit to start up, without the use of an external transmission or distribution voltage power source
BLM	U.S. Department of the Interior, Bureau of Land Management
BMI	Benthic Macroinvertebrates
BMP	Best Management Practice
BO	Biological Opinion
BOD	Biochemical Oxygen Demand
BOR	U.S. Department of the Interior, Bureau of Reclamation
BP	Before Present
bypass flow	Bypass flows (cfs) are those flows that are required to be released into a stream.
C	
C	Celsius
CAA	Clean Air Act
CALFED	An interagency committee with management and regulatory responsibility for the Bay-Delta Estuary.
Cal-IPC	California Invasive Plant Council
CalTrans	California Department of Transportation
capital improvement	The construction, installation, or assembly of a new fixed asset, or the significant alteration, expansion, or extension of an existing fixed asset, to accommodate a change of purpose.
CDBAW	California Department of Boating and Waterways
CDEC	California Data Exchange Center
CDF	California Department of Forestry and Fire Protection
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CD-ROM	Compact Disc-Read-Only Memory
CDSOD	California Division of Safety of Dams, within the CDWR
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cf or ft^3	cubic feet
cfs	cubic feet per second. One cfs equals approximately 1.98 ac-ft per day.
CHRIS	California Historical Resources Information Center
cm	Centimeter
CNDDB	California Natural Diversity Data Base
CNPPA	California Native Plant Protection Act
CNPS	California Native Plant Society
CNPS-1A	Plant presumed by the CNPS to be extinct in California.
CNPS-1B	Plant considered by the CNPS as rare or endangered in California and elsewhere.
CNPS-2	Plant considered by the CNPS as rare or endangered in California, but more common elsewhere.
CNPS-3	Plant that requires more information by the CNPS before assigning to other lists.
CNPS-4	Plant considered by the CNPS as a plant of limited distribution.
COE	U.S. Department of Defense, Army Corps of Engineers
Commission	Federal Energy Regulatory Commission; also referred to as FERC.
component	A named data set in an operation model that is a building block for a condition.

Glossary. (continued)

Term	Definition
C (continued)	
conceptual design for recreation facilities	A conceptual design is the designer's initial communication to convey proposed design solutions. Conceptual designs for a facility may consist of diagrammatic sketches, bubble diagrams, line diagrams, preliminary floor plans, or renderings. A conceptual design is prepared prior to a site development plan. (Forest Service Handbook 7309.11, Chapter 30.)
condition	The main building block of a scenario, containing the data used by the operation model to simulate the system. At this time, the only condition defined by components is 'Turbine Generator.'
conduit	A pipe, flume, or canal used for diverting or moving water from one point to another, usually used when there is no existing streambed or waterway.
Control Area	An electric system, bounded by interconnection metering and telemetry, capable of controlling generation to maintain its interchange schedule with other control areas, and contributing to frequency regulation of the interconnection. A Control Area operates its AGC on a tie-line frequency bias.
CORP	California Outdoor Recreation Plan
CPUC	California Public Utility Commission
CRLF	California red-legged frog
CRMP	Cultural Resource Management Plan
CSBP	California Stream Bioassessment Procedure
CSPA	California Sportfishing Protection Alliance
CRWQCB	California Regional Water Quality Control Board
CSC	California Special Concern Species, an administrative designation by CDFG.
cu yd or yd^3	cubic yard
CVP	Federal Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships System
CZMA	Coastal Zone Management Act
D	
Dam Base Width or DBW	The width of a dam at its widest point along the foundation.
Dam Crest Elevation or DCE	The elevation of a dam at its lowest point along the crest.
Dam Crest Width or DCW	The width of a dam at its crest.
dam fish release requirement	The flow that must be released to the stream downstream of the dam; also known as minimum streamflow release requirement, or bypass flow.
Dam Height or DH	The height of the dam, from the dam crest (top of dam) to the stream channel at the downstream toe of the dam.
Dam Low Level Outlet Control	The type of gate and/or valve that controls the release, from the low level outlet.
Dam Low Level Outlet Type	A description of the low level outlet facilities.
Dam Max Low Level Outlet Capacity	The flow that can be discharged through the low level outlet at the normal maximum water surface.
Dam Max Spillway Discharge	The maximum flow the spillway can pass, with the water surface at the crest of the dam.
Dam Slope – Upstream Face	The slope of the upstream face of the dam.
Dam Slope – Downstream Face	The slope of the downstream face of the dam.
Dam Spillway Control	The type of device that controls the spillway.
Dam Spillway Crest Elevation	The elevation of the lowest point of the spillway.
Dam Spillway Type	The type of spillway.
Dam Type	A description of the type of dam.
Dam Year Placed in Service	The first calendar year water was impounded behind the dam.
dbh	diameter at breast height
DEA	Draft Environmental Assessment

Glossary. (continued)

Term	Definition
D (continued)	
decommission	Demolition, dismantling, removal, obliteration, and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates maintenance needs for the fixed asset. Portions of an asset or component may remain, if they do not cause problems or require maintenance.
deferred maintenance	Maintenance that was not performed when it should have been, or when it was scheduled, and which, therefore, was put off or delayed for a future period. There are three types of deferred maintenance actions: *Repair*. Work to restore a damaged, broken, or worn-out fixed asset, component, or item of equipment to normal operating condition. Repairs may be done as annual maintenance or deferred maintenance activities. *Rehabilitation*. Renovation or restoration of an existing fixed asset, or any of its components, in order to restore the functionality, or life, of the asset. Because there is no significant expansion or change of purpose for the fixed asset, the work primarily addresses deferred maintenance. *Replacement*. Substitution or exchange of an existing fixed asset or component, with one having essentially the same capacity and purpose. Replacement eliminates deferred maintenance needs for the replaced fixed asset or component. The decision to replace a fixed asset or component is usually reached when replacement, rather than repair or rehabilitation, is more cost effective, more environmentally sound, or in the best interest of the government. The size or capacity of the existing fixed asset is not significantly expanded in a replacement. Replacement of an asset or component usually occurs when it nears or has exceeded its useful life.
°	Degree(s)
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model. The format of the USGS digital elevation data sets, containing elevation values primarily derived from the USGS topographic map series.
dependable capacity	The maximum dependable output (in units of power, e.g., MW) of a generator or a group of generators under a combination of adverse hydrologic conditions and high electrical demand.
discharge	water released by a plant
Dispatch	Given performance data for a specific plant, a calculation that determines the most efficient way to divide flow among the units in many powerhouses.
distribution system	The substations, transformers, and lines that convey electricity from high-power transmission lines to the consumer. Usually 115 kV and lower voltage.
DLA	Draft License Application
DO	Dissolved oxygen
DOC	Dissolved organic carbon
Draft EA	Draft Environmental Assessment
Draft EIR	Draft Environmental Impact Report
E	
EA	Environmental Assessment
EAP	Emergency Action Plan
ECPA	Electric Consumers Protection Act
EFH	Essential Fish Habitat
EIA	Energy Information Administration
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
El.	Elevation
EPT	Orders of benthic insects: Ephemeroptera, Plecoptera, and Tricoptera
ESA	Federal Endangered Species Act
ESU	Evolutionarily significant unit
EVC	Existing Visual Condition
Exhibit E	The portion of an application for a new license that addresses environmental effects of the proposed Project.

Glossary. (continued)

Term	Definition
F	
401 Certification	Water quality certification issued by the SWRCB, the California agency responsible for administering Section 401 of the Clean Water Act.
F	Fahrenheit
FAC	Federal Advisory Committee
FACA	Federal Advisory Committee Act
FARM	Framework for Archaeological Research and Management of Forests of the North Central Sierra Nevada
FC	Federal Candidate Species, a species or subspecies currently proposed as a candidate for listing under the ESA.
FE	A species or subspecies listed as endangered under the Federal Endangered Species Act.
FEA	Final Environmental Assessment
FESA	Federal Endangered Species Act
FEMA	Federal Emergency Management Agency
FEPD	A federally-listed endangered species currently proposed for delisting from the ESA.
FERC	Federal Energy Regulatory Commission, or Commission
FERC Project Boundary	The area surrounding Project facilities and features, as delineated in Exhibit G or K of the FERC license, which is required for the normal operation and maintenance of the Project.
FGDC	Federal Geographic Data Committee. Promotes the coordinated development, use, sharing, and dissemination of geographic data.
FHSA	Federal Historic Sites Act
FHWA	Federal Highway Administration
fixed asset	A constructed feature, such as a building, road, campground, trail, or other item of infrastructure. Real property improvements. Facilities in the general sense.
fixed asset component	A subsystem, major item of equipment, or other portion of a fixed asset. Examples of components include: roof for a building, deck for a bridge, pavement for a road, interpretive kiosk at a viewing area, and site furnishings (tables, grills, etc.) at a campground.
flashboards	Removable boards installed seasonally in reservoir spillways, to temporarily increase storage capacity.
flood elevation	The reservoir elevation at which the plant's reservoir spills.
FLPMA	Federal Land Policy and Management Act
flume	A lined structure, commonly made of wood, metal or concrete, used for conveyance of water, usually where no streambed exists or the topography is not suitable for a canal or tunnel.
FMP	Fire Management Plan
FMU	Fire Management Unit
forebay	A reservoir upstream from the powerhouse, from which water is drawn into a tunnel or penstock, for delivery to the powerhouse.
Forest Service	United States Department of Agriculture, Forest Service
FOW	Forced Oil and Water Cooled
FP	A species or subspecies designated as "fully protected" under the CDFG Code.
FPA	Federal Power Act
FPD	Federal Proposed Delisting, a federally listed species currently proposed for delisting from the ESA.
fps	feet per second
FPT	A species or subspecies proposed for listing, as either threatened or endangered, under the Federal Endangered Species Act.
Francis Turbine	A radial-inflow reaction turbine, where flow through the runner is radial to the turbine shaft.
Frequency Regulation	The ability of a Control Area to assist the interconnected system in maintaining scheduled frequency.
FSC	Federal Species of Concern. An administrative designation by USFWS (former category 2 species).
FSM	Forest Service Manual
FSS	A species or subspecies designated as "sensitive" by the USFS.

Glossary. (continued)

Term	Definition
F (continued)	
FSV	A species designated by the Sierra Nevada Framework, as moderate to high vulnerability, and species of concern.
FT	A species or subspecies listed as threatened, under the Federal Endangered Species Act.
ft	foot or feet
FTPD	A federally listed, threatened species, currently proposed for delisting from the ESA.
FWCA	Fish and Wildlife Coordination Act
FYLF	Foothill yellow-legged frog
G	
G	Giga
g	Gram
gate leakage	The amount of water that leaks through the wicket gates for each unit when the gates are closed.
generator	A machine powered by a turbine that converts rotating mechanical energy into electrical potential.
GIS	Geographic Information System
GMP	General Management Plan
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
grizzly	A metal grating across the entry to a water conduit
gross head	The difference between the headwater elevation and the tailwater elevation.
GWh	Gigawatt hour (equals one million kilowatt hours)
H	
H	Horizontal
"H"-frame structure	A wood pole transmission structure that consists of two wood poles with a horizontal cross arm above the conductor.
HA	Commercially or recreationally harvested species; a non-protected species.
HABS	Historic American Building Survey
HABTAT	IFIM simulation model
HAER	Historic American Engineering Record
HCP	Habitat Conservation Plan
head	The vertical height of water that represents potential energy.
head loss	The amount of head that is lost (to friction, etc.) between the headwater (reservoir/forebay/intake) and the tailwater.
HEC-ResSim	U.S. Army Corps of Engineers — Hydrologic Engineering Center (USACE-HEC) Reservoir Simulation (HEC-ResSim) model, Version 3.0. Also referred to as ResSim.
HEP	Habitat Evaluation Procedures
HLCTS	Hydropower License Compliance Tracking System
hp	horsepower
HPMP	Historic Properties Management Plan
hr	Hour
HREZ	Heritage Resource Emphasis Zones
HRMA	Heritage Resource Management Area
HSC	Habitat Suitability Criteria
HSI	Habitat Suitability Indices
HUC	Hydrologic unit codes developed by the Water Resources Council, corresponding to hierarchal classification of hydrologic drainage basins in the United States. Each hydrologic unit is identified by a unique hydrologic unit code.
HVAC	Heating Ventilation and Air Conditioning System
Hz	hertz (cycles per second)

Glossary. (continued)

Term	Definition
I	
ICD	Initial Consultation Document, also known as PAD
IFIM	USFWS Instream Flow Incremental Methodology
IHA	Indicators of Hydrologic Alteration
ILP	Integrated Licensing Process
Immediate Vicinity	The area extending to about one mile out from a Project feature.
In.	Inch
inflow	The flow water entering a plant's reservoir.
Initial License	The first license for a project issued by FERC.
Installed capacity	The nameplate MW rating of a generator or group of generators.
Interchange	Electric power that flows from one entity to another.
Interested Parties	All governmental agencies, non-governmental organizations, Native American tribes, and unaffiliated members of the public that routinely participate in FERC relicensings in California, or that have advised NID and/or PG&E that they wish to become involved in one or more of the relicensing proceedings. NID and PG&E are considered Interested Parties.
ISO	California Independent System Operator
ITA	Indian Trust Asset
J	
K	
K	kilometer; 1,000 meters
Kcfs	thousand cubic feet per second
Kg	kilogram; 1,000 grams
kg/day	kilograms per day
kg/ha	kilograms per hectare
kg/yr	kilograms per year
km	kilometer
kV	Kilovolt; 1,000 volts
kVA	kilovolt amperes
KVP	Key View Point
kW	kilowatt; 1,000 watts
kWh	kilowatt-hour; 1,000 watt hours
L	
L	Liter
lb	Pound
LCMMP	Land Coordinated Mapping and Monitoring Program
LEO	Law Enforcement Officer
level	reservoir surface elevation
level fluctuation	The change in reservoir surface elevation.
level fluctuation limits	A constraint specifying the number of feet allowed between the maximum elevation and minimum elevation achieved each day.
level fluctuation rates	A constraint specifying the maximum allowable rate of elevation change for the reservoir.
License Application	Application for a new license; submitted to FERC no less than two years in advance of expiration of an existing license.
Licensee	Either Nevada Irrigation District if the term is used in the Yuba-Bear Hydroelectric PAD, or Pacific Gas and Electric Company if the term is used in the Drum-Spaulding Project PAD or the Rollins Transmission Line Project PAD.
Licensees	Nevada Irrigation District and Pacific Gas and Electric Company
license term	The period for which a license is issued by FERC; usually between 30 and 50 years.
load shapes	The daily schedule of power pricing and the hour duration of each price.

Glossary. (continued)

Term	Definition
L (continued)	
local inflow	The incremental inflow between two plants (also known as Accretion Flows).
LOP	Limited operating periods
LRMP	Land and Resource Management Plan
LWD	Large woody debris
M	
µ	Micro
µg	microgram
µg/l	micrograms per liter (equals parts per billion, or ppb)
µmho/cm	micromhos per centimeter; a measurement of conductivity
M	Mega
m	Meter
m	Milli
mainstream plane	A plant located on the main stream that runs through the system. Not a plant on a side or tributary stream.
maintenance	The act of keeping fixed assets in acceptable condition. It includes preventive maintenance normal repairs, replacement of parts and structural components, and other activities needed to preserve a fixed asset so that it continues to provide acceptable service and achieves its expected life. Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than those originally intended. Maintenance includes work needed to meet laws, regulations, codes, and other legal direction as long as the original intent or purpose of the fixed asset is not changed.
mbf	million board feet
MBTA	Migratory Bird Treaty Act
MCA/T	Mandatory conditioning agencies/tribes
MCL	Maximum contaminant level
Meeting Participant	A Relicensing Participant that attends a specific meeting. Meeting Participants are different for each meeting.
metadata	"Data about data." Describes the content, quality, condition, purpose, and other characteristics of data.
mg	Milligram
mg/l	milligrams per liter (equals parts per million, or ppm)
mgC/m^2	milligrams of carbon per square meter
mi	Mile
mills/kWh	0.1 cent per kilowatt hour, equivalent to $$/mwh
minimum daily average flow	The lowest average flow in any one day.
minimum elevation	The lowest allowable reservoir elevation. At elevations below the minimum, the operations model will set the daily discharge to 0 cfs.
minimum flow unit	A small unit that is installed specifically to generate power from the minimum instantaneous flow when released through a low level outlet. Typically this unit is separate from the powerhouse, and therefore requires handling outside of the core scheduling routines.
minimum instantaneous flow	A lowest flow that occurs.
MIR	Minimal implementation requirement; a USFS system.
MIS	USFS Management Indicator Species
mm	millimeters
MNBMC	Species designated by the USFWS as a Migratory Bird of Management Concern because of: (1) Documented or apparent population declines; (2) small or restricted populations; or (3) dependence on restricted or vulnerable habitats.
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding

Glossary. (continued)

Term	Definition
M (continued)	
MPN	Most probable number
mps	meters per second
msl	mean sea level
must-run	Energy or ancillary services necessary to maintain system reliability.
MVA	megavolt-ampere
MW	megawatt; equal to 1,000 kw
MWh	megawatt-hours; equal to 1,000 kwh
Mya	Million Years ago
N	
n	Nano
NAAQS	National Ambient Air Quality Standards
NAVD 83	North American Datum 1983. Based on a definition of the size and shape of the earth. It is the datum for map projections and coordinates within the United States and throughout North America.
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	California Native American Heritage Commission
National Register	National Register of Historical Places
natural inflow	The flow that a point in the system would have received, if there were no upstream plants in the system. This flow is equal to the sum of all upstream accretion inflows. Also known as unimpaired or unregulated flows.
NCIC	North Central Information Center
NDA	no data available
NEPA	National Environmental Policy Act
NEPA	National Energy Policy Act
NERC	North American Electric Reliability Corporation
Nevada Irrigation District	The current FERC license holder and owner/operator of the Nevada Irrigation District Yuba-Bear Hydroelectric Project.
new construction	The erection, construction, installation, or assembly of a new fixed asset.
New License	A license issued for a project for which FERC has issued an initial license.
NFMA	National Forest Management Act
NGO	Non-Governmental Organizations
NGVD	National Geodetic Vertical Datum
NHA	National Hydropower Association
NHI	Natural Heritage Institute
NHPA	National Historic Preservation Act
NID	The Nevada Irrigation District, which owns, operates, and holds the current license to the Yuba-Bear Hydroelectric Project (FERC Project No. 2266). Also referred to individually as Licensee, or with PG&E as Licensees.
NLT	No later than
NMFS	Department of Commerce, National Marine Fisheries Service
NMWSE	Normal maximum water surface elevation
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	U.S. Department of Agriculture, National Marine Fisheries Service
Normal operating capacity	The maximum MW output of a generator or group of generators under normal maximum head and flow conditions.
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
NRCS	Natural Resource Conservation Act

Glossary. (continued)

Term	Definition
N (continued)	
NRHP	National Register of Historical Places
NTU	Nephelometric turbidity unit
NWI	National Wetlands Inventory
NWS	National Weather Service
O	
O&M	operation and maintenance
OEP	FERC Office of Energy Projects (formerly Office of Hydropower Licensing).
OHP	State Office of Historic Preservation
OHV	Off highway vehicle
operations	Activities related to the normal performance of the functions for which a fixed asset or component is intended to be used. Costs such as utilities (electricity, water, sewage), fuel, janitorial services, window cleaning, rodent and pest control, upkeep of grounds, vehicle rentals, waste management, and personnel costs for operating staff are generally included within the scope of operations and are not considered maintenance costs.
ORV	Off-road vehicle ***or*** Outstanding Remarkable Views
OS	Office of the Solicitor
oz	Ounce
P	
PA	Programmatic Agreement
PAC	Protected activity center
PAD	Pre-Application Document
PAD Questionnaire	Questionnaire developed and circulated by NID and PG&E to gather existing, relevant, and reasonably available information for inclusion in the Yuba-Bear Hydroelectric Project, Drum-Spaulding Project and Rollins Transmission Line Project PADs.
PAOT	people at one time
PCT	Pacific Crest Trail
PCWA	Placer County Water Agency
PDF	portable document format
peaking	Operation of generating facilities to meet maximum instantaneous electrical demands.
penstock	An inclined pipe through which water flows from a forebay or tunnel to the powerhouse turbine.
penstock capacity	The maximum design flow in the penstock.
penstock connections	The type of connections in the penstock both within the cans themselves and between cans.
penstock diameter	The nominal diameter of the penstock.
penstock length	The length of the penstock from the tunnel or upstream inlet to the turbine shut off valve.
maximum penstock velocity	The maximum velocity in the penstock at the "penstock capacity," as defined above. This will occur at the smallest penstock diameter.
penstock supports	The type of supports for the penstock.
penstock type	A description of the type of pipe, and whether the pipe is surface or buried.
pf	power factor
PG&E	Pacific Gas and Electric Company, which owns, operates, and holds the current license to the Drum-Spaulding Project (FERC Project No. 2310) and the Rollins Transmission Line Project (FERC Project No. 2784). Also referred to a Licensee, or, when with NID, as Licensees.
PH	Powerhouse
pH	The measure of the acidity or alkalinity of a substance or liquid.

Glossary. (continued)

Term	Definition
P (continued)	
plant operation type	A reference to the manner in which water is scheduled though a plant. At this time, there are seven operating types: Diversion Plant: A plant that cannot control its daily release. A plant that uses an uncontrolled outlet to divert water from one watershed basin to another. Fill and Spill: A plant that peaks with the loadshape, but gives priority to the upstream plant, and will spill in order for the upstream plant to follow the loadshape as closely as possible. Non-Generating: A plant that peaks its discharge to follow the loadshape. Strictly Peaking: A plant that peaks its discharge. Attempts to schedule water in highest value periods of day. Can instantaneously (in a 15 minute increment) change load. Peaking with Ramp Rates: A plant where the water discharge still closely follows the loadshape (plant will Peak); however, the plant is constrained by ramping rates. Pure Run of River: A plant where inflows are equal to outflows on an instantaneous basis. Re-regulating: A plant designed to regulate peaked discharge from upstream plants into smooth discharges. This plant releases constant outflows for the whole day. Re-regulating plants may or may not be constrained by ramping rates. If so, then they are required to ramp between days.
powerhouse maximum capability	Maximum megawatt output generated by the specific powerhouse. For powerhouses with two units, this value is the maximum simultaneous total output generated.
PHABSIM	Physical Habitat Simulation Models
PM&E measures	Facilities, operations, and management activities undertaken for the purpose of protecting or mitigating impacts that would result, due to operation and maintenance of the proposed Project, or for the purpose of enhancing resources that would be affected by the proposed Project.
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
POAOR	California Public Opinion and Attitudes in Outdoor Recreation Survey
Posted File	A file that either NID or PG&E has placed on its respective Relicensing Website.
Power Factor	The ratio of actual power to apparent power. Power factor is the cosine of the phase angle difference between the current and voltage of a given phase. Unity power factor exists when the voltage and current are in phase.
ppb	parts per billion
ppm	parts per million
Project	Either NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E's Drum-Spaulding Project (FERC Project No. 2310), or the Rollins Transmission Line Project (FERC Project No. 2784).
PAA	Project Affected Area. The geographic area in which a specific resource is potentially affected by Project presence, operation, or maintenance. The extent of the geographic area is dependant on the resource (i.e., water, recreation, or cultural resources).
Project Area	The area within the FERC Project Boundary.
Project Boundary	The boundary defined in the license issued by FERC for the Project, outlining the geographic area needed for the Project operations and maintenance.
Project Drainage Basins	Combination of the Middle Yuba River, Yuba River, and Bear River drainage basins.
Project Region	An area on the order of county or national forest size that surrounds the Project.
Project Vicinity	The area surrounding the Projects, on the order of a U.S. Geological Survey 1:24,000 topographic quadrangles.
Project Viewshed	The area from which project features are visible. The land base from which the project may be seen.
Project Works	All of the infrastructure associated with the operations of the project.
projects	Two or more of the following projects: NID's Yuba-Bear-Hydroelectric Project, PG&E's Drum-Spaulding Project, and PG&E's Rollins Transmission Line Project.
Proposed PM&E Measure	A PM&E measure proposed by a Relicensing Participant, to modify project facilities and operations, and other management activities, as conditions of the new license, for the purpose of protecting a resource from or mitigating impacts that would result from continued project operations and maintenance, or for the purpose of enhancing resources that would be affected by continued project operation and maintenance.

Glossary. (continued)

Term	Definition
P (continued)	
proposed Project	The Yuba-Bear Hydroelectric Project or Drum-Spaulding Project, as proposed by NID or PG&E, respectively, in its application for new license. The proposed Project includes PM&E measures.
protection	All of the relays and other equipment used to open the necessary circuit breakers, to separate pieces of equipment from each other when trouble develops.
protective relay	A device whose function is to detect defective lines or apparatus, or other power system conditions of an abnormal or dangerous nature, and to initiate appropriate control circuit action.
PSEA	Pacific Service Employees Association
psi	pounds per square inch
PSR	Pacific Southwest Region of USFS
PURPA	Public Utilities Regulatory Policies Act
PWC	personal water craft
PWD	Persons with Disabilities
PX	California Power Exchange
Q	
QF	A qualifying facility, a cogenerator, or small power producer that sells its excess power to a utility.
R	
ramping	The act of increasing or decreasing stream flows from a powerhouse, dam, or division structure.
ramping rates	Constraints on the rate at which a plant's discharge can change.
ramping rate curve	The river flow vs. stage curve relationship, at the point where ramping rate compliance is measured.
RCA	Riparian Conservation Areas, as defined by TNF.
RCO	Riparian Conservation Objectives, as defined by TNF.
RD	Recreation Day, which equals a visit by a person to a Project development for recreation purposes during any portion of a 24-hour period.
Reach	A stretch of stream between readily identifiable endpoints (such as structures or stream confluence).
Regulated hydrology	The hydrology of project-affected streams, subsequent to construction of the project.
relicensing	The process of acquiring a new license for a project that has an existing license from FERC, sometimes called the "relicensings," if referred to collectively, or the "relicensing" if referred to individually.
Relicensing Contact List	List of Interested Parties that have provided to NID and/or PG&E an e-mail address, to which NID and PG&E may forward information regarding the relicensings. Also referred to as Contact List.
Relicensing Participants	Interested Parties, which include NID and PG&E, that routinely actively take part (i.e., attend meetings/workshops, and make filings) in one or more of the relicensing proceedings.
relicensing proceedings	Relicensing of two or more of the following projects: NID's Yuba-Bear Hydroelectric Project; PG&E's Drum-Spaulding Project; and PG&E's Rollins Transmission Line Project. Sometimes referred to as the Relicensings.
reservoir	The water retained by a dam. Also referred to as headwater, storage, forebay, or headpond.
reservoir drainage area	The area that drains into the reservoir.
reservoir gross storage	Reservoir storage at maximum normal water surface elevation.
reservoir length	The distance between the two most distant points on the reservoir shore, at normal maximum water surface elevation.
reservoir max storage capacity	The gross volume of water that can be stored in the reservoir.
reservoir NMWS elevation	The elevation of the lowest spill crest (if uncontrolled), the top of the gates (for gates), at the top of the dam.
reservoir surface area	The surface area of the reservoir at the normal maximum water surface elevation.
reservoir storage curve	A curve that defines a reservoir's volume in ac-ft at various surface elevations.
reservoir useable capacity	A volume measurement of the amount of water that can be stored for generation, down to a minimum level.
reservoir width	The maximum distance between the two most distant points on the reservoir shore, at normal maximum water surface elevation, taken at a right angle to the line at reservoir length.

Glossary. (continued)

Term	Definition
R (continued)	
ResSim	U.S. Army Corps of Engineers — Hydrologic Engineering Center (USACE-HEC) Reservoir Simulation (HEC-ResSim) model, Version 3.0. Also known as HEC-ResSim.
RIMS	Records & Information Management System
Riparian	Relating to the bank of a natural course of water.
riparian vegetation	The vegetation immediately adjacent to a body of water. Typically, a structurally diverse community, consisting of herbaceous shrub and woody components.
RM	River mile, as measured along the river course, from downstream to upstream.
RNA/ACEC	Research Natural Area/Area of Critical Environmental Concern
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-way
rpm	revolutions per minute
RRMP	Redding Resource Management Plan
RTD	Resistance temperature detector
RTU	Remote terminal unit, or remote telemetry unit. A remotely located piece of equipment used for collecting data, and/or for operating equipment via SCADA.
run-of-the-river	A hydro project that uses the flow of a stream with little or no reservoir capacity for storing water.
RVD	Recreation Visitor Days
RWQCB	Regional Water Quality Control Board
S	
SCADA	Supervisory Control And Data Acquisition system
scenario	A collection of settings that constitutes a Res-Sim™ operation model run. Output data for a run are referenced by the scenario name.
SCORP	State Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1: A document issued by FERC summarizing the relicensing process for a Project; generally issued following the first public meeting after the NOI.
SD2	Scoping Document 2: A document issued by FERC summarizing the relicensing process for a Project; generally issued following the first public meeting after the NOI
SE	A species or subspecies listed as endangered, under the CESA.
Secchi	A method of measuring surface water transparency in a reservoir.
Section 106	Refers to Section 106, of the National Historic Preservation Act.
Setting	A collection of conditions that form the building blocks of a scenario. A setting is made up of conditions.
SHPO	California Department of Parks and Recreation, Office of Historic Preservation, State Historic Preservation Officer
sidestream plant	A plant that is not on the main fork of the river. A plant that is located on a sidestream, or minor tributary.
SIP	State implementation plan
siphon	A pipe section or conduit that crosses a stream channel or ravine.
site development plan for recreation facilities	A site development plan depicts the logical and progressive establishment or replacement of improvement, buildings, pedestrian and vehicular circulation ways, and utilities needed for effective use of the site (not detailed construction drawings). Physical conditions, opportunities, needs, zoning and management objectives shape the site development plan. A site development plan consists of two parts: a site survey plan and a development plan. The site survey consists of the basic site information and all existing features. The development plan provides conceptual and specific proposed improvements. A site development plan is prepared after a conceptual design. (Forest Service Handbook 7309.11, Chapter 20.)
SL	Standard Length
Sluice	An artificial channel for conducting water, with a valve or floodgate to regulate the flow.
SM	Stream mile. (See RM or River Mile.)
SMS	USFWS Scenery Management System

Glossary. (continued)

Term	Definition
S (continued)	
SMZ	Streamside Management Zone, as defined by TNF
SNEP	Sierra Nevada Ecosystem Project
SNFPA	Sierra Nevada Forest Plan Amendment
SNTEMP	USFWS' Stream Network Temperature Model
SNYLF	Sierra Nevada yellow-legged frog
SOHA	Spotted owl habitat areas
SRMP	BLM's Sierra Resource Management Plan
SSWD	South Sutter Water District
SPI	Sierra Pacific Industries, Inc.
Special-Status Species	Species or subspecies, listed under the FESA or CESA as endangered or threatened, or by a Federal or State agency as a species of special concern, sensitive species, fully protected species, or management indicator species.
spill	Water passes over a spillway without going through the units.
spill channel	Property down gradient from a conduit, for which an easement over private property or withdrawal under FERC license has been granted. A spill channel is used when it becomes necessary to release water from a section of conduit.
spillway	A passage for releasing surplus water from a reservoir.
spillway capacity curve	A curve that defines the maximum spill in cfs, for the spillway at given reservoir elevations.
SPT	Sediment Pass-Through
sq ft or ft^2	square foot
sq mi or mi^2	square mile
SR	A species or subspecies listed as rare under the CESA.
ST	A species or subspecies listed as threatened under the CESA.
stage	The river surface elevation in feet, based on a local datum.
state	State of California
station use	Energy used to operate the generating facility's auxiliary equipment.
STATSGO	State Soil Geographic Database
STNF	Shasta Trinity National Forest
STNF-LRMP	Shasta Trinity National Forest Land Resources Management Plan
stoplogs	Removable logs installed seasonally in reservoir spillways, to temporarily increase storage capacity.
STORET	USEPA's computerized water quality data storage system.
Study Area	The geographic area covered by a specific study.
Study Description	A detailed description of an individual study.
Study Plan	The aggregate of all study descriptions.
SUP	Special Use Permit, issued by the USFS.
surge chamber	A structure, similar to a holding tank, located on a tunnel or penstock, which is used to absorb and attenuate the overflow, and prevent any disruption, due to a sudden change in water pressure through a tunnel or penstock.
SWDU	Statement of Water Diversion and Use
switching center	The main control center for any given river system, which is responsible for operation of the automatic, semiautomatic, and manual powerhouses on that river system. The Switching Center is staffed 24 hours a day.
SWP	State Water Project
SWRCB	State Water Resources Control Board
T	
tailrace	Channel through which water is discharged from the powerhouse turbines.
tailwater curve	A curve that defines the tailwater elevation of the range of powerhouse flows.

Glossary. (continued)

Term	Definition
tailwater elevation	The elevation where all energy from the water passing the turbine had been extracted. (Can be the turbine centerline or the river surface elevation at the point of powerhouse discharge.)
T (continued)	
TCP	Traditional Cultural Property
TDS	total dissolved solids
technical memoranda	Reports that contain the results of a relicensing study or portion of a relicensing study.
TES	Threatened, Endangered. or Sensitive Species
THP	Timber Harvest Plan
three-winding transformer	A transformer with a primary, secondary, and tertiary winding, which may be used to connect generation with two different voltage transmission circuits, or with both distribution and transmission circuits, without the use of additional transformers.
TLP	Traditional Licensing Procedure, as defined by FERC regulations
TMDL	total maximum daily load
TN	total nitrogen
TNC	The Nature Conservancy
TNF	Tahoe National Forest
TNF LRMP	Tahoe National Forest Land Resources Management Plan
TP	total phosphorous
TPN	total persulfate nitrogen
trash rack	A mechanism, found on a dam or intake structure, which clears the water of debris before the water passes through the structure.
TRP	Traditional Relicensing Procedure, as defined by FERC regulations.
TSP	total soluble phosphorus
TSS	total suspended solids
tunnel capacity	The maximum design flow in the tunnel.
tunnel diameter	The nominal design size of the tunnel.
tunnel length	The length of the tunnel from the upstream portal to the downstream portal.
tunnel lining	The type of lining in the tunnel, if any.
tunnel maximum tunnel velocity	The maximum velocity in the tunnel at the "capacity" and at the nominal diameter, as defined above.
tunnel type	Either pressure or free flow.
turbine	A machine that converts the energy of a stream of water into the mechanical energy of rotation. This energy is then used to turn an electrical generator or other device. Also called a "water wheel".
TWD	Tailwater Depression Unit
U	
Unimpaired hydrology	Synthesized hydrology of Project-affected streams with no developments.
Unit	A term referring to the combined turbine-generator machine
US	United States
USACE	U.S. Department of Defense, Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of Interior, Fish and Wildlife Service
USGS	U.S. Department of Interior, Geological Survey

Glossary. (continued)

Term	Definition
UTM	Universal Transverse Mercator. The map projection upon which the UTM Coordinate System is based.
V	
V	Volts
VELB	Valley elderberry longhorn beetle
VFW	Veterans of Foreign Wars
VMS	USFS Visual Management System
VQO	Visual Quality Objectives, a USFS visual classification system.
VQI	Visual Quality Index, a USFS visual classification system.
VRM	Visual Resource Management
W	
W	Watts
Watch List	A list prepared by an individual National Forest LRMP, of plants and animal species that are locally rare (as opposed to declining throughout their range), and are of public concern, occur as disjunct populations, are newly described taxa, or lacking sufficient information on population size, threats, trends, or distribution. These species are not on the FSS list.
water withdrawals	Water that is withdrawn from the reservoir, therefore not available for energy generation, and which is lost from the system. Withdrawals can be either positive or negative.
WBWG	Bat species designated by the Western Bat Working Group as High Priority, because they are imperiled, or at high risk of imperilment.
WECC	Western Electricity Coordinating Council
WHR	California Wildlife Habitat Relationships Database
WPT	Western Pond Turtle
WSEL	Water surface elevation
WSRA	Wild & Scenic Rivers Act
WUA	Weighted Usable Area
X	
Y	
ya	Years ago
YCWA	Yuba County Water Agency
yd	yard
YOY	young-of-the-year
Z	

SECTION 1
ORGANIZATIONAL SUMMARY OF EXHIBIT E

Pursuant to Sections (§§) 5.17 and 5.18 of Title 18 of the Code of Federal Regulations (CFR), in April 2011, Nevada Irrigation District (NID), filed this application for a new license with the Federal Energy Regulatory Commission (FERC or Commission) for NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and Pacific Gas and Electric Company (PG&E) filed this application for a new license for PG&E's Drum-Spaulding Project (FERC Project No. 2310).[1]

The two projects are located at least in part in the Yuba River and Bear River basins. Portions of both projects are located on public land managed by the United States Department of Agriculture, Forest Service as part of the Tahoe National Forest (TNF), United States Bureau of Reclamation (BOR), and United States Bureau of Land Management (BLM). Both projects have licenses that expire on April 30, 2013. NID and PG&E have historically closely coordinated the operations of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project. FERC, in its October 6, 2008 revised its Scoping Document 2 (SD2), stated that it intended to prepare a multi-project environmental impact statement (EIS) that would be used by FERC to determine whether, and under what conditions, to issue new hydropower licenses to each project. Each new license will include certain facilities, and certain operations and management activities that FERC believes each Licensee needs to undertake for the purpose of protecting or mitigating impacts that would result from the operation and maintenance (O&M) of the Proposed Project, or for the purpose of enhancing resources that would be affected by the Proposed Projects; these facilities and operations and management activities are referred to as protection, mitigation and enhancement measures (PM&E measures). In recognition of this overlap, NID and PG&E have coordinated and cooperated in their respective relicensing, including the preparation of this joint Exhibit E, Environmental Report.

This joint Exhibit E (prepared pursuant to 18 CFR § 5.18(b)) contains the analysis of existing, relevant and reasonably available information, including at least in part, the results to date of the resource studies Licensees conducted to investigate potential effects of one or both of the Proposed Projects on various biological, recreational and cultural resources associated with each Project. Licensees reported study results to federal and State of California agencies, local agencies, tribes, non-governmental organizations and unaffiliated members of the public (herein referred to with Licensees as Relicensing Participants)[2] as soon as data were collected, checked for accuracy, and compiled into technical memos that present study objectives and methods, including any modifications, and study results. The technical memoranda are filed with this Exhibit E in Attachment E12. As of the date this FLA is filed with FERC, Licensees have completed 20 technical memoranda; by October 31, 2011 PG&E will complete an additional 18

[1] NID and PG&E are referred to individually as "Licensee" and collectively as "Licensees"; and the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project are referred to individually as "Project" and collectively as "projects."

[2] When the term Relicensing Participants is used in this document, it includes those parties actively participating in one or more of the relicensings and includes NID and PG&E.

technical memoranda and NID will complete an additional 20 technical memoranda. Licensees discuss the status of each technical memorandum at the beginning of the pertinent resource subsection in Section 6 (Environmental Analysis) and provide an overall summary of all the technical memoranda in Section 10 (Consultation Document).

This Exhibit E includes the following sections and appendices:

- Section 1: Organizational Summary of Exhibit E – This section summarizes the organization of Exhibit E and the related appendices.
- Section 2: General Description of the River Basins – This section includes a description of the river basins in which the projects are located.
- Section 3: Cumulative Effects - Geographic and Temporal Scope – A description of the geographic scope and temporal scope of the cumulative affects analysis, including a list of reasonable foreseeable future actions considered in the analysis is included in this section. This section also includes a brief summary of HEC-ResSim Operation Model runs made by Licensees in support of this FLA.
- Section 4: Applicable Laws – This section includes a description of relevant laws that pertain to the relicensing of each Project and the status of each Project's compliance with such laws.
- Section 5: Project Facilities and Operations - The section describes for each Project, existing and proposed Project facilities, operations and environmental measures.
- Section 6: Environmental Analysis – This section analyzes, by major resources area, and for each Project, the effects of the projects on resources. In general, each major resource section is divided into five subsections: 1) status of any remaining studies; 2) Affected Environment; 3) Environmental Effects; 4) Proposed Environmental Measures; and 5) Unavoidable Adverse Impacts, if any. For both the Water and Aquatic resources areas, an additional section on Cumulative Effects is included.
- Section 7: NID's Economic Analysis – Yuba-Bear Hydroelectric Project – This section analyzes NID's proposed Yuba-Bear Hydroelectric Project's use of the water resources to generate power, estimates the economic benefits of the existing and proposed Yuba-Bear Hydroelectric Project, and estimates the cost of various environmental and recreational measures and the effects of those measures on Project operations. This section also discusses the developmental benefits of the Project.
- Section 8: PG&E's Economic Analysis – Drum-Spaulding Project – This section analyzes the Drum-Spaulding Project's use of the water resources to generate power, estimates the economic benefits of the existing and proposed Drum-Spaulding Project, and estimates the cost of various PM&E measures and the effects of those measures on Project operations. This section also discusses the developmental benefits of the Project.
- Section 9: Consistency with Comprehensive Plans – This section discusses the consistency of each Project with qualifying comprehensive plans.

- Section 10: Consultation Documentation – This section describes Licensees' consultation with other Relicensing Participants and actions taken by Licensees to comply with FERC's Integrated Licensing Process (ILP) regulations, including the performance of studies.
- Section 11: References Cited - This section contains a list of references cited in the document.
- Appendix E1: List of Parties Consulted – This appendix contains a list of all parties with whom Licensees consulted during the relicensings.
- Appendix E2: NID's Replies to Comments on the Yuba-Bear Hydroelectric Project Draft License Application – This appendix includes NID's replies to comments on the Yuba-Bear Hydroelectric Project DLA.
- Appendix E3: NID Proposed Measures included in the Proposed Yuba-Bear Hydroelectric Project – Appendix E3 contains the specific measures NID proposes to be included by FERC in the new Yuba-Bear Hydroelectric Project license.
- Appendix E4: NID's Proposed Implementation Plans included in the Proposed Yuba-Bear Hydroelectric Project – This appendix includes implementation plans referenced by NID in Appendix E3.
- Appendix E5: NID's Miscellaneous Information Related to Measures included in the Proposed Yuba-Bear Hydroelectric Project – This appendix includes functional drawings, descriptions of operations and maintenance procedures, an implementation and construction schedule, and maps related to NID's proposed measures in Appendix E3.
- Appendix E6: PG&E's Replies to Comments on the Draft License Application - Drum-Spaulding Project – This appendix includes PG&E's replies to comments on the Drum-Spaulding Project DLA.
- Appendix E7: PG&E's Proposed Measures and Rationale Statements - Drum-Spaulding Project – Appendix E7 contains the specific measures PG&E proposes to be included by FERC in the new Drum-Spaulding Project license, and a rationale statement for each measure.
- Appendix E8: PG&E's Proposed Implementation Plans - Drum-Spaulding Project – This appendix includes implementation plans referenced by PG&E in Appendix E7.
- Appendix E9: PG&E's Discussion of Wise Powerhouse Operations - Drum-Spaulding Project – This appendix includes, as requested by FERC, a description of the Drum-Spaulding Project's Wise Powerhouse and the associated canal operations.
- Appendix E10: PG&E's Miscellaneous Information Related to Proposed Measures - Drum-Spaulding Project – This appendix includes functional drawings, descriptions of operations and maintenance procedures, an implementation and construction schedule, and maps related to PG&E's proposed measures in Appendix E7.

- Appendix E11: PG&E's Background Information Regarding Water Resources - Drum-Spaulding Project – This appendix provides background information regarding water resources in the vicinity of PG&E's Drum-Spaulding Project.
- Appendix E12: HEC-ResSim Operations Model, Hydrologic Information, Technical Memoranda for NID's and PG&E's Relicensing Studies, and Helicopter Video of Project Facilities - This appendix includes: 1) the HEC-ResSim Operations Model for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project ResSim Model and Output, including the results of model runs made by Licensees to support their FLAs; 2) hydrologic information, including hydrology used by Licensees in their Habitat Duration Analysis (HDA); 3) a technical memorandum in final or interim form for each of Licensees' FERC-approved studies (38 for Drum-Spaulding Project and 39 for Yuba-Bear Hydroelectric Project) with one exception: an interim technical memorandum for NID's 2011 Dutch Flat No. 2 Conduit Entrainment Netting Study (Study 2.3.17) has not been prepared because the study will not begin until mid April 2011. Licensees intend to file with FERC final technical memoranda for the studies in progress by October 31, 2011; and 4) a helicopter video of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project facilities and features and stream reaches affected by the projects.

SECTION 2
GENERAL DESCRIPTION OF THE RIVER BASINS

Pursuant to 18 CFS § 5.18(b)(1), this section provides a brief description of the river basins in which the projects are located. Section 2.1 provides general information, including locale, topography, climate, major land uses and economic activities. Section 2.2 discusses the affected sub-basins, including facilities in each basin. Section 2.3 describes the river systems including relevant tributaries, measurements of the basins and lengths of streams and river miles (RM)[1] for key reference points, including Project and non-Project facilities.

2.1 General Information

2.1.1 Locale

The projects are located on the west slope of the Sierra Nevada in Northern California with projects' facilities ranging in elevation from about 435 feet at the Drum-Spaulding Project's Newcastle Powerhouse to 7,840 ft at the Drum-Spaulding Project's White Rock Lake Dam.[2] Portions of each Project are located in the South Yuba River and Bear River basins. In addition, some Yuba-Bear Hydroelectric Project facilities are located in the Middle Yuba River basin, and some Drum-Spaulding Project facilities are located in the North Fork of the American River and Sacramento River basins. Figure 2.1-1 shows the major river basins affected by the two projects.

2.1.2 Topography

At elevations above 3,000 ft, the basins are steep, rugged, sparsely populated, and mostly vegetated with coniferous forests. The rivers are confined in about 1,000-ft deep canyons, and river beds are composed mostly of large boulders and cobble. Below 3,000 ft, the topography is slightly less severe as the projects enter the Sierra Nevada foothills. Many of the rivers show the legacy of over 150 years of gold mining, and the surrounding area is generally rural, with portions of the Drum-Spaulding Project near and within the City of Auburn. At these lower elevations, land in the basins is predominantly privately-owned, with small portions of public land managed by the United States Department of Agriculture (USDA), Forest Service as part of the Tahoe National Forest (TNF) or administered by United States Department of Interior (USDOI), Bureau of Land Management (BLM) or USDOI Bureau of Reclamation (BOR).

2.1.3 Climate

The basins experience warm, dry summers and cool winters with precipitation falling generally as snow above 5,000 ft in elevation and as rain in the lower elevations. The National Weather

[1] River miles are provided in tenths of a mile beginning at the downstream end of the river or stream (designated as RM 0.0) and moving upstream.
[2] Unless otherwise indicted, elevation data are in United States Department of Commerce (USDOC), National Oceanic and Atmospheric Association (NOAA), National Geodetic Survey Vertical Datum of 1929 (NGVD 29).

Service (NWS) maintains a monitoring station (Number 044713) located at Blue Canyon, California. Blue Canyon is at elevation 5,280 ft, which is roughly the elevation mid-point of the Project Vicinity.[3] July air temperatures at Blue Canyon range from an average high of 77.3 degrees Fahrenheit (°F) to an average low of 59.3°F. The average high temperature for January is 43.6°F, while the average low temperature is 31.3°F. The annual average high and low temperatures for Blue Canyon are 58.3°F and 42.9°F, respectively. Annual mean total precipitation at Blue Canyon is 69.89 inches, most of which (65 percent) occurs from December through March. The summer months of June through August produce 2 percent of the total annual average precipitation. The remaining 33 percent of precipitation in the basins occur during spring and fall. Licensees obtained information concerning climate of Blue Canyon, California, from <http://www.wrcc.dri.edu/summary/climsmnca.html> in July 2010.

Provided below is a description of the portions of the basins and sub-basins in which each Project has facilities, and a description of river reaches affected by one or both of the projects.

2.1.4 Major Land Uses

Land within the basins has a patchwork of ownership. At the upper elevations above 3,000 feet, the Forest Service manages a majority of the land as part of the TNF. Other land managers and owners above 3,000 feet include private corporations such as timber companies, NID, PG&E and other private entities. Below 3,000 feet, land in the basin is predominantly privately-owned, with small portions owned by the United States and managed by the Forest Service as part of the TNF, and by the BLM as part of the Sierra Resource Management Area, and by the BOR. The portions of land within the Project Area[4] for each Project managed by federal agencies are administered according to their respective resource management plans (e.g., TNF Land and Resource Management Plan - TNF LRMP, 1990).

The counties are the primary agencies for establishing land use policies for private land within the basins. The County General Plans provide the land use policies for each county. Placer County adopted its General Plan in 1994; Nevada County adopted its General Plan in 1996, and Sierra County adopted its General Plan in 1996. In general, the majority of Placer, Nevada and Sierra county lands near the projects are designated for timber, grazing and open space uses. This is particularly true in the upper portions of the basins. At the lower elevations, the lands are more often designated by the counties for residential and agricultural uses.

2.1.5 Economic Activities

As described above, large portions of the basins in the upper elevations are forested, public lands managed by the Forest Service, with some private land owned mostly by timber companies, NID and PG&E. The major economic activities in these areas are related to timber, grazing, and recreation. Major economic activities in the lower elevations are also related to timber, grazing

[3] The Project Vicinity is the area surrounding the projects on the order of a United States Geological Survey (USGS) 1:24,000 scale topographic quadrangle.
[4] The Project Area is the area within the FERC Project Boundary.

and recreation especially near Rollins Reservoir, but because of the more rural and residential land uses, economic activities are more diverse (e.g., related to construction, government services, retail services and real estate).

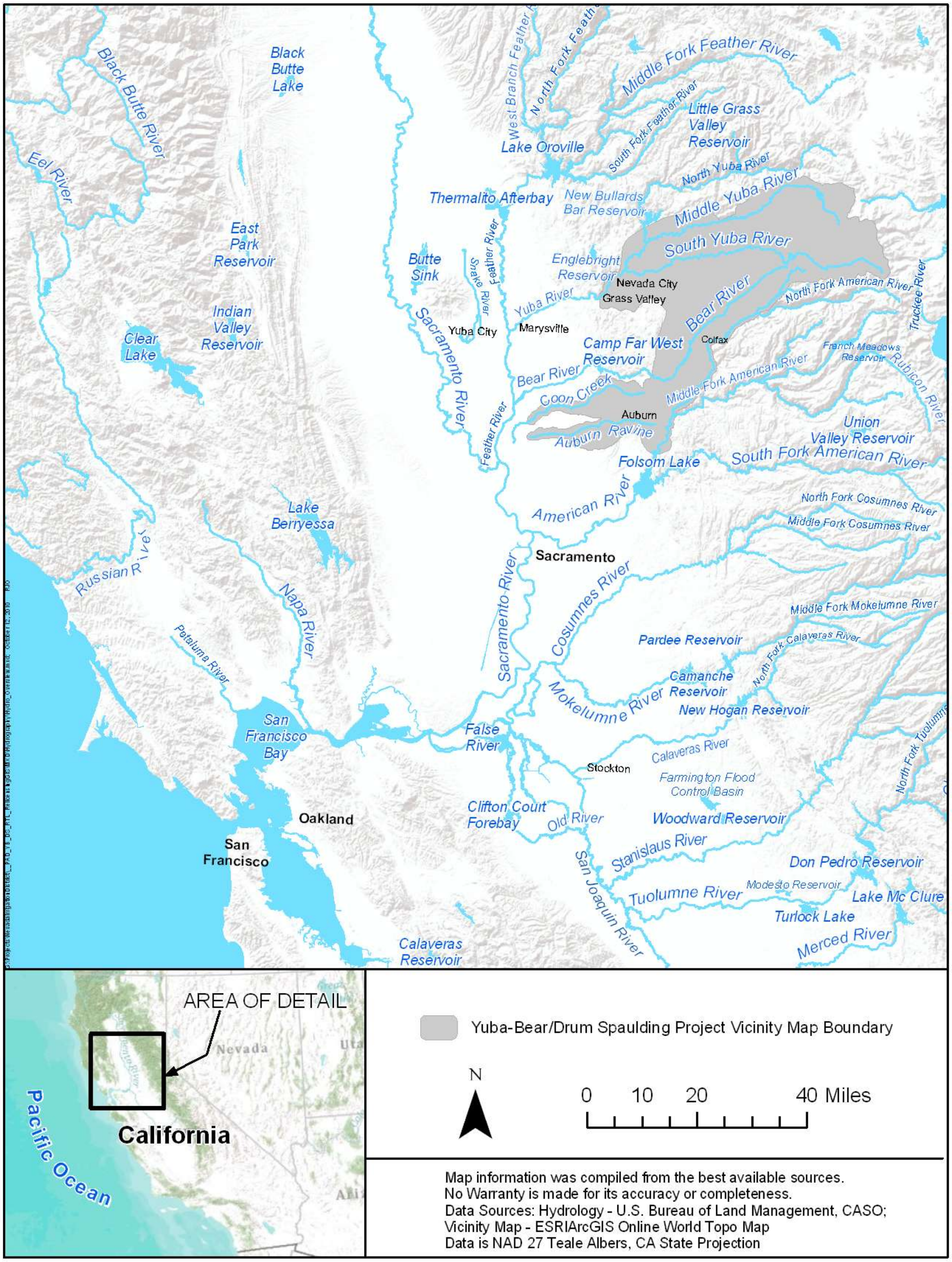

Figure 2.1-1. Basins in which the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project are located in relation to San Francisco Bay, California, and tributary watersheds.

2.2 Affected Sub-Basins

There are 45 main dams and 13 diversion dams (Project and non-Project) in the sub-basins that contain Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities. Table 2.2-1 shows the owners of these major dams and their associated reservoir capacities.

Table 2.2-1. Owners and capacities of dams in the vicinity of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

Owner	FERC No.	River/Tributary	Dam/Diversion	Useable Storage (ac-ft)
MIDDLE YUBA RIVER SUB-BASIN				
NID	2266	Middle Yuba River	Jackson Meadows Dam	64,641
NID	2266	Middle Yuba River	Milton Main and South Dam	295
NID	2266	Wilson Creek	Wilson Creek Diversion Dam	Negligible
YCWA	2246	Middle Yuba River	Our House Diversion Dam	Negligible
DEER CREEK SUB-BASIN				
NID	none	South Fork Deer Creek	Cascade Canal Diversion Dam[1]	Negligible
CANYON CREEK SUB-BASIN				
NID	2266	Jackson Creek	Jackson Lake Dam	975
NID	2266	Canyon Creek	French Lake Dam	13,940
NID	2266	Canyon Creek	Faucherie Lake Dam	3,740
NID	2266	Canyon Creek	Sawmill Lake Dam	3,030
NID	2266	Canyon Creek	Bowman-Spaulding Conduit Diversion Dam	Negligible
NID	2266	Canyon Creek	Bowman Lake Dam	68,127
NID	2266	Texas Creek	Texas Creek Diversion Dam	Negligible
PG&E	2310	Texas Creek	Upper Rock Lake Dam	207
PG&E	2310	Texas Creek	Lower Rock Lake Dam	48
PG&E	2310	Texas Creek	Culbertson Lake Dam	953
PG&E	2310	Texas Creek	Upper Lindsey Lake Dam	18
PG&E	2310	Texas Creek	Middle Lindsey Lake Dam	110
PG&E	2310	Texas Creek	Lower Lindsey Lake Dam	278
FALL CREEK SUB-BASIN				
PG&E	2310	Fall Creek	Feeley Lake Dam	739
PG&E	2310	Fall Creek	Carr Lake Dam	150
NID	2266	Clear Creek	Clear Creek Diversion	Negligible
NID	2266	Fall Creek	Fall Creek Diversion Dam	Negligible
NID	2266	Trap Creek	Trap Creek Diversion	Negligible
RUCKER CREEK SUB-BASIN				
PG&E	2310	Rucker Creek	Blue Lake Dam	1,158
PG&E	2310	Rucker Creek	Rucker Lake Dam	648
NID	2266	Rucker Creek	Rucker Creek Diversion	Negligible
SOUTH YUBA RIVER SUB-BASIN				
PG&E	2310	Unnamed Creek	Fuller Lake Dam	1,109
PG&E	2310	Fordyce Creek	Meadow Lake Dam	4,841
PG&E	2310	Fordyce Creek	White Rock Lake Dam	570
PG&E	2310	Fordyce Creek	Lake Sterling Dam	1,764
PG&E	2310	Fordyce Creek	Fordyce Lake Dam	49,426
PG&E	2310	South Yuba River	Kidd Lake Dam	1,505
PG&E	2310	South Yuba River	Upper Peak Lake Dam	1,736
PG&E	2310	South Yuba River	Lower Peak Lake Dam	484
PG&E	2310	South Yuba River	Lake Spaulding Dam	75,912

Table 2.2-1. (continued)

Owner	FERC No.	River/Tributary	Dam/Diversion	Useable Storage (ac-ft)
BEAR RIVER SUB-BASIN				
PG&E	2310	Off Channel	Drum Forebay Dam	436
PG&E	2310	Bear River	Drum Afterbay Dam	150.4
NID	2266	Off Channel	Dutch Flat No. 2 Forebay Dam	159.8
NID	2266	Bear River	Dutch Flat Afterbay Dam	1,359.2
NID	2266	Off Channel	Chicago Park Forebay Dam	103
NID	2266	Bear River	Rollins Dam	54,453
PG&E	2310	Bear River	Bear River Diversion Dam	Negligible
NID	none	Bear River	Van Giesen Dam (Lake Combie)	5,555
PCWA	none	Little Bear River	Lower Boardman Canal Diversion Dam	Negligible
NORTH FORK AMERICAN RIVER SUB-BASIN				
PG&E	2310	North Fork of the North Fork American	Lake Valley Dam	7,902
PG&E	2310	Sixmile Creek	Kelly Lake Dam	352
Private (unknown)	none	Sixmile Creek	Unnamed Dam (Snowflower Reservoir)[2]	Unknown
PG&E	2310	North Fork of the North Fork American	Lake Valley Canal Diversion Dam	Negligible
PG&E	2310	Canyon Creek (NF American tributary)	Towle Canal Diversion Dam	Negligible
PCWA	none	Canyon Creek (NF American tributary)	Pulp Mill Canal Diversion Dam[3]	Negligible
COON CREEK SUB-BASIN				
PG&E	2310	Rock Creek	Rock Creek Reservoir Dam	482
PCWA	none	Dry Creek	Lake Theodore Dam[4]	Unknown
PCWA	none	Dry Creek	Lake Arthur Dam[5]	Unknown
NID	none	Coon Creek	Camp Far West Canal Diversion Dam[6]	Negligible
PG&E	2310	Dry Creek	Halsey Afterbay Dam	76
AUBURN RAVINE SUB-BASIN[7]				
NID	none	Auburn Ravine	Auburn Ravine I Dam (diversion dam)	Negligible
NID	none	Auburn Ravine	Hemphill Dam (diversion dam)	Negligible
Private (Lincoln Ranch Duck Club)	none	Auburn Ravine	Lincoln Ranch Duck Club Dam (diversion dam)	Negligible
Private (Unknown)	none	Auburn Ravine	Nelson Lane Dam (diversion dam)	Negligible
Operated by SSWD	none	Auburn Ravine	Moore Dam (diversion dam)	Negligible
Private (Aitken)	none	Auburn Ravine	Aitken Ranch Dam (diversion dam)	Negligible
Private (Unknown)	none	Auburn Ravine	Tom Glen Dam (diversion dam)	Negligible
Operated by SSWD	none	Auburn Ravine	Coppin Dam (diversion dam)	Negligible
Operated by SSWD	none	Auburn Ravine	Pleasant Grove (diversion dam)	Negligible
Private (Unknown)	none	Auburn Ravine	Davis Dam (diversion dam)	Negligible

Table 2.2-1. (continued)

Owner	FERC No.	River/Tributary	Dam/Diversion	Useable Storage (ac-ft)
OFF-CHANNEL INTER-BASIN TRANSFER DAMS				
PG&E	2310	Off Channel	Deer Creek Forebay Dam	10.7
PG&E	2310	Off Channel	Alta Forebay Dam	19.4
PG&E	2310	Off Channel	Halsey Forebay Dam	238
PG&E	2310	Off Channel	Wise Forebay Dam	32

[1] Historically, PG&E's Deer Creek Development conveyed water to Deer Creek, just above NID's Cascade Diversion Dam, through coordinated operations with NID for water supply. In addition to delivering NID's water supply demand, PG&E also historically diverted water, as available, through Deer Creek Powerhouse to fully utilize water for power generation (i.e., if water otherwise would have been lost to both projects through spills). While Cascade Diversion Dam is not an NID Yuba-Bear Hydroelectric Project facility (and is not included in FERC's geographic scope for the projects), the water deliveries are addressed in this FLA (both historic and in the Proposed Projects). Therefore, there is no additional cumulative effect that the Licensees are aware of for this dam and it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[2] Snowflower Reservoir is a private reservoir on Sixmile Creek at RM 2.0. PG&E's Kelly Lake is 0.3 miles above Snowflower Reservoir. Both reservoirs are small and water that PG&E releases from Kelly Lake has no place else to go other than through Snowflower Reservoir and ultimately into the North Fork of the North Fork American River. As a result, Snowflower Reservoir does not have any additional cumulative effect it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[3] PCWA's Pulp Mill Canal Diversion Dam is a small, run-of-the-river diversion dam that serves as a backup delivery point for PCWA (primarily when Alta Powerhouse is off-line). Thus, the same water is delivered to one delivery point or the other for PCWA and there is no additional cumulative effect for those deliveries. As a result, Pulp Mill Canal Diversion Dam does not have any additional cumulative effect it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[4] Lake Theodore is a PCWA facility located on Dry Creek that is part of their Lower Boardman Canal water delivery system. The water deliveries are addressed in this FLA (both historic and in the Proposed Project). Therefore, there is no additional cumulative effect that the Licensees are aware of for this reservoir and it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[5] Lake Arthur Dam is downstream of Lake Theodore on Dry Creek and is also part of PCWA's Lower Boardman Canal water delivery system. PCWA's water deliveries are addressed in this FLA (both historic and in the Proposed Project). Therefore, there is no additional cumulative effect that the Licensees are aware of for this dam and it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[6] NID's Camp Far West Canal Diversion Dam is located on Coon Creek at RM 36 and is not a Yuba-Bear Hydroelectric Project facility. This diversion diverts water from Coon Creek and is part of NID's water delivery system. NID's water deliveries are addressed in this FLA (both historic and in the Proposed Project). Therefore, there is no additional cumulative effect that the Licensees are aware of for this dam and it is not further discussed in the cumulative effects analysis in the aquatic and water resources sections of this joint Exhibit E of this FLA.

[7] The cumulative effects related to all of the dams in this sub-basin are discussed in Exhibit E, Section 6.5 rather than in the cumulative effects section of water and aquatic resources because of the issues of threatened and endangered species (steelhead and critical habitat) that have been raised in this area.

2.2.1 Sub-Basins

Sub-basins in which Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities are located are shown in Figure 2.2-1 and described below.

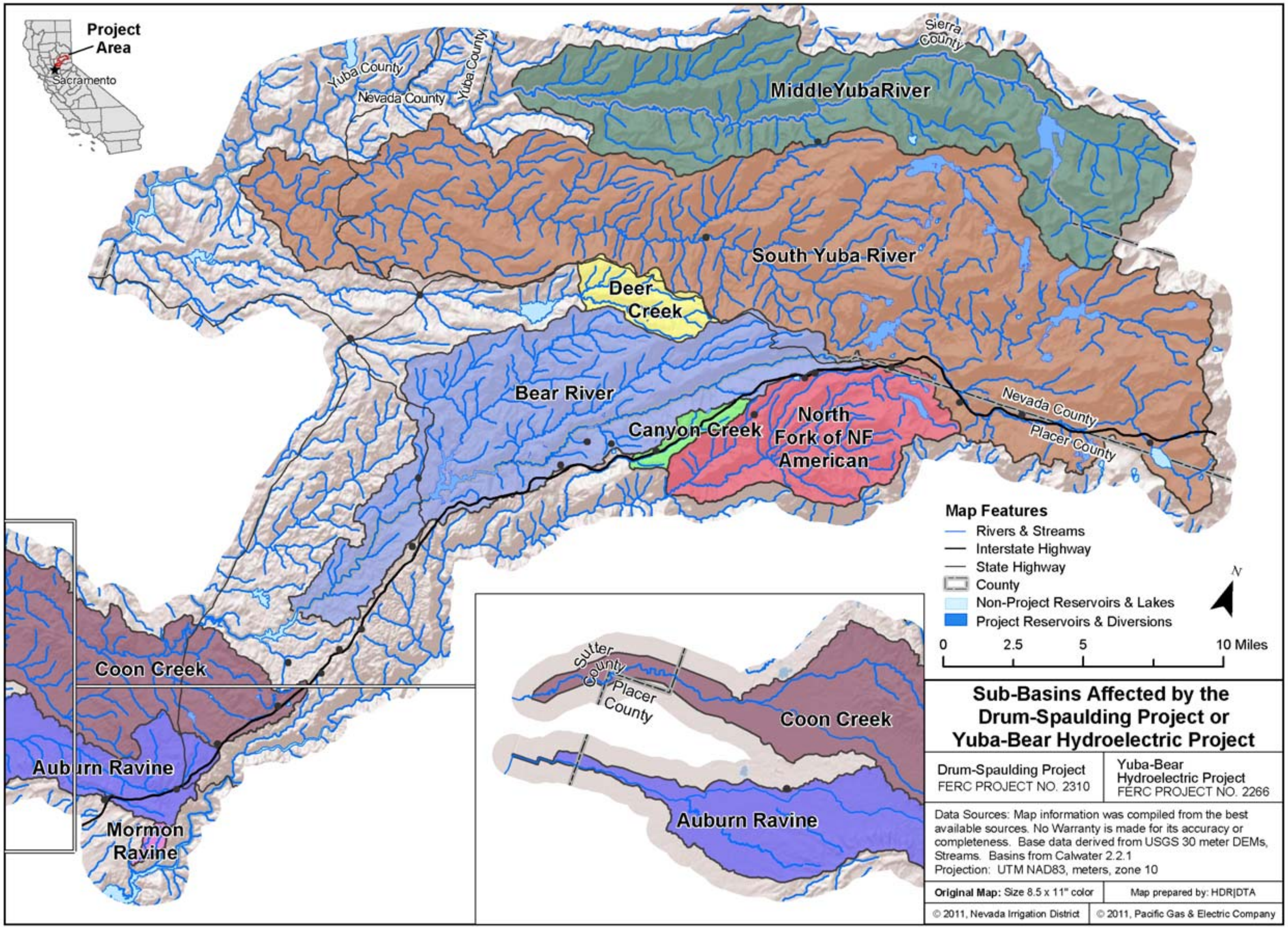

Figure 2.2-1. Sub-basins containing Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities.

2.2.1.1 Middle Yuba River Sub-Basin

The Middle Yuba River sub-basin, a tributary to the Yuba River Basin, originates at an elevation of approximately 7,200 ft along the northern side of Meadow Lake Hill, and converges with the North Yuba River at an elevation of about 1,350 ft, downstream of Yuba County Water Agency's (YCWA) New Bullards Bar Reservoir, which is part of FERC Project No. 2246, near the unincorporated town of North San Juan to form the main stem of the Yuba River. The Middle Yuba River upstream of YCWA's Our House Dam drains approximately 144.4 sq. mi. and has several major tributaries. These major unregulated tributaries include East Fork Creek, Bear Creek, Wolf Creek, Bloody Run, Kanaka Creek and Indian Creek.

Yuba-Bear Hydroelectric Project facilities on the Middle Yuba River include Jackson Meadows Dam, Milton Diversion Dam, and Milton-Bowman Conduit Inlet on the Middle Yuba River, and Wilson Creek Diversion Dam on Wilson Creek.

There are no Drum-Spaulding Project facilities on the Middle Yuba River, nor do Drum-Spaulding Project facilities divert any water from, or supply any water to, the Middle Yuba River.

2.2.1.2 South Yuba River, Canyon Creek, Fall Creek, Rucker Creek and Deer Creek Sub-Basins

The South Yuba River sub-basin forms at an elevation of about 7,200 ft near Donner Pass, and flows southwest to its confluence with the main stem of the Yuba River at the United States Army Corps of Engineers' (USACE) Englebright Reservoir. From Englebright Reservoir, the Yuba River flows southwest to the Feather River in Marysville.

The Canyon Creek sub-basin originates at an elevation of approximately 7,800 ft at Baltimore Lake, and flows west and southwest to just upstream of the town of Washington where it drains into the South Yuba River sub-basin at an elevation of about 3,000 ft.

Fall Creek forms at an elevation of about 6,800 ft near Feeley Lake and flows southwest to an elevation of about 3,200 ft where it enters the South Yuba River. Fall Creek has two main tributary streams: Clear and Trap creeks.

The Rucker Creek sub-basin originates at an elevation of about 5,900 ft near Blue Lake and flows southwest to an elevation of about 5,200 ft where it enters the South Yuba River, about 1.6 miles upstream of the Fall Creek confluence and 4.7 miles upstream of the Canyon Creek confluence. Texas Creek, a tributary to Canyon Creek, originates in the Grouse Ridge area near Upper Rock Lake, and flows west, where it drains into Canyon Creek at an elevation of approximately 4,700 ft.

The South Yuba River and its tributary sub-basins, including Canyon, Fall and Rucker creeks, drain approximately 344 sq. mi. of land upstream of the South Yuba River confluence with the mainstem Yuba River at Englebright Reservoir.

The South Yuba River Canyon Creek, Fall Creek, Rucker Creek and Deer Creek sub-basins can be divided into 13 areas, which contain facilities of one or both of the projects. These areas are:

- South Yuba River, Canyon Creek, Fall Creek, and Rucker Creek Sub-Basin Areas Affected by the Yuba-Bear Hydroelectric Project
  - The Yuba-Bear Hydroelectric Project does not include any facilities directly on the South Yuba River or Deer Creek sub-basins.
  - Canyon Creek from its headwaters to the confluence with Texas Creek. Yuba-Bear Hydroelectric Project facilities in this sub-basin include Jackson Lake Dam on Jackson Creek; and French Lake Dam, Faucherie Lake Dam, Sawmill Lake Dam, Bowman Lake Dam, the Bowman Powerhouse and Bowman-Spaulding Diversion on Canyon Creek. Other tributaries to the sub-basin upstream of the Texas Creek confluence are small and few, but include Celina Creek (unregulated).
  - Fall Creek from the headwaters of Clear and Trap creeks to their confluence with Fall Creek. Yuba-Bear Hydroelectric Project facilities in this sub-basin include the Bowman-Spaulding Conduit and diversions on Clear and Trap creeks, which divert flows into the Bowman-Spaulding Conduit.
  - Rucker Creek from the Bowman-Spaulding Conduit to the confluence with the South Yuba River. Yuba-Bear Hydroelectric Project facilities in this sub-basin include the Bowman-Spaulding Conduit.
- South Yuba River, Canyon Creek, Fall Creek, Rucker Creek and Deer Creek Sub-Basin Areas Affected by the Drum-Spaulding Project
  - South Yuba River sections of streams affected by the Drum-Spaulding Project include: 1) Fuller Lake Dam to Jordan Creek on an unnamed stream; 2) Jordan Creek Diversion Dam to the South Yuba River on Jordan Creek; 3) Meadow Lake Dam to Fordyce Lake on an unnamed stream; 4) White Rock Lake Dam on White Rock Creek to Fordyce Lake; 6) Lake Sterling Dam on Bloody Creek to Fordyce Lake; 7) Lake Fordyce Dam to Lake Spaulding on Fordyce Creek; 8) Kidd Lake Dam to the South Yuba River on an unnamed stream; 9) Lower Peak Lake Dam to the South Yuba Confluence on Cascade Creek; and 10) Lake Spaulding Dam to Canyon Creek confluence with the South Yuba River. This area includes the higher-elevation Drum-Spaulding Project reservoirs, including Meadow Lake, White Rock Lake, Lake Sterling, Kidd Lake, Upper Peak Lake, Lower Peak Lake, Fordyce Lake, and Lake Spaulding, along with Spaulding No. 1, No. 2, and No. 3 powerhouses.
  - Canyon Creek in the Grouse Ridge area along Texas and Lindsey creeks. Specifically, the affected reaches include Texas Creek from Upper Rock Lake Dam to the Yuba-Bear Hydroelectric Project's Bowman-Spaulding Conduit; Lindsey Creek from Upper Lindsey Lake to the Bowman-Spaulding Conduit; and an unnamed tributary from Culbertson Lake Dam to Texas Creek. Drum-Spaulding Project facilities in this sub-basin include Upper and Lower Rock lakes; Upper, Middle, and Lower Lindsey lakes, and Culbertson Lake.

- Fall Creek sub-basin areas affected by the Drum-Spaulding Project include Feeley Lake Dam to the Carr Creek confluence on Lake Creek. The Drum-Spaulding Project's Carr Lake and Feeley Lake are located on Fall Creek in the upper parts of the sub-basin above the Bowman-Spaulding Conduit.
- Rucker Creek sub-basin areas affected by the Drum-Spaulding Project include Blue Lake Dam to the Bowman-Spaulding Conduit. The Drum-Spaulding Project's Blue Lake and Rucker Lake are located on Rucker Creek above Bowman-Spaulding Conduit.
- Deer Creek sub-basin area affected by the Drum-Spaulding Project is the 0.1-mile long section of South Fork of Deer Creek from the tailrace of Deer Creek Powerhouse downstream to NID's Cascade Canal Diversion Dam.[5]

- South Yuba River, Canyon Creek, Fall Creek, and Rucker Creek Sub-Basin Areas Affected to Some Degree by Both the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project

  - South Yuba River from its confluence with Jordan Creek to the USACE's Englebright Reservoir; along Jordan Creek from the Drum-Spaulding Project's Jordan Creek Siphon to the confluence with the South Yuba River; and on the unnamed stream downstream of the Drum-Spaulding Project's Fuller Lake, from Fuller Lake Dam to the confluence with Jordan Creek. Project facilities in this sub-basin include the downstream portion of the Yuba-Bear Hydroelectric Project's Bowman-Spaulding Conduit. This sub-basin is affected by both projects for a variety of reasons. For example, the Drum-Spaulding Project manages the majority of the flow into and out of the sub-basin (i.e., Lake Spaulding) for both PG&E and NID. In addition, the Yuba-Bear Hydroelectric Project affects inflows into the South Yuba River from Jordan, Rucker, Fall, Texas and Canyon creeks and the unnamed stream downstream of Fuller Lake Dam through its operation of the Bowman-Spaulding Conduit, diversions and Bowman Lake.
  - Canyon Creek along Texas Creek from the Yuba-Bear Hydroelectric Project's Texas Creek Diversion Dam to the confluence with Canyon Creek, and along Canyon Creek from its confluence with Texas Creek to the South Yuba River. The sub-basin is affected by both projects because, under certain conditions (i.e., winter storage in Culbertson, Upper Rock, Lower Rock, Upper Lindsey, Middle Lindsey and Lower Lindsey lakes), the Drum-Spaulding Project as well as the Yuba-Bear Hydroelectric Project can influence flow in these portions of the sub-basin. Other notable tributaries to Canyon Creek downstream of the Texas Creek confluence are few, but include Little Canyon Creek near the confluence of Canyon Creek and the South Yuba River.
  - Fall Creek along Fall Creek from the Yuba-Bear Hydroelectric Project's Fall Creek Diversion Dam to Fall Creek's confluence with the South Yuba River. This sub-basin is affected by both projects because, under certain conditions (i.e., winter storage in Feeley and Carr lakes), the Drum-Spaulding Project and the Yuba-Bear Hydroelectric Project can influence flow in this portion of the sub-basin.

[5] The Cascade Diversion Dam is part of NID's water supply infrastructure, and is not part of the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project, or otherwise subject to FERC's jurisdiction.

- Rucker Creek along Rucker Creek from the Yuba-Bear Hydroelectric Project's Rucker Creek Diversion Dam to the South Yuba River. This sub-basin is affected by both projects because, under certain conditions (i.e., winter storage in Blue and Rucker lakes), the Drum-Spaulding Project as well as the Yuba-Bear Hydroelectric Project can influence flow in this portion of the sub-basin.

2.2.1.3 Bear River Sub-Basin

The Bear River originates at an elevation of approximately 4,900 ft at Bear Valley and flows into the Feather River northeast of the town of Nicolaus at an elevation of about 50 ft. The Bear River upstream of Lake Combie[6] drains approximately 124 sq. mi. of watershed. Due to the steep, narrow canyons through which the Bear River flows, the Bear River upstream of Lake Combie has few large tributaries, which include Little Bear Creek, Steephollow Creek and Greenhorn Creek; most small tributaries are unnamed.

The Bear River basin can be divided into three areas, portions of which are affected by one or both of the two projects.

- Bear River Sub-Basin Areas Affected by the Yuba-Bear Hydroelectric Project
  - Bear River from Dutch Flat Afterbay to the Drum-Spaulding Project's Bear River Canal Diversion Dam. Yuba-Bear Hydroelectric Project facilities in this sub-basin include Dutch Flat Afterbay Dam, Dutch Flat No. 2 Powerhouse, the Chicago Park Powerhouse and Rollins Dam.
- Bear River Sub-Basin Areas Affected by the Drum-Spaulding Project
  - Bear River from the inflow from Drum Canal (gage YB-137) to the Drum Afterbay Dam (noted on Table 2.2.2-1 as Bear River Reach #1 and #2), and along the Little Bear River from Alta Powerhouse to the Yuba-Bear Hydroelectric Project Dutch Flat Afterbay. Drum-Spaulding Project reservoirs and facilities in this portion of the sub-basin include South Yuba Canal, Drum Canal, Drum Forebay, Drum Afterbay, Drum No. 1 and No. 2 powerhouses, and Alta Powerhouse. With regard to Bear River Reaches #1 and #2, PG&E does not divert water from these reaches, and, aside from a stream gage, PG&E does not have any Project facilities in these reaches. PG&E believes that in the Proposed Projects, Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches with NID because water from both projects is anticipated to be periodically moved through the reaches as is currently the case. NID disagrees with PG&E for three reasons. First, NID's Yuba-Bear Hydroelectric Project has no facilities in this section of the Bear River. Second, under historic as well as current conditions, PG&E at its sole discretion and without request by NID, releases water from Drum Canal into the Bear River at RM 35.3. Third, at this time, NID has made no decision regarding whether releases from the Drum Canal into the Bear River at RM 35.3 might be

[6] Lake Combie is part of NID's water supply infrastructure, and is not part of the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project. It is under FERC's jurisdiction as part of an exempt project.

beneficial to NID in the future, and has not requested that PG&E include such releases in PG&E's application for a new Drum-Spaulding Project license.

- Bear River Sub-Basin Areas Affected to Some Degree by Both the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project
  - Bear River from the Drum-Spaulding Project's Drum Afterbay Dam to the Yuba-Bear Hydroelectric Project's Dutch Flat Afterbay and from the Drum-Spaulding Project's Bear River Canal Diversion to NID's Lake Combie. These portions of the sub-basin are affected by both projects because operation of each Project may have effects in the reaches of the Bear River between the Drum Afterbay Dam and the Dutch Flat Afterbay through the diversions for the Yuba-Bear Hydroelectric Project's Dutch Flat No. 2 Powerhouse and the Drum-Spaulding Project's Dutch Flat No. 1 Powerhouse (both from Drum Afterbay), and in the reach downstream of the Bear River Canal Diversion because of the Drum-Spaulding Project's operation of that canal and the Yuba-Bear Hydroelectric Project's operation of Rollins Reservoir, immediately upstream of the Bear River Canal Diversion Dam.

2.2.1.4 North Fork American River Sub-Basin

The Drum-Spaulding Project has facilities in the North Fork American River sub-basin including the North Fork of the North Fork American River and Canyon Creek.[7] The North Fork of the North Fork American River originates at an elevation of approximately 6,500 ft just above Lake Valley Reservoir and flows southwest to its confluence with the North Fork American River just southeast of the town of Alta. Canyon Creek begins at an elevation of approximately 4,500 ft near Blue Canyon and flows into the North Fork American River just southeast of the town of Magra.

The portion of the sub-basin affected by the Drum-Spaulding Project is from the Project's Lake Valley Reservoir and Kelly Lake downstream to the confluence with the North Fork American River, and along Canyon Creek (tributary to the North Fork American River) from RM 10.1 at the point of inflow from Drum Forebay to the Placer County Water Agency's Pulp Mill Canal Diversion. The Drum-Spaulding Project's facilities in the sub-basin include Lake Valley Reservoir, Kelly Lake, Lake Valley Canal Diversion Dam, the Towle Diversion and Towle Canal Diversion Dam.

There are no Yuba-Bear Hydroelectric Project facilities in the North Fork American River sub-basin, nor do Yuba-Bear Hydroelectric Project facilities divert any water from or supply any water to the North Fork American River.

[7] There are two streams named Canyon Creek that are affected by the two projects; the larger of the two is tributary to the South Yuba River, the smaller is tributary to the North Fork American River. For clarity, where the smaller Canyon Creek, tributary to the North Fork American River, is referred to, the text includes the receiving stream name in parentheses as follows: Canyon Creek (NF American tributary).

2.2.1.5 Coon Creek and Auburn Ravine Sub-Basins

These streams flow due west out of the foothills and into the flat California Central Valley to the South Sutter Water District's (SSWD) East Side Canal, a non-Project facility. This canal then flows into the Sacramento River just upstream of the City of Sacramento.

There are two sub-basins affected by the Drum-Spaulding Project:

- Dry Creek in the Coon Creek sub-basin from Halsey Afterbay to the privately-owned Red Hawk Ranch Reservoir, and along Rock Creek from Rock Creek Reservoir to the confluence of Rock and Dry creeks. Dry Creek and Rock Creek are tributaries to Coon Creek. Drum-Spaulding Project facilities in the sub-basin are located only on Dry Creek and Rock Creek, and include Halsey Afterbay, Halsey Powerhouse and Rock Creek Reservoir.
- Auburn Ravine in the Auburn Ravine sub-basin from the point of discharge of the Wise powerhouses downstream to the PCWA Auburn Tunnel outflow (Upper Auburn Ravine), where PCWA can import up to 50 cfs from the North Fork American River. Drum-Spaulding Project facilities in this sub-basin include Wise Powerhouse, Wise No. 2 Powerhouse, and South Canal. Lower Auburn Ravine, which extends from PCWA's Auburn Tunnel outflow approximately 26.4 miles to the South Sutter Water District's East Side Canal is discussed further in this Exhibit E, Section 6.5 and in PG&E's Western Placer County Streams Technical Memorandum (3-13).

There are no Yuba-Bear Hydroelectric Project facilities in the Coon Creek or Auburn Ravine sub-basins, nor do Yuba-Bear Hydroelectric Project facilities divert any water from or supply any water to Coon Creek or Auburn Ravine.

2.2.1.6 Mormon Ravine Sub-Basin

The section of the Mormon Ravine sub-basin affected by the Drum-Spaulding Project extends from the point of inflow from the Newcastle Powerhouse Header Box 0.3 mile above BOR's Central Valley Project's (CVP) Folsom Lake.

There are no Yuba-Bear Hydroelectric Project facilities in the Mormon Ravine sub-basin, nor do Yuba-Bear Hydroelectric Project facilities divert any water from or supply any water to Mormon Ravine.

2.3 Description of River Reaches and River Mile Designations

Table 2.2.2-1 provides by basin, sub-basin and stream, a description of river reaches affected by the Yuba-Bear Hydroelectric Project or the Drum-Spaulding Project or both projects, including for each reach: 1) upstream and downstream and points with river mile designations; 2) length; 3) drainage area; and 4) which projects affect the reach. Each of the reaches listed in Table 2.2.2-1 is affected by one or both of the projects.

Based on Table 2.2.2-1, the Yuba-Bear Hydroelectric Project has a potential to directly/indirectly affect 12 river reaches that have a total length of 54.3 river miles (i.e., those reaches in Table 2.2.2-1 which have an "X" in the last column labeled "Yuba-Bear Hydroelectric Project FLA" but not an "X" in the second to last column labeled "Drum-Spaulding Project FLA"). Three of the reaches are less than 1 mile long; five of the reaches are between 1 and 2 miles in length; one reach is 3 miles long; one is 4.4 miles long; one is 5.4 miles long; and the longest reach (Milton Diversion Dam Reach) is 32.0 miles (60 percent of the total).

Based on Table 2.2.2-1, the Drum-Spaulding Project has a potential to directly/indirectly affect 37 river reaches that have a total length of 82.0 river miles (i.e., those reaches in Table 2.2.2-1 which have an "X" in the second to last column labeled "Drum-Spaulding Project FLA" but not an "X" in the last column labeled "Yuba-Bear Hydroelectric Project FLA," excluding the Lower Auburn Ravine Reach). Eighteen of the reaches are less than 1 mile long; six reaches are between 1 and 2 miles long; six reaches are between 2 and 3 miles long; three reaches are between 3 and 4 miles long; and the remaining reaches are 7.6, 10.5, 12.2 and 13.2 miles long.

Jointly to some degree, the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project have the potential to affect an additional 14 river reaches that have a total length of 67.9 river miles (i.e., those reaches in Table 2.2.2-1 which have an "X" in the second to last column labeled "Drum-Spaulding Project FLA" and an "X" in the last column labeled "Yuba-Bear Hydroelectric Project FLA"). Six of these reaches are 2.0 miles or less in length; four reaches are between 3 and 4 miles long; one reach is 6.1 miles long; and three reaches are longer than 8 miles.

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Table 2.2.2-1. List of stream reaches potentially affected by Pacific Gas and Electric Company's Drum-Spaulding Project, FERC Project No. 2310 (Project facilities shown in red font) or Nevada Irrigation District's Yuba-Bear Hydroelectric Project, FERC Project No. 2266 (Project facilities shown in blue font), or both.

Basin	Sub-basin	Stream	Reach Name	Stream Section (River Mile)[1]		Reach Length	Drainage Area Upstream of Reach[2]	Final License Application Where Each Reach is Addressed	
				Upstream End	Downstream End	(miles)	(square miles)	Drum-Spaulding Project FLA	Yuba-Bear Hydroelectric Project FLA
Yuba River	Middle Yuba River	Middle Yuba River	Jackson Meadows Dam Reach	Jackson Meadows Dam (RM 47.1)	Milton Diversion Dam Impoundment (RM 45.5)	1.6	37.3		X
			Milton Diversion Dam Reach	Milton Diversion Dam (RM 44.8)	YCWA's[3] Our House Dam (RM 12.8)	32.0	39.8		X
		Wilson Creek	Wilson Creek Diversion Reach	Milton-Bowman Diversion Conduit (RM 0.3)	Middle Yuba River Confluence (RM 0.0)	0.3	0.82		X
	Deer Creek	South Fork Deer Creek	Deer Creek Powerhouse Reach	Deer Creek Powerhouse (RM 3.0)	NID's[4] Cascade Canal Diversion Dam (RM 2.9)	0.1	4.32	X	
	Canyon Creek	Jackson Creek	Jackson Lake Dam Reach	Jackson Lake Dam (RM 3.0)	Bowman Lake (RM 0.0)	3.0	0.70		X
		Canyon Creek	French Lake Dam Reach	French Lake Dam (RM 18.4)	Faucherie Lake (RM 17.0)	1.4	4.82		X
			Faucherie Lake Dam Reach	Faucherie Lake Dam (RM 16.5)	Sawmill Lake (RM 14.7)	1.8	9.29		X
			Sawmill Lake Dam Reach	Sawmill Lake Dam (RM 14.0)	Bowman Lake (RM 13.2)	0.8	17.0		X
			Bowman-Spaulding Diversion Dam Reach	Bowman-Spaulding Diversion Dam (RM 10.5)	Texas Creek Confluence (RM 6.1)	4.4	28.5		X
			Canyon Creek below Texas Creek Confluence Reach	Texas Creek Confluence (RM 6.1)	South Yuba River Confluence (RM 0.0)	6.1	39.4	X	X
		Texas Creek	Upper Rock Lake Dam Reach	Upper Rock Lake Dam (RM 5.0)	Lower Rock Lake (RM 4.9)	0.1	0.18	X	
			Lower Rock Lake Dam Reach #1	Lower Rock Lake Dam (RM 4.7)	Lindsey Creek Confluence (RM 1.1)	3.6	0.29	X	
			Lower Rock Lake Dam Reach #2	Lindsey Creek Confluence (RM 1.1)	Bowman-Spaulding Conduit (RM 0.6)	0.5	2.9	X	
			Texas Creek Diversion Dam Reach	Bowman-Spaulding Conduit (RM 0.6)	Canyon Creek Confluence (RM 0.0)	0.6	4.60	X	X
		Unnamed Tributary	Culbertson Lake Dam Reach	Culbertson Lake Dam (RM 0.2)	Texas Creek Confluence (RM 0.0)	0.2	0.47	X	
		Lindsey Creek	Upper Lindsey Lake Dam Reach	Upper Lindsey Lake Dam (RM 2.6)	Middle Lindsey Lake (RM 2.5)	0.1	0.16	X	
			Middle Lindsey Lake Dam Reach	Middle Lindsey Lake Dam (RM 2.1)	Lower Lindsey Lake (RM 1.8)	0.3	0.37	X	
			Lower Lindsey Lake Dam Reach	Lower Lindsey Lake Dam (RM 1.4)	Texas Creek Confluence (RM 0.0)	1.4	0.88	X	
	Fall Creek	Clear Creek	Clear Creek Diversion Dam Reach	Bowman-Spaulding Conduit (RM 0.9)	Fall Creek Confluence (RM 0.0)	0.9	1.48		X
		Lake Creek	Feeley Lake Dam Reach	Feeley Lake Dam (RM 2.5)	Carr Lake (RM 2.4)	0.1	0.40	X	
			Carr Lake Dam Reach # 1	Carr Lake Dam (RM 2.2)	Fall Creek Confluence (RM 0.0)	2.2	0.48	X	
		Fall Creek	Carr Lake Dam Reach # 2	Lake Creek Confluence (RM 3.3)	Bowman-Spaulding Conduit (RM 2.0)	1.3	5.3	X	
			Fall Creek Diversion Dam Reach	Bowman-Spaulding Conduit (RM 2.0)	South Yuba River Confluence (RM 0.0)	2.0	5.81	X	X
		Trap Creek	Trap Creek Diversion Dam Reach	Bowman-Spaulding Conduit (RM 1.2)	Fall Creek Confluence (RM 0.0)	1.2	0.60		X
	Rucker Creek	Rucker Creek	Blue Lake Dam Reach	Blue Lake Dam (RM 2.9)	Rucker Lake (RM 2.2)	0.7	0.24	X	
			Rucker Lake Dam Reach	Rucker Lake Dam (RM 1.6)	Bowman-Spaulding Conduit (RM 1.2)	0.4	1.65	X	
			Rucker Creek Diversion Dam Reach	Bowman-Spaulding Conduit (RM 1.2)	South Yuba River Confluence (RM 0.0)	1.2	1.74	X	X
	South Yuba River	Unnamed Tributary	Fuller Lake Dam Reach	Fuller Lake Spillway (RM1.0)	Jordan Creek Confluence (RM 0.0)	1.0	0.54	X	X
		Jordan Creek	Jordan Creek Diversion Reach	Jordan Canal Diversion Dam (RM 1.7)	South Yuba River Confluence (RM 0.0)	1.7	0.24	X	X
		Unnamed Tributary	Meadow Lake Dam Reach	Meadow Lake Dam (RM 1.4)	Fordyce Lake (RM 0.0)	1.4	1.30	X	
		White Rock Creek	White Rock Lake Dam Reach #1	White Rock Lake Dam (RM 2.7)	North Creek Confluence (RM 0.0)	2.7	1.17	X	
		North Creek	White Rock Lake Dam Reach #2	White Rock Creek Confluence (RM 2.2)	Fordyce Lake (RM 0.0)	2.2	3.13	X	
		Bloody Creek	Lake Sterling Dam Reach	Lake Sterling Dam (RM 0.3)	Fordyce Lake (RM 0.0)	0.3	1.06	X	
		Fordyce Creek	Fordyce Lake Dam Reach	Fordyce Lake Dam (RM 10.5)	Lake Spaulding (RM 0.0)	10.5	31.29	X	
		Tributary to South Yuba River	Kidd Lake Dam Reach	Kidd Lake Dam (RM 0.7)	South Yuba River Confluence (RM 0.0)	0.7	0.56	X	
		Cascade Creek	Lower Peak Lake Dam Reach	Lower Peak Lake Dam (RM 1.1)	South Yuba River Confluence (RM 0.0)	1.1	1.01	X	
		South Yuba River	Upper South Yuba Reach #1	Kidd Lake Dam Reach Confluence (RM 56.1)	Cascade Creek Confluence (RM 55.5)	0.6	26.46	X	
			Upper South Yuba Reach #2	Cascade Creek Confluence (RM 55.5)	Lake Spaulding (RM 43.3)	12.2	29.38	X	
			South Yuba below Spaulding Dam Reach	Lake Spaulding Dam (RM 41.1)	Spaulding No. 2 Powerhouse (RM 40.9)	0.2	117.7	X	
			South Yuba below Spaulding No. 2 Powerhouse Reach	Spaulding No. 2 Powerhouse (RM 40.9)	Jordan Creek Confluence (RM 40.2)	0.7	118.3	X	
			South Yuba Reach #1 (Jordan Creek Confluence Reach)	Jordan Creek Confluence (RM 40.2)	Rucker Creek Confluence (RM 37.0)	3.2	120.0	X	X
			South Yuba Reach #2 (Rucker Creek Confluence Reach)	Rucker Creek Confluence (RM 37.0)	Fall Creek Confluence (RM 35.6)	1.4	126.3	X	X
			South Yuba Reach #3 (Fall Creek Confluence Reach)	Fall Creek Confluence (RM 35.6)	Canyon Creek Confluence (RM 32.4)	3.2	136.0	X	X

Table 2.2.2-1. (continued)

Basin	Sub-basin	Stream	Reach Name	Stream Section (River Mile)[1] Upstream End	Stream Section (River Mile)[1] Downstream End	Reach Length (miles)	Drainage Area Upstream of Reach[2] (square miles)	Final License Application Where Each Reach is Addressed: Drum-Spaulding Project FLA	Final License Application Where Each Reach is Addressed: Yuba-Bear Hydroelectric Project FLA
Yuba River (continued)	South Yuba River (continued)	South Yuba River (continued)	South Yuba Reach #4 (Canyon Creek Confluence Reach)	Canyon Creek Confluence (RM 32.4)	Poorman Creek Confluence (RM 28.0)	4.4	187.0	X	X
			South Yuba Reach #5 (Poorman Creek Confluence Reach)	Poorman Creek Confluence (RM 28.0)	Humbug Creek Confluence (RM 19.5)	8.5	222.0	X	X
			South Yuba Reach #6 (Humbug Creek Confluence Reach)	Humbug Creek Confluence (RM 19.5)	USACE's[5] Englebright Reservoir (RM 0.0)	19.5	255.0	X	X
Bear River	Bear River	Bear River	Bear River Reach #1	Inflow from Drum Canal YB-137 (RM 35.3)	Inflow from Drum Canal YB-139 (RM 35.0)	0.3	0.78	X[10]	
			Bear River Reach #2	Inflow from Drum Canal YB-139 (RM 35.0)	Drum Afterbay (RM 27.4)	7.6	1.62	X[10]	
			Drum Afterbay Dam Reach	Drum Afterbay Dam (RM 26.9)	Dutch Flat Afterbay (RM 22.2)	4.7	11.9	X	X
			Dutch Flat Afterbay Dam Reach	Dutch Flat Afterbay Dam (RM 21.3)	Chicago Park Powerhouse (RM 15.9)	5.4	21.2		X
			Chicago Park Powerhouse Reach	Chicago Park Powerhouse (RM 15.9)	Rollins Reservoir (RM 14.4)	1.5	27.5		X
			Bear River Canal Diversion Dam Reach	Bear River Canal Diversion Dam (RM 10.4)	NID's Lake Combie (RM 0.0)	10.4	103.6	X	X
		Little Bear River	Alta Powerhouse Reach	Alta Powerhouse (RM 2.0)	Dutch Flat Afterbay (RM 0.0)	2.0	1.58	X	
American River	NF American River	NF of NF American River	Lake Valley Reservoir Dam Reach	Lake Valley Reservoir Dam (RM 16.3)	Lake Valley Canal Diversion Dam (RM 13.2)	3.1	4.36	X	
			Lake Valley Canal Diversion Dam Reach	Lake Valley Canal Diversion Dam (RM 13.2)	North Fork American River Confluence (RM 0.0)	13.2	9.01	X	
		Sixmile Creek	Kelly Lake Dam Reach	Kelly Lake Dam (RM 2.3)	Thousand Trails's[6] Snowflower Reservoir (RM 2.0)	0.3	0.53	X	
		Canyon Creek (NF American tributary)	Canyon Creek Above Towle Canal Diversion Dam Reach	Towle Diversion - from Drum Forebay (RM 10.1)	Towle Canal Diversion Dam (RM 9.3)	0.8	0.91	X	
			Towle Canal Diversion Dam Reach	Towle Canal Diversion Dam (RM 9.3)	PCWA's[7] Pulp Mill Canal Diversion Dam (RM 5.6)	3.7	1.56	X	
	Mormon Ravine	Mormon Ravine	Mormon Ravine Reach	Inflow from Newcastle Powerhouse Header Box (RM 0.3)	USBR's[8] Folsom Lake (RM 0.0)	0.3	1.44	X	
Sacramento River	Coon Creek	Rock Creek	Rock Creek Dam Reach	Rock Creek Reservoir Dam (RM 2.1)	Dry Creek Confluence (RM 0.0)	2.1	2.18	X	
		Dry Creek	Halsey Afterbay Dam Reach	Halsey Afterbay Dam (RM 6.0)	Red Hawk Ranch's Unnamed Reservoir (RM 3.8)	2.2	3.07	X	
			Lower Dry Creek Reach	Rock Creek Confluence (RM 1.6)	Orr Creek Confluence (RM 0.0)	1.6	2.36	X	
	Auburn Ravine	Auburn Ravine	Wise Powerhouse Overflow Reach (Upper Auburn Ravine)	Wise Powerhouses (RM 27.6)	PCWA's Auburn Tunnel (RM 26.4)	1.2	9.9	X	
			Lower Auburn Ravine Reach (reach that is cumulatively-affected by numerous entities)	PCWA's Auburn Tunnel (RM 26.4)	SSWD's[9] East Side Canal (RM 0.0)	26.4	12.2	X	

1 In general, river reaches extend from one watershed feature (e.g., base of a dam, powerhouse discharge, and confluence with a stream) to another. Where the downstream feature is a reservoir, the reach extends to the upstream end of the normal maximum water surface elevation (NMWSE) of the reservoir.
2 Drainage area upstream of upstream end of reach.
3 Yuba County Water Agency (YCWA)
4 Nevada Irrigation District; not a part of the Yuba-Bear Hydroelectric Project (FERC Project No. 2266)
5 United States Army Corps of Engineers (USACE)
6 Thousand Trails is a private camping club.
7 Placer County Water Agency (PCWA)
8 United States Department of Interior, Bureau of Reclamation (BOR)
9 South Sutter Water District (SSWD)
10 As noted in Section 2.2.1.3, PG&E believes that Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches. NID disagrees with PG&E.

SECTION 3
CUMULATIVE EFFECTS – GEOGRAPHIC AND TEMPORAL SCOPE

Pursuant to 18 CFR § 5.18(b)(2), this section, *inter alia*, lists the cumulatively affected resources and the temporal scope of the analysis for those resources.

According to the Council on Environmental Quality's regulations for implementing the National Environmental Protection Act (NEPA), an action may cause cumulative effects if its impacts overlap in space and/or time with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time, including hydropower and other land and water development activities.

3.1 Cumulatively Affected Resources

FERC's revised Scoping Document 2 dated October 6, 2008 (revised SD2), states that water resources and aquatic resources have the potential to be cumulatively affected by one or both of the projects' continued O&M in combination with other activities that occur in the watersheds.

3.2 Geographic Scope of Analysis for Cumulatively Affected Resources

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effect on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary. In revised SD2, FERC stated that:

> For water resources and aquatic resources, the geographic scope for cumulative effects extends generally from the headwaters of the various project waterbodies downstream to Englebright Lake on the South Yuba River, Our House Dam on the Middle Yuba River, Lake Combie on the Bear River and Folsom Lake on the American River.[1]

[1] Although FERC did not specifically note whether it viewed Auburn Ravine as a cumulatively affected resource, in the attachment to FERC's July 23, 2010 Determination on Requests for Modifications to the Yuba-Bear, Drum-Spaulding, and Rollins Projects' Study Plan, FERC stated that, based on the information that was included in Licensees' Technical Memorandum 3-13, "we preliminarily conclude that there is a nexus between the project and flows delivered to both the upper and lower reaches of Auburn Ravine--although the strength of the nexus is variable by season (study criteria 5). During the irrigation season (mid-April to mid-October), the water discharges from the project into Auburn Ravine are largely dictated by irrigators and not project operations. However, outside of the irrigation season (mid-October to mid-April), water discharges into Auburn Ravine appear to be dictated by project operations." In the same correspondence, FERC also stated that: "Staff has determined that it has sufficient information to evaluate the need for minimum instream flows, ramping rates, and spill flow limitations for Auburn Ravine. The licensees, however, shall include a detailed discussion in the draft license application of the operations of the Wise powerhouse and associated canal systems, and the facility's operational capabilities and/or limitations for providing ramping rates, minimum instream flows, and attenuating of spill flows to Auburn Ravine." PG&E

3.3 Temporal Scope of Analysis for Cumulatively Affected Resources

The temporal scope of cumulative analysis includes past, present, and future actions and their possible cumulative effects on each resource listed above. Based on the license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effect of reasonably foreseeable future actions on the resources. The historical discussion is, by necessity, limited to the amount of available information for each resource.

3.4 Past, Present and Reasonably Foreseeable Future Actions

According to the requirements of 18 CFR § 5.18(b)(2), Licensee must: "Include a brief discussion of past, present, and future actions, and their effects on resources based on the new license term (30-50 years). Highlight the effect on the cumulatively affected resources from reasonably foreseeable future actions. Discuss past actions' effects on the resource in the Affected Environment section." These actions are discussed further below, without consideration of the added effects, if any, of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

Consistent with revised SD2 and FERC's comments to Licensees' respective DLAs, Exhibit E Sections 6.2.3 (in Water Resources), and 6.3.3 (in Aquatic Resources) discuss the effect of these past, present and future activities in conjunction with the cumulative effects of the proposed projects and other projects in the watershed.[2]

3.4.1 Historical Dam Construction and Water Diversions

Water and aquatic resources in the Yuba River and Bear River basins have been affected by dam construction and water diversions since the mid 1850s. The first inter-basin diversion of Bear River water began in 1851 via the Bear River Canal that diverted water from the Bear River to the Auburn area for water supply and milling operations. These inter-basin diversions were supplemented in 1852-53 when the Upper Boardman Canal on Bear River and the South Yuba Canal on the South Yuba River began diverting water. French Dam on Canyon Creek and English Meadow Dam on the Middle Yuba River were constructed by gold miners in 1859. Bowman and Faucherie dams, both on Canyon Creek, were constructed in 1872 to support hydraulic mining. Spaulding Dam was constructed on the South Yuba River in 1892 and was enlarged to its present size in 1913. In 1910, the California Debris Commission constructed Daguerre Point Dam on the lower Yuba River near Marysville (downstream of present-day Englebright Reservoir) to capture sediment, much of it laden with mercury from mining, washing down from the upper river. In 1924, the USACE installed fish ladders at Daguerre Point Dam, but these ladders were washed out during winter storms in 1927-28. Although

has provided this information in Appendix E9 to this Exhibit E. This issue is also further discussed in Section 6.5 (Threatened and Endangered Species) of this Exhibit E.

[2] PG&E also discusses certain cumulative effects in Section 6.5.4.2.4 (in Threatened and Endangered Species, with respect to anadromous fish in Auburn Ravine).

USACE rebuilt the ladders, passage at the dam was considered to remain impeded until about 1951-52 when fish ladders were provided. In 1926, Milton Diversion Dam, Milton-Bowman and Bowman-Spaulding conduits were constructed to divert water from the Middle Yuba River and Canyon Creek to the Bear River and Deer Creek (via Lake Spaulding) to support developing communities in Nevada and Placer counties. In 1941, the Debris Commission constructed a second dam, the 280-foot-high Englebright Dam, in the lower Yuba River upstream of Daguerre Point Dam, to capture mercury-laden sediment from mining. This dam blocks upstream passage of anadromous fish into the upper Yuba River watershed.

All of these activities had substantial effects on water and aquatic resources. The dams captured sediment that otherwise would have moved downstream, which affected aquatic habitat. The dams also stored water, which created flatwater recreation opportunities, including fishing in the new reservoirs, and affected the flow and quality of water below the dams. Peak flows were generally captured as storage, and releases, if any, from some of the dams were very low. Flows in the streams were also affected by diversions for water supply, which resulted in reduced flows in some sections of streams, such as below Milton Diversion Dam on the Middle Yuba River, and increased flows in other sections of stream, such as the Bear River below Rollins Dam.

In more recent years additional dams and diversions have been constructed throughout the watersheds by various entities, which have had also had similar effects (e.g. captured sediment, and new recreation opportunities) in the watersheds. Table 2.2-1 in Section 2 of this Exhibit E of this FLA provides a current list (based on the best information available to Licensees at this time) of the owners and the capacities of dams in the vicinity of the two projects, including those that are associated with the NID Yuba-Bear Hydroelectric Project and the PG&E Drum-Spaulding Project.

3.4.2 Mining

As mentioned above, most historical dams and diversions were put in place to support mining and the communities that were established to support mining activities. The effects of these historical dams on water quality and quantity are described above. Mining caused other aquatic habitat effects, most notably due to changes in channel morphology and sediment. Mining changed parts of the Yuba River, including the Middle and South Yuba rivers, and the Bear River from a supply-limited system to a transport-limited system. Erosion of stored placer deposits from gold mining is the primary contributor to annual sediment yield (James 1988). Much of the sediment produced by incision into mining tailing deposits was deposited near the aggrading confluences of Steephollow and Greenhorn creeks with the Bear River, and the mining sediment deposits currently form deltas in Rollins Reservoir (James 2004) and Englebright Reservoir. Some alluvial fans created by sand and gravel from mining tailings were so large that they completely filled the main channel in much of the Bear River (James 2004).

Current geomorphologic processes of many of the larger channels of Middle and South Yuba rivers and the Bear River, and to a lesser extent the North Fork of the North Fork American River, are still dominated by mining effects. Mining activities continue to modify the in-stream and near-stream environment due to, among other things, excavation of the sediments in and near the channel, washing and sorting of sediments, camping associated with mining, and floods that continue to re-distribute the mining tailings. Historic and current mining activities destabilize fledgling riparian growth, streambed, and banks. Historic mining created huge sediment deposits through which many channels continue to work. These deposits are non-cohesive, droughty (i.e., do not retain water well), and are not conducive to strong riparian growth.

3.4.3 Land Management

In 1905, the federal government created the TNF to manage timber harvesting, grazing and other resources; these activities led to the construction of numerous roads in the basins, which, in turn, attracted recreationists to the area. Along with the federal government, private companies, such as Sierra Pacific Industries (SPI), cleared trees from slopes and built roads to meet the increasing demand for timber supplies in the early and mid 1900s. In 1946, BLM began managing some of the lands in the lower elevations of the Yuba and Bear River basins. These activities affected water quality due to erosion of sediment, primarily from roads, into streams.

Another land management practice that pre-dates the projects is the stocking of fish in reservoirs and streams. Starting in the mid 1800s, Euro-American settlers began introducing salmonid fishes into upper elevation lakes and streams, many of which were fishless since the retreat of the glaciers (Knapp 2001 et al.). Sheep herders, miners, and other settlers moved native trout, which they used as a food source (CDFG 2007a). Beginning in the 1860s, sportsman's groups, the Sierra Club, the USACE, the California Fish Commission, and individual outdoorsmen introduced trout into fishless areas for recreational fishing opportunities (CDFG 2007a). Among the non-native trout introductions were brook trout from the eastern United States, brown trout from continental Europe and Scotland, and Arctic grayling from Alaska. In the 1950s, stocking by pack animal gave way to aerial stocking, by CDFG. Brook, golden, and rainbow trout have been the most common species planted, while brown, cutthroat, and lake trout have been planted in fewer lakes (CDFG 2007a).

3.4.4 Water Supply

As described above, many of the historical dams and diversions were put in place to support mining activities and provide water supply for mining communities. Water delivery systems have expanded and water at the tap for drinking and water to irrigate crops, a luxury in the late 1800s and early to mid 1900s, became commonplace and NID now considers this supply critical for the continued viability and expansion of the foothill communities.

Two water purveyors derive a large portion of their water supplies from the parts of the upper Yuba and Bear river watersheds occupied by the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project: Nevada Irrigation District, and Placer County Water Agency, via contracts with PG&E. NID was founded in 1921 under the California Irrigation District Act of 1897, and operates as a nonprofit water agency and has a current service area of 287,000 acres, primarily in Nevada and Placer counties (NID 2005). NID was organized for the primary purpose of storing and delivering irrigation water to farmers and ranchers. According to NID, it has water rights including pre-1914 rights, various rights acquired from Empire Mines and Investment Company and Goldfield Consolidated Mines Company on the Middle and South Yuba rivers dating to 1926 and 1930, and several other water right permits and licenses. NID now serves treated water to over 18,900 connections and raw water to approximately 6,000 agricultural and municipal customers, including the cities of Grass Valley, Nevada City, and a portion of the City of Lincoln. The region within NID boundaries is primarily rural and semi-rural, and agricultural water use constitutes 90 percent of NID's total water demand (NID 2006). Some of the western area around the communities of Auburn and Lincoln served by NID is rapidly changing from rural demands (and use of raw water) to suburban in character, which uses treated water. The Yuba-Bear Hydroelectric Project occupies the highest-elevation portions of the Yuba and Bear River watersheds; NID's delivery area and irrigation canal system is located at lower elevations at approximately 3,500 feet in elevation and lower.

In addition to water supplies from its Yuba-Bear Hydroelectric Project, NID may also purchase water from PG&E via contracts for delivery and use in NID's service area. The Consolidated Contract (PG&E and NID 1963) currently allows for purchase of up to 59,361 acre-feet (ac-ft) annually in normal years, which can be reduced to 23,591 ac-ft annually in dry years (NID 2006.) The 1963 Consolidated Contract expires on July 1, 2013. There is also a 1992 Agreement between PG&E and NID for Delivery of Supplementary Water at the Wise Powerhouse Tailrace; the agreement allows NID to purchase up to 20,000 ac-ft of water at the Wise Powerhouse tailrace from PG&E when that water is available. This agreement regarding supplemental water is not considered a firm supply and expires April 30, 2013.

PCWA was formed in 1957 and its service area is coincident with the County of Placer; it serves raw water to approximately 4,000 connections and treated water to over 32,000 connections (PCWA 2006). PCWA derives its surface water supplies from the upper South Yuba River watershed, the North Fork of the North Fork American River watershed, and the Bear River watershed (via contract with PG&E), from the Middle Fork American River through storage at its own Middle Fork Project and the American River Pump Station at Auburn, and from the Central Valley Project at Folsom Lake through contract with the U.S. Bureau of Reclamation (PCWA 2006). PCWA serves a somewhat more urbanized area than NID, and uses water from PG&E contracts to serve both treated and raw water customers in the vicinity of Auburn and Newcastle in PCWA's zones 1 and 3, as well as some customers along Auburn Ravine to the west of Auburn toward the City of Lincoln in its Zone 5. Its two water supply contracts currently allow for purchase of up to 125,400 acre-feet of water annually from PG&E: 100,400 ac-ft annually for Zone 1, and 25,000 ac-ft for Zone 3 (PCWA 2006); the first contract expires April 30, 2013, the second has no expiration date. PCWA also has wholesale contracts with purveyors within the greater Sacramento metropolitan area to provide surface water when available, with The City of Roseville, Sacramento Suburban Water District (Sac Suburban) and San Juan Water District (SJWD) and provides water to the City of Lincoln, the California American Water Company, and other smaller utilities/property owner associations from its canal system (PCWA 2005).

Historically, water was delivered to much of Placer County via canals which pre-dated the projects; these water deliveries began as early as the 1850s for gold mining purposes. PCWA still uses the backbone of the original Gold Rush-era canal system to deliver water from the

Drum-Spaulding Project to PCWA's customers and water treatment plants (PCWA 2011a). NID's system also relies on the Gold Rush era canals (e.g. South Yuba Canal and Chalk Bluff Canal) that have become part of the Drum-Spaulding Project, to convey water from the upper Yuba watershed to NID's distribution canals.

3.4.4.1 Current Water Demand

The Drum-Spaulding Project delivers water, sourced by both NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project (purchased from PG&E by NID), to NID at four nodes:[3] 1) deliveries above Wise Forebay from the Bear River and Wise canals (NID-1); 2) deliveries from the South Canal below Wise Powerhouse into Auburn Ravine (NID-2); 3) deliveries downstream of the Bear River Canal Diversion Dam to Lake Combie (NID-3),[4] and 4) deliveries from Deer Creek Powerhouse tailrace to Cascade Canal Diversion Dam via South Fork Deer Creek (NID-4). Downstream of the Wise Powerhouse, NID diverts water for distribution to raw water customers in the western NID service area at the Auburn Ravine I diversion and at the Hemphill diversion. Water is diverted year round at the Auburn Ravine I diversion and from April through October at the Hemphill diversion. These are only two of 10 known permanent or seasonal dams on Auburn Ravine (other dams on Auburn Ravine are identified in Table 2.2-1 and owned by South Sutter Water District and other private entities); these other dams are also used to divert irrigation water seasonally. The presence of multiple dams along Auburn Ravine has a cumulative effect on aquatic resources in Auburn Ravine including fish; these effects and operations of Drum-Spaulding Project and non-project facilities in Auburn Ravine are described in greater detail in Section 6.5 of this Exhibit E. In years when there is supplemental water available from PG&E for purchase by NID, NID may make a portion of that water available to South Sutter Water District (SSWD) for purchase in Auburn Ravine. Sales of water to SSWD occurred in 9 out of 10 years between 2000 and 2010 (no sale occurred in 2007).

The Drum-Spaulding Project delivers water to PCWA at multiple points for Zone 1 (represented by four nodes) and Zone 3 (represented by one node). The Alta Powerhouse tailrace provides water to PCWA's Zone 3, for diversion into the Lower Boardman Canal.[5] According to PCWA, it currently has no alternative water sources that can serve demand in Zone 3. Multiple points off of the Drum-Spaulding Project's Bear River, Wise and South Canals allow diversion of water to PCWA's Zone 1, its largest service zone. Water can be diverted above Halsey Forebay (PCWA-2), below Halsey Forebay near Rock Creek Reservoir (PCWA-3), at Wise Forebay (PCWA-4), and at multiple locations below Wise Powerhouse off of the Drum-Spaulding Project's South Canal (PCWA-5). These diversion points serve four water treatment plants and provide raw water to customers from the Auburn area west to the City of Lincoln, and as far south as the unincorporated areas of Placer County surrounding the City of Roseville. The portion of Zone 1 in the vicinity of the City of Auburn can only be served water from the PG&E system via the

[3] For the purpose of this discussion, water deliveries are grouped into nodes (NID-1, NID-2, NID-3, and NID-4.) These refer to the aggregations of water deliveries represented in Licensees' Water Balance / Operation Model.

[4] Water delivered at NID-3 (Bear River below Bear River Canal Diversion Dam) is sourced wholly by NID waters.

[5] Water can also be diverted to Zone 3 via PCWA's Pulp Mill Canal on Canyon Creek during outage periods, but is primarily diverted at the Lower Boardman Canal.

Bear River, Wise and South canals (PCWA 2005) and cannot be supplied with water from PCWA's Middle Fork Project or other sources: the lower portion of Zone 1 west of Newcastle served by water from PG&E's system via the Auburn Ravine, can also be served by American River water from PCWA's Auburn Tunnel pumped into Auburn Ravine. PCWA has existing pumping facilities that enable it to pump American River water from the Auburn Tunnel into the Drum-Spaulding Project's South Canal at times during planned canal outages however, under its current contract with PG&E PCWA has no rights to do so.

Recent demands for NID and PCWA from WY 2001-2009 are presented in Table 3.4-1, below, which presents recent historical average deliveries, recent peak deliveries, and projected deliveries as provided by NID and PCWA.

Table 3.4-1. Recent historical and projected water demand for Yuba and Bear River watersheds. SOURCES: NID and PCWA.[1]

Water Delivery Point	General Location	Gages Used in Delivery (YB-XX)	WY2001-WY2009			Projected circa 2032	Projected circa 2062
			WY2001-WY2009 Annual Average demand (ac-ft)	**WY2001-WY2009 Peak Annual Demand (ac-ft)**	**Year of Peak**	**Projected Annual Demand (ac-ft)**	**Projected Annual Demand (ac-ft)**
NEVADA IRRIGATION DISTRICT							
NID-1	Deliveries above Wise Forebay from Bear River/Wise canals	YB-86+255+108+64	9,045	19,075	2007	7,577	7,782
NID-2	Auburn Ravine deliveries	YB-132+259 (partial)	34,373	39,515	2008	49,228	61,426
NID-3	Bear River below Bear River Canal Diversion Dam (to Lake Combie)	YB-196 (partial)	60,606	70,719	2006	76,100	90,163
NID-4	Deer Creek Powerhouse tailrace (to Cascade Diversion Dam)	YB-34 (partial)	35,451	38,224	2008	38,169	41,928
		NID Total	**139,475**	**148,331**	**2002**	**171,075**	**201,299**
PLACER COUNTY WATER AGENCY							
PCWA-1	Zone III deliveries (Lower Boardman Canal, including Alta PH tailrace)	184+95+288	9,659	10,625	2004	13,434	17,973
		PCWA Zone III Total	*9,659*	*10,625*	*2004*	*13,434*	*17,973*
PCWA-2	Zone I deliveries above Halsey Forebay	56+87	13,197	15,209	2002	14,068	14,068
PCWA-3	Zone I deliveries below Halsey Afterbay	69	15,095	16,345	2001	14,802	14,802
PCWA-4	Zone I deliveries at Wise Forebay	73	4,546	5,023	2008	4,500	4,500
PCWA-5	Zone I deliveries off South Canal	76+278+136+91-75-108	62,144	67,638	2007	67,029	67,029
		PCWA Zone I Total	*94,981*	*100,389*	*2008*	*100,400*	*100,400*
		PCWA Total	**104,640**	**109,896**	**2007**	**113,834**	**118,373**

[1] Licensees have not conducted any analysis regarding future demand distribution patterns, facility limitations or other factors related to the projected demands reflected in this table.

3.4.4.2 Projected Water Demand

Table 3.4-1 shows the reasonably foreseeable projected water demands, provided by NID and PCWA, as those demands pertain to water from the upper Yuba and Bear river watersheds. The table shows projected demand at two different points in the future: one around approximately 2032,[6] and the further projection for approximately 2062, which represents an estimate of anticipated demand at the end of a 50-year license term for the two projects. Projected water demand is anticipated to have a slightly different distribution from historical demand as different levels of development are expected to occur in different communities; these changes in distribution are reflected in the projected demands for each of the delivery points described above. These projected demands for 2062 are used in the Water Balance / Operations Model future case to represent reasonably foreseeable water demands within the term of the projects' next licenses. Estimated 2062 water demands for NID are based on the combined trend of 1) the 2001-2009 historical water demands, and 2) the 2032 projected demands based on the 2009 NID Phase 2 Raw Water Master Plan Update. These historical and projected demands and the trends for demand increase are shown by delivery area in Figure 3.4-1.

For PCWA's projected water supply, the increase in demands across the district as a whole are expected to be met using a variety of different sources. In its entirety, PCWA's projected water supply includes a blend of surface water, groundwater and recycled water to meet a variety of needs over a wide geographic area (PCWA 2005). Although PCWA's demand through the year 2062 is expected to increase in both Zone 1 and Zone 3 to 100,400 ac-ft and 17,973[7] ac-ft per year, respectively, PCWA's cumulative water demand projections for both Zones (with regard to water from PG&E) are within current contract amounts. According to PCWA, demands in Zone 3 cannot be met by any other PCWA source of water, and must be obtained through contract with PG&E from the Drum-Spaulding system. Thus, PCWA's Zone 3 is the primary location for a reasonably foreseeable increase in PCWA's demands for water from the Drum-Spaulding system. Projected demand through 2062 as provided by PCWA is shown in Figure 3.4-2 (PCWA 2011a).

It should be noted that there can be substantial inter-annual variation in water demands, which can be seen in the recent historical data, as well as differences in the pattern of water demand across different months. Water demands are heavily dependent on climatologic and hydrologic conditions, especially for agricultural purposes, which constitute 90 percent of NID's demand. In wet years, particularly ones with substantial natural rainfall in April or May (such as 2005 and 2006) water demand may be relatively low in spring and early summer; conversely, in drier years, or years with warm springtime months (such as 2001) water demand may be higher overall and may occur earlier in the year than usual. This inter-annual variability makes it difficult to discern an exponential trend in water demand growth from one year to the next; here,

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[6] Current water demand planning under required Urban Water Management Plans for NID and PCWA extends approximately 20 years from the present; these projected demands have a higher level of confidence associated with them. However, in the interest of providing water demand projections for the full term of the next license period, NID and PCWA have attempted to characterize demands through 2062.

[7] This projection (which was generally reflected in PCWA's comment letter on Licensees' DLAs at Attachment 8, Figure 1) was confirmed by PCWA on March 10, 2011 via correspondence with Licensees.

it is assumed that water demand will increase on a roughly linear trend but retain the potential for substantial inter-annual variability.

To understand the potential effects of the Licensees' proposed projects and the cumulative effects of water demand increases, the Water Balance / Operations Model was run for the Licensees' Proposed Project's and two water demand scenarios: one scenario with the 2001-2009 average water demands, and a future case with the 2062 projected water demands. Examining these two cases provides a "bookend" approach to understanding potential interaction of the Proposed Project's and increased water demand. In the case that a dry period comparable to one of the historical droughts in the modeled period occurs in the early period of the next license period, reductions in water supply may be approximated well by 2001-2009 average demand case; if such a dry period occurs near the end of the next License term when demands have increased substantially, reductions in water supply would be better represented by the 2062 projected demand case.

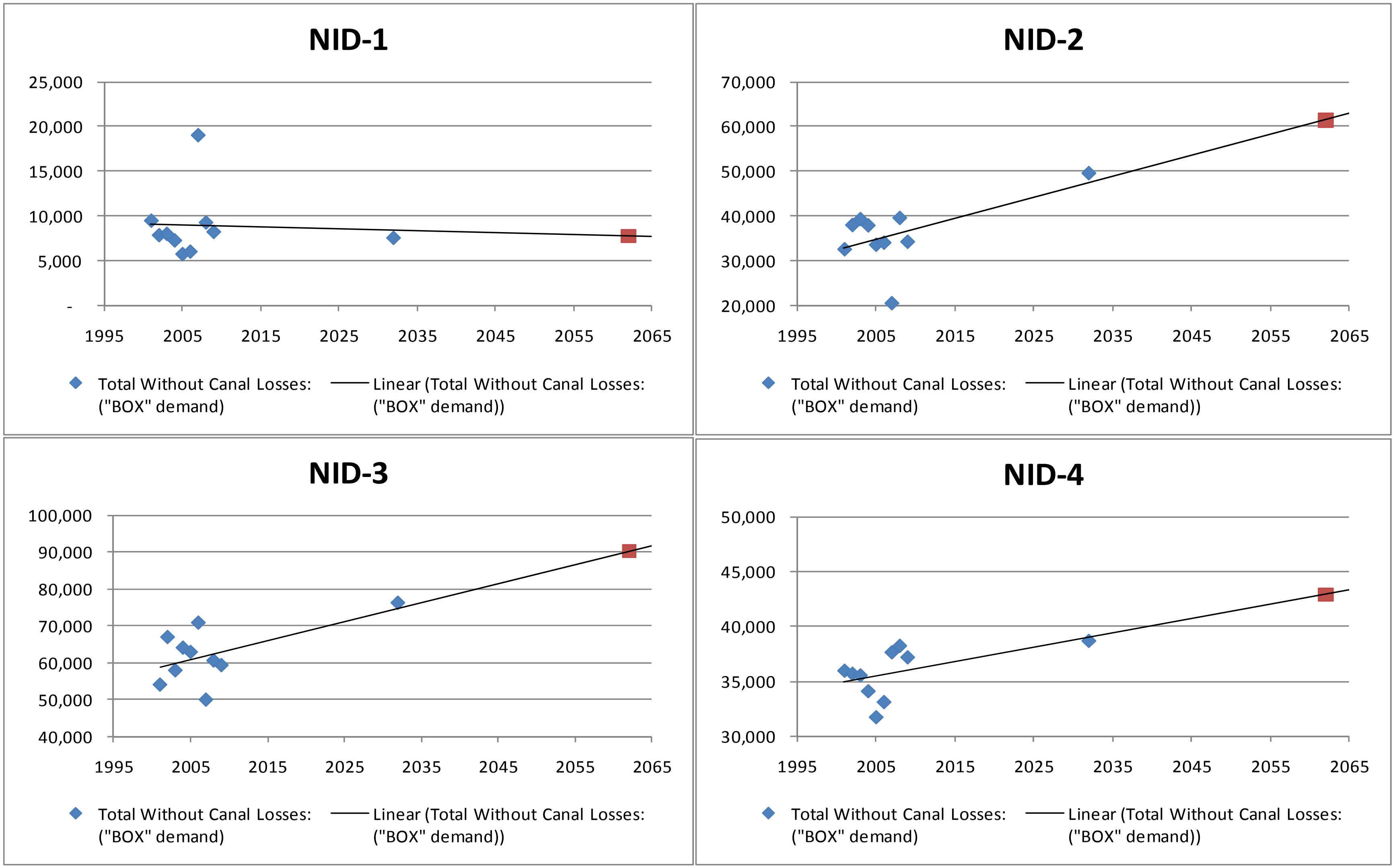

Figure 3.4-1. NID's projected growth in water demand at four primary delivery areas.

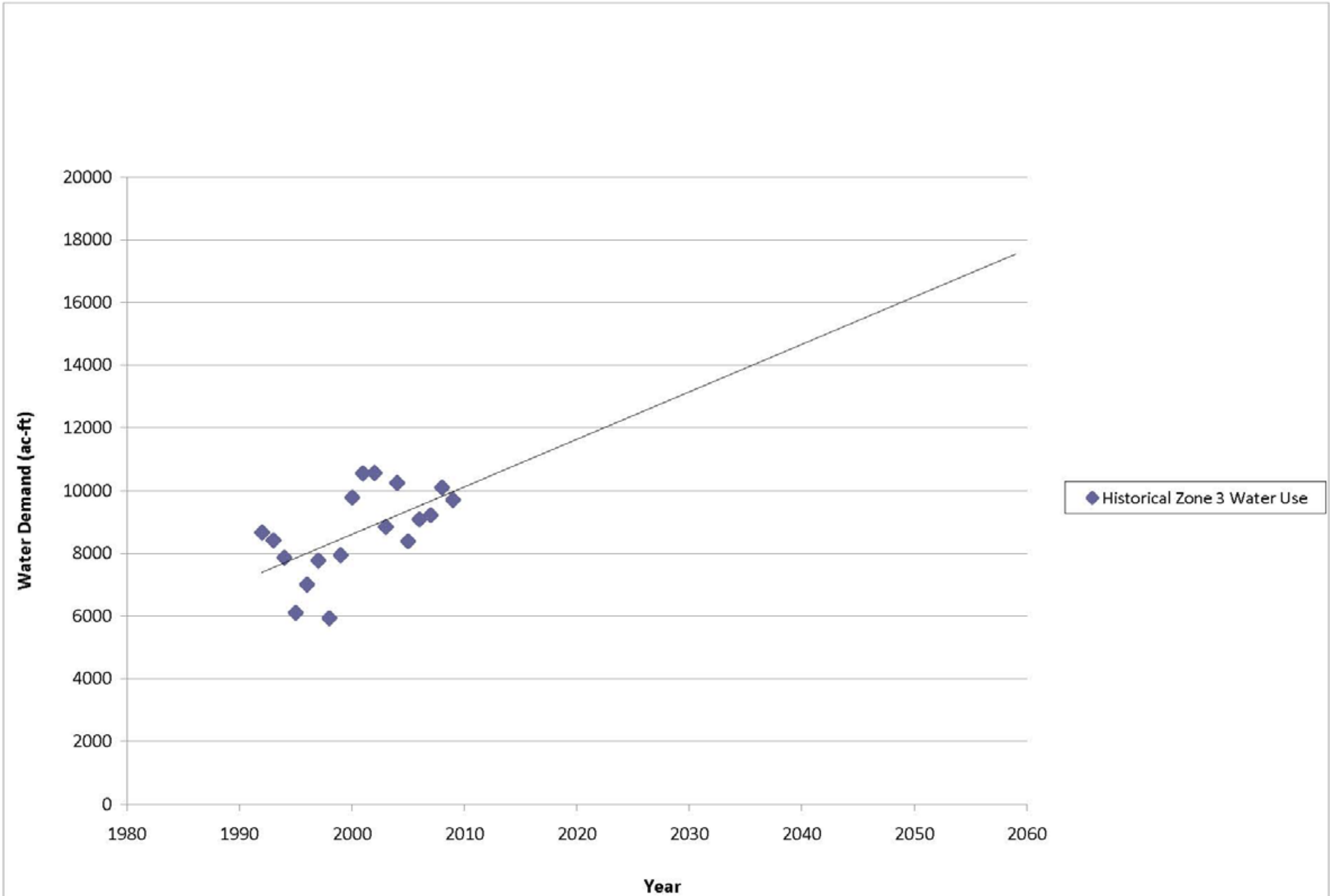

Figure 3.4-2. PCWA's projected growth in Zone 3 water demand (SOURCE: PCWA 2011a).

3.4.4.3 Continued Operations of Other Projects in Project-Affected Watersheds

Among the reasonably foreseeable future actions for the watershed is the continued water demands and related water deliveries. It is anticipated that NID, PCWA, SSWD, the City of Roseville, and other Sacramento-area water purveyors and community associations will continue to deliver water to their service areas, served in part (or in the case of NID, entirely) by water sourced from the Yuba, Bear and Sacramento river watersheds. PG&E anticipates negotiating new water supply and delivery contracts that will take effect upon expiration of the original FERC license term for the Project.

In addition, continued operation of NID's Yuba-Bear Hydroelectric Project would represent a cumulative effect on aquatic and water resources in reaches that are jointly affected by the Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project, from the perspective of the Drum-Spaulding Project. Conversely, continued operation of Drum-Spaulding Project would represent a cumulative effect on aquatic and water resources in reaches that are jointly affected by the Drum-Spaulding Project and the Yuba-Bear Hydroelectric Project, from the perspective of the Yuba-Bear Hydroelectric Project.

3.4.4.4 Socioeconomic Aspects of Water Supply

Several entities who filed comment letters on the Licensees' DLAs noted that high-quality, affordable water from the Yuba and Bear rivers is crucial to the economies of communities in Placer and Nevada counties; the availability and reliability of water supplies has been essential to development of the economy, sustenance of agriculture, and increases in population of Placer and Nevada counties over the past several decades. In some areas, water supplies from the Yuba-Bear and Drum-Spaulding projects are used and managed in conjunction with water from other sources (such as groundwater or other surface water); however, as noted by PCWA, there may be substantial cost to replace one water source with another (including costs to pump or construct additional infrastructure to provide replacement water) (PCWA 2011a,b). According to the County of Placer, the water supply from PCWA's Zone 1 and Zone 3 is viewed as "irreplaceable," and a reduction in that water supply would cause "irreparable damage" to residents of the county (County of Placer 2011a).

According to NID, water from the Yuba and Bear rivers is of extremely high quality, and its replacement with lower-quality water would result in significant technical challenges and economic impacts. Some high-technology and industrial water users require extremely high-quality water in order to operate; higher-quality water allows for more efficient agricultural water use and decreases the risk of accumulation of salts in the soils. NID and PCWA's ability to provide high-quality water from surface water sources allows economically important industries to locate and remain viable within Placer and Nevada counties (PCWA 2005).

3.5 Activities Not Considered in Cumulative Effects Analysis

As directed by FERC in revised SD-2, Licensees have included cumulative effects Sections in 6.2 (Water Resources) and 6.3 (Aquatic Resources). However, some parties that filed comments on Licensees' DLAs also requested Licensees' FLAs consider the effects of the projects in combination with: 1) activities related to the passage of anadromous fish upstream of USACE's Englebright Dam; and 2) activities related to the relicensing of the YCWA's Yuba River Development Project (FERC Project No. 2246). For the reasons set forth below, these requests are not further addressed by Licensees in the cumulative effects discussions in Sections 6.2 and 6.3.

With regard to Englebright Dam, Licensees note that Englebright Dam is downstream of the geographic scope of cumulative effects analysis established by FERC in revised SD2. Licensees are aware of a number of ongoing discussions related to potential passage of anadromous fish upstream of Englebright Dam. However, none of these activities are reasonably foreseeable in that there is an ongoing process that would result in passage at a definite time in the future: it is unclear how or when such discussions will be concluded or whether they will ultimately result in fish passage. In addition, NID points out that even if anadromous fish are passed upstream of Englebright Dam, YCWA's Our House Dam on the Middle Yuba River would block fish from passing further upstream in the Middle Yuba River.

As with Englebright Dam, YCWA's project is located downstream of the geographic scope of cumulative effects analysis established by FERC in revised SD2. Nevertheless, Licensees are aware that YCWA is in the process of relicensing its Yuba River Development Project.[8] This is an ongoing federal activity whose outcome is unknown at this time. It would be impossible to assess the effects of Licensees' proposed projects on YCWA's project or the resources directly/indirectly affected by YCWA's project because, at this time, YCWA's proposed project and how YCWA's proposed project will affect resources are unknown.

3.6 Operation Model and Model Scenarios

The Yuba-Bear Hydroelectric Project and Drum-Spaulding Project are hydraulically connected, and together they form a complex system that ranges in elevation from 7,400 to 500 feet; encompasses over 200 miles of river in three counties; and include over 30 dams, 16 powerhouses, and over 90 miles of water conduits. To facilitate the analysis of one or more potential changes to the projects, especially with regards to streamflows and reservoir elevations, Licensees, in collaboration with Relicensing Participants, developed and validated a computerized operations model for the combined projects and made model scenarios, five of which are discussed in this Exhibit E. This section describes the operations model and provides an overview of each model scenario referenced in this Exhibit E.[9] A more detailed description of the operations model including a model validation report and the result of each model scenario are included (on DVD) in Appendix E12 of this Exhibit E.

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[8] YCWA filed with FERC a Notice of Intent on November 5, 2010. The notice stated YCWA expected to file its application by April 30, 2014, two years before the current license expires.

[9] See Exhibit E, Sections 6.2, 6.3, 7 and 8.

3.6.1 Operations Model

The program utilized to develop the operations model was USACE's - Hydrologic Engineering Center (HEC) Reservoir Simulation (ResSim) Version 3.0. HEC-ResSim is a deterministic, spatially-oriented computer model that combines a number of HEC-developed modules and is customized for each project on which it is used.

ResSim is a deterministic model in that it contains no random (stochastic) components. The physical variables at each operations model component are determined by mathematical equations or measured data so that for any specified input scenario, the corresponding model output variables are determined.

The model is spatially-oriented in that it uses a set of graphical layers, much like layers in a GIS database, to create reservoir networks and route flows. The shape files are the equivalent of "trace paper" in ResSim, allowing the modeler to develop nodes in a spatially appropriate location and draw realistic reservoir shapes.

HEC-ResSim is a computer model in that it scenarios on a computer and is built using the Java™ programming language with input and output data written to the HEC's Data Storage System (HEC-DSS). Data in HEC-DSS database files can be graphed, tabulated, edited and manipulated with HEC-DSSVue, a Java™-based visual utilities program. Time-series data can be imported and exported from Microsoft Excel using an Excel add-in created by HEC.

HEC-ResSim is a numerical representation of the reservoirs, diversion dams, canals, and powerhouses that are used in the operation of the projects. To capture this concept, HEC-ResSim uses a set of operational priorities. These priorities include, but are not limited to, minimum instream flow releases, reservoir operation characteristics, consumptive water demand, and power generation. The calculation of elevations, flows and power generation are based on reservoir inflow from a time-series input file, and a specific guide curve, also known as "target elevation" or "rule curve," for each reservoir. The guide curve represents the basic objective of the reservoir - get the pool elevation to, and hold it at, the guide curve. Without any other operational constraints, the decision logic will attempt to get to and maintain reservoir elevations at the guide curve, within maximum outlet capacity and physical rate of change constraints.

For each day, and from upstream to downstream, HEC-ResSim allocates available water for use from each reservoir using a daily time step. The model makes decisions and prioritizes releases from "operation zones" in each reservoir. These zones represent an actual range of reservoir elevations within which individual priorities are created, and are shown graphically as subsets under each operation zone. One zone, typically the "Conservation" pool, is designated as the guide curve. Any available water for use in that day that cannot be used is retained in the reservoir and contributes to the next day's beginning elevation.

HEC-ResSim is always run for all projects' developments because there is dependency on inflows from one reservoir to another, but run periods (i.e., from an entire period of record, to a critical period, to one year) can vary. Minimum and maximum reservoir elevations, including seasonal changes where applicable, are also modeling using operation zones with zone-specific rules (e.g. all releases in excess of minimum in-stream flow are forced to cease once a reservoir reaches its "minimum pool" operation zone). Output data can be viewed from annual average to daily average down to 15-minute-increment time steps (depending on the time step used for the simulation). HEC-ResSim output includes all facilities modeled, but can focus on any one facility or group of facilities.

For the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project, Licensees customized HEC-ResSim using the existing physical (i.e. reservoir and water conveyance capacities), contractual (i.e., assumptions that existing water supply deliveries would continue) and other project data. Guide curves were developed based on recent historical reservoir elevation data and were confirmed with Licensees' operations staff.

In addition, the operations model for Yuba-Bear Hydroelectric and Drum-Spaulding projects uses mean daily unimpaired flow data as the hydrology inputs (i.e., the source of water or discretionary volume of water to the projects) for simulations of a given scenario. "Unimpaired flows" are defined as synthesized mean daily stream flows that would have occurred in the absence of flow regulation (e.g., storage, diversion or release) by the projects or other parties in the basins. These synthesized mean daily unimpaired flow data were developed by Licensees in collaboration with other Relicensing Participants. The hydrology period for the model encompasses 33 water years (1976 to 2008). This period of record is based upon the availability of gage data for all pertinent features of the two projects, including reservoir storage, stream flow below dams (bypass reach flows), and diversion flows for consumptive water delivery and power generation.[10]

The operations model is coded to run day-to-day operations of the projects based on general operating conditions or rules. The model follows these rules strictly without exception, 365 days per year, similar to an automated operation of the projects.[11]

It is important to note that the model makes releases from reservoirs in the following descending priority:

- Meet minimum streamflow requirements
- Meet minimum reservoir pool requirements (reservoirs can be drawn down below minimum pool requirements to make releases to meet minimum streamflow requirements)

[10] Hydrologic data used as input into the model, as well model output for each Model Scenario, are provided in Appendix E12 to this Exhibit E.

[11] It is important to recognize that, while actual projects' operations generally follow the operating rules in the operations model, human intervention periodically deviates from the general operating rules to accommodate day-to-day realities, such as equipment failure and maintenance, periodic access by NID and PG&E staff to remote locations or inaccessibility due to snow, changing hydrologic conditions and energy demand, potential end of year water sales, and "over-releases" of minimum instream flows to ensure license compliance. In addition, there are also inherent discrepancies between the model and reality as a result of input data inaccuracies (e.g., uncertainties in hydrology data, turbine or generator efficiencies and reservoir storage curves). Finally, several operating conditions exist that cannot be explicitly modeled using ResSim. Where this is the case, a modeling assumption has been made which is deemed to most accurately simulate the results of said operating condition over a long-term period of analysis.

- Meet water deliveries (water deliveries are only met after minimum streamflows are met and do not infringe on minimum pool requirements)
- Release water for power generation (when releases are made, generation will occur if possible but discretionary releases for power generation are only made after the above four criteria are met)

3.6.2 Model Scenarios

Licensees conducted five model scenarios in this Exhibit E. One of the scenarios (i.e., Base Case) describes existing conditions as defined by the No Action Alternative (See Exhibit B, Section 2). All subsequent model scenarios are compared to the Base Case model scenario. A second run (i.e., Licensees' Proposed Projects) describes the flow, reservoir and generation conditions that would occur if FERC included in the new licenses NID's and PG&E's proposed PM&E measures as described in this Exhibit E. The third run (i.e., FWN Flow Proposal) describes the flow, reservoir and generation conditions that would occur if the measures proposed by FWN in its DLA comments, which were subsequently modified, were included in the new licenses. FWN's proposal was the only detailed flow measure provided in DLA comments. Each of the above three model scenarios assume consumptive water deliveries that occur under existing conditions, as defined in Section 3.4.4.2. The last two model scenarios (i.e., Licensees' Proposed Projects with Projected Future (2062) Water Deliveries, and FWN's Flow Proposal with Projected Future [2062] Water Deliveries) are modifications of Licensees' Proposed Project model scenario and FWN's Flow Proposal model scenario. They assume consumptive water deliveries, provided by NID and PCWA that are projected to occur in the year 2062.

Each of the above five model scenarios is summarized below. Appendix E12 of this Exhibit E includes the detailed model runs and output. In addition, the economic consequences of FWN's Proposed Project measures (including additional capital costs and lost hydropower generation) are discussed in Section 8 of Exhibit E for PG&E's Drum-Spaulding Project and in Section 7 of Exhibit E for NID's Yuba-Bear Hydroelectric Project.

3.6.2.1 No-Action Alternative (ResSim Model Scenario: Base Case)

3.6.2.1.1 <u>Description</u>

The No-Action Alternative, modeled in ResSim as "Base Case," consists of the following primary assumptions (see NID's and PG&E's respective Exhibit Bs for a more detailed description of these assumptions):

- Minimum instream flows and reservoir elevations as described in the existing Yuba-Bear Hydroelectric Project license and the existing Drum-Spaulding Project license
- Water deliveries to NID and PCWA based on Water Year 2001-2009 averages, by delivery point

- Retirement of Alta Powerhouse, Unit 2
- Re-operation of Dutch Flat No. 1 and No. 2
- PG&E's Winter/Spring Operating Plan
- Reservoir bathymetry as performed by Licensees at several Project reservoirs

3.6.2.1.2 Summary of Results

Some noteworthy findings are:

- In many years, especially Critically Dry Water Years, the reservoir elevations in the major project reservoirs are lower than the bottom of the boat ramps for much of the summer recreation season.
- Water deliveries are not met in one out of 33 water years (1977), with slight deficiencies observed in 1976 and 1978, as well. 1977 was a Critically Dry water year based on Licensees' Proposed Water Year Type definitions.

A summary of the No Action Alternative model scenario is provided below.

Under the No Action Alternative, the minimum streamflows and pool requirements in Licensees' existing FERC licenses are met at all times.

Table 3.6.2.1-1 presents summertime reservoir water surface elevation in the projects' major storage reservoirs at which recreation occurs under the No Action Alternative.

Table 3.6.2.1-1. Summertime reservoir water surface elevation by water year type at NID'S Yuba-Bear Hydroelectric Project's Jackson Meadows Reservoir, Bowman Lake and Rollins Reservoir and PG&E's Drum-Spaulding Project's Fordyce Lake, Lake Spaulding and Lake Valley Reservoir under the No Action Alternative using average 2001-2009 water supply deliveries.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
JACKSON MEADOWS RESERVOIR							
Critically Dry	5,999.5	5,995.8	5,990.3	5,987.3	5,983.5	5,980.3	5,978.6
Dry	6,021.5	6,019.1	6,015.0	6,010.1	6,004.0	5,998.7	5,992.7
Below Normal	6,032.7	6,030.2	6,026.4	6,021.8	6,016.0	6,011.1	6,005.7
Above Normal	6,035.1	6,033.1	6,029.4	6,025.0	6,019.4	6,014.7	6,009.5
Wet	6,035.0	6,035.0	6,031.9	6,027.7	6,022.1	6,017.5	6,012.4
BOWMAN LAKE							
Critically Dry	5,537.8	5,530.2	5,520.6	5,510.8	5,497.8	5,486.0	5,470.9
Dry	5,557.2	5,549.9	5,540.9	5,535.3	5,528.3	5,524.5	5,521.1
Below Normal	5,560.0	5,552.6	5,544.0	5,538.6	5,532.4	5,530.1	5,526.7
Above Normal	5,563.5	5,558.2	5,550.3	5,545.0	5,539.0	5,536.1	5,533.6
Wet	5,563.6	5,559.8	5,552.6	5,547.6	5,541.7	5,539.3	5,537.0
ROLLINS RESERVOIR							
Critically Dry	2,160.3	2,148.6	2,129.9	2,120.4	2,111.2	2,105.3	2,072.8
Dry	2,170.9	2,169.0	2,166.2	2,164.5	2,161.6	2,161.4	2,141.4
Below Normal	2,170.9	2,169.9	2,168.0	2,166.3	2,164.3	2,161.7	2,141.4
Above Normal	2,170.9	2,170.0	2,168.7	2,166.9	2,164.9	2,161.7	2,141.7
Wet	2,171.1	2,170.0	2,168.9	2,167.1	2,164.9	2,161.7	2,142.0

Table 3.6.2.1-1. (continued)

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
FORDYCE LAKE							
Critically Dry	6,374.0	6,371.7	6,360.0	6,350.0	6,336.3	6,322.8	6,321.1
Dry	6,397.2	6,390.0	6,370.0	6,361.1	6,349.2	6,338.9	6,338.1
Below Normal	6,404.6	6,395.0	6,375.0	6,366.4	6,355.1	6,345.7	6,346.0
Above Normal	6,405.1	6,400.0	6,380.0	6,371.8	6,361.1	6,353.3	6,353.7
Wet	6,405.1	6,405.0	6,387.0	6,379.4	6,369.4	6,362.5	6,354.1
LAKE SPAULDING							
Critically Dry	4,902.2	4,895.3	4,900.1	4,899.7	4,899.9	4,901.7	4,915.1
Dry	4,973.4	4,965.4	4,966.9	4,958.0	4,946.7	4,938.9	4,950.7
Below Normal	4,989.9	4,987.3	4,989.6	4,981.8	4,971.9	4,964.9	4,975.7
Above Normal	5,006.6	5,008.0	5,006.2	4,995.8	4,983.1	4,974.8	4,987.2
Wet	5,014.0	5,009.9	5,005.8	4,995.5	4,984.2	4,978.7	4,999.2
LAKE VALLEY RESERVOIR							
Critically Dry	5,779.0	5,778.4	5,777.3	5,773.8	5,769.5	5,765.8	5,765.2
Dry	5,782.6	5,781.9	5,780.7	5,778.6	5,775.9	5,772.8	5,772.2
Below Normal	5,783.8	5,782.7	5,781.1	5,780.1	5,779.0	5,776.7	5,776.1
Above Normal	5,783.8	5,782.7	5,781.1	5,780.1	5,779.0	5,776.9	5,776.4
Wet	5,783.9	5,782.7	5,781.1	5,780.1	5,779.0	5,776.9	5,776.3

[1] Yellow highlighted rows indicate periods when the reservoir elevation would be below the bottom useable portion (3 vertical feet above the actual end of the paved ramp) of existing boat ramps in the reservoirs. Where multiple boat ramps exist at a reservoir, only the periods when water is below the lowest boat ramp is highlighted. Jackson Meadows Reservoir has two ramps, the useable bottom of each are at 6,016.0 and 5,996.5 feet. Rollins Reservoir has three ramps, the useable bottom elevations of which are 2,146.0, 2,137.0 and 2,133.0 ft. Lake Spaulding and Lake Valley Reservoir each have one boat ramp, the useable bottom of which are 4,942.6 and 5,783.1, respectively. Bowman and Fordyce lakes do not have developed (paved) boat ramps.

Table 3.6.2.1-2 presents existing deficits to water deliveries to NID and PCWA under the No Action Alternative using average 2001-2009 water supply deliveries.

Table 3.6.2.1-2. Water deliveries deficits to NID and PCWA under the No Action Alternative using average 2001-2009 water supply deliveries.

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)	
Year	Type	NID	PCWA	NID	PCWA
1976	Critically Dry	99%	98%	1,000	2,000
1977	Critically Dry	89%	55%	19,000	51,000
1978	Above Normal	98%	91%	3,000	10,000
1979	Below Normal	100%	100%	0	0
1980	Wet	100%	100%	0	0
1981	Below Normal	100%	100%	0	0
1982	Wet	100%	100%	0	0
1983	Wet	100%	100%	0	0
1984	Above Normal	100%	100%	0	0
1985	Dry	100%	100%	0	0
1986	Wet	100%	100%	0	0
1987	Critically Dry	100%	100%	0	0
1988	Critically Dry	100%	100%	0	0
1989	Above Normal	100%	100%	0	0
1990	Dry	100%	100%	0	0
1991	Dry	100%	100%	0	0
1992	Dry	100%	100%	0	0
1993	Above Normal	100%	100%	0	0

Table 3.6.2.1-2. (continued)

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)	
Year	Type	NID	PCWA	NID	PCWA
1994	Dry	100%	100%	0	0
1995	Wet	100%	100%	0	0
1996	Above Normal	100%	100%	0	0
1997	Wet	100%	100%	0	0
1998	Wet	100%	100%	0	0
1999	Above Normal	100%	100%	0	0
2000	Above Normal	100%	100%	0	0
2001	Dry	100%	100%	0	0
2002	Below Normal	100%	100%	0	0
2003	Below Normal	100%	100%	0	0
2004	Below Normal	100%	100%	0	0
2005	Below Normal	100%	100%	0	0
2006	Wet	100%	100%	0	0
2007	Dry	100%	100%	0	0
2008	Dry	100%	100%	0	0

Last, Table 3.6.2.1-3 shows, by project, annual power generation in gigawatt-hours (GWh) by powerhouse and by water year type under the No Action Alternative.

Table 3.6.2.1-3. Power generation by project and by powerhouse and by water year type under the No Action Alternative using average 2001-2009 water supply deliveries.

Powerhouse and Water Year Type	GWh/yr
YUBA-BEAR HYDROELECTRIC PROJECT	
By Powerhouse:	--
Bowman	12.4
Dutch Flat No. 2	63.8
Chicago Park	132.5
Rollins	66.4
By Water Year Type:	--
Critically Dry	112
Dry	194
Below Normal	289
Above Normal	330
Wet	375
Total	**275**
DRUM-SPAULDING PROJECT	
By Powerhouse:	--
Spaulding 3	35.5
Spaulding 2	34.7
Spaulding 1	13.4
Deer Creek	28.4
Drum 1	85.9
Drum2	274.5
Alta	5.3
Dutch Flat No. 1	99.8
Halsey	53.2
Wise	71.5
Wise 2	8.2
Newcastle	28.7

Table 3.6.2.1-3. (continued)

Powerhouse and Water Year Type	GWh/yr
DRUM-SPAULDING PROJECT (continued)	
By Water Year Type:	--
Critically Dry	406
Dry	609
Below Normal	776
Above Normal	842
Wet	909
Total	**739**

3.6.2.2 Licensees' Proposed Projects Using Average 2001-2009 Water Supply Deliveries (ResSim Model Scenario: L030311)

3.6.2.2.1 Description

The Licensees' Proposed Projects, modeled in ResSim as "L030311," utilizes average 2001-2009 water supply and consists of all the assumptions for the No Action Alternative except for minimum instream flows and reservoir elevations. For Licensees' Proposed Projects model scenario, minimum instream flows and reservoir elevations are those proposed by NID in Appendix E3 of this Exhibit E and by PG&E as proposed in Appendix E7 of this Exhibit E.

3.6.2.2.2 Summary of Results

Some noteworthy findings are:

- As compared to the No Action Alternative, reservoir elevations change slightly, with the greatest changes at Jackson Meadows Reservoir in Critically Dry and Dry water years. There is almost no change in the useable portion of the boat ramps.
- As compared to the No Action Alternative, there is no reduction in water deliveries to NID and negligible reduction (<2 percent in 1977 and <1 percent in 1978; no change in other water years) in deliveries to PCWA.
- Overall, the Yuba-Bear Hydroelectric Project experiences a 2.1 percent decrease in generation and the Drum-Spaulding Project lost generation is 1.7 percent, as compared to the No Action Alternative. Generation losses are most pronounced for units on the Bear River and Bear River/Wise/South canal system, due primarily to additional diversions to instream flow under the Licensees' Proposed Project in the Middle Yuba River, South Yuba River and Canyon Creek. For both projects, lost generation is greatest in Above Normal water years (2.8 percent and 2.4 percent) and least in Critically Dry Water Years (0.4 percent and 0.2 percent).

A summary of the Licensees' Proposed Projects model scenario using average 2001-2009 water supply deliveries is provided below.

Under Licensees' Proposed Projects, the minimum streamflow and minimum pool requirements proposed by Licensees' are met at all times.

Table 3.6.2.2-1 shows, as compared to the No Action Alternative (Table 3.6.2.1-1), the changes that would occur to summertime reservoir water surface elevation in the projects' major storage reservoirs under Licensees' Proposed Projects.

Table 3.6.2.2-1. Changes in summertime reservoir water surface elevation by water year type as compared to the No Action Alternative at NID'S Yuba-Bear Hydroelectric Project's Jackson Meadows Reservoir, Bowman Lake and Rollins Reservoir and PG&E's Drum-Spaulding Project's Fordyce Lake, Lake Spaulding and Lake Valley Reservoir under Licensees' Proposed Projects using average 2001-2009 water supply deliveries.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
JACKSON MEADOWS RESERVOIR							
Critically Dry	-5.3	-5.3	-2.7	-3.0	-3.5	-2.3	-1.3
Dry	-4.5	-4.5	-4.7	-4.8	-5.1	-5.3	-5.8
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BOWMAN LAKE							
Critically Dry	4.7	4.7	2.6	3.1	3.8	3.4	1.0
Dry	-0.1	0.0	0.0	0.1	0.3	2.6	-0.3
Below Normal	0.0	-0.2	-0.5	-0.9	-1.5	-1.4	-0.9
Above Normal	-0.1	-0.7	-1.6	-2.1	-3.2	-3.3	-3.3
Wet	0.0	-0.6	-1.6	-2.4	-3.3	-3.3	-3.6
ROLLINS RESERVOIR							
Critically Dry	0.7	0.9	0.4	-0.3	-1.1	-1.8	-2.4
Dry	0.0	-0.1	-0.2	-0.3	-0.2	0.1	0.0
Below Normal	0.0	-0.2	-0.5	-0.7	-1.1	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FORDYCE LAKE							
Critically Dry	-5.9	-5.8	-1.6	-1.4	-0.7	-0.1	-1.6
Dry	-1.4	0.0	0.0	0.1	0.5	0.6	-0.8
Below Normal	-0.3	0.0	0.0	0.2	0.4	0.5	-1.4
Above Normal	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	0.0	0.0	0.0	0.2	0.3	-0.4	0.0
LAKE SPAULDING							
Critically Dry	1.1	0.9	-4.8	-4.0	-3.0	-2.2	-0.6
Dry	1.1	-0.5	-0.5	-0.6	-0.8	-0.9	0.0
Below Normal	0.1	-0.2	-0.3	-0.5	-0.7	-0.9	-0.6
Above Normal	0.0	0.0	-0.4	-1.2	-2.4	-3.0	-3.9
Wet	0.0	0.0	-0.4	-1.3	-0.5	-0.3	-2.7
LAKE VALLEY RESERVOIR							
Critically Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3.6.2.2-1. (continued)

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Yellow highlighted rows indicate periods when the reservoir elevation would be below the usable bottom of existing boat ramps in the reservoirs. Refer to footnote 1 in Table 3.6.2.1-1 for the elevation of the boat ramps.

Table 3.6.2.2-2 shows the changes that would occur to NID's and PCWA's water delivery deficits as compared to the No Action Alternative (Table 3.6.2.1-2) under Licensees' Proposed Projects.

Table 3.6.2.2-2. Changes, as compared to the No Action Alternative, in water deliveries deficits to NID and PCWA under Licensees' Proposed Projects, using average 2001-2009 water supply deliveries.

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	Type	NID	PCWA	NID	PCWA	NID	PCWA
1976	Critically Dry	99%	98%	1,000	2,000	0	0
1977	Critically Dry	89%	53%	19,000	54,000	0	-2%
1978	Above Normal	98%	90%	3,000	11,000	0	-1%
1979	Below Normal	100%	100%	0	0	0	0
1980	Wet	100%	100%	0	0	0	0
1981	Below Normal	100%	100%	0	0	0	0
1982	Wet	100%	100%	0	0	0	0
1983	Wet	100%	100%	0	0	0	0
1984	Above Normal	100%	100%	0	0	0	0
1985	Dry	100%	100%	0	0	0	0
1986	Wet	100%	100%	0	0	0	0
1987	Critically Dry	100%	100%	0	0	0	0
1988	Critically Dry	100%	100%	0	0	0	0
1989	Above Normal	100%	100%	0	0	0	0
1990	Dry	100%	100%	0	0	0	0
1991	Dry	100%	100%	0	0	0	0
1992	Dry	100%	100%	0	0	0	0
1993	Above Normal	100%	100%	0	0	0	0
1994	Dry	100%	100%	0	0	0	0
1995	Wet	100%	100%	0	0	0	0
1996	Above Normal	100%	100%	0	0	0	0
1997	Wet	100%	100%	0	0	0	0
1998	Wet	100%	100%	0	0	0	0
1999	Above Normal	100%	100%	0	0	0	0
2000	Above Normal	100%	100%	0	0	0	0
2001	Dry	100%	100%	0	0	0	0
2002	Below Normal	100%	100%	0	0	0	0
2003	Below Normal	100%	100%	0	0	0	0
2004	Below Normal	100%	100%	0	0	0	0
2005	Below Normal	100%	100%	0	0	0	0
2006	Wet	100%	100%	0	0	0	0
2007	Dry	100%	100%	0	0	0	0
2008	Dry	100%	100%	0	0	0	0

Table 3.6.2.2-3 shows, as compared to the No Action Alternative, the change, by project, power generation by powerhouse and by water year type under Licensees' Proposed Projects.

Table 3.6.2.2-3. Changes in power generation, as compared to the No Action Alternative, by powerhouse and by water year type under the Licensees' Proposed Projects using average 2001-2009 water supply deliveries.

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
YUBA–BEAR HYDROELECTRIC PROJECT		
By Powerhouse	--	--
Bowman	12.1	-2.8%
Dutch Flat #2	62.3	-2.3%
Chicago Park	129.4	-2.3%
Rollins	65.5	-1.4%
By Water Year Type	--	--
Critically Dry	112	0.4%
Dry	191	-1.4%
Below Normal	282	-2.2%
Above Normal	321	-2.8%
Wet	367	-2.2%
Total	**269**	**-2.1**
DRUM-SPAULDING PROJECT		
By Powerhouse	--	--
Spaulding 3	34.5	-2.9%
Spaulding 2	33.8	-2.5%
Spaulding 1	13.2	-1.3%
Deer Creek	28.2	-0.7%
Drum 1	79.5	-7.4%
Drum2	274.4	-0.1%
Alta	5.3	0.1%
Dutch Flat #1	98.4	-1.4%
Halsey	52.6	-2.9%
Wise 1	70.6	-2.5%
Wise 2	8.0	0.29
Newcastle	27.9	0.28
By Water Year Type	--	--
Critically Dry	407	0.2%
Dry	599	-1.6%
Below Normal	764	-1.6%
Above Normal	823	-2.4%
Wet	893	-1.7%
Total	**726**	**-1.7**

3.6.2.3 FWN's Flow Proposal Using Average 2001-2009 Water Supply Deliveries (ResSim Model Scenario: FWN022411)

3.6.2.3.1. Description

FWN's Flow Proposal, modeled in ResSim as "FWN022411," consists of all the assumptions for the No Action Alternative except for minimum instream flows. For FWN's Flow Proposal model scenario, minimum instream flows are those proposed by FWN through informal submittals in Relicensing Participants workshops in August and September 2010, along with a formal submittal to Licensees dated February 24, 2011. Average 2001-2009 water supply deliveries are also used.

3.6.2.3.2. Summary of Results

Some noteworthy findings are:

- Minimum streamflows in Auburn Ravine proposed by FWN are not met during the Wise Canal outage, due to a lack of reservoir storage immediately upstream of the minimum instream flow delivery point.
- As compared to the No Action Alternative, Jackson Meadows, Spaulding and Rollins reservoir elevations are lower
- As compared to the No Action Alternative, water supply deficits in the most Critically Dry water year (1977) jumps by 11,000 ac-ft for NID and 15,000 ac-ft for PCWA, and deficits spread into multiple dry year periods for both NID and PCWA. However, neither would see impacts greater than 5 percent of annual delivery in the period outside of 1976-1978.
- Overall, the Yuba-Bear Hydroelectric Project experiences a 23.2 percent decrease in generation and the Drum-Spaulding Project lost generation is 19.0 percent, as compared to the No Action Alternative. Spaulding No. 1, Drum No. 1, Dutch Flat No. 2 and Newcastle powerhouses experience the largest losses; and Bowman, Spaulding No. 3 and Alta powerhouses have the least impacts. The largest proportional reductions in water availability for hydropower generation occur in the Drum and Bear River/Wise/South canals, due to the instream flow increases in the Middle Yuba River, South Yuba River and Canyon Creek as compared to both the No-Action Alternative and the Licensees' Proposed Project.
- A summary of the FWN's Flow Proposal model scenario is provided below.

FWN did not propose any minimum pool requirements in their flow proposal. As reflected in Table 3.6.2.3-1 below, the minimum pool levels for Licensees' proposed projects are met under FWN's Flow Proposal in all cases except for Critically Dry water years.

Table 3.6.2.3-1 shows, as compared to the No Action Alternative (Table 3.6.2.1-1), the changes that would occur to summertime reservoir water surface elevation in the projects' major storage reservoirs under FWN's Flow Proposal using historical water supply deliveries.

Table 3.6.2.3-1. Changes in summertime reservoir water surface elevation by water year type as compared to the No Action Alternative at NID'S Yuba-Bear Hydroelectric Project's Jackson Meadows Reservoir, Bowman Lake and Rollins Reservoir and PG&E's Drum-Spaulding Project's Lake Spaulding, Fordyce Lake and Lake Valley Reservoir under FWN's Flow Proposal using average 2001-2009 water supply deliveries.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
JACKSON MEADOWS RESERVOIR							
Critically Dry	-6.7	-7.0	-6.0	-7.1	-6.7	-4.7	-4.8
Dry	-6.7	-7.3	-7.6	-7.8	-8.2	-8.8	-11.1
Below Normal	-3.8	-7.9	-9.2	-9.4	-9.8	-10.1	-10.6
Above Normal	-4.4	-8.9	-11.3	-11.6	-12.1	-12.5	-12.7
Wet	-2.3	-7.0	-12.3	-12.6	-13.1	-13.5	-13.5
BOWMAN LAKE							
Critically Dry	-14.6	-16.8	-21.3	-25.6	-27.3	-24.3	-16.1
Dry	-1.1	-2.0	-3.0	-4.1	-5.6	-6.4	-7.0
Below Normal	-2.6	1.2	1.1	0.1	-1.2	-2.2	-2.0
Above Normal	-6.0	-1.8	1.4	0.5	-0.6	-0.6	-2.2
Wet	-5.7	-2.9	1.9	0.7	-0.6	-1.2	-1.9
ROLLINS RESERVOIR							
Critically Dry	-10.2	-14.4	-22.1	-32.9	-32.8	-40.3	-28.4
Dry	-12.2	-14.4	-20.1	-21.2	-20.5	-20.8	-24.6
Below Normal	-10.8	-17.0	-20.1	-20.5	-24.4	-26.1	-29.3
Above Normal	-11.9	-16.2	-19.9	-20.0	-19.2	-15.7	-14.9
Wet	-1.3	-12.1	-22.8	-23.1	-23.1	-20.0	-20.1
FORDYCE LAKE							
Critically Dry	-5.9	-5.8	-1.6	-1.4	-0.7	-0.1	-1.6
Dry	-1.4	0.0	0.0	0.1	0.5	0.6	-0.8
Below Normal	-0.3	0.0	0.0	0.2	0.4	0.5	-1.4
Above Normal	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	0.0	0.0	0.0	0.2	0.3	-0.4	0.0
LAKE SPAULDING							
Critically Dry	-6.6	-5.8	-13.7	-14.0	-17.4	-18.7	-34.3
Dry	-10.8	-13.2	-15.7	-18.0	-21.4	-22.5	-26.3
Below Normal	-6.8	-6.9	-8.5	-9.9	-12.0	-12.9	-17.5
Above Normal	-5.2	-5.1	-14.6	-13.6	-11.5	-9.4	-15.5
Wet	-0.2	-2.4	-6.3	-3.6	-2.7	-2.5	-10.3
LAKE VALLEY RESERVOIR							
Critically Dry	0.0	0.0	-0.2	-0.2	-0.3	0.0	0.0
Dry	0.0	-0.1	-0.1	-0.2	-0.1	0.0	0.0
Below Normal	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
Above Normal	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
Wet	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0

[1] Yellow highlighted rows indicate periods when the reservoir elevation would be below the bottom of existing boat ramps in the reservoirs. Refer to footnote 1 in Table 3.6.2.1-1 for the elevation of the boat ramps.

Table 3.6.2.3-2 shows the changes that would occur to NID's and PCWA's water delivery deficits using FWNs proposed minimum flows and historical water supply deliveries as compared to the No Action Alternative (Table 3.6.2.1-2) under FWN's Flow Proposal.

Table 3.6.2.3-2. Changes, as compared to the No Action Alternative, in water deliveries deficits to NID and PCWA under FWN's Flow Proposal using average 2001-2009water supply deliveries.

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	Type	NID	PCWA	NID	PCWA	NID	PCWA
1976	Critically Dry	97%	89%	5,000	13,000	-2%	-9%
1977	Critically Dry	83%	42%	30,000	66,000	-6%	-13%
1978	Above Normal	98%	90%	3,000	11,000	0	-1%
1979	Below Normal	99%	99%	1,000	1,000	-1%	-1%
1980	Wet	99%	99%	1,000	1,000	-1%	-1%
1981	Below Normal	100%	98%	0	2,000	0	-2%
1982	Wet	99%	99%	1,000	1,000	-1%	-1%
1983	Wet	100%	100%	0	0	0	0
1984	Above Normal	99%	99%	1,000	1,000	-1%	-1%
1985	Dry	99%	99%	1,000	1,000	-1%	-1%
1986	Wet	99%	99%	1,000	1,000	-1%	-1%
1987	Critically Dry	100%	98%	0	2,000	0	-2%
1988	Critically Dry	99%	98%	1,000	2,000	-1%	-2%
1989	Above Normal	99%	95%	2,000	6,000	-1%	-5%
1990	Dry	99%	99%	1,000	1,000	-1%	-1%
1991	Dry	99%	97%	1,000	3,000	-1%	-3%
1992	Dry	99%	97%	1,000	3,000	-1%	-3%
1993	Above Normal	99%	99%	1,000	1,000	-1%	-1%
1994	Dry	99%	98%	1,000	2,000	-1%	-2%
1995	Wet	100%	99%	0	1,000	0	-1%
1996	Above Normal	100%	100%	0	0	0	0
1997	Wet	99%	99%	1,000	1,000	-1%	-1%
1998	Wet	100%	99%	0	1,000	0	-1%
1999	Above Normal	99%	100%	1,000	0	-1%	0
2000	Above Normal	99%	99%	1,000	1,000	-1%	-1%
2001	Dry	99%	98%	1,000	2,000	-1%	-2%
2002	Below Normal	99%	99%	1,000	1,000	-1%	-1%
2003	Below Normal	99%	99%	1,000	1,000	-1%	-1%
2004	Below Normal	99%	98%	1,000	2,000	-1%	-2%
2005	Below Normal	99%	99%	1,000	1,000	-1%	-1%
2006	Wet	99%	99%	1,000	1,000	-1%	-1%
2007	Dry	99%	99%	1,000	1,000	-1%	-1%
2008	Dry	99%	98%	1,000	2,000	-1%	-2%

Table 3.6.2.3-3 shows as compared to the No Action Alternative, the change, by project, power generation by powerhouse and by water year type under FWN's Flow Proposal.

Table 3.6.2.3-3. Changes in power generation, as compared to the No Action Alternative, by powerhouse and by water year type under FWN's Flow Proposal using average 2001-2009 water supply deliveries.

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
YUBA–BEAR HYDROELECTRIC PROJECT		
By Powerhouse	--	--
Bowman	11.3	-9.2%
Dutch Flat #2	39.8	-37.6%
Chicago Park	104.5	-21.1%

Table 3.6.2.3-3. (continued)

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
YUBA–BEAR HYDROELECTRIC PROJECT (continued)		
Rollins	55.6	-16.3%
By Water Year Type	--	--
Critically Dry	83	-25.7%
Dry	135	-30.5%
Below Normal	222	-23.2%
Above Normal	253	-23.3%
Wet	304	-19.1%
Total	**211**	**-23.2**
DRUM-SPAULDING PROJECT		
By Powerhouse	--	--
Spaulding 3	31.7	-10.7%
Spaulding 2	24.8	-28.4%
Spaulding 1	11.5	-14.1%
Deer Creek	21.7	-23.6%
Drum 1	54.0	-37.1%
Drum2	228.9	-16.6%
Alta	5.3	-0.5%
Dutch Flat #1	82.4	-17.4%
Halsey	31.7	-12.1%
Wise 1	24.8	-12.5%
Wise 2	11.5	-24.0%
Newcastle	21.7	-22.2%
By Water Year Type	--	--
Critically Dry	305	-24.8%
Dry	455	-25.2%
Below Normal	632	-18.5%
Above Normal	693	-17.7%
Wet	772	-15.1%
Total	**598**	**-19.0%**

3.6.2.4 Licensees' Proposed Project with Projected Future (2062) Water Deliveries (ResSim Model Scenario: L030311-P)

3.6.2.4.1 Description

The Licensees' Proposed Project with Projected Future (2062) Water Deliveries, modeled in ResSim as "L030311-P," consists of the assumptions listed in Section 3.6.2.2, with the exception of water deliveries, which are modeled at projected future (2062) levels.

3.6.2.4.2 Summary of Results

Noteworthy findings include:

- Major changes to reservoir elevation and power generation are related to increased water supply delivery, not Licensees' proposed minimum flow and reservoir pool requirements.

- As compared to the No Action Alternative, Rollins Reservoir elevations are substantially lower, with some effect on Jackson Meadows Reservoir in Critically Dry and Dry Water Years.
- As compared to the No Action Alternative, water supply deficits are spread into multiple Dry Water Year periods for both NID and PCWA, however NID does not experience deficits greater than 2 percent of annual delivery in the period outside of 1976-1978. The transition period of 1986-1987 (i.e., Wet Water Year followed by a Critically Dry Water Year) shows negligible effect to NID (100 percent of deliveries met in 1987 by NID, with less than 1,000 ac-ft of deficit).
- Overall, the Yuba-Bear Hydroelectric Project experiences a 5.9 percent decrease in generation and the Drum-Spaulding Project lost generation is 4.8 percent, as compared to the No Action Alternative. The Drum No. 1, Dutch Flat No. 2 and Newcastle powerhouses experience the largest losses. The Spaulding No. 1, Deer Creek and Alta powerhouses experience a gain in generation due to more water passing through these powerhouses for water supply.

A summary of the Licensees' Proposed Project with Projected Future (2062) Water Deliveries model scenario is provided below.

Under this scenario, the minimum streamflow and minimum pool requirements proposed by Licensees are met at all times.

Table 3.6.2.4-1 shows, as compared to the No Action Alternative (Table 6.3.2.1-1), the changes that would occur to summertime reservoir water surface elevation in the projects' major storage reservoirs under Licensees' Proposed Projects with Projected (2062) Water Deliveries.

Table 3.6.2.4-1. Changes in summertime reservoir water surface elevation by water year type as compared to the No Action Alternative at NID'S Yuba-Bear Hydroelectric Project's Jackson Meadows, Bowman Lake and Rollins Reservoir and PG&E's Drum-Spaulding Project's Fordyce Lake, Lake Spaulding and Lake Valley Reservoir under Licensees' Proposed Projects with Projected Future (2062) Water Deliveries.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
JACKSON MEADOWS RESERVOIR							
Critically Dry	-12.6	-12.0	-11.0	-8.6	-5.6	-3.0	-2.1
Dry	-13.8	-15.9	-18.4	-19.3	-21.0	-19.5	-14.0
Below Normal	-2.9	-4.4	-6.1	-6.3	-6.5	-6.8	-7.1
Above Normal	-1.6	-3.1	-4.7	-4.8	-5.0	-5.1	-5.3
Wet	-0.5	-1.4	-2.9	-3.0	-3.1	-3.1	-2.7
BOWMAN LAKE							
Critically Dry	-2.2	-3.4	-5.7	-8.8	-15.9	-39.4	-28.3
Dry	0.4	2.2	4.1	3.9	2.2	-2.0	-8.1
Below Normal	0.0	0.9	2.4	1.8	1.0	0.4	0.0
Above Normal	0.1	0.7	1.4	0.6	-0.5	-0.9	-2.8
Wet	0.0	0.8	1.3	0.3	-0.8	-1.3	-2.3

Table 3.6.2.4-1. (continued)

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
ROLLINS RESERVOIR							
Critically Dry	-15.9	-23.4	-40.8	-51.4	-56.2	-66.1	-45.7
Dry	-9.6	-14.9	-22.5	-29.4	-37.9	-47.7	-85.3
Below Normal	-4.8	-9.6	-16.3	-22.2	-30.6	-35.3	-64.2
Above Normal	-0.7	-0.9	-0.6	-0.9	-2.5	-1.8	-11.1
Wet	0.0	-0.6	-0.1	-0.3	-4.2	-6.7	-16.4
FORDYCE LAKE							
Critically Dry	-11.7	-14.4	-10.3	-11.3	-13.9	-16.9	-17.8
Dry	-4.9	-2.1	0.0	0.1	0.5	0.6	-0.8
Below Normal	-1.7	0.0	0.0	0.2	0.4	0.5	-1.4
Above Normal	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	0.0	-0.1	0.0	0.2	0.3	-0.4	0.0
LAKE SPAULDING							
Critically Dry	7.3	7.7	-2.7	-2.7	-2.2	-2.2	-4.4
Dry	7.8	4.7	2.1	2.6	2.9	2.5	3.1
Below Normal	1.9	0.0	0.3	0.6	0.6	0.6	0.9
Above Normal	0.2	0.0	-0.7	-1.5	-2.6	-3.1	-3.9
Wet	0.0	0.1	-0.7	-1.3	-0.6	-0.6	-3.0
LAKE VALLEY RESERVOIR							
Critically Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Yellow highlighted rows indicate periods when the reservoir elevation would be below the bottom of existing boat ramps in the reservoirs. Refer to footnote 1 in Table 3.6.2.1-1 for the elevation of the boat ramps.

Table 3.6.2.4-2 shows the changes that would occur to NID's and PCWA's water delivery deficits as compared to the No Action Alternative (Table 3.6.2.1-2) under Licensees' Proposed Projects with Projected (2062) Water Deliveries.

Table 3.6.2.4-2. Changes, as compared to the No Action Alternative, in water deliveries deficits to NID and PCWA under Licensees' Proposed Projects with Projected (2062) Water Deliveries.

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	Type	NID	PCWA	NID	PCWA	NID	PCWA
1976	Critically Dry	94%	83%	12,000	20,000	-6%	-15%
1977	Critically Dry	75%	38%	51,000	73,000	-14%	-15%
1978	Above Normal	97%	90%	6,000	12,000	-1%	-1%
1979	Below Normal	100%	100%	1,000	0	0	0
1980	Wet	100%	100%	0	0	0	0
1981	Below Normal	99%	98%	3,000	2,000	-1%	-2%
1982	Wet	100%	97%	1,000	4,000	0	-3%
1983	Wet	100%	100%	0	0	0	0
1984	Above Normal	100%	100%	0	0	0	0
1985	Dry	100%	100%	1,000	0	0	0
1986	Wet	100%	100%	0	0	0	0
1987	Critically Dry	100%	100%	1,000	0	0	0
1988	Critically Dry	98%	92%	5,000	9,000	-2%	-8%

Table 3.6.2.4-2. (continued)

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	**Type**	**NID**	**PCWA**	**NID**	**PCWA**	**NID**	**PCWA**
1989	Above Normal	100%	94%	1,000	7,000	00	-6%
1990	Dry	100%	100%	1,000	0	0	0
1991	Dry	100%	100%	1,000	0	0	0
1992	Dry	99%	98%	2,000	2,000	-1%	-2%
1993	Above Normal	100%	94%	1,000	7,000	0	-6%
1994	Dry	100%	100%	1,000	0	0	0
1995	Wet	100%	97%	0	4,000	0	-3%
1996	Above Normal	100%	100%	0	0	0	0
1997	Wet	100%	100%	0	0	0	0
1998	Wet	100%	100%	0	0	0	0
1999	Above Normal	100%	100%	0	0	0	0
2000	Above Normal	100%	100%	0	0	0	0
2001	Dry	100%	100%	1,000	0	0	0
2002	Below Normal	100%	98%	1,000	2,000	0	-2%
2003	Below Normal	100%	100%	0	0	0	0
2004	Below Normal	100%	100%	1,000	0	0	0
2005	Below Normal	100%	100%	0	0	0	0
2006	Wet	100%	100%	0	0	0	0
2007	Dry	100%	100%	1,000	0	0	0
2008	Dry	100%	100%	1,000	0	-1%	-2%

Table 3.6.2.4-3 shows as compared to the No Action Alternative, the change, by project, power generation by powerhouse and by water year type under Licensees' Proposed Projects with Projected (2062) Water Deliveries.

Table 3.6.2.4-3. Changes in power generation, as compared to the No Action Alternative, by powerhouse and by water year type under Licensees' Proposed Projects with Projected (2062) Water Deliveries.

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
YUBA–BEAR HYDROELECTRIC PROJECT		
By Powerhouse	--	--
Bowman	12.2	-1.3%
Dutch Flat #2	59.3	-7.0%
Chicago Park	124.9	-5.7%
Rollins	62.5	-5.8%
By Water Year Type	--	--
Critically Dry	102	-8.6%
Dry	181	-6.8%
Below Normal	272	-5.8%
Above Normal	310	-6.1%
Wet	357	-4.8%
Total	**259**	**-5.9%**
DRUM-SPAULDING PROJECT		
By Powerhouse	--	--
Spaulding 3	34.8	-2.1%
Spaulding 2	33.8	-2.6%
Spaulding 1	13.9	3.8%

Table 3.6.2.4-3. (continued)

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
DRUM-SPAULDING PROJECT (continued)		
Deer Creek	29.7	4.5%
Drum 1	72.2	-15.9%
Drum2	270.7	-1.4%
Alta	7.3	37.7%
Dutch Flat #1	96.2	-3.5%
Halsey	50.0	-6.0%
Wise 1	67.6	-5.4%
Wise 2	7.7	-6.3%
Newcastle	20.0	-30.5%
By Water Year Type	--	--
Critically Dry	379	-6.6%
Dry	573	-5.8%
Below Normal	741	-4.5%
Above Normal	801	-4.9%
Wet	875	-3.7%
Total	**704**	**-4.8%**

3.6.2.5 FWN's Flow Proposal with Projected Future (2062) Water Deliveries (ResSim Model Scenario: FWN022411-P)

FWN's Flow Proposal with Projected Future (2062) Water Deliveries, modeled in ResSim as "FWN022411-P," consists of the assumptions listed in Section 3.6.2.3 above with the exception of water deliveries, which are modeled at projected future (2062) levels.

3.6.2.5.2 Summary of Results

Noteworthy findings include:

- Large increases in water supply deficits, due to both the increased demand in the projected case and additional instream flows under FWN's proposal in the Middle Yuba River, South Yuba River and Canyon Creek.
- As compared to the No Action Alternative, water supply deficits spread into all periods (except the two consecutive wet periods of '82-'83 and '95-'96) for both NID and PCWA, including impacts greater than 10 percent of annual delivery in 20 of 34 years for PCWA, and 3 of 34 years for NID (NID impacts of at least 5 percent of annual delivery in 16 of 34 years)
- As compared to the No Action Alternative, Jackson Meadows, Spaulding and Rollins reservoir elevations are drastically lower.
- Overall, the Yuba-Bear Hydroelectric Project experiences a 28.4 percent decrease in generation and the Drum-Spaulding Project lost generation is 20.9 percent, as compared to the No Action Alternative. The Spaulding No. 1, Drum No. 1, Dutch Flat No. 2 and Newcastle powerhouses experience the largest losses. The Spaulding No. 1, Deer Creek and

Alta powerhouses experience a gain in generation due to more water passing through these powerhouses for water supply.

A summary of the FWN's Flow Proposal with Projected Future (2062) Water Deliveries model scenario is provided below. Under FWN's Flow Proposal with Projected Future (2062) Water Deliveries, the minimum streamflow and minimum pool requirements proposed by FWN are met at all times.

Table 3.6.2.5-1 shows, as compared to the No Action Alternative (Table 3.6.2.1-1), the changes that would occur to summertime reservoir water surface elevation in the projects' major storage reservoirs under FWN's Flow Proposal with Projected Future (2062) Water Deliveries.

Table 3.6.2.5-1. Changes in summertime reservoir water surface elevation by water year type as compared to the No Action Alternative at NID'S Yuba-Bear Hydroelectric Project's Jackson Meadows Reservoir, Bowman Lake and Rollins Reservoir and PG&E's Drum-Spaulding Project's Fordyce Lake, Lake Spaulding and Lake Valley Reservoir under FWN's Flow Proposal with Projected Future (2062) Water Deliveries.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
JACKSON MEADOWS RESERVOIR							
Critically Dry	-14.5	-14.9	-12.6	-11.2	-9.4	-7.5	-7.6
Dry	-16.4	-18.5	-21.1	-22.2	-24.4	-20.0	-15.0
Below Normal	-8.4	-11.5	-13.5	-13.9	-14.5	-15.1	-15.9
Above Normal	-5.0	-10.0	-12.9	-13.3	-13.7	-14.2	-14.8
Wet	-2.3	-7.0	-12.7	-13.0	-13.4	-13.9	-13.8
BOWMAN LAKE							
Critically Dry	-17.8	-20.8	-27.6	-33.4	-31.4	-29.2	-22.6
Dry	-0.8	0.0	0.9	-0.3	-1.6	-5.1	-11.6
Below Normal	-2.5	0.2	0.9	-0.1	-1.4	-2.4	-2.0
Above Normal	-5.8	-1.8	2.5	1.7	0.4	0.1	-1.8
Wet	-5.4	-2.9	2.3	1.0	-0.3	-0.9	-1.6
ROLLINS RESERVOIR							
Critically Dry	-61.5	-87.6	-99.9	-90.3	-84.4	-82.8	-63.4
Dry	-59.7	-74.4	-98.0	-126.7	-131.6	-132.7	-117.7
Below Normal	-27.6	-38.3	-65.9	-82.5	-108.6	-125.9	-113.9
Above Normal	-20.4	-34.5	-50.2	-61.8	-83.3	-102.1	-112.8
Wet	-6.9	-23.7	-49.8	-64.7	-87.7	-111.7	-105.8
FORDYCE LAKE							
Critically Dry	-11.7	-14.4	-10.4	-11.3	-13.9	-16.9	-17.8
Dry	-4.9	-2.1	0.0	0.1	0.5	0.6	-0.8
Below Normal	-1.7	0.0	0.0	0.2	0.4	0.5	-1.4
Above Normal	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	0.0	-0.1	0.0	0.2	0.3	-0.4	0.0
LAKE SPAULDING							
Critically Dry	2.4	2.6	-11.1	-17.1	-17.4	-19.1	-37.0
Dry	-6.8	-11.5	-15.9	-18.1	-21.5	-22.8	-27.2
Below Normal	-6.6	-8.6	-10.4	-12.0	-14.3	-15.2	-20.3
Above Normal	-6.5	-7.2	-14.6	-13.6	-11.3	-9.3	-15.2
Wet	-1.1	-2.3	-6.3	-3.6	-2.6	-2.4	-9.8

Table 3.6.2.5-1. (continued)

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
LAKE VALLEY RESERVOIR							
Critically Dry	0.0	0.0	-0.2	-0.2	-0.3	0.0	0.0
Dry	0.0	-0.1	-0.1	-0.2	-0.1	0.0	0.0
Below Normal	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
Above Normal	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0
Wet	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0

[1] Yellow highlighted rows indicate periods when the reservoir elevation would be below the bottom of existing boat ramps in the reservoirs. Refer to footnote 1 in Table 3.6.2.1-1 for the elevation of the boat ramps.

Table 3.6.2.5-2 shows the changes that would occur to NID's and PCWA's water delivery deficits as compared to the No Action Alternative (Table 3.6.2.1-2) under FWN's Flow Proposal with Projected Future (2062) Water Deliveries

Table 3.6.2.5-2. Changes, as compared to the No Action Alternative, in water deliveries deficits to NID and PCWA under FWN's Flow Proposal with Projected Future (2062) Water Deliveries.

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	Type	NID	PCWA	NID	PCWA	NID	PCWA
1976	Critically Dry	89%	73%	22,000	32,000	-10%	-25%
1977	Critically Dry	71%	29%	59,000	84,000	-18%	-26%
1978	Above Normal	95%	86%	11,000	16,000	-4%	-5%
1979	Below Normal	97%	94%	7,000	7,000	-3%	-6%
1980	Wet	97%	90%	7,000	12,000	-3%	-10%
1981	Below Normal	95%	86%	11,000	17,000	-5%	-14%
1982	Wet	97%	92%	7,000	10,000	-3%	-8%
1983	Wet	99%	99%	2,000	1,000	-1%	-1%
1984	Above Normal	96%	93%	9,000	8,000	-4%	-7%
1985	Dry	96%	93%	9,000	8,000	-4%	-7%
1986	Wet	96%	90%	8,000	12,000	-4%	-10%
1987	Critically Dry	95%	87%	10,000	15,000	-5%	-13%
1988	Critically Dry	89%	70%	23,000	35,000	-11%	-30%
1989	Above Normal	94%	86%	12,000	16,000	-6%	-14%
1990	Dry	93%	81%	14,000	22,000	-7%	-19%
1991	Dry	94%	81%	13,000	23,000	-6%	-19%
1992	Dry	93%	73%	15,000	32,000	-7%	-27%
1993	Above Normal	96%	88%	9,000	14,000	-4%	-12%
1994	Dry	94%	84%	12,000	19,000	-6%	-16%
1995	Wet	98%	92%	5,000	10,000	-2%	-8%
1996	Above Normal	99%	100%	2,000	0	-1%	0%
1997	Wet	95%	90%	10,000	12,000	-5%	-10%
1998	Wet	99%	95%	2,000	6,000	-1%	-5%
1999	Above Normal	98%	97%	5,000	3,000	-2%	-3%
2000	Above Normal	96%	94%	8,000	7,000	-4%	-6%
2001	Dry	95%	85%	10,000	18,000	-5%	-15%
2002	Below Normal	96%	89%	8,000	13,000	-4%	-11%
2003	Below Normal	97%	92%	6,000	10,000	-3%	-8%
2004	Below Normal	95%	91%	10,000	11,000	-5%	-9%
2005	Below Normal	96%	89%	8,000	13,000	-4%	-11%

Table 3.6.2.5-2. (continued)

Water Year		Percent (%) of Annual Total Target Delivery Met		Annual Delivery Deficit (acre-feet)		Percent (%) Change As Compared to No Action Alternative	
Year	**Type**	**NID**	**PCWA**	**NID**	**PCWA**	**NID**	**PCWA**
2006	Wet	97%	95%	6,000	6,000	-3%	-5%
2007	Dry	94%	88%	12,000	14,000	-6%	-12%
2008	Dry	92%	74%	17,000	31,000	-8%	-26%

Table 3.6.2.5-3 shows as compared to the No Action Alternative, the change, by project, power generation by powerhouse and by water year type under FWN's Flow Proposal with Projected Future (2062) Water Deliveries.

Table 3.6.2.5-3. Changes in power generation, as compared to the No Action Alternative, by powerhouse and by water year type under FWN's Flow Proposal with Projected Future (2062) Water Deliveries.

Powerhouse and Water Year Type	GWh/yr	Percent (%) Change As Compared to No Action Alternative
YUBA–BEAR HYDROELECTRIC PROJECT		
By Powerhouse	--	--
Bowman	11.4	-7.8%
Dutch Flat #2	37.5	-41.3%
Chicago Park	99.9	-24.6%
Rollins	48.2	-27.4%
By Water Year Type	--	--
Critically Dry	69	-38.5%
Dry	114	-41.2%
Below Normal	210	-27.2%
Above Normal	240	-27.3%
Wet	294	-21.8%
Total	**197**	**-28.4%**
DRUM-SPAULDING PROJECT		
By Powerhouse	--	--
Spaulding 3	32.0	-9.8%
Spaulding 2	25.2	-27.3%
Spaulding 1	14.3	6.3%
Deer Creek	32.4	14.1%
Drum 1	50.4	-41.3%
Drum2	224.6	-18.2%
Alta	6.8	28.5%
Dutch Flat #1	79.5	-20.3%
Halsey	41.7	-21.6%
Wise 1	56.3	-21.3%
Wise 2	6.3	-23.1%
Newcastle	15.2	-47.2%
By Water Year Type	--	--
Critically Dry	284	-30.1%
Dry	425	-30.2%
Below Normal	625	-19.5%
Above Normal	683	-18.9%
Wet	771	-15.2%
Total	**585**	**-20.9%**

3.6.3 Summary of Changes in Power Generation

Table 3.6.3-1 provides a summary of changes in power generation, as compared to the No Action Alternative, for each of the four model scenarios.

Table 3.6.3-1. Power generation by project and by powerhouse and by water year type under the No Action Alternative using average 2001-2009 water supply deliveries.

Powerhouse and Water Year Type	Power Generation Under No Action Alternative	Change in Power Generation Compared to No Action Alternative			
		Licensees' Proposed Project	FWN's Proposed Flows	Licensee's Proposed Project with Projected (2062) Water Deliveries	FWN's Flow Proposal with Projected (2062) Water Deliveries
	GWh/yr	GWh/yr	GWh/yr	GWh/yr	GWh/yr
YUBA-BEAR HYDROELECTRIC PROJECT					
By Powerhouse:	--	--	--	--	--
Bowman	12.4	-2.8%	-9.2%	-1.3%	-7.8%
Dutch Flat No. 2	63.8	-2.3%	-37.6%	-7.0%	-41.3%
Chicago Park	132.5	-2.3%	-21.1%	-5.7%	-24.6%
Rollins	66.4	-1.4%	-16.3%	-5.8%	-27.4%
By Water Year Type:	--	--	--	--	--
Critically Dry	112	0.4%	-25.7%	-8.6%	-38.5%
Dry	194	-1.4%	-30.5%	-6.8%	-41.2%
Below Normal	289	-2.2%	-23.2%	-5.8%	-27.2%
Above Normal	330	-2.8%	-23.3%	-6.1%	-27.3%
Wet	375	-2.2%	-19.1%	-4.8%	-21.8%
Total	**275**	**-2.1**	**-23.2**	**-5.9%**	**-28.4%**
DRUM-SPAULDING PROJECT					
By Powerhouse:	--	--	--	--	--
Spaulding 3	35.5	-2.9%	-10.7%	-2.1%	-9.8%
Spaulding 2	34.7	-2.5%	-28.4%	-2.6%	-27.3%
Spaulding 1	13.4	-1.3%	-14.1%	3.8%	6.3%
Deer Creek	28.4	-0.7%	-23.6%	4.5%	14.1%
Drum No. 1	85.9	-7.4%	-37.1%	-15.9%	-41.3%
Drum No. 2	274.5	-0.1%	-16.6%	-1.4%	-18.2%
Alta	5.3	0.1%	-0.5%	37.7%	28.5%
Dutch Flat No. 1	99.8	-1.4%	-17.4%	-3.5%	-20.3%
Halsey	53.2	-2.9%	-12.1%	-6.0%	-21.6%
Wise	71.5	-2.5%	-12.5%	-5.4%	-21.3%
Wise 2	8.2	0.29	-24.0%	-6.3%	-23.1%
Newcastle	28.7	0.28	-22.2%	-30.5%	-47.2%
By Water Year Type:	--	--	--	--	--
Critically Dry	406	0.2%	-24.8%	-6.6%	-30.1%
Dry	609	-1.6%	-25.2%	-5.8%	-30.2%
Below Normal	776	-1.6%	-18.5%	-4.5%	-19.5%
Above Normal	842	-2.4%	-17.7%	-4.9%	-18.9%
Wet	909	-1.7%	-15.1%	-3.7%	-15.2%
Total	**739**	**-1.7**	**-19.0%**	**-4.8%**	**-20.9%**

SECTION 4
APPLICABLE LAWS

Pursuant to 18 CFR § 5.18(b)(3), this section discusses for each project the status of compliance with, or consultation under, relevant laws.

4.1 Clean Water Act of 1970

Under Section 401(a)(1) of the Clean Water Act (CWA) of 1970, as amended, 33 USC § 1329(a)(1), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA, 33 USC § 1251 *et seq*.

Pursuant to 18 CFR § 5.23(b), NID and PG&E each intend to file a request with the State Water Resources Control Board (SWRCB) for Section 401 Water Quality Certifications for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project, respectively, within 60 days of the date FERC issues its notice accepting each Licensee's application for a new license and stating that each application is ready for environmental review (REA Notice).[1]

4.2 Endangered Species Act of 1973

The federal Endangered Species Act (ESA) of 1973, as amended, (16 USC § 1531 *et seq.*) was enacted to protect and conserve endangered and threatened species and the ecosystems upon which they depend. The ESA defines an "endangered" species in part as a, "species which is in danger of extinction throughout all or a significant portion of its range" and a "threatened" species as one, "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." 16 USC § 1532(6), (20). A species may be officially proposed for listing under the ESA as endangered or threatened. The ESA is administered by the Secretary of the Interior through the USDOI, Fish and Wildlife Service (USFWS) for most species, and by the Secretary of USDOC, NOAA, National Marine Fisheries Service (NMFS) for marine and anadromous species.

Section 7 of the ESA requires federal agencies to consult with the USFWS and NMFS to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat for these listed species. Jeopardy exists when an action would "reduce appreciably the likelihood of both the survival and recovery of a listed species . . . ." (50 CFR § 402.02). Consultation involves a request to the USFWS and NMFS for an inventory of threatened and endangered species that may be affected by the project. FERC then prepares a biological assessment (BA) to determine whether any listed species or critical habitat is likely to be adversely affected by the federal action, and therefore requires formal consultation. At the end of the consultation process, the USFWS or NMFS may issue a biological opinion (BO) that

[1] Licensees note that FERC may issue its REA for each project at different times.

specifies whether the action will place a threatened or endangered species, or critical habitat, in jeopardy. If a jeopardy opinion is issued, the USFWS or NMFS must include reasonable and prudent alternatives to the action. A non-jeopardy opinion may be accompanied by an incidental take statement that specifies potential impacts of the taking, mitigation measures, and terms and conditions for implementation of the mitigation measures.

On June 10, 2008, the Commission initiated informal consultation with USFWS and NMFS as required under Section 7 of the ESA and the interagency cooperation regulations at 50 CFR § 402, and designated each Licensee as FERC's non-federal representative for their respective projects for purposes of informal consultation.

Consistent with the requirements of 18 CFR 5.18(b)(3)(ii) regarding the ESA, the status of informal Section 7 consultation and potential adverse effects on ESA listed species and their Critical Habitat, if any, for each project, is summarized in Section 6.5 of this Exhibit E.

4.3 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The purpose of Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (16 USC § 1801 *et seq.*) (Act) is to conserve and manage, among other resources, commercial anadromous fishery resources of the United States. The Act establishes eight Regional Fisheries Management Councils and authorizes them to prepare, monitor and revise fishery management plans in a way that will achieve and maintain the optimum yield from each fishery. In California, the Pacific Fisheries Management Council (PFMC) is responsible for achieving the objectives of the statute. The Secretary of Commerce has oversight authority.

The act was amended in 1996 to establish a new requirement to describe and identify "essential fish habitat" (EFH) in each fishery management plan. EFH is defined in the amended Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." (U.S.C. 1855(b)). The geographic extent of the "waters" includes the portion of a watershed within specific hydrologic units (HU) that are currently, or were historically, accessible to the anadromous fish species. For the purpose of EFH, NMFS uses fourth field hydrologic unit codes (HUCs) developed by the USGS as defined in the USGS publication, Hydrologic Unit Maps, Water Supply Paper 2294, 1987.[2]

The act requires that all federal agencies consult with NMFS on all actions, or proposed actions, permitted, funded, or undertaken by the agency (i.e., lead agency), that may adversely affect EFH [Magnusons-Stevens Act § 305(b) U.S.C. § 1855(b)(2)(2000)]. Comments from NMFS following consultation are advisory only; however, the lead agency must provide a written explanation to NMFS if it does not agree with NMFS's recommendations regarding EFH.

[2] The geographic extent of HUCs range is from the first field, which is the largest geographic extent, to the sixth field, which is the smallest geographic extent. Fourth field HUCs divide the landscape into distinct geographic areas that are identified by eight numbers unique to that hydrologic unit.

Within the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project affected basins, PFMC designated freshwater EFH for Pacific salmon. The designation is identified in Amendment 14 of the Pacific Salmon FMPs and codified in CFR Part 660, Subpart H.[3] The designation does not identify specific salmon species or races (e.g., spring-run or fall-run). However, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley fall- late-fall run Chinook salmon are species managed under the Pacific Coast Salmon FMP that occur in the Central Valley.

Table 4.3-1 lists by river basin and for each hydrologic unit in which PFMC designated EFH: 1) the current upstream limit of salmon occupation within the hydrologic unit; 2) the historical upstream limit of salmon in the hydrological unit as identified by NMFS; 3) the amount of habitat within the EFH; and 4) the status (e.g., abundance, distribution, available habitat and habitat used) of salmon within the EFH reach potentially affected by the projects for each HU and for the geographic scope of Project effects identified by the Commission in its SD2.

Table 4.3-1. Information regarding Essential Fish Habitat (EFH) and salmon abundance and distribution within geographic area of potential Yuba-Bear Hydroelectric Project and Drum-Spaulding Project effects.

HU Name and Code in Which EFH Occurs	Current Upstream Limit of Salmon in HU	Historic Upstream Limit of Salmon in HU [1]	Amount of EFH in FERC's Geographic Scope of Project Effects in HU	Current Status of Salmon in EFH in FERC's Geographic Scope of Project Effects in HU
BEAR RIVER				
lower Bear River (18020108)	Bear River Waterfall at vicinity of Camp Far West Reservoir	"Bear River Waterfall at vicinity of Camp Far West Reservoir."[1]	None. FERC identified the upper end of Lake Combie as the downstream extent of project effects on the Bear River. Lake Combie Dam is over 15 miles upstream of Camp Far West Dam.	No salmon present.
MIDDLE YUBA RIVER				
upper Yuba River (18020125)	None. Currently, USACE's Englebright Dam completely blocks upstream salmon passage. Therefore, salmon are not currently found in HU 18020125.	"The lower [Yuba] river, near where the North Fork joins. Direct information on the distribution is lacking."[1]	None. FERC identified YCWA's Our House Dam as the downstream extent of Yuba-Bear Hydroelectric Project effects on the Middle Yuba River. YCWA's Our House Dam, which can divert about 860 cfs, is 12 miles upstream of the North Fork confluence. The nearest Project facility to the confluence with the North Yuba River is Milton Diversion Dam, about 50 miles upstream.	No salmon present.

[3] Code of Federal Regulations TITLE 50 - Wildlife and Fisheries Chapter VI - Fishery Conservation and Management, National Oceanographic and Atmospheric Administration, Department of Commerce Part 660 - Fisheries Off West Coast States Subpart H - West Coast Salmon Fisheries Sections 660.4391 and 660.392.

Table 4.3-1. (continued)

HU Name and Code in Which EFH Occurs	Current Upstream Limit of Salmon in HU	Historic Upstream Limit of Salmon in HU [1]	Amount of EFH in FERC's Geographic Scope of Project Effects in HU	Current Status of Salmon in EFH in FERC's Geographic Scope of Project Effects in HU
SOUTH YUBA RIVER				
upper Yuba River (18020125)	None. Currently, USACE's Englebright Dam completely blocks upstream salmon passage. Therefore, salmon are not currently found in HU 18020125.	"1-2 miles upstream and perhaps spring-run salmon accessed the present Town of Washington on the South Yuba River. Direct information on the distribution is lacking."[1]	Approximately 29 miles of the South Yuba River from the upper end of Englebright Reservoir to the Town of Washington. FERC identified the upper end of USACE's Englebright Reservoir as the downstream extent of project effects on the South Yuba River. The nearest Drum-Spaulding Project facility to the Town of Washington is Lake Spaulding Dam on the South Yuba River, about 13 miles upstream. The nearest Yuba-Bear Hydroelectric Project facility to the Town of Washington is Bowman Dam in Canyon Creek, about 14 miles upstream.	Salmon do not currently occur in this area, and cannot occur under existing conditions. If they historically occurred, they have not been present since USACE's Englebright Dam was constructed in 1941.
AUBURN RAVINE				
lower Sacramento River (18020109)	Upstream limit of HUC 18020109 is approximately 4 miles upstream of the City of Lincoln on Auburn Ravine [~RM 18.4). It is presumed that salmon reach this far upstream.	It is presumed that salmon reach to the upstream limit of HUC 18020109 (~RM 18.4). Note that the PFMC has not designated the adjoining upstream HUC (18020127) as EFH.[2]	FERC did not identify, in revised SD2, the downstream geographic extent of the project's effects in Auburn Ravine, but FERC's July 23, 2010 study determination indicates there may be a Project nexus in Auburn Ravine from October through April each year (when irrigation deliveries have ceased).	Essential Fish Habitat for salmon extends to RM 18.4, which is downstream of PCWA's Auburn Tunnel Outlet (RM 26.4) and NID's Auburn Ravine #1 Diversion Dam (RM 23.8).

[1] Direct quotes from NMFS SWR Website accessed September 22, 2010 at http://swr.nmfs.noaa.gov/hcd/cvschshd.htm.
[2] Pacific Fisheries Management Council (PFMC). 1999. Amendment 14 to the Pacific Coast Salmon Plan, Appendix A

As shown in Table 4.3-1, the geographic area of NID's Yuba-Bear Hydroelectric Project in both the Bear River and Middle Yuba River do not include EFH. While the area of the Project's cumulative effect in the South Yuba River includes designated EFH, the EFH has been unoccupied for at least 70 years and anadromous fish are unable to access the area under existing conditions (i.e., USACE's Englebright Dam blocks salmon upstream migration). Therefore, NID has not prepared an EFH assessment for the Yuba-Bear Hydroelectric Project.

Likewise, the geographic area of PG&E's Drum-Spaulding Project in the Bear River does not include EFH. While the area of the Project's cumulative effect in the South Yuba River includes designated EFH, the EFH has been unoccupied for at least 70 years and anadromous fish are unable to access the area under existing conditions (i.e., USACE's Englebright Dam blocks salmon upstream migration). Finally, there are no salmon in Auburn Ravine above PCWA's Auburn Tunnel Outlet at RM 26.4 and NID's Auburn Ravine 1 Diversion Dam at RM 23.8. Therefore, PG&E has not prepared an EFH assessment for the Drum-Spaulding Project.

4.4 Coastal Zone Management Act of 1972

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA) of 1972, as amended, (16 U.S.C. §1456(3)(A)), the Commission cannot issue a license for a project that is within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The projects are not located within the state-designated CZMA, which extends inland up to 5 miles from the shoreline of the Pacific Ocean (CERES 2007), and relicensing the projects would not affect California's coastal resources. Therefore, the projects are not subject to California coastal zone program review and no consistency certification is needed.

4.5 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, (16 USC § 470 et seq.) requires that every federal agency take into account how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

On June 10, 2008, the Commission initiated informal consultation with the State Historic Preservation Officer (SHPO) as required by Section 106 of the NHPA and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2, and designated each Licensee as FERC's non-federal representative for their respective projects for the purposes of carrying out informal consultation.

Both NID and PG&E have prepared Historic Properties Management Plans (HPMP) for their respective projects. Because the plans contain confidential information, each HPMP, including the appendices, is located in Volume IV (Security Level – Privileged), in each Licensee's FLA. NID and PG&E have included these HPMPs in Exhibit E to satisfy the requirements of 18 CFR 5.18(b)(3)(v) regarding the NHPA.

4.6 Wild and Scenic Rivers Act of 1968

Rivers protected under the Wild and Scenic Rivers Act of 1968, as amended, (16 USC §§ 1271 *et seq*.) are designated as such for their outstandingly remarkable scenic, recreational, geologic, biological, historic, cultural or other values. According to the National Wild and Scenic River system, these rivers shall be preserved in free-flowing condition, and they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Wild and Scenic designation is not intended to prevent use of the river, but such use must preserve and protect the outstandingly remarkable values for which the river has been designated as Wild and Scenic.

The projects do not include any river segments protected under the federal Wild and Scenic Rivers Act. The nearest Wild and Scenic Rivers to the two projects is the North Fork American River, which was added to the National Wild and Scenic Rivers System through an act of the U.S. Congress for its outstanding scenery, remote recreation, and historic gold mining values. The designated reach of the North Fork American River occurs from a point 0.3 miles above Heath Springs downstream to a point 1,000 feet upstream of the Colfax-Iowa Hill Bridge. The total designated reach is 38.3 miles long and is managed by the TNF and BLM. The nearest Project facility is the Drum-Spaulding Project's Lake Valley Diversion Dam, located at RM 13.4 on the North Fork of the North Fork American River, which is a tributary to the proposed Wild and Scenic section of the North Fork American River. The Yuba-Bear Hydroelectric Project is not located in the American River basin.

In 1999, the TNF released a Wild and Scenic River Study Report that evaluated 22 rivers within the TNF along the western slope of the Sierra Nevada for their eligibility and recommended whether these 22 rivers should receive Wild and Scenic designation. During the course of the study, the TNF identified six alternatives (Alternatives A through F), one of which was the inclusion of no rivers (Alternative B) into the Wild and Scenic system. The five remaining alternatives involved the designation of various rivers or river segments as Wild and Scenic. The TNF recommended Alternative C, which proposed that the South Yuba River below Lake Spaulding Dam be considered for federal Wild and Scenic designation based on the river's scenic and recreational values. The U.S. Congress and the Secretary of the Interior, which have authority for designating Wild and Scenic Rivers, have not acted on the TNF's recommendation.

At this time, the Forest Service and BLM have not formally commented on the two projects in relation to consistency with Wild and Scenic Rivers.

SECTION 5
PROJECT FACILITIES AND OPERATIONS

Pursuant to 18 CFR § 5.18(b)(4), this section describes the facilities and operations for each of the projects as those projects exist today and as they are proposed in this Final License Application (FLA). Specifically, Section 5.1 describes for each Project the existing facilities, operations and environmental measures.[1] Section 5.2 provides an overview for each Licensee's proposed Project, including proposed facilities, operations, and environmental measures.

5.1 Existing Projects

5.1.1 Yuba Bear Hydroelectric Project

5.1.1.1 Existing Project Facilities

The existing Yuba-Bear Hydroelectric Project consists of four developments - Bowman, Dutch Flat, Chicago Park, and Rollins - each of which is described below. The existing Project can store and use 218,700 ac-ft of water and has generated an average of about 354.3 gigawatt-hours (GWh) of power annually from 1972 through 2007 (periods for Rollins and Bowman powerhouses are shorter as they came online in 1981 and 1986, respectively). The total installed capacity is 79.32 MW and the dependable capacity, based on Licensees' No-Action Alternative, is 44.2 MW. Table 5.1.1-1 and Table 5.1.1-2 summarize key information for Project turbine/generators and reservoirs/impoundments, respectively. Figure 5.1.1-1 provides a flow schematic of Project facilities.

Table 5.1.1-1. Key information regarding Yuba-Bear Hydroelectric Project existing powerhouses.

Powerhouse	Unit Number	Turbine Type	Rated Head (ft)	Rated Hydraulic Capacity (cfs)		Installed Capacity (MW)		Historical Average Annual Energy (GWh)[3]
				Minimum	Maximum	Nameplate Rating[1]	Dependable[2]	
Bowman	1	Francis	135	45	313	3.60	0.8	12.8
Dutch Flat No. 2	1	Francis	581	80	600	24.57	7.9	108.7
Chicago Park	1	Francis	480	125	1,100	39.00	35.2	161.9
Rollins	1	Francis	208	142	840	12.15	2.0	70.6
Total	**4**	--	--	--	--	**79.32**	**44.2**	**354.3**

[1] At 0.9 Power Factor.
[2] Dependable capacity calculations based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse water conditions coupled with high demand for electricity.
[3] Values represent historical average annual energy from 1972-2007 with the exception of Bowman Powerhouse, which is calculated from 1986-2007, and Rollins Powerhouse, which is calculated from 1981-2007. These values differ from the No-Action Alternative average annual energy statistics from the Licensee's Operations Model, due both to differences in period of analysis and in operating assumptions over the term of the analysis. For more information regarding Licensees' Operations Model, see Exhibit E, Section 6.2.

[1] For a discussion of the "No Action Alternative," which uses the existing projects as the baseline, please see Section 6.0 of this Exhibit E.

Table 5.1.1-2. Key information regarding Yuba-Bear Hydroelectric Project reservoirs and impoundments.

Project Reservoir	NMWSE[1] (ft)	Gross Storage[2] (ac-ft)	Usable Storage[2] (ac-ft)	Surface Area[2] (ac)	Maximum Depth[2] (ft)	Shoreline Length[2] (mi)	Drainage Area (sq mi)
MIDDLE YUBA RIVER SUB-BASIN							
Jackson Meadows Reservoir[3]	6,036.0	67,435	64,641	1,008	144	9.9	37.3
Milton Diversion Dam Impoundment	5,690.0	275	275	100	37	1.3	39.8
CANYON CREEK SUB-BASIN							
Jackson Lake	6,592.67	1,330	975	52	54	1.1	0.70
French Lake	6,660.0	13,940	13,940	356	65	5.3	4.82
Faucherie Lake	6,123.0	3,980	3,740	150	42	2.4	9.29
Sawmill Lake	5,860.0	3,030	3,030	113	55	2.6	17.0
Bowman Lake[3]	5,562.0	68,363	68,363	827	162	7.6	28.5
BEAR RIVER SUB-BASIN							
Dutch Flat No. 2 Forebay	3,330.0	177.9	159.8	8	61	0.5	0.10
Dutch Flat Afterbay[3]	2,741.0	1,359.2	1,359.2	38	170	1.9	21.2
Chicago Park Forebay	2,716.0	103	103	7	31	0.7	Negligible
Rollins Reservoir[3]	2,171.0	58,682	54,453	788	209	19.0	104
Total	**--**	**218,739**	**212,847**	**--**	**--**	**--**	**--**

[1] Normal Maximum Water Surface Elevation
[2] At Normal Maximum Water Surface Elevation
[3] Storage and area statistics based on Licensee’s bathymetric surveys in 2007-2008.

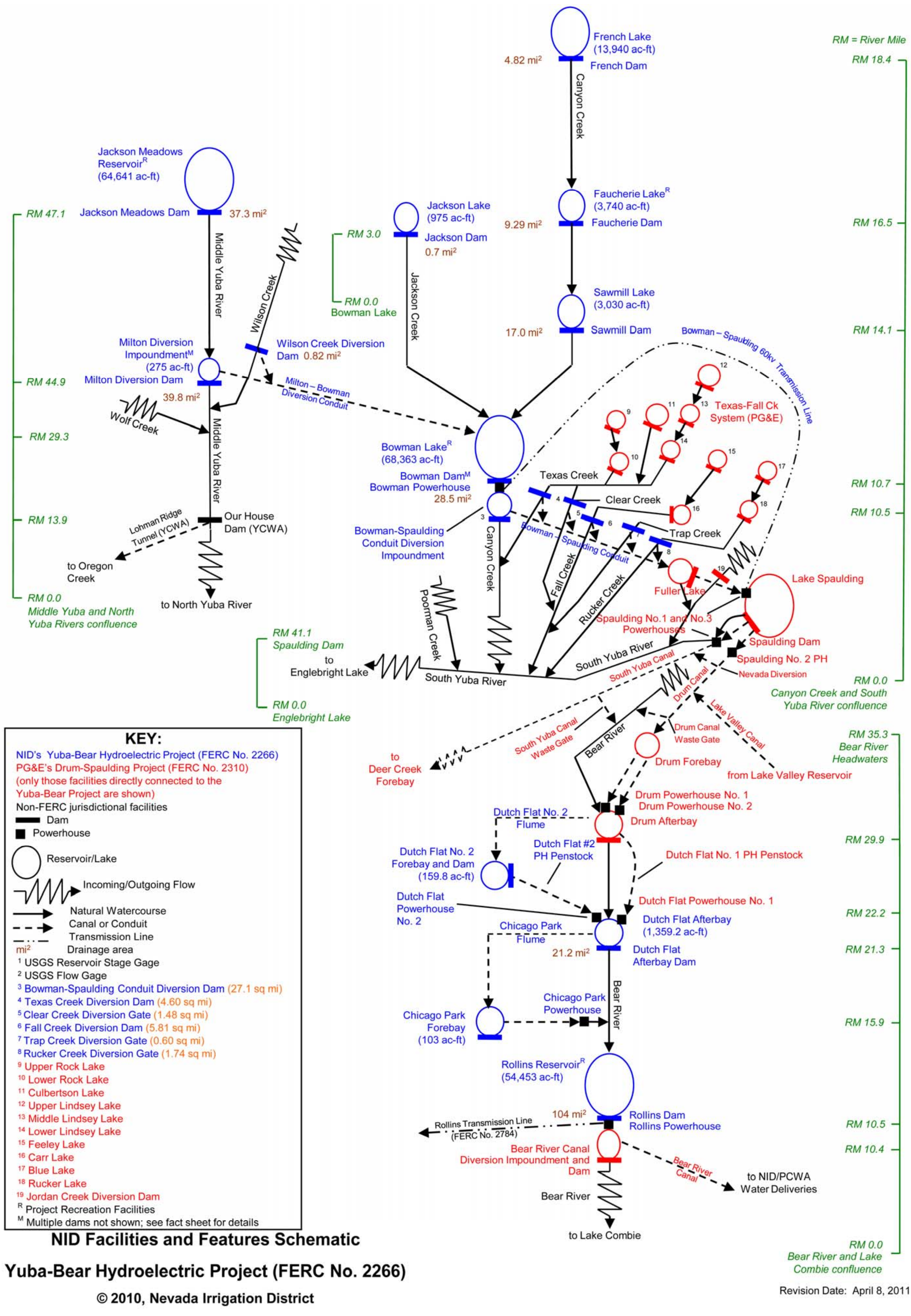

Figure 5.1.1-1. Yuba-Bear Hydroelectric Project flow schematic.

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5.1.1.1.1 Bowman Development

The Bowman Development is composed of:

1. Jackson Meadows Dam, a zoned embankment structure with a core, filter zones, and rockfill shells located on the Middle Yuba River 47.1 miles upstream of its confluence with the North Yuba River. The dam is 195 feet high with a crest length of 1,530 feet and a crest elevation of 6,044.5 feet,[2] and a drainage area of 37.3 square miles. The dam includes two low-level outlets (El. 5,933.0 ft) with a combined maximum design capacity of about 760.1 cubic feet per second (cfs) at full pool.

2. Jackson Meadows Dam Spillway, a 3-bay, gated spillway composed of reinforced concrete. The ogee crest elevation of the spillway is 6,021 feet. A reinforced concrete chute carries spillway flow about 200 feet past the gates and discharges into a rock-lined channel. The maximum design capacity of the spillway is 40,000 cfs at zero freeboard.

3. Jackson Meadows Reservoir, a man-made storage reservoir on the Middle Yuba River formed by Jackson Meadows Dam. At normal maximum water surface elevation (6,036.0 ft), Jackson Meadows Reservoir extends about 2.8 miles upstream, has an estimated usable storage capacity of 64,641 ac-ft, a surface area of 1,008 acres, and a shoreline of about 9.9 miles.

4. Milton Main (Diversion) Dam, a concrete arch dam located on the Middle Yuba River about 44.9 miles upstream of its confluence with the North Yuba River. The dam is 37 feet high with a crest elevation of 5,690.0 feet, and a drainage area of 39.8 square miles. The dam includes one low-level outlet (El. 5,663.0 ft) with a maximum design capacity of about 113 cfs at full pool and one 8-inch valve for minimum instream releases with a capacity of 5 cfs.

5. Milton South (Diversion) Dam, a concrete arch dam located on the Middle Yuba River about 44.9 miles upstream of its confluence with the North Yuba River. The dam is 30 feet high with a crest elevation of 5,696.0 feet.

6. Milton Diversion Dam Spillway, the main concrete arch dam acts as an ungated, uncontrolled spillway with a maximum design capacity of 50,000 cfs.

7. Milton Diversion Impoundment, a man-made impoundment on the Middle Yuba River formed by Milton Diversion Dam. At normal maximum water surface elevation (5,690.0 ft), Milton Reservoir extends 0.4-mile upstream, has a gross storage capacity of 275 ac-ft, a surface area of 100 acres, and a shoreline of about 1.3 miles.

8. Wilson Creek Diversion Dam, a grouted rubble matrix dam located on Wilson Creek about 0.4 miles upstream of its confluence with the Middle Yuba River. The dam is 3 feet high with a crest elevation of 5,690 feet.

[2] Unless otherwise stated, all elevation data throughout this document are in National Geodetic Vertical Datum of 1929 (NGVD 29).

9. Milton-Bowman Diversion Conduit, composed of both pipeline (a 3,315 ft-long, 84 inch-diameter, concrete pipeline) and tunnel (22,623 ft-long, 7.5 ft by 9.5 ft tunnel) sections carrying water from Milton Reservoir to Bowman Reservoir.

10. Jackson Dam, a homogeneous, compacted earth fill dam located on Jackson Creek, about 3 miles upstream of Bowman Lake on Jackson Creek. The dam is 28 feet high with a crest length of 772 feet and a crest elevation of 6,596.0 feet, and a drainage area of 0.7 square mile. The dam includes one low-level outlet (El. 6,570.0 ft) with a maximum design capacity of about 60 cfs at full pool.

11. Jackson Dam Spillway, a 50 foot long, uncontrolled, sharp-crested weir with rubble masonry training walls at a crest elevation of 6,592.67 feet. The maximum design capacity of the spillway is 1,481 cfs.

12. Jackson Lake, a man-made storage reservoir formed by Jackson Dam on Jackson Creek (originally formed in 1859). At normal maximum water surface elevation (6,592.67 ft), Jackson Lake extends 0.4-mile upstream, has a gross storage capacity of 1,330 ac-ft, a surface area of 52 acres, and a shoreline of about 1.1 miles.

13. French Dam, a rockfill dam with reinforced gunite and shotcrete on Canyon Creek, 1.3 miles upstream of Faucherie Lake. The dam is 70 feet high with a crest length of approximately 200 feet and a crest elevation of 6,665 feet, and a drainage area of 4.82 square miles. The dam includes one low-level outlet (El. 6,594.9 ft) with a maximum design capacity of about 650 cfs at full pool.

14. French Dam Spillway, an uncontrolled 100-foot long weir wall constructed of reinforced concrete. The crest of the spillway is 6,660 feet. An unlined rock channel carries spillway flow into the river channel. The maximum design capacity of the spillway is 3,810 cfs.

15. French Lake, a man-made storage reservoir on Canyon Creek formed by French Dam. At normal maximum water surface elevation (6,660.28 ft), French Lake Reservoir extends 1.6 miles upstream, has a usable storage capacity of 13,940 ac-ft, a surface area of 356 acres, and a shoreline of about 5.3 miles.

16. Faucherie Dam, a zoned embankment dam on Canyon Creek with sloping core and filter zones and riprap reinforcement, 1.5 miles upstream of Sawmill Lake. The dam is 65 feet high with a crest length of approximately 665 feet and a crest elevation of 6,131.0 feet, and a drainage area of 9.29 square miles. The dam includes two low-level outlets (El. 6,090 ft) with a combined maximum design capacity of about 288.5 cfs at full pool.

17. Faucherie Dam Spillway, an uncontrolled, 3 foot high sharp-crested concrete weir directing spillway discharge into an unlined rock channel that returns discharge to the creek downstream. The spillway is 150 feet long with a crest elevation of approximately 6,123 feet. The maximum design capacity of the spillway is 10,000 cfs.

18. Faucherie Lake, a man-made storage reservoir on Canyon Creek formed by Faucherie Dam. At normal maximum water surface elevation (6,123.0 ft), Faucherie Lake extends 0.7-mile

upstream, has a usable storage capacity of 3,740 ac-ft, a surface area of approximately 150 acres, and a shoreline of about 2.4 miles.

19. Sawmill Dam, a rockfill dam on Canyon Creek, 0.8-mile upstream of Bowman Lake. The dam is 60 feet high with a crest length of approximately 384 feet and a crest elevation of 5,865.0 feet, and a drainage area of 17 square miles. The dam includes one low-level outlet with a maximum design capacity of about 160 cfs at full pool.

20. Sawmill Dam Spillway, an uncontrolled, flat slab and buttress that direct spillway discharge into an unlined rock channel that returns discharge to the creek downstream. The spillway is 230 feet long with a crest elevation of approximately 5,860.0 feet. The maximum design capacity of the spillway is 15,000 cfs at zero freeboard.

21. Sawmill Lake, a man-made storage reservoir on Canyon Creek formed by Sawmill Dam. At normal maximum water surface elevation (5,860.0 ft), Sawmill Lake extends 0.8-mile upstream, has a usable storage capacity of 3,030 ac-ft, a surface area of approximately 113 acres, and a shoreline of about 2.6 miles.

22. Bowman North Dam, a concrete-faced rockfill dam located on Canyon Creek, 10.7 miles upstream of its confluence with the South Yuba River. The dam is 175 feet high with a crest length of approximately 700 feet, a crest elevation of 5,567.0 feet, and a drainage area of 28.5 square miles. The dam includes three low-level outlets (El. 5,400 ft) with a combined maximum design capacity of about 400 cfs at full pool.

23. Bowman South Dam, a constant radius arch dam constructed in nine monoliths, located on Canyon Creek. The dam is 135 feet high with a crest length of approximately 400 feet and a crest elevation of 5,563.6 feet.

24. Bowman South Dam Spillway, a reinforced concrete flat slab and buttress structure with 12 bays, 5 of which permit uncontrolled overflow and 7 of which are fitted with radial gates. The spillway is 175 feet long with a crest elevation of 5,563.6 feet for the 5 uncontrolled bays (85 feet in length) and 5,557.2 feet for the seven bays (90 feet in length) controlled by radial gates (140 inches wide by 70 inches high). The maximum design capacity of the combined spillway structures is 4,000 cfs at elevation 5,563 feet. In addition, the Bowman South Dam acts as an ungated, uncontrolled spillway with a maximum design capacity of 25,000 cfs.

25. Bowman Lake, a man-made storage reservoir on Canyon Creek formed by Bowman North and South dams. At normal maximum water surface elevation (5,562.0 ft), Bowman Lake extends 2.6 miles upstream, has a usable storage capacity of 68,363 ac-ft, a surface area of approximately 827 acres, and a shoreline of about 7.6 miles.

26. Bowman Penstock, a submerged, concrete encased, 62 inch diameter penstock that diverts a maximum of 375 cfs to Bowman Powerhouse.

27. Bowman Powerhouse, an above-ground, indoor powerhouse constructed of reinforced concrete located near the base of Bowman North Dam, adjacent to Canyon Creek. The

powerhouse consists of one horizontal Francis turbine with a nameplate rated capacity of 3.6 MW at a head of 135 feet and a flow of 313 cfs.

28. Bowman Switchyard, located adjacent to Bowman Powerhouse.

29. Bowman Transmission Line, an above-ground, 9.0-mile-long, 60 kV transmission line that connects the Bowman Powerhouse Switchyard to PG&E's Drum-Spaulding 60 kV line approximately 1.5 miles west of PG&E's Spaulding No. 1 Powerhouse, which is part of PG&E's Drum-Spaulding Project.

30. Jackson Meadows Reservoir Recreation Area, a recreation area that includes Findley Campground with 14 campsites, East Meadows Campground with 46 campsites, Fir Top Campground with 12 campsites, Pass Creek Campground with 30 campsites, Woodcamp Campground with 20 campsites, Aspen Group Campground with a capacity for 100 people at one time (PAOT), Silvertip Group Campground with a capacity for 50 PAOT, and Jackson Point boat-in campground with 10 campsites.

31. Bowman Lake Recreation Area, a recreation area that includes Bowman Lake Campground (11 sites), primitive campsite (14 sites) and informal boat launches (2 ramps).

32. Faucherie Lake Recreation Area, a recreation area that includes Faucherie Group Campground with a capacity for 50 PAOT, and a day use area.

33. Canyon Creek Campground, a campground that includes 16 developed sites, with a capacity for 80 PAOT.

34. All appurtenant facilities and features.

5.1.1.1.2 Dutch Flat Development

The Dutch Flat Development is composed of:

1. Bowman-Spaulding Conduit Diversion Dam, a concrete structure, with a height of 21 feet and a crest elevation of 5,400 feet. The dam is located at River Mile 10.5 of Canyon Creek (immediately downstream of Bowman North Dam), has an upstream drainage area of 27.1 square miles, and has a maximum diversion capacity of 300 cfs. The dam has a 30-inch diameter low-level outlet used to release instream flows with a capacity of 80 cfs, and a canal inlet section used to divert flows directly into the head of the Bowman-Spaulding Conduit.

2. Bowman-Spaulding Conduit, which diverts flows from Canyon Creek below Bowman Lake to Fuller Lake and Lake Spaulding (part of PG&E's Drum-Spaulding Project) via 40,501 feet of canals and flumes and 16,192 feet of tunnels. Flow is diverted by the Bowman Spaulding Diversion Dam through a 12-foot wide radial head gate into the conduit. The Diversion Dam has a 30-inch diameter corrugated iron pipe controlled by a 30-inch diameter slide gate used as a low level outlet. Maximum design capacity of the conduit at the head gate is 300 cfs but increases to 325 cfs at its terminus into Lake Spaulding.

3. Texas Creek Diversion Dam, a concrete reinforced diversion dam on Texas Creek, 0.6-mile upstream of its confluence with Canyon Creek, which diverts a portion of flow into the Bowman-Spaulding Conduit. The dam has a drainage area of 4.6 square miles and is 21 feet tall with a crest length of 50 feet and a crest elevation of 5,385.75 feet. The dam has a low-level outlet with a capacity of 80 cfs.

4. Fall Creek Diversion Dam, a concrete reinforced diversion dam on Fall Creek, 1.2 miles downstream of its confluence with Lake Creek, which diverts a portion of flow into the Bowman-Spaulding Conduit. The dam has a drainage area of 5.81 square miles, and is 5.5 feet tall with a crest length of 74.5 feet and a crest elevation of 5,368.68 feet. The dam has a low-level outlet with a capacity of 80 cfs.

5. Fall Creek Diversion Flume, a 204 foot long, 6 foot 4 inch diameter steel flume that diverts water from Fall Creek Diversion Dam to the Bowman-Spaulding Conduit. Maximum design capacity of the flume is 100 cfs.

6. Other Bowman-Spaulding Conduit Diversions, including (in descending order) Clear Creek, Trap Creek, and Rucker Creek Diversions, each of which divert their entire streamflow. These diversions take place as each creek flows over the upstream wall or section into the Bowman-Spaulding Conduit. Dump gates, whose style and dimensions vary by diversion, are located in the downstream wall opposite the diversion which can carry flow into the downstream channel.

7. Dutch Flat No. 2 Conduit, a 24,728 foot long combination of tunnel, flume, siphon and canal that diverts water from Drum Afterbay, part of PG&E's Drum-Spaulding Project, to Dutch Flat No. 2 Forebay at a maximum design capacity of 610 cfs.

8. Dutch Flat Forebay Dam, a zoned earthfill embankment dam located off-stream, adjacent to the Bear River, 0.4 mile north of Dutch Flat Afterbay. The dam is 77 feet high with a crest length of 440 feet and a crest elevation of 3,336.0 feet, and a drainage area of 0.1 square mile. The dam does not include a low-level outlet because it is off-stream.

9. Dutch Flat Forebay Dam Spillway, an uncontrolled, concrete spillway 250 feet in length and a crest elevation of 3,331.6 feet. Discharge is routed through two 60 inch-diameter metal pipes down to a tributary of the Bear River. The maximum design capacity of the spillway is 4,500 cfs.

10. Dutch Flat Forebay, an off-stream man-made re-regulating reservoir adjacent the Bear River formed by Dutch Flat Forebay Dam. At normal maximum water surface elevation (3,330 feet), Dutch Flat Forebay has a usable storage capacity of 159.8 ac-ft, a surface area of 8 acres, and a shoreline of about 0.5-mile.

11. Dutch Flat No. 2 Powerhouse Penstock, a 1,370.2 foot long, 8 foot diameter, steel penstock that diverts water, at a maximum design capacity of approximately 610 cfs, from Dutch Flat Forebay to Dutch Flat No. 2 Powerhouse.

12. Dutch Flat No. 2 Powerhouse, an above-ground, outdoor powerhouse constructed of reinforced concrete and located adjacent to Dutch Flat Afterbay, part of the Bear River. The

powerhouse consists of one vertical axis Francis turbine with a nameplate rated capacity of 24.57 MW at a head of 581 feet and a flow of 600 cfs.

13. Dutch Flat No. 2 Powerhouse Switchyard, located adjacent to the Dutch Flat No. 2 Powerhouse.

14. All appurtenant facilities and features.

5.1.1.1.3 Chicago Park Development

The Chicago Park Development is composed of:

1. Dutch Flat Afterbay Dam, a zoned embankment dam with rockfill shells located on the Bear River 6 miles upstream of its confluence with Rollins Reservoir. The dam is 165 feet high with a crest length of 495 feet and a crest elevation of 2,755.0 feet, and a drainage area of 21.2 square miles. The dam includes two low-level outlets (El. 2,640.0 ft) with a combined maximum design capacity of about 150 cfs at full pool.

2. Dutch Flat Afterbay Dam Spillway, an uncontrolled, concrete-lined spillway 100 wide with a crest elevation of 2,741 feet. Discharge goes over an ogee crest and down a 405 foot-long concrete chute that discharges into the Bear River. The maximum design capacity of the spillway is 21,500 cfs.

3. Dutch Flat Afterbay, a man-made re-regulating reservoir located on the Bear River formed by Dutch Flat Afterbay Dam. At normal maximum water surface elevation (2,741 ft), Dutch Flat Afterbay Reservoir extends about 0.9-mile upstream, has a usable storage capacity of 1,359.2 ac-ft, a surface area of 38 acres, and a shoreline of about 1.9 miles.

4. Chicago Park Conduit, which diverts water from Dutch Flat Afterbay Dam to Chicago Park Forebay via 16,225 feet of concrete flume (18 feet wide by 10 feet deep) and gunite-lined ditch (14 feet wide and 10 feet deep). Maximum design capacity of the conduit is 1,100 cfs.

5. Chicago Park Forebay Dam, an earthfill dam with gunite face located off-stream, adjacent to the Bear River approximately 0.3-mile east of the confluence of the Bear River and Steephollow Creek. The dam is 35 feet high with a crest length of 200 feet and a crest elevation of 2,720.0 feet, and no associated drainage area. The dam includes one low-level outlet (El. 2689.0 ft) with a maximum design capacity of about 75 cfs.

6. Chicago Park Forebay Dam Spillway, an uncontrolled side channel spillway 40 feet in length, with a crest elevation of 2,717.3 feet, located on the Chicago Park Conduit 0.5-mile above the Chicago Park Powerhouse Penstock intake structure. The maximum design capacity of the spillway is 1,100 cfs.

7. Chicago Park Forebay, a man-made re-regulating reservoir located adjacent to the Bear River formed by Chicago Park Forebay Dam. At normal maximum water surface elevation (2,716 ft), Chicago Park Forebay Reservoir has a usable storage capacity of 103 ac-ft, a surface area of 7 acres, and a shoreline of about 0.7-mile.

8. Chicago Park Powerhouse Penstock, an approximately 2,200-foot long, 9.25-10.0 foot-diameter steel penstock that diverts water, at a maximum design capacity of approximately 1,167 cfs, from Chicago Park Forebay to Chicago Park Powerhouse.
9. Chicago Park Powerhouse, an above-ground, indoor powerhouse constructed of concrete and located adjacent to the Bear River, approximately 800 feet southeast of the confluence of the Bear River and Steephollow Creek. The powerhouse consists of one vertical axis Francis turbine with a nameplate rated capacity of 39 MW at a head of 480 feet and a maximum flow of 1,100 cfs.
10. Chicago Park Switchyard, located adjacent to Chicago Park Powerhouse.
11. All appurtenant facilities and features.

5.1.1.1.4 Rollins Development

The Rollins Development is composed of:

1. Rollins Dam, a zoned embankment dam located on the Bear River approximately 10.5 river miles upstream of Combie Dam, a non-project facility. The dam is 252.5 feet high with a crest length of 1,260 feet and a crest elevation of 2,187.5 feet, and a drainage area of 104 square miles. The dam includes one low-level outlet (El. 2,022 ft) with a maximum design capacity of about 2,000 cfs at full pool.
2. Rollins Dam Spillway, an uncontrolled concrete ogee crest spillway 620 feet in length, with a crest elevation of 2,171.0 feet and a maximum design capacity of 70,000 cfs.
3. Rollins Reservoir, a man-made storage reservoir located on the Bear River and formed by Rollins Dam. At normal maximum water surface elevation (2,171.0 ft), Rollins Reservoir extends about 3.3 miles upstream, has a usable storage capacity of 54,453 ac-ft, a surface area of 788 acres, and a shoreline of about 19 miles.
4. Rollins Powerhouse Penstock, an approximately 524 foot-long, 8.5 foot-diameter, steel penstock partially encased in concrete that diverts water, at a maximum design capacity of approximately 840 cfs, from Rollins Dam to Rollins Powerhouse.
5. Rollins Powerhouse, an above-ground, outdoor powerhouse constructed of reinforced concrete and located at the toe of the dam. The powerhouse consists of one vertical axis Francis turbine with a nameplate rated capacity of 12.15 MW at a head of 208 feet and a maximum flow of 840 cfs.
6. Rollins Switchyard, located adjacent to the Rollins Powerhouse.
7. Rollins Reservoir Recreation Area, four Project recreation facilities at Rollins Reservoir, which includes Peninsula Campground with 67 campsites; Greenhorn Campground with 79 campsites; Long Ravine Campground with 85 campsites; and Orchard Springs Campground with 101 campsites (each facility includes a boat launch).

8. All appurtenant facilities and features.

5.1.1.2 Current Project Operations

In general, the Project is characterized by high elevation storage and lower elevation power generation via a network of natural and man-made conveyances. Water is stored and released from the upper reservoirs (also known as the "Mountain Division") based on NID's consumptive needs and combined reservoir storage targets developed as part of the Consolidated Contract with PG&E. Discretionary releases are made from Jackson Meadows Reservoir and Jackson, French, Faucherie, and Sawmill lakes during the spring runoff season through late fall. These releases are conveyed to Bowman Lake via the Milton-Bowman Tunnel (releases from Jackson Meadows Reservoir), Jackson Creek (releases from Jackson Lake), and Canyon Creek (releases from French, Faucherie, and Sawmill lakes). This water is then stored and released by Bowman Dam through Bowman Powerhouse into the Bowman-Spaulding Conduit Diversion Impoundment.

While the majority of the Bowman-Spaulding Conduit flow is provided by releases at Bowman Lake, five small diversion structures (known as "feeders") on creeks that run perpendicular to the alignment of the Bowman-Spaulding Conduit also provide water to the conduit. These feeders augment flows in the conduit up to its capacity, and spill the remainder into their respective natural drainages downstream of the conduit. Two types of feeders occur on the Bowman-Spaulding Conduit: diversion dams on Texas Creek and Fall Creek; and side water inflows from Clear, Trap, and Rucker creeks. The diversion dam-style feeders utilize spillways and outlet conduits to release water downstream into the creek, while the side water style feeders utilize dump gates on the downstream side of the Bowman-Spaulding Conduit to make releases into drainages.

Flows upstream of the Bowman-Spaulding Conduit in Texas, Fall, and Rucker creeks are regulated by upstream reservoirs owned and operated by PG&E. These are Culbertson, Upper Rock, Lower Rock, Upper Lindsey, Middle Lindsey, and Lower Lindsey lakes in the Texas Creek watershed; Carr and Feeley lakes in the Fall Creek watershed; and Blue and Rucker lakes in the Rucker Creek watershed.

Bowman-Spaulding Conduit discharges into PG&E's Fuller Lake, where it then is diverted to a second section of the Bowman-Spaulding Conduit before it is utilized by PG&E for power generation at Spaulding No. 3 Powerhouse (part of PG&E's Drum-Spaulding Project). PG&E then passes this water through PG&E's Lake Spaulding into PG&E's Drum and South Yuba canals. Water transported into the Drum Canal is passed through PG&E's Drum Forebay and then diverted from PG&E's Drum Afterbay, located on the Bear River, into the Dutch Flat No. 2 Flume, Forebay, and Powerhouse. Water transported by PG&E into the South Yuba Canal is passed through PG&E's Deer Creek Forebay and Deer Creek Powerhouse prior to being released into South Fork Deer Creek. NID re-diverts most of this water out of South Fork Deer Creek, approximately 0.1 mile downstream, to meet consumptive demand. Daily volumes into each canal are scheduled by PG&E and NID for downstream consumptive demand and discretionary hydropower generation.

Water from the Project's Dutch Flat No. 2 Powerhouse and PG&E's Dutch Flat No. 1 Powerhouse discharge into the Project's Dutch Flat Afterbay located on the Bear River, where the water is then delivered via the Chicago Park Flume to the Project's Chicago Park Powerhouse by way of the Project's Chicago Park Forebay. Daily volumes are scheduled for downstream consumptive demand and discretionary hydroelectric power generation. These waters are discharged into the Bear River roughly 1.5 miles upstream of the high water line of the Project's Rollins Reservoir.

With a gross storage capacity of roughly 59,000 ac-ft, Rollins Reservoir is the Project's major low-elevation storage reservoir.[3] Located near Interstate 80 and State Highway 174, Rollins Reservoir is a multipurpose facility that meets municipal, irrigation, domestic water supply, recreation, and power generation needs. Under existing operations, Rollins Reservoir is generally kept as high as possible through the recreation season of Memorial Day through Labor Day. This is accomplished through upstream deliveries into the Bear River watershed by PG&E's Drum and Lake Valley canals. The Drum Canal is supplied by a combination of Licensee's water transfers out of the Middle Yuba River (via the Milton-Bowman Tunnel) and Canyon Creek (via the Bowman-Spaulding Conduit) watersheds, along with PG&E reservoirs and natural runoff in the South Yuba and North Fork of the North Fork American river watersheds.

A significant decrease in reservoir storage is generally experienced during the outage period of the Drum Canal, which occurs in the last two weeks of September each year. Rollins Reservoir storage is generally recovered through natural runoff and canal flows in the fall and early winter months. The primary purposes of the Drum Canal outage are as follows: 1) annual maintenance/repair of canal lining and structure; 2) cleaning of debris, sediment, and algae from the canal bottoms and side walls to improve conveyance capacity; and 3) maintenance of Spaulding No. 1 Powerhouse, which directly feeds the Drum Canal via Drum Tunnel. This two-week outage results in a significant reduction of net inflows into Drum Afterbay, Dutch Flat Afterbay, and Rollins Reservoir on the Bear River (at this time of year, typical Drum Canal imports represent over 90 percent of the overall inflow into Rollins Reservoir, due to the low level of unimpaired accretion typically experienced in late summer / early fall. Drum and Dutch Flat afterbays are negligibly affected due to their relatively low minimum instream flow requirements, but Rollins Reservoir is significantly affected due to the relatively high level of instream flow and water delivery demands from the reservoir in this time period. In an average water year, Rollins Reservoir is drawn down by approximately 900 acre-feet per day during the Drum Canal outage due to the mismatch between supply (Drum Canal plus unimpaired accretion) and demand (minimum instream flow and water deliveries into both the Bear River and the Bear River Canal). See Figure 5.1.1-2 for a graphical representation of this phenomenon.

[3] Gross storage estimate based on NID's 2007 reservoir bathymetry study.

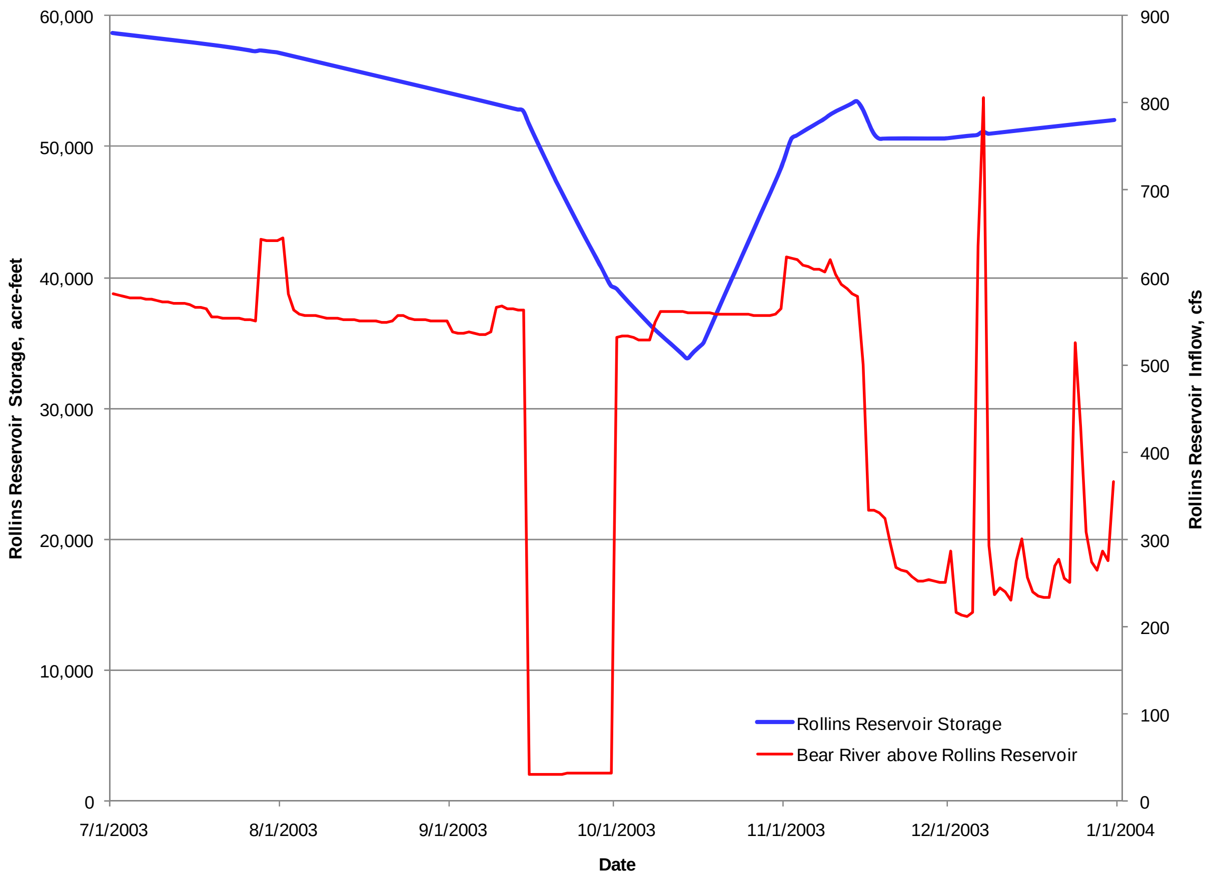

Figure 5.1.1-2. Rollins Reservoir storage and inflow in water year 2003 in response to the Drum Canal outage; water year 2003 is representative of the general trend across the period of record.

Besides physical (e.g., size of dams and tunnels) and hydrologic (e.g., natural runoff) constraints, major factors that constrain Licensee's normal operation of the Project include, but are not limited to; public and employee safety; conditions in the current FERC Project license; conditions in the NID/PG&E Consolidated Contract; other agreements made with PG&E and Davis-Grunsky Agreement reservoir elevation requirements; and other downstream water supply demand and associated requirements. The Consolidated Contract, Davis-Grunsky Agreement, and some of the other agreements expire at the same time as the existing FERC license.

The medians of the historical daily storage values illustrating the normal fill and spill operation of these reservoirs are presented in Figure 5.1.1-2.[4]

[4] Median daily storage quantities reported are based on historical area-capacity estimates; see Exhibit A for revised gross and usable storage estimates.

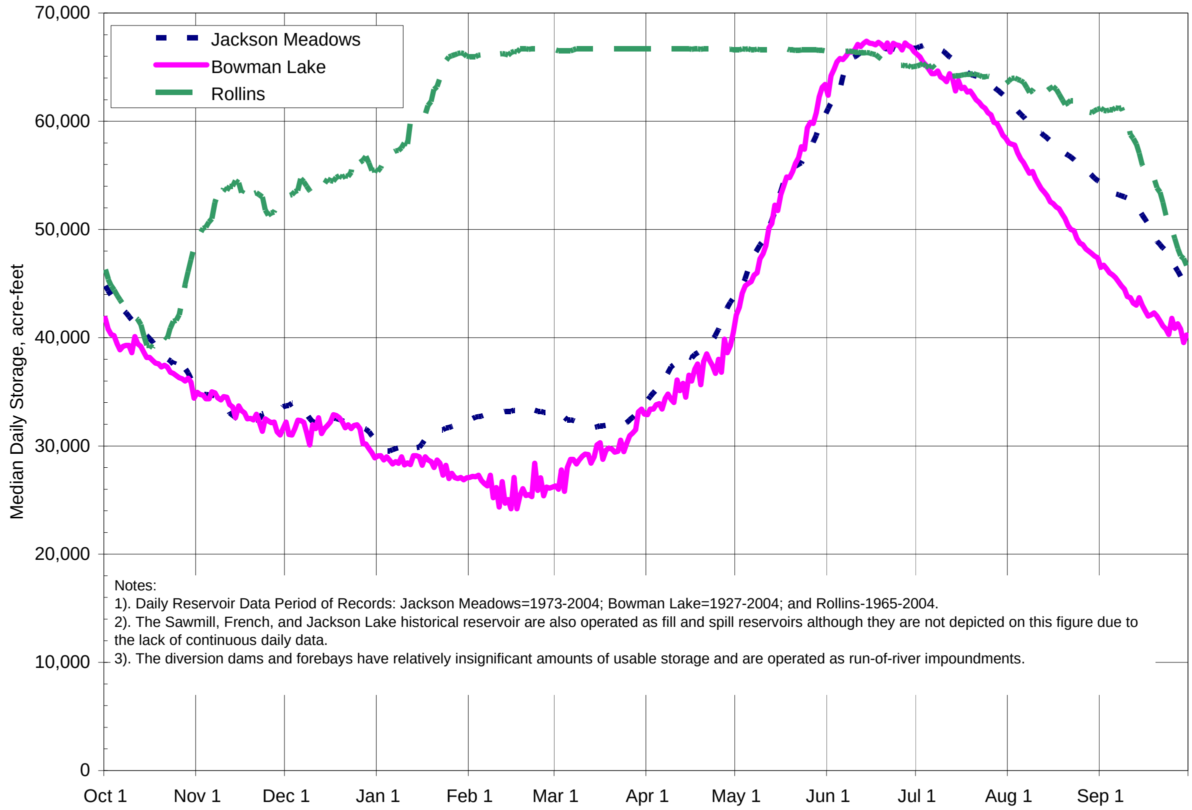

Figure 5.1.1-3. Median historical daily reservoir storage for Jackson Meadows, Bowman, and Rollins reservoirs (storage values based on pre-relicensing area-capacity information).

5.1.1.3 Current Environmental Measures

The existing license for the Yuba-Bear Hydroelectric Project requires NID to consult annually with the Forest Service, USFWS, and other resource agencies with regard to measures needed to ensure protection and development of the natural resource values of the Project area, and to file with the Commission within two months of the consultation a report that includes any recommendations made by the agencies.

The existing license includes the minimum flow requirement shown in Table 5.1.1-3.

Table 5.1.1-3. Existing minimum flow requirements for the Yuba-Bear Hydroelectric Project.

From	To	Release (cfs)	Period	Applicable Water Year Type
Jackson Meadows Dam	Middle Yuba River	5	Continuous	All
Milton Diversion Dam	Middle Yuba River	3	Continuous	All
Jackson Lake Dam	Jackson Creek	0.75	Continuous	All
French Lake Dam	Canyon Creek to Bowman Reservoir	2.5	Continuous	All
Bowman-Spaulding Diversion Dam	Canyon Creek	3 2	4/1 to 10/31 11/1 to 3/31	All

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Table 5.1.1-3. (continued)

From	To	Release (cfs)	Period	Applicable Water Year Type
Dutch Flat Afterbay Dam	Bear River	10 5	5/1 to 10/31 11/1 to 4/30	All
Rollins Dam[1]	Bear River	75 20	5/1 to 10/31 11/1 to 4/30	Normal[2]
		40 15	5/1 to 10/31 11/1 to 4/30	Less than Normal[2]

[1] As measured at the Colfax-Grass Valley streamflow gage (Bear River at Highway 174 crossing).
[2] Normal and Less than Normal are based on monthly precipitation at Lake Spaulding.

The existing license also requires the Project adhere to the following ramping rates:

- Jackson Meadows Dam. No more than releases of 15 cfs over 30 minutes when releases are in the range of 5 to 125 cfs, or greater than 15 cfs over 15 minutes when releases are at a level of 125 cfs or greater. In addition, the flow changes in the Middle Yuba River below Jackson Meadows Dam are limited to four changes (i.e., two increases and two decreases) per year, except in cases of emergency and/or uncontrolled spills.
- Rollins Dam. One foot in 6 hours or 3 inches during any 1 hour as measured at the Colfax-Grass Valley streamflow gage.

The existing license for the Project includes the following reservoir pool limitations:

- Jackson Meadows Reservoir. In Normal and Wet Water Years, not less than 10,000 ac-ft from October 1 through May 31 and not less than 21,000 ac-ft from June 1 through September 30; and in Dry Water Years, not less than 3,000 ac-ft from October 1 through May 31 and not less than 21,000 ac-ft from June 1 through September 30. For the purpose of this measure, a dry year is one in which the April-July run-off forecast made by the California Department of Water Resources (CDWR) on May 1 for the Bowman area-Middle Yuba River and Canyon Creek is for less than 70,000 acre-feet.
- Milton Diversion Dam Impoundment. An elevation of 5,686 feet year-round except when repair to the Milton-Bowman Tunnel is necessary, at which time the normal pool may be drawn to a minimum elevation of 5,678 feet.
- Rollins Reservoir. A minimum pool year-round of not less than 5,000 ac-ft.

NID is required to, in consultation with the US Geological Survey (USGS), install and maintain recorders for determining the stage and flows in streams from which water is diverted or released, and the amount of water retained in storage.

The current license provides that NID cooperate with the Forest Service, USFWS, and CDFG in planning the location of deer-proof fences, crosswalks, escape ramps, and such other reasonable structures necessary to protect deer and to maintain these facilities.

The existing license prohibits the use of pesticides or herbicides on National Forest System (NFS) lands for any purpose without the prior written approval of the Forest Service.

The existing license requires that prior to any ground-disturbing activity, NID consult with the California State Historic Preservation Officer (SHPO) and the Forest Service, if the work is on NFS land, about the need for a cultural resources survey and salvage work.

5.1.2 PG&E's Drum-Spaulding Project

5.1.2.1 Existing Project Facilities

PG&E's existing Drum-Spaulding Project is a power project that consists of 10 developments: Spaulding No. 3 Development, Spaulding No. 1 and No. 2 Development, Deer Creek Development, Alta Development, Drum No. 1 and No. 2 Development, Dutch Flat No. 1 Development, Halsey Development, Wise Development, Wise No. 2 Development, and Newcastle Development. In the 10 developments, there are 29 reservoirs; 6 major water conduits; 12 powerhouses with associated switchyards with a combined authorized installed capacity of 191.5 MW; 6 transmission lines; 1 distribution line; and appurtenant facilities and structures, including recreation facilities (see Exhibit E, Section 6.6, for a complete description of the recreation facilities). Each of the developments is described below. The existing Project has a usable storage of approximately 151,355 ac-ft of water and historically generated an annual average of 794 GWh from 1972 (or first full year of generation) to 2007, and had a historical dependable capacity of 142 MW. As a comparison, the simulated Licensee's No-Action Alternative Operations Model average annual energy is 739 GWh with a total dependable capacity of 139.8 MW. The difference in generation and dependable capacity between historical and No-Action Alternative Operations Model results is due in large part to the factors described in Exhibit B, Section 7.

Tables 5.1.2-1 and 5.1.2-2 summarize key information for Project powerhouse units and reservoirs/impoundments, respectively. Schematics of the facilities are provided in Figure 5.1.2.-1. Figure 5.1.2-2, located at the end of Section 5, is a map of the Project vicinity showing major existing Project facilities.

Table 5.1.2-1. Key information regarding Drum-Spaulding Project powerhouses.

Powerhouse	Unit No.	Turbine Type	Rated Head (ft)	Rated Hydraulic Capacity (cfs)		Installed Capacity (MW)		Historical Average Annual Energy (GWh)[3]
				Minimum	Maximum	Nameplate Rating[1]	Dependable[4]	
Alta	1	Pelton	648	2.6	28	1.0	0.8	5.2
	2[2]	Pelton		2.6	28	1.0		
Deer Creek	1	Pelton	837	12	110	5.7	4.7	22.0
Drum No. 1	1	Pelton	1,372	34	161	14.1	30.0	128.2
	2	Pelton		34	161	14.1		
	3	Pelton		34	161	14.1		
	4	Pelton		34	161	14.1		
Drum No. 2	1	Pelton	1,370	53	505	49.5		273.5
Dutch Flat No. 1	1	Francis	643	162	490	22.0	22.0	84.4
Halsey	1	Francis	328	114	495	11.0	11.0	64.6
Newcastle	1	Francis	415	130	392	11.5	0.0	34.9
Spaulding No. 1	1	Francis	197	194	600	7.0	3.8	33.9
Spaulding No. 2	1	Francis	344	64	200	4.4	1.7	12.9

Table 5.1.2-1. (continued)

Powerhouse	Unit No.	Turbine Type	Rated Head (ft)	Rated Hydraulic Capacity (cfs)		Installed Capacity (MW)		Historical Average Annual Energy (GWh)[3]
				Minimum	Maximum	Nameplate Rating[1]	Dependable[4]	
Spaulding No. 3	1	Francis	318	100	330	5.8	3.8	37.1
Wise	1	Francis	519	133	393	14.0	9.0	86.3
Wise No. 2	1	Francis	519	30	80	3.2	3.0	10.6
Total	**17**	--	--	--	--	**192.5**	**139.8**	**793.6**

1 At 0.9 Power Factor.
2 Alta Powerhouse Unit 2 is out of service and is proposed to be retired under Licensees' Proposed Project.
3 Values represent historical average annual energy from 1972-2007 with the exception of Newcastle Powerhouse, which is calculated from 1987-2007. These values differ from the average annual energy statistics from the Licensee's No Action Alternative Operations Model, due both to differences in period of analysis and in operating assumptions over the term of the analysis.
4 Dependable capacity calculations based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse water conditions coupled with high demand for electricity.

Table 5.1.2-2. Key information regarding Drum-Spaulding Project reservoirs and impoundments.

Project Reservoir	NMWSE[1] (ft)	Gross Storage[2] (ac-ft)	Usable Storage[2] (ac-ft)	Surface Area[2] (ac)	Maximum Depth[2] (ft)	Shoreline Length[2] (mi)	Drainage Area (sq mi)
CANYON CREEK SUB-BASIN							
Upper Rock Lake	6,714.5	275	207	19.8	17	0.9	0.18
Lower Rock Lake	6,625.8	unknown	48	7.6	8.5	0.2	0.29
Culbertson Lake	6,436.4	3,150	953	70.5	16	2.0	0.47
Upper Lindsey Lake	6,482.6	unknown	18	3.9	7	0.5	0.16
Middle Lindsey Lake	6,435.7	unknown	110	21.5	7	1.2	0.38
Lower Lindsey Lake	6,235.6	unknown	278	29.4	13	0.9	0.88
FALL CREEK SUB-BASIN							
Feeley Lake	6,723.6	unknown	739	52	17	1.6	0.40
Carr Lake	6,663.7	unknown	150	15.8	16	0.6	0.48
RUCKER CREEK SUB-BASIN							
Blue Lake[3]	5,931.6	4,065	1,158	59.7	157.6	1.3	0.24
Rucker Lake	5,464.2	Unknown	648	78.6	17	1.5	1.65
SOUTH YUBA RIVER SUB-BASIN							
Fuller Lake	5,341.55	unknown	1,109	70.2	30	1.3	0.54
Meadow Lake	7,281.8	4,935	4,841	240	38	3.3	1.30
White Rock Lake	7,820.0	unknown	570	88.9	10	1.6	1.17
Lake Sterling	6,987.9	unknown	1,764	104.7	55	1.8	1.06
Fordyce Lake[3]	6,405.1	49,525	49,426	716.2	156	10.4	31.29
Kidd Lake	6,627.6	unknown	1,505	86.7	28	1.7	0.56
Upper Peak Lake	6,607.4	unknown	1,736	83.8	35	2.4	0.62
Lower Peak Lake	6,581.9	unknown	484	33	21	1.1	1.01
Lake Spaulding[3]	5,014.6	75,912	75,912	682	239	8.6	117.7
Deer Creek Forebay	4,473.0	15.8	10.7	3.3	10	0.2	Negligible
NORTH FORK OF NORTH FORK AMERICAN RIVER SUB-BASIN							
Kelly Lake	5,907.9	unknown	352	28	unknown	0.8	0.53
Lake Valley Reservoir[3]	5,784.9	7,902	7,902	303.9	57	4.7	4.36

Table 5.1.2-2. (continued)

Project Reservoir	NMWSE[1] (ft)	Gross Storage[2] (ac-ft)	Usable Storage[2] (ac-ft)	Surface Area[2] (ac)	Maximum Depth[2] (ft)	Shoreline Length[2] (mi)	Drainage Area (sq mi)
BEAR RIVER BASIN							
Drum Forebay	4,756.0	621	436	20	31.5	0.8	Negligible
Drum Afterbay	3,383.25	154.5	150.4	10	78	1.0	11.91
Alta Forebay	4,240.0	37.5	19.4	5	10	0.3	Negligible
Halsey Forebay	1,816.7	244	238	18.0	23.5	0.6	Negligible
Halsey Afterbay	1,494.0	86	76	10.3	24	0.2	3.08
Rock Creek Reservoir[3]	1,442.1	485	482	58	22	1.8	2.18
Wise Forebay	1,418.0	32	32	4.5	11	0.3	Negligible
Total	**--**	**unknown**	**151,416**	**--**	**--**	**--**	**--**

1 Normal Maximum Water Surface Elevation.
2 Parameters when reservoir level is at Normal Maximum Water Surface Elevation.
3 Gross and useable storages for these reservoirs are from PG&E's 2007-2008 bathymetric surveys.

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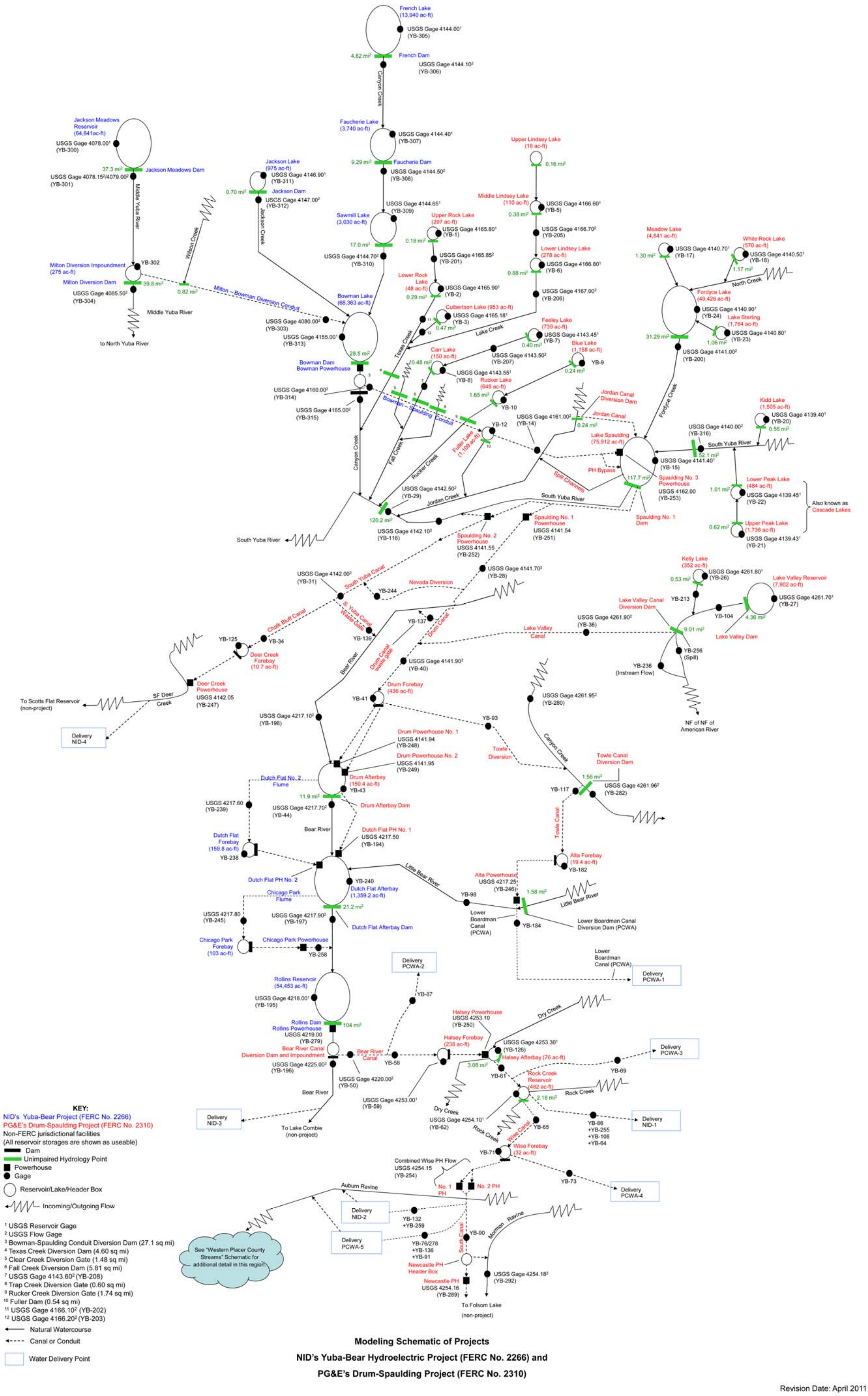

Figure 5.1.2-1. Combined Yuba-Bear Hydroelectric Project and Drum-Spaulding Project schematic.

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5.1.2.1.1 Spaulding No. 3 Development

The Spaulding No. 3 Development includes seven reservoirs, four lakes, two diversion dams, three diversion gates, the Spaulding No. 3 Powerhouse, and one transmission line. Upper Rock Lake, Lower Rock Lake, Upper Lindsey Lake, Culbertson Lake, Middle Lindsey Lake, Lower Lindsey Lake, Feeley Lake, Carr Lake, Blue Lake, and Rucker Lake are operated as storage reservoirs to temporarily store spring runoff that accumulates during the snowmelt season and then gradually release these waters during the summer and fall to augment stream flows and meet consumptive water demands. Fuller Lake is used as a re-regulating pool for hydropower generation shaping. The Texas Creek Diversion Dam (owned and operated by NID), Clear Creek Diversion Intake (owned and operated by NID), Fall Creek Diversion Dam (owned and operated by NID), Trap Creek Diversion Intake (owned and operated by NID), and Rucker Creek Diversion Gate (owned and operated by NID) all divert water into the Bowman-Spaulding Conduit (owned and operated by NID), which supplies water to Spaulding No. 3 Powerhouse. The Project's Fuller Lake receives water diverted by the Bowman-Spaulding Conduit and is used to control the rate at which water enters Spaulding No. 3 Powerhouse. Spaulding No. 3 Powerhouse is located on the northwest side of Lake Spaulding. This indoor powerhouse is a semi-automatic plant operated in a base-loaded fashion, generating based on flows which are scheduled for consumptive water and power demands. Spaulding No. 3 Powerhouse has an installed capacity of 5.8 MW with a synchronous generator, four Francis turbines with a rated nameplate hydraulic capacity of 270 cfs, and a dependable capacity of 4.3 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. The Spaulding No. 3-Spaulding No. 1 Transmission Line is a 60-kV line approximately 1.1 mile long that connects Spaulding No. 3 Powerhouse to Spaulding No. 1 Powerhouse Switchyard.

Existing recreational facilities include: Upper Rock Lake primitive campsites (3 sites), Lower Rock Lake primitive campsites (3 sites), Culbertson Lake primitive campsites (3 sites), Middle Lindsey Lake primitive campsites (3 sites), Lower Lindsey Lake Campground (12 sites), Lower Lindsey Lake Trailhead (20 parking spaces), Carr Lake Walk-In Campground (11 sites), Carr-Feeley Trailhead (30 parking spaces), Rucker Lake Walk-In Campground (7 sites), Fuller Lake Day Use and Boat Launch (8 picnic sites, 14 parking spaces, and a 1-lane concrete ramp), Fuller Lake Angler Access (6 parking spaces), Blue Lake primitive campsites (10 sites), Bear Valley Group Campground (1 site), and Sierra Discovery Trail (1 mile interpretive trail and 4 picnic sites).

5.1.2.1.2 Spaulding No. 1 and No. 2 Development

The Spaulding No. 1 and No. 2 Development includes eight reservoirs, the Spaulding No. 1 and No. 2 penstocks, the Spaulding No. 1 and No. 2 powerhouses, and one transmission line. The reservoirs include Meadow Lake, White Rock Lake, Sterling Lake, Fordyce Lake, Upper Peak Lake, Lower Peak Lake (the latter two also known collectively as Cascade Lakes), Kidd Lake, and Lake Spaulding. These reservoirs are operated to fill with spring and summer runoff that accumulates during the snowmelt season, to provide water for consumptive downstream demand, hydroelectric generation, environmental water releases, and recreational benefits. Spaulding No. 1 Powerhouse is located downstream of Lake Spaulding and discharges, along with the Spaulding No. 1 Powerhouse Bypass, up to 840 cfs into Drum Canal (part of the Drum No. 1 and No. 2 Development). This indoor powerhouse features semi-automatic operation and is scheduled as base-loaded for downstream water demand. Spaulding No. 1 Powerhouse has an installed capacity of 7.0 MW with a synchronous generator and one Francis turbine with a nameplate hydraulic capacity of 600 cfs. The Spaulding No. 2-Spaulding No. 1 Transmission Line is a 2.3-kV single circuit line 0.04 mile long that connects Spaulding No. 2 Powerhouse to Spaulding No. 1 Powerhouse transformer.

Spaulding No. 2 Penstock diverts up to 200 cfs of water from Lake Spaulding to the Spaulding No. 2 Powerhouse. Spaulding No. 2 Powerhouse is located downstream of Lake Spaulding, adjacent to Spaulding No. 1 Powerhouse. This indoor powerhouse features semi-automatic operation and is scheduled as base loaded for downstream water demand. Spaulding No. 2 Powerhouse has an installed capacity of 4.4 MW with a synchronous generator and one Francis turbine with a rated nameplate hydraulic capacity of 200 cfs.

The Spaulding No. 1 and No. 2 Development has a combined dependable capacity of 5.5 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity.

The Spaulding No. 2-Spaulding No. 1 Transmission Line is a 2.3 kV single circuit line 0.04 mile long that connects Spaulding No. 2 Powerhouse to Spaulding No. 1 Powerhouse.

Existing recreational facilities include: White Rock Lake primitive campsites (6 sites), Meadow Lake Campground (15 sites), Meadow Lake Shoreline Campsites (10 sites), Meadow Knoll Group Campground (2 sites), Lake Sterling Walk-In Campground (6 sites), Kidd Lake Group Campground (3 sites), Lake Spaulding Campground (25 sites), Lake Spaulding Overflow Campground (10 sites), and Lake Spaulding Boat Launch (67 parking spaces, 2-lane concrete ramp, and 3 picnic sites).

5.1.2.1.3 Deer Creek Development

The Deer Creek Development includes the South Yuba Canal, Chalk Bluff Canal, Deer Creek Forebay, Deer Creek Powerhouse Penstock, Deer Creek Powerhouse, and one transmission line. South Yuba Canal diverts up to 125 cfs from Spaulding No. 2 Powerhouse to the confluence with Chalk Bluff Canal, where the South Yuba Canal terminates. Chalk Bluff Canal has a capacity of 107 cfs from the confluence with the South Yuba Canal to Deer Creek Forebay. Deer Creek Forebay is operated as a re-regulating reservoir, regulating flow into Deer Creek Powerhouse. Deer Creek Powerhouse is located 1.05 miles from the Deer Creek Forebay and is connected to the Forebay via the Deer Creek Penstock. This indoor powerhouse is a semi-automatic plant operated as a diversion plant generating for daily downstream water demands of NID. Deer Creek Powerhouse has an installed capacity of 5.7 MW with a synchronous generator, one double overhung impulse turbine with a rated nameplate hydraulic capacity of 110 cfs, and a dependable capacity of 4.7 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. The Deer Creek-Drum Transmission Line is a 60-kV single-circuit line that extends 6.25 miles from Deer Creek Powerhouse to Drum Powerhouse Switchyard.

Existing recreational facilities include the Deer Creek Forebay Angler Access (5 parking spaces).

5.1.2.1.4 Alta Development

The Alta Development includes Towle Diversion, Towle Canal Diversion Dam, Towle Canal, Alta Forebay, and Alta Powerhouse. Towle Canal diverts water (up to 42 cfs) from Canyon Creek (primarily consisting of deliveries from Drum Forebay into Canyon Creek upstream via Towle Diversion) to Alta Forebay. Alta Forebay is operated as a re-regulating reservoir, regulating flow into Alta Powerhouse. Alta Powerhouse is located below Alta Forebay, northeast of Alta. This indoor powerhouse is a semi-automatic plant with flows used for generation based on Placer County Water Agency's (PCWA) downstream water demands. Alta Powerhouse has an installed capacity of 2.0 MW with a synchronous generator, two overhung impulse turbines with a combined rated nameplate hydraulic capacity of 56 cfs, and a dependable capacity of 0.8 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. The water that discharges from Alta Powerhouse enters into the Alta Powerhouse tailrace area where most of it is immediately re-diverted into PCWA's Lower Boardman Canal for downstream consumptive water demands.

Please see Exhibit A, Section 3.2, for a discussion regarding the retirement of Alta Powerhouse Unit 2 in 2007. The Project will continue to operate utilizing Alta Unit 1 only.

This development does not have any existing recreation facilities.

5.1.2.1.5 Drum No. 1 and No. 2 Development

The Drum No. 1 and No. 2 Development includes Lake Valley Reservoir, Kelly Lake, Lake Valley Canal Diversion Dam, Lake Valley Canal, Drum Canal, Drum Forebay, Drum No. 1 Powerhouse penstocks No. 1 and No. 2, Drum No. 2 Powerhouse Penstock No. 3, Drum No. 1 Powerhouse, and Drum No. 2 Powerhouse. Lake Valley Reservoir and Kelly Lake are operated as storage reservoirs to fill with spring runoff that accumulates during the snowmelt season, providing water for consumptive downstream demand, hydroelectric generation, environmental water releases, and recreational benefits. Lake Valley Canal Diversion Dam diverts water released upstream from the Lake Valley Reservoir and Kelly Lake to the Lake Valley Canal which delivers up to 36 cfs of water to the Drum Canal. Drum Canal delivers up to 840 cfs to Drum Forebay. Drum Forebay is operated as a re-regulating reservoir, regulating flow into the Drum No. 1 Powerhouse and Drum No. 2 Powerhouse penstocks. Drum No. 1 Powerhouse Penstock and Drum No. 2 Powerhouse 2 Penstock divert up to 643 cfs and 505 cfs, from Drum

Forebay to Drum No. 1 Powerhouse and Drum No. 2 Powerhouse, respectively. Both powerhouses are located on Drum Afterbay (part of the Dutch Flat No. 1 Development). Drum No. 1 and No. 2 powerhouses are indoor powerhouses and are semi-automatically operated as strictly peaking plants generating for daily peaking loads for power demands. Drum No. 1 Powerhouse has an installed capacity of 56.4 MW (normal operating capacity is 54.0 MW) with a synchronous generator, three double overhung impulse turbines, and one single overhung impulse turbine with a rated nameplate hydraulic capacity of 643 cfs. Drum No. 2 Powerhouse has an installed capacity of 49.5 MW with a synchronous generator, with one vertical impulse turbine with a rated nameplate hydraulic capacity of 505 cfs.

The Drum No. 1 and No. 2 Development has a combined dependable capacity of 79.5 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity.

Existing recreational facilities are located at Lake Valley Reservoir including Lodgepole Campground (35 sites) and Silvertip Picnic Area and Boat Launch (10 picnic sites, 20 parking spaces, and a 1-lane concrete ramp); and at Kelly Lake including Kelly Lake Picnic Area (5 picnic sites).

5.1.2.1.6 Dutch Flat No. 1 Development

The Dutch Flat No. 1 Development includes Drum Afterbay, Dutch Flat Tunnel and Penstock, Dutch Flat No. 1 Powerhouse, and two transmission lines. Drum Afterbay is operated as a re-regulating reservoir, regulating flow from the Bear River into the Dutch Flat No. 1 Tunnel and Penstock. Dutch Flat No. 1 Penstock diverts water, up to 490 cfs, from Drum Afterbay to Dutch Flat No. 1 Powerhouse. Dutch Flat No. 1 Powerhouse is located on Dutch Flat Afterbay. This indoor powerhouse is a semi-automatic plant operated for limited peaking power demands. Dutch Flat No. 1 Powerhouse has an installed capacity of 22 MW with a synchronous generator, one vertical Francis unit with a rated nameplate hydraulic capacity of 490 cfs, and a dependable capacity of 22 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. The Dutch Flat No. 1 Transmission Line is a 115-kV single-circuit line that extends 0.12 mile from Dutch Flat No. 1 Powerhouse to the Drum-Higgins 115 kV Transmission Line. The Dutch Flat No. 2 Tie is a 115-kV single-circuit line that extends 0.41 mile from Nevada Irrigation District's Dutch Flat No. 2 Powerhouse, a part of Project No. 2266, to the 115 kV Drum-Rio Oso No. 1 Transmission Line.

This development does not have any existing recreation facilities.

5.1.2.1.7 Halsey Development

The Halsey Development includes the Bear River Canal Diversion Dam, Bear River Canal, Halsey Forebay, Halsey Powerhouse Penstock, and the Halsey Powerhouse. Bear River Canal diverts up to 470 cfs from the Bear River to Halsey Forebay. Water diverted at Bear River Canal Diversion Dam includes NID water and Licensee water. Halsey Powerhouse Penstock diverts water from Halsey Forebay to the Halsey Powerhouse, located adjacent to Halsey Afterbay. Halsey Forebay is operated as a re-regulating reservoir, regulating flow into the Halsey Powerhouse. Halsey Powerhouse is an indoor powerhouse and is a semi-automatic plant operated with SCADA control from Licensee's Wise Switching Center. Halsey Powerhouse is a base-loaded plant generating for downstream water demands. Halsey Powerhouse has an installed capacity of 11 MW with a synchronous generator, one Francis double-overhung turbine with a rated nameplate hydraulic capacity of 495 cfs, and a dependable capacity of 11 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity.

Existing recreational facilities include the Halsey Forebay Picnic Area (9 picnic sites and 12 parking spaces).

5.1.2.1.8 Wise Development

The Wise Development includes Halsey Afterbay, Rock Creek Reservoir, Wise Canal, Wise Forebay, Wise Powerhouse Penstock, Wise powerhouses, and one distribution line. Halsey Afterbay is operated as a re-regulating reservoir diverting flows in Dry Creek and from Halsey Powerhouse into Wise Canal. During periods of high flow in Dry Creek, water is occasionally spilled into the downstream reach. Upper Wise Canal diverts up to 488 cfs to Rock Creek Reservoir, also operated as a re-regulating reservoir. Rock Creek Reservoir diverts flows in Rock Creek and Upper Wise Canal into the Lower Wise Canal, which continues to Wise Forebay. During periods of high flow in Rock Creek, water is occasionally spilled into the downstream reach. Wise Forebay is operated as a re-regulating reservoir for flows into Wise Powerhouse Penstock. Wise Penstock bifurcates into two separate penstocks approximately 1,000 feet above the Wise powerhouses, allowing up to 393 cfs to Wise Powerhouse and 80 cfs to Wise No. 2 Powerhouse. Wise Powerhouse, an indoor powerhouse, is a semi-automatically operated plant operated as a base-loaded plant for downstream water demand. Spills into Auburn Ravine occur below Wise powerhouses due to 1) capacity differences between the powerhouses and South Canal and 2) water deliveries to NID and PCWA. Wise Powerhouse has an installed capacity of 14 MW with a synchronous generator, one Francis turbine with a rated nameplate hydraulic capacity of 393 cfs, and a dependable capacity of 9.0 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. The Wise Powerhouse distribution line is a 12-kV single circuit line extending 0.001 mile from Wise Powerhouse to a connection with Licensee's interconnected system adjacent to the powerhouse yard.

A more detailed description of Wise Powerhouse and Wise No. 2 Powerhouse operation is provided in Exhibit E, Appendix E9.

This development does not have any existing recreation facilities.

5.1.2.1.9 Wise No. 2 Development

The Wise No. 2 Development includes Wise No. 2 Powerhouse Penstock and Wise No. 2 Powerhouse. The penstock delivers up to 80 cfs to Wise No. 2 Powerhouse. Wise No. 2 Powerhouse, an indoor powerhouse, is a semi-automatically controlled plant operated as a base-loaded plant for downstream water demand. Wise No. 2 Powerhouse has an installed capacity of 3.2 MW (normal operating capacity is 3.1 MW) with a synchronous generator, one Francis turbine with a rated nameplate hydraulic capacity of 80 cfs, and a dependable capacity of 3.0 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. Wise No. 2 Powerhouse began operating at the end of 1986. As stated in the introduction to Section 6.8, spills into Auburn Ravine occur below Wise and Wise No. 2 powerhouses due to 1) capacity differences between the powerhouses and South Canal and 2) water deliveries to NID and PCWA.

This development does not have any existing recreation facilities.

5.1.2.1.10 Newcastle Development

The Newcastle Development includes the South Canal, Newcastle Powerhouse Header Box, Newcastle Penstock, Newcastle Powerhouse, and one transmission line. South Canal currently diverts up to 375 cfs from the two Wise powerhouses to Newcastle Powerhouse. In 1987, South Canal lost capacity due to concrete work on the bottom of South Canal downstream of YB-132. South Canal is comprised of open ditch, flume, and tunnel sections, and traverses over (or under in the event of a tunnel crossing) the Dutch, Secret, and Miners ravine watersheds, respectively. No water (outside of minimal leakage) is released or spilled from South Canal into these drainages. South Canal flows are delivered to the Newcastle Penstock, a pipe with steel and concrete sections and a capacity of 392 cfs, via the Newcastle Powerhouse Header Box. The header box delivers a minimum instream flow, as well as periodic spills, from the South Canal into Mormon Ravine.

Newcastle Powerhouse, an indoor powerhouse, is an automatic plant with SCADA control from the Wise Switching Center and is operated as a base-loaded plant. Newcastle Powerhouse has an installed capacity of 11.5 MW with a synchronous generator, one Francis turbine with a rated nameplate hydraulic capacity of 392 cfs, and a dependable capacity of 0 MW based on average daily power generation data as estimated in the Licensees' No-Action Alternative Operations Model run over the period of July-August 1977, which represents a period of adverse (i.e., low) water conditions coupled with high demand for electricity. Because Newcastle Powerhouse is the most downstream facility in PG&E's Drum-Spaulding Project, its economic viability (measured in both annual energy and dependable capacity) is particularly subject to upstream water availability. The Newcastle Powerhouse Tap is a 500-foot-long underground 115-kV transmission line that connects the Newcastle Powerhouse to the Newcastle Switchyard for the Placer-Gold Hill No. 1 and No. 2 115-kV Transmission Lines.

This development does not have any existing recreation facilities.

5.1.2.2 Current Project Operations

The Project's larger reservoirs (Fordyce Lake, Lake Spaulding, and Lake Valley Reservoir) operate as storage reservoirs to capture rain and snowmelt during the spring and summer months and are slowly drawn down through summer and fall months, releasing water for power generation, irrigation, and domestic consumption purposes. These reservoir dams have spill gates or flashboard structures, which are used to optimize the storage in the reservoirs during the snowmelt period. In particular, Lake Spaulding is a "hub" for conveyance of upstream regulated releases (primarily Fordyce Lake) along with water transfers into (via NID's Bowman-Spaulding Conduit) and out of (via South Yuba Canal and Drum Canal) the reservoir. Combined with the large, high elevation unimpaired watershed above Lake Spaulding and subsequent snowmelt runoff forecasting, reservoir operations at Lake Spaulding are the most complex of any in the Project.

The hydrologic and hydraulic operation planning for the Project is implemented to manage basin runoff throughout the annual hydrologic cycle for irrigation, municipal water supply, recreation, and power generation. The Project utilizes storage capacity within its reservoirs to temporarily store spring runoff that occurs during the snowmelt season. To provide additional perspective regarding the amount of runoff that is available as spring and summer snowmelt, the April-July unimpaired runoff in the Yuba River is 42.5 percent of the full water-year unimpaired runoff, based on the 50-year average[5] from Water Year 1951-2000. This stored water is gradually released during summer and fall to augment stream flows, provide hydroelectric generation, and meet consumptive water demands. The storage reservoirs are generally operated in accordance with target storage curves to achieve reservoir levels and storage capacity that manages the available water effectively.

The operation planning forecasting for the Project is conducted by PG&E in cooperation with NID. Together, the two parties perform monthly snow surveys in the Project watershed during the winter months and, combined with snow course data from California Department of Water Resources (CDWR), provide this information to PG&E's hydrologists who use these data to develop runoff forecast models. In addition, PG&E uses larger scale snowmelt runoff forecasts generated by CDWR in the form of Bulletin 120 Forecasts (provided as "South Yuba River at Lang's Crossing," which is just downstream of Lake Spaulding Dam). These data are shared with NID to determine best operational practices.

[5] As measured by CDWR at the "Yuba River near Smartville plus Deer Creek" calculation point.

PG&E inputs monthly precipitation and runoff data to schedule energy needs, flow releases, and water demands for the Project into PG&E's proprietary SOCRATES forecasting tool. Using this forecasting model, PG&E develops a water management plan in order to achieve end of the month storage targets for the three major Project storage reservoirs: Fordyce Lake, Lake Spaulding and Lake Valley Reservoir. The remaining reservoirs are either operated with a consistent annual drawdown curve or are operated as re-regulating reservoirs and run-of-river reservoirs, generally reshaping and diverting the flows from upstream storage reservoirs for irrigation and consumptive water supply and power generation.

In general, weekly and daily operation of the Drum-Spaulding Project is prioritized for facility and public safety, regulatory compliance, and to balance irrigation and domestic consumptive water demands with power generation. The Project is also operated to comply with Licensee's existing water rights licenses and permits (see Exhibit E, Appendix E11, of the FLA for Licensee's water rights related to power generation for the Drum-Spaulding Project).

The median historical daily storage values illustrating the normal fill and spill operation of the three largest Project storage reservoirs are presented in Figure 5.1.2-2. Meadow Lake, White Rock Lake, and Lake Sterling are examples of the other type of reservoirs in the system that are also operated as fill and spill reservoirs, but do not have spill gate structures on the reservoir dams and the dams have passive spillways that overtop when the water level exceeds the storage capacity of the dam. Licensee maintains only periodic water surface records at these locations; therefore, their median daily storages are not included in Figure 5.1.2-2. The forebays and afterbays, including Deer Creek, Drum, Halsey, Dutch Flat, Alta, and Wise, have minimal usable storage capacities and are operated as regulating reservoirs, reshaping and diverting flows from upstream storage reservoirs for power generation, irrigation, and consumption purposes. Because the forebays, afterbays, and diversion dams have minimal storage capacities and daily records are not recorded, their median daily storages are not depicted on Figure 5.1.2-2.

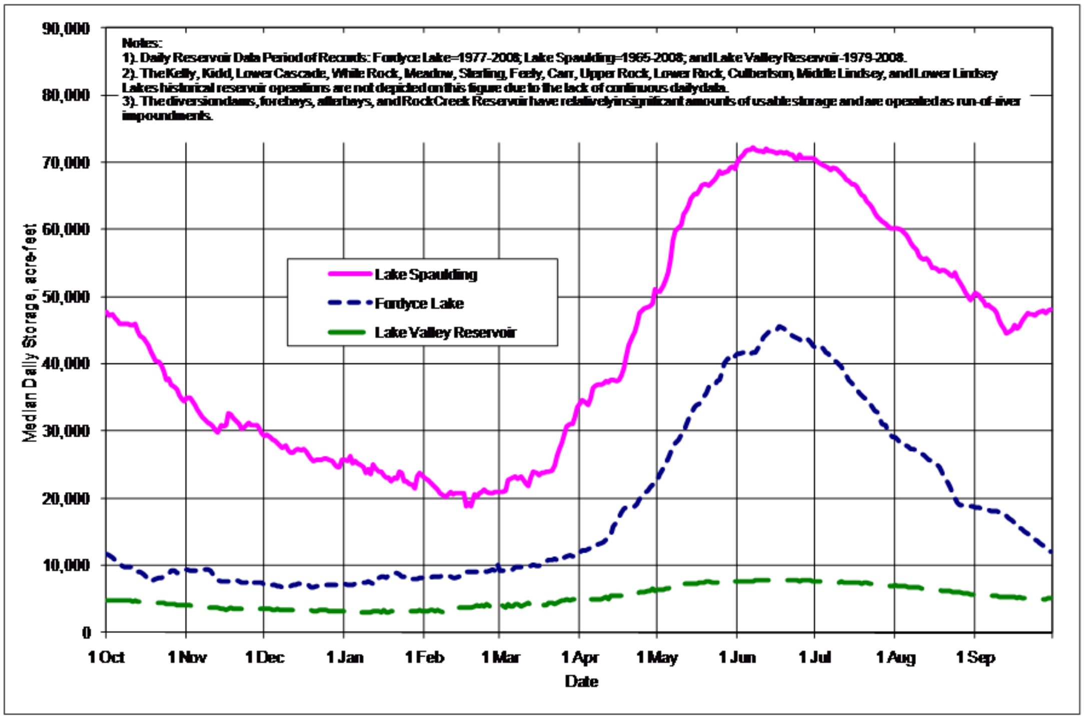

Figure 5.1.2-2. Median historical daily reservoir storage for Lake Spaulding, Fordyce Lake, and Lake Valley Reservoir.

Detailed historical reservoir operations for the Drum-Spaulding Project are presented for each of the 10 Project developments in Section 6 of this exhibit. This detailed reservoir information includes reservoir area-capacity curves; historical reservoir water surface elevation statistics; reservoir rule curves; and dam spillway rating curves. Reservoir area-capacity curves and dam spillway rating curves are based on the best information available; either measured or calculated curves, as noted for each reservoir. Historical reservoir water surface elevation statistics are based on daily reservoir records, where available. The median historical reservoir water surface elevation is presented as a proxy for the reservoir rule curve; these curves vary at several of the Project reservoirs from one water year to the next, depending on current and forecasted inflow hydrology. Reservoir rule curves are used to help drive the reservoir operation in ResSim.

The three Spaulding powerhouses, and Deer Creek, Alta, Halsey, Wise, Wise No. 2, and Newcastle powerhouses are operated as base-loaded plants; Dutch Flat No. 1 Powerhouse is operated for intermediate and some peaking power demands; and the Drum No. 1 and No. 2 powerhouses are operated as peaking plants.

Project powerhouses are semi-automatically operated using PG&E proprietary SCADA controls. Spaulding No. 1, No. 2, and No. 3, Drum No. 1, Drum No. 2, Dutch Flat No. 1, Deer Creek, and Alta powerhouses are operated from the Drum Switching Center, located at Drum No. 1 Powerhouse. Halsey, Wise, and Newcastle powerhouses are operated by Wise Switching Center, located at Wise Powerhouse.

5.1.2.3 Current Environmental Measures

The existing license for the Drum-Spaulding Project includes the minimum flow requirement shown in Tables 5.1.2-3 and 5.1.2-4. For a complete description of existing FERC license conditions, see Appendix B1 of the FLA.

Table 5.1.2-3. Existing minimum flow requirements for the Drum-Spaulding Project Upper Rock Lake, Lower Rock Lake, Middle Lindsey Lake, Lower Lindsey Lake, Feeley Lake, Carr Lake, Blue Lake, Rucker Lake and Culbertson Lake.[1]

Release Location	Period	Target Flow (cfs)	Allowable Minimum Flow (cfs)
Upper Rock Lake	7/1-9/30	0.25	0.10
Lower Rock Lake	7/1-9/30	0.25	0.10
Middle Lindsey Lake	7/1-9/30	0.25	0.10
Lower Lindsey	All Year	0.50	0.20
Feeley Lake (Upper)	All Year	0.50	0.20
Carr Lake (Lower Feeley)	All Year	0.50	0.20
Blue Lake	All Year	0.50	0.20
Rucker Lake	All Year	0.50	0.20
Culbertson Lake	All Year	0.75	0.30

[1] During dry years, these flows shall be adjusted according to the following formula:

$$(0.80*[storage^{July1}]*0.504)/(123)$$

where 0.80 is used to account for evaporation in the lake; 0.504 is the conversion from acre-feet to cubic feet per second (cfs); and 123 is the number of days from July 1-October 31.

Table 5.1.2-4. Existing minimum flow requirements for the Drum-Spaulding Project in Fordyce Creek, South Yuba River below Lake Spaulding, South Yuba River below Langs Crossing, Bear River in Bear Valley above Drum Afterbay, Bear River below Drum Afterbay, Canyon Creek below Towle Diversion and Bear River below Upper Boardman Canal.

Stream	Period	Minimum Flow (cfs)	Qualifications
Fordyce Creek below Fordyce Lake	Yearlong provided that sufficient Lake storage shall be reserved at the time of outlet adjustment for unattended winter operation to insure an initial flow of 5 cfs and not less than 3 cfs at lake level of maximum winter drawdown	5.0	Lake storage in excess of these release to be prorated over the period 7/1 to the date of winter operational adjustment without causing Spaulding Reservoir to spill; Fordyce Lake not to be drawn down below 3,000 acre feet of storage
South Yuba River below Lake Spaulding	Yearlong	1.0	None
South Yuba River Langs Crossing	Yearlong	5.0	To be released from Lake Spaulding
Bear River (0.1 mile below the site of the CDFG's Bear River Fish Planting Base in Bear Valley)[1]	Yearlong	5.0	None

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Table 5.1.2-4. (continued)

Stream	Period	Minimum Flow (cfs)	Qualifications
Bear River below Drum Afterbay	3/1-9/30	Normal year 10 Dry year 5	Dry year conditions are deemed to exist in the month following whenever the accumulated seasonal precipitation at Lake Spaulding commencing with Oct. 1, is equal to or less than: 29 inches as of Jan. 31, 35 inches as of Feb. 28-29, 40 inches as of March 31, 45 inches *[as of April 30; provided that if total precipitation by April 30 is 45 inches or less, Dry year conditions are deemed to exist for the remainder of the year.] (Note: The latter part of the above text in italics was omitted in the August 14, 1980 order).*
	10/1-2/28-29	Normal year 5 Dry Year 5	
Canyon Creek below Towle Diversions	Yearlong	1.0	Or natural streamflow, whichever is less
Bear River below Upper Boardman Canal Diversion Dam	Yearlong	1.0	Or natural streamflow, whichever is less
Mormon Ravine above Newcastle Powerhouse	Yearlong	5.0	No minimum flow required during South Canal outage.

1 The proposed CDFG Bear River Fish Planting Base in Bear Valley was never constructed; the minimum flow requirement is currently measured at Licensee's Gage YB-198.

The existing license provides that PG&E regulate downstream releases in as near uniform flow as possible, and provides further that PG&E conduct the normal operations of the Bear River waste gate so as to provide gradual changes in rates of releases from the Drum Canal into the Bear River insofar as possible excepting emergencies and allowances for the safety of the Drum Canal.

The existing license also requires that the Project maintain water levels in Project reservoirs as shown in Table 5.1.2-5.

Table 5.1.2-5. Existing Drum-Spaulding Project reservoir level requirements.

Reservoir	Water Level Schedule
Meadow Lake	Maximum level consistent with project operation June 1 to August 1.
Rucker Lake Sterling Lake Lower Rock Lake Lower Feeley Lake	Maximum level consistent with project operations June 1 to September 1.
Fuller Lake	Maximum level consistent with project operations year round; any necessary drawdowns not to decrease the level below the bottom elevation of Nevada Irrigation District's outlet ditch.
Upper Lindsey Lake	Level as permitted with no drawdown for irrigation or power purposes.
Upper Cascade (Peak) Lake Lower Cascade (Peak) Lake	Maximum level consistent with project operations and with use of the storage to maximize recreational use of the lakes and to augment the flow of the South Yuba River during the fall months.
Rock Creek Reservoir Halsey Forebay Halsey Afterbay	Maximum level consistent with project operation June 1 to September 1.
White Rock Lake	Consistent with project operations; storage level used to augment flows into North Creek during summer and fall months.

PG&E is required to operate Project reservoirs during flood conditions so that releases are no more than would have occurred under natural stream conditions.

PG&E is required to, in consultation with USGS, install and maintain recorders for determining the stage and flows in streams from which water is diverted or released, and the amount of water held in storage.

The existing license provides that PG&E construct and maintain deer-proof fences, crosswalks, escape ramps, and such other reasonable structures necessary to protect deer as may be prescribed by the Forest Service, CDFG, and USFWS.

The existing license requires that prior to any ground-disturbing activity, PG&E will consult with SHPO and the Forest Service, if the work is on NFS land, about the need for a cultural resources survey and salvage work.

In addition to the FERC license requirements, PG&E entered into three agreements with resource agencies that included various streamflow-related requirements, which are summarized below.

- April 11, 1963 agreement between PG&E, Forest Service, and CDFG (expires April 30, 2013)
  - ➢ Signed by all three parties
  - ➢ Requires 1 cfs in the North Fork of the North Fork American River below Lake Valley Reservoir
  - ➢ Requires 1 cfs below Lake Valley Canal Diversion Dam (however, 3 cfs is the current minimum flow per a water rights permit-related “agreement” in the mid-1980’s with CDFG). Includes drawdown provisions for Kelly Lake and Kidd Lake (modified in June 22, 1979 agreement below)
  - ➢ Provisions to use storage in White Rock Lake to augment flow of North Creek in summer and fall months
- June 22, 1979 letter agreement between PG&E, CDFG, and USFS
  - ➢ Note on letter indicates it was signed by all three parties
  - ➢ This is an “interim modification to the 1963 agreement”
  - ➢ “PG&E shall make releases from Kidd Lake and Upper and Lower Peak (Cascade) Lakes to maintain a minimum flow of 5 cfs and a maximum water temperature of 70°F in the South Yuba River, as measured at Cisco Grove, consistent with the primary purposes of the project and as water conditions permit. However, releases from these reservoirs prior to September 1 shall be controlled to keep the lake water surfaces as high as reasonably possible during the recreation season.”
  - ➢ April 21, 1987 “letter agreement” between PG&E and CDFGPG&E operates according to this letter from PG&E to CDFG
  - ➢ Agreement to bypass 0.25 cfs year-round in Little Bear River below Alta Powerhouse

5.2 Applicant's Proposal

5.2.1 Yuba Bear Hydroelectric Project

5.2.1.1 Proposed Project Facilities

5.2.1.1.1 Generation Facilities

NID does not propose any changes to existing Yuba-Bear Hydroelectric Project generation facilities, other than an expansion of the existing Rollins Development through the proposed addition of Rollins No. 2 Powerhouse. The new facility would more effectively capture the combined releases from Rollins Reservoir. The existing powerhouse consists of one vertical axis, Francis turbine with a rated capacity of 12.15 MW at a head of 208 feet and maximum flow of 840 cfs. At this time, NID anticipates that the new powerhouse would be constructed entirely on privately-owned land adjacent to the existing powerhouse location in a laydown area just below the existing parking lot on the right bank of the river. The existing powerhouse would be unaltered and remain in full operation.

The current design concept for the new powerhouse includes a 58-feet-by-40-feet concrete building that would house a single Francis turbine with a maximum flow of 600 cfs and synchronous generator combination yielding a maximum capacity of 11.4 MW. The average annual plant factor for the powerhouse, based on a model of plant operations from water year 1995 through 2008, is expected to be approximately 0.55 (dependable capacity of 6.27 aMW). The plant is expected to generate approximately 18.4 GWh per year and to operate at 64 percent of capacity during dry years, at 83 percent of capacity during normal years, and at 96 percent of capacity during wet years. This new facility would be an automatic, remotely operable, unmanned installation. The upgrade would require modifications to the existing penstock to allow for a new bifurcation to route flow to the new generation facility, and would include replacing the Rollins Powerhouse Switchyard with a new switchyard that will service both the existing and proposed powerhouses. The upgrade would occur entirely within the existing FERC Project Boundary and affect less than 1 acre of NID-owned land.

Figure 5.2.1-1 provides a photograph of the approximate location of the proposed Rollins No. 2 Powerhouse. Figure 5.2.1-2 provides the conceptual site plan.

Figure 5.2.1-1. Approximate location of proposed Rollins No. 2 Powerhouse (existing Rollins Dam and Powerhouse are shown).

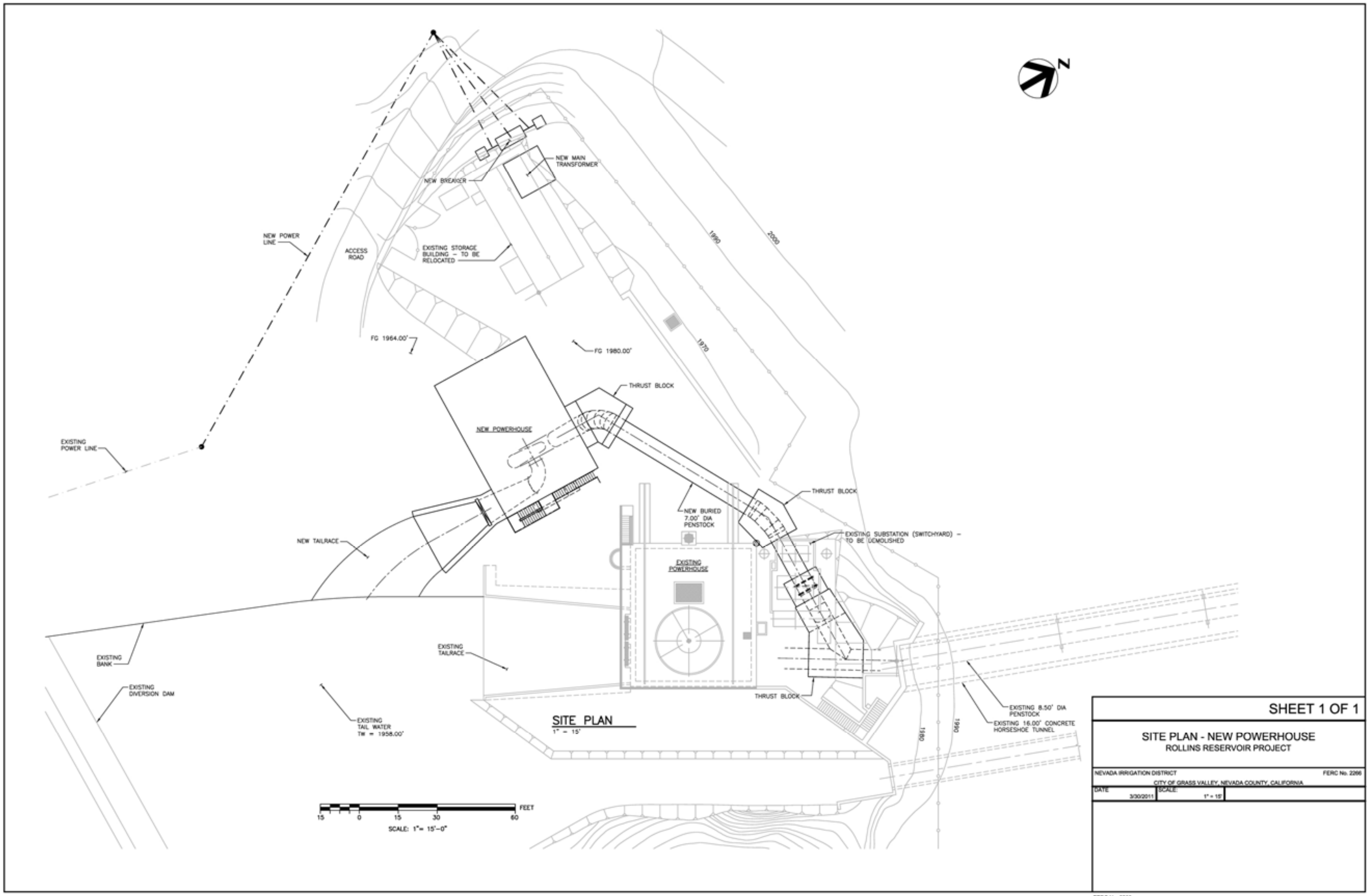

Figure 5.2.1-2. Conceptual site plan of the proposed Rollins No. 2 Powerhouse (existing Project features shown in grayscale).

As currently conceived, construction will proceed in four phases, which collectively will take about 1 year. Access would occur over existing roads, and likely not require any modification to the roads. NID anticipates that the size of the construction crew on-site will average about 10-15 people, but could be about 30-40 during periods of heaviest construction. Each construction phase is briefly described below, although details may change as final design and selection of a contractor occurs.

In the first phase, site preparation would occur including ground disturbing activities to create a construction lay down area, expose the existing pipe for addition of the bifurcation, and prepare the area for addition of the new building. Excavated material would be piled on site for backfilling purposes in Phase 3.

NID anticipates that in the second phase, a temporary bulkhead or cofferdam would be constructed from the existing tailrace wall to the north bank of the river. The cofferdam or bulkhead would isolate the construction work in the bed from the stream. The area enclosed by the cofferdam or bulkhead would be minor. Then, standing water enclosed by the cofferdam or bulkhead would be allowed to settle, and pumped into the tailrace. The area of the new powerhouse and tailrace would be excavated down to the foundation level. The concrete foundation would then be placed, followed by the new walls of the tailrace and powerhouse. The last portion of this phase would be installation of the turbine and generator. During this phase, the bifurcation and new penstock would be installed as well.

In the third phase, the area would be backfilled around the new powerhouse walls using material that was excavated from the area in Phase 1, and stoplogs or a tailrace gate would be placed in the tailrace to stop water from entering the draft tube. The cofferdam would then be removed. Backfilling around the new bifurcation and penstock would also occur during this phase.

In the fourth phase the remainder of the powerhouse equipment would be installed and the roof of the powerhouse completed. Equipment testing would occur during this phase. In this phase, site clean-up and remediation would occur including stabilizing all slopes and finalizing drainage and paving of the road and access areas. Any excess clean material (e.g., excavated dirt) or construction material would be properly disposed of off-site. Final as-built drawings would be prepared and filed with FERC.

Prior to any ground disturbing activities, NID and/or its contractor would obtain all necessary approvals/permits for construction.

NID has included in its FLA conceptual-level design drawings for the upgrade. If approved, detailed drawings would be provided to the Commission as appropriate for FERC approval.

5.2.1.1.2 Non-Generation Facilities

NID proposes to add to or modify the existing Project through the non-generating facilities described below.

5.2.1.1.3 Project Reservoir Storage Modifications

NID does not propose any storage modifications to Project reservoirs. However, NID reserves the right to increase the gross and/or useable storage of Project reservoirs through means including, but not limited to, dredging and sluicing. In the event that a storage modification is proposed over the term of the new license, NID will consult with and obtain all necessary permits from required local, state and federal agencies, and will file with FERC a Request for License Amendment.

5.2.1.1.4 Primary Project Access Roads

NID does not propose any additional Primary Project access roads.

5.2.1.1.5 Streamflow Gages

NID proposes to add to the Project three new streamflow gages for the purpose of monitoring compliance with minimum flow releases. The new gages will be located on the downstream face of the diversion facilities at Texas, Fall and Rucker creeks. Each gage will consist of a fixed orifice, sized to deliver the minimum instream flows proposed in this FLA for Texas, Fall and Rucker creeks downstream of the Bowman-Spaulding Conduit crossing. The gages will be named YB-316, YB-317 and YB-318, respectively. Each gage will be located within the existing FERC Project Boundary. A more detailed description of the new gages is provided in Appendix E5.

5.2.1.1.6 Recreation Facilities

NID's proposed Project includes a Recreation Facilities Plan, which is included in Appendix E4. The plan includes many components including replacement and upgrade of existing recreation facilities and evaluation for new recreation facilities over the term of the new license. However, at this time, the plan includes the addition of the following specific new facilities:

- Jackson Meadows Reservoir
  - ➢ Additional parking for up to 20 boats with trailers (double spaces) at or near the existing Pass Creek Boat Launch to accommodate boat ramp use during the high water period typically through July when the lower boat launch parking area is not useable.
  - ➢ Replace the existing Woodcamp Boat Launch to California Department of Boating and Waterways standards.
  - ➢ Construct a non-motorized trail from Aspen Group Campground to the Aspen Picnic Area parking area.
- Milton Diversion Impoundment:
  - ➢ Provide up to two parking areas (native surface) with vehicle barriers and directional signage along north shoreline that allows parking in designated parking areas only.

- Provide up to 5 walk-in campsites along impoundment shoreline adjacent to the designated parking areas each with a steel fire ring.
- One car-top boat launch that allows direct vehicle access to the shoreline for boat launching purposes only.

- Canyon Creek:
  - Install animal-resistant food lockers at nine sites.
- Sawmill Lake:
  - Up to 10 primitive walk-in campsites (1 accessible campsite); install table, fire ring/grill, tent pad, site marker, and signage at each campsite.
  - A single gravel/native surface parking area with barriers including information kiosk.
  - One 2-unit vault restroom
- Bowman Lake:
  - One parking area (native surface) with vehicle barriers and directional signage at Jackson Creek inflow along the north shoreline/Bowman Lake Road.
  - One information kiosk at the junction of Bowman Lake Road and Graniteville Road near the dam.
  - Fourteen primitive campsites each with a picnic table, fire ring, site marker and signage along the north shoreline.
- Dutch Flat No. 2 Forebay:
  - One information kiosk
- Dutch Flat Afterbay:
  - One day use area along the shoreline of the afterbay if a suitable location can be found on either NID or BLM land. Potential improvements may include facilities such as picnic tables, a vault restroom, signage or information kiosk and a defined parking area.

5.2.1.2 Proposed Changes to FERC Project Boundary

NID does not propose any changes to existing Yuba-Bear Hydroelectric Project FERC Project Boundary except for the following:

- The use of contours derived from the USGS National Elevation Dataset 1/3 arc second digital elevation model as a partial replacement to survey metes and bounds that are used in the existing license to define the FERC Project Boundary around Jackson Meadows Reservoir, Bowman Reservoir, French Lake, Jackson Lake, Sawmill Lake, Faucherie Lake, Dutch Flat Forebay, and Dutch Flat Afterbay. Where the derived contour lines exceeded 200 horizontal feet from the Project Reservoir normal maximum water surface, 200 foot horizontal buffers of the aforementioned reservoir's maximum water surface were used to define the Project Boundary.

- The removal of the area that incorporates the mineral survey area south of Dutch Flat Afterbay
- The modification of the boundary to more accurately contain and encompass several recreation sites (East Meadow Campground, Fir Top Campground, Bowman Lake Campground and Canyon Creek Area Campground)
- The addition of the area which incorporates the Primary Project portion of French Lake Dam Road (Forest Service Road 843-20), including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Milton Pipeline Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Wilson Creek Diversion Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Bunkhouse Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Texas Creek Diversion Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Bowman-Spaulding Canal Berm Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Bowman-Spaulding Canal Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Stump Canyon Siphon Intake Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Canyon Siphon Low Level Valve Access Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of "B" Alarm Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Chicago Park Forebay Road, including a right-of-way of 20 feet on road centerline
- The addition of the area which incorporates the Primary Project portion of Chicago Park Powerhouse Access Road, including a right-of-way of 20 feet on road centerline

For a discussion of the overall changes in area between the existing Project Boundary and the Proposed Project Boundary, please refer to Section 6.0 of Exhibit A.

5.2.1.3 Proposed Project Operations

NID proposes to operate the proposed Project in a similar manner to how the existing Project is currently operated, including providing a source of water to meet NID's growing consumptive water demand. Refer to Exhibit B for a detailed description of the proposed Project operations.

5.2.1.4 Proposed Environmental Measures

NID's proposed environmental and recreational measures are discussed in Section 6 and included in detail in Appendix E3, which also describes whether a measure is the continuation of an existing measure or a proposed new measure. Table 5.2.1-1 lists the proposed measures by major resource area.

Table 5.2.1-1. Measures included in NID's proposed Yuba-Bear Hydroelectric Project.

NID Proposed Measure	Description
GENERAL	
YB-GEN1	Annual Consultation with Forest Service and BLM
YB-GEN2	Annual Employee Training
YB-GEN3	Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land
YB-GEN4	Consultation Regarding New Ground Disturbing Activities on Federal Land
YB-GEN5	Consultation Regarding New Facilities on Federal Land
YB-GEN6	Development and Implementation of Coordinated Operations Plan for Yuba-Bear Hydroelectric Project and Drum-Spaulding Project
GEOLOGY AND SOILS	
YB-G&S1	Development and Implementation of Rollins Upgrade Construction Erosion Control and Restoration Plan
YB-G&S2	Development and Implementation of Recreation Facilities Construction Erosion Control and Restoration Plan
YB-G&S3	Implement Clear and Trap Creeks Stabilization Plans[1]
WATER RESOURCES	
YB-WR1	Development and Implementation of Rollins Upgrade Construction Hazardous Material Spill Prevention, Control and Countermeasures Plan
YB-WR2	Development and Implementation of Recreation Facilities Construction Hazardous Material Spill Prevention, Control and Countermeasures Plan
AQUATIC RESOURCES	
YB-AQR1	Streamflows
YB-AQR2	Fish Stocking in Bowman Lake
YB-AQR3	Jackson Meadows Reservoir Minimum Pool
YB-AQR4	Milton Diversion Impoundment Normal Pool
YB-AQR5	Rollins Reservoir Minimum Pool
YB-AQR6	Faucherie Lake Minimum Pool
YB-AQR7	Fish Stocking in Rollins Reservoir
TERRESTRIAL RESOURCES	
YB-TR1	Implement Invasive Species Management Plan on Federal Land[1]
YB-TR2	Implement Vegetation Management Plan on Federal Land[1]
YB-TR3	Pesticide and Herbicide Use Restrictions on Federal Land
YB-TR4	Consult When Replacing Canal Wildlife Escape Facilities
YB-TR5	Monitor Animal Losses in Project Canals
YB-TR6	Bat Management

Table 5.2.1-1. (continued)

NID Proposed Measure	Description
RECREATION RESOURCES	
YB-RR1	Implement Recreation Facilities Plan[1]
YB-RR2	Provide Recreation Flow Information
YB-RR3	Provide Supplemental Flows in Canyon Creek Below French Dam for Whitewater Boating
LAND USE	
YB-LU1	Implement Transportation Management Plan[1]
YB-LU2	Implement Fire Prevention and Response Plan on Federal Land[1]
CULTURAL RESOURCES	
YB-CR1	Implement Historic Properties Management Plan[2]
AESTHETIC RESOURCES	
YB-AER1	Implement Visual Resource Management Plan on Federal Land[1]

[1] Plan included in Appendix E4 of FLA.
[2] Plan included in Volume IV of FLA, and is considered Privileged.

Appendix E3 includes the full text of each measure included in NID's proposed Project. Appendix E4 includes implementation plans identified in the measures. Appendix E5 includes: 1) for each facility necessary for implementation of an environmental measure, a functional design drawing; 2) a description of the operation and maintenance procedures for any proposed measures; 3) an implementation or construction schedule for any proposed measures of facilities, showing the interval after issuance of a new license when implementation of the measure or construction would be commenced and completed; and 4) maps showing the location of the facility/measure.

5.2.2 PG&E's Drum-Spaulding Project

5.2.2.1 Proposed Project Facilities

5.2.2.1.1 Proposed Changes to Roads and Recreation Facilities

PG&E met with the agencies and others to develop a comprehensive list of Primary Project Roads; see Section 6.7 (Land Use) of Exhibit E and Exhibit G for further information regarding these proposed modifications.

PG&E also proposes to build new recreation facilities and rehabilitate existing recreation facilities. The details of PG&E's proposed new and rehabilitated recreation facilities are detailed in Section 3 of PG&E's Recreation Facilities Plan, which filed with this FLA in Appendix E8 (Proposed Implementation Plans). A brief summary of the proposed new facilities is provided below.

- Meadow Lake: develop a rustic 3-unit picnic area, parking area with up to 8 parking spaces, and turn-around for launching boats near the existing Meadow Lake Campground and informal boat launch. Install a potable water system at the existing Meadow Lake Campground. Install a 1-unit vault toilet at the existing Meadow Lake Shoreline Campsites.

- Lake Sterling: designate 3 primitive campsites each with a steel fire ring, animal-resistant food locker, and information signs on the east side of the reservoir; and install a host site near the reservoir.
- Fordyce Lake: develop a primitive campground with up to 10 campsites along Fordyce Lake Road. Each campsite will include a fire ring, animal-resistant food locker, and a site marker. The facility will also include a 1-unit composting toilet, facility identification sign, and improved information signs at the information board.
- Lake Spaulding: designate 3 boat-in shoreline campsites with steel fire rings and animal resistant food lockers at least 100 feet from the high water line on the north side of the reservoir. Establish and maintain appropriate fire safe vegetation clearances at each boat-in campsite.
- Lower Lindsey Lake: reconstruct the existing rustic Lower Lindsey Lake Campground to a Development Scale 2 campground including gravel roads and spurs, and installation of vehicle barriers.
- Fuller Lake: expand the parking area by lengthening the parking spaces to 40 feet for vehicles and trailers; and re-route the paved entrance road to allow for the expanded parking. Install an accessible fishing pier including accessible parking and access route to the pier.
- Lower Peak Lake: designate up to 5 primitive campsites each with a steel fire ring and an animal resistant food locker along the shoreline.
- Lake Valley Reservoir: develop a new group campground for 50 to 100 people, and when monitoring triggers are reached, develop a new 35-unit family campground.
- Wise Forebay: install an asphalt parking area for up to 5 vehicles on PG&E property on the southwest corner of the Forebay.

5.2.2.1.2 Official Retirement of Alta Powerhouse, Unit 2

Licensee does not propose to add any new generation facilities to the Project. However, as described in Section 1.4 above, Licensee proposes to officially retire Alta Powerhouse, Unit 2, from the Project (which ceased operating in 2007).

Alta Powerhouse, located on the Little Bear River, was originally a two-unit facility commissioned on November 7, 1902. Each of the two units consisted of a Pelton single overhung impulse turbine. Water supply for Alta Powerhouse originates from the Drum Forebay where it is released through the low-level outlet into Canyon Creek, and then diverted downstream at Towle Canal Diversion Dam into Towle Canal, which conveys the water approximately 3.9 miles before discharging into the Alta Forebay. A 36-inch-diameter penstock conveys the water from Alta Forebay to Alta Powerhouse. The water utilized through Alta Powerhouse is discharged into the tailrace where it is diverted into PCWA's Lower Boardman Canal (non-Project facility) for domestic and irrigation use downstream by PCWA. Historically, PCWA water demand in the Lower Boardman Canal has ranged from a low of 2 cfs to a maximum of 22 cfs. A fixed orifice at the diversion gate facilitates a minimum constant flow of 0.25 cfs in the Little Bear River below the powerhouse. With the exception of a few weeks during the spring runoff period, Alta Powerhouse is operated to meet PCWA's demand downstream. With the maximum capacity of one unit able to utilize 28 cfs, typical operation would have only one unit operating at any given time.

In 1955, the majority of the original 48-inch riveted steel penstock, dating from 1902, was replaced with a 36-inch-diameter welded steel pipe. The lower 100-foot section of pipe, including the manifold that connected to each unit, was not replaced at that time. In 2005, condition assessment tests on this downstream 100-foot section of pipe indicated that it was showing signs of significant deterioration, corrosion, and loss of wall thickness. In 2007, construction was undertaken to remove the existing 100 feet of original riveted steel pipe, and to install approximately 40 feet of new 36-inch-diameter penstock and manifold connection to Unit 1.

Cost-benefit studies conducted at the time concluded that it would not be cost effective to reconnect Unit 2 to the new penstock section and return it to operation. Because Alta Powerhouse is operated primarily for PCWA water demand, and that demand can be met through the operation of a single unit, there was no economic incentive to invest in restoring the unit to operation. Unit 2 was secured (not operational since 2007), and left intact after the construction of the pipe was completed.[6] The new 100-foot section of pipe and manifold was not connected to Unit 2. The header pipe connecting Unit 2 to the original manifold was removed and the end of the header pipe leading to Unit 2 was covered with a blind flange. Unit 2 was decommissioned at that time and the unit was left intact, but hydraulically disconnected from the penstock. It will be utilized for spare parts as needed for future maintenance of Unit 1. No further work or related costs are planned or required in order to officially retire Alta Unit 2.

The retirement of Alta Powerhouse Unit 2 results in a reduction in nameplate capacity by 1.0 MW. As a result, the Proposed Project nameplate capacity will be 191.5 MW.

5.2.2.2 Proposed Project Boundary

On June 14, 2010, PG&E submitted a request to FERC to correct the existing Exhibit J and K maps approved on April 1, 2009. The corrections were related to the transmission line separation Geographic Information System (GIS) conversion and former actions requiring map updates. In addition, the submittal included adjustments to canals widths to reflect operational needs and a boundary adjustment to accommodate a recent condemnation proceeding from PCWA. These corrections were identified as Phase 1 changes on the drawings submitted to FERC.

[6] Prior to replacement of the header pipe, PG&E consulted SHPO to determine if Alta Powerhouse, header pipe, and an associated stacked rock wall were eligible for listing to the National Register of Historic Places, and whether PG&E's construction would adversely affect the eligibility of these resources. SHPO concluded that HABS/HAER documentation should be completed for the header pipe, rock wall, and powerhouse (including interior elements of the powerhouse); the HABS/HAER documentation was completed and accepted by SHPO and the related construction was completed in 2007 as noted above.

The Phase 1 Exhibit J and K maps that were submitted to FERC on June 14, 2010 have been converted to Exhibit G maps for this FLA. Additional changes from those submitted as Phase 1 are included in the Exhibit G maps as Phase 2 changes. Phase 2 focuses on changing the Project boundary to be consistent with Table 1.0-1 in the FERC-approved Roads and Trails Study Plan (Technical Memorandum 9-1) and to correct discrepancies in the boundary through the use of aerial maps and field observations.

Upon FERC's approval of the Phase 1 changes, new Exhibit J and K maps will be issued incorporating those changes. Phase 2 Exhibit G changes will be incorporated upon FERC's issuance of a new license. Refer to Appendix G2 for a detailed description of all phase 2 changes along with color coded maps displaying both Phase 1 and Phase 2 proposed changes.

5.2.2.3 Proposed Project Operations

PG&E proposes to utilize historical operations along with five items: 1) the retirement of the Alta Powerhouse Unit 2; and 2) gross and useable storage estimates generated by the Licensees' 2007-2009 bathymetric studies, where applicable. In addition, PG&E has proposed environmental measures as discussed below.

5.2.2.4 Proposed Environmental Measures

PG&E's proposed environmental and recreational measures are discussed in Section 6 of this Exhibit E and are included in detail in Appendix E7, which also describes whether a measure is the continuation of an existing measure. Provided in Table 5.2.2-1 is a list of PG&E's proposed measures by major resource area.

Table 5.2.2-1. Measures proposed by PG&E for the Drum-Spaulding Project.

PG&E's Proposed Measure	Description
GENERAL	
DS-GEN1	Annual Consultation with Forest Service, BLM and BOR
DS-GEN2	Annual Employee Training
DS-GEN3	Develop and Implement Coordinated Operations Plan for the Drum-Spaulding Project and the Yuba-Bear Hydroelectric Project
AQUATIC RESOURCES	
DS-AQR1	Streamflows (Part 1: Minimum and Target Streamflows; Part 2: Water Year Type; Part 3: Consecutive Dry Water Years; Part 4: Ramping Rates; Part 5: Streamflow Measurement)
DS-AQR2	Fordyce Lake Minimum Pool
DS-AQR3	Fish Stocking in Lake Spaulding
TERRESTRIAL RESOURCES	
DS-TR1	Develop and Implement Integrated Vegetation Management Plan
DS-TR2	Monitor Animal Losses in Project Canals
DS-TR3	Bear River Canal Deer Assessment
DS-TR4	Channel Morphology and Riparian Vegetation Assessment in Bear Valley
RECREATION RESOURCES	
DS-RR1	Implement Recreation Facilities Plan
DS-RR2	Provide Recreation Flow Information
LAND USE	
DS-LU1	Implement Transportation Management Plan for Primary Project Roads
DS-LU2	Implement Fire Prevention and Response Plan on Federal Land

Table 5.2.2-1. (continued)

PG&E's Proposed Measure	Description
CULTURAL RESOURCES	
DS-CR1	Implement Historic Properties Management Plan
AESTHETIC RESOURCES	
DS-AER1	Implement Visual Resource Management Plan on Federal Land

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SECTION 6

ENVIRONMENTAL ANALYSIS

6.0 Introduction to Environmental Analysis

Pursuant to 18 USC § 5.18(b), this section explains effects of each of the Proposed Projects on environmental resources using the information filed in each Licensee's Pre-Application Document (PAD), information developed through Licensees' FERC-approved study plans, and other information otherwise developed or obtained by Licensees. Because these are large and complex projects and a voluminous amount of information exists or has otherwise been developed for many resource areas, Licensees have made a good faith effort to bring forward the most important and relevant information into this Section (and throughout each Licensee's respective FLA). However, if readers want a more comprehensive understanding of the totality of available information, data and study results for these projects, readers should review other relicensing materials (including Licensees' PADs and the technical memoranda that have been filed in Appendix E12 of this Exhibit E).

This section is divided into the following major resource areas:

- Geology and Soils (Section 6.1)
- Water Resources (Section 6.2)
- Aquatic Resources (Section 6.3)
- Terrestrial Resources (Section 6.4)
- Threatened and Endangered Species (Section 6.5)
- Recreation Resources (Section 6.6)
- Land Use (Section 6.7)
- Cultural Resources (Section 6.8)
- Aesthetic Resources (Section 6.9)
- Socio-economic Resources (Section 6.10)
- Air Quality (Section 6.11)
- Noise (Section 6.12)

Excluding Section 6.5,[1] each of the above resource areas is divided into the following five sub-sections:

- Licensees' Studies. A list of the pertinent studies (as approved by FERC in its Study Determination on February 29, 2009, as amended) conducted by Licensees is provided at the beginning of each resource area. The information developed for each study is intended to

[1] Although Section 6.5 does discuss Licensees' studies and includes analysis of both the affected environment and potential environmental effects, Section 6.5's organization is structured by species.

supplement existing, relevant and reasonably available information. The studies are not discussed in a serial order in each resource area. Instead, the relevant information from each study is incorporated into each sub-section as appropriate in the context of the resource area. If, as of the time each Licensee's FLA is filed, a FERC-approved study has not been completed, the status of that study (including Licensees' anticipated completion date) is described, and the implication of the incomplete study, if any, is discussed.

- Affected Environment. This sub-section uses existing, relevant and reasonably available information included in the PADs and the results of Licensees' studies to describe the condition of the environment under the existing projects. In general, the affected environment discussion is divided into major areas of interest in the resources area. For instance, the terrestrial resource section (Section 6.4) is divided into botanical and wildlife, and under botanical the following areas are discussed: 1) special-status and California Endangered Species Act (CESA)-listed plants; 2) vegetation distribution and abundance; 3) riparian habitat and wetlands; and 4) noxious weeds/invasive plants. The affected environment is the baseline (No-Action Alternative)[2] against which Licensees' Proposed Projects and any proposed alternatives to Licensees' Proposed Projects are measured. For simplicity, the affected environment is described once for both the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project (i.e., the description covers the area potentially affected by both projects).

- Environmental Effects. This sub-section describes, for each Project, the beneficial and adverse effects of the Proposed Projects. For the Yuba-Bear Hydroelectric Project, this section focuses on NID's proposed Yuba-Bear Hydroelectric Project, which includes NID's proposed environmental measures. For PG&E's Drum-Spaulding Project, this section focuses on a description of any anticipated ongoing environmental impacts of continued operation of the existing Project, and the incremental impact of the Proposed Project with PG&E's proposed environmental measures. This section describes how each of Licensee's proposed measures would protect or enhance the existing environment, including, where possible, a non-monetary quantification of the anticipated environmental benefits of the measure.

- Proposed Environmental Measures. The proposed environmental measures sub-section for each resource area provides, for each Project, Licensee's proposed environmental measures designed to address Project effects. The measures are listed in this subsection. Appendix E7 includes, for each measure proposed by PG&E for the Drum-Spaulding Project, the full text of the measures and a rationale statement for the measure. Appendix E3 includes the full text of each environmental measure that would be included in NID's proposed Yuba-Bear Hydroelectric Project. NID has included the rationale for each of its measures in the corresponding Environmental Effects section, not in Appendix E3. In instances where

[2] As discussed is numerous locations throughout each Licensee's FLA, with minor exceptions that are more fully described in Exhibit B of each Licensee's FLA, under the No-Action Alternative, the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project would continue to operate under the terms and conditions of their respective current licenses, and no new PM&E measures would be implemented.

Licensees thought it would be helpful, Licensees have noted if a proposed measure is a continuation of a measure included in their existing FERC license.

- Unavoidable Adverse Effects. This section describes any adverse environmental effects under the Proposed Projects that can not be mitigated, including whether the effect is: short- or long-term; minor or major; cumulative or site-specific.

As described in Section 3.1 of this Exhibit E, FERC's revised SD2 dated October 6, 2008, states that water resources and aquatic resources have the potential to be cumulatively affected by continued Project O&M in combination with other activities that occur in the watersheds. Therefore, Section 6.2 (Water Resources) and Section 6.3 (Aquatic Resources) include a sixth area of discussion – cumulative effects – and that cumulative effects discussion is located following the section on Licensee's proposed measures, and before the section on unavoidable adverse effects.

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6.1 Geology and Soils

The discussion of geology and soils is broken into five sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding geology and soils (Table 6.1-1). Second, the affected environment is discussed in Section 6.1.1. Third, the environmental effects of the projects are located in Section 6.1.2. Fourth, proposed measures are listed in Section 6.1.3. Finally, unavoidable adverse effects, if any, are addressed in Section 6.1.4.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on geology and soils, Licensees developed and conducted the studies listed in Table 6.1-1.

Table 6.1-1. Geology and Soils resource studies conducted by Licensees.[1]

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress[1]	Study Complete	Date Study is Scheduled to be Complete
2.1.1	Channel Morphology	1-1	1/24/11	--	10/31/11
2.9.1	Primary Project Roads and Trails	9-1	7/23/10	--	10/31/11

[1] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, the two studies listed in Table 6.1-1 are in progress; the most recent version of the interim technical memorandum that has been posted to the Relicensing Website for each study is being filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; lists of variances to the FERC-approved study, if any; attachments to the technical memorandum; and references.

The status of each study, including the expected completion date, is described below.

- Channel Morphology (Study 2.1.1). Licensees completed all tasks in the FERC-approved study, including the development of an Addendum as requested by agencies, and on January 24, 2011, posted to the Relicensing Website a technical memorandum for the study. However, Licensees, after filing their DLAs, learned that there was missing hydrology information for Bear River Reach #2 that necessitates revaluating the data for this reach. Licensees have used the revised hydrology data in their FLAs, and plan to revise the Channel Morphology Technical Memorandum using the corrected Bear River Reach #2 hydrology so that the information in the final technical memorandum will be consistent with the information in the FLAs. In addition, at the same time, although the Licensees do not expect it to alter the conclusions in the technical memorandum in any significant way, Licensees

[1] Another document that provides relevant information regarding channel morphology is Licensees' Habitat Mapping and Channel Characterization Report, which is Attachment 3.2A of the Instream Flow Technical Memorandum (3.2) contained in Appendix E12. The information was used for, among other things, reach and study-site selection and the large woody debris assessment.

will revise the technical memorandum using the new Base Case hydrology as directed by FERC. Licensees plan to file the final technical memorandum with FERC by October 31, 2011.

- Primary Project Roads and Trails Study (Study 2.9.1). Licensees posted a technical memorandum to the Relicensing Website on July 23, 2010. Subsequently, PG&E identified one road, which accesses the South Yuba Canal, that had not been surveyed under Study 2.9.1. PG&E has included this road in the Proposed Project FERC boundary. PG&E intends to survey the road (to complete Study 2.9.1), and file with FERC a final technical memorandum by October 31, 2011.

6.1.1 Affected Environment

This section describes existing geology and soil conditions in five general areas: 1) geologic setting, physiography, soils and seismicity; 2) gold mining; 3) roads and other potential upland sources of sediment; 4) reservoir shorelines and sedimentation; and 5) stream channel morphology.

6.1.1.1 Geologic Setting, Seismicity, Physiography, and Soils

The bedrock geology in the vicinity of the projects is complex, but is generally composed of Paleozoic metasediments and metavolcanics (i.e., Shoofly and Calaveras formations), Paleozoic and Mesozoic granitic rocks (i.e., Bowman Lake and Sierra Nevada batholiths and the Yuba River pluton), and a Mesozoic ophiolite complex (i.e., Smartville Complex). Younger units in the region include Eocene marine rocks and Eocene auriferous sediments (i.e., Tertiary river gravels) deposited by the ancestral Yuba River. Other Tertiary units present include Miocene-Pliocene rhyolites, rhyolitic sediments (i.e., Valley Springs Formation), and andesitic lahars (i.e., Mehrten Formation) that cap some ridgetops (Curtis et al. 2005b). Much of the higher-elevation terrain underlain by Mesozoic granitic rocks has been overridden by ice. Figure 6.1-1 provides a generalized geologic map of the vicinity of the projects.

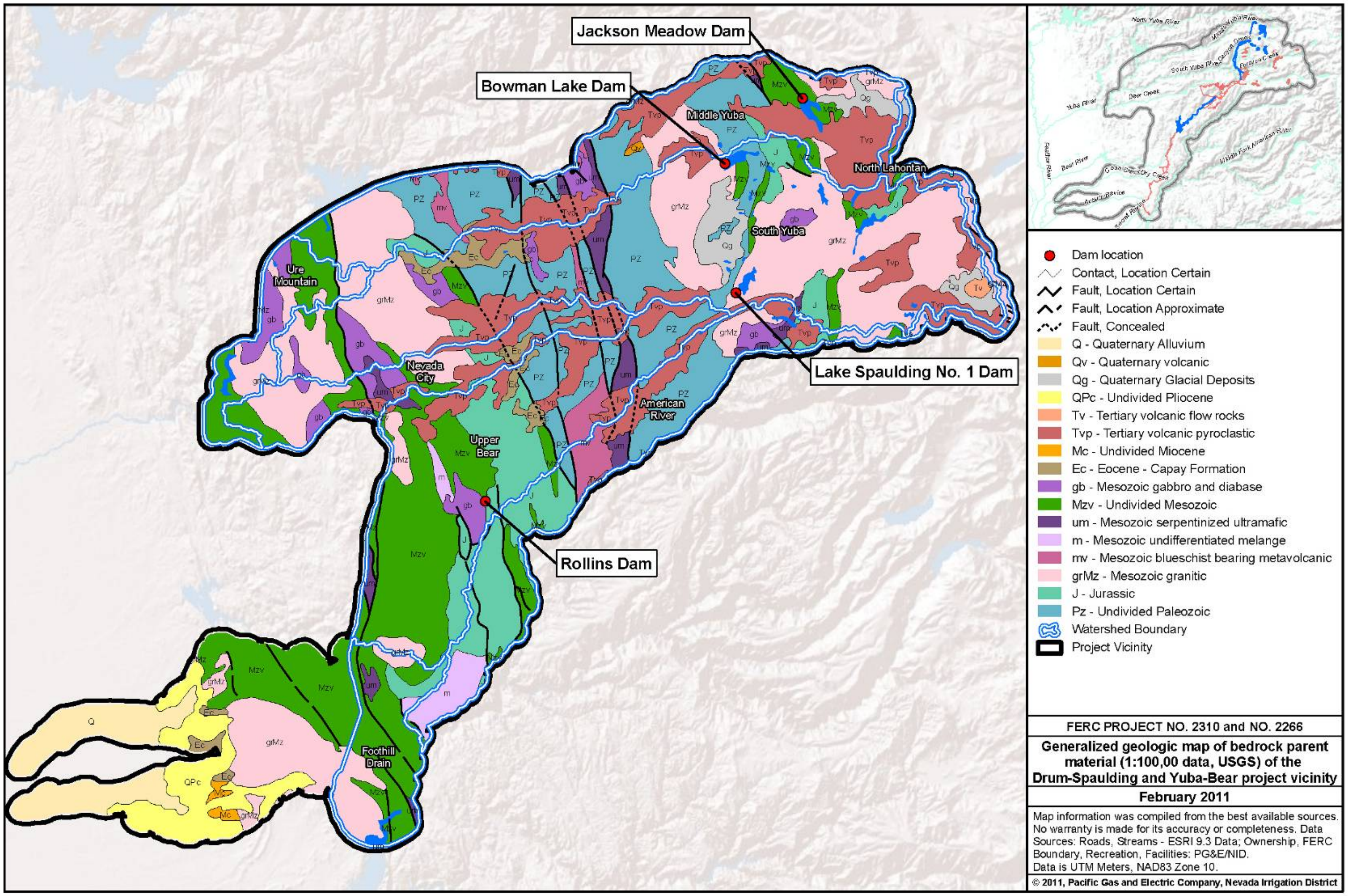


Figure 6.1-1. Generalized geologic map of bedrock parent material (1:100,000 data, USFS) in the vicinity of the Drum-Spaulding and Yuba-Bear Hydroelectric projects.

6.1.1.1.1 Seismicity

The projects are in an area of low to moderate seismicity, with most seismic activity concentrated east and southeast of the projects area near Lake Tahoe and to the northwest of the projects area, south of Lake Oroville. Expected seismic shaking intensities within the projects area from these nearby faults are considered to be low (California Geological Survey 2003, 2005).

A number of north-to-northwest trending faults cross the projects, most of which are associated with the Foothills Fault System. Among the more significant faults are the Grass Valley Fault, the Melones Fault Zone, the Big Bend/Wolf Creek Fault Zone, the Giant Gap Fault and the Camel Peak Fault Zone (California Division of Mines and Geology 1994). None of the mapped faults within the projects area have been active in Quaternary time. A portion of the Giant Gap fault south of the projects is designated as having been active in Quaternary time. The nearest active fault, defined by the California Geological Survey as movement within the past 11,400 years, is the Cleveland Hill Fault located to the northwest of the projects near Lake Oroville; that fault had recorded movement in 1975. Other active faults are located to the east and southeast of the projects near Lake Tahoe.

6.1.1.1.2 Physiography

The Sierra Nevada Range is about 400 miles long and runs south-southeast to north-northwest in the eastern portion of California. The Sierra Nevada crest forms the eastern limit of the Yuba and Bear basins and trends north-northwest. Drainage within the basins is west to southwest from the Sierra Crest to the adjacent floor of the Sacramento Valley. To the east of the basins, downfaulting of the eastern Sierra face has affected drainage evolution by creating channels that now have their headwaters facing east (James and Davis 1994).

Uplifting and tilting of the Sierra Block reorganized drainage networks and initiated a period of sustained channel incision (Curtis et al. 2005a, Curtis et al. 2005b), and many of the modern river channels have elevations below Tertiary-age river channels. The ancestral (Tertiary Period) Yuba River had cut about 1,000 feet below a surface defined by San Juan, Washington, and Harmony ridges (James 2003). These ancestral deep channels drained north-northwest across the strike of the modern drainages (James 1991). The south branch of the ancestral Yuba River flowed north from Gold Run to Badger Hill, then southwest to Smartsville and Marysville (Merwin 1968). The ancestral channels were filled first by very coarse, boulder material rich in gold, followed by finer gravel and sand deposits (James and Davis 1994), also rich in gold. These Tertiary gravel deposits are the source of the gold heavily mined in the late 1800's.

Tertiary channels/gravels were buried by rhyolitic and andesitic volcanics, then severely eroded and exposed by deep fluvial incision. The modern Yuba and Bear rivers began incising 5 million years ago (Curtis et al. 2005a). Modern foothill channels strike perpendicular to the ancestral channels, and have downcut leaving the deposits of the ancestral channels as upland gravels (Merwin 1968).

The basins were also affected by extensive Quaternary Period glacial erosion. Pre-glacial Bear River headwaters were captured by the South Yuba River in response to ice-damming of the upper Bear River, probably during maximum glacial advance (James 1988), making the upper Bear River a glacial trough filled with outwash. Today, outwash deposits extend downstream from Bear Valley and grade into coarse channel lag gravel and boulders upstream of Drum Powerhouse. The South Yuba Gorge truncates the Bear Valley trough at its upper end, which has isolated the Bear Valley from substantial sediment or hydrologic input.

The modern Yuba and Bear basins drain the northwestern Sierra Nevada via a series of deep canyons cut by mountain channels, separated by high, steep sided ridges and a parallel drainage network. A parallel drainage network results in narrow ridges between small tributaries, small tributary-contributing areas, and low tributary sediment loads under natural conditions; prehistoric debris fans at tributary junctions were not common (James and Davis 1994). Stratigraphic evidence indicates the presence of stepped, Quaternary Period terraces similar to piedmont channels flowing out of the Sierra Nevada (James 1988), but these terraces were generally buried by mining sediment. Downcutting, as noted specifically in the Bear River, through the relatively soft Paleozoic metamorphic rock (Shoo Fly Complex) has created a deep, v-shaped canyon where short, steep-sided tributary drainages are typical (Geomatrix 1997). Distinctive v-shaped inner gorge areas are common in all of the major drainages in the vicinity of the projects (Figure 6.1-2).

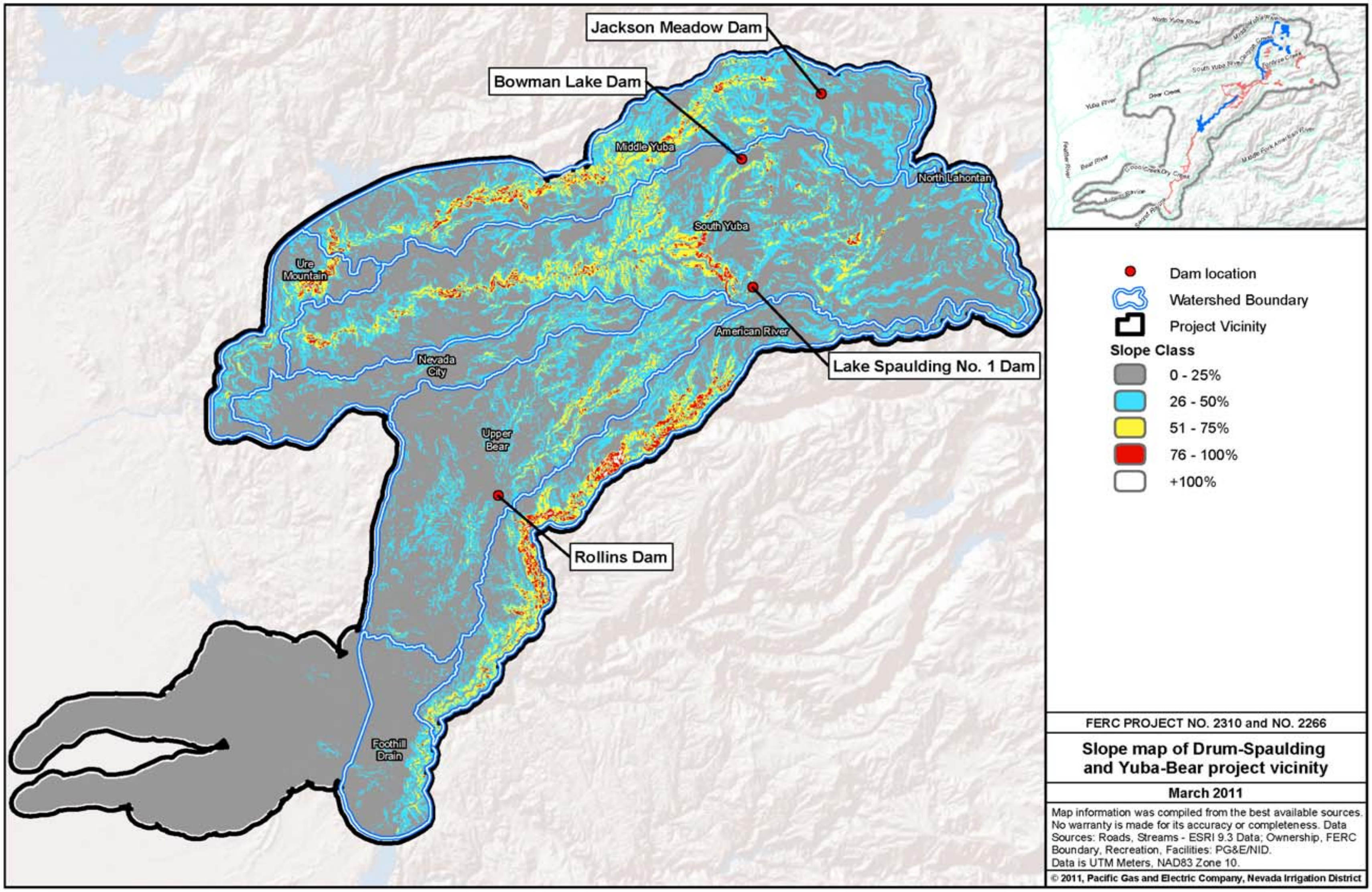


Figure 6.1-2. Slope map in the vicinity of the Drum-Spaulding and Yuba-Bear Hydroelectric projects.

6.1.1.1.3 Sediment Sources

Hillslope sediment sources indicate low hillslope erosion rates and 95 percent of the watershed has negligible to moderate hillslope erosion potential (Curtis et al. 2005b), though certain areas such as the north side of Washington Ridge and the Missouri Bar and Poorman subwatersheds (near the town of Washington, and the Malakoff Diggings State Park, as identified by the Forest Service) have high mass wasting potential (USFS 2002). Sediment sources generally, but not specifically, include highly erodible andesitic mudflows, serpentinized ultramafics, and unvegetated hydraulic mine pits. In the upper Yuba River Basin, mass wasting dominates erosion. Most of the mass wasting in the area is associated with the contact zone between the Mehrten (andesitic lahars, mudflows) and Valley Springs Formation (volcanic tuff) and the underlying metasedimentary rocks (USFS 2002). Slumping and landslides involving bedrock typically occur near the contact between the glacial deposits and deeply weathered phyllite schist of the Shoo Fly Formation. Specific and identified sediment sources as they affect sediment supply and channel stability are discussed in Sections 6.1.1.5.4, 6.1.2.1.4, and 6.1.2.2.3.

In the upper Bear River drainage, landslides and debris flows are most common in unconsolidated surficial deposits (till, outwash, colluvium). Colluvial hillslopes and unconsolidated glacial deposits have been assessed as unstable in the Bear River drainage where they overlie more impermeable and weathered phyllite schist and are located on very steep (over 60º) slopes (Geomatrix 1997), but none have been specifically identified as currently adversely affecting the projects. There are landslides in the Bear River above the Drum-Spaulding Project's Drum Afterbay that are generally stable or have only moved very small amounts. An exception is a flume failure that occurred in 1986 ("Pittman Spill"), where 550,000 cubic yards was delivered from the hillslope through the Bear River for about 1.5 miles to Drum Afterbay; monitoring and restoration of the hillslope are on-going and little additional sediment is expected.

6.1.1.1.4 Sediment Yield

Between the South Yuba River and Middle Yuba River drainages, South Yuba River has a larger drainage area, higher flow, and absence of man-made structures that restrict sediment movement. Eighty-eight percent of the Middle Yuba River is above dams that restrict downstream movement of sediment (Curtis et al. 2006) so that yield is reduced. Annual sediment yield of 5 tons/square mile in the Middle Yuba River is significantly lower than the South Yuba River at 14 tons/square mile. Bedload represents 1 percent or less of the total annual load through the period of October 2001 through September 2003. Erosion of stored channel sediment from gold mining is the primary contributor to annual sediment yield and mining sediment remains the dominant sediment source (James 1988). Pre-mining bedload is coarser than deposits exposed in channels.

6.1.1.1.5 Soils

Soils are strongly influenced by underlying bedrock. Soil Orders in the vicinity of the projects include Alfisols, Andisols, Entisols, Inceptisols, Mollisols, and Ultisols in combination with mesic or frigid soil temperature regimes and zeric, udic, aridic, or aquic soil moisture regimes. Figure 6.1-3 shows the dominant soil associations in the vicinity of the Drum-Spaulding and Yuba-Bear Hydroelectric projects. Frigid soils are found in the upper elevations (above El. 5,000 feet) and are derived from granitic, glacial-alluvial, metasedimentary, or volcanic origin (andesitic tuffs and mudflows). Soils in the mid-range of the projects (between El. 2,000-5,000 feet) follow the andesitic mudflow parent materials that remain on the ridges and are also influenced and appear to track the fault zones (e.g., Dubakella) and have generally mesic or thermic temperature regimes. The fault soils are derived from ultrabasic volcanic material and often have a high component of serpentine minerals. Lower in the mid-section, plutons composed of granitic material appear again (similar to upper elevation) and soils are derived from acid igneous (granitic, granodiorite) parent material. There is also a significant influence from metasedimentary, tuff breccia, and schists and shales. The mid-basin soils are more heterogeneous as they represent a transition from the granitic/glacial mountainous uplands with cool temperatures, to the foothills where temperatures are more moderate (i.e., transition from mesic to thermic). The lower part of the projects' vicinity has mesic and thermic soils of metavolcanic, metasedimentary, and acid igneous origin. Erosion hazard within a soil series is often strongly dependent upon slope; the steeper the slope, the more erodible the soil. Some features of the soil series found in the vicinity of the projects are summarized in Table 6.1-2. The features presented include parent material, slope, elevation range, depth and drainage, erosion hazard, and geomorphic position. Specific, identified sediment sources affecting sediment supply to project-affected reaches and channel stability are discussed in Sections 6.1.1.5.4, 6.1.2.1.4, and 6.1.2.2.3.

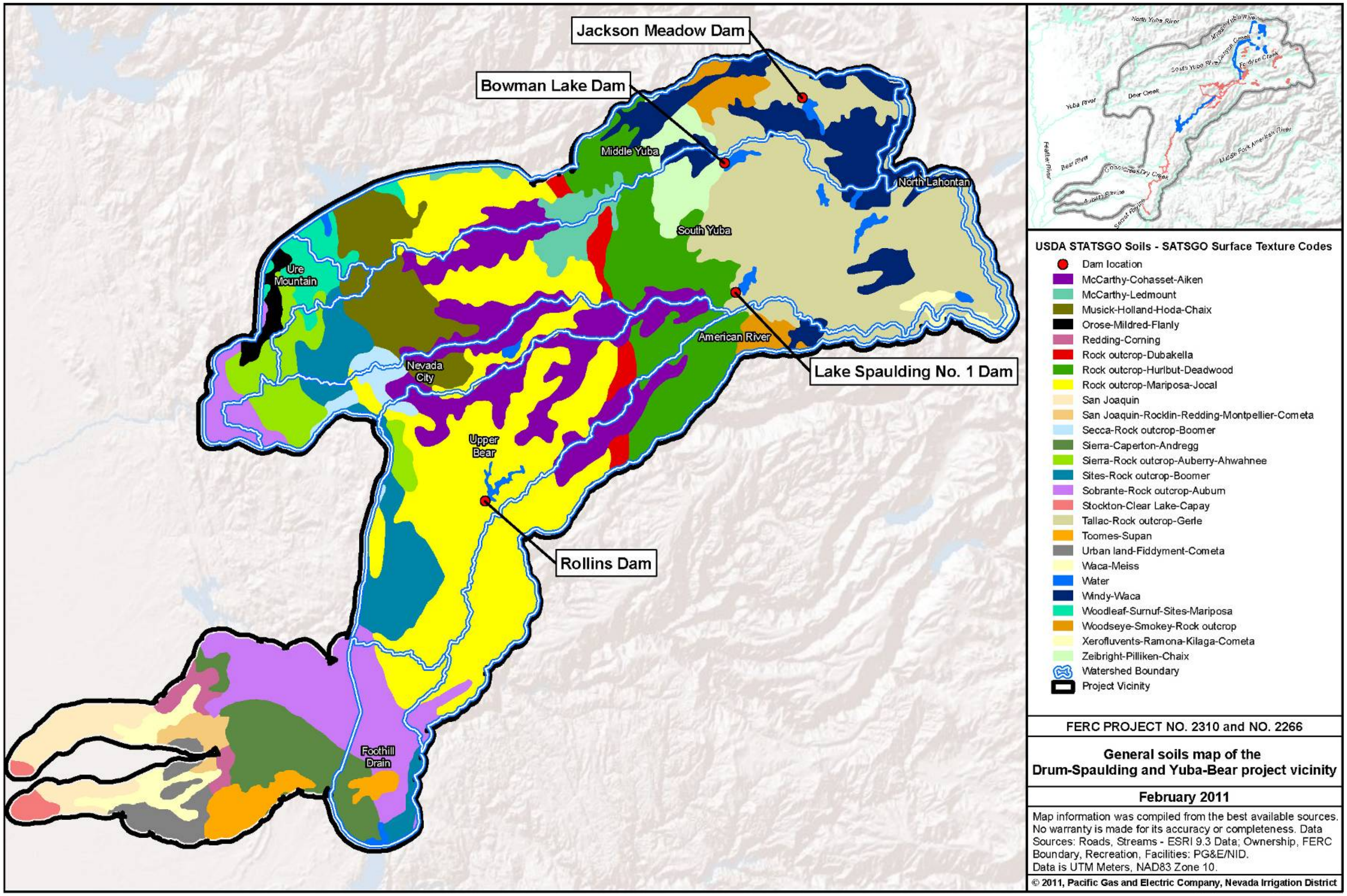


Figure 6.1-3. General soils map in the vicinity of the Drum-Spaulding and Yuba-Bear Hydroelectric projects.

Table 6.1-2. Soil series found in the vicinity of the Drum-Spaulding and Yuba-Bear Hydroelectric projects.

Series	Parent Material	Slope Range (%)	Elevation (ft)	Depth, Drainage	Erosion Hazard[1]	Geomorphic Position
Ahwanee	Granitic	2-75	200-2,800	Deep, well-drained	High	Gently sloping foothills to steep mtns
Aiken	Basic volcanic (tuff breccia)	2-70	1,200-1,500	Deep, well-drained	Slight-Mod	Broad, gently sloping tabular ridges
Andregg	Acid igneous (granodiorite)	2-70	200-1,500	Deep, well-drained	Mod	Undulating to steep foothills
Auberry	Intrusive igneous (quartz diorite or granodiorite)	5-75	400-3,500	Deep, well-drained	Slight-Mod	Foothills and mountainous uplands
Auburn	Amphibolite schist	2-75	125-3,000	Shallow-mod. deep	Slight-Mod	Foothills
Boomer	Metavolcanic	2-75	500-5,000	Deep, well-drained	Slight-Mod	Uplands
Capay	Alluvium derived from sandstone and shale	0-9	0-1,200	Very deep, moderately well drained	Slight-Mod	Alluvial fans and flats, interfan basins and basin rims
Caperton	Intrusive igneous (quartz diorite or granodiorite)	2-50	200-1,500	Shallow, excessively drained	Mod-High	Uplands
Chaix	Acid igneous (granite, granodiorite)	5-75	1,200-6,500	Deep, excessively drained	Mod-High	Mountain slopes
Clear Lake	Fine-textured alluvium dreived from sandstone and shale	0-2	25-2,000	Very deep, poorly drained	None-Slight	Basins and swales of drainageways
Cohasset	Volcanic	2-50	800-5,500	Deep, well-drained	Slight-Mod	Plateau-like uplands
Cometa	Alluvium from granitic rock	0-15	20-600	Deep, moderately or well drained	Slight	Gently sloping, slightly dissected older stream terraces
Corning	Gravelly alluvium weathered from mixed rock sources	0-30	75-1,300	Very deep, well or moderately well drained	Slight-Mod	High terraces with mount, intermound microrelief
Deadwood	Hard metasedimentary	2-100	3,000-6,000	Shallow, excessively drained	Severe-Very Severe[2]	Mountainous uplands
Dubakella	Ultramafic w/ serpentine minerals	5-75	2,200-4,100	Deep, well-drained	Mod-High	Mountains
Fiddyment	Consolidated sediments of mixed rock sources	0-15	50-350	Moderately deep, well-drained	Slight-Mod	Nearly level to rolling low terraces and hills
Flanly	Acid igneous (granodiorite, qtz diorite, diorite)	2-75	125-2,100	Deep, well-drained, drainage	Slight-Severe[2]	Foothills
Gerle	Glacial till, outwash & alluvium from granitic rocks	2-70	5,100-7,500	Deep, well-drained	Moderate-Severe[2]	Gently sloping to steep moraine and outwash plains
Hoda	Acid igneous (granodiorite)	2-75	2,000-4,200	Deep, well-drained	Mod-High	Mountains
Holland	Granitic	2-75	1,200-5,600	Deep, well-drained	Mod-High	Mountains
Hurlbut	Metamorphosed sedimentary	2-75	1,200-5,500	Deep, well-drained	Severe-Very Severe[2]	Mountains
Jocal	Metasedimentary	2-75	2,000-5,000	Deep, well-drained	Moderate-Severe[2]	Mountain slopes
Kilaga	Alluvium from mixed rock sources	0-9	50-200	Deep and very deep, well drained	Slight	Terraces
Ledmount	Andesitic tuff breccia	2-75	200-6,000	Shallow, excessively drained	Moderate-Severe[2]	Mountain sideslopes and narrow ridge tops
Mariposa	Tilted slates and schists	2-75	1,600-5,600	Deep, well-drained	Mod-Very High	Ridges, mountainsides

Table 6.1-2. (continued)

Series	Parent Material	Slope Range (%)	Elevation (ft)	Depth, Drainage	Erosion Hazard[1]	Geomorphic Position
McCarthy	Andesitic mudflows	2-75	2,000-6,000	Deep, well-drained	Slight-High	Gently sloping to very steep on dissected plateau-like areas
Meiss	Andesitic	2-75	6,000-10,000	Shallow, excessively drained	Mod-High	Mountains
Mildred	Basic intrusive igneous (olivine, gabbro, norite)	3-50	1,500-2,500	Deep, well-drained	Severe[2]	Mountains
Montpellier	Old alluvium form granitic rock sources	2-30	100-500	Deep to very deep, well or moderately drained	Slight-Severe[2]	Nearly level to hilly dissected terraces
Musick	Granitic colluvium	2-75	2,000-5,000	Deep, well-drained	Mod-High	Mountains
Orose	Basic intrusive igneous (gabbrodiorite)	3-30	125-1,900	Shallow, well-drained	Slight-Severe[2]	Foothills
Pilliken	Granitic	5-75	3,600-5,800	Deep, well-drained	Moderate-Severe[2]	Mountainsides
Ramona	Alluvium from granitic and related rock sources	0-25	250-3,500	No info, well drained	Slight-Mod	Terraces and fans
Redding	Alluvium derived from mixed sources	0-30	40-2,000	Moderately deep to duripan, well or moderately well drained	Slight-Severe[2]	Nearly level or dissected and undulating to hilly high terraces
Rocklin	Old alluvium from granitic rock sources	0-15	80-500	Moderately deep to hardpan, well or moderately well drained	Slight-Mod	Nearly level to rolling dissected terraces
San Joaquin	Alluvium derived for mixed but dominantly granitic rock sources	0-9	20-500	Moderate deep to duripan, well and moderately well drained	Slight-Mod	Undulating low terraces
Secca	Metabasic, basic, ultrabasic volcanic		1,700-3,000	Moderately well drained	Slight-High	Gently sloping to steep mountains
Sierra	Acid igneous residuum, often w/ rock outcrops		200-3,500	Deep, well-drained	Slight-High	Western foothills
Sites	Metabasic and metasedimentary	2-75	600-5,000	Deep, well-drained	Slight-Mod	Mountains
Smokey	Metasedimentary	5-50	5,500-7,200	Deep, well-drained	Moderate-Very Severe[2]	mountains
Sobrante	Basic igneous and metamorphic (amphibolite schist, diabase, andesite, basalt)	2-75	125-3,500	Deep, well-drained	Slight-Mod	Foothills
Stockton	Alluvium from mixed rock sources	0-2	0-100	Deep to duripan, somewhat poorly drained	Slight	Basins and swales of drainageways
Surnuf	Basic intrusive igneous (gabbrodiorite)	8-50	1,400-2,800	Deep, well-drained	Moderate-Severe[2]	Hills and mountains
Supan	Andesity and basaltic tuff-breccia or similar		1,500-4,000	Moderately deep, well-drainged	Moderate-Very Severe	Sloping, plateau-like in upper foothills
Tallac	Glacial deposits	0-75	5,000-9,000	Deep, well-drained	Slight-Mod	Nearly level to very steel lateral and terminal glacial morains and outwash plains
Toomes	Tuff breccia, basalt, and andesite	2-75	150-4,000	Very shallow and shallow, well to somewhat excessively drained	Moderate-Very Severe	Gently sloping to very steep slopes on ridges and plateaus
Waca	Andesitic tuff	5-75	6,000-9,000	Deep, well-drained	High	Gently sloping to very steep mountains

Table 6.1-2. (continued)

Series	Parent Material	Slope Range (%)	Elevation (ft)	Depth, Drainage	Erosion Hazard[1]	Geomorphic Position
Windy	Andesitic mudflows	5-75	4,000-9,000	Deep, well-drained	Moderate-Severe[2]	Moutains and plateaus
Woodleaf	Ultramafic w/ serpentine minerals	3-30	2,000-3,200	Deep, well-drained	Slight-Severe[2]	Mountains
Woodseye	Metasedimentary, metavolcanic	2-90	6,000-9,000	Shallow, well-drained	Moderate-Very Severe[2]	Mountain side slopes

[1] Each series usually has several forms that are separated by slope ranges. Steeper slopes within the same series will have a higher erosion hazard rating.

[2] Erosion hazard classification, using Natural Resources Conservation Service (NCRS) current system of classification, is a site-specific process. Whereas previously a generic erosion hazard was presented, the current system provides factors that are relevant in soil erosion but each site must be reviewed on site for specific soils. NCRS does provide an estimate of the hazard of erosion both from off-road and off-trail use and road and trail erosion Hazard estimates are based on slope and soils erosion factor “K” and rock fragments. For more information see: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm?TARGET_APP=Web_Soil_Survey_application_zmawo3z1cgndca45bjcoqpfb.

6.1.1.2 Gold Mining

Gold is the dominant mineral resource in the area affected by both projects, and gold mining is the dominant human influence in how the Yuba and Bear rivers look today. Mining began in earnest before 1853 (Hunerlach et al. 1999) with exploitation of surface deposits of placer gold, followed by riverbed, quartz, and alluvial gravel mining. Over 150 years after gold mining began, mine tailings still dominate the Yuba and Bear channels (James 1991). Anthropogenic changes due to mining changed the Bear River from a supply-limited system to a transport-limited system. Erosion of stored channel sediment from gold mining is the primary contributor to annual sediment yield (James 1988). Much of the sediment produced by incision into mining tailing deposits was deposited near the aggrading confluences of Steephollow and Greenhorn creeks with the Bear River, and the mining sediment deposits currently form deltas in Rollins Reservoir (James 2004). Some alluvial fans created by sand and gravel from mining tailings were so large that they completely blocked the main channel in the Bear River (James 2004). The North Fork American River received from 58 to 70 percent of the hydraulic mining sediment produced in the basin. Modern day (e.g., Twentieth Century) mining sediment has also affected basins with remaining gold deposits (i.e., Middle and South Yuba, Bear River, and the American River).

Current geomorphologic processes of many of the larger channels of Middle and South Yuba rivers and the Bear River, and to a lesser extent the North Fork of the North Fork American River, are still dominated by mining effects. Local placer and hydraulic mining continue to modify the in-stream and near-stream environment due to, among other things, excavation of the sediments in and near the channel, washing and sorting of sediments, camping associated with mining, and floods that continue to re-distribute the mining tailings. Historic and current mining activities destabilize fledgling riparian growth, streambed, and banks. Historic mining created huge sediment deposits through which many channels continue to work. These deposits are non-cohesive, droughty (i.e., do not retain water well), and are not conducive to strong riparian growth.

6.1.1.3 Roads and Other Upland Sources of Sediment

Besides the projects' roads and trails that are discussed below, Licensees are unaware of any potential major upland sources of sediment or erosion, such as slope failures or mass wasting areas, associated with the projects. Recreation facilities, particularly in more gently-sloping areas, have the potential to contribute sediment from surface erosion, although their surface area is negligible in comparison to the size of the watershed.

In 2008 and 2009, Licensees inspected 70 discrete Primary Project Roads[2] or Trails segments encompassing 57 miles of road and 4 miles of developed trail (NID and PG&E 2010ff). Licensees assessed the condition of all road features (e.g., surface, water crossings, culverts,

[2] Primary Project Roads are non general use roads that are used primarily for the Project, are in the Proposed Project FERC Boundary and will therefore be under FERC's jurisdiction. Primary Project Roads are further discussed in several places in this FLA, including Section 6.6 (Recreational Resources) and Section 6.7 (Land Use) of Exhibit E, and depicted in Exhibit G maps.

bridges and drainages) to determine if the road or trail met appropriate maintenance levels, and noted any environmental damage, such as excessive erosion or bank instability. More than 1,200 discrete features were identified, including 204 water crossings and 289 drainage features (e.g., culverts, drainage ditches). Systematic analysis of attribute data, including condition, maintenance requirements, and erosion potential, was used to establish a ranking process applicable to both discrete features and entire road segments. Each road segment was ranked as "excellent", "good", or "poor".

Nineteen segments (about 30 percent) of the Primary Project Road segments were ranked as "poor", generally because of the condition of water crossings (e.g., typically undersized), drainage features (e.g., damaged culvert), or environmental damage (e.g., surface erosion and sedimentation at culvert outlet). Table 6.1-3 lists these 19 road segments, including length, overall erosion risk and identified problem. For a key to roads segments, refer to Licensees' Roads and Trails Technical Memorandum (9.1), which is filed with this FLA in Appendix E12. All of the Primary Project Trails were ranked as being in "good" condition.

Table 6.1-3. Yuba-Bear Hydroelectric Project and Drum-Spaulding project roads with identified erosion problems.

Road ID	Road Name	Length (mi)	Overall Erosion Risk	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems
YUBA-BEAR HYDROELECTRIC PROJECT							
YBBSC _001	Bowman-Spaulding Berm Road	0.8	Medium	10	Native rock	Poor	Erosion/landslide
YBCPF_001	Chicago Park Forebay Road	1.7	High	13	Gravel/rock	Poor	Erosion
YBCPF_002	Chicago Park Forebay Road	0.6	High	14	Gravel/rock	Poor	Landslide
YBFL_001	French Lake Road	2.1	Medium	12	Native rock	Poor	Erosion
DRUM-SPAULDING PROJECT							
DS004	Lower Peak Road	0.4	High	12	Native rock	Poor	Erosion/several hazard trees
DS005	Langs Crossing Spillway Road	0.6	Medium	20	Native rock	Poor	Erosion
DS011	Drum Canal Access Road	1.7	Medium	12	Gravel/native rock	Poor	Erosion
DS013	PG&E Road	1.2	Low	13	Paved/gravel	Poor	Erosion
DS015	Drum Canal Road	1.7	Low	13	Gravel/rock	Poor	Erosion
DS017	Pittman Spill Channel North	1.8	High	12	Native rock	Poor	Erosion/landslide
DS018	Pittman Spill Channel South	1.5	High	12	Native rock	Poor	Erosion/landslide
DS019	Boardman Canal/PG&E Canal Road	0.2	High	12	Native rock	Poor	Erosion
DS021	Drum #3 Penstock Access	1	High	11	Native rock	Poor	Erosion
DS026	Downstream End of Little Tunnel	2.2	High	12	Native rock	Poor	Erosion/landslide
DS027	Telephone House Road	0.72	High	12	Native soil	Poor	Erosion
DS030	Downstream Steephollow 1	1.35	High	11	Native rock	Poor	Erosion
DS035	Chalk Bluff Spur Road	0.79	Erosion	12	Native soil	Poor	Erosion/landslide

Table 6.1-3. (continued)

Road ID	Road Name	Length (mi)	Overall Erosion Risk	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems
DRUM-SPAULDING PROJECT (continued)							
DS041	Drum Power House	4.36	High	14	Paved	Poor	Erosion/landslide/ blind spots
DS060	13 Mile Spill	2.12	Medium	13	Gravel/rock	Poor	Erosion/landslide

6.1.1.4 Reservoir Shorelines and Sedimentation

6.1.1.4.1 Reservoir Shoreline Erosion

The projects include a combined 40 reservoirs or impoundments. There are seven main storage reservoirs: Jackson Meadows Reservoir, French Lake, Bowman Lake, Rollins Reservoir, Lake Valley Reservoir, Fordyce Lake and Lake Spaulding. Twenty-four of the reservoirs are very small diversion impoundments (i.e., <1,000 ac-ft of appreciable storage), and nine of the reservoirs are small off-stream impoundments.

The majority of projects' reservoir shorelines are composed of bedrock, sand, and rock fragments up to the high-water surface elevations of the reservoirs. Water lines are visible along bedrock shorelines in many of the reservoirs when water levels are lowered, reflecting the various stages of operation in the reservoirs. Above the high-water line, tree vegetation dominates the shorelines and the landscape, much of which is evergreen. Similar vegetation also exists on rock outcroppings that form small islands in some of the reservoirs. With the exception of Rollins Reservoir, reservoir shorelines are free of residences.

Reservoirs throughout the watershed are generally not at risk of shoreline erosion because they are made up of bedrock and/or have gently sloping shorelines, and most reservoirs do not experience daily water levels fluctuations that would threaten slopes. The forebays that are off-channel fluctuate daily but turbid releases have not been reported as an issue or observed by Licensees. In a few isolated areas, trees may have fallen into the reservoirs. These trees are gathered by the Licensees at a log boom or during reservoir maintenance and piled off site or burned in piles. Judging from the small amounts of debris pulled from the reservoirs (tables 6.1-10 and 6.1-11 in section 6.1.1.5.5), debris removal and disposal are infrequent. Shorelines are considered stable on all projects' reservoirs.

6.1.1.4.2 Sediment Deposition in Reservoirs

Alluvial deposits have accumulated in some the projects' larger reservoirs (e.g., Lake Spaulding and Rollins Reservoir), though this deposition has not required Licensees to dredge or otherwise remove sediment from any project reservoirs, or modify operations of the projects.

Prior to relicensing, Licensees performed bathymetric surveys of the projects' larger reservoirs. Table 6.1-4 provides an estimate of rate of sedimentation in these reservoirs based on Licensees' recent surveys as compared to as-built drawings. Changes in volume are based on as-built surveys, and the accuracy of these surveys cannot be independently verified. In some cases, the calculated sedimentation rate is close to the "noise" of the uncertainty due to accuracy of the as-built data.

Table 6.1-4. Sedimentation deposition in some of the projects' larger reservoirs.

Reservoir	Contributing Drainage Area (mi^2)	Year Dam put in Service	Years between Service data and Bathymetric Survey	Gross Storage		Difference		Rate of Deposition (ac-ft/mi^2/yr)
				Based on As-Built Drawings (ac-ft)	Based on Recent Bathymetric Survey (ac-ft)	Volume (ac-ft)	Percent Change	
YUBA-BEAR HYDROELECTRIC PROJECT								
Jackson Meadows Reservoir	37.6	1965	42	69,205	67,435	-1,770	-2.6%	1.1
Bowman Lake	10.7	1928	81	68,510	68,363	-147	0.2%	0.2
Dutch Flat Afterbay	9.2	1965	42	2,037	1,397	-640	-31.4%	1.7
Rollins Reservoir	104	1965	42	65,988	58,682	-7,306	-11.1%	1.7
DRUM-SPAULDING PROJECT								
Blue Lake	0.24	1875	134	Unknown	4,042	Unknown	Unknown	Unknown
Fordyce Lake	31.7	1864	145	50,073	49,525	-548	-1.1%	0.1
Lake Valley Reservoir	4.54	1887	120	7,964	7,902	-62	-0.8%	0.1
Rock Creek Reservoir	2.17	1916	91	548	485	-63	-11.5%	0.3
Lake Spaulding	118.0	1912	96	75,034	75,912	878	1.2%	*

* Insufficient accuracy; within noise of as-built and deposition rate appears negative.

None of the rate of deposition values in Table 6.1-4 are high compared to selected reservoirs in the United States presented in Chow (1964; Table 17-1-7). In those reservoirs, the loss of storage ranged from 0.9 percent to 60.2 percent, and the median was 9.4 percent. As a regional comparison, the USACE's Englebright Reservoir, with over 461 sq mi of drainage, accumulated 17,750 ac-ft of sediment (4.5 percent) over 61 years, which results in a deposition rate of 0.6 ac-ft/mi^2/yr (Childs et al. 2003). So, Jackson Meadows Reservoir, Dutch Flat Afterbay, and Rollins Reservoir are on the high end of the regional sedimentation rate, but not as compared to a wide range of reservoirs nation-wide. Rollins Reservoir has accumulated mining sediments (James 2004), which contributes to a higher rate, and Drum Afterbay was affected by sediment delivered due to a flume failure in 1986. There are wide variations in rates of sediment production and reservoir sedimentation within physiographic provinces so there is no defined "typical" rate (Chow 1964). Also, as stated above, Licensees have not dredged nor otherwise removed sediment for any projects' reservoirs.[3] Sediment was removed from the Drum Afterbay due to the Pittman Spill input (see Section 6.1.1.5.4 – Bear River Reach #2 Boardman [Sub-Reach discussion]).

[3] CDFG constructed a channel in the Milton Diversion Impoundment, but it was not done at the request of NID or needed for Project operations.

6.1.1.5 Stream Channel Morphology

Licensees collected specific, comprehensive, and detailed information on aquatic habitat and channel morphology characteristics of all stream reaches affected by both projects (see Habitat Mapping and Channel Characterization Report, Attachment 3.2A to the Instream Flow Technical Memorandum [3-2], filed with this FLA in Appendix E12). Data collected included length and width of habitat, depth of pools, dominant and sub-dominant substrate, bank material, spawning gravel, bank erosion, and large woody debris. Photographs and UTM coordinates were taken to reference each ground-mapped section. The Channel Morphology Technical Memorandum (1-1) documented existing channel conditions at three to four cross sections and along a minimum of 0.2-mile-long sections of channel at 10 sites selected in collaboration with other Relicensing Participants. Parameters measured included cross-section and longitudinal profiles, bankfull elevation and discharge, floodprone width, channel gradient, particle sizes of the channel bed and trout spawning gravel, bank and channel stability, and fine material quantity in pools and in potential trout spawning gravels. At two other sites, a more limited data set (e.g., cross section, longitudinal profile and bed particle sizes) was obtained to estimate bed mobility. The Channel Morphology Technical Memorandum (1-1), together with Licensees' hydrology database, which included unimpaired and regulated mean daily annual maximum flows, were used to describe channel conditions. In addition, Licensees developed additional gravel transport analysis at each of the channel morphology transects.

6.1.1.5.1 <u>Overview</u>

Stream channels affected by both projects are generally carved into steep canyons and are frequently characterized by exposed bedrock. Peak streamflows, which typically occur from snowfall runoff, continue to carve the streambeds into bedrock, and channel substrate generally consists of various sizes of rock fragments, boulders, and bedrock. Channel gradients are also relatively steep, up to and exceeding 10 percent in some localized areas.

Most stream channels are characterized by a coarse bed dominated by gravel- to cobble-size material (cobble and larger), with low width-to-depth ratio, moderate to high slopes in relatively straight channels that may be either unconfined or confined. Channels often lack rhythmic bedforms, though flow obstructions such as boulders, bedrock outcrops, and large woody debris may force local pool and bar formation. Sediment supply is attendant on parent material, localized bank and hillslope failures, mobilized terrace material through side channel development, historic and current mining activities, and occasionally surface erosion.

There are large mining sediment deposits in most of the reaches affected by both projects to the west of Highway 80 that continue to affect the location of the stream and the riparian corridor by creating immobile channel boundaries and conditions that are not conducive to riparian colonization. For example, large deposits removed from the channel and placed alongside the channel inhibit riparian growth and channel migration (e.g., South Yuba near Poormans Creek). Another example is the large amount of hydraulic mining debris (that does not hold water) that fills valleys. The size of material deposited in the channel during flood events, and that material remaining after winnowing of finer material, often greatly exceeded the dominant channel flow competence (i.e., sediment mobility during regulated median and high flows) and only the finer particles are mobile at the frequently occurring flows. Most of the reaches are transport reaches for spawning-sized gravel material that only occurs in limited quantity and locations.

High energy flow events, such as the 1986 and 1997 floods, are important as "reset" mechanisms in most every project-affected reach, and work in combination with legacy mining effects. For example, in the South and Middle Yuba, the 1997 event exceeded 30,000 cfs and 20,000 cfs respectively, which is an 18- and 22-year recurrence interval (based on mean daily annual peaks). Figure 6.1-4 shows examples of hydrographs for four project-affected reaches to show the influence of major storm events on the hydrograph: Canyon Creek at Bowman Lake, Middle Yuba above Wolf Creek, North Fork of the North Fork of the American River at Lake Valley Canal Diversion Dam, and Bear River at Highway 20 in Bear Valley. The blue lines represent unimpaired estimates of what the hydrograph would look like given no regulation, and the red lines are the observed values (though values for the Middle Yuba above Wolf Creek had no gage so hydrology is modeled) representing regulated conditions at these same locations. The 1986 and 1997 flows were substantial in the Middle and South Yuba and the Bear River drainages west of Highway 80. In the case of the Bear River, 400 cfs was exceeded six times between 1993 and 2000[4]. The gage for this site is very near the headwaters and most of this flow has historically been delivered from the Drum Canal because Bear River is periodically used as a conveyance reach to deliver water for both projects to the Drum Afterbay. In the North Fork of the North Fork American River, which is east of Highway 80, 1995, 1996, and 2002 years had large observed events (though much lower than unimpaired estimates); the gage was out of service for the 1997 event. Unimpaired synthesized data indicate that the water years of 1980, 1982, 1986, and 1997 likely influenced the drainages to the east of Highway 80, in addition to the 2002 event that was observed.

[4] USGS gage located on the Bear River at Highway 20 crossing was rated for "full range in stage" prior to 2005. In 2005, maximum flow rating was reduced to about 160 cfs.

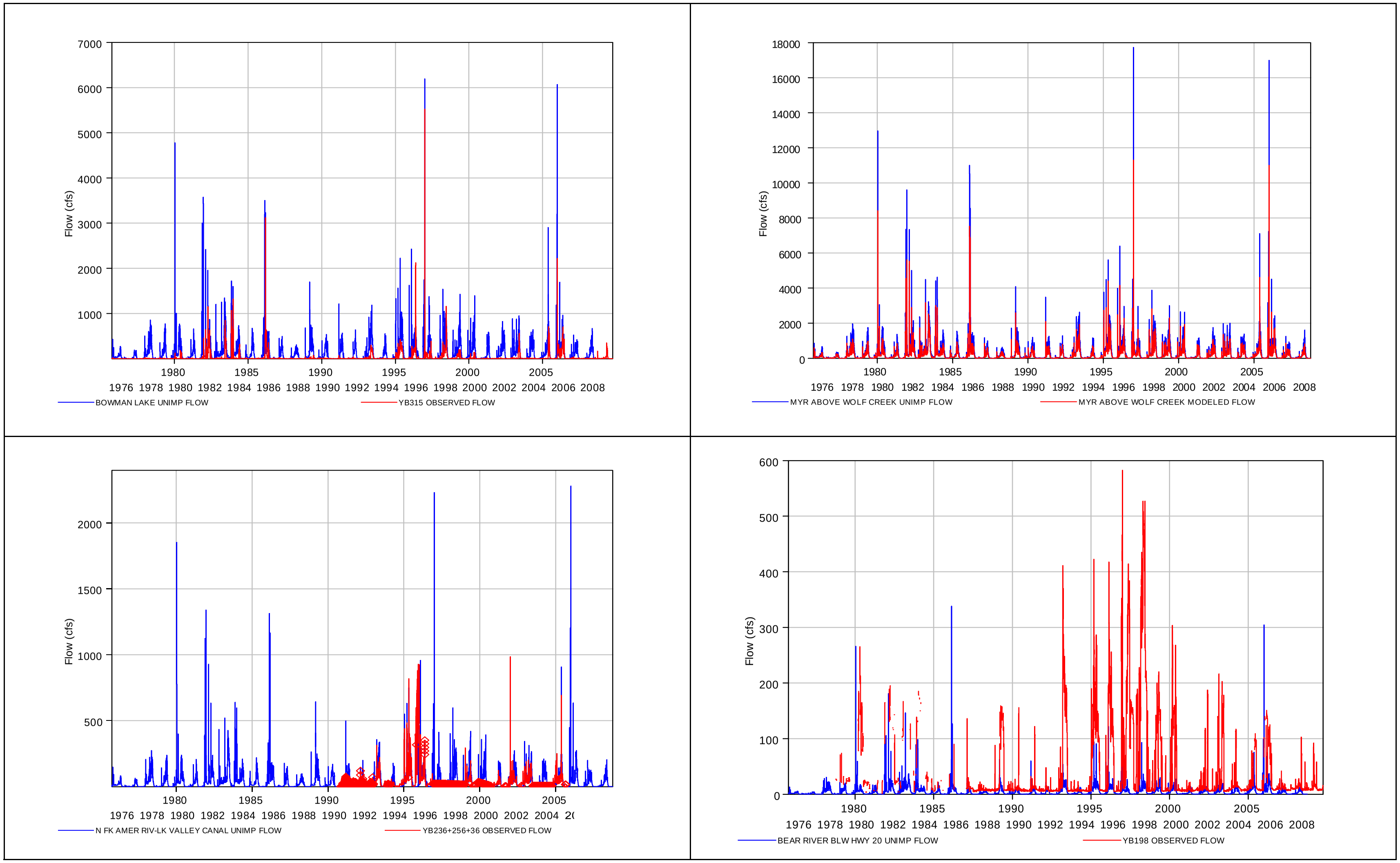


Figure 6.1-4. Examples of hydrographs of storm events in the area affected by both projects. Upper left is Canyon Creek at Bowman Lake, upper right is Middle Yuba above Wolf Creek, lower left is North Fork of the North Fork American River at Lake Valley Canal Diversion, and lower right is Bear River at Highway 20 (blue is unimpaired, red is observed/modeled).

6.1.1.5.2 Bankfull and Flood Discharges

Regulated bankfull discharge return intervals in the reaches studied by Licensees ranged from less than 1 up to 3 years (Table 6.1-5), which is low compared to the range of return intervals of channel-forming flows in stable channels (Leopold 1994). However, the return interval is based on a relatively short period of record and the peaks are dampened by using the mean annual daily peaks (i.e., lower values occur more frequently relative to higher values). Under regulated conditions, the first depositional surface that the streams encounter (also known as the "first break") were at approximate recurrence intervals between less than 1 year to 29 years, with a median of about 1.5 years, which is closer to the range determined by researchers for bankfull discharge in stable channels. The estimated recurrence interval for regulated and unimpaired floodprone discharge ranged from less than 2 years to over 500 years. This wide range is due not only to the difficulty in identifying bankfull in this morphologic setting, but also to the importance of flood events (e.g., the 1997 flood as a "reset" mechanism that created large deposits within and adjacent to the channel). Additionally, the recurrence interval is based on only 33 years of data, and is based on the mean daily annual peaks. Floodprone surfaces have a greater probability of being inundated under unimpaired conditions. However, floodprone surfaces are based on maximum bankfull depth, which would likely be different under unimpaired conditions, so the surfaces may not be "formed" at the same elevation. Floodprone return frequency would then be different; it is not just a matter of comparing the hydrology between regulated and unimpaired conditions, but also a matter of what the hydrology has changed in channel morphology. It is a somewhat iterative process and there is inertia in the system (i.e., there may be a shift in hydrology but the change in hydrology has not yet caused a change in morphology).

Table 6.1-5. Bankfull, first break, and floodprone estimated discharges and recurrence intervals (based on modeled mean daily annual maximums 1976-2008) for regulated and unimpaired conditions.

Site	Transect	Bankfull		First Break		Floodprone	
		Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)	Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)	Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)
Jackson Meadows Dam Reach	T1	486	2.5/1.3	bankfull	2.5/1.3	6,538	114/31
	T11	536	2.71.4	bankfull	2.7/1.4	6,251	98/29
Milton Diversion Dam Reach, Upper Milton Sub-Reach, Dead End Mine Site (Middle Yuba)	T1	554	1.1/1	1,275	1.6/1.3	8,533	15/9
	T3	297	1.05/1	1,157	1.5/1.3	6,515	11/6
	T6	206	1.01/<1	1,524	1.9/1.4	3,156	2.8/2
Faucherie Lake Dam Reach	T7	127	1.3/1.1	1,532	29/22	5,973	>500/>500
	T15	144	1.4/1.1	466	3.8/2.7	3,274	305/162
	T18	36	1.0/<1	338	2.6/2	875	10/7
Bowman-Spaulding Diversion Dam Reach	T3	141	1.1/<1	223	1.2/1	1,792	14/3
	T7	188	1.1/1	942	4/2	2,062	19/4
	Gage	250	1.6/1	bankfull	1.6/1	700	3.5/1.5
Fordyce Lake Dam Reach	T7	207	1/<1	311	1.2/1	1,390	3/2
	T13	254	1/1	371	1.2/1	5,466	70/13
	T19	614	1.5/1.2	bankfull	1.5/1.2	6,308	149/18

Table 6.1-5. (continued)

Site	Transect	Bankfull		First Break		Floodprone	
		Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)	Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)	Discharge (cfs)	Recurrence Interval Reg/Unimp (yrs)
South Yuba Reach #4	T6	258	1.0/<1	bankfull	1.0<1	3,693	2.4/1
	T14	282	1.0/<1	759	1.2/<1	4,961	2.8/1.5
	T16	195	1.0/<1	332	1.0/<1	1,910	1.6/1
Bear River Reach #2, Meadow Sub-Reach	LM2	68	<1/2.7	bankfull	<1/2.7	356	12
	MM5	185	1.5/9.2	bankfull	1.5/9.2	2,545	>500
	UM2	78	<1/3	bankfull	<1/3	944	>500
Dutch Flat Afterbay Dam Reach	T4	183	3/1.3	292	2.5/1.5	2,199	3.5/7
	T13	189	3/1.3	bankfull	3/1.3	1,962	25/6
	T18	86	1.5/1.1	bankfull	1.5/1.1	617	4/2
Bear River Canal Diversion Dam Reach	T1	1,180	1.5/1.5	bankfull	1.5/1.5	2,960	2.5/2.5
	T2	1,250	1.5/1.5	bankfull	1.5/1.5	3,650	2.8/2.8
	T3	650	1.2/1.2	bankfull	1.2/1.2	2,100	2/2
Lake Valley Reservoir Dam Reach	T5	63	1.1/1	bankfull	1.1/1	876	66/9
	T6	80	1.2/1	bankfull	1.2/1	1,655	>500/30
	T7	24	<1/<1	84	1.2/1	240	3/2
	T13	14	<1/<1	168	1.5/1.4	1,318	269/18

6.1.1.5.3 Sediment Transport

Licensees found that at most channel morphology study sites, channels are characterized by large substrate, vertical confinement, low bank erodibility, and low fine sediment accumulation, indicative of low sediment supply relative to transport capability, which is common in steeper Sierra Nevada streams. As part of Licensees' Channel Morphology Technical Memorandum (1-1), the mobility of the substrate and trout spawning gravels at 25- and 50- percent exceedance flows were evaluated. In comparing sediment mobility under regulated and unimpaired conditions at 25 percent and 50 percent exceedance flows, flow regulation does not often change the frequency with which the median (D_{50}) bed particle size would be mobilized under unimpaired flow conditions (Figure 6.1-5). The larger particles within the cross sections (D_{84}) were rarely mobile under 25- and 50- percent exceedance conditions for either regulated or unimpaired conditions (Figure 6.1-6). Generally, the larger material in the channel exceeds the dominant channel flow competence (i.e., sediment mobility during regulated median and high flows) as generally only the D_{16} was mobile under regulated or unimpaired conditions, and was slightly more mobile under regulated conditions (Figure 6.1-7).

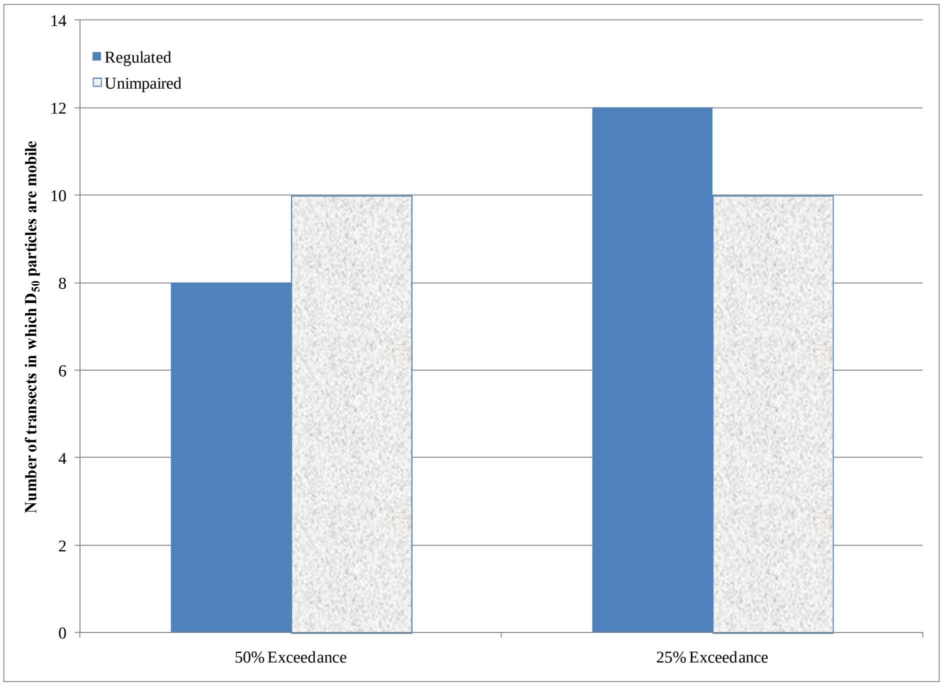


Figure 6.1-5. Number of transects in which the D_{50} particle size was mobile (using assumed Shield's parameters of either 0.045 and 0.065) under 50- and 25-percent flow annual exceedance under regulated and unimpaired conditions.

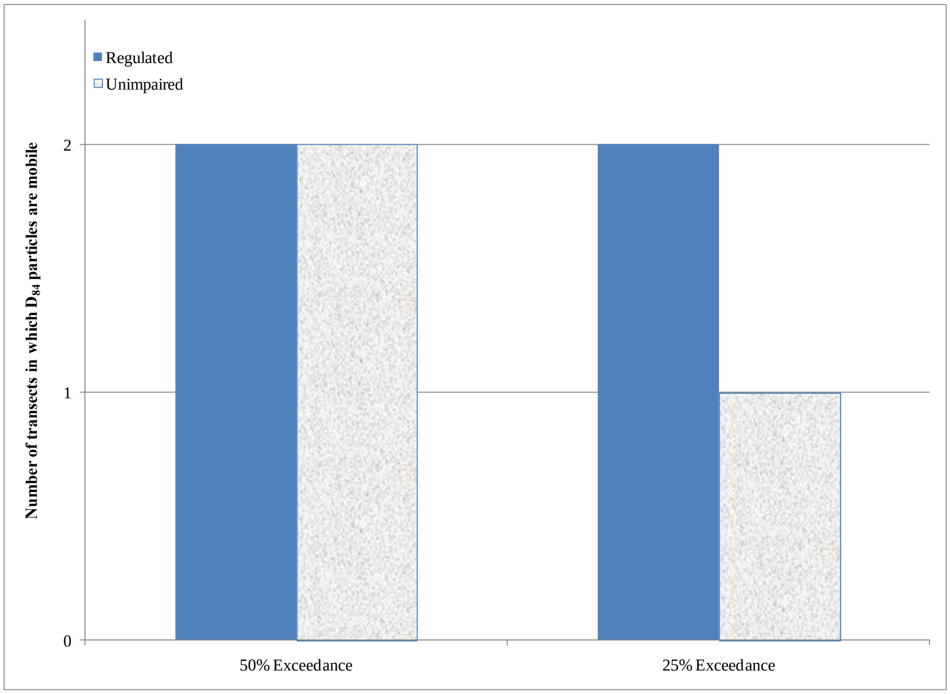


Figure 6.1-6. Number of transects in which the D_{84} particle size was mobile (using assumed Shield's parameters of either 0.045 and 0.065) under 50- and 25-percent flow annual exceedance under regulated and unimpaired conditions.

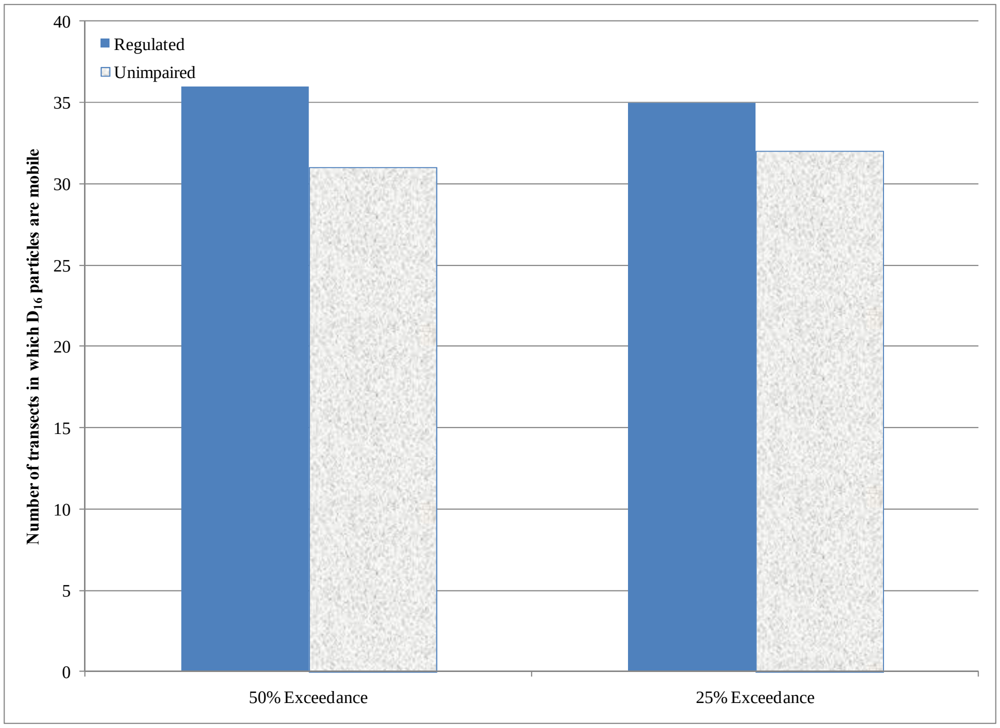


Figure 6.1-7. Number of transects in which the D_{16} particle size was mobile (using assumed Shield's parameters of either 0.045 and 0.065) under 50- and 25-percent flow annual exceedance under regulated and unimpaired conditions.

In evaluating individual cross sections, there was no change in the mobility of the median particle size (D_{50}) in 47 of 49 cross sections under 50 percent exceedance flow conditions, and 41 of 49 transects under 25 percent exceedance flows. Under 50 percent exceedance flow, particles were more mobile under unimpaired conditions in two cross sections. With 25 percent exceedance flows, median particles were more mobile under regulated conditions in five cross sections and under unimpaired conditions in three cross sections.

There were some differences between regulated and unimpaired conditions in the mobility of trout spawning-sized gravels. Trout spawning gravels were mobile at 18 of 25 transects evaluated at the Channel Morphology Study sites (Figure 6.1-8). Gravels were mobile at slightly more transects under regulated conditions for both median (50-percent exceedance) and high flows (25-percent exceedance). In evaluating the differences between individual transects, at 17 of 25 transects, there was no change in trout spawning gravel mobility under regulated conditions as compared to unimpaired flow conditions. In seven transects, median-sized trout spawning gravels were more mobile under regulated flow conditions; and in one transect the gravels were more mobile under unimpaired conditions.

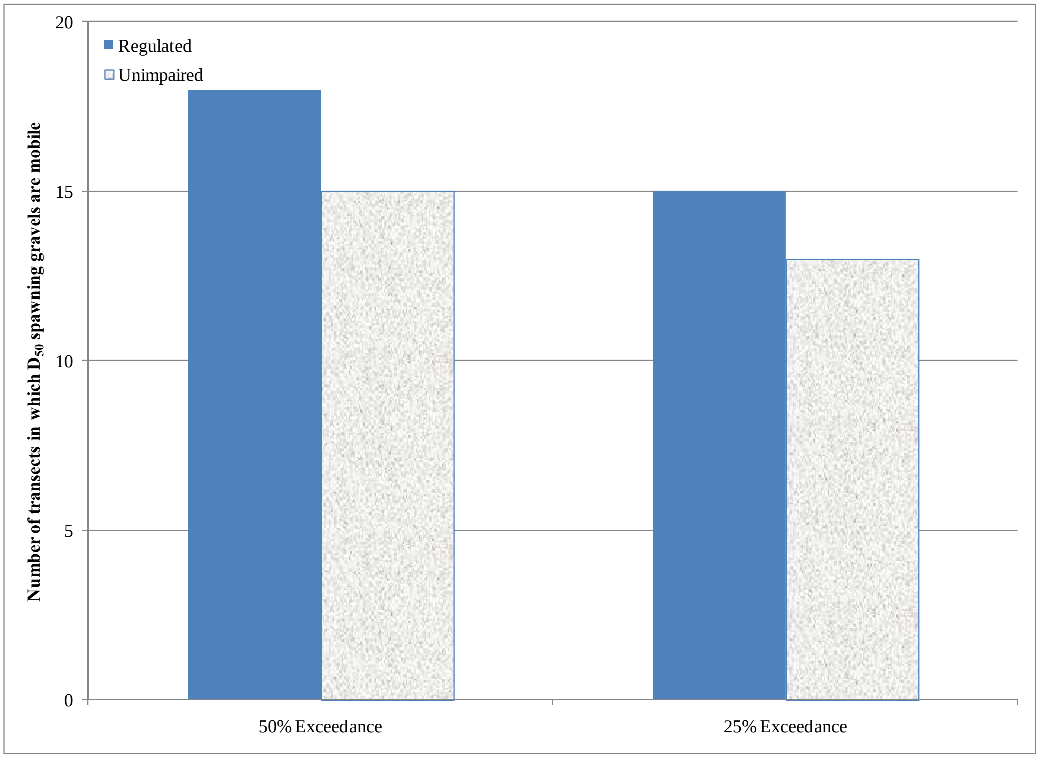


Figure 6.1-8. Number of transects in which the D_{50} spawning gravel was mobile (using assumed Shield's parameters of either 0.045 and 0.065) under 50- and 25-percent flow annual exceedance under regulated and unimpaired conditions.

There are sources of sediment that create gravel bars, floodplains, and enhance riparian growth, as indicated by sand and gravel deposits on some lateral gravel/sand bars, floodplains, and low terraces. The sediment sources include bank erosion, surface erosion, debris flows, side channel development, historic spill channel erosion, and current and historic mining debris.

Supplemental analysis of the particle size mobility was performed by Licensees. An incipient motion analysis was done on the median particle size (D_{50}) of each transect at each study site. Channel shear was estimated using Shield's parameters of 0.03, 0.045, and 0.065. During an iterative process, the model was run until channel shear exceeded or equaled critical shear, the point of motion. Table 6.1-6 and Table 6.1-7 present a summary of the largest median-size particles (substrate and spawning-size gravel, respectively) that are mobile. Substrate particles from as small as 20 mm to as large as 285 mm were found to be mobile at flows ranging between 45 to 9,165 cfs (Table 6.1-6). Recurrence intervals of mobility of substrate, estimated using mean daily annual maximums, ranged from annual mobility to more than every 13 years. Mostly, substrate particles were mobile every 1-3 years under regulated and unimpaired conditions. Three out of ten sites (Table 6.1-7) had differences in median particle mobility between regulated and unimpaired conditions. There was little to no change in seven sites (i.e., less than a 1 yr difference in median particle mobility recurrence interval between regulated and unimpaired conditions), decreased mobility at two sites (Jackson Meadows and South Yuba) and increased mobility at one site (Bear River Reach #2 Meadow Sub-Reach).

Table 6.1-6. Summary of largest median (D_{50}) particle size that is mobile at Channel Morphology Study sites.

Site	Size (mm)	Shield's Parameter	Minimum Discharge needed to move median particle (cfs)	Regulated Recurrence Interval (yrs)	Unimpaired Recurrence Interval (yrs)
Jackson Meadows Dam Reach	80	0.045	3,162	13	3
Milton Diversion Dam Reach (Upper Milton Sub-Reach, Dead End Mine Site)	100	0.045	Not mobile before max. shear at 522-727 cfs	N/A	N/A
Faucherie Lake Dam Reach	62.5	0.065	147	1.4	1.2
Bowman-Spaulding Diversion Dam Reach	66/73.5*	0.065	141/216	1.25/1.2	<1/1
Fordyce Lake Dam Reach	25-145	0.045	Not mobile before max. shear at 250-820 cfs	N/A	N/A
South Yuba Reach #4 (Canyon Creek Confluence Reach)	130	0.065	9,165	6	2.5
Bear River Reach #2 (Meadow Sub-Reach)	41	0.065	220	2.4	11
Dutch Flat Afterbay Dam Reach	70	0.045	128	1.8	1.2
Bear River Canal Diversion Dam Reach	71.5	0.065	534	1.1	1.1
Lake Valley Reservoir Dam Reach	20	0.045	45	1	1
Bear River Reach #2 (Boardman Sub-Reach)	285	0.065	455	2.2	2.7
Drum Afterbay Dam Reach	135	0.065	288	2.3	1.8

*above Texas Creek/Gage Transect
N/A – not applicable because particles were not mobile

Trout spawning gravels ranged from 14 to 27 mm and were mobile with discharges between 12 to 255 cfs (Table 6.1-7). Return intervals of these flows was between less than 1 to 3 years and were mobile under both regulated and unimpaired conditions.

Table 6.1-7. Summary of mobility of trout spawning-size gravel (D_{50}) in Channel Morphology Study sites.

Site	Size (mm)	Shield's Parameter	Minimum Discharge needed to move (cfs)	Regulated Return Frequency (yrs)	Unimpaired Return Frequency (yrs)
Jackson Meadows Dam Reach	20	0.045	255	1.5	1.1
Milton Diversion Dam Reach (Upper Milton Sub-Reach, Dead End Mine Site)	19	0.045	75	<1	<1
Faucherie Lake Dam Reach	22	0.065	Less than 21cfs in steeper sections; not mobile at 409 cfs in areas where gravels have accumulated	--	--
Bowman-Spaulding Diversion Dam Reach	21	0.065	15	<1	<1
Fordyce Lake Dam Reach	27	0.045	177	1	<1
South Yuba Reach #4 (Canyon Creek Confluence Reach)	18	0.065	80	<1	<1
Bear River Reach #2 (Meadow Sub-Reach)	17	0.065	76	<1	3
Dutch Flat Afterbay Dam Reach	NA – no spawning gravels	0.045	N/A	N/A	N/A
Bear River Canal Diversion Dam Reach	NA – no spawning gravels	0.065	N/A	N/A	N/A
Lake Valley Reservoir Dam Reach	14	0.045	12	<1	<1

-- 21 cfs is below the flows evaluated for return frequency, and gravels are not mobile at 409 cfs, which is the flow at which maximum channel shear occurs.
N/A – not applicable as gravels are not available

Licensees modeled gravel (particles 4 to 64 mm) mobility using the hydraulic model developed for the initial sediment transport analysis. The results are depicted in a series of graphs that present the channel shear as a function of discharge for each of 49 transects from 12 Channel Morphology Study reaches (Channel Morphology Technical Memorandum [1-1). Inset into each graph is a subset of Table 6.1-8. Table 6.1-8 shows the critical shear at three assumed Shield's parameters. Each transect has a Shield's parameter that was assumed as most appropriate, and the critical shear values using that Shield's parameter were presented on the graph for each transect. Theoretically, if the channel shear stress exceeds the critical shear stress at a given discharge, the particle is mobile at that discharge.

Table 6.1-8. Estimated critical shear stress for gravel particle sizes that are the upper limit of the five classes within the Uden-Wentworth scale for gravels.

Particle Size (mm)	Critical Shear Stress (N/m^2)		
	β= 0.03	β = 0.045	β = 0.065
64	31.1	46.6	67.3
32	15.5	23.3	33.7
16	7.8	11.7	16.8
8	3.9	5.8	8.4
4	1.9	2.9	4.2

The hydraulic model was run to create a channel shear-versus-discharge graph. Figure 6.1-9 is an example. Discharges were limited to the 0.995 annual exceedance probability at the lower end and 0.002 annual exceedance probability at the upper end. Table 6.1-9 summarizes the maximum discharge that could be modeled within the surveyed cross section. For flows above the surveyed cross section limits, the hydraulic model assumes vertical walls on the side of the cross section. This excludes the additional flow area of the overbank floodplain from the hydraulic computations. Therefore, resulting water surface elevations, and presumably channel shears for flows above the surveyed channel endpoints are overly-conservative estimates and should be treated with caution. The maximum gravel mobile (Column A Table 6.1-9) represents the largest particle of the five gravel particle sizes tested that would be mobile given the channel shear for that transect within the surveyed cross section. In other words, where channel shear exceeds critical shear, theoretically, motion would be initiated. Column B of Table 6.1-9 shows the estimated discharge at which the channel shear exceeds critical shear for the particle in Column A. Column C shows the estimated recurrence interval (using mean daily annual peaks) under regulated and unimpaired conditions from Attachment 1-1B of Channel Morphology Technical Memorandum 1-1. To determine what particles actually exist on each transect, refer to Attachment 1-1D of the Channel Morphology Technical Memorandum (1-1) (filed with this FLA in Appendix E12), which contains particle size distribution graphs based on pebble counts along each transect.

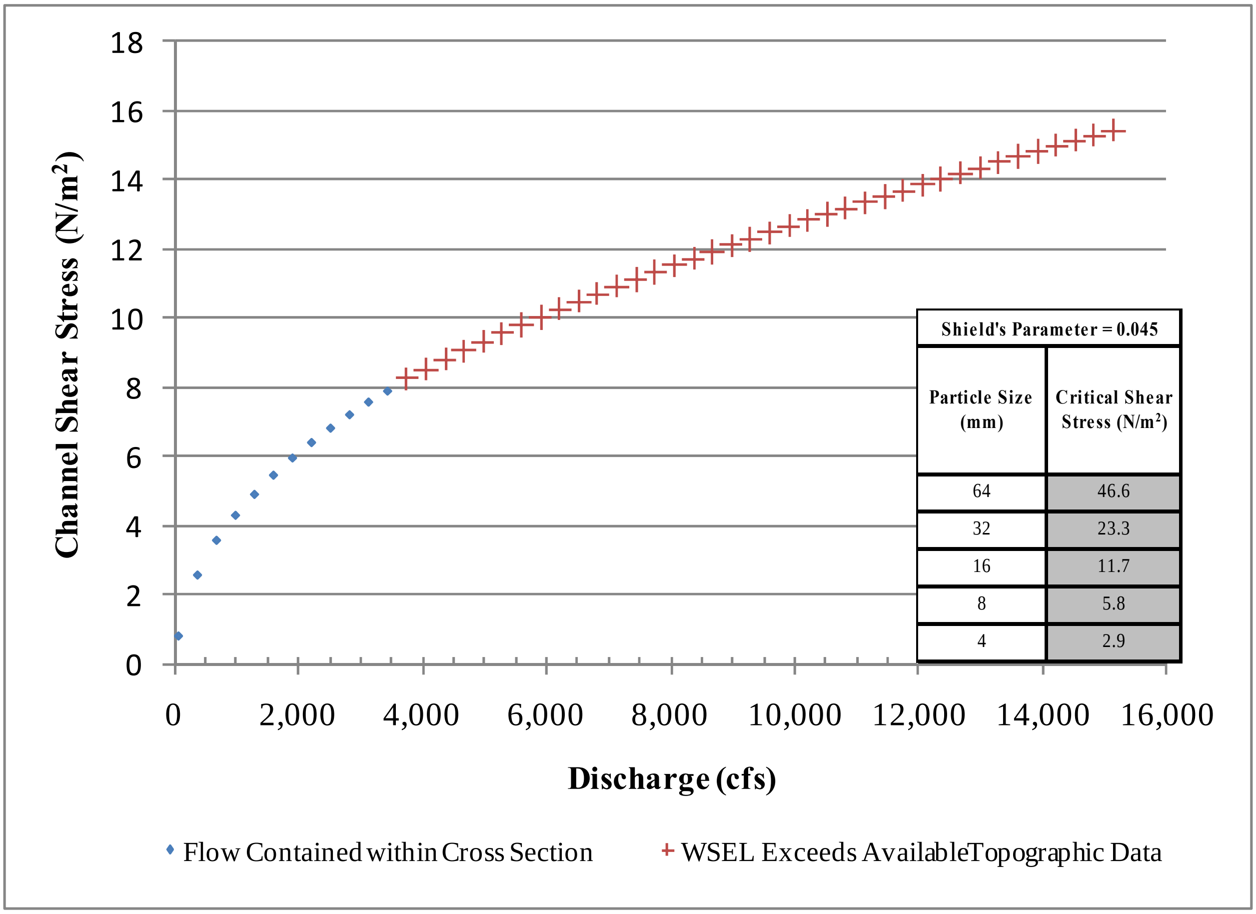


Figure 6.1-9. Jackson Meadows Lake Dam Reach Transect 1. Channel shear stress as a function of 0.995 to 0.002 annual exceedance discharges (based on mean daily annual peak data), and critical shear stress values for gravel particles (Shield's Parameter = 0.045).

In evaluating the differences in mobility of maximum gravel that is mobile under regulated and unimpaired conditions, there were 36 cross sections in which there was little to no change (i.e., less than or equal to 1 yr difference in recurrence interval), nine cross sections where recurrence interval increased under regulated conditions (i.e., mobility occurs less frequently), and two cross sections where recurrence interval decreased with regulation (i.e., mobility occurs more frequently (Table 6.1-9)).

Table 6.1-9. Summary of output from hydraulic and gravel-transport modeling analysis.

Site	Transect	Assumed Shield's Parameter (β)	Maximum discharge contained within surveyed cross section (cfs)	Maximum gravel mobile within surveyed cross section[1] (mm) Column A	Minimum approximate discharge where channel shear exceeds critical shear of particle in Column A (cfs) Column B	Approximate Return Interval of Discharge of Column B[2] Regulated/Unimpaired (yrs) Column C
Jackson Meadows Dam Reach	1	0.045	3,437	8	1,800	12/3
	CMA		1,897	64	1,800	12/3
	11		3,129	64	2,000	15/4
Milton Diversion Dam Reach (Upper Milton Sub-Reach, Dead End Mine Site)	1	0.045	1,718	16	1,000	1.5/1.1
	3		945	32	945	1.5/1.1
	6		1,718	64	1,500	100/25
Faucherie Lake Dam Reach	7	0.06	3,598	64	100	1.1/1
	15		2,079	16	1,300	25/15
	18		471	64	100	1.1/1
Bowman-Spaulding Diversion Dam Reach	3	0.065	876	16	300	1.5/1
	7		3,625	64	200	1.2/1
	Gage		2,058	64	100	1.2/<1
Fordyce Lake Dam Reach	7	0.045	1,377	64	900	2/1.4
	13		1,191	64	400	1.2/1
	19		1,005	<4	Gravel-sized particles are not mobile	N/A
South Yuba Reach #4 (Canyon Creek Confluence Reach)	6	0.065	10,404	64	1,000	1.2/1
	14		10,404	64	7,000	4/2
	16		15,546	64	2,500	1.7/1.1
Bear River Reach #2 (Meadow Sub-Reach)	LM2	0.065	806	64	680	200/100
	MM5		100	32	100	1/4
	UM2		821	64	390	14/29
Bear River Reach #2 (Boardman Sub-Reach)	1	0.065	2,282	8	800	4/5
	2		1,913	64	900	5/6
	3		2,282	64	600	3/3
	4		2,282	64	65	1/1.1
	5		1,913	64	360	1.8/2.4
	6		437	64	310	1.6/2.2
	7		437	64	400	2/2.5
	8		2,466	64	60	1/1.1
	9		2,282	64	60	1/1.1
Dutch Flat Afterbay Dam Reach	4	0.045	3,180	32	2,000	10/6
	13		3,180	64	500	4/2
	18		3,180	64	300	2/1.5

Table 6.1-9. (continued)

Site	Transect	Assumed Shield's Parameter (β)	Maximum discharge contained within surveyed cross section (cfs)	Maximum gravel mobile within surveyed cross section[1] (mm) Column A	Minimum approximate discharge where channel shear exceeds critical shear of particle in Column A (cfs) Column B	Approximate Return Interval of Discharge of Column B[2] Regulated/Unimpaired (yrs) Column C
Drum Afterbay Dam Reach	9	0.065	959	16	350	2.5/2
	10		959	16	900	5/4.5
	11		959	64	800	5/4
	12		3,822	64	900	5/4.5
	13		4,777	64	900	5/4.5
	14		6,280	64	800	5/4
	15		2,868	64	100	1.5/1
	16		4,299	64	200	2/1.5
	17		2,868	64	200	2/1.5
Bear River Canal Diversion Dam Reach	1	0.06	5,034	64	1,500	1.5/1.5
	2		8,319	64	1,500	1.5/1.5
	3		1,749	8	1,500	1.5/1.5
Lake Valley Reservoir Dam Reach	5	0.045	480	32	60	1/1
	6		540	32	100	1.3/1
	7		329	32	80	1.1/1.1
	13		269	<4	Gravel-sized particles are not mobile	N/A

[1] Represents upper limit of size class where critical shear for that size is exceeded by channel shear within the surveyed cross section and mobility is theoretically initiated.
[2] Based on mean daily annual maximum values for period of record.
N/A – non-applicable. Gravels are not mobile so there is no recurrence interval of mobilizing flows.

Trout spawning gravels that were sampled within project-affected stream reaches tended to have a low fine sediment composition. The amount of fine sediment found within project-affected streams is considered low for areas within weathered granite, which occurs in most of the reaches. However, in reaches with parent materials with a greater fines component, such as glacial material in Bear Valley, or the sandstones and siltstones of the Shoofly Complex in the North Fork of the North Fork American River (e.g., Lake Valley Reservoir Dam Reach), higher amounts of fines were expected, and were found within the trout spawning sediments within these reaches, though only one location in one study site (Bear River Reach #2 [Meadow Sub-Reach, Middle Meadow]) had fines of 18 percent that exceeded a 14 percent threshold, a threshold determined by Kondolf (2000) to limit fry emergence in trout. Bank failures located proximally upstream are likely contributors to the localized fine sediment that was sampled within the gravels. Other indicators of high fine sediment availability, such as pools filling or long tails of sediment in velocity shadows, were absent at the site. Additionally, the fines observed at this site appears to be a localized issue, as the upstream and downstream sites within the Bear River Reach #2 had values of 5 and 11 percent, respectively.

6.1.1.5.4 Channel Stability

Within the habitat mapping and channel characterization report (Licensees' Habitat Mapping and Channel Characterization Report, Attachment 3.2A of the Instream Flow Technical Memorandum [3-2]), sediment supply, vertical and lateral stability were discussed for each reach. Sixty-eight of 94 evaluated reaches affected by one or both projects had a low sediment supply and little lateral or vertical instability, including the mainstems of the Middle and South Yuba rivers. These reaches are stable in their current form and location due to bedrock control of bed and banks, resistant parent material that is not easily eroded nor provides high quantities of sediment, and because of this they are considered transport reaches (i.e., steep channels, dominated by non-depositional processes). Twelve of the remaining reaches had a moderate sediment supply that was intermittent (i.e., short sections where banks are eroding occasionally, separated by long sections of banks that are not eroding), where some depositional characteristics occur.

Specific sediment inputs and/or stability issues have been identified in 15 project-affected stream reaches, described below. These sediment sources are from local bank failures and from upstream events such as spill channel erosion. For six of these 15 reaches, channel stability analysis was also done as part of the Proper Functioning Condition assessment that is documented in the Riparian Habitat Technical Memorandum (6-1). These six reaches are more fully described below for specific sediment sources that also had data collected that evaluated channel stability, and included: Jackson Meadows Dam Reach, Faucherie Lake Dam Reach, Bowman-Spaulding Diversion Dam Reach, Fordyce Lake Dam Reach, Bear River Reach #2 (Meadow Sub-Reach), and Dutch Flat Diversion Dam Reach. Bank channel stability was assessed in the context of the type of and location of erosion and deposition in the channel and within the riparian zone and the ability of the channel to withstand lateral or vertical movement.

Jackson Meadows Dam Reach

The Jackson Meadows Dam Reach is a 1.6-mi-long section of the Middle Yuba River that extends from Jackson Meadows Dam (El. 5,900 ft) to the Milton Diversion Dam Impoundment (El. 5,700 ft). The surrounding area is mostly riparian forest on low terraces, with significant sections of unvegetated rocky slopes. There is an extensive wetland at the inflow to Milton Diversion Dam Impoundment that captures sediment, and flow is distributed through numerous surface and sub-surface channels (i.e., about 3,600 ft of the 1.6 mi reach). Historic spillway erosion has resulted in cobble lag deposits, which affect about 1,800 ft of channel (i.e., 20 percent of the reach), and have created side channels through riparian forests. Also, a 285-ft long (3 percent of the reach), 10-ft high exposed bank (estimated 2,000 cu yds of mixed sand/gravel material delivered to channel) occurs along the lower section of the reach where bank erodibility hazard is greater. The channel has little potential for lateral and vertical adjustments (Pfankuch [1975] score: 55/good, bank erosion hazard is very low due to bedrock/boulder controls) in the sections of the stream that are steeper and confined. However, within the lower, unconfined section of channel within the cobble lag deposits and adjacent to the exposed bank, the channel is slightly entrenched, with potential for lateral and vertical adjustments (Pfankuch [1975] score: 107/poor). Banks on one side are stable where bank erosion hazard is very low to low where vegetated and part of the active floodplain. The non-stable banks are due to non-cohesive lag deposits forming one bank (bank erosion hazard moderate), and erosion along the base of the terrace (bank erosion hazard extreme).

Jackson Lake Dam Reach

Jackson Lake Dam Reach is a 3.0-mi-long section of Jackson Creek that extends from Jackson Lake Dam (El. 6,585 ft) to Bowman Lake (El. 5,580 ft). The surrounding area is mostly wooded hillslopes, with a meadow at the top of the reach near the outflow of Jackson Lake and a debris fan through the Jackson Creek Campground near the base of the reach. About 27 percent of the reach is considered “unstable”. The lower 0.8 mi of the reach flows through unconsolidated debris fan deposits, which were the result of a large rain-on-snow event in 1997 that affected Jackson Creek and a tributary, Prairie Creek, which were the source of the deposits. The deposits changed the course of Jackson Creek, which now flows through coarse boulder and finer, poorly sorted alluvial fan debris. The channel is exposed with little overhead cover or three-dimensional heterogeneity, and flow goes underground through coarse substrate during the low flow period. Banks are erodible, with little bank cohesiveness; 65 percent of the streambanks within this fan are actively eroding. Most of the sediment is trapped behind the Meadow Lake Road crossing that has two culverts to pass the water.

Faucherie Lake Dam Reach

Faucherie Lake Dam Reach is a 1.8-mi-long section of Canyon Creek that extends from Faucherie Dam (El. 6,132 ft) to Sawmill Dam (El. 5,863 ft). The surrounding area is mostly moderately-vegetated mature forest and shrubs on gentle slopes. This channel is slightly entrenched in more alluvial sections, and moderately entrenched within steeper sections that are bounded by more resistant and steeper banks. The channel in the lower gradient, alluvial section has potential for lateral and vertical adjustments (Pfankuch [1975] 97/poor; bank erodibility hazard moderate to high) and is wider than expected given the drainage area, so further riparian widening is possible. Near the dam, there is little potential for adjustments within the steeper sections bounded by more resistant bed and banks (Pfankuch [1975] 75/fair; bank erodibility hazard moderate to low). In the lower, more bedrock-controlled portion of the reach, the channel is moderately entrenched, with little potential for lateral and vertical adjustments (Pfankuch [1975] score: 69/fair) and bank erosion hazard is very low due to bedrock/boulder controls.

Uncontrolled spill from Faucherie Lake Dam occurred in 2,512 out of 3,584 days from December 1999 to 2008; the eight highest spill discharges ranged from an estimated 430 cfs to just over 1,000 cfs and averaged about 600 cfs. The spill flow is ungaged, so the volumes are estimated based on height above spill crest. The spill channel has been eroded to bedrock and little further erosion is expected, though there may be some gravel and sediment added from adjacent side slopes. Most of the erosion that occurred in the Faucherie Lake Dam spillway channel was during the 1997 rain-on-snow event in Canyon Creek. The eroded spill channel is about 1,300 ft long (14 percent of the 1.8 mi reach). The flow during the storm flowed through the riparian forest that is separated from the main channel, for about 350 ft. Sediments transported from the spill channel are mostly stored in the side-channel, but there are gravel deposits in the main channel that could have come from spill channel erosion. Erosion within the flood-flow channel within the riparian forest is restricted to the upper third of the side-channel; most of the material is re-deposited before the floodflow channel re-enters the main channel. Sediment from additional spill erosion would be transported to the junction with the main channel during the next spill event. There are also currently trout spawning-sized gravel accumulations in the main channel that is bypassed by the floodflow channel, so some finer grained materials are entering the mainstem though the drainage area above the study site is small. Further significant spill erosion is considered unlikely.

Bowman-Spaulding Diversion Dam Reach

Bowman-Spaulding Diversion Dam Reach is a 4.4-mi-long section of Canyon Creek that extends from the Bowman-Spaulding Diversion Dam (El. 5,160 ft) to Texas Creek (El. 4,640 ft). The upper half of the area is typified by exposed and thinly vegetated granite bedrock, while the lower half is more dense mature forest on steep side slopes. This channel is moderately entrenched, with banks and substrate somewhat deformable, leaving a dynamic plan and profile possible (Pfankuch [1975]: poor). However, the banks are fairly stable, composed of cobbles and reinforced with perennial riparian roots. The bank erodibility hazard is moderate to low, although there is some residual undermining of upper banks due to the large flood flows in 1997.

Spill flow due to an emergency release of 20,000 cfs from Bowman Reservoir in 1997 washed through the spill channel. Material was deposited above the junction with the main channel, and some material extends into the main channel at the USGS flow gaging station and directly influenced about 2,100 ft of channel (i.e., 9 percent of the reach). Most of the gravel and finer sediment has been transported from the reach, though there are some gravel and cobble bars that are remnant from that spill and other localized inputs.

A dump gate at the outlet of the 84” reinforced concrete pipe downstream of tunnel # 2 of the Bowman-Spaulding Conduit was used to release high flow between 1997 and 2000 and created a 1,300 ft long, 6 to 20 ft wide channel down a steep slope to Canyon Creek, resulting in up to an estimated 1,400 cu yd of material added to Canyon Creek above Texas Creek. There is some fine sediment stored in pools, with an average of 13 percent of the residual volume of the pool filled with fine sediment. Two to 15 percent of the limited supply of trout spawning gravels is less than 2 mm. While both fine and coarse sediment were likely delivered from hillslope erosion due to releases from the canals, most of the material appears to have been transported through the active channel and is not long-term resident. Limited gravel and cobble bars, and some pool-tailout gravels are all that remain in this transport-dominated reach.

Lower Rock Lake Dam Reach #1

Lower Rock Lake Dam Reach is a 3.6-mi-long section of Texas Creek between Lower Rock Lake Dam (El. 6,622 ft) and Lindsey Creek (El. 5,800 ft. The channel is shallow, and is mostly confined between moderate slopes composed of non-cohesive glacial and colluvial material. Most of the channel has storage of coarse boulder and smaller sized material in a dynamic, somewhat narrow riparian zone composed of mountain alder. Just below Bowman Road, there is a 310-ft long, 10-ft high exposed and eroding bank from a Bowman Road failure. The stream has widened and split, but vegetative recovery is narrowing the exposed channel. The toe of the slope is somewhat protected by boulders, and large woody debris with rootwads protect the slope and stores material. These eroding banks may be a source of spawning-sized gravels as even though this reach has a gradient of 5 percent, there are 65 ft^2 of spawning-sized gravel accumulations (many reaches in the area have none).

Clear Creek Diversion Dam Reach

This short reach (0.9 mi) extends from Bowman-Spaulding Conduit (El. 5,360 ft) to Fall Creek (El. 5,200 ft). The surrounding area is mostly gently sloping terraces with harvested and mature timber. Side slopes are moderate and covered with mature forest and shrubs. A dump gate releases water from the conduit into the creek. This practice has resulted in an eroded slope about 415 ft long and 10-20 ft wide. The slope supplies gravel, sand and finer material directly to Clear Creek. Other than this localized input, the stream is laterally and vertically stable with no streambank erosion.

Fall Creek Diversion Dam Reach

Fall Creek Diversion Dam Reach is a 2.0-mi-long section of Fall Creek that extends from the Bowman-Spaulding Conduit (El. 5,320 ft) to the South Yuba River (El. 3,200 ft). The surrounding area is mostly moderately dense mature forest on moderate to gentle slopes until the creek flows over thinly vegetated granite bedrock cliffs for the lower 1.2 miles. The channel below the Bowman-Spaulding Conduit has widened and coarsened for about 300 ft (i.e., 3 percent of the entire reach) due to emergency releases from Bowman-Spaulding Conduit during the 1997 flood. The main channel is composed of cobbles and boulders set within larger, immobile boulders. Willows have colonized the exposed margins and the vegetative recovery has begun to narrow the exposed area. Smaller releases occur at low flow periods to drain the Conduit of residual water during outages. Exposed banks (i.e., 600 ft of a 0.8 mi reach; 14 percent of the non-bedrock portion of the reach) and upstream sources supply trout spawning-sized gravels to the depositional part of the reach above the cliff section. The lower part of the reach is transport-dominated as it spills over bedrock cliffs and storage of gravels is limited.

Trap Creek Diversion Dam Reach

This is a 1.2-mi-long reach that extends from the Bowman-Spaulding Conduit (El. 5,360 ft) to Fall Creek (El. 3,600 ft). There is an 1,100 ft eroded section within the historical Trap Creek where emergency releases from the spill gate has created vertical, eroding banks due to undermining of the moderate slopes vegetated with mature forest and shrubs. The eroded section is within the upper 0.85 miles of the reach within glacial parent material and a 13 percent gradient; and the material appears to be stored within this section. The lower 0.35 mi flows over steep (i.e., 57 percent gradient) resistant granite bedrock, adjacent to thinly forested steep slopes. This lower section is transport-dominated and has low, local sediment supply.

Fuller Lake Dam Reach

Fuller Lake Dam Reach is a 1-mi-long unnamed drainage that extends from Fuller Lake (El. 5,320 ft) to Jordan Creek (El. 4,600 ft). The area is typified by fairly steep slopes with mature forest until the lower 0.2 mi, which is thinly vegetated, steep (over 30 percent) granite bedrock. This reach receives spills from Fuller Lake through an automatic siphon when the lake is too full or due to a plugged trash rack. There are about 1,000 ft of 2 to 6-ft high vertical exposed and eroding banks within 4,200 ft of stream (i.e., 12 percent of the reach) downstream of the lake before the stream flows over the resistant bedrock cliff to Jordan Creek. Though ungaged, Fuller Lake was very high during the 1997 flood event; incision is likely due to spill from the 1997 event. There is no sediment plume or fan at the junction with Jordan Creek, so it appears that sediment input is not significant enough to leave a trace in Jordan Creek and/or there is sufficient flow in Jordan Creek to transport the added sediment. Stream-side trees are being undermined and added to the active channel, and provide a source of large woody debris to Fuller Lake Dam Reach to store sediment and provide roughness to reduce erosive energy.

Jordan Creek Diversion Dam Reach

This reach is short (1.6 mi) and extends from the Jordan Creek Diversion Dam (El. 5,200 ft) to the South Yuba River (El. 4,480 ft). The reach consists of two sub-reaches: the upper sub-reach is a steep, transport section that flows through densely wooded mature forests on steep slopes, while the lower sub-reach is a wide, glacially-formed valley with a few hardwoods within the valley floor bounded by a thin mixed forest on adjacent steep valley slopes. The lower glacial valley has also been affected by large spills from Lake Spaulding Dam. The spills have scoured the glacial-valley for about 1 mi in which substrate is boulder sized, flow is subsurface, and alluvial processes are dominated by high-energy spill-flow. The largest four spill events were in 1986, 1996, 1997, and 2007; instantaneous peaks as measured at Langs Crossing, which measures input from spill events that travel through Jordan Creek and minimum flow releases from Lake Spaulding, ranged from 20,400 cfs to over 34,000 cfs. The active and above-ground portion of the channel in the lower one-third of the lower sub-reach is about 10 to 30 ft wide in a valley that is 140 to 235 ft wide. There are vertical eroding banks/valley walls for about 3,000 ft, though eroded material from this potential source of sediment is not evident in the channel.

Fordyce Lake Dam Reach

This is a 10.5-mi-long reach between Fordyce Dam (El. 6,400 ft) to Lake Spaulding (El. 5,040 ft). About 78 percent of the channel has about a 1.8 percent gradient, but there are short sections at and above 4 percent. The channel flows through thinly vegetated mature forest and shrubs on granite bedrock. The granitic bedrock is generally resistant to erosion but there are some sources of sand in the reach that have resulted in sandy deposits in the deeper sections of the channel. Most of the channel is entrenched within bedrock, and laterally and vertically stable due to boulder and bedrock control (Pfankuch [1975] score: fair to good, bank erodibility hazard is very low). There are short alluvial sections usually less than 0.2 mi long, where terraces and floodplains exist. These short alluvial sections are subject to erosion and incision, and there were 1,405 ft of one or both exposed banks along a 1,500-ft section of channel (about 50 percent of the alluvial section of channel) and where bank erodibility hazard is high to very high though channel stability is still fair (Pfankuch [1975] score: fair). Undermined, vertical banks in the short alluvial sections are beginning to lie back at a more natural angle of repose, and floodplains/point bars are forming within the previously incised channel. There are also remnant small, marginal sandy deposits within the more confined, bedrock-dominated sections that have been and continue to degrade. The reach is used as a conveyance, transporting flows of 300 to 500 cfs during the summer months, when historical unimpaired flows were at a minimum (e.g., 10 to 100 cfs). This sustained high flow during the summer months may have reduced the margin deposits because they occur during the growing season and are sustained the entire summer, and may have also created incision in the short alluvial sections.

Bear River Reach #1

Bear River Reach #1 extends 0.3 mi from Bear River at the point of inflow from Drum Canal (inflows measured at gage YB-137) (El. 4,800 ft) to the point of inflow from South Yuba Canal (inflows measured at gage YB-139) (El. 4,600 ft). Bear River Reach #1 is dominated by boulders and cobbles, and splits around a vegetated island above the Bowman-Spaulding Road bridge. Right at the bridge, the channel flows over bedrock, then through a vertically and laterally stable, planear, cobble/gravel channel for a short distance to the junction with the South Yuba inflow. Flows into Bear River Reach #1 over the last 10 years have generally been below 400 cfs, although in 2006 there were sustained flows above 400 cfs.

Bear River Reach #2

Bear River Reach #2 extends 7.6 mi from Bear River at the point of inflow from South Yuba Canal (inflows measured at gage YB-139) (El. 4,600 ft) to Drum Afterbay (El. 3,400 ft.). This reach consists of two sub-reaches: the upper Meadow Sub-Reach is 2.3 miles long and extends from 4,600 to 4,480 ft elevation; the lower Boardman Sub-Reach is 5.3 miles long and extends from 4,480 ft to 3,400 ft elevation. The Meadow Sub-Reach flows through a large meadow dominated by grasses and sedges with extensive willow and shrubs growing on the channel margin. The lower Boardman Sub-Reach flows through a mature forest and shrub community, and includes the Zeibright Mine in the middle of the reach and the Pittman Spill in the lower part of the reach.

Peak flows that have moved through this reach are the result of major storm events and the periodic release of water from the projects.[1] Effects of releases may have caused or exasperated channel incision and bank failures in the Meadow Sub-Reach above and below Highway 20. Observed regulated flows and synthesized unimpaired flows indicate that releases through this reach have occasionally exceeded estimated unimpaired values. Peak regulated flows for the past 30 years of record were often lower than unimpaired high flows, but peak releases in excess of 100 cfs occurred with greater frequency. Under unimpaired conditions, there would generally be little flow through this reach during the months of May through October, with periodic high flow events in November through April that rarely exceed 300 cfs, except in storm events. Under regulated conditions, there is a sustained 5 cfs minimum flow throughout the year (measured at YB-198), with frequent high winter and early spring flow events that generally do not exceed 400 cfs. Between 1993 and 1997 peak flows were higher, more frequent, and sustained longer than unimpaired conditions, with six high flow events that ranged from just over 300 cfs to nearly 580 cfs. The higher sustained flows in 1997 were primarily due to the New Year's Day flood event, which sent a large pulse of sediment into Drum Afterbay and incapacitated the hydroelectric powerhouses. The powerhouses were placed on an extended outage due to the sedimentation, and water diverted from NID's and PG&E's projects' facilities in the Middle and South Yuba rivers was subsequently moved through the Bear Valley and directly into Drum Afterbay as a result (typically, these flows would be moved into the Bear River watershed via the Drum Canal).

In the Meadow Sub-Reach, while there is evidence of active erosion in some locations (about 345 ft), most of the banks are in the process of recovery from the effects of grazing and high flows. The riparian system is considered "Functional - At Risk with an upward trend" (Riparian Habitat Technical Memorandum [6-1]). The characteristics of the Meadow Sub-Reach differ slightly based on location, as described below.

In the Upper Meadow (top of reach to about HWY 20), the channel is slightly entrenched where intermittent floodplains exist, with potential for lateral adjustments through fine grained, though cohesive, sediment. Bank erosion hazard is high due to vertical, occasionally undermined banks in several locations where there is vegetative or root protection. The adjacent steep meadow

[1] With regard to Bear River Reaches #1 and #2, PG&E does not divert water from these reaches, and, aside from a stream gage, PG&E does not have any Project facilities in these reaches. PG&E believes that in the Proposed Projects, Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches with NID because water from both projects is anticipated to be periodically moved through the reaches as is currently the case. NID disagrees with PG&E for three reasons. First, NID's Yuba-Bear Hydroelectric Project has no facilities in this section of the Bear River. Second, under historic as well as current conditions, PG&E at its sole discretion and without request by NID, releases water from Drum Canal into the Bear River at RM 35.3. Third, at this time, NID has made no decision regarding whether releases from the Drum Canal into the Bear River at RM 35.3 might be beneficial to NID in the future, and has not requested that PG&E include such releases in PG&E's application for a new Drum-Spaulding Project license.

slopes are significantly higher than the stream channel and appear to be supported by groundwater sources and not through hydraulic connection or overbank deposits from the river.

In the Middle Meadow, Highway 20 and the Lower Meadow, there are indicators of incision (e.g., exposed tree roots and vertical banks) and about 10 percent of the reach has recent erosion, such as block failures and slumping. In the Middle Meadow, the channel is entrenched, with little potential for lateral adjustments because banks are composed of a cobble-boulder berm/banks on one side and terrace slope with strong vegetative control on the other and bank erodibility hazard is low. Vertical stability is controlled by immobile substrate. There is boulder and imbricated cobble material that limit any further vertical incision (Pfankuch [1975] score: 62/good).

In the Lower Meadow (last half mile of the sub-reach), the channel is slightly entrenched, with potential for lateral adjustment through natural meandering. Since livestock have been removed from the area, willows and other woody species have increased dramatically, as seen on historical aerial photos. Woody riparian vegetation has served to stabilize affected stream banks. Lateral movement of the stream through the meadow is limited by the incised nature of the channel and continuing growth of willows and sedges. Banks are becoming more vegetated, and the toes of the banks are often protected by vegetation or an incipient, inset floodplain. The outside of bends have experienced some bank failures, which is expected in a meandering stream, and the inside of the bends are often well-vegetated and have a resistant riparian zone with sedges, willows, and an active floodplain. There are aquatic plants, such as aquatic buttercup (*Ranunculus aquatilis*) that are growing thickly on low gradient riffles, which have affected the mobility and size distribution of the gravels on the riffles.

In the Boardman Sub-Reach, the channel is mostly transport-dominated and there is little erosion (57 ft within 1.3 miles of mapped channel: 1 percent). The reach is mostly laterally and vertically stable. An exception to this stability is the section between the Pittman Spill at RM 28.8 and just above the Drum Powerhouse at RM 27.6, which was widened and disturbed due to the flood effects of the Pittman Spill. The initial Pittman Spill occurred in 1986 when the Drum Siphon failed and 550,000 yd^3 was added to Bear River. A debris torrent of sediment and water widened the active channel considerably for about 1.2 miles. Restoration activities and monitoring have been done at the failure site since 1986. The channel is dominated by lateral and vertical bedrock controls except for the last 0.2 miles above the Drum Afterbay. Channel mobility analysis estimates that particles up to 285 mm are mobile at 455 cfs (2 yr and 2.7 yr, regulated and unimpaired return interval, respectively) in at least a portion of the channel. Reach-averaged D_{50} is 161 mm and median regulated flow is 407 cfs. This shows that particles greater than the median particle sizes are mobile and the channel bed will continue to coarsen and that transport capability likely exceeds sediment supply.

Dutch Flat Afterbay Dam Reach

The Dutch Flat Afterbay Dam Reach is the 5.4-mi-long section of the Bear River that extends from Dutch Flat Afterbay (El. 2,560 ft) to Chicago Park Powerhouse (El. 2,240 ft). The channel flows through and within multiple terraces that are composed of hydraulic mining detritus.

Terraces are thinly vegetated with some small conifers and low density of shrubs and herbs. Hillslopes are steep and densely vegetated with mature trees and shrubs. There are some willows and alders becoming established along the channel margin, but these are often undermined by continuous erosion (bank erodibility hazard – high to extreme). Streambanks are erodible and droughty due to the character of the mining sediment (coarse cobble to sand-sized material with few organics) that composes bed, banks, and terraces. Riparian growth and sediment deposition in the channel margin are poorly developed along many of the non-cohesive banks. There is some inset, incipient floodplain development along portions of the channel where bank erodibility hazard is very low. Overall, the channel is moderately entrenched, with potential for lateral and vertical adjustments (Pfankuch [1975] score: 111/poor). Boulders and bedrock knobs create pools and increase depth and channel heterogeneity, though these elements are rare. Particles of 70 mm (larger than trout spawning gravel) are estimated to be mobile at 128 cfs (1.8 yr return interval regulated, 1.2 yr return interval unimpaired), so it is likely that spawning-sized gravels are transported readily. There were few patches of trout-spawning gravels in the reach.

Chicago Park Powerhouse Reach

The Chicago Park Powerhouse Reach is the 1.5-mi-long section of the Bear River that extends from Chicago Park Powerhouse (El. 2,240 ft) to Rollins Reservoir (normal maximum water surface elevation of 2,171 ft). The braided reach consists of numerous shifting channels over a broad floodplain. There are willows and alders along the channel margin, but they are young and poorly resistant to flow stresses; a thinly-vegetated shrub and herb layer is the dominant cover on the floodplain. Hillslopes are steep with moderately dense trees and shrubs. Streambanks are erodible and droughty from high amounts of mining sediment that compose bed, banks, and terraces. About 2,200 ft of one or both banks of a 0.52 mi stretch was actively eroding (40 percent erosion). Riparian growth and sediment deposition in the channel margin are not promoted along many of the non-cohesive banks, but there is some incipient and inset floodplain development along portions of the channel. Boulders and bedrock knobs will create pools and increase depth and channel heterogeneity, though these elements are rare and channel is mostly shallow and dominated by low-gradient riffles and glides.

6.1.1.5.5 Large Woody Debris

As part of the Habitat Mapping and Channel Characterization work (Attachment 3.2A of the Instream Flow Technical Memorandum [3-2]), Licensees recorded large woody debris (LWD) within length and diameter categories and documented the amount of wood removed from the larger reservoirs. All pieces of wood (dead or dying) lying within the bankfull width of the channel were counted if they measured one-half bankfull width or longer. Only wood both downed and with a portion lying within the bankfull channel was recorded. Individual pieces were separated into size classes based on diameter and total length. The diameter size classes were: 6 to 12 inches, 12 to 24 inches, 24 to 36 inches, and greater than 36 inches. The length size classes were: 3 to 10 ft, 10 to 25 ft, 25 to 50 ft, 50 to 75 ft, and greater than 75 ft. The number of pieces of LWD found within the wetted channel width (wetted during the assessment) was a separate category, essentially a sub-set of the total number of pieces found within the bankfull width.

The steep and confined channel network in project-affected reaches offers limited opportunity for LWD debris retention and long-term sediment storage within the bankfull channel perimeter. Ruediger and Ward (1996) found mean LWD piece frequency ranged from 9.5 to 24.6 pieces/100 meters (153-396/mile) in 17 streams in the Sierra Nevada, whereas 48 project-affected streams in which LWD was counted had a range of 0-307 pieces/mile (based on pieces counted within the bankfull channel of ground-mapped sections; Table 6.1-10). Only four of the streams had values within the range found by Ruediger and Ward (median value was 27 pieces/mile). Although Ruediger and Ward used a different minimum length (greater than one meter) than that used during the habitat mapping and channel condition assessment (scaled to channel size at 0.5 bankfull width), the range is within that found by Ruediger and Ward and the comparison appears to be valid. Based on the estimated volume of wood removed from project reservoirs where records of debris removed are kept, the range was 0.0002 to 0.03 cubic meters/hectare. This volume is based on truckloads removed and drainage area above the reservoir (Table 6.1-11). Mean volume of LWD in the Ruediger and Ward (1996) streams ranged from 36 to 320 cubic meters/hectare. Therefore, it appears the project-affected reaches have much less volume of LWD in the channels than was found in other parts of the Sierra Nevada, and significant amounts of debris are not being stored in the reservoirs. There may be more wood sinking or stored in locations other than the channel (e.g., above mean high water line in the reservoirs), so the volume collected from the reservoirs may be a conservative estimate. The exception to low amounts of large woody debris transported to reservoirs was in the Bear River during the 1986 and 1997 floods when the Drum Afterbay was filled with trees. The amount was not quantified, but existing in-channel wood in the reach above Drum Afterbay (Bear River Reach #2) is estimated to be 24 pieces/mile; this amount was likely greater prior to the storm events. None of the other Bear River reaches or diversions has significant amounts of wood so there may have been more stream-side trees that were undermined and transported in this reach compared to the other reaches.

Table 6.1-10. Summary of large woody debris counted by Licensees during habitat mapping assessment in 2008 and 2009 in sections of project-affected reaches.

Basin	Stream	Reach Name	LWD/mile
YUBA-BEAR HYDROELECTRIC PROJECT			
Middle Yuba	Middle Yuba River	Jackson Meadows Dam Reach	52
		Milton Diversion Dam Reach	25
	Jackson Creek	Jackson Lake Dam Reach	19
	Canyon Creek	French Lake Dam Reach	20
		Faucherie Lake Dam Reach	22
		Sawmill Lake Dam Reach	13
		Bowman-Spaulding Diversion Dam Reach	1
Fall Creek	Clear Creek	Clear Creek Diversion Dam Reach	18
	Trap Creek	Trap Creek Diversion Dam Reach	107
Bear River	Bear River	Dutch Flat Afterbay Dam Reach	12
		Chicago Park Powerhouse Reach	1

Table 6.1-10. (continued)

Basin	Stream	Reach Name	LWD/mile
DRUM-SPAULDING HYDROELECTRIC PROJECT			
Deer Creek	South Fork Deer Creek	Deer Creek Powerhouse Reach	0
Canyon Creek	Texas Creek	Upper Rock Lake Dam Reach	41
		Lower Rock Lake Dam Reach #1	10
		Lower Rock Lake Dam Reach #2	0
	Unnamed Tributary	Culbertson Lake Dam Reach	85
	Lindsey Creek	Middle Lindsey Lake Dam Reach	41
		Lower Lindsey Lake) Dam Reach	29
Fall Creek	Lake Creek	Feeley Lake Dam Reach	99
		Carr Lake Dam Reach #1	307
		Carr Lake Dam Reach #2	3
Rucker Creek	Rucker Creek	Blue Lake Dam Reach	234
		Rucker Lake Dam Reach	76
South Yuba River	Unnamed Tributary	Meadow Lake Dam Reach	12
	White Rock Creek	White Rock Lake Dam Reach #1	138
	Bloody Creek	Lake Sterling Dam Reach	44
	Fordyce Creek	Fordyce Lake Dam Reach	14
	Tributary to South Yuba River	Kidd Lake Dam Reach	19
	Cascade Creek	Lower Peak Lake Dam Reach	172
	South Yuba River	Upper South Yuba Reach #1	31
		Upper South Yuba Reach #2	8
		South Yuba below Spaulding #2 Powerhouse Reach	156
Bear River	Bear River	Bear River Reach #1[1]	91
		Bear River Reach #2[1]	24
	Little Bear River	Alta Powerhouse Reach	89
NF American River	NF of NF American River	Lake Valley Reservoir Dam Reach	90
		Lake Valley Canal Diversion Dam Reach	41
	Sixmile Creek	Kelly Lake Dam Reach	61
	Canyon Creek	Towle Canal Diversion Dam Reach	23
Morman Ravine	Morman Ravine	Mormon Ravine Reach	16
Coon Creek	Rock Creek	Rock Creek Dam Reach	7
	Dry Creek	Halsey Afterbay Dam Reach	9
YUBA-BEAR AND DRUM-SPAULDING HYDROELECTRIC PROJECTS			
Canyon Creek	Canyon Creek	Canyon Creek below Texas Creek Confluence Reach	0
Rucker Creek	Rucker Creek	Rucker Creek Diversion Dam Reach	14
South Yuba River	Unnamed Tributary	Fuller Lake Dam Reach	50
	Jordan Creek	Jordan Creek Diversion Reach	142
	South Yuba River	South Yuba (Reaches 1-6)	6
Bear River	Bear River	Drum Afterbay Dam Reach	29
		Bear River Canal Diversion Dam Reach	0

[1] As noted in footnote number 1 to Bear River Reach #2 in Section 6.1.1.5.4 above, PG&E believes that Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches. NID disagrees with PG&E.

Table 6.1-11. Yuba-Bear Hydroelectric Project reservoir large woody debris management

NID Reservoir	LWD Removed	When	How	Quantity	Log Boom	Comments
Jackson Meadows	Yes	Fall	LWD remaining in the approach to the spillway is bucked, piled and burned in place. LWD on the dam face is removed and taken to a burn pile in the borrow area at the right of the dam and burned.	6 to 8 truck loads per year. (Truck load = 10 yard dump truck) Estimated 0.006 m^3/ha/yr	Yes - in place year round	Most LWD gets stopped by the log booms.
Milton Diversion Impoundment	Yes	Fall	If Milton spills, LWD is allowed to go over the spill. When Milton stops spilling and NID crews can access Milton after snowmelt, any LWD caught on the dam is cut up using a power saw. LWD prevented from going to the Milton Bowman Intake by a log boom is removed and taken to the Jackson Meadows burn pile in the borrow area at the right of the dam and burned.	Maybe 1 truck load if there is a major spill event. Otherwise 1 load every 3-4 years. Estimated 0.0002 m^3/ha/yr	Yes - removed in the late Fall and replaced in Spring after snowmelt.	
French Lake	Yes	Fall	LWD is allowed to go over the spillway during spill events. When a NID crew can access the lake and if LWD is blocking the spillway, the crew bucks the LWD and piles it in the spill channel below the spillway. The piles are burned in the fall when conditions permit.	1 truck load every year Estimated 0.0007 m^3/ha/yr	Yes - removed in the late Fall and replaced in Spring after snowmelt.	
Faucherie Lake	Yes	Fall	In the fall when the lake is drafted down and if there is LWD on the spillway, it is removed, bucked, piled and burned when conditions permit.	1-4 pieces of LWD annually Estimated trace m^3/ha/yr	Yes - removed in the Fall and replaced in Spring after snowmelt.	
Sawmill Lake	Yes	Fall	In the fall when the lake is drafted down and if there is LWD on the spillway, it is removed, bucked, piled and burned when conditions permit.	1 truck load every year Estimated 0.0002 m^3/ha/yr	Yes - removed in the late Fall and replaced in Spring after snowmelt.	
Bowman Lake	No				Yes - in place year round	There is very little LWD to deal with at Bowman. Both dams are concrete faced so LWD doesn't attach itself to the dam. Bowman spills infrequently so LWD has a very small chance of getting caught in the spillway.
Dutch Flat Afterbay	Yes	Year 'round	Most LWD is caught on the CP Flume Intake trash rack. This debris is removed and trucked to a burn pile located near the Dutch Flat #1 PH road. During spill events caused by excess runoff, debris is encouraged to go over the spillway to the Bear River.	Approximately 10 truck loads per year. Estimated 0.03 m^3/ha/yr	Yes - one in front of the trash rack year round. One in the approach to the spillway removed in late Fall and replaced in the late Spring.	Approximately 50% of the debris removed here could be classified as less than LWD (leaves, pine needles, etc.).

Table 6.1-11. (continued)

NID Reservoir	LWD Removed	When	How	Quantity	Log Boom	Comments
Rollins Reservoir	Yes	Fall	LWD remaining in the approach to the spillway is bucked, piled and burned in place. LWD on the dam face is removed and taken to a burn pile in the spillway approach and burned.	Approximately 10 truck loads per year. Estimated 0.0036 m^3/ha/yr	Yes - in place year round	
Lake Spaulding	Yes	Debris is removed when it becomes a public safety issue, or immediately if large diameter debris appears.	Debris combined in floating rafts when lake is at maximum storage elevation. Moved above high water mark and burned in fall.	Moderate quantities of small woody debris present along the shoreline, although some larger material is also present. Estimated trace m^3/ha/yr.	Yes – installed year round in front of the spill gates at Dam #2.	Majority is small (e.g., <6 inches in diameter).
Fordyce Lake	Yes		Debris is passed through spillway and skimmer gate when lake levels allow. Large diameter debris is isolated and tied off for removal later in the year.	Medium amount of small woody debris present along shoreline. Estimated trace m^3/ha/yr.	Yes – installed year round in front of the spill structure.	
Drum Afterbay	Yes		Material is passed through afterbay by lowering skimmer gate in center of dam.	Small amount of small woody debris present each year during high flows. Estimated trace m^3/ha/yr; flood event not quantified.	Yes – installed year round in front of the spill gates.	Exception years occurred during 1986 and 1997 floods, when Afterbay was completely filled with trees.
Lake Valley Reservoir	Yes	Every 5 years.	Debris is collected and burned.	Medium amounts of small woody debris present along the shoreline. Estimated trace m^3/ha/yr.	Yes – installed year round in front of the spill gates.	Debris stays somewhat dispersed

6.1.2 Environmental Effects

6.1.2.1 Yuba-Bear Hydroelectric Project

This section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3), on geology and soils. The section is divided into the following areas: 1) effects due to new ground disturbing activities; 2) effects on upland erosion and sources of sediment; 3) effects of shoreline erosion and sediment deposition in Project reservoirs; 4) effects of the Project on channel stability; 5) effects on sediment transport; and 6) effects on large woody debris.

6.1.2.1.1 Effects due to New Ground Disturbing Activities

If NID were to propose ground disturbing activities not currently addressed in the FLA, these activities could affect erosion and sediment in surface waters, which in turn could affect water quality and aquatic resources. NID's proposed Project includes two measures to address such instances.

The first measure, Annual Consultation, would: 1) assure that NID's planned activities are efficiently coordinated to the extent possible with the Forest Service and BLM activities; 2) make the Forest Service, BLM and other agencies aware of NID's planned O&M activities; and 3) make NID aware of all pertinent Forest Service and BLM orders, rules and policies that might affect NID's planned activities. NID would meet with the Forest Service, BLM, potentially affected tribes, and other agencies in the first quarter of each year to discuss NID's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate since NID normally develops an annual maintenance plan early in each calendar year. NID would file documentation of the meeting with FERC, including recommendations by the Forest Service and BLM, if requested by FERC. The measure does not imply that NID may not proceed with planned Project O&M activities until NID has reviewed the planned O&M activity with the Forest Service and BLM, or relieve NID from obtaining all necessary approvals and permits for the planned maintenance work. Implementation of the measure would provide early notice to agencies regarding any planned ground disturbing activities.

The next measure pertains to new ground disturbing activities. If during the term of the new license, NID proposes ground disturbing activities not addressed by the relicensing NEPA process; such activities have the potential to adversely affect special-status species and other resources. This measure would assure that reasonable PM&E measures are developed to address the potential effects of the new ground disturbing activities. Specifically, prior to performing the new ground disturbing activity, NID would consult with the Forest Service or BLM, as appropriate, and other appropriate agencies to: 1) discuss potential effects; 2) determine if additional information is needed to assess effects; 3) gather additional information, if needed; and 4) upon Forest Service's receipt or BLM's request, as appropriate, enter into an agreement to fund a reasonable portion of Forest Service's staff or BLM's staff, as appropriate, to perform staff activities related to the proposed ground disturbing activity. This measure provides for the timely review of new ground disturbing activities.

6.1.2.1.2 Effects of Upland Erosion and Sources of Sediment

The only known source of sediment from upland areas near the Projects is Project roads, some of which include facilities in poor condition. Implementation of the Transportation Plan, part of NID's proposed Project, will have a beneficial effect. Under the plan, NID, or the Forest Service or BLM in some cases, would maintain Primary Project Roads and Trails in proper functioning condition, which would result in an overall reduction in erosion and sedimentation.

Construction of the Rollins Upgrade and recreation facilities, as proposed by NID, has the potential to increase erosion and sedimentation during construction and after construction if the affected slopes are not properly stabilized. NID has included in its proposed Project a measure that would require NID prepare and file with FERC 1) a Rollins Upgrade construction erosion control and stabilization plan; and 2) a recreation facilities construction erosion control and stabilization plan. The measure would require NID to provide a draft of each plan to the appropriate agencies for a 30-day review period, and file the plan with evidence of consultation with FERC at least 90-days in advance of initiating construction. Each plan would address the implementation of Best Management Practices (BMP) during construction to control erosion and stabilize areas that may be disturbed during construction. Implementation of this measure is expected to reduce construction impacts due to erosion to less than significant because any effects would be short-term, of minor magnitude, and limited to the site.

6.1.2.1.3 Effects of Shoreline Erosion and Sediment Deposition in Project Reservoirs

The amount of deposition in Project reservoirs since the Yuba-Bear Hydroelectric Project began is low, reservoir shoreline erosion is minor, and there is not an apparent need for infusion of sediment downstream of Project facilities. NID does not propose to remove sediment from Project reservoirs as part of its proposed Project, or propose any activities that are likely to increase shoreline erosion or deposition of sediment in Project reservoirs. Minor shoreline erosion, which is typical for reservoirs in the Sierra Nevada, and some deposition of sediment in Project reservoir are expected to continue with the proposed Project, but these effects are considered less than significant. Effects are less than significant because impacts are of minor magnitude and limited to localized areas.

6.1.2.1.4 Effects on Channel Stability

Sources of sediment that may lead to channel instability, resulting from excessive soil erosion and slope failures are limited to short sections of stream. In some cases, the affected areas are associated with historic operations of Project dam spillways or canal overflow areas (i.e., use of canal dump gates). However, the majority of stream reaches affected by the Project are stable transport reaches where the capacity of the channel to move sediment is much greater than the amount of sediment entering the channel. NID does not propose any changes to the Project or its operations that would have a significant effect on channel stability or the nature of the transport reaches. Effects of continued slope failures and bank erosion associated with spillways or canal overflow that are not covered below are of short duration, limited in magnitude and limited to localized areas.

NID has identified nine locations associated with Project facilities that currently show some evidence of bank or channel instability (e.g., excessive erosion or bank failure). In some areas, spills in very high water years have added sediment to the stream and led to some stream movement into the riparian zone. However, spills are a necessary mechanism when reservoirs or canals are too full (e.g., during storm events when all streams have large discharges) and much of the effects have already occurred; the spill channels are scoured to bedrock and the effects are not longitudinally extensive (e.g., the spill channel erosion and deposition affects only a small portion of the stream network). Table 6.1-12 provides a brief summary of the areas with evidence of bank or channel instability and an assessment of Project effects.

Table 6.1-12. Channel instability areas associated with the Yuba-Bear Hydroelectric Project.

River/Stream	Reach and Length of Reach	Description of Possible Problem Area	Project Effects	Proposed for Stabilization
Middle Yuba River	Jackson Meadows Dam Reach (1.6 mi)	Spillway erosion has created cobble lag deposits that have created side channels. There is potential for lateral and vertical shifting by the channel as indicated by a poor channel stability rating. Bank erosion hazard is extreme where a 285 ft long, 10 ft high bank is actively eroding in the lower section of reach. It is unclear whether the Project is causing the bank erosion; it may be a combination of natural bank erosion on the outside of a bend, changing grade level due to the downstream base level control from Milton Diversion Dam Impoundment, and cobble lag deposits forcing the channel in new directions than would have occurred naturally.	Beneficial effect. Little additional spillway erosion is expected to occur, and the side channels and exposed bank are sources of gravel for relatively short reach of state-designated Wild Trout Stream. Excessive deposition from erosion does not seem to be a problem since NID has not needed to remove sediment from Milton Diversion Dam in over 45 years of operations.	None
Jackson Creek	Jackson Lake Reach (3.0)	A 1997 flood deposited coarse boulder and finer, poorly sorted alluvial fan debris in the channel. The channel is exposed with little overhead cover or three-dimensional heterogeneity, and flow goes underground through coarse substrate during the low flow period. Banks are erodible, with little bank cohesiveness; 65 percent of the stream length is actively eroding. Most of the sediment is trapped behind a non-Project road crossing that has two culverts to pass the water.	No effect. Debris fan is not a result of Project operations.	None
Canyon Creek	Faucherie Lake Dam Reach (1.8 mi)	Faucherie Lake spillway erosion has created 1,300' of eroded spillway and spill flows into riparian forest and a poor channel stability rating indicates that lateral and vertical movement are possible. There are intermittent locations where banks have high to moderate erodibility though extent of erosion is limited by vegetation, bedrock, and cohesive soils.	Less-than-significant effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Little additional spillway erosion is expected to occur, there is only a small portion of the reach affected, and the spill channels may be a source of spawning-sized gravel.	None

Table 6.1-12. (continued)

River/Stream	Reach and Length of Reach	Description of Possible Problem Area	Project Effects	Proposed for Stabilization
Canyon Creek (continued)	Bowman-Spaulding Diversion Dam Reach (4.4 mi)	Bowman Lake spill channel erosion and deposition and dump gate spill channel erosion, poor channel stability in fresh deposits or where some shifting occurred during the 1997 flood event.	No effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Little additional spillway erosion is expected to occur. NID no longer uses and does not propose to use the dump gate, so the eroded dump gate spillway does not receive high flows that would result in further instability.	None
Fall Creek	Fall Creek Diversion Dam Reach (2.0 mi) Shared	Emergency releases from Bowman-Spaulding Conduit have created a widened channel with eroding banks for 300 ft of its length.	Less than significant effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Only a small portion of channel is affected and gravel material is provided to a channel that has limited amounts of gravel-sized material.	None
Clear Creek	Clear Creek Diversion Dam Reach (0.9 mi)	Releases from the Bowman-Spaulding Conduit through a low-level release value has created the "Christmas Tree Spill", which has led to active erosion and sediment delivered directly to Clear Creek.	Significant effect from Christmas Tree Spill hillslope erosion.	Initiate stabilization plan..
Trap Creek	Trap Creek Diversion Dam Reach (1.2 mi)	About 1,100 ft of erosion where emergency releases from the spill gate have widened and created vertical, eroding banks, undermining the moderate slopes vegetated with mature forest and shrubs.	Significant effect from emergency release from Bowman-Spaulding Conduit.	Initiate stabilization plan.
Bear River	Dutch Flat Afterbay Dam Reach (5.4 mi)	Streambanks are erodible and droughty due to the character of the high amounts of mining sediment (coarse cobble to sand-sized material with few organics) that compose bed, banks, and terraces. Riparian growth and sediment deposition in the channel margin are not promoted due to peaking and non-cohesive soils Bank Erodibility Hazard is high to extreme, and Channel Stability Rating is poor in numerous locations, which reflects lateral and vertical instability.	Some affect due to the Project because reach experiences uncontrolled due to small reservoir capacity and emergency spills due to Chicago Park Powerhouse emergency shutdown; majority of effect is due to mining-derived sediments.	None.
	Chicago Park Powerhouse Reach (1.5 mi)	Channel is a braided channel with numerous shifting channels over a broad floodplain. There are willows and alders along the channel margin, but they are young and poorly resistant to flow stresses. Streambanks are erodible and droughty from high amounts of mining sediment that compose bed, banks, and terraces. About 2,201 ft is actively eroding in o.52 mi of assessed channel (amount along entire reach may be greater).	Less than significant effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Effects due to Project operations are non-significant; majority of effect is due to mining-derived sediments and extent of effect is less than 1.3 mi of riverine channel that is used for peaking flows.	None.

Implementation of NID's Clear and Trap Creeks Channel Stability Plan, part of the proposed Project, would have a beneficial effect because two locations identified as current problem areas - in Clear and Trap creeks below the Bowman-Spaulding Conduit - would be stabilized.

6.1.2.1.5 Effects on Sediment Transport

There are no extensive sediment accumulations, and substrate is fairly coarse in the Project-affected reaches that were evaluated for sediment mobility. Particles up to 80 mm were mobile with flows of over 3,000 cfs (which have a probability of occurring every 13 years under regulated conditions). Discharges as low as 128 cfs move particles up to 70 mm in some reaches. The flows as low as 12 cfs could move trout spawning gravels (range was 12 to 255 cfs). If sediment supply exceeded transport capability, the bed substrate would be much finer, there would be "sand tails" downstream of boulders or velocity shadows, and pools would be accumulating sediment. None of these indices were evident. In addition, the frequency of flows that mobilize the finer particles (D_{16} of the substrate and D_{50} of spawning gravels) is high, and resultant bed is coarse.

Gravel-size particles up to 64 mm are mobile on 21 of the 30 transects that were analyzed in reaches affected by the Yuba-Bear Hydroelectric Project and by both projects. Flows as low as 471 cfs (Faucherie Lake Dam Reach) and as high as 15,546 cfs (South Yuba Reach #4 Canyon Creek Confluence Reach) initiated motion. On two transects, mobile gravels were limited to 8 mm; these locations were also where gravel-sized material was present (Jackson Meadows Dam Reach Transect 1, and Bear River Canal Diversion Dam Reach Transect 3). The frequency of mobility has decreased under regulated conditions at all transects. The decrease in gravel mobility is a positive effect in streams where gravel-sized material is in low supply, which is the case in most reaches affected by the projects.

6.1.2.1.6 Effects on Large Woody Debris

Large woody debris is uncommon in the Project-affected stream channels and reservoirs. The streams flow through mature forests yet there is very little storage of large woody debris in the channels. The numbers found in streams affected by the Yuba-Bear Project are lower than that found in other Sierra Nevada streams, with the possible exception of Trap Creek and Jordan Creek that is just under the minimum value found by Ruediger and Ward (1996). Also, judging from the amount of wood pulled from the reservoirs, wood is not being transported to the reservoirs. The data show that there are generally low quantities of wood in the streams surveyed and the reservoirs so the Project does not appear to be currently affecting LWD availability. Additionally, LWD, when available, plays a minor role in the geomorphology of Sierra Streams (Ruediger and Ward 1996). No action is proposed by NID.

6.1.2.2 Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on geology and soils. In some instances, it is concluded that the existing project does not adversely affect a geology and soils resource, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific geology and soils resource, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed three PM&E measures that are relevant to this resource area, which are listed in Section 6.1.3.2.1 below. The complete text of the measure and the accompanying rationale is presented in Appendix E7 of this FLA.

6.1.2.2.1 Effects on Upland Erosion and Sources of Sediment

The only known source of Project-related sediment from upland areas of the Drum-Spaulding Project is Project roads. Some of the existing roads used to access the Project facilities for O&M are on NFS land and land administered by BLM and BOR, and a few of these were rated as in poor condition during PG&E's Roads and Trails Study (Table 6.7.12-30). PG&E's Proposed Project includes a Transportation Management Plan for Primary Project Roads related to maintenance of Primary Project Roads. Implementation of the Transportation Management Plan for Primary Project Roads will, among other things, enable Primary Project Roads to be maintained and rehabilitated to improve access and resource protection.

6.1.2.2.2 Effects of Shoreline Erosion and Sediment Deposition in Project Reservoirs

The amount of deposition in Project reservoirs since the Project began is low and reservoir shoreline erosion is minor. PG&E does not propose to remove sediment from Project reservoirs as part of its Proposed Project, or propose any activities that are likely to increase shoreline erosion or deposition of sediment in Project reservoirs. Minor shoreline erosion, which is typical for reservoirs in the Sierra Nevada, and some deposition of sediment in Project reservoir are expected to continue with the Proposed Project, but these effects are considered less than significant. Unavoidable adverse impacts of shoreline erosion in reservoirs are minor in magnitude and limited in extent to localized, site-specific locations though will be expected through the life of the Project.

6.1.2.2.3 Effects on Channel Stability

Sources of sediment that may lead to channel instability, resulting from excessive soil erosion and slope failures are limited to short sections of stream. In some cases, the affected areas are associated with historic operations of Project dam spillways or canal overflow areas. Unavoidable adverse impacts of continued slope failures and bank erosion associated with bank erosion, spillways, or canal overflow that are not covered below are of short duration, localized in extent, and minor in magnitude.

PG&E has identified seven locations associated with Project facilities that currently show some evidence of bank or channel instability (e.g., excessive erosion or bank failure). In some areas, spills in very high water years have added sediment to the stream and led to some stream movement into the riparian zone. However, spills are a necessary mechanism when reservoirs or canals are too full (e.g., during storm events when all streams have large discharges) and much of the effects have already occurred; the spill channels are scoured to bedrock and the effects are not longitudinally extensive (i.e., the spill channel erosion and deposition affects only a small portion of the stream network). Table 6.1-13 provides a brief summary of the bank or channel areas with evidence of instability and an assessment of Project effects.

Table 6.1-13. Channel instability areas associated with the Drum-Spaulding Project.

River/Stream	Reach (Length of Reach)	Description of Possible Problem Area	Project Effects
Fuller Creek	Fuller Lake Dam Reach (1.6 mi) Shared	1,000 ft of vertical and actively eroding slopes from spill from Fuller Lake.	Less than significant effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Only a small portion of the hillslope is affected, there are no evident adverse effects of sediment upon a fish-bearing stream, and large-woody debris additions from adjacent hillslopes are expected to assist in storage of fine and coarse sediment on-site. Both projects affect this reach as indicated in Table 2.2.2-1 in Section 2 of this Exhibit E.
Jordan Creek	Jordan Creek Diversion Reach (1.6 mi) Shared	Lake Spaulding spills have created an underfit, boulder-dominated valley with a channel that is often underground.	No effect. Spill is a necessary emergency measure and effects are not expected to get worse than what has already occurred and may actually improve as less spill is expected due to changes in release valve operation at Spaulding Dam; natural seepage maintains riparian vegetation and local aquatic communities.
Texas Creek	Lower Rock Lake Dam Reach #1 (3.6 mi)	310' of exposed and eroding banks, and widened, exposed channel due to Bowman Road failure.	No effect. Effects are non-Project related. Large woody debris and spawning gravel additions may be seen as a positive effect.
Fordyce Creek	Fordyce Lake Dam Reach (10.5 mi)	1,405' of exposed, vertical and eroding banks (one or both sides) through mature terrace. Bank Erodibility Hazard: moderate to very high	Less than significant effect. Unavoidable adverse impacts are of short duration, minor in magnitude, and limited to site-specific, localized areas. Erodible portion is only within a very minor part of the reach (one or both banks along a 1,500' section out of 10.5 mi). Conditions are not expected to change as the sediment has been removed and there is insufficient fine sediment given the current high sediment transport capability to build the riparian margin back to its previous level (there would have to be deposits up to 6' high on the channel margins).
Bear River	Bear River Reach #1 (0.3 mi)	Releases from Drum Canal have incised into loose soils overlying glacial deposits in a portion of the reach, exposing roots and boulders.	Less than significant effect. Effects of emergency releases (350-500 cfs in 1997 and 1998) were significant and created a spill channel over bedrock and through unconsolidated hillslope material and extended into the upper part of Bear Reach #1. Ten percent exceedance maximum (i.e., flood flow) is 324 cfs (based on 1993 – 2004 data). Additionally, recent data indicate that releases were as high as 350 cfs after 2003. It is expected that regular releases will not change and these releases have been contained within the incised channel and additional erosion or incision of the hillslope is not anticipated. Unavoidable adverse impacts of additional soil erosion from this point forward are expected to be of short duration, minor in magnitude, and limited in extent.
	Bear River Reach #2 Meadow Sub-Reach (2.3 mi)	Historic releases from Drum Canal have created flows that incised the channel and affected bank erosion, in addition to historic grazing and construction of Highway 20. Bank Erodibility Hazard is high in localized and intermittent locations.	Less than significant effect. Effects of releases may have caused or exasperated channel incision and bank failures. Observed regulated flows and synthesized unimpaired flows indicate that Project releases through this reach have exceeded estimated unimpaired values, particularly between 1993 and 1997, during which time there were six high flow events that ranged from just over 300 cfs to nearly 580 cfs. The higher sustained flows in 1997 were primarily due to the New Year's Day flood event. Under regulated conditions, there is a sustained 5 cfs minimum flow throughout the year, with frequent high flow winter and early spring events that generally do not exceed 400 cfs. Sustained flows approaching 400 cfs may have the potential create bank instability so observational monitoring will be initiated to evaluate effects of operational releases of 350 cfs or above (see Exhibit 7 of this FLA, DS-TR4 for PM&E measure).

Table 6.1-13. (continued)

River/Stream	Reach (Length of Reach)	Description of Possible Problem Area	Project Effects
Bear River (continued)	Bear River Reach #2 Boardman Sub-Reach (5.3 mi)	Pittman Spill created a debris torrent that widened channel, deposited sediment, and changed morphology.	Less than significant effect. Additional input is not expected, sediment has been largely removed from the active channel, riparian recovery is continuing and material on channel margins will become less available to active channel processes. Unavoidable adverse impacts of additional soil erosion from this point forward are expected to be of short duration, minor in magnitude, and limited in extent.

6.1.2.2.4 Effects on Sediment Transport

There are no extensive sediment accumulations, and substrate is fairly coarse in the reaches that were evaluated for sediment mobility. Particles up to 285 mm were mobile with flows of over 450 cfs (which have a probability of occurring every 2 years under regulated conditions). Discharges as low as 45 cfs move particles of 20 mm in some reaches. Flows as low as 12 cfs move trout spawning gravels (range was 12 to 177 cfs). If sediment supply exceeded transport capability, the bed substrate would be much finer, there would be “sand tails” downstream of boulders or velocity shadows, and pools would be accumulating sediment. None of these indices were evident. In addition, the frequency of flows that mobilize the finer particles (D_{16} of the substrate and D_{50} of spawning gravels) is high, and resultant bed is coarse.

The exception is the Lake Valley Reservoir Dam Reach just below the dam but above the spill channel, which was not a Channel Morphology Study Site but was evaluated during the Licensees’ habitat mapping and channel characterization effort in 2008 and 2009. In Lake Valley Reservoir Dam Reach below the dam, while there are fine sediments accumulating in the main channel, no action is proposed because there have been no adverse effects or issues identified in this short reach that has diverse in-stream habitat and a resilient and interactive riparian zone.

Gravel-size particles up to 64 mm are mobile on 24 of the 34 transects that were in reaches affected solely by the Drum-Spaulding Project as well as in reaches affected by both projects. Flows as low as 100 cfs (Bear River Reach #2, Meadow Sub-Reach) and as high as 15,546 cfs (South Yuba Reach #4 Canyon Creek Confluence Reach) initiated motion. On two transects, mobile gravels were limited to 8 mm (Bear River Reach #2, Boardman Sub-Reach Transect 1, and Bear River Canal Diversion Dam Reach Transect 3). The frequency of mobility has been increased under regulated conditions Bear River Reach #2 with the exception of one transect in the Meadow Sub-Reach. The frequency of mobility has decreased under regulated conditions in the Fordyce Lake Dam Reach, Lake Valley Reservoir Dam Reach, South Yuba Reach #4 Canyon Creek Confluence Reach, and Drum Afterbay Dam Reach but not substantially (i.e., usually less than a 20% change). The decrease in gravel mobility is a positive effect in streams where gravel-sized material is in low supply, which is the case in most project-affected reaches. There was no change in the frequency of mobility in the Bear River Canal Diversion Dam Reach.

6.1.2.2.5 Effects on Large Woody Debris

Large woody debris is uncommon in the Project stream channels and reservoirs. The streams flow through mature forests yet there was very little storage of large woody debris in the sections of stream channels where large woody debris counts were taken. The numbers found in the streams are lower than that found in other Sierra Nevada streams, with the exception of 3 out of 36 Drum-Spaulding Project-affected reaches that were evaluated that were within the values found by Ruediger and Ward (1996). Also, judging from the small amounts of wood pulled from the reservoirs, the wood is not being removed by Project flows and transported to the reservoir. The data show that there are generally low quantities of wood in the stream and the reservoirs so the Project does not appear to be currently affecting LWD availability. Additionally, LWD, when available, plays a minor role in the geomorphology of Sierra Streams (Ruediger and Ward 1996). No action by Licensee is proposed.

6.1.3 Proposed Environmental Measures

6.1.3.1 Yuba-Bear Hydroelectric Project

6.1.3.1.1 NID's Proposed Measures

As described above, NID's proposed Project includes six measures specifically related to geology and soils:

- Proposed Measure YB-GEN1: Annual Consultation
- Proposed Measure YB-GEN4: Consultation Regarding New Ground Disturbing Activities
- Proposed Measure YB-G&S1: Development and Implementation of a Rollins Upgrade Construction Erosion Control and Restoration Plan
- Proposed Measure YB-G&S2: Development and Implementation of a Recreation Facilities Construction Erosion Control and Restoration Plan
- Proposed Measure YB-G&S3: Implement Clear and Trap Creeks Stabilization Plans
- Proposed Measure YB-L1: Implement Transportation Plan on Federal Lands

Each of these measures is provided in full in Attachment E3.

6.1.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Consult If Sediment Removal and Disposal Is Planned

In their joint letter, the Forest Service, BLM, NPS and CDFG recommended the following measure:

> Prior to finalizing plans and a schedule for any sediment removal action at any project facility, the licensees should consult with the appropriate resource agencies to determine appropriate fisheries and/or water quality monitoring needs. On a project-specific basis, the licensees will need to consider fish species, distribution, and age classes present in project reservoirs, and any risk of impact associated with sediment removal. Additionally, the licensees must consult with the land management agency to determine specific resource protection measures and/or monitoring needs when planning a sediment removal and disposal project whether or not it is within the FERC boundary on public lands. (p.12)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

NID has not adopted the measure, even in its general form, for three reasons. First, NID's proposed Project does not include any sediment removal or disposal activities, and therefore the recommended measure would not provide any protection or mitigation related to the activities included in the proposed Project.

Second, NID has included in its proposed Project two measures, YB-GEN1 and YB-GEN4, that would provide early notice and coordination with agencies should NID propose any new ground-disturbing activities, such as sediment removal and disposal. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures, would provide greater protection to the resources.

Third, should NID propose to remove sediment from a Project reservoir, NID would be required to consult with numerous federal and state agencies, including with FERC under the FPA, with the USACE under Section 404 of the CWA, with the SWRCB under Section 401 of the CWA, with CDFG under Section 1601 of the California Fish and Game Code, and with the Forest Service or BLM if the sediment removal or disposal was planned to occur on federal land. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures and these numerous requirements to consult – *consultation that would be required whether or not FERC included the agencies' recommended measure in the new license* – would provide greater protection to the resources.

Consult Regarding Moving Large Woody Debris Downstream of Project Reservoirs

The Forest Service, BLM, NPS and CDFG recommended in their joint letter the following measure:

> Large woody debris caught in dams and trash racks should be moved downstream in a collaboratively agreed upon location and not simply removed nor burned nor disposed of at an approved disposal site. Large woody debris is uncommon in project-affected stream reaches and

> reservoirs; however, a substantial amount of large wood is pulled from reservoirs. The resource agencies are interested in discussing how to move large woody debris downstream from reservoirs rather than removing it. (pp. 12 & 13)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

Nevertheless, NID has not adopted the measure, even in its general form, for two reasons. First, the agencies provide no evidence to support their statement that LWD in stream reaches in "uncommon" or that a "substantial amount" of large wood is removed from Project reservoirs. Table 6.1-10 shows that, with a few exceptions, LWD ranges from about 20 to 107 pieces per mile in reaches affected by the Project. The agencies have provided no evidence to support that this represents an "uncommon" level of LWD. Table 6.1-11 estimates the amount of wood, some of which might be characterized as LWD, removed by NID from Project reservoirs. Again, the agencies have provided no evidence to support that this amount of wood is a "substantial amount" in terms of potential benefits to the stream if the wood were passed downstream.

Second, the agencies have provided no information regarding why the introduction of wood into the stream below the Project reservoirs would have any environmental benefit, especially considering that the steep and confined channel network in Project-affected reaches offers limited opportunity for LWD debris retention.

In summary, the agencies provide no evidence to support that inclusion of their recommended measure would provide any environmental protection.

Monitor Geomorphology Conditions

The Forest Service, BLM, NPS and CDFG recommended in their joint letter the following measure:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are [sic] an essential part of proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion.
>
> - Geomorphology (p. 51 & 52)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

NID has not included in its proposed Project the general geomorphology monitoring plan for two reasons. First, NID's proposed Project includes four specific measures that address potential effects to streams due to erosion: 1) YB-G&S1, Development and Implementation of a Rollins Upgrade Construction Erosion Control and Restoration Plan; 2) YB-G&S2, Development and Implementation of a Recreation Facilities Construction Erosion Control and Restoration Plan; 3) YB-G&S3: Implement Clear and Trap Creeks Stabilization Plans; and 4) YB-L1, Implement Transportation Plan on Federal Lands. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures, would provide greater protection to the resource.

Second, Licensees' Channel Morphology Study did not identify any ongoing geomorphic effects that are not addressed by NID's proposed measures. The agencies have not identified the need for monitoring (i.e., what reason is there to believe that monitoring is needed?). Without such evidence, monitoring would provide no environmental protection, but would be monitoring for monitoring's sake.

Develop Sediment Pass-Through Management Plans

FWN recommended the following measure:

> The PG&E and NID FLA's should include Sediment Management Plans with measures to pass through sediment at their dams to enhance geomorphologic function, reduce the cost and environmental damage of dredging, and preserve the capacity of the reservoirs. The plans should address the existing infrastructure and any necessary improvements to provide passive sediment management. The Plan should also assess mercury accumulation behind the dams and how passive sediment management could avoid methylation of that mercury and its re-entering the streamflow. Alternatively, the Plan should discuss options for dredging the reservoirs, cleaning the sediment of mercury and depositing the sediment on banks downstream for high flow redistribution downstream. (p. 76)

FWN has provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

Nevertheless, NID has not adopted FWN's recommended measure, even in its general form, for three reasons. First, FWN has provided no evidence to support its implication that pass-through of sediment at Project dams would enhance geomorphic function. Licensees' Channel Morphology Study did not identify any substantial geomorphic issues. Second, NID does not propose dredging Project reservoirs. FWN has not provided any information regarding what the anticipated "environmental damage" from dredging, which is not proposed by NID, would be - especially given that, as mentioned above, should NID propose to remove sediment from a Project reservoir, NID would be required to consult with numerous federal and state agencies. Third, since NID does not propose to disturb sediment in reservoirs, there is no need to assess mercury accumulation in sediment. In summary, FWN provides no evidence to support that inclusion of its recommended measure would provide any environmental protection.

Develop Sediment Management Plan for Chicago Park Powerhouse Reach

FWN recommended the following measure:

> The NID Sediment Management Plan should include measures to restore geomorphic function in the Bear River Below [sic] Chicago Park Powerhouse. (p. 76)

FWN has provided insufficient detail for Licensee to perform an in depth analysis of the recommended measure, or for Licensee to estimate the cost associated with implementing the measure.

Licensee has not adopted the general measure because it is not warranted or practical. Historic mining debris is the source of the sediment in the droughty, non-cohesive sediment in the reach and for the channel morphology, and this condition was not a result of the Project but caused by past mining practices. Restoration of such an area (e.g., removal of existing sediment and replacement with more natural sediment conditions, and reforming the channel) would be very expensive. The cost of such a measure is not warranted given that the Project did not create the condition and only a short section of stream (1.3 miles) is affected.

Remediation Regarding Maintenance Deposition Yards

FWN recommended the following measure:

> In addition, the FLA should include a full inventory of proposed maintenance deposition yards, their condition, status with relation to the property owners concerned, and remediation measures to assure no further damage or pollution results, and that a stable and sustainable condition has been achieved. (p. 76)

FWN has provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure. Specifically, FWN does not describe where such Yuba-Bear Hydroelectric Project "deposition yards" occur. The Project does not include such areas, nor does NID propose to create such areas under the proposed Project. FWN has provided no evidence to support including its recommended measure in the new license.

Perform Sediment Transport and Supply Study

NMFS recommended that Licensees develop information regarding sediment supply and sediment transport under regulated and unimpaired conditions at all Project-affected reaches:

> In order to evaluate potential avoidance, mitigation and offset measures properly, NMFS requests the Commission obtain the necessary information to evaluate sediment transport and supply for the Project, which as stated above needs to include:
>
> - Average annual sediment transport capacity (mass or volumetric) under regulated and unimpaired conditions at all Project affected reaches
> - Average annual sediment supply under regulated and unimpaired conditions to all Project affected reaches
>
> Given NMFS' concerns (described above) in the analysis approach to assess the Project-related effects of substrate supply and transport, it reserves final comment regarding Project measures to improve coarse substrate conditions and Chinook spawning habitat in upper Yuba EFH. (p. 26)

The Yuba-Bear Hydroelectric Project does not directly/indirectly affect any reaches in which Chinook occur. Therefore, the requested information would not inform license requirements.

6.1.3.2 Drum-Spaulding Project

6.1.3.2.1 PG&E's Proposed Measures

PG&E has included in its Proposed Project the following three measures that relate to geology and soils:

- Proposed Measure DS-GEN1: Annual Consultation with Forest Service, BLM and BOR
- Proposed Measure DS-LU1: Implement Transportation Management Plan for Primary Project Roads
- Proposed Measure DS-TR4: Channel Morphology and Riparian Vegetation Assessment in Bear Valley

Refer to Appendix E7 for the full text of each measure and the accompanying rationale statement.

6.1.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope, purpose and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposal as required by the regulations and FERC PM&E Guidance. However, some commenters made requests that provided PG&E with enough information that PG&E could address at least components of the request. Below PG&E has made its best effort to capture each of these proposals (and PG&E's response to each proposal, including whether the proposal was consistent with study results) that relate to this resource area.

Consult Regarding Sediment Removal

In their joint January 28, 2011 letter, the Forest Service, BLM, NPS and CDFG recommended that PG&E consult with appropriate resource agencies prior to finalizing any plans for sediment removal:

> Prior to finalizing plans and a schedule for any sediment removal action at any project facility, the licensees should consult with the appropriate resource agencies to determine appropriate fisheries and/or water quality monitoring needs. On a project-specific basis, the licensees will need to consider fish species, distribution, and age classes present in project reservoirs, and any risk of impact associated with sediment removal. Additionally, the licensees must consult with the land management agency to determine specific resource protection measures and/or monitoring needs when planning a sediment removal and disposal project whether or not it is within the FERC boundary on public lands. (p.12).

PG&E's Proposed Project does not include any sediment removal or disposal activities. In addition, PG&E has included in its Proposed Project a measure (DS-GEN1) that would provide annual consultation with agencies; this includes early notice and coordination with agencies should PG&E propose any new ground-disturbing activities, such as sediment removal and disposal. Also, should PG&E propose to remove sediment from a Project reservoir, PG&E would be required to consult with numerous federal and state agencies, including with FERC under the FPA, with the USACE under Section 404 of the CWA, with the SWRCB under Section 401 of the CWA, with CDFG under Section 1601 of the California Fish and Game Code, and with the Forest Service, BLM or BOR if the sediment removal or disposal was planned to occur on federal land. Thus, it is unclear how the agencies' proposal regarding consultation would provide greater protection to the resources than Licensee's proposed measure and these numerous legal requirements that necessitate consultation.

Consult Regarding Moving Large Woody Debris Downstream of Project Reservoirs

In their joint letter, the resource agencies also made the following recommendation regarding large woody debris:

> Large woody debris caught in dams and trash racks should be moved downstream in a collaboratively agreed upon location and not simply removed nor burned nor disposed of at an approved disposal area. Large woody debris is uncommon in project-affected stream reaches and reservoirs; however, a substantial amount of large wood is pulled from reservoirs. The resource agencies are interested in discussing how to move large woody debris downstream from reservoirs rather than removing it. (p.12-13).

The agencies have provided insufficient detail (including schedule, cost, or the location/s to which debris would be transported) for Licensee to perform an in depth analysis of the recommended measure, or for Licensee to estimate the cost associated with implementing the measure. In addition, the agencies did not point to any information or study results that suggest that the amount of LWD in Project-affected stream reaches is uncommon or otherwise problematic from an environmental standpoint.

Monitor Geomorphology Conditions

The resource agencies recommended in their joint letter that Licensees monitor geomorphic conditions:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are [sic] an essential part of proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion. [Geomorphology was included in the list.] (p. 119).

The agencies have provided insufficient detail for PG&E to perform an in depth analysis of the recommended measure, or for PG&E to estimate the cost associated with implementing the measure.

PG&E's Proposed Project does not include any proposed measures related to geology and soils except for one monitoring measure proposed for Bear Valley (DS-TR4, Channel Morphology and Riparian Vegetation Assessment in Bear Valley), discussed further below. The agencies have not described how inclusion of their recommended measure would provide greater protection to the resource. The Licensees' Channel Morphology Study did not identify any ongoing geomorphic effects that are not addressed by PG&E's proposed measure. The agencies have not identified the need for monitoring. Without such evidence, monitoring would provide no environmental protection, but would be monitoring for monitoring's sake.

Develop Sediment Pass-Through Management Plans

FWN (in its February 1, 2011 letter) recommended Licensees include in their FLAs sediment-pass through management plans:

> The PG&E and NID FLA's should include Sediment Management Plans with measures to pass-through sediment at their dams to enhance geomorphologic function, reduce the cost and environmental damage of dredging, and preserve the capacity of the reservoirs. The plans should address the existing infrastructure and any necessary improvements to provide passive sediment management. The Plan should also assess mercury accumulation behind the dams and how passive sediment management could avoid methylation of that mercury and its re-entering the streamflow. Alternatively, the Plan should discuss options for dredging the reservoirs, cleaning the sediment of mercury and depositing the sediment on banks downstream for high flow redistribution downstream. (p. 76).

FWN has provided no evidence to support its conclusion that pass-through of sediment at Project dams would enhance geomorphic function. Licensees' Channel Morphology Technical Memorandum (1-1) (filed with this FLA in Appendix E12) did not identify any substantial geomorphic issues. In addition, the recommendation by FWN does not provide adequate specificity (including time, locations, scope or cost) for PG&E to assess the viability of this suggestion or provide FERC with cost estimates. PG&E does not propose dredging or disturbing sediment in reservoirs.

Remediation Regarding Maintenance Deposition Yards

FWN also recommended Licensees propose remediation measures related to proposed maintenance deposition yards:

> In addition, the FLA should include a full inventory of proposed maintenance deposition yards, their condition, status with relation to the property owners concerned, and remediation measures to assure no further damage or pollution results, and that a stable and sustainable condition has been achieved. (p. 76).

PG&E does not propose any maintenance deposition yards on third party property. PG&E's standard maintenance practice does not include dredging of the canals for sediment, refuse, or construction debris. During the annual outage to the canal systems, small front end loaders are utilized to remove small rocks and debris if warranted. This material is either piled within the existing canal easement on the berm or removed to a landfill if required. In the past, at one location along the canal, some concrete bottom material has been deposited on the canal berm with the property owners' permission. Normal practice is to remove this material and haul it to a landfill.

Although there have been historical instances of canal berm failures, PG&E has endeavored to remove this material and repair these areas to the extent possible. PG&E has not removed sediments from the canals and deposited them on third party property owners without permission. In addition, the recommendation by FWN does not provide adequate specificity (including the standard to assess that "no further damage or pollution results" or "that a stable and sustainable condition has been achieved" or the scope or cost) for PG&E to assess FWN's recommendation or provide FERC with cost estimates.

Bear Valley Assessment

In its letter, FWN recommended that:

> PG&E's FLA should include a measure for post-licensing assessment and implementation options to restore the Bear River in the Bear Valley to a functioning meadow system. The assessment should consider a combination of measures to repair the channel in the Bear Valley meadow area, and control flow magnitudes and rates of flow changes. The assessment should analyze options including: streambank stabilization and revegetation, the "pond and plug" approach used to reconnect meadow streams to meadow floodplains, [sic] (p.57).

Bear Valley has been identified as historically having bank stability issues associated with high flow releases from the Drum and South Yuba Canals as well as cattle grazing and other activities such as the Emigrant Trail and Highway 20 crossings. A proposed channel morphology and riparian vegetation assessment measure DS-TR4 (Channel Morphology and Riparian Vegetation Assessment in Bear Valley) has been added as part of PG&E's Proposed Project, see Appendix E7 of this Exhibit E. As noted above, results of the channel morphology and riparian studies indicate that the current flow regime (including periodic flows above 400 cfs over the last ten years) supports the recovery of riparian habitat toward reaching Proper Functioning Condition. However, because effects of sustained flows approaching 400 cfs into the Bear River may cause or exasperate channel incision, bank failures, or other signs of channel instability in Bear Valley, PG&E has proposed measure DS-TR4. Evaluation of sustained flows above 350 cfs should provide useful information regarding potential impacts to channel morphology and riparian vegetation; the measure will also inform the development of protection and mitigation measures.

Perform Sediment Transport and Supply Study

NMFS (in its February 1, 2011 letter) recommended that Licensees develop information regarding sediment supply and sediment transport under regulated and unimpaired conditions at all Project-affected reaches:

> In order to evaluate potential avoidance, mitigation and offset measures properly, NMFS requests the Commission obtain the necessary information to evaluate sediment transport and supply for the Project, which as stated above needs to include:
>
> - Average annual sediment transport capacity (mass or volumetric) under regulated and unimpaired conditions at all Project affected reaches
> - Average annual sediment supply under regulated and unimpaired conditions to all Project affected reaches
>
> Given NMFS' concerns (described above) in the analysis approach to assess the Project-related effects of substrate supply and transport, it reserves final comment regarding Project measures to improve coarse substrate conditions and Chinook spawning habitat in upper Yuba EFH. (p. 25). [NMFS made similar comments on p. 22.]

NMFS' recommendation does not request an identifiable measure for PG&E to assess. Specifically, the proposal does not provide adequate detail (including the scope of information requested, the schedule or cost) for PG&E to assess the viability of this request or to provide FERC with cost estimates.

6.1.4 Unavoidable Adverse Impacts

6.1.4.1 Yuba-Bear Hydroelectric Project

Project dams would continue to intercept some sediment and LWD from upstream sources, but the long-term impacts to geology and soils are expected to be minor given existing conditions. Many of the stream reaches, such as the Bear River below Chicago Park Powerhouse, have been inexorably impacted by a legacy of mining that has severely affected channel morphology and sediment. In many cases, non-Project dams, which also capture sediment and LWD, occur upstream of the Project dam leading to cumulative effects on geology and soils. In addition, most of the reaches below Project dams are transport reaches, which means that sediment and LWD are not retained in the reach. Also, the amount of sediment deposition behind Project dams is relatively minor because many of the dams are in the upper portion of the basins.

Project dams and diversions would continue to alter flow, generally reducing peak springtime flows and augmenting low summertime flows, and spills would occur at Project dams and canal spillways. These impacts would be long-term and minor. Licensee's proposed Project includes measures to stabilize stream sections affected by erosion due to spills. Overall, most channels affected by the Project are in stable condition.

Project roads would continue to erode during runoff events, which is a long-term, minor impact. Licensee's Transportation Plan would maintain Project roads in good condition, which would reduce any adverse effects.

Construction of Licensee's proposed new Rollins Powerhouse and recreation facilities could result in site-specific, short-term erosion problems. However, the effects would be minor with implementation of Licensee's proposed erosion and stabilization plans.

6.1.4.2 Drum-Spaulding Project

Operating and maintaining the Drum-Spaulding Project would continue to capture some sediment and LWD from upstream sources in Project reservoirs, but the long-term impacts to geology and soils are expected to be minor given existing conditions and many of the reasons discussed above. It is understood that channel morphology conditions below dams are often altered from pre-dam conditions. The existing condition is that many channels in the Project-affected area are reaches that do not accumulate large amounts of sediment, with the exception of reaches that continue to be affected by large quantities of mining debris. Many channels are resistant to large-scale changes in channel form and process because the channels are composed of immobile substrate and/or bedrock. The continued operation of the project will not change this.

Project dams and diversions would continue to alter flow, generally reducing peak springtime flows and augmenting low summertime flows, and spills would occur at Project dams and canal spillways. These impacts would be long-term and minor. Overall, most channels affected by the Project are considered in stable condition in that they are not obviously aggrading or degrading or moving laterally across the valleys through which they flow.

Project roads would continue to erode during runoff events, which is a long-term, minor impact. PG&E's Transportation Plan would maintain Project roads in good condition, which would reduce any adverse effects.

Replacement of Project recreation facilities could result in site-specific, short-term erosion problems. However, PG&E plans to consult with appropriate agencies and obtain all necessary agency approvals and permits to assure that short-term adverse effects are minor.

6.2 Water Resources

The discussion of water resources is broken into six sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding water resources. Second, the affected environment is discussed in Section 6.2.1. Third, the environmental effects of the projects are located in Section 6.2.2. Fourth, proposed measures are listed in Section 6.2.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Fifth, cumulative effects are addressed in Section 6.2.4. Sixth, unavoidable adverse impacts, if any, are addressed in Section 6.2.5.

Where existing, relevant, and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on water resources, Licensees developed and conducted the five studies listed in Table 6.2-1.

Table 6.2-1. Water resources studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress	Study Complete	Date Study is Scheduled to be Complete
2.2.1	Water Quality	2-1	--	2/10/10	--
2.2.2	Water Temperature Monitoring	2-2	--	8/26/10	--
2.2.3	Water Temperature Modeling	2-3	--	1/29/11	--
2.2.4	Hydrologic Alteration	2-4	--	1/27/11	--
2.2.5	Bioaccumulation	2-5	--	2/25/10	--

At the time this FLA is filed with FERC, all of the studies listed in Table 6.2-1 are complete. A final technical memorandum for each of the five completed studies has been posted to the Relicensing Website and is filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; lists of variances to the FERC-approved study, if any; attachments to the technical memorandum; and references.

6.2.1 Affected Environment

This Section describes existing water resources conditions in two general areas: 1) hydrology and operations; and 2) water quality. For hydrology and operations, this Section describes the hydrological setting of the sub-basins affected by the projects, and provides a summary of the projects' operations as they relate to basin hydrology, organized by development. For water quality, this Section first describes the regulatory context of water quality in the basins and sub-basins, and then describes existing water quality conditions in four areas: 1) general water quality; 2) water temperature condition in streams; 3) water temperature condition in reservoirs; and 4) bioaccumulation of mercury in fish tissue.

6.2.1.1 Hydrology and Operations

6.2.1.1.1 Hydrological Setting

The projects are located in northern California in the following river basins: Yuba River Basin, Bear River Basin, American River Basin, and Sacramento River Basin. The river basins are located in Nevada, Placer, and Sierra counties along the western slopes of the Sierra Nevada Range geomorphic province. Various sub-basins within the larger river basins contain projects' facilities as well as non-projects' facilities.

Figure 6.2.1-1 shows sub-basins within the Yuba River, Bear River, American River, and Sacramento River basins that are affected by the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project. The projects-affected sub-basins have a total drainage area of about 500,000 acres.

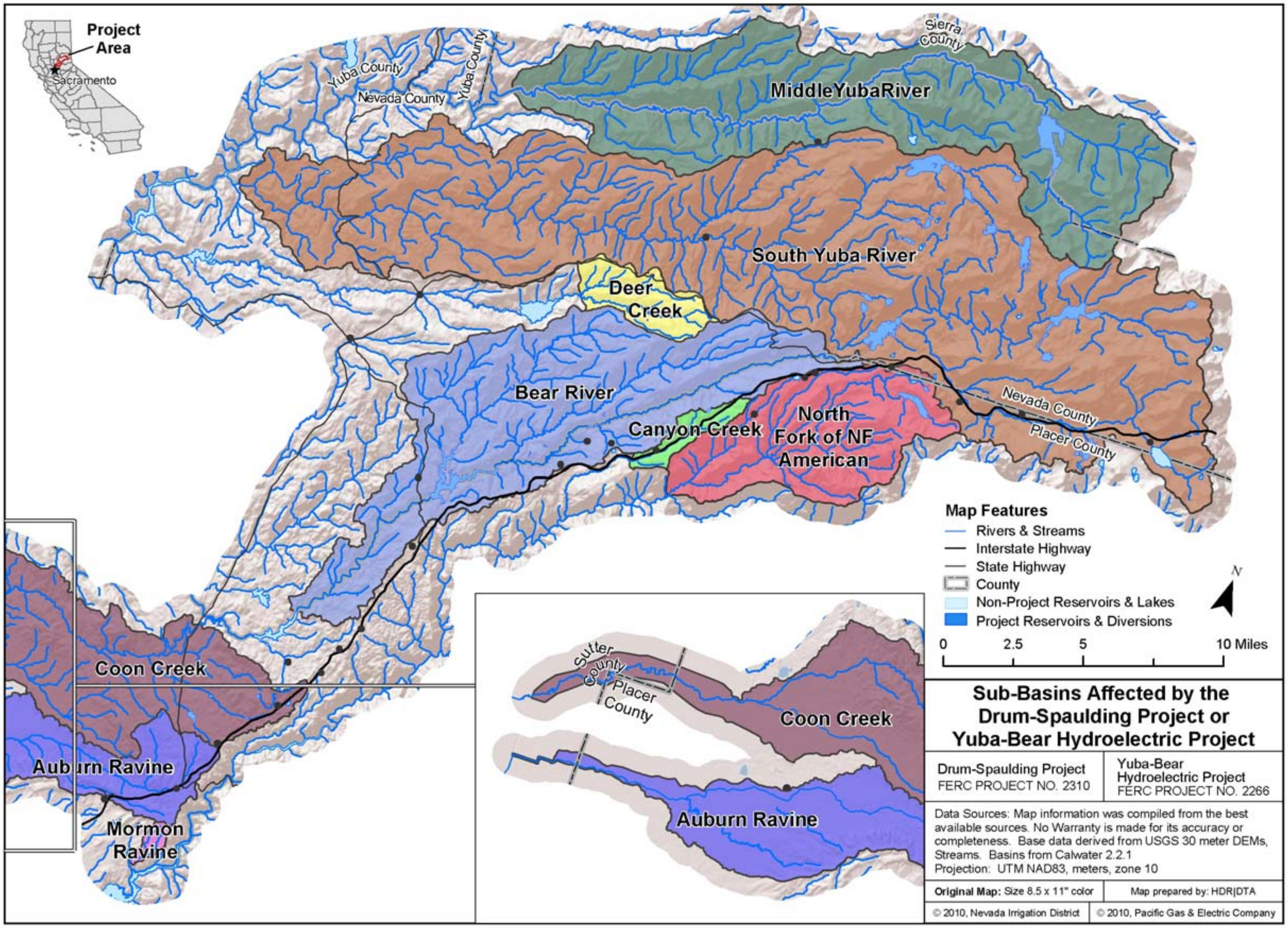


Figure 6.2.1-1. Sub-basins containing Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities.

From their origins, the Yuba River, Bear River, and American River flow generally southwest toward the Central Valley of California. The Middle and South Yuba rivers, and forks of the Yuba River on which projects' facilities are located, originate at elevations of approximately 7,000 feet near Henness Pass and approximately 7,200 feet near Donner Pass, respectively, and flow southwest to the United States Army Corps of Engineers' (USACE) Englebright Reservoir at an elevation of about 1,200 feet. From Englebright Reservoir (non-Project), the Yuba River flows southwest to its confluence with the Feather River near Marysville, California. Canyon Creek and Fordyce Creek are primary tributaries to the upper South Yuba River, which are also affected by the projects.

The portions of the American River basin potentially affected by the Drum-Spaulding Project include the North Fork of the North Fork American River and Canyon Creek,[1] both of which are tributaries to the North Fork American River. The North Fork of the North Fork American River originates at an elevation of approximately 6,500 feet just above Lake Valley Reservoir, and flows southwest to its confluence with the North Fork American River just southeast of the town of Alta, California. Canyon Creek (North Fork American tributary) begins at an elevation of approximately 4,500 feet near Blue Canyon, California and flows into the North Fork American River just southeast of the town of Weimar, California.

The portion of the Sacramento River system where Drum-Spaulding Project facilities are located includes small tributaries to the Sacramento River (i.e., Dry Creek, Rock Creek, and Auburn Ravine) that originate near the City of Auburn at an elevation of approximately 1,500 feet. These tributaries flow due west, out of the foothills and into the California Central Valley, ultimately draining into the East Side Canal (non-Project). This canal then flows into the Sacramento River just downstream of the Feather River's confluence with the Sacramento River near Pleasant Grove, California.

The Bear River originates at an elevation of approximately 4,900 feet at Bear Valley and flows into the Feather River northeast of the town of East Nicolaus, California at an elevation of about 50 feet.

Additional descriptions of sub-basins affected by the projects can be found in Section 2 (sub-Section 2.2.1) of Exhibit E.

Unimpaired and Regulated Hydrology

Hydrology data for regulated and associated unimpaired flows for water years 1976-2008 at projects' reservoirs, powerhouses, canals, and conduits, along with stream reaches affected by the two projects, are provided on the Project Relicensing Hydrology and Power Generation Data digital versatile disc (DVD), included in Appendix E12 of this FLA. The DVD includes the following datasets:

[1] The Drum-Spaulding Project Vicinity includes two streams named Canyon Creek; the larger of the two is tributary to the South Yuba River, the smaller is tributary to the North Fork American River. For clarity, where this DLA refers to the smaller Canyon Creek, tributary to the North Fork American River, the text includes the receiving stream name in parentheses as follows: Canyon Creek (NF American tributary).

- combined hydrology files (Excel spreadsheets)
- DSS hydrology files
- power generation data
- synthesis of unimpaired hydrology (raw data & source files)
- channel cross-section geometry (Middle and South Yuba rivers)
- Water year types (background data and summary)

6.2.1.1.2 Description of Operations Related to Basin Hydrology

Yuba-Bear Hydroelectric Project

In general, the Yuba-Bear Hydroelectric Project is characterized by high elevation storage and lower elevation power generation via a network of natural and man-made conveyances. Water is stored and released from the upper reservoirs (also known as the "Mountain Division") based on NID's consumptive needs and combined reservoir storage targets developed as part of a Consolidated Contract with PG&E (for a description of the contract see Section 3 of Exhibit E). Discretionary releases are made from Jackson Meadows Reservoir and Jackson, French, Faucherie, and Sawmill reservoirs during the spring runoff season through late fall. These releases are conveyed to Bowman Lake via the Milton-Bowman Tunnel (releases from Jackson Meadows Reservoir), Jackson Creek (releases from Jackson Lake), and Canyon Creek (releases from French, Faucherie, and Sawmill lakes). This water is then stored and released by Bowman Dam through Bowman Powerhouse into the Bowman-Spaulding Conduit Diversion Impoundment. Bowman Powerhouse is operated as a base-loaded plant whose schedule is based on downstream water demands through the Bowman-Spaulding Conduit in addition to instream flow requirements in Canyon Creek. Figure 5.1.1-1 shows a schematic diagram of the Project.

While the majority of the Bowman-Spaulding Conduit flow is provided by releases at Bowman Lake, five small diversion structures (known as "feeders") on creeks that run perpendicular to the alignment of the Bowman-Spaulding Conduit also provide water to the conduit. These feeders augment flows in the conduit up to its capacity, and spill the remainder into their respective natural drainages downstream of the conduit. Two types of feeders occur on the Bowman-Spaulding Conduit: diversion dams on Texas Creek and Fall Creek; and side water inflows from Clear, Trap, and Rucker creeks. The diversion dam-style feeders utilize spillways and outlet conduits to release water downstream into their respective creeks, while the side water style feeders utilize dump gates on the downstream side of the Bowman-Spaulding Conduit to make releases into drainages.

Flows upstream of the Bowman-Spaulding Conduit in Texas, Fall, and Rucker creeks are regulated by upstream reservoirs owned and operated by PG&E (Culbertson, Upper Rock, Lower Rock, Upper Lindsey, Middle Lindsey, Lower Lindsey lakes in the Texas Creek watershed, Carr and Feeley lakes in the Fall Creek watershed, and Blue and Rucker lakes in the Rucker Creek watershed).

Bowman-Spaulding Conduit discharges into PG&E's Fuller Lake, where it then is diverted to a second section of the Bowman-Spaulding Conduit before it is utilized by PG&E for power generation at Spaulding No. 3 Powerhouse. This water is then passed through PG&E's Lake Spaulding into PG&E's Drum and South Yuba canals. Water transported into the South Yuba Canal is passed through PG&E's Deer Creek Forebay (an off-channel reservoir) and Deer Creek Powerhouse, located on South Fork Deer Creek. This water is then largely diverted by NID at their Cascade Canal Diversion Dam located immediately downstream. Water transported into the Drum Canal is passed through PG&E's Drum Forebay and then diverted from PG&E's Drum Afterbay, located on the Bear River, into the Dutch Flat No. 2 Flume, Forebay, and Powerhouse. Licensee operates Dutch Flat No. 2 Powerhouse to meet intermediate loads with some peaking operation. Daily volumes are scheduled by NID for downstream consumptive demand.

Water from the Project's Dutch Flat No. 2 and PG&E's Dutch Flat No. 1 powerhouses discharge into the Project's Dutch Flat Afterbay located on the Bear River, where the water is then delivered via the Chicago Park Flume to the Project's Chicago Park Powerhouse by way of the Project's Chicago Park Forebay. Chicago Park Powerhouse is operated to meet intermediate loads with some peaking operation, while daily volumes are scheduled for downstream consumptive demand. These waters are discharged into the Bear River roughly 1.5 miles upstream of the high water line of the Project's Rollins Reservoir.

With a gross storage capacity of roughly 59,000 ac-ft, Rollins Reservoir is the Yuba-Bear Hydroelectric Project's major low-elevation storage reservoir.[2] Located near Interstate 80 and State Highway 174, Rollins Reservoir is a multipurpose facility that meets municipal, irrigation, domestic water supply, recreation, and power generation needs. Rollins Powerhouse is located at the base of the dam and is operated as a base loaded plant generating power according to consumptive water demand and water conditions. Rollins Reservoir is generally kept as high as possible through the recreation season of Memorial Day through Labor Day. This is accomplished through upstream deliveries into the Bear River watershed by PG&E's Drum and Lake Valley canals. Drum Canal is supplied by a combination of Licensee's water transfers out of the Middle Yuba River (via Milton-Bowman Tunnel) and Canyon Creek (via Bowman-Spaulding Conduit) watersheds, along with PG&E reservoirs and natural runoff in the South Yuba and North Fork of the North Fork American river watersheds. A significant decrease in reservoir storage is generally experienced during the outage period of PG&E's Drum Canal, which occurs in the last two weeks of September each year. Rollins Reservoir storage is generally recovered through natural runoff and upstream canal flows in the fall and early winter months.

Besides physical (e.g., size of dams and tunnels) and hydrologic (e.g., natural runoff) constraints, major factors that constrain Licensee's normal operation of the Project include, but are not limited to, public and employee safety; conditions in the current FERC Project license; conditions in the NID/PG&E Consolidated Contract; other agreements made with PG&E and Davis-Grunsky reservoir elevation requirements; and other downstream water supply demand and associated requirements.

[2] Gross storage estimate based on NID's 2007 reservoir bathymetry study.

Categorization of Yuba-Bear Hydroelectric Project-Affected Stream Reaches

The following Project-affected stream reaches have Project storage facilities located upstream and are used to re-regulate and convey flows, directly or indirectly, to a downstream Project facility:

- Jackson Meadows Reservoir Dam Reach (Middle Yuba River)
- Jackson Lake Dam Reach (Jackson Creek)
- French Lake Dam Reach (Canyon Creek)
- Faucherie Lake Dam Reach (Canyon Creek)
- Sawmill Lake Dam Reach (Canyon Creek)

The following Project-affected stream reaches have Project diversion facilities immediately upstream, and are perennial in nature:

- Milton Diversion Dam Reach (Middle Yuba River)
- Bowman-Spaulding Diversion Dam Reach (Canyon Creek)
- Texas Creek Diversion Dam Reach (Texas Creek)
- Fall Creek Diversion Dam Reach (Fall Creek)
- Rucker Creek Diversion Reach (Rucker Creek)
- Dutch Flat Afterbay Dam Reach (Bear River)
- Bear River Canal Diversion Dam Reach (Bear River)

The following Project-affected stream reaches have Project diversion facilities immediately upstream, and are ephemeral in nature:

- Wilson Creek Diversion Dam Reach (Wilson Creek)
- Clear Creek Diversion Reach (Clear Creek)
- Trap Creek Diversion Reach (Trap Creek)

The following Project-affected stream reaches have Project powerhouses that discharge directly upstream:

- Chicago Park Powerhouse Reach (Bear River)

For a complete list of reaches affected by the Yuba-Bear Hydroelectric Project, see Section 2 of this Exhibit E. Additional information regarding Yuba-Bear Hydroelectric Project operations can be found in Exhibit B, Project Operations and Resource Utilization, of NID's Application for a new License for the Project.

Drum-Spaulding Project

The Drum-Spaulding Project consists of 29 reservoirs and 37 dams with a total usable storage capacity of 151,355 acre-feet. The Project's largest reservoirs (Fordyce, Spaulding, and Lake Valley) operate as storage reservoirs to capture rain and snowmelt during the spring and summer months and are slowly drawn down through summer and fall months, releasing water for power generation, irrigation, and domestic consumption purposes. These lakes have spill gates or flashboard structures, which are used to optimize the storage in the reservoirs during the snowmelt period. In particular, Lake Spaulding is a "hub" for conveyance of upstream regulated releases (primarily Fordyce Lake) along with water transfers into (via NID's Bowman-Spaulding Conduit) and out of (via South Yuba Canal and Drum Canal) the reservoir. Combined with the large, high elevation unimpaired watershed above Lake Spaulding and subsequent snowmelt runoff forecasting, reservoir operation at Lake Spaulding are the most complex of any other reservoir operation in the Drum-Spaulding Project.

The hydrologic and hydraulic operation planning for the Project is implemented to manage basin runoff throughout the annual hydrologic cycle for irrigation, municipal water supply, recreation, and power generation. The Project utilizes storage capacity within its reservoirs to temporarily store spring runoff that occurs during the snowmelt season. To provide additional perspective regarding the amount of runoff that is available as spring and summer snowmelt, the April-July unimpaired runoff in the Yuba River (as measured at the Smartville gage) is 42.5 percent of the full water-year unimpaired runoff, based on the 50-year average[3] from 1951-2000. This stored water is gradually released during summer and fall to augment stream flows, provide hydroelectric generation, and meet consumptive water demands. The storage reservoirs are generally operated in accordance with target storage curves to achieve reservoir levels and storage capacity to effectively manage available water.

The operation planning forecasting for the Project is completed by PG&E in cooperation with NID. Together, the two parties perform monthly snow surveys in the projects' watersheds during the winter months and, combined with snow course data from CDWR, provide this information to PG&E's hydrologists who use these data to develop runoff forecast models. In addition, PG&E uses larger scale snowmelt runoff forecasts generated by CDWR in the form of Bulletin 120 Forecasts (provided as "South Yuba River at Lang's Crossing," which is just downstream of Lake Spaulding). These data are shared with NID to determine best operational practices.

PG&E inputs monthly precipitation and runoff data to schedule energy needs, flow releases, and water demands for the Project into PG&E's proprietary SOCRATES forecasting tool. Using this forecasting model, PG&E develops a water management plan in order to achieve end of the month storage targets for the three major Project storage reservoirs: Fordyce Lake, Lake Spaulding and Lake Valley Reservoir. The remaining reservoirs are either operated with a consistent annual drawdown curve or are operated as re-regulating reservoirs (e.g., Project

[3] As measured by the California Department of Water Resources (CDWR) at the "Yuba River near Smartville plus Deer Creek" calculation point.

forebays) and run-of-river reservoirs (e.g., Fuller Lake), generally reshaping and diverting the flows from upstream storage reservoirs for irrigation, consumptive water supply and power generation.

In general, weekly and daily operation of the Drum-Spaulding Project is prioritized for facility and public safety, regulatory compliance, and to balance irrigation and domestic consumptive water demands with power generation. The Project is also operated to comply with Licensee's existing water rights licenses and permits (see Exhibit E, Appendix E11 for Licensee's water rights related to the Drum-Spaulding Project).

Additional information regarding Drum-Spaulding Project operations can be found in Exhibit B, Project Operations and Resource Utilization.

Categorization of Drum-Spaulding Project-affected Stream Reaches

The following Project-affected stream reaches have Project storage facilities located upstream and are used to re-regulate and convey flows, directly or indirectly, to a downstream Project facility:

- White Rock Lake Dam Reach No. 1 and No. 2 (White Rock and North creeks)
- Meadow Lake Dam Reach (unnamed tributary to Fordyce Creek)
- Sterling Lake Dam Reach (Bloody Creek)
- Fordyce Lake Dam Reach (Fordyce Creek)
- Kidd Lake Dam Reach (unnamed tributary to South Yuba River)
- Lower Peak Lake Dam Reach (Cascade Creek)
- Upper South Yuba Reach No. 1 and No. 2 (South Yuba River)
- Upper Rock Lake Dam Reach (Texas Creek)
- Lower Rock Lake Dam Reach No. 1 (Texas Creek)
- Lower Rock Lake Dam Reach No. 2 (Texas Creek)
- Culbertson Lake Dam Reach (unnamed tributary to Texas Creek)
- Upper Lindsey Lake Dam Reach (Lindsey Creek)
- Middle Lindsey Lake Dam Reach (Lindsey Creek)
- Lower Lindsey Lake Dam Reach (Lindsey Creek)
- Feeley Lake Dam Reach (Lake Creek)
- Carr Lake Dam Reach No. 1 (Lake Creek)
- Carr Lake Dam Reach No. 2 (Fall Creek)
- Blue Lake Dam Reach (Rucker Creek)
- Rucker Lake Dam Reach (Rucker Creek)
- Bear River Reach No. 1 (Bear River)
- Bear River Reach No. 2 (Bear River)
- Lake Valley Reservoir Dam Reach (NF of NF American River)
- Kelly Lake Dam Reach (Sixmile Creek)
- Canyon Creek above Towle Canal Diversion Dam Reach (Canyon Creek – tributary to North Fork American River)

The following Project-affected stream reaches have Project diversion facilities immediately upstream, and are perennial in nature:

- South Yuba below Spaulding Dam Reach (South Yuba River)
- South Yuba River Reaches No. 1 through No. 6 (South Yuba River)
- Lake Valley Canal Diversion Dam Reach (NF of NF American River)
- Towle Canal Diversion Dam Reach (Canyon Creek – North Fork American)
- Drum Afterbay Dam Reach (Bear River)
- Bear River Canal Diversion Dam Reach (Bear River)
- Rock Creek Reservoir Dam Reach (Rock Creek)
- Halsey Afterbay Dam Reach (Dry Creek)
- Lower Dry Creek Reach (Dry Creek)

The following Project-affected stream reaches have Project diversion facilities immediately upstream, and are ephemeral in nature:

- Fuller Lake Dam Reach (unnamed tributary to Jordan Creek)
- Jordan Creek Diversion Dam Reach (Jordan Creek)

The following Project-affected stream reaches have a Project powerhouse or powerhouse bypass that discharges directly upstream:

- Deer Creek Powerhouse Reach (South Fork Deer Creek)
- Alta Powerhouse Reach (Little Bear River)
- Wise Powerhouse Overflow Reach (Upper Auburn Ravine)
- Mormon Ravine Reach (Mormon Ravine)

For a complete list of reaches affected by the Drum-Spaulding Project, see Section 2 of this Exhibit E. Additional information regarding Drum-Spaulding Project operations can be found in Exhibit B (Project Operations and Resource Utilization) of PG&E's FLA.

Storage and Conveyance Facility Data

Reservoir storage curves and area-capacity curves for both projects can be found in each Licensees' respective FLA in Exhibit B. Specifications for the projects' dams, reservoirs, powerhouses, and conveyances can be found in each Licensee's FLA in Exhibit A.

6.2.1.1.3 Project's Operations Model (ResSim)

A computer model was developed to characterize current conditions and operations of the two projects. The model was based upon site-specific details of the projects and is therefore referred to as the Yuba-Bear/Drum-Spaulding Operations Model (Operations Model). The Operations Model was developed as a tool for use in evaluating impacts to Project-affected water resources as a result of potential operations and facilities modifications during the relicensing process.

These modeled impacts on water resources were also utilized for various resource impact assessments throughout Exhibit E. The Operations Model is provided on DVD in Appendix E12 of this Exhibit E.

The program utilized to develop the Operations Model was the United States Army Corps of Engineers - Hydrologic Engineering Center (HEC) Reservoir Simulation (ResSim) Version 3.0. This model is public domain software and was downloaded at HEC's website (http://www.hec.usace.army.mil/software/ResSim/hecressim-hecressim.htm), where model documentation and support information can also be found (USACE 2003; 2005).

ResSim is a deterministic, spatially-oriented computer model that combines a number of HEC-developed modules and is customized for each project on which it is used. ResSim is a deterministic model in that it contains no random (stochastic) components, and it is spatially-oriented in that it uses a set of graphical layers (much like layers in a Geographic Information System, or GIS, database) to create reservoir networks and route flows. GIS shape files for the Project were made available by the licensees and were imported into the Operations Model as the first step in building the connectivity of the reservoir network. The shape files are the equivalent of "trace paper" in ResSim, allowing the modeler to develop nodes in a spatially appropriate location and draw realistic reservoir shapes.

ResSim is a computer model that is built using the Java™ programming language with input and output data written to the HEC's Data Storage System (HEC-DSS). Data in HEC-DSS database files can be graphed, tabulated, edited, and manipulated with HEC-DSSVue, a Java™-based visual utilities program. Time-series data can be imported and exported from Microsoft Excel using an Excel add-in created by HEC.

ResSim is a numerical representation of the reservoirs, diversion dams, canals, and powerhouses that are used in the operation of the projects. A schematic of the modeled nodes (including unimpaired hydrology nodes and Operations Model termini) is shown in Section 5 of this Exhibit E (see Figure 5.1.2-1). To capture this concept, ResSim uses a set of operational priorities. These priorities include (but are not limited to) minimum instream flow releases, reservoir operation characteristics, consumptive water demand, and power generation. The calculation of elevations, flows, and power generation are based on reservoir inflow (from a time-series input file), and a specific guide curve (also known as "target elevation" or "rule curve") for each reservoir.

The guide curve represents the basic objective of the reservoir - get the pool elevation to, and hold it at, the guide curve. Without any other operational constraints, the decision logic will attempt to get to and maintain reservoir elevations at the guide curve, within maximum outlet capacity and physical rate of change constraints. A guide curve was developed based on recent historical reservoir elevation data and has been confirmed with Licensees' operations staff.

For each day, and from upstream to downstream, ResSim allocates available water for use from each reservoir using a daily time step. The model makes decisions and prioritizes releases from the projects' reservoirs as specified by the user within the Reservoir Editor module, as shown in

Figure 6.2.1-2. Within the Reservoir Editor, "operation zones" are defined (as shown on the left hand side of the figure as "Top of Dam," "Maximum Pool," etc.). These zones represent an actual range of reservoir elevations, within which individual priorities are created (shown graphically as subsets under each operation zone). One zone (typically the "Conservation" pool) is designated as the guide curve. Any available water for use in that day that cannot be used is retained in the reservoir and contributes to the next day's beginning elevation. ResSim is always run for all projects' developments because there is dependency on inflows from one reservoir to another, but run periods (entire period of record, a critical period, one year, etc.) can vary. Minimum and maximum reservoir elevations (including seasonal changes, where applicable) are also modeled using operation zones with zone-specific rules (e.g., all releases in excess of minimum in-stream flow are forced to cease once a reservoir reaches its "Minimum Pool" operation zone). Output data can be viewed from annual average to daily average down to 15-minute-increment time steps (depending on the time step used for the simulation). Operations Model output includes flow out of and into each of the projects' facilities, but can focus on any one facility or group of facilities.

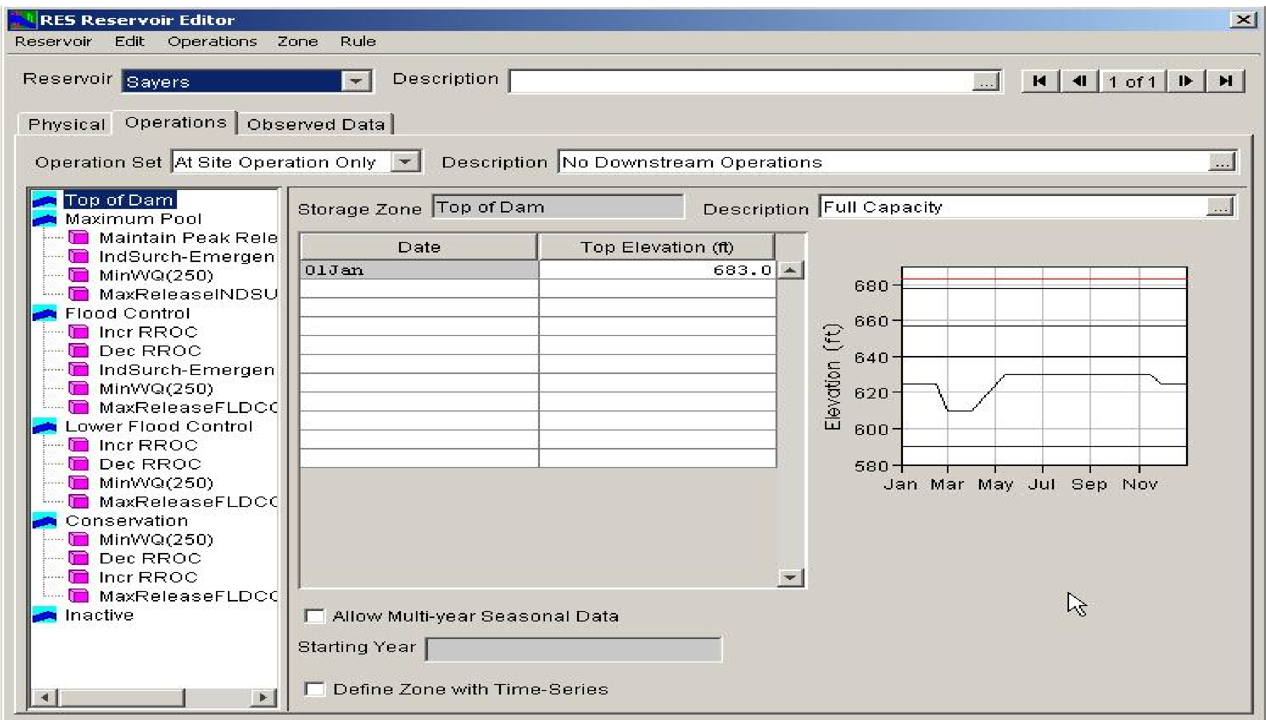


Figure 6.2.1-2. ResSim's Reservoir Editor (example project shown).

For the two projects, the Operations Model was customized using the existing physical, contractual (e.g, existing seasonal minimum Project water conveyance flows as defined in coordinated operations contracts between NID and PG&E), and other Project data (e.g., recreation-based reservoir targets). In addition, the Operations Model used mean daily unimpaired flow data as the hydrology inputs (i.e., the source of water or discretionary volume of water to the Projects) for simulations of a given scenario. "Unimpaired flows" are defined as synthesized mean daily stream flows that would have occurred in Project-affected reaches in the absence of flow regulation. This synthesized mean daily unimpaired flow data were developed by the Licensees, and provided on the Project Relicensing Hydrology and Power Generation Data digital versatile disc (DVD), included in Appendix E12 of this Exhibit E. The hydrology period for the model encompassed water years 1976 to 2008. This period of record was based upon the availability of gage data for all pertinent features of the two projects, including reservoir storage, stream flow below dams (bypass reach flows), and diversion flows for consumptive water delivery and power generation.

Definition of Terms Used in Operations Modeling

To better understand the modeling process, including model validation, it is useful to define several terms related to the sequential process of model development:

- Conceptual Operations Model: An expert's view of the process being modeled, often conveyed as a schematic. In the case of a hydropower project, the schematic includes interconnected components with inflow, outflow, and storage among the components. The conceptual model also includes specifications of components (e.g., hydraulic capacities, flow and storage rating curves) as well as rules of operations (e.g., seasonal reservoir elevation constraints, seasonal diversion limits).

- Mathematical Operations Model: A set of equations that describe the conceptual model in mathematical terms. The mathematical model can be either “deterministic” or “stochastic.” ResSim is a deterministic model, with equations that represent water inflowing at certain rates, reservoir elevations changing at certain rates, water discharging at certain rates, and with inflow hydrology based on gage data. In contrast, a stochastic model is a mathematical model that contains random (stochastic) components or inputs; consequently, for any specified input scenario, the corresponding model output variables are known only in terms of probability distributions. An example would be to run a scenario that used randomly generated (stochastic) hydrology data to represent inflow to the model rather than hydrology based on gage measurements. Typically these types of runs are made with numerous iterations, and the results are presented as a Monte Carlo distribution.

- Computer Operations Model: A mathematical model converted to computer code so that the input and parameter values are entered into a computer and the program determines the associated output values. The computer model follows a sequence of computer coded operations that reflects the conceptual model via implementation of the mathematical model. For a hydropower project model, the computer model includes logic that works within the confines of the math equations to implement various effects, such as maximizing generation, while maintaining certain minimum flows in stream reaches and minimizing spills.

- Calibration: Adjustments of input parameter values (e.g., turbine efficiency curve data) so that the model output estimates (e.g., generation) are closer to the measured system output values. Calibration adjustments may occur by manually varying the value of one or more input parameters, or by statistical estimation techniques such as least square regression to vary input parameters. A calibrated model is technically valid only for a particular scenario and data base. This is also called *model tuning*.

- Verification: Determination that the computer model is a faithful representation of the mathematical model, and that the mathematical model is a faithful representation of the conceptual model. For the Operations Model, the verification process includes comparing model results to recent historical data, where appropriate.

- Validation: Determination of the extent to which a model is well-founded and fulfills the purpose for which it was constructed. Validation denotes the establishment of legitimacy. It requires verification and successful evaluation.

Operations Model Validation/Verification

The Operations Model was developed using the best available knowledge of the system components (specifications) and system operation. Operations Model verification occurs by running the Operations Model with unimpaired flow data for a given year or series of years and then comparing the Operations Model results (output) to historical data (e.g., recorded gage measurements or calculations of reservoir elevations, bypass flows, powerhouse flows and generation, etc.), to verify that Operations Model results provide a reasonable match against historical data. Operations Model validation is an evaluation of the verification results to determine whether the Operations Model output provides a reasonable representation of historical Project operations for the year(s) modeled, and is hence appropriate for use in comparing Operations Model simulation results of "current" versus "alternative" Project operations that may be considered during evaluations or within the relicensing process. Differences greater than 5 percent were examined, and refined if possible given best available information. It is expected that some differences occurred due to: 1) a change in operating style over time (e.g., more conservative winter operations due to facility safety concerns, addition or modification of facilities, increased consumptive water demands), which the Operations Model cannot predict, 2) unplanned outages which the Operations Model can not predict, and 3) explicit operating decisions based on external variables, such as meteorological conditions or energy value, which the Operations Model often cannot make.

Four verification scenarios were evaluated for validation of the Operations Model:

- Water Year 2001 (dry year)
- Water Year 1995 (wet year)
- Water Year 2003 (normal year)
- Water Year 1994-Water Year 2004 (recent historical period)

Verification of the Operations Model was conducted for water years 2001, 1995, and 2003, which are representative of three hydrologic conditions: normal, wet, and dry hydrologic years. Water year 2003 was selected as a representative normal year, 1995 as a representative wet year, and 2001 as a representative dry year. The modeled results for each verification year were compared with historic generation, reservoir levels, and discharge volumes. In addition to verifying the Operations Model under different hydrologic conditions, it was also important to select relatively recent years for Operations Model verification under conditions that are representative of current projects' operating conditions, physical arrangement, and data availability. These periods were used during the Operations Model verification process, which took place prior to the extension of the relicensing hydrologic dataset from WY2004 to WY2008. As such, these representative years and period of analysis are not necessarily the same as those utilized for other analyses in this FLA. As an example, the representative wet year that is utilized for resource impact analyses within this FLA is Water Year 2006.

The Operations Model is coded to run day-to-day operations of the two projects based on general operating conditions or rules. The computer Operations Model follows these rules strictly without exception, 365 days per year, similar to an automated operation of the projects. Actual projects' operations generally follow the operating rules, but human intervention periodically deviates from the general operating rules to accommodate day-to-day realities, such as equipment failure and maintenance, periodic access by NID and PG&E staff to remote locations or inaccessibility due to snow, changing hydrologic conditions and energy demand, and potential end of year water sales, etc. In addition to differences between modeled operations versus actual operations that include human interventions, there are also inherent discrepancies as a result of input data inaccuracies (e.g., uncertainties in hydrology data, turbine or generator efficiencies, reservoir storage curves, etc.). Finally, as stated above, several operating conditions exist that cannot be explicitly modeled using ResSim. Where this is the case, a modeling assumption has been made that is deemed to most accurately simulate the results of said operating condition over a long-term period of analysis. It is important to understand that due to these differences between actual operating conditions versus modeled conditions, Operations Model results will never completely match historic operations. It is also important to note that modeling is often a balance of absolute accuracy through specificity and comparative functionality through flexible model parameters. This consideration has been important in the development of rules and schedules within the Operations Model.

The verification scenarios simulated historic generation based on available historic operations data for water years 2001, 1995, 2003, and 1994-2004, discussed below. The historic operation data, listed below, was input to simulate actual generation and verify computed generation and discharge.

- Maintenance/Diversion Capacity Schedules: A maintenance schedule was developed and input for all canals based on reported outages and/or periods of zero discharge at either a powerhouse or at an associated stream gage. In addition, diversion flow decisions can vary based on meteorological, maintenance, or downstream capacity constraints. Therefore, diversion capacities were modified to "shape" diversion flows where necessary to provide a reasonable fit from a seasonal and annual volume perspective.
- Guide Curve Elevations: Historical reservoir levels for 2001, 1995, and 2003 were modeled as "conservation pool" guide curve elevations for all Project reservoirs (where data is available). General target elevations (based on recent median reservoir elevations, also taking into account historic fill patterns) are modeled as the Recent Historical Verification for the period of water years 1994-2004.

Operations Model verification is evaluated by a combination of quantitative and qualitative comparisons between modeled outputs versus historic data. The quantitative component of verification is the comparison of modeled versus historic power generation and discharge flows at each node. The qualitative component of verification is the comparison of hydrographs for modeled versus historic data at each node. Operations Model verification also includes a check of the Operations Model output for violations of the projects' operating constraints that may have occurred during a given simulation (e.g., violation of minimum instream flow requirements, reservoir fluctuation limits, etc.). Finally, verification also includes a global evaluation of system-wide generation and management of water resources.

As mentioned previously, at the completion of an Operations Model run, the ResSim software produces output that provides a check of the Operations Model output to identify whether any operating constraints were violated during the Operations Model run. The Operations Model reports minimum modeled instream flows for potential violations of requirements and minimum reservoir elevations. The user must compare required operating conditions to the Operations Model output to determine whether a violation has taken place.

Summary of Modeled Results versus Historical Data

For an indication of the performance of the Operations Model, the historic annual generation was compared to the Operations Model-predicted generation (as based on the Operations Model run developed during this verification process) for each of the sixteen powerhouses in the two projects and for the system total under the verification periods described above. The results of this analysis are provided in Table 6.2.1-1. The model-estimated generation closely matched historic generation values at the majority of powerhouses and verification periods. The comparison of generation totals (i.e., sum of all sixteen powerhouses) between modeled and observed for each of the three years was 0.5 percent, 0.7 percent, and 0.9 percent for 1995, 2001, and 2003, respectively, and was 1.9 percent for the recent historical period of WY1994-WY2004.

Table 6.2.1-1. Generation comparisons for dry (WY 2001), wet (WY 1995), normal (WY 2003), and recent historical (WY1994-2004) verification periods (based on results generated during the Operations Model verification process). Differences of greater than 5 percent are italicized.

Powerhouse (Licensee)	Operations Model (GWh/year)	Historical (GWh/year)	Percent Difference
WY 2001 (dry water year)			
Bowman (NID)	9.2	8.9	3.4%
Spaulding No. 3 (PG&E)	24.8	24.0	3.2%
Spaulding No. 1 (PG&E)	20.9	20.8	0.5%
Spaulding No. 2 (PG&E)	8.0	8.4	-4.3%
Deer Creek (PG&E)	23.1	22.9	0.9%
Drum No. 1 (PG&E)	50.8	52.1	-2.7%
Drum No. 2 (PG&E)	215.8	213.0	1.3%
Alta (PG&E)	3.4	3.4	-2.0%
Dutch Flat No. 1 (PG&E)	62.7	61.9	1.2%
Dutch Flat No. 2 (NID)	54.4	51.7	5.3%
Chicago Park (NID)	100.2	95.4	5.0%

Table 6.2.1-1. (continued)

Powerhouse (Licensee)	Operations Model (GWh/year)	Historical (GWh/year)	Percent Difference
WY 2001 (dry water year) (continued)			
Rollins (NID)	46.6	45.5	2.4%
Halsey (PG&E)	53.7	54.8	-2.0%
Wise (PG&E)	67.0	72.4	-7.4%
Wise No. 2 (PG&E)	8.5	9.0	-5.6%
Newcastle (PG&E)	28.2	27.3	3.3%
Total	**777.1**	**771.3**	**0.7%**
WY 1995 (wet water year)			
Bowman (NID)	14.0	15.2	-7.9%
Spaulding No. 3 (PG&E)	40.2	38.8	3.6%
Spaulding No. 1 (PG&E)	36.2	43.4	-16.5%
Spaulding No. 2 (PG&E)	18.4	17.9	2.9%
Deer Creek (PG&E)	26.0	24.8	4.9%
Drum No. 1 (PG&E)	185.3	184.7	0.3%
Drum No. 2 (PG&E)	288.8	286.7	0.7%
Alta (PG&E)	3.9	3.9	1.4%
Dutch Flat No. 1 (PG&E)	105.3	105.6	-0.2%
Dutch Flat No. 2 (NID)	143.3	144.8	-1.0%
Chicago Park (NID)	219.0	213.4	2.6%
Rollins (NID)	85.0	86.1	-1.4%
Halsey (PG&E)	66.7	65.7	1.6%
Wise (PG&E)	88.8	83.7	6.0%
Wise No. 2 (PG&E)	15.0	14.1	6.8%
Newcastle (PG&E)	41.2	41.5	-0.7%
Total	**1,377.2**	**1,370.2**	**0.5%**
WY 2003 (normal water year)			
Bowman (NID)	15.8	16.2	-2.7%
Spaulding No. 3 (PG&E)	36.6	36.0	1.8%
Spaulding No. 1 (PG&E)	38.3	38.9	-1.7%
Spaulding No. 2 (PG&E)	11.5	11.6	-0.6%
Deer Creek (PG&E)	22.8	22.1	3.1%
Drum No. 1 (PG&E)	122.8	124.8	-1.6%
Drum No. 2 (PG&E)	321.4	319.5	0.6%
Alta (PG&E)	4.1	4.1	-0.3%
Dutch Flat No. 1 (PG&E)	104.8	99.0	5.9%
Dutch Flat No. 2 (NID)	106.4	104.1	2.2%
Chicago Park (NID)	183.4	175.3	4.6%
Rollins (NID)	75.3	74.4	1.3%
Halsey (PG&E)	58.7	60.1	-2.3%
Wise (PG&E)	81.9	87.6	-6.5%
Wise No. 2 (PG&E)	5.0	5.3	-6.3%
Newcastle (PG&E)	35.9	34.5	4.1%
Total	**1,224.7**	**1,213.5**	**0.9%**
WY 1994 - WY 2004 (Recent Historical Period)			
Bowman (NID)	16.4	15.2	8.4%
Spaulding No. 3 (PG&E)	40.5	36.4	11.2%
Spaulding No. 1 (PG&E)	34.1	35.9	-5.2%
Spaulding No. 2 (PG&E)	13.1	12.5	4.7%
Deer Creek (PG&E)	22.8	21.5	5.8%
Drum No. 1 (PG&E)	129.4	113.0	14.5%
Drum No. 2 (PG&E)	299.7	285.2	5.1%
Alta (PG&E)	4.2	4.2	-0.9%

Table 6.2.1-1. (continued)

Powerhouse (Licensee)	Operations Model (GWh/year)	Historical (GWh/year)	Percent Difference
WY 2001 (dry water year)			
Dutch Flat No. 1 (PG&E)	82.8	80.1	3.3%
Dutch Flat No. 2 (NID)	113.6	124.0	-8.4%
Chicago Park (NID)	165.1	168.5	-2.1%
Rollins (NID)	68.5	69.9	-2.0%
Halsey (PG&E)	60.1	58.8	2.3%
Wise (PG&E)	79.7	83.4	-4.4%
Wise No. 2 (PG&E)	11.7	9.9	17.7%
Newcastle (PG&E)	32.7	34.0	-4.1%
Projects Total	**1,174.1**	**1,152.6**	**1.9%**

The results from the verification runs confirm that the logic used to develop the regulated hydrology, reservoir operations, and power generation in the Operations Model are appropriate to represent the Licensees' No-Action Alternative for both the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

Development of the Licensees' No-Action Alternative Operations Model

Once Operations Model verification has been completed for representative water years and the recent historical period, there is no further need to compare Operations Model results to historical data. For all operations modeling during the relicensing process, the Licensees' No-Action Alternative simulation serves as the benchmark, or baseline, for comparison of future simulation modeling results. The No-Action Alternative, which is the same for both projects, is described in Exhibit B, of each Licensee's FLA for their respective Project.

The comparison of the No-Action Alternative to the historical operations of a project frequently yields similar results (e.g., power generation or reservoir elevation statistics); in this instance, the results differ slightly. The difference here is primarily due to the following five items that are factors in the No-Action Alternative: 1) the official retirement of Alta Powerhouse, Unit 2; 2) the re-operation between PG&E's Dutch Flat No. 1 and NID's Dutch Flat No. 2 powerhouses; 3) PG&E and NID's modified winter/spring operations since 1997; 4) the use of new usable storage capacity estimates generated by Licensees' 2007-2009 bathymetric studies at selected reservoirs; and 5) the use of the WY2001-2009 annual average water demands (as compared to actual annual water demands under the historical case).

Exhibits A and B of each Licensee's FLA present the existing Project facilities and operations, respectively, used to represent the Licensees' No-Action Alternative.

6.2.1.1.4 Description of Operation Under Licensees' Proposed Projects

Licensees' Proposed Projects include the operating assumptions made in the No-Action Alternative outlined above along with Licensees' proposed PM&E measures relevant to projects' operations and resource utilization, including minimum streamflows and reservoir minimum pools. In addition, in Licensees' cumulative effects analyses, Licensees evaluate all operating scenarios with and without the assumption of projected[4] water supply demands as projected through the year 2062 by PCWA and NID. The projected water supply demands are discussed in greater detail in Exhibit E, Section 3. See Appendices E3 and E7 for NID's and PG&E's proposed PM&E measures, respectively.

The Licensees' Proposed Projects flow duration curves illustrating: monthly; representative dry (2001), normal (2003), and wet (2006) water years; and period of record (1976 to 2008) flow exceedances are provided for streams below reservoirs where the Proposed Project hydrology differs from the Licensees' No-Action Alternative. Monthly flow duration curves, including the period of record (1976 to 2008), are also provided below for all the powerhouses.

Yuba-Bear Hydroelectric Project

The sections below describe water resources in Project-affected reaches, as modeled under Licensees' Proposed Projects. The hydrology did not change from the No-Action Alternative to the Licensees' Proposed Projects at Jackson Creek below Jackson Lake; therefore, flow duration curves under the Licensees' Proposed Projects at this location were not included below. Additional information regarding Yuba-Bear Hydroelectric Project operations, including flow duration curves under the No-Action Alternative, can be found in Exhibit B, Project Operations and Resource Utilization, of NID's Application for a new License for the Project.

<u>Jackson Meadows Reservoir</u>
Since Jackson Meadows Reservoir is operated to capture and store spring and early summer runoff, discharge below Jackson Meadows Dam into the Middle Yuba River is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-3 for water years 1976 through 2008. Figure 6.2.1-4 shows flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows at this location are measured by NID gage YB-301, but do not include spillway flows; the Operations Model data shown in the figures below include both low level outlet releases and spillway flows.

[4] NID's projected consumptive water demands for use in Licensees' Proposed Projects Operations Model are based on recent historical trends, anticipated water demand increases based on the Raw Water Master Plan 2032 projections, and a continued increase in demands through the year 2062. PCWA's projected consumptive water demands through 2062 for use in Licensees' Proposed Projects Operations Model were provided to the Licensees in March 2011, and the anticipated trend for demand increases was presented by PCWA in their January 31, 2011 comment letter on Licensees' DLAs.

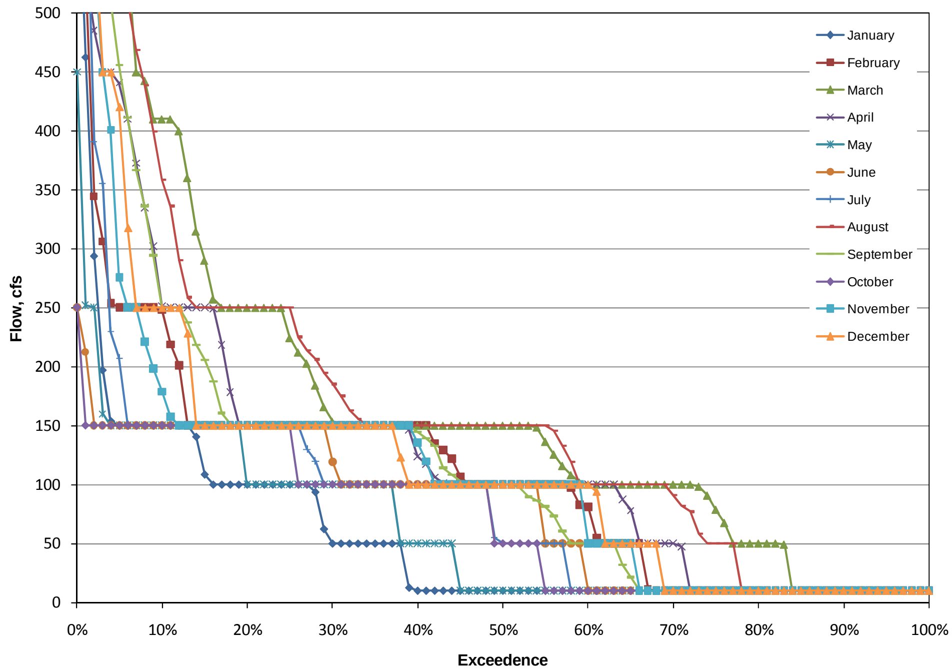


Figure 6.2.1-3. Modeled monthly flow duration curves for Middle Yuba River below Jackson Meadows Reservoir for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

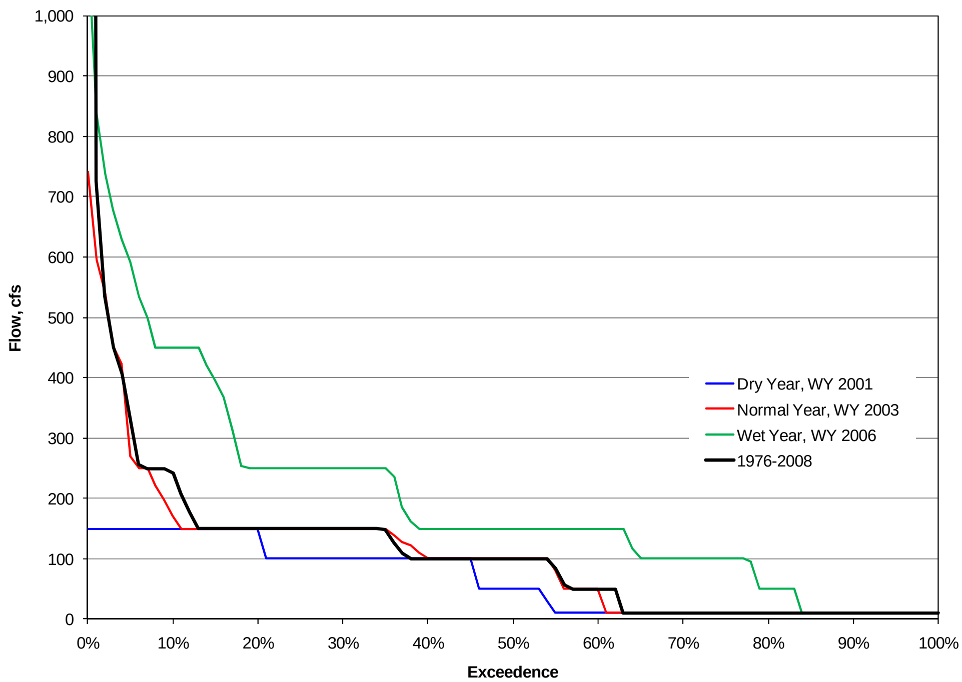


Figure 6.2.1-4. Modeled flow duration curves for Middle Yuba River below Jackson Meadows Reservoir in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Milton Diversion Impoundment

Inflows are regulated by local accretion and releases from Jackson Meadows Reservoir. Milton Diversion Impoundment operates as a flow control feature, diverting up to 425 cfs into the Milton-Bowman Diversion Conduit to Bowman Lake. There are no rule curve requirements for Milton Diversion Impoundment, as can be seen in the flow duration curves shown in Figures 6.2.1-5 and 6.2.1-6. Flow duration curves for the Milton-Bowman Tunnel are provided in Figures 6.2.1-7 and 6.2.1-8. Regulated flows at Middle Yuba River below Milton Diversion Dam are measured by NID gage YB-304. Regulated flows in the Milton-Bowman Tunnel are measured by NID gage YB-303.

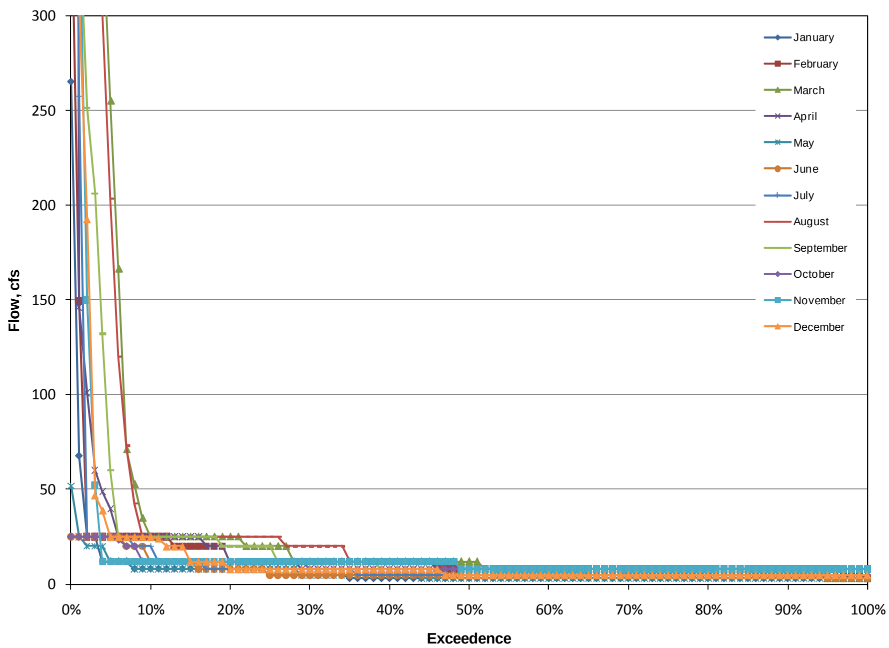


Figure 6.2.1-5. Modeled monthly flow duration curves for Middle Yuba River below Milton Diversion Dam for the relicensing period of record of 1976 through 2008 under Licensees' Proposed Projects Operations Model.

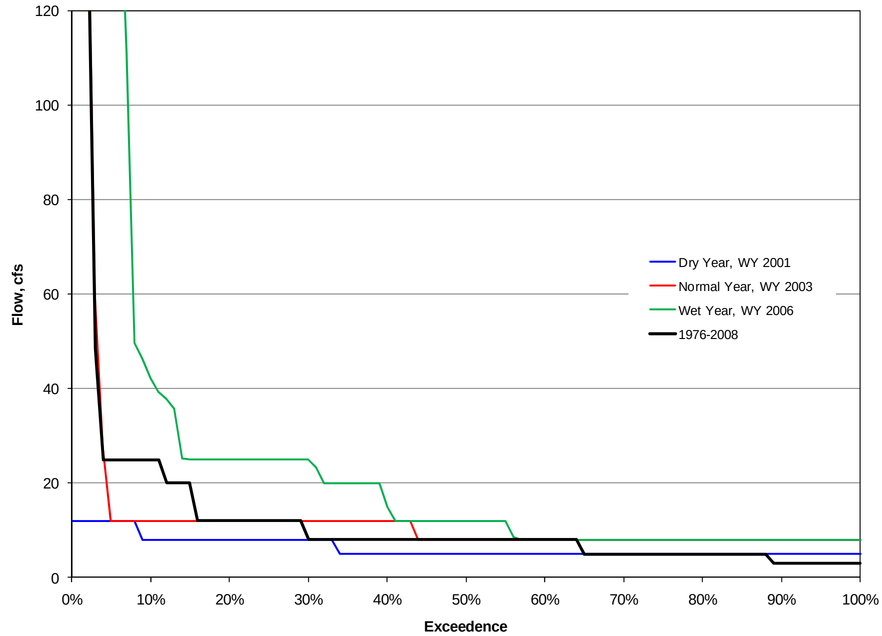


Figure 6.2.1-6. Modeled flow duration curves for Middle Yuba River below Milton Diversion Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

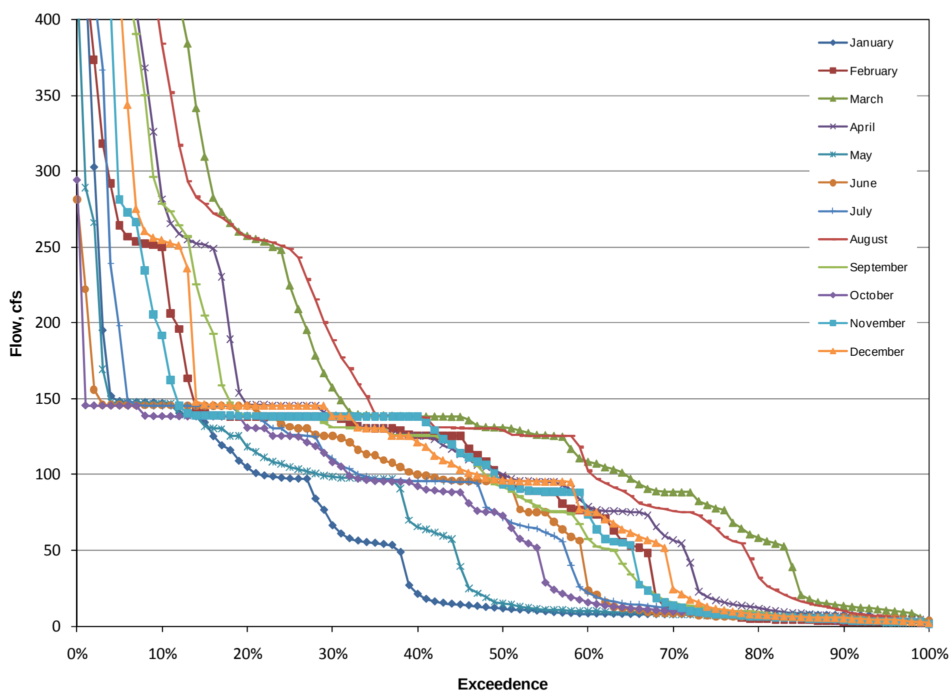


Figure 6.2.1-7. Modeled monthly flow duration curves for Milton-Bowman Tunnel Outlet for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

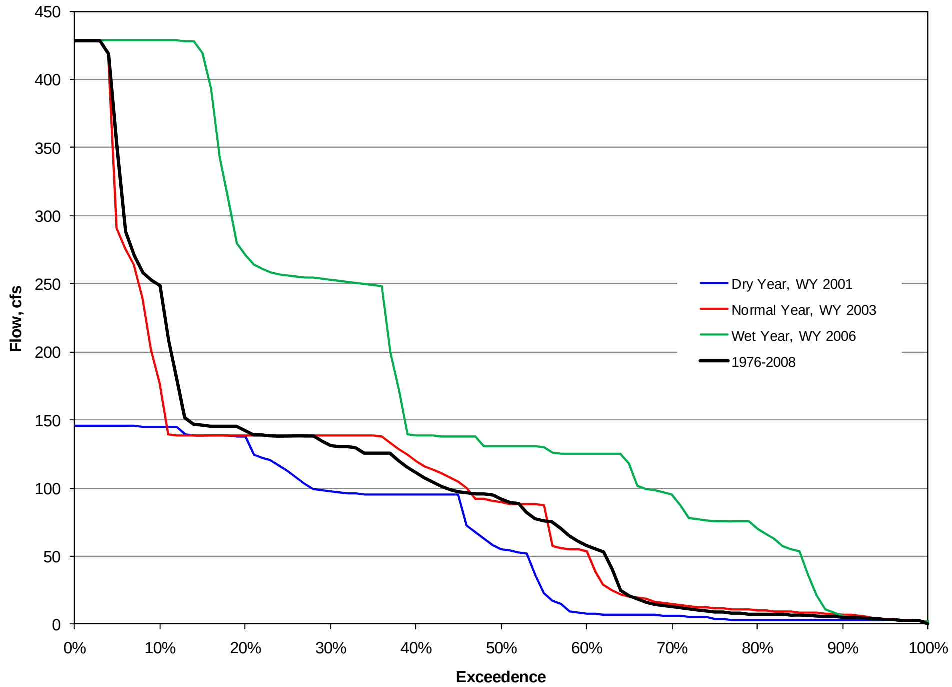


Figure 6.2.1-8. Modeled flow duration curves for Milton-Bowman Tunnel Outlet in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

French Lake

Since French Lake is operated to capture and store spring and early summer runoff, discharge below French Lake Dam into Canyon Creek is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-9 for water years 1976 through 2008. Figure 6.2.1-10 shows the flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows at this location are measured by NID gage YB-306.

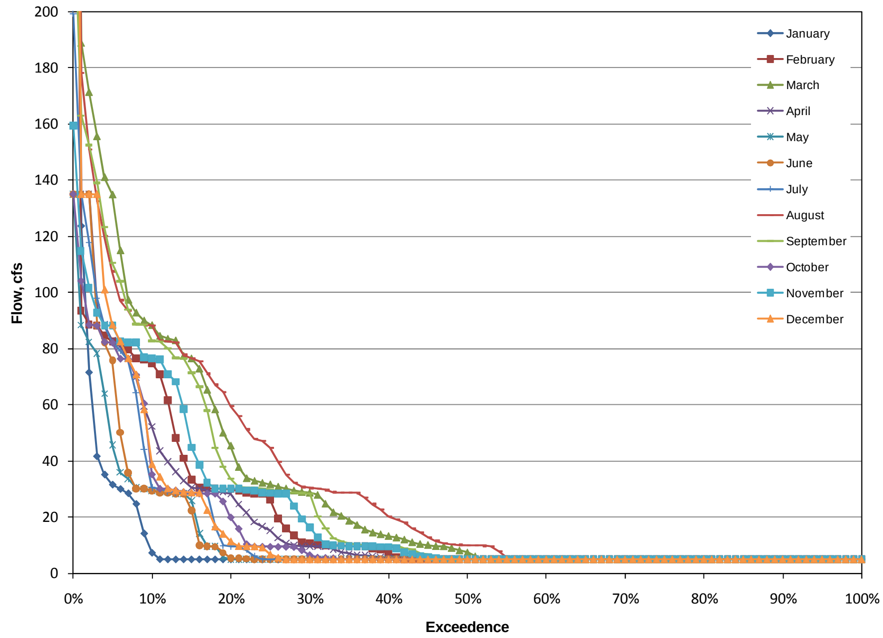


Figure 6.2.1-9. Modeled monthly flow duration curves for Canyon Creek below French Lake for the relicensing period of record of 1976 through 2008 under Licensees' Proposed Projects Operations Model.

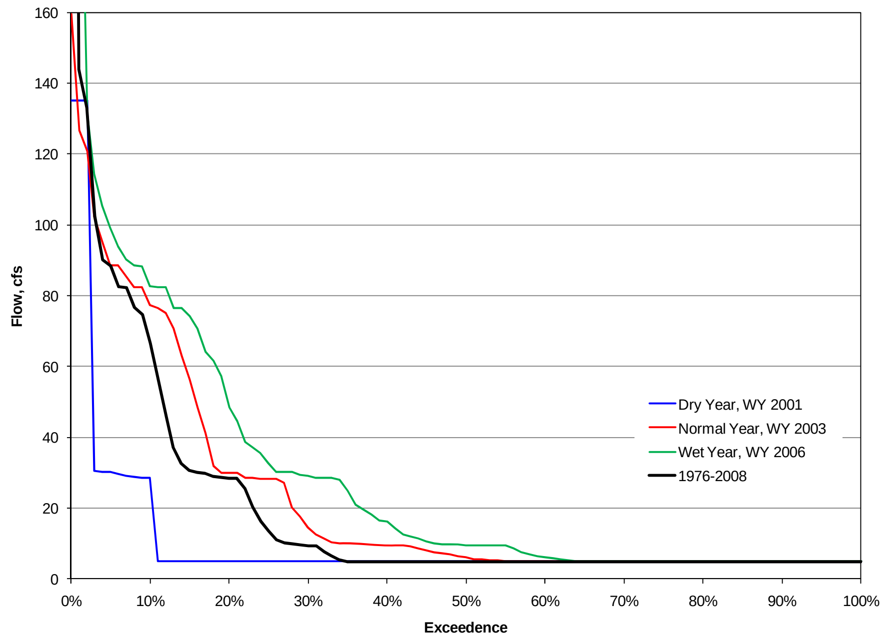


Figure 6.2.1-10. Modeled flow duration curves for Canyon Creek below French Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Faucherie Lake

Inflows into Faucherie Lake are regulated by local accretion and releases from French Lake. Since the reservoir is operated to capture and store spring and early summer runoff, discharge below Faucherie Lake Dam into Canyon Creek is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-11 for water years 1976 through 2008. Figure 6.2.1-12 shows monthly flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows at this location are measured by NID gage YB-308.

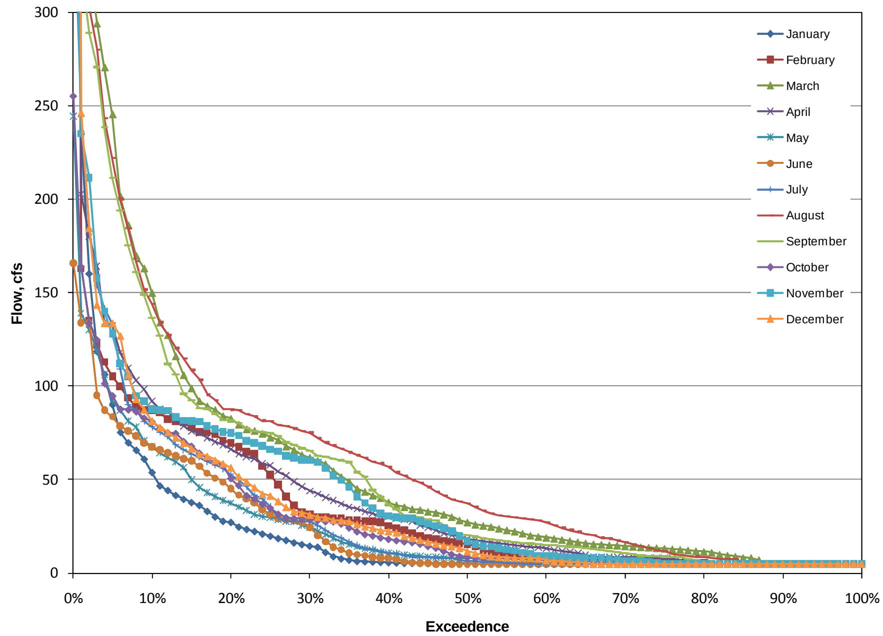


Figure 6.2.1-11. Modeled monthly flow duration curves for Canyon Creek below Faucherie Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

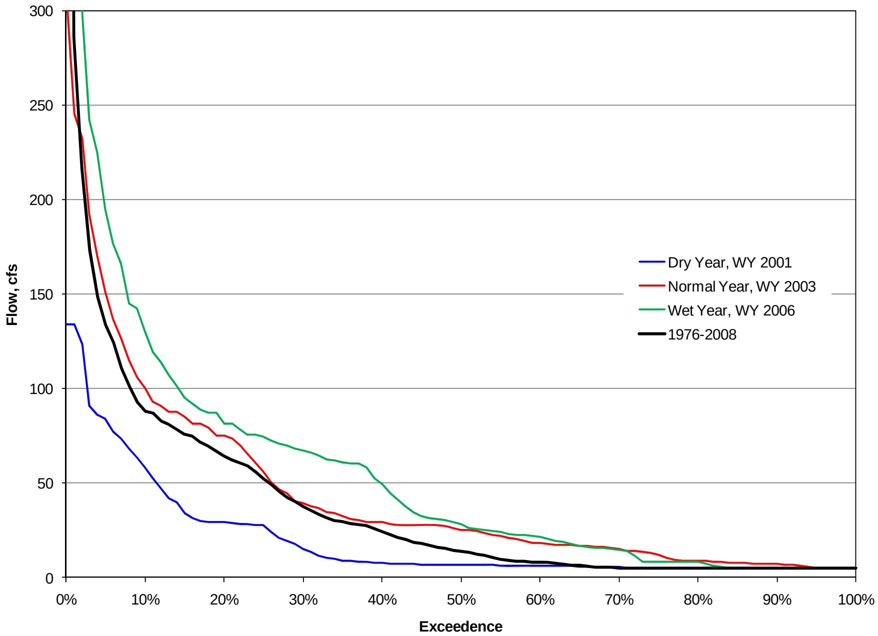


Figure 6.2.1-12. Modeled flow duration curves for Canyon Creek below Faucherie Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Sawmill Lake

Inflows into Sawmill Lake are regulated by local accretion and two upstream reservoirs. Since the reservoir is operated to capture and store spring and early summer runoff, discharge below Sawmill Lake Dam into Canyon Creek is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-13 for water years 1976 through 2008. Figure 6.2.1-14 shows flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows at this location are measured by NID gage YB-310.

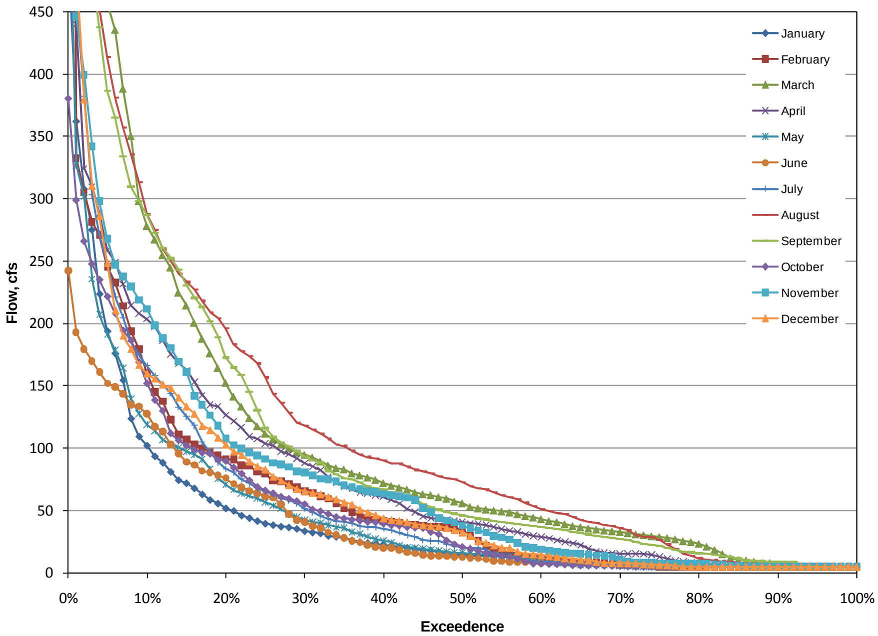


Figure 6.2.1-13. Modeled monthly flow duration curves for Canyon Creek below Sawmill Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

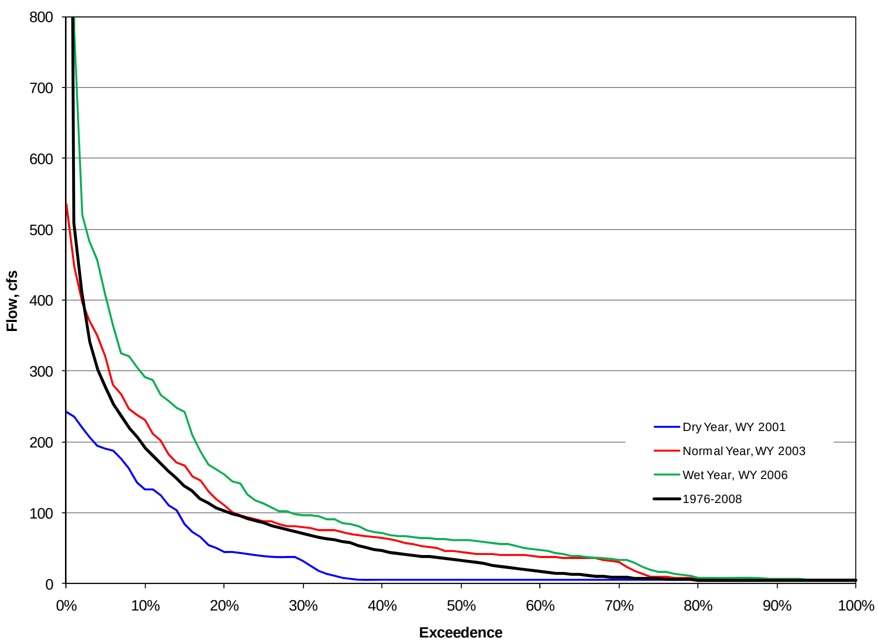


Figure 6.2.1-14. Modeled flow duration curves for Canyon Creek below Sawmill Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Bowman Lake

Inflows into Bowman Lake are highly regulated by multiple upstream reservoirs and local accretion. The reservoir is operated to capture and store spring and early summer runoff and to divert water to Bowman Powerhouse. Flow duration curves for Canyon Creek below Bowman Dam are provided in Figures 6.2.1-15 and 6.2.1-16. Flow duration curves for the Bowman-Spaulding Conduit are provided in Figures 6.2.1-17 and 6.2.1-18. Both sets of flow duration curves are for the period of record. Regulated flows at Canyon Creek below Bowman-Spaulding Diversion Dam are measured by NID gage YB-315. Regulated flows in the Bowman-Spaulding Conduit below the Bowman-Spaulding Diversion Dam are measured by NID gage YB-314.

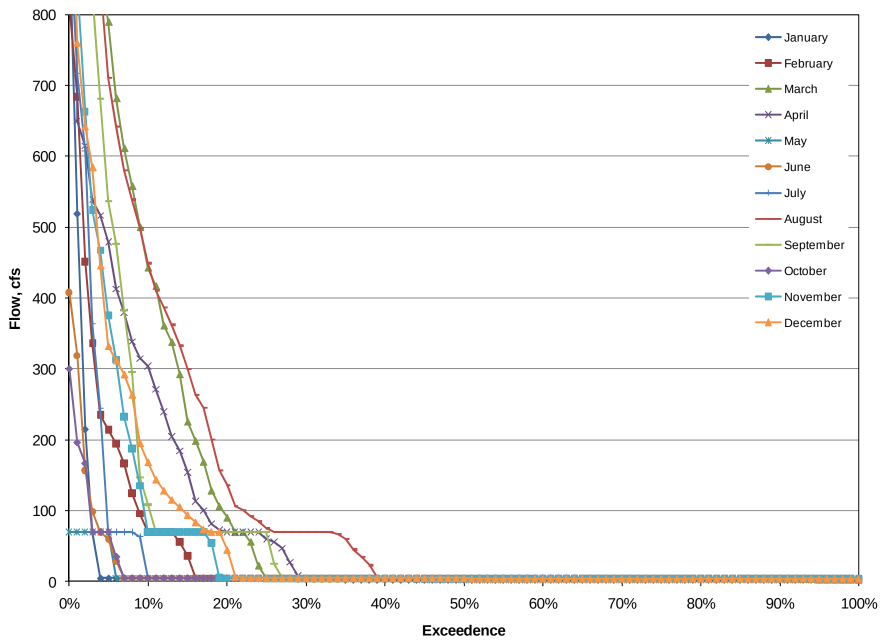


Figure 6.2.1-15. Modeled monthly flow duration curves for Canyon Creek below Bowman Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

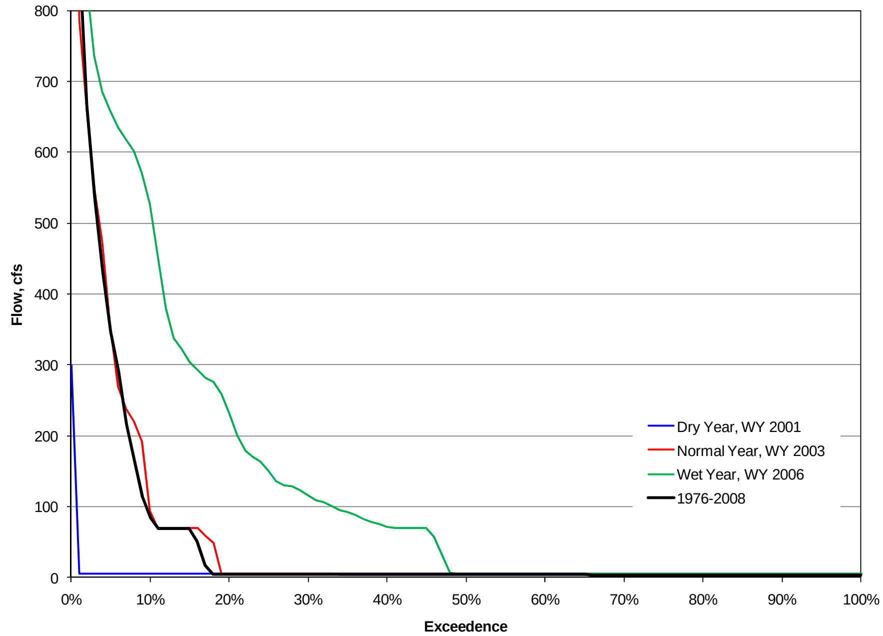


Figure 6.2.1-16. Modeled flow duration curves for Canyon Creek below Bowman Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

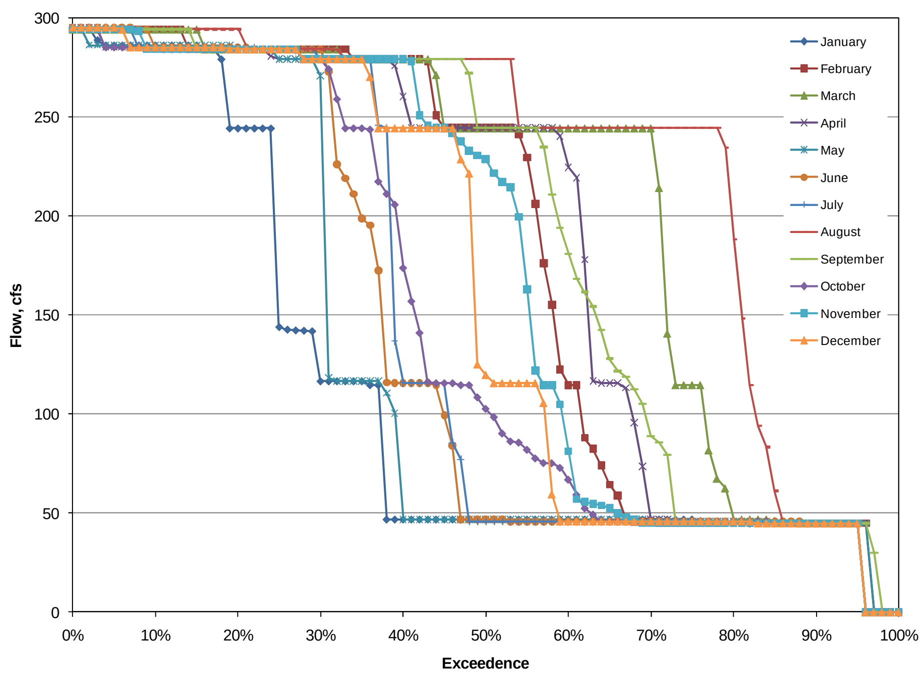


Figure 6.2.1-17. Modeled monthly flow duration curves for Bowman-Spaulding Conduit below Bowman-Spaulding Conduit Diversion Dam for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model Run.

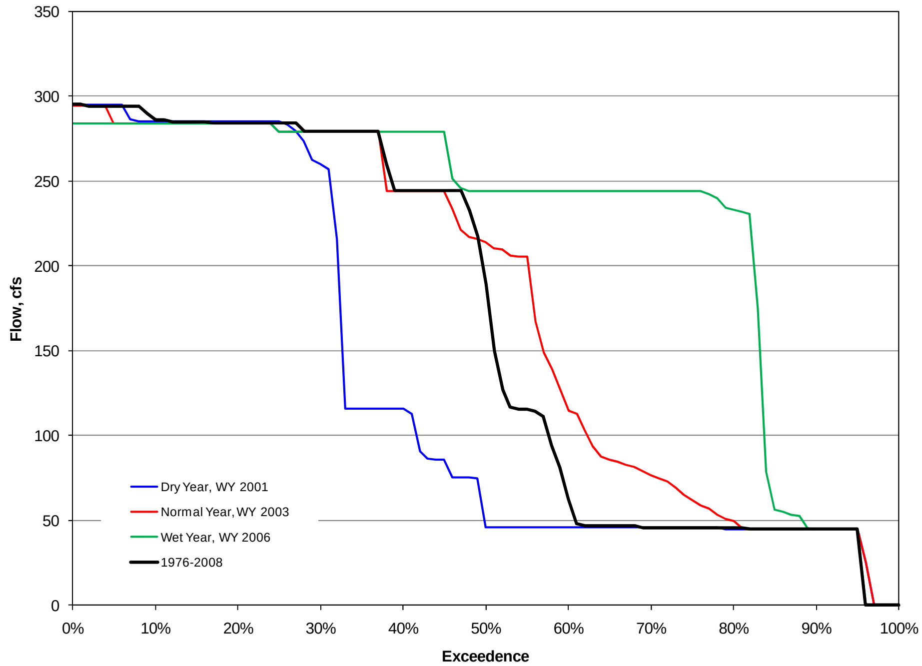


Figure 6.2.1-18. Modeled flow duration curves for Bowman-Spaulding Conduit below Bowman-Spaulding Conduit Diversion Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Dutch Flat Afterbay

Dutch Flat Afterbay is operated as a re-regulating reservoir, regulating inflows from the Bear River, PG&E's Dutch Flat No. 1 Powerhouse, and NID's Dutch Flat No. 2 Powerhouse into Chicago Park Flume. Discharge below Dutch Flat Afterbay Dam into the Bear River is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-19 for water years 1976 through 2008. Figure 6.2.1-20 shows flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows in the Bear River below Dutch Flat Afterbay Dam are measured by NID gage YB-197.

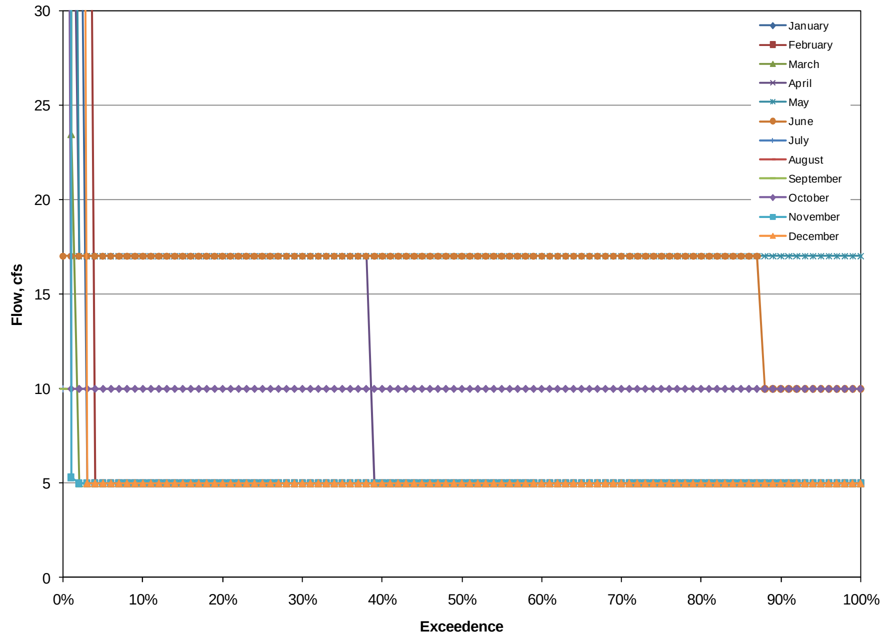


Figure 6.2.1-19. Modeled monthly flow duration curves for Bear River below Dutch Flat Afterbay for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

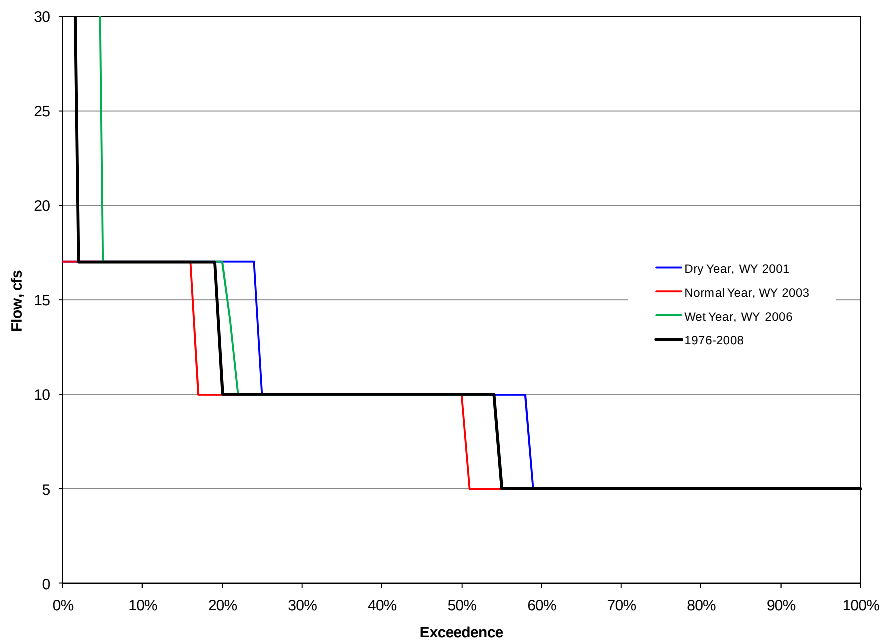


Figure 6.2.1-20. Modeled flow duration curves for Bear River below Dutch Flat Afterbay in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model Run.

Rollins Reservoir

Rollins Reservoir is operated as a storage reservoir for irrigation, recreation, and power demands. Discharge below Rollins Reservoir Dam into the Bear River[5] is regulated, as indicated in the monthly flow duration curves shown in Figure 6.2.1-21 for water years 1976 through 2008. Figure 6.2.1-22 shows flow duration curves for the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record (1976-2008). Regulated flows in the Bear River below Bear River Canal Diversion Dam are measured by NID gage YB-196.

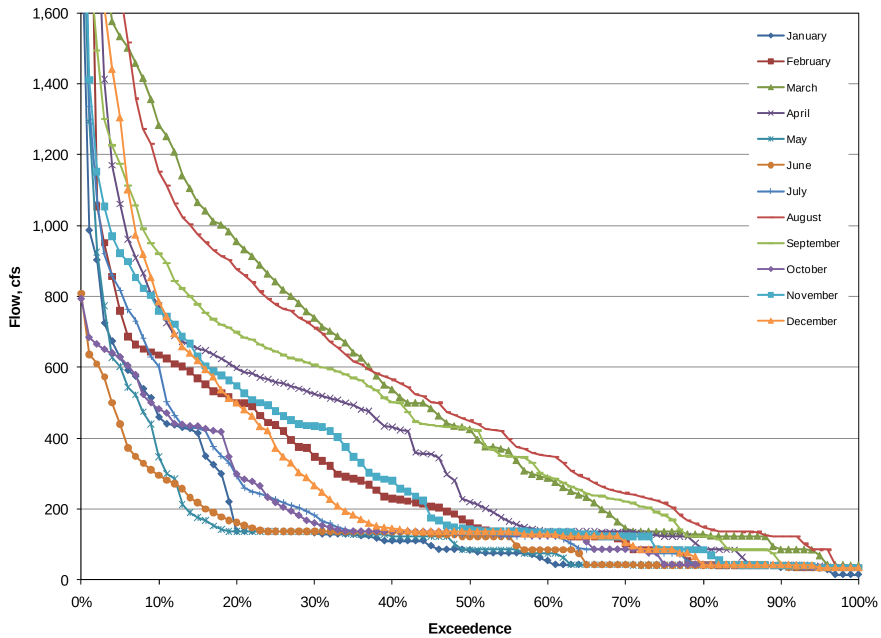


Figure 6.2.1-21. Modeled monthly flow duration curves for Bear River below Rollins Reservoir for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

[5] Model node is located at Bear River at Highway 173 crossing, below PG&E's Bear River Canal Diversion Dam (also known as YB-196).

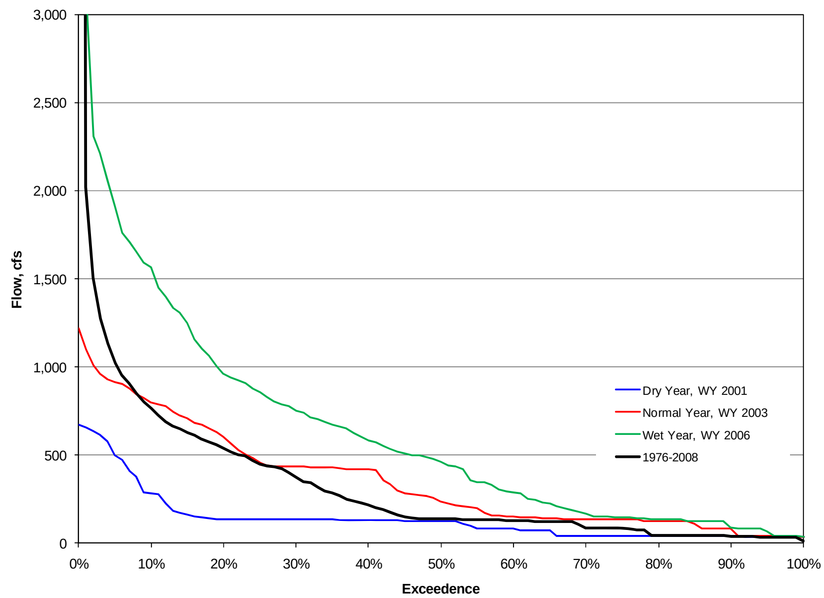


Figure 6.2.1-22. Modeled flow duration curves for Bear River below Rollins Reservoir in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Bowman Powerhouse

Annual and monthly flow duration curves for Bowman Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-23. Data shown are derived from Operations Model output at Bowman Powerhouse.

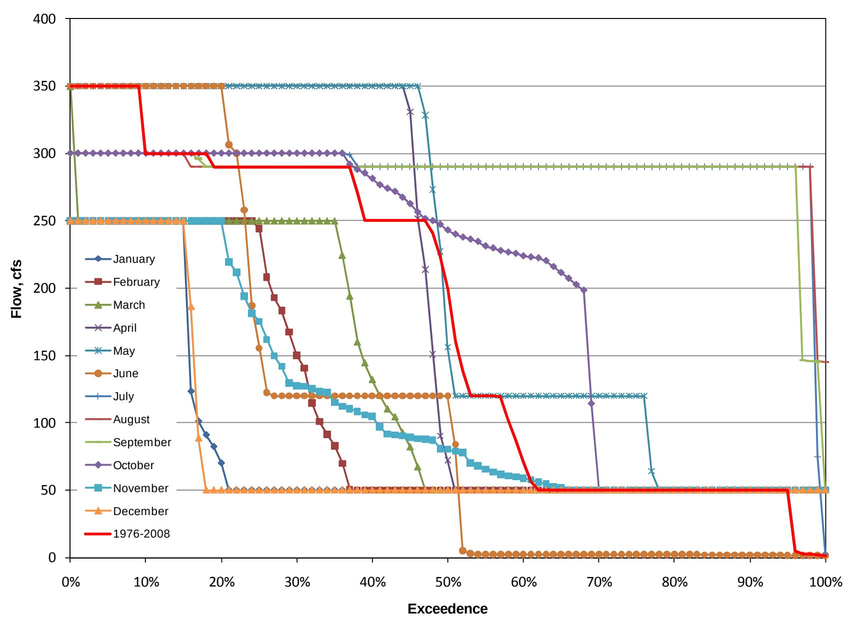


Figure 6.2.1-23. Bowman Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Dutch Flat No. 2 Powerhouse

Annual and monthly flow duration curves for Dutch Flat No. 2 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-24. Data shown are derived from Operations Model output at Dutch Flat No. 2 Powerhouse.

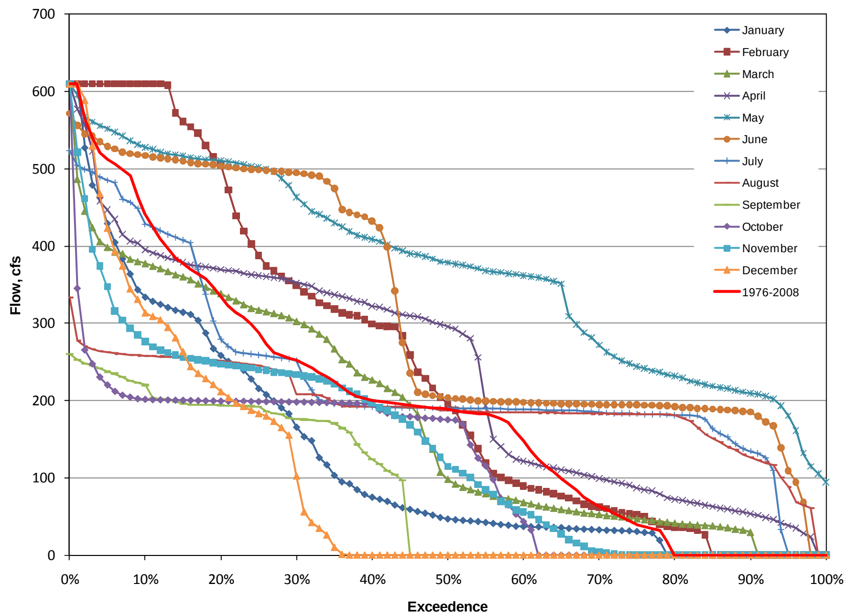


Figure 6.2.1-24. Dutch Flat No. 2 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Chicago Park Powerhouse

Annual and monthly flow duration curves for Chicago Park Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-25. Regulated flows at this location are measured by NID gage YB-258.

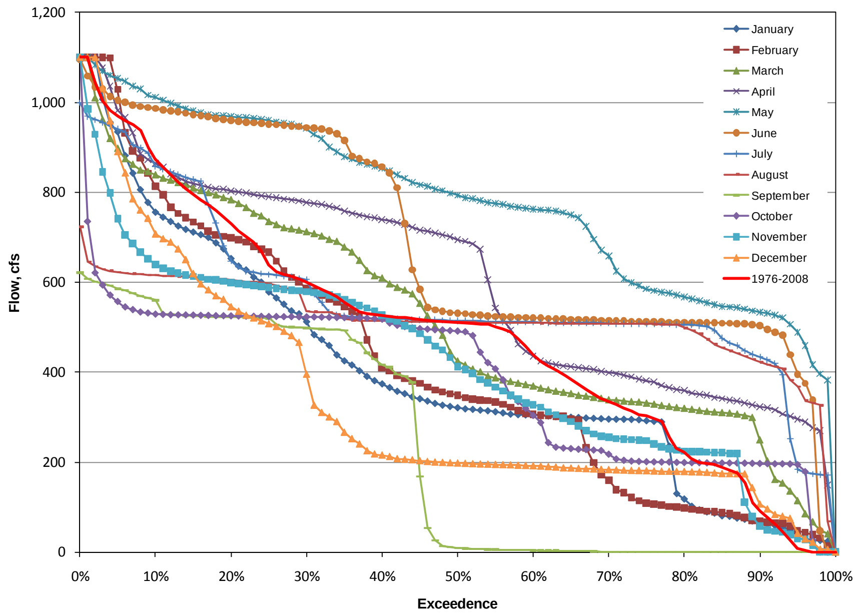


Figure 6.2.1-25. Chicago Park Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Rollins Powerhouse

Annual and monthly flow duration curves for Rollins Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-26. Regulated flows at this location are measured by NID gage YB-279.

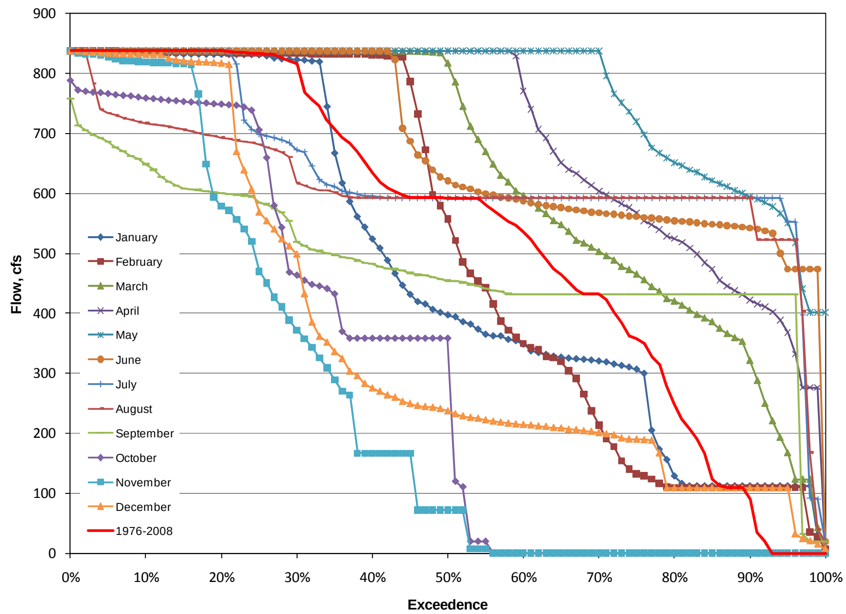


Figure 6.2.1-26. Rollins Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Drum-Spaulding Project

The sections below describe flow duration curves in Project-affected reaches, as modeled under Licensees' Proposed Projects. The hydrology did not change from the No-Action Alternative to the Proposed Project at the following locations (see Exhibit B for the No-Action Alternative flow duration curves at these locations):

- White Rock Creek below White Rock Lake
- South Yuba River below Kidd Lake and Lower Peak Lake
- Cascade Creek below Upper Peak Lake
- Cascade Creek below Lower Peak Lake
- Lindsey Creek below Upper Lindsey Lake
- Lindsey Creek below Middle Lindsey Lake
- Lindsey Creek below Lower Lindsey Lake
- Texas Creek below Upper Rock Lake
- Texas Creek below Lower Rock Lake
- Lake Creek below Feeley Lake
- Lake Creek below Carr Lake

Culbertson Lake

Culbertson Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Lake Spaulding. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for the unnamed tributary below Culbertson Lake for water years 1976 through 2008 are shown in Figure 6.2.1.27. Figure 6.2.1.28 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-203.

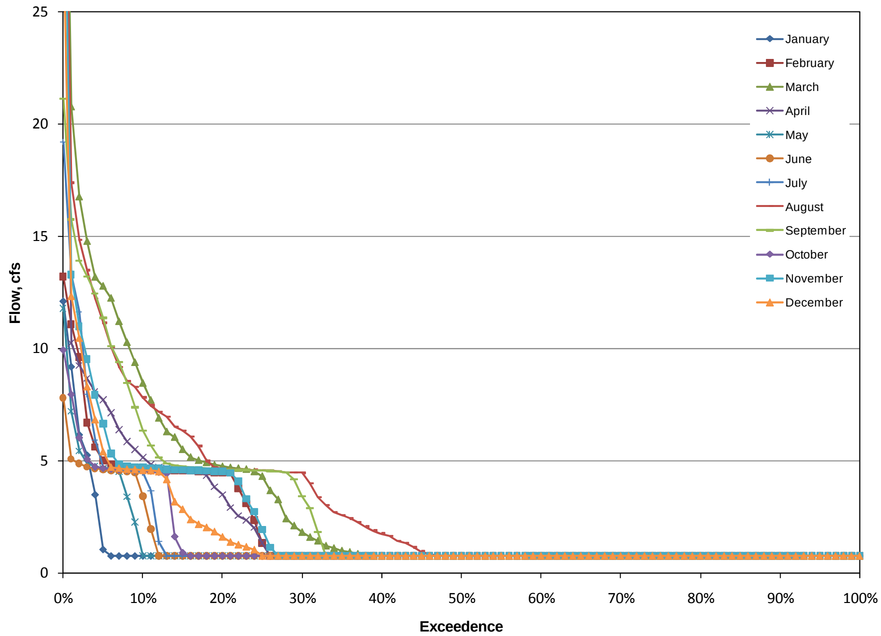


Figure 6.2.1-27. Modeled monthly flow duration curves for the unnamed tributary below Culbertson Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

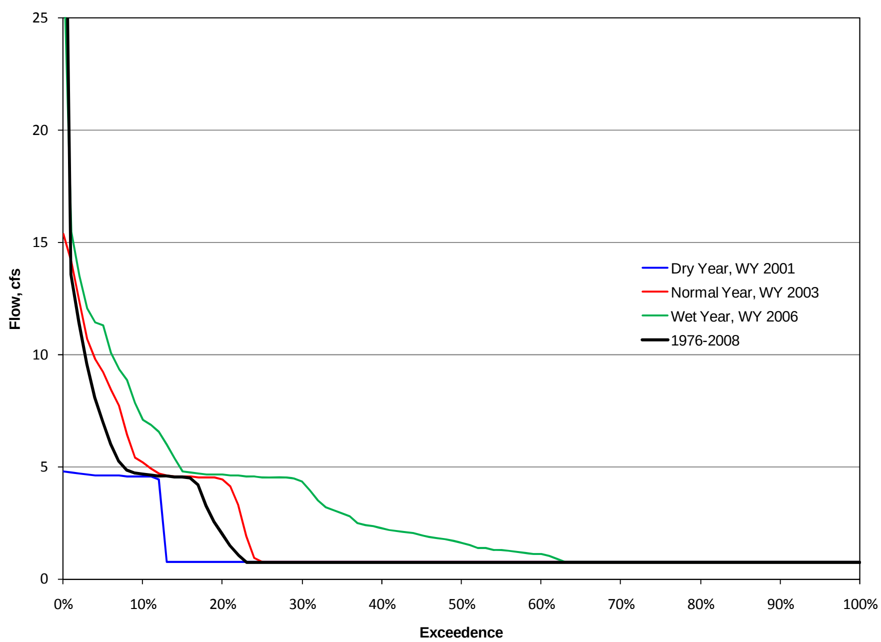


Figure 6.2.1-28. Modeled flow duration curves for the unnamed tributary below Culbertson Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Middle Lindsey Lake

Middle Lindsey Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Lake Spaulding. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Lindsey Creek below Middle Lindsey Lake for water years 1976 through 2008 are shown in Figure 6.2.1-29. Figure 6.2.1-30 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-205.

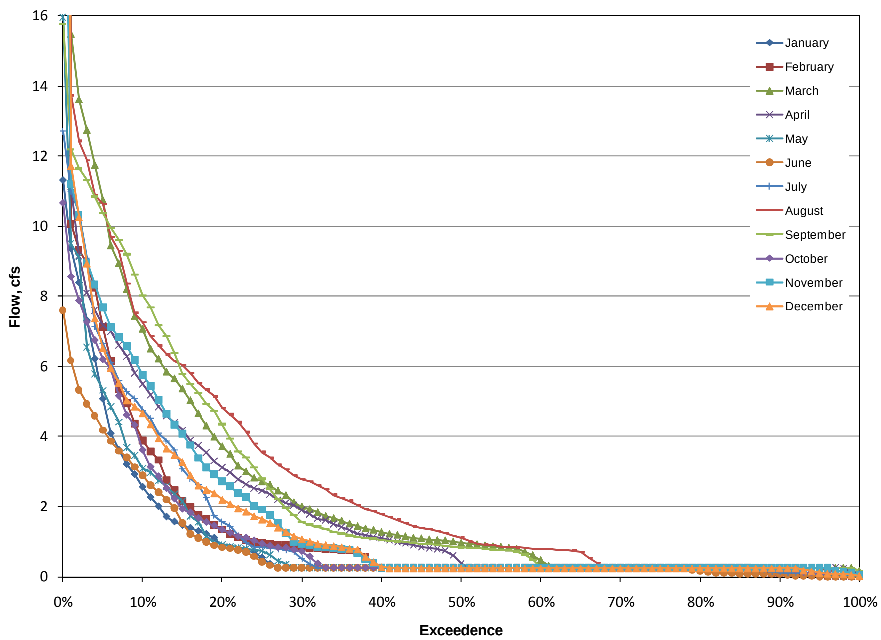


Figure 6.2.1-29. Modeled monthly flow duration curves for Lindsey Creek below Middle Lindsey Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

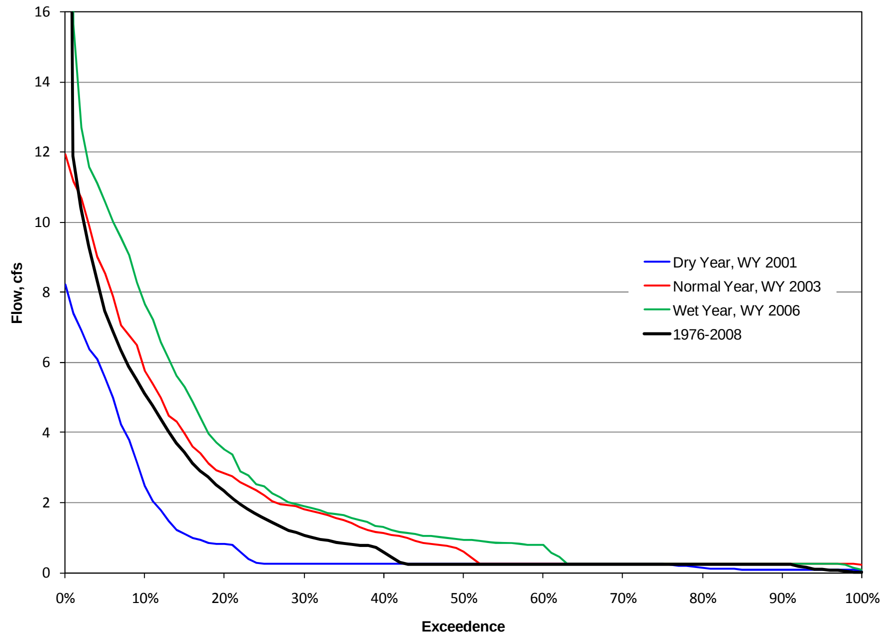


Figure 6.2.1-30. Modeled flow duration curves for Lindsey Creek below Middle Lindsey Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Lower Lindsey Lake

Lower Lindsey Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Lake Spaulding. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Lindsey Creek below Lower Lindsey Lake for water years 1976 through 2008 are shown in Figure 6.2.1-31. Figure 6.2.1-32 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-206.

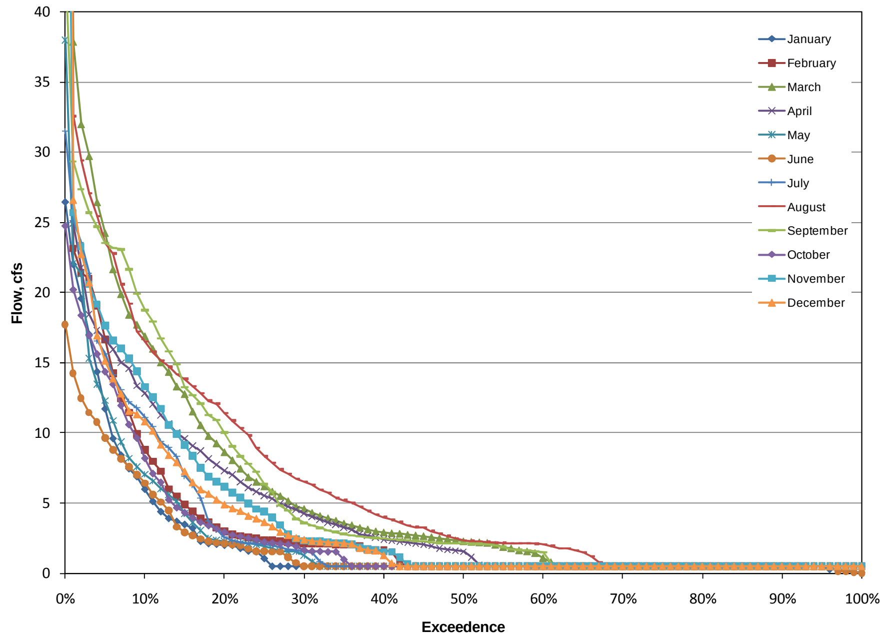


Figure 6.2.1-31. Modeled monthly flow duration curves for Lindsey Creek below Lower Lindsey Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

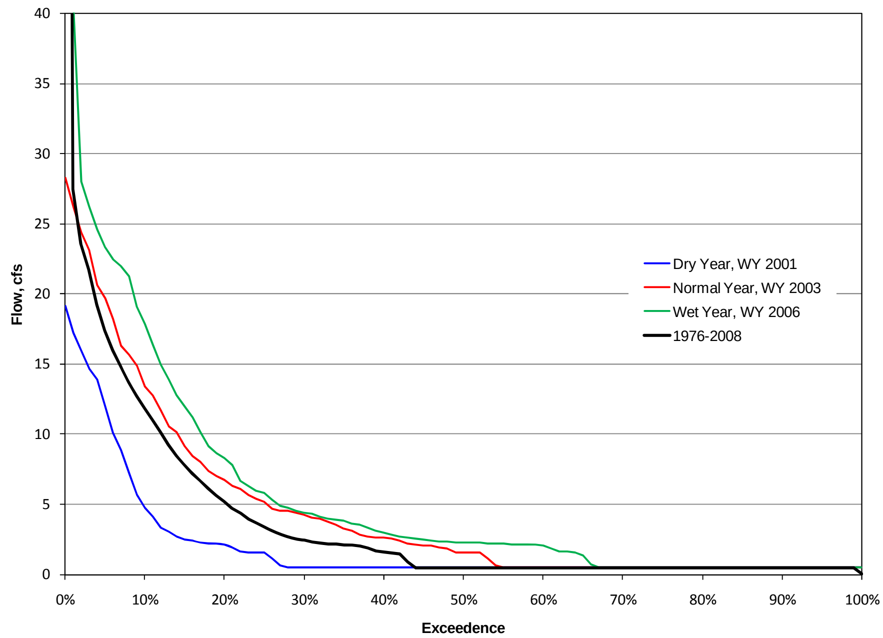


Figure 6.2.1-32. Modeled flow duration curves for Lindsey Creek below Lower Lindsey Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

<u>Blue Lake</u>

Blue Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Lake Spaulding. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Rucker Creek below Blue Lake for water years 1976 through 2008 are shown in Figure 6.2.1-33. Figure 6.2.1-34 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-209.

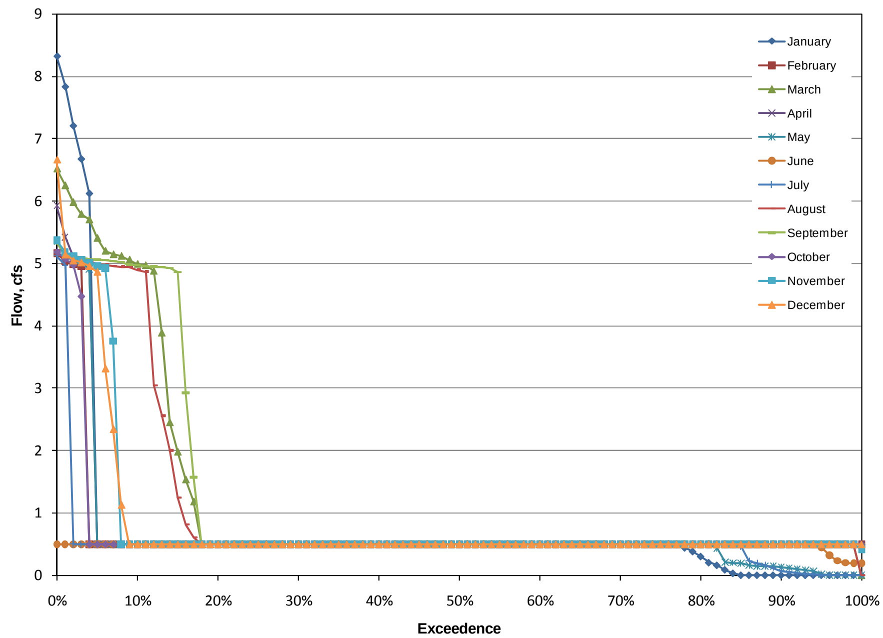


Figure 6.2.1-33. Modeled monthly flow duration curves for Rucker Creek below Blue Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

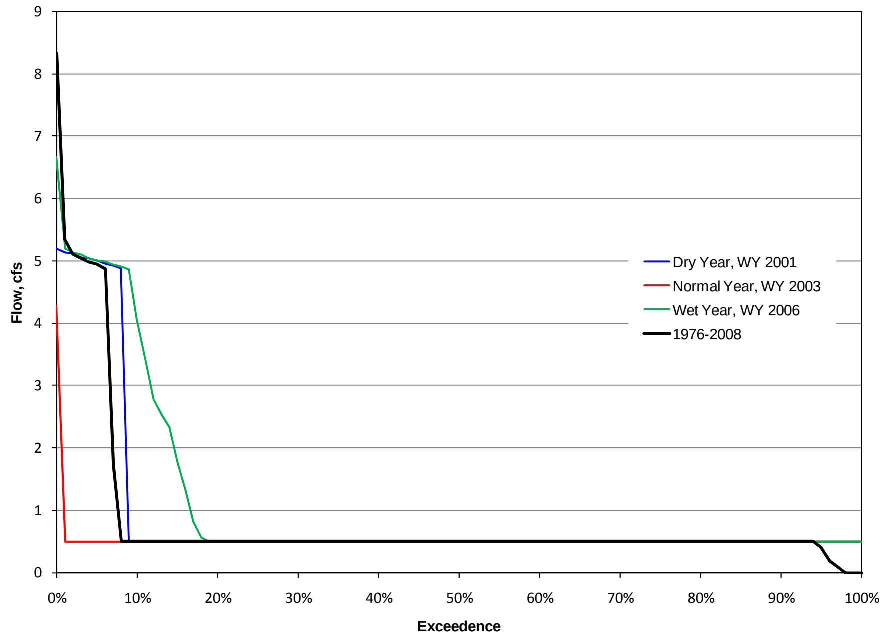


Figure 6.2.1-34. Modeled flow duration curves for Rucker Creek below Blue Lake Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

<u>Rucker Lake</u>

Rucker Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Lake Spaulding. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Rucker Creek below Rucker Lake for water years 1976 through 2008 are shown in Figure 6.2.1-35. Figure 6.2.1-36 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-210.

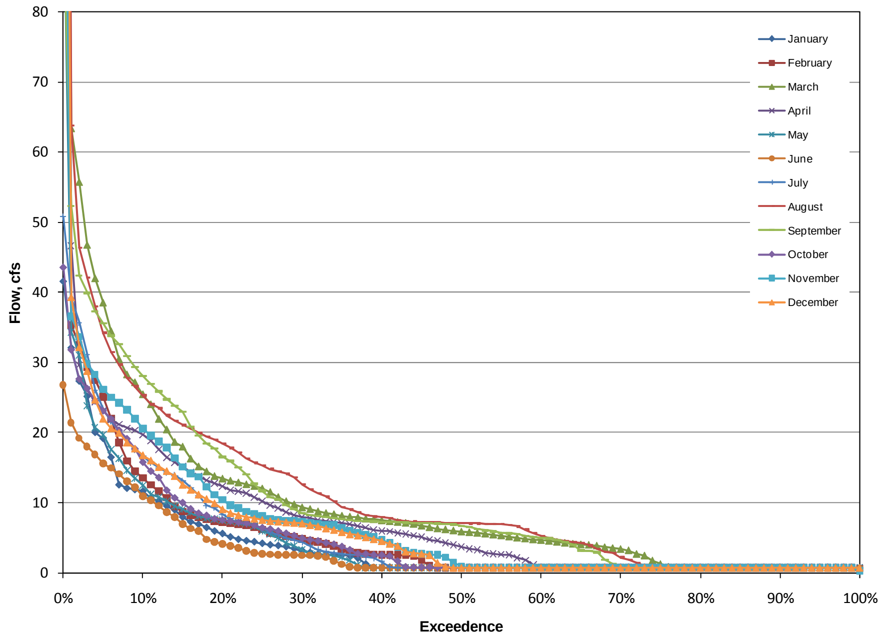


Figure 6.2.1-35. Modeled monthly flow duration curves for Rucker Creek below Rucker Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

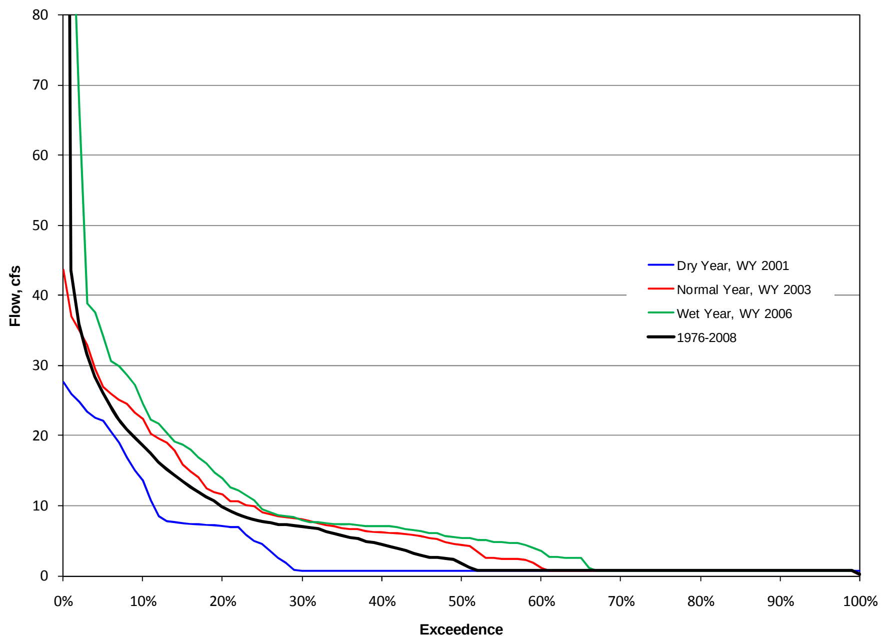


Figure 6.2.1-36. Modeled flow duration curves for Rucker Creek below Rucker Lake in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

<u>Fuller Lake</u>

Fuller Lake is used as a re-regulating pool for hydropower generation shaping. Modeled monthly flow duration curves for the unnamed tributary below Fuller Lake for water years 1976 through 2008 are shown in Figure 6.2.1-37. Figure 6.2.1-38 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Data shown are derived from Operations Model output in the unnamed tributary (to Jordan Creek) below Fuller Lake Dam.

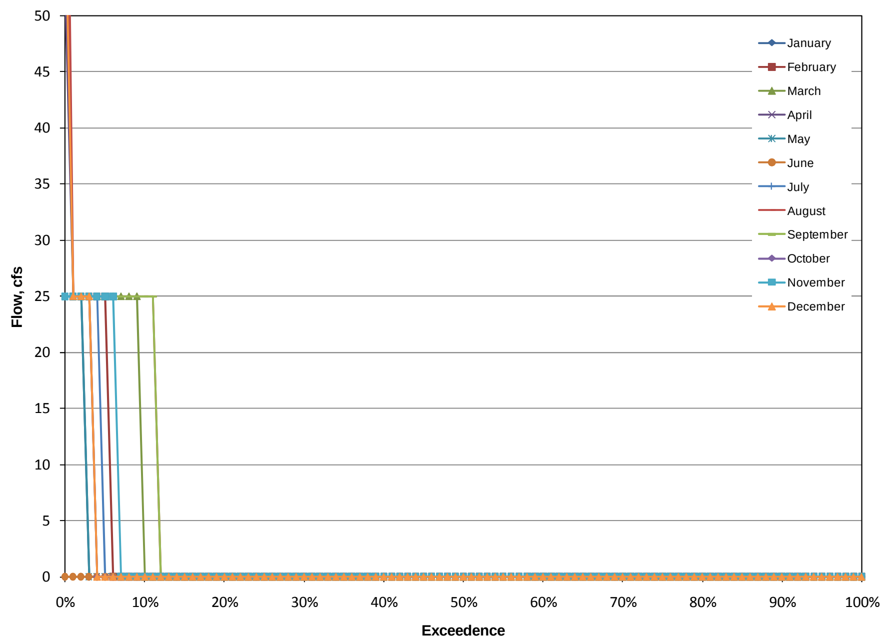


Figure 6.2.1-37. Modeled monthly flow duration curves for the unnamed tributary below Fuller Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

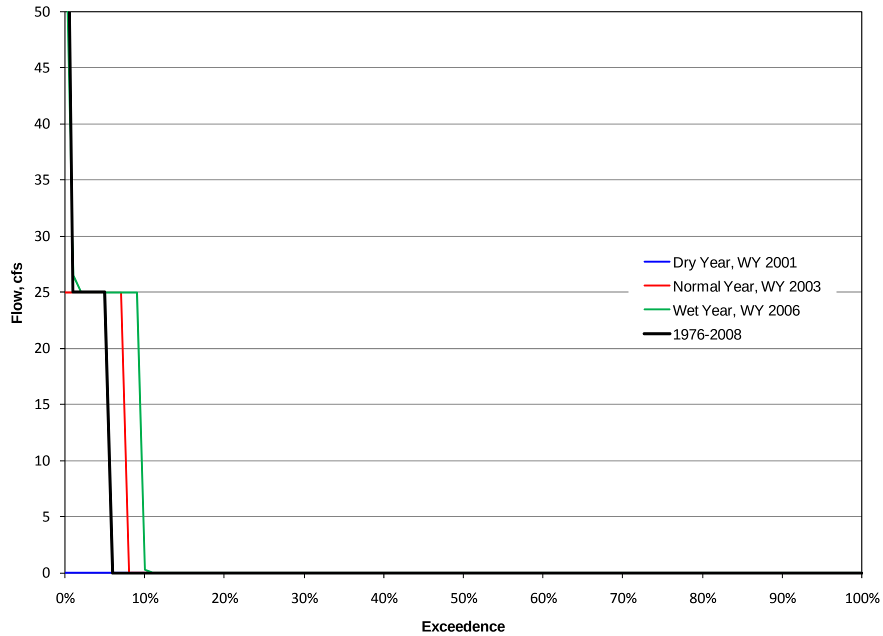


Figure 6.2.1-38. Modeled flow duration curves for the unnamed tributary below Fuller Lake in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Meadow Lake (unnamed tributary to Fordyce Lake)

Meadow Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Fordyce Lake. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for the unnamed tributary to Fordyce Lake below Meadow Lake for water years 1976 through 2008 are shown in Figure 6.2.1-39. Figure 6.2.1-40 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location will be measured by proposed PG&E gage YB-217.

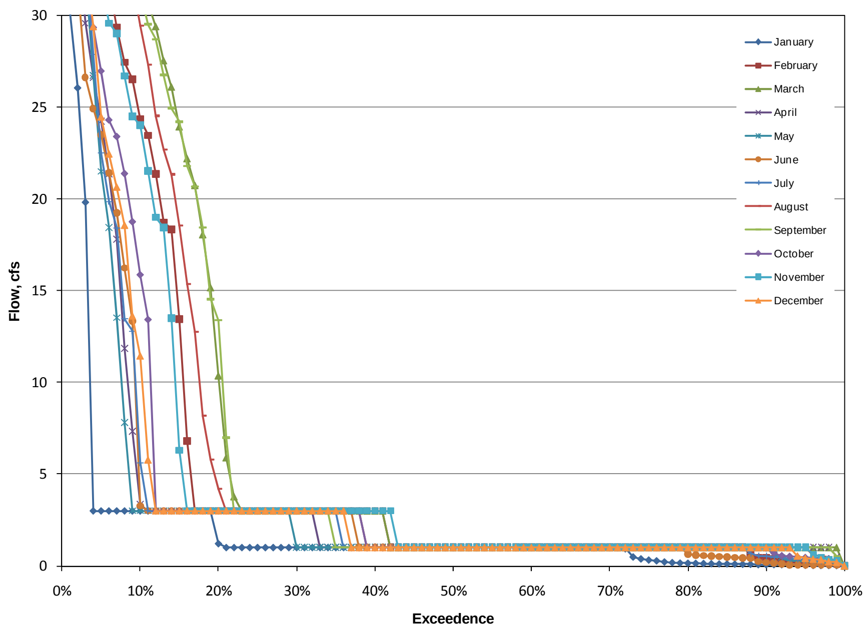


Figure 6.2.1-39. Modeled monthly flow duration curves for the unnamed tributary below Meadow Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

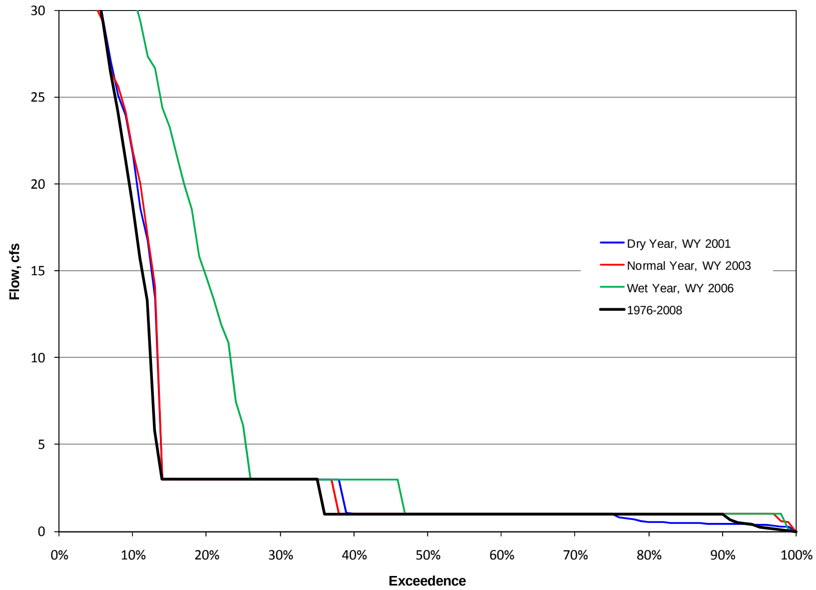


Figure 6.2.1-40. Modeled flow duration curves for the unnamed tributary below Meadow Lake in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Fordyce Lake

Fordyce Lake generally is used to store water in the winter and spring and then releases stored water into Fordyce Creek in the summer to augment levels in Lake Spaulding. Modeled monthly flow duration curves for Fordyce Creek below Fordyce Lake for water years 1976 through 2008 are shown in Figure 6.2.1-41. Figure 6.2.1-42 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-200.

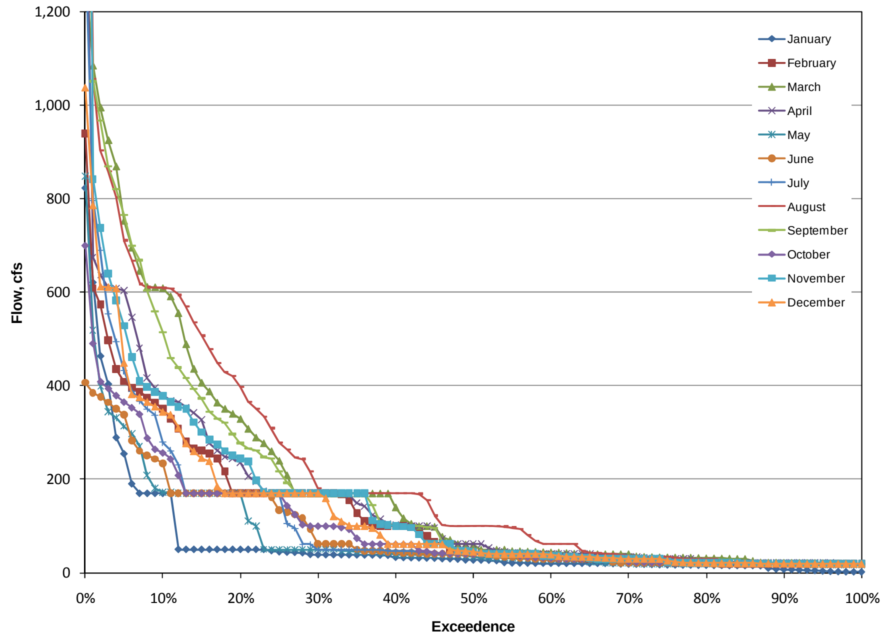


Figure 6.2.1-41. Modeled monthly flow duration curves for Fordyce Creek below Fordyce Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

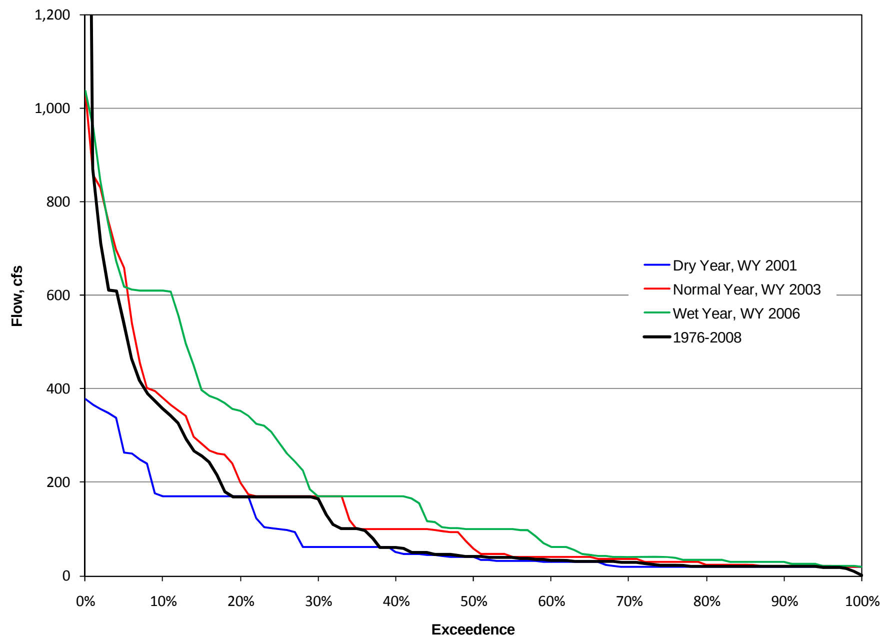


Figure 6.2.1-42. Modeled flow duration curves for Fordyce Creek below Fordyce Lake in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Lake Sterling

Lake Sterling is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment storage in Fordyce Lake. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Bloody Creek below Lake Sterling for water years 1976 through 2008 are shown in Figure 6.2.1-43. Figure 6.2.1-44 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Data shown are derived from Operations Model output in Bloody Creek below Lake Sterling Dam.

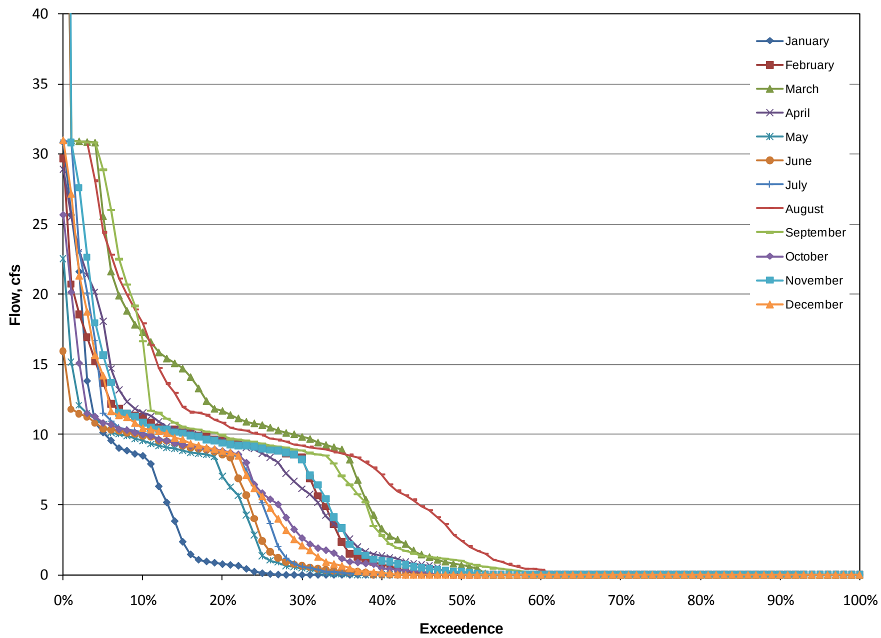


Figure 6.2.1-43. Modeled monthly flow duration curves for Bloody Creek below Lake Sterling for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

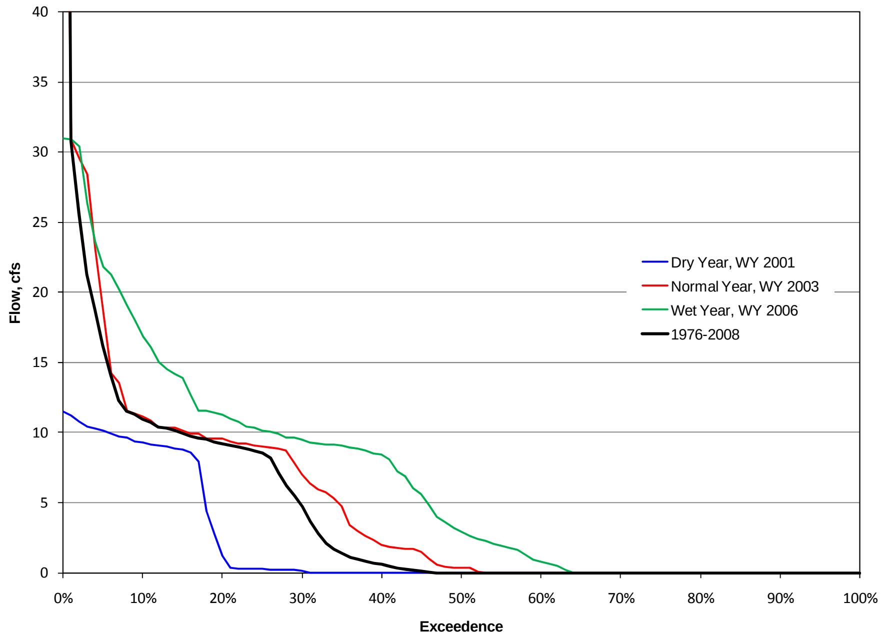


Figure 6.2.1-44. Modeled flow duration curves for Bloody Creek below Lake Sterling in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Lake Spaulding

Lake Spaulding is principally used for water delivery scheduling and carryover storage (in most years) into the South Yuba and Drum canals. Modeled monthly flow duration curves for the South Yuba River below Lake Spaulding for water years 1976 through 2008 are shown in Figure 6.2.1-45. Figure 6.2.1-46 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at South Yuba River below Langs Crossing are measured by PG&E gage YB-29.

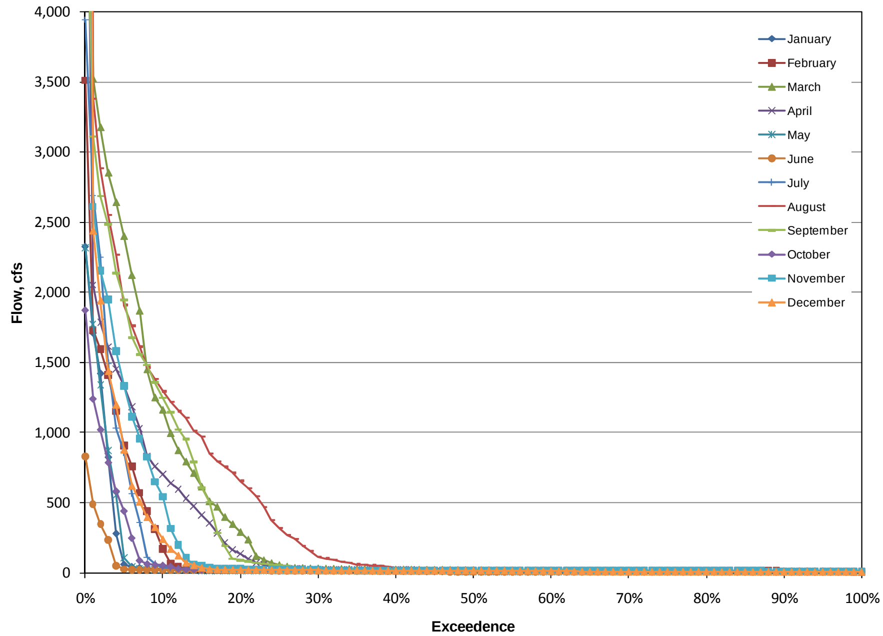


Figure 6.2.1-45. Modeled monthly flow duration curves for South Yuba River below Lake Spaulding for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

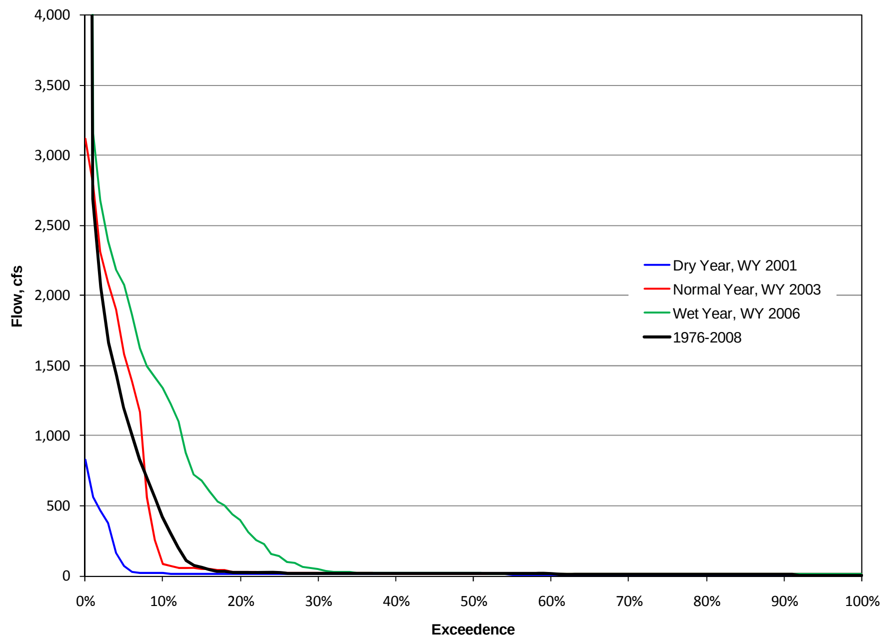


Figure 6.2.1-46. Modeled flow duration curves for South Yuba River below Lake Spaulding in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Bear River at Highway 20 Crossing (YB-198)

Highway 20 crosses the Bear River below the spill from the Drum Canal into the Bear River at YB-137 and the input from the South Yuba Canal Waste Gate at YB-139 and above Drum Afterbay. Modeled monthly flow duration curves for the Bear River at Highway 20 for water years 1976 through 2008 are shown in Figure 6.2.1-47. Figure 6.2.1-48 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-198.

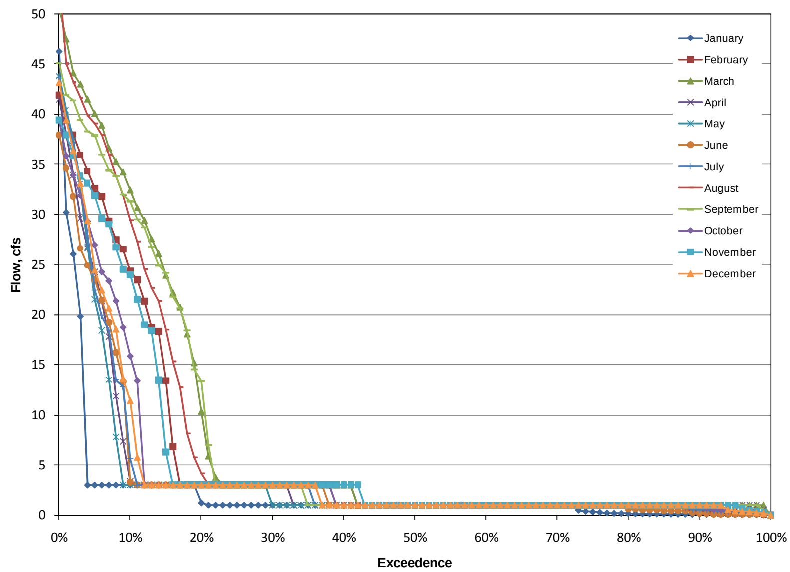


Figure 6.2.1-47. Modeled monthly flow duration curves for Bear River at Highway 20 for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

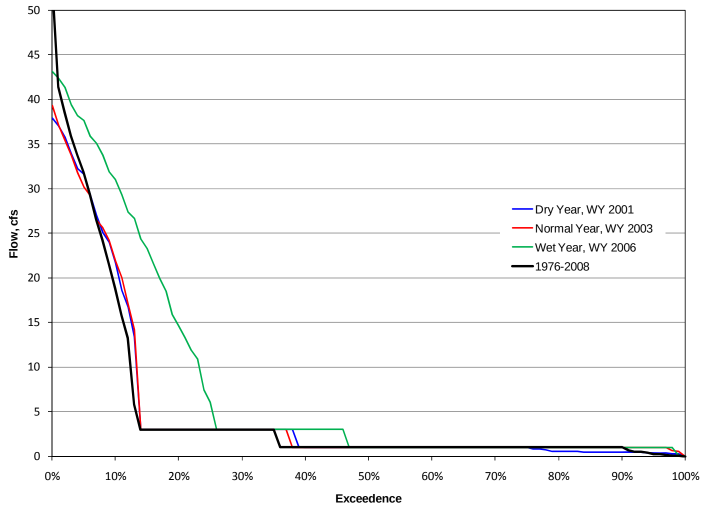


Figure 6.2.1-48. Modeled flow duration curves for Bear River at Highway 20 in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Lake Valley Reservoir

Lake Valley Reservoir is principally used for water delivery scheduling and carryover storage (in most years) in the North Fork of the North Fork American River. Modeled monthly flow duration curves for the North Fork of the North Fork American River below Lake Valley Reservoir for water years 1976 through 2008 are shown in Figure 6.2.1-49. Figure 6.2.1-50 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-104.

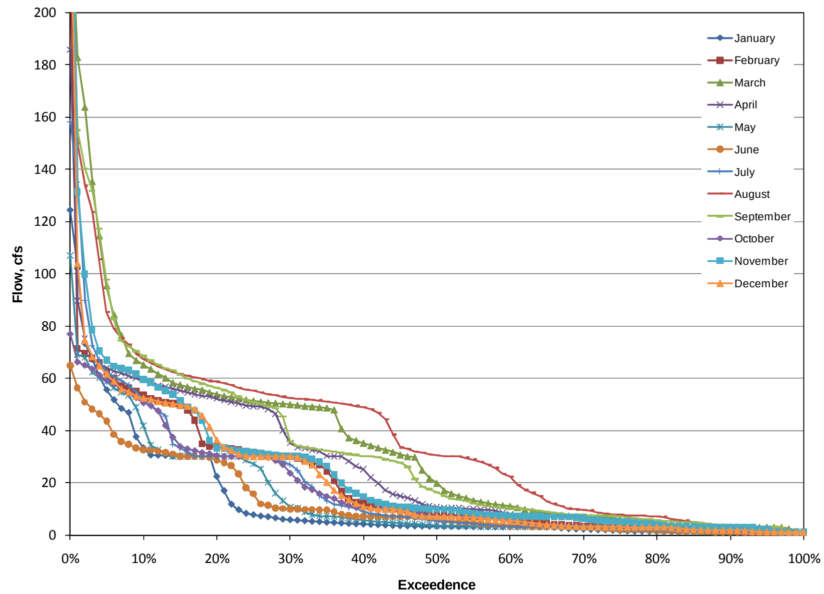


Figure 6.2.1-49. Modeled monthly flow duration curves for North Fork of the North Fork American River below Lake Valley Reservoir for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

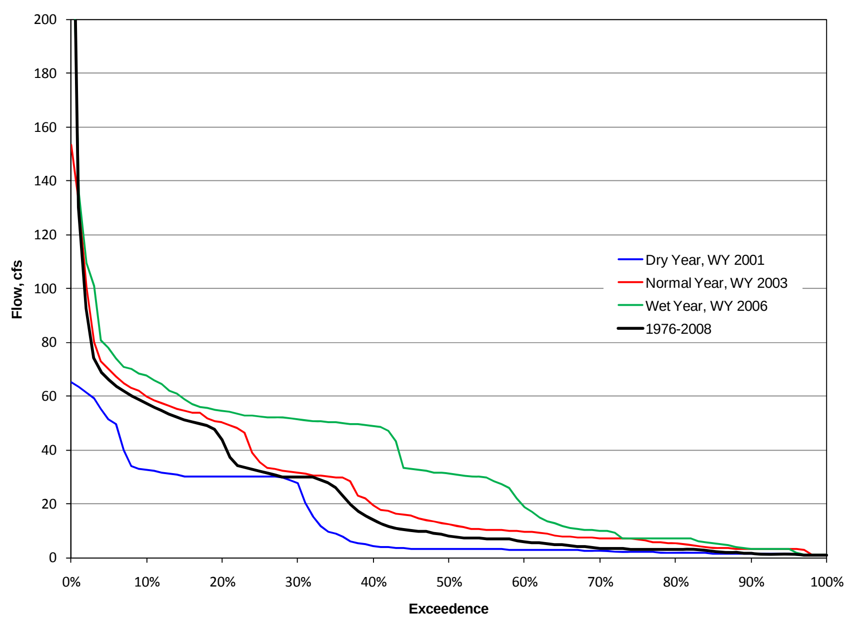


Figure 6.2.1-50. Modeled flow duration curves for North Fork of the North Fork American River below Lake Valley Reservoir in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Kelly Lake

Kelly Lake is used to capture spring and early summer runoff, and to release flow in the summer and fall months to augment flow in the North Fork of the North Fork American River below Lake Valley Reservoir for diversion at Lake Valley Canal Diversion Dam to the Drum Canal. This reservoir has minimal carryover storage. Modeled monthly flow duration curves for Six Mile Creek below Kelly Lake for water years 1976 through 2008 are shown in Figure 6.2.1-51. Figure 6.2.1-52 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-213, located below Snowflower Reservoir (non-Project).

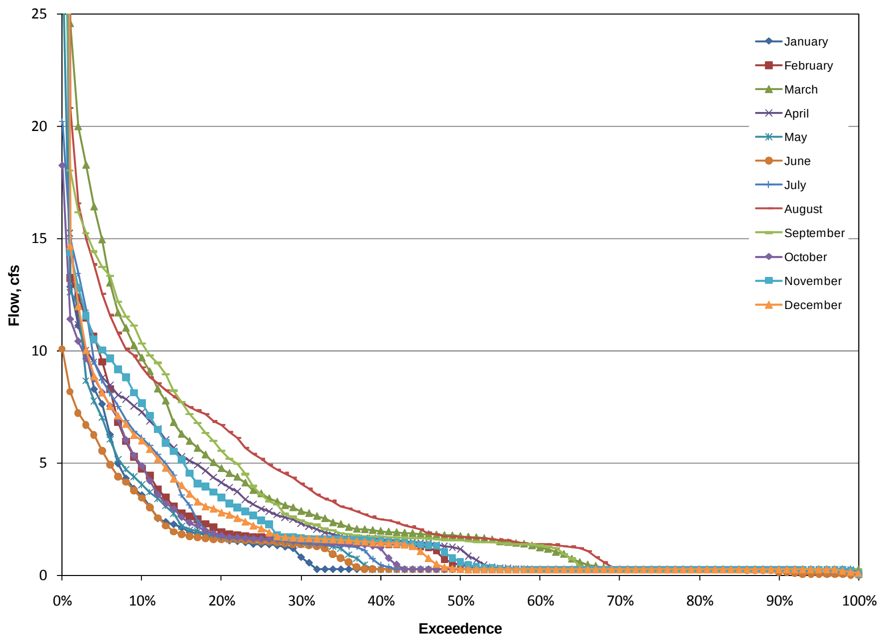


Figure 6.2.1-51. Modeled monthly flow duration curves for Six Mile Creek below Kelly Lake for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

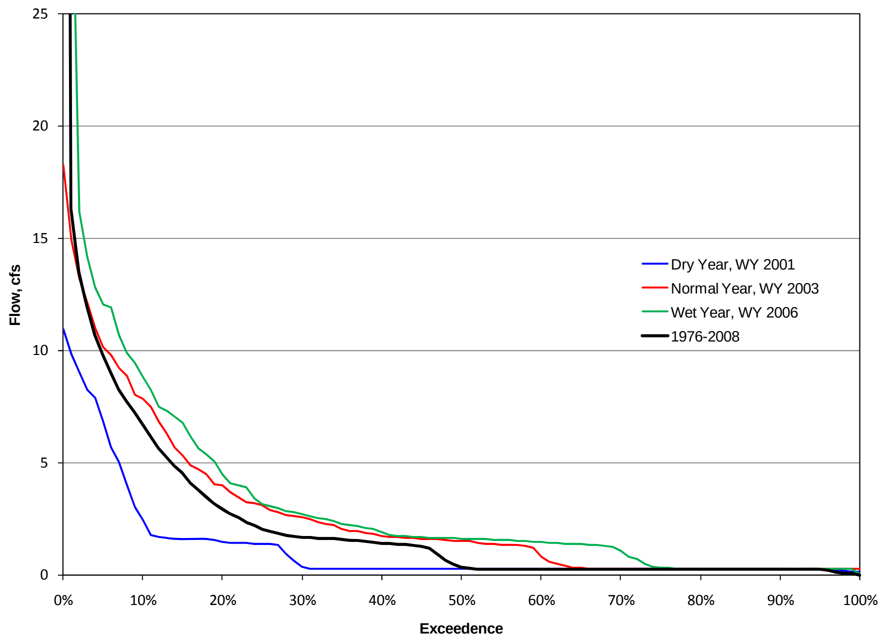


Figure 6.2.1-52. Modeled flow duration curves for Six Mile Creek below Kelly Lake in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

<u>Drum Afterbay</u>

Drum Afterbay is used as a re-regulating pool for hydropower generation shaping. Modeled monthly flow duration curves for Bear River below Drum Afterbay for water years 1976 through 2008 are shown in Figure 6.2.1-53. Figure 6.2.1-54 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-44.

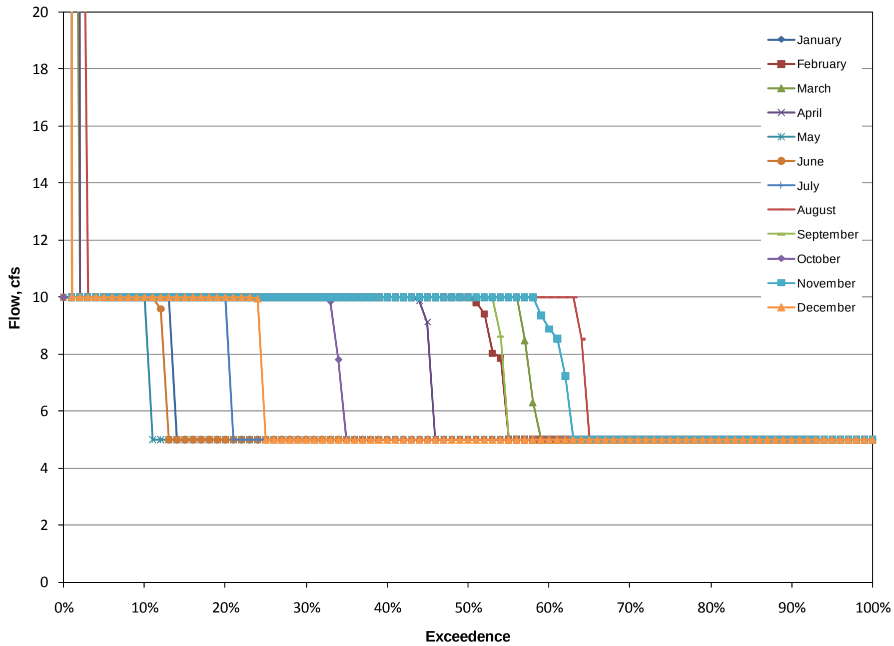


Figure 6.2.1-53. Modeled monthly flow duration curves for Bear River below Drum Afterbay for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

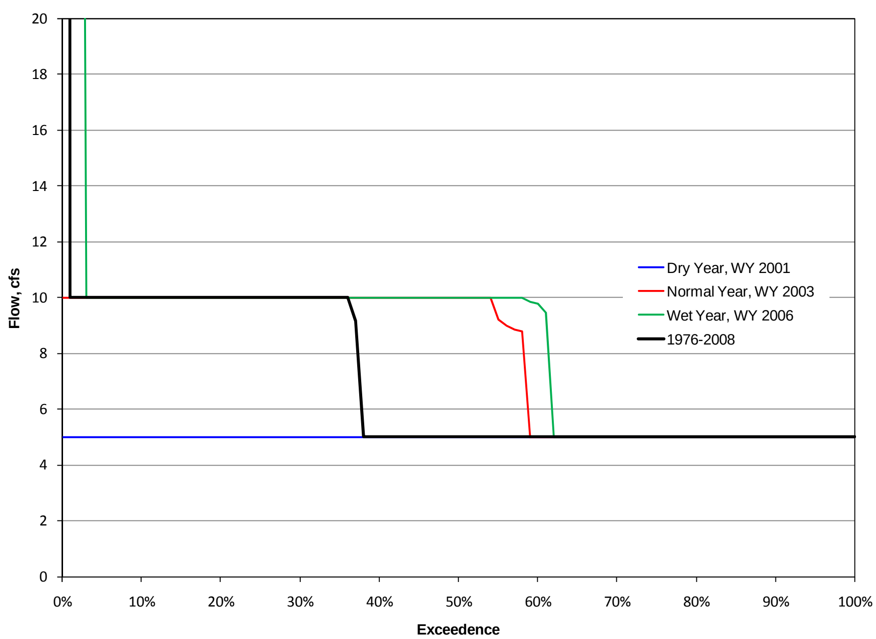


Figure 6.2.1-54. Modeled flow duration curves for Bear River below Drum Afterbay in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Canyon Creek above Towle Canal Diversion Dam

The hydrology in Canyon Creek above the Towle Canal Diversion Dam is below the diversions from the Drum Forebay via the Towle Diversion (outlet from Drum Forebay). Modeled monthly flow duration curves for Canyon Creek above the Towle Canal Diversion Dam for water years 1976 through 2008 are shown in Figure 6.2.1-55. Figure 6.2.1-56 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Data shown are derived from Operations Model output in Canyon Creek above the Towle Canal Diversion Dam.

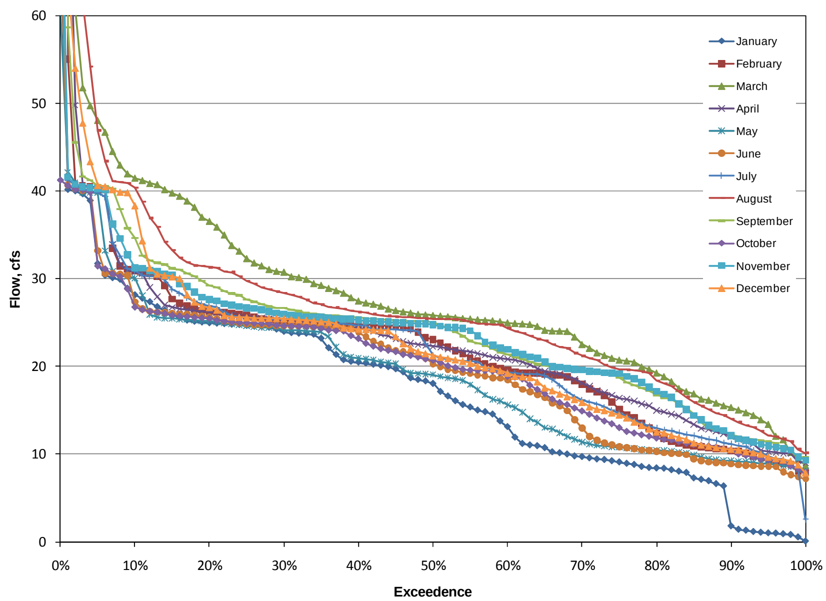


Figure 6.2.1-55. Modeled monthly flow duration curves for Canyon Creek above Towle Canal Diversion Dam for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

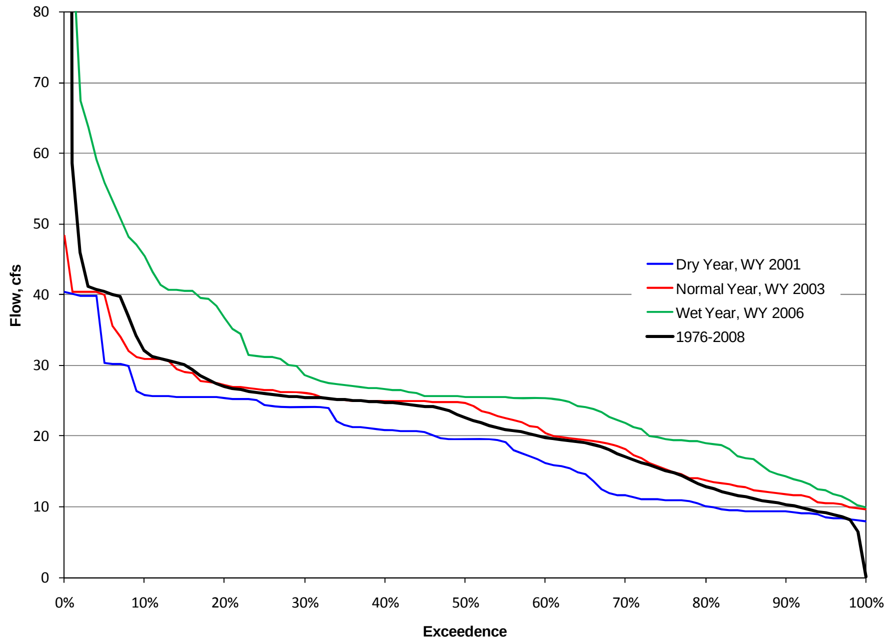


Figure 6.2.1-56. Modeled flow duration curves for Canyon Creek above Towle Canal Diversion Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

<u>Canyon Creek below Towle Canal Diversion Dam</u>

The hydrology in Canyon Creek below the Towle Canal Diversion Dam is calculated immediately below the dam. Modeled monthly flow duration curves for Canyon Creek below the Towle Canal Diversion Dam for water years 1976 through 2008 are shown in Figure 6.2.1-57. Figure 6.2.1-58 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-282.

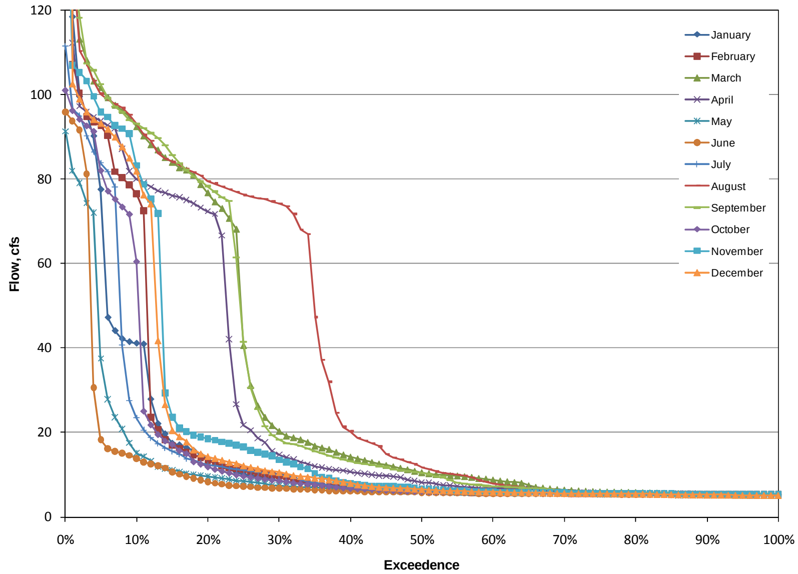


Figure 6.2.1-57. Modeled monthly flow duration curves for Canyon Creek below Towle Canal Diversion Dam for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

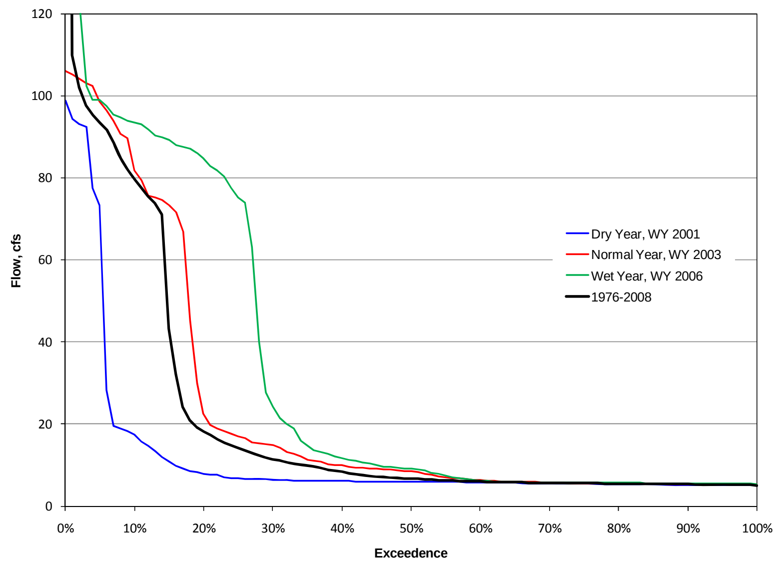


Figure 6.2.1-58. Modeled flow duration curves for Canyon Creek below Towle Canal Diversion Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Little Bear River below PCWA's Lower Boardman Canal Diversion Dam

The hydrology in Little Bear River below Alta Powerhouse tailrace PCWA's Lower Boardman Canal Diversion Dam is located immediately below the dam. Modeled monthly flow duration curves for Little Bear River below the Lower Boardman Diversion Dam for water years 1976 through 2008 are shown in Figure 6.2.1-59. Figure 6.2.1-60 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Regulated flows at this location are measured by PG&E gage YB-98.

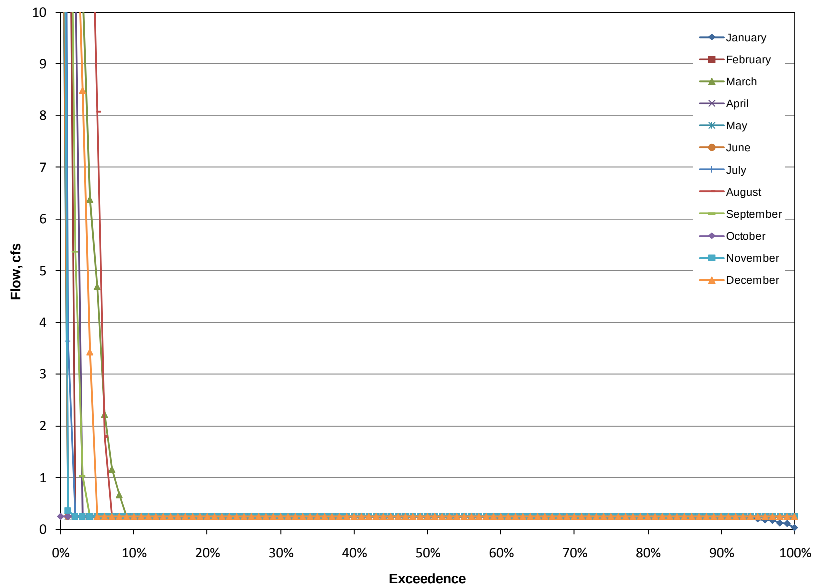


Figure 6.2.1-59. Modeled monthly flow duration curves for Little Bear River below Lower Boardman Canal Diversion Dam for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

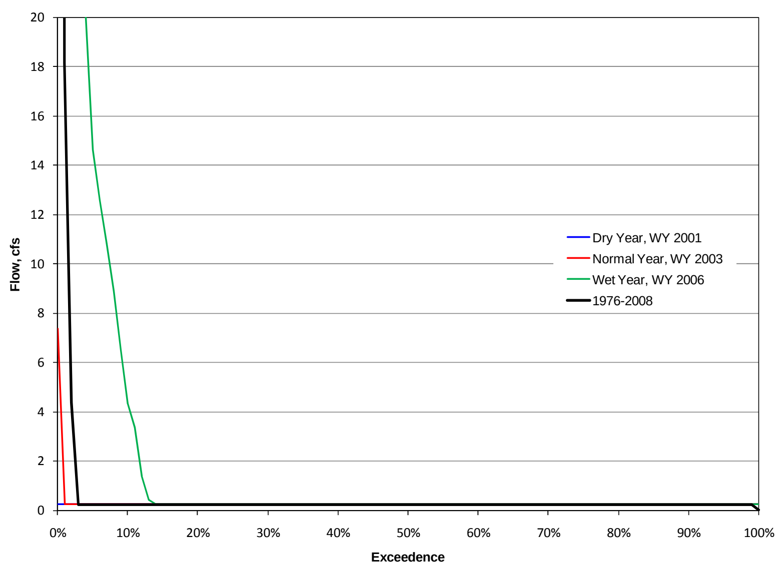


Figure 6.2.1-60. Modeled flow duration curves for Little Bear River below Lower Boardman Canal Diversion Dam in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Halsey Afterbay

Halsey Afterbay is used as a re-regulating pool for hydropower generation shaping. Modeled monthly flow duration curves for Dry Creek below Halsey Afterbay for water years 1976 through 2008 are shown in Figure 6.2.1-61. Figure 6.2.1-62 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Data shown are derived from Operations Model output in Dry Creek below Halsey Afterbay Dam.

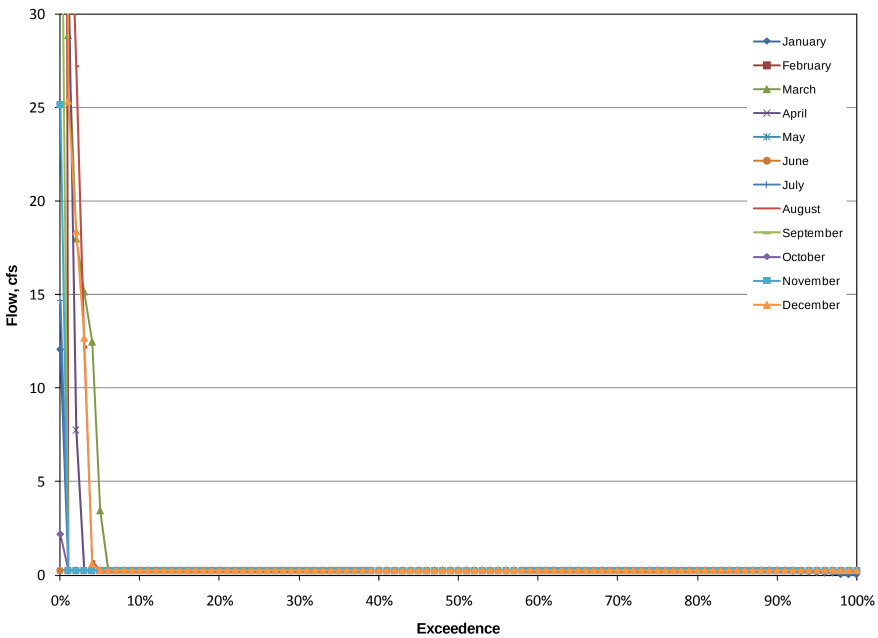


Figure 6.2.1-61. Modeled monthly flow duration curves for Dry Creek below Halsey Afterbay for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

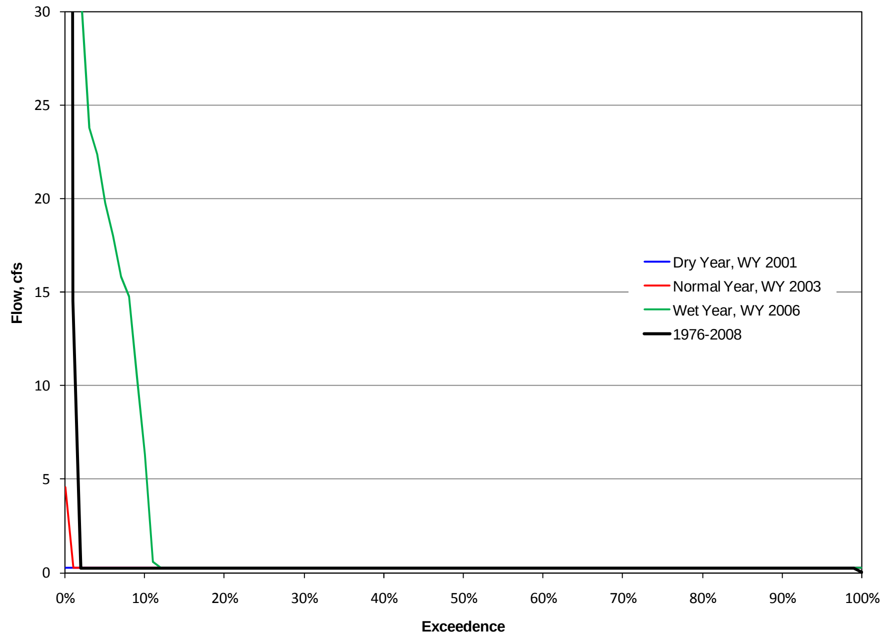


Figure 6.2.1-62. Modeled flow duration curves for Dry Creek below Halsey Afterbay in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Rock Creek Reservoir

Rock Creek Reservoir is used as a re-regulating pool for hydropower generation shaping. Modeled monthly flow duration curves for Rock Creek below Rock Creek Reservoir for water years 1976 through 2008 are shown in Figure 6.2.1-63. Figure 6.2.1-64 shows the modeled flow duration curves for representative dry (2001), normal (2003), and wet (2006) water years and the period of record (1976 to 2008). Data shown are derived from Operations Model output in Rock Creek below Rock Creek Reservoir Dam.

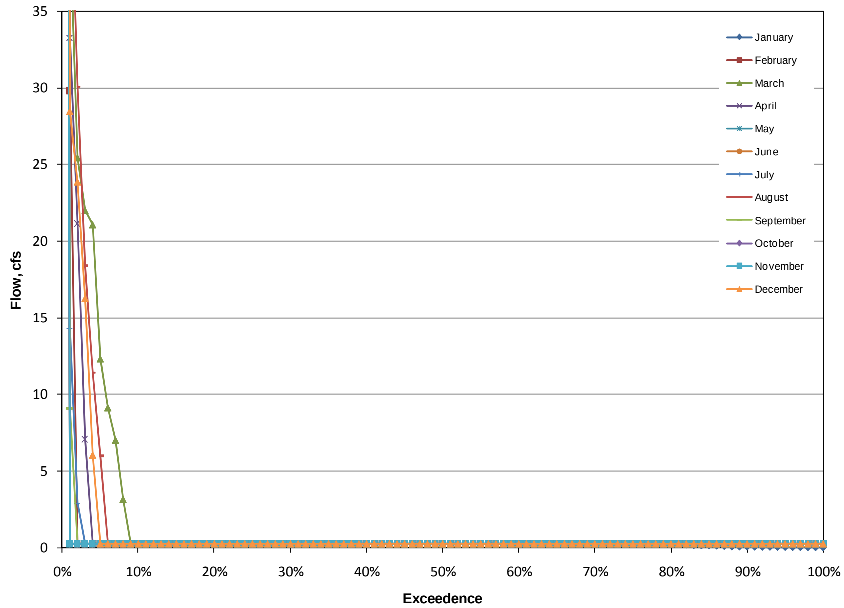


Figure 6.2.1-63. Modeled monthly flow duration curves for Rock Creek below Rock Creek Reservoir for water years 1976 through 2008 under Licensees' Proposed Projects Operations Model.

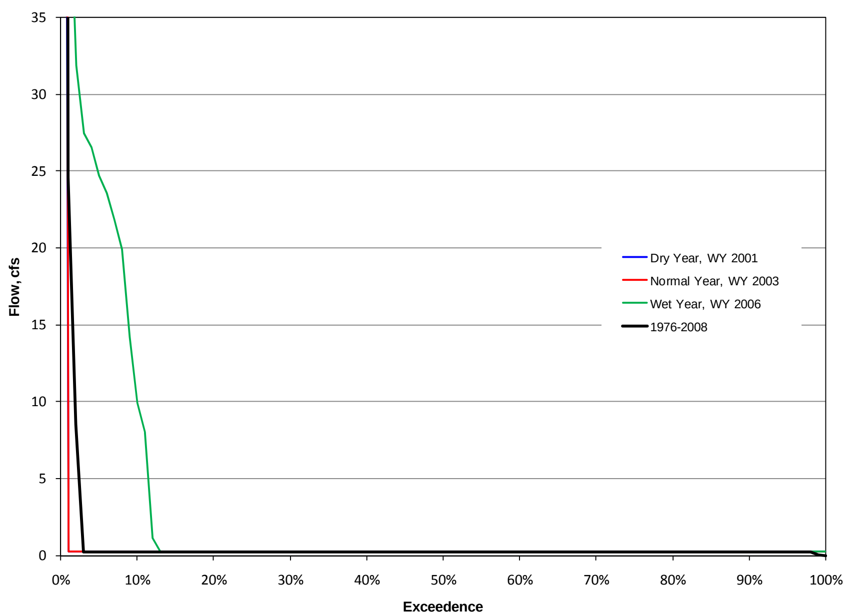


Figure 6.2.1-64. Modeled flow duration curves for Rock Creek below Rock Creek Reservoir in the representative dry (2001), normal (2003), and wet (2006) water years and for the period of record under Licensees' Proposed Projects Operations Model.

Spaulding No. 3 Powerhouse

Modeled annual and monthly flow duration curves for Spaulding No. 3 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-65. Regulated flows at this location are measured by PG&E gage YB-253.

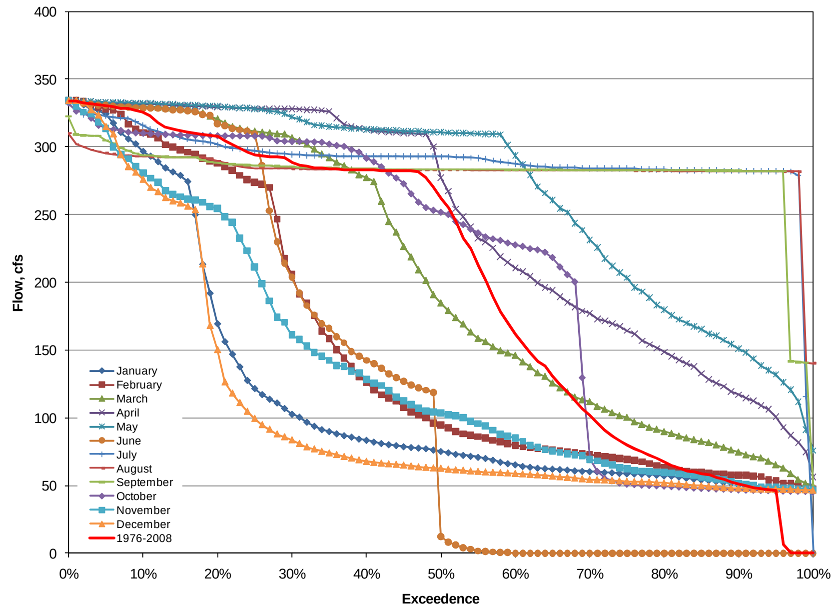


Figure 6.2.1-65. Spaulding No. 3 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Spaulding No. 1 Powerhouse

Modeled annual and monthly flow duration curves for Spaulding No. 1 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-66. Regulated flows at this location are measured by PG&E gage YB-251.

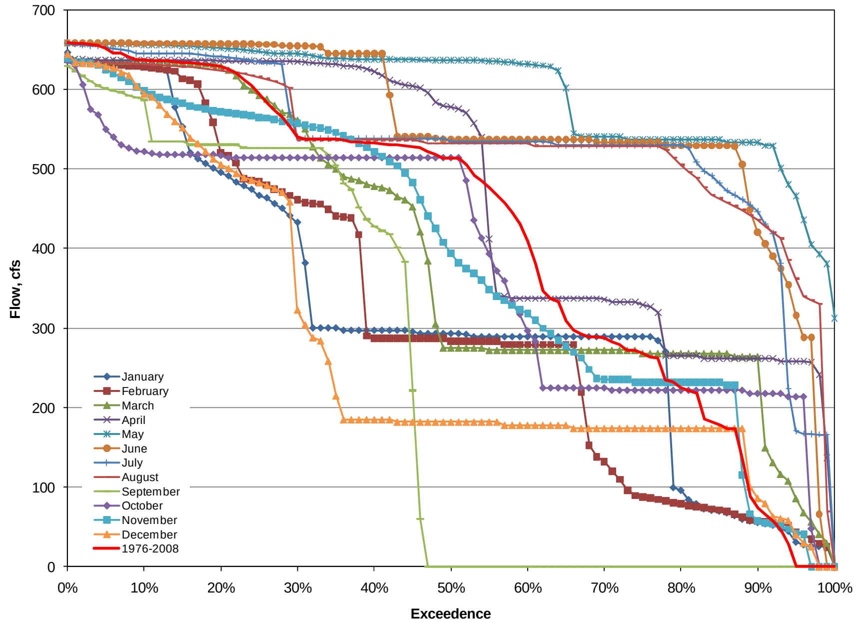


Figure 6.2.1-66. Spaulding No. 1 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Spaulding No. 2 Powerhouse

Modeled annual and monthly flow duration curves for Spaulding No. 2 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-67. Regulated flows at this location are measured by PG&E gage YB-252.

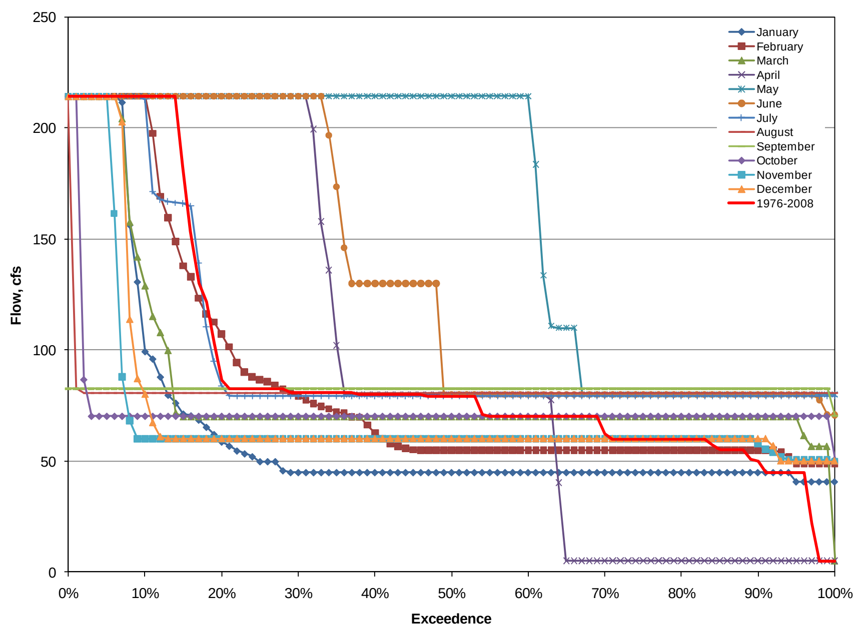


Figure 6.2.1-67. Spaulding No. 2 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Deer Creek Powerhouse

Modeled annual and monthly flow duration curves for Deer Creek Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-68. Regulated flows at this location are measured by PG&E gage YB-247.

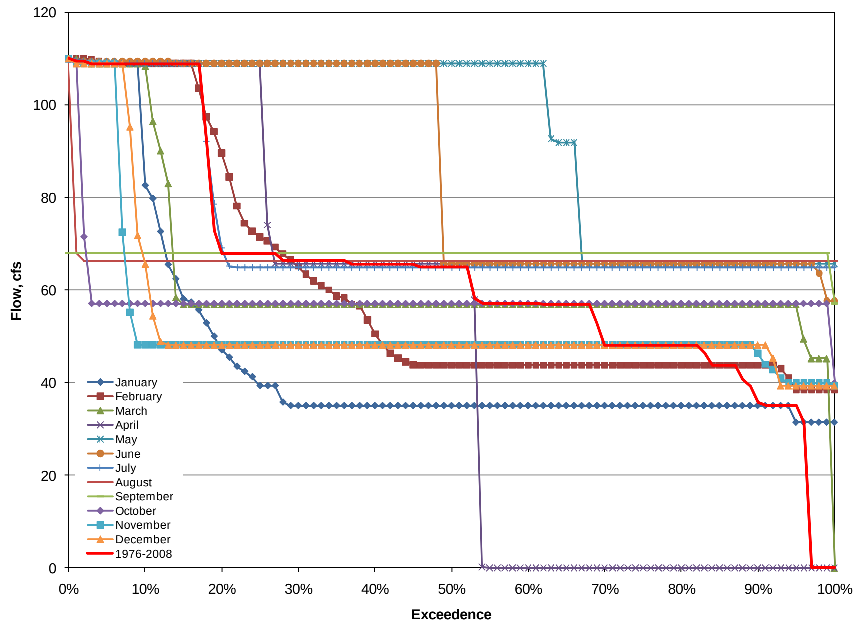


Figure 6.2.1-68. Deer Creek Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Alta Powerhouse

Modeled annual and monthly flow duration curves for Alta Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-69. Regulated flows at this location are measured by PG&E gage YB-246.

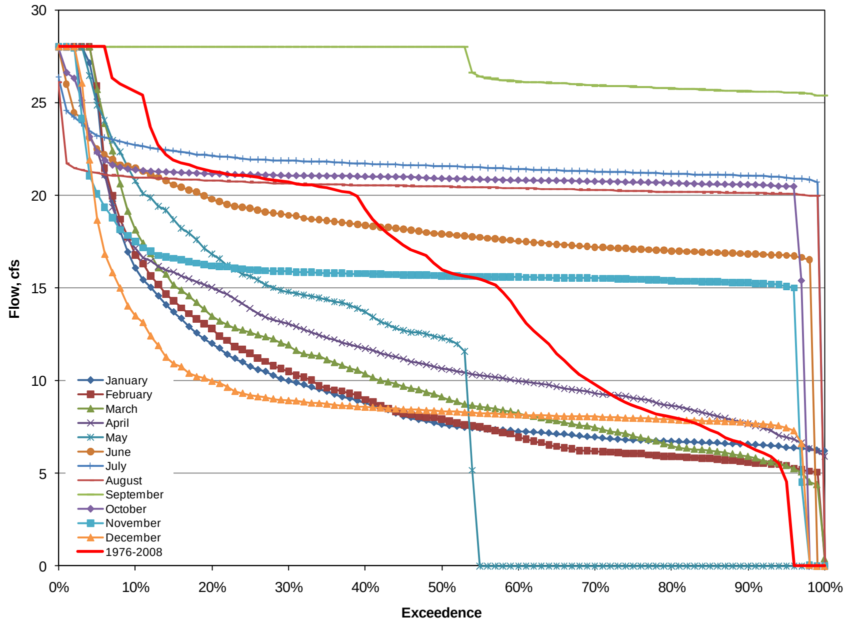


Figure 6.2.1-69. Alta Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Drum No. 1 Powerhouse

Modeled annual and monthly flow duration curves for Drum No. 1 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-70. Regulated flows at this location are measured by PG&E gage YB-248.

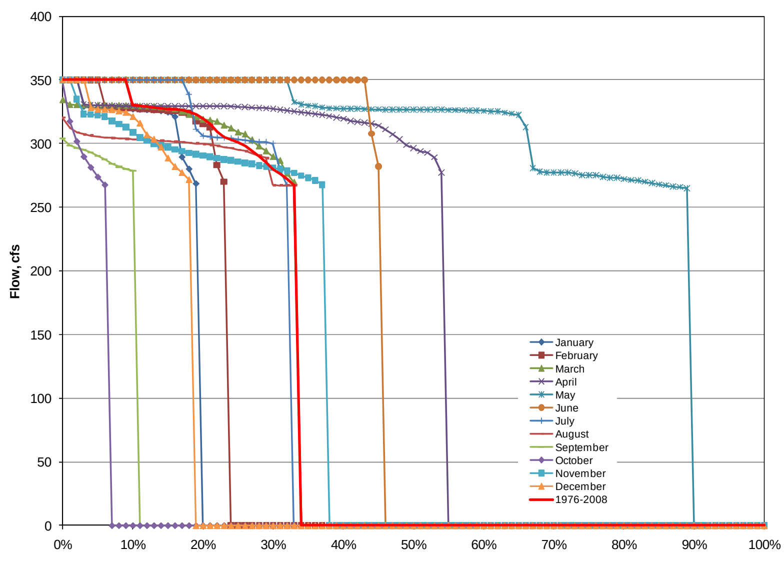


Figure 6.2.1-70. Drum No. 1 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Drum No. 2 Powerhouse

Modeled annual and monthly flow duration curves for Drum No. 2 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-71. Regulated flows at this location are measured by PG&E gage YB-249.

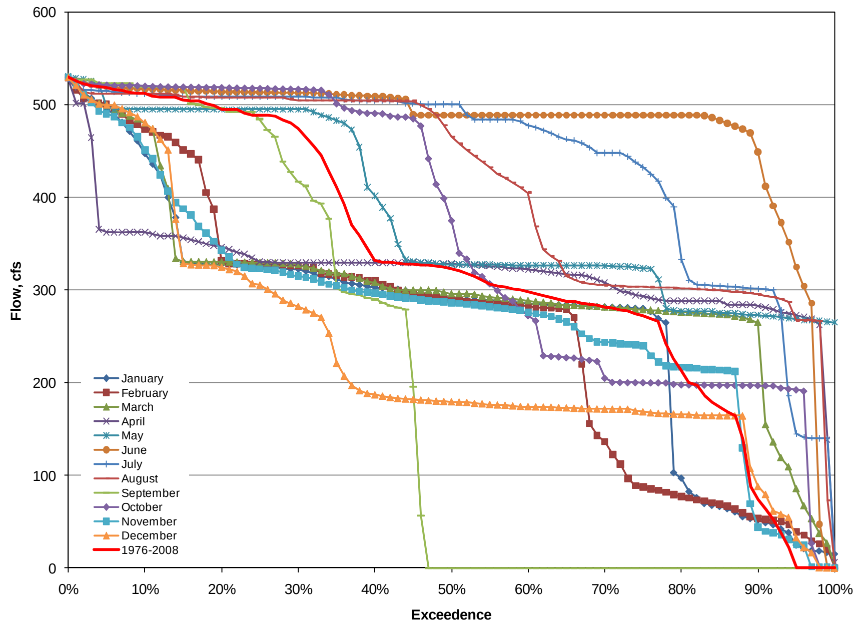


Figure 6.2.1-71. Drum No. 2 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Dutch Flat No. 1 Powerhouse

Modeled annual and monthly flow duration curves for Dutch Flat No. 1 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-72. Regulated flows at this location are measured by PG&E gage YB-194.

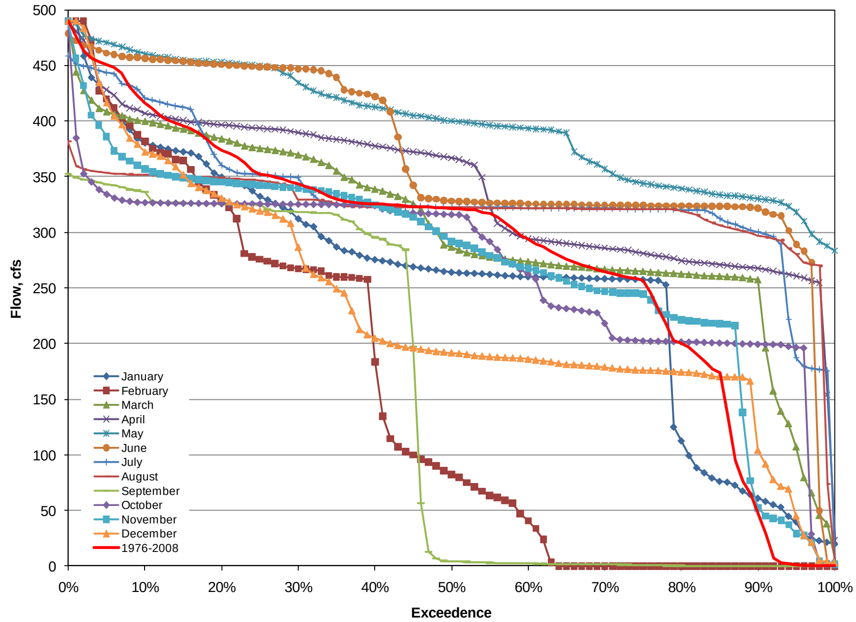


Figure 6.2.1-72. Dutch Flat No. 1 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Halsey Powerhouse

Modeled annual and monthly flow duration curves for Halsey Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-73. Regulated flows at this location are measured by PG&E gage YB-250.

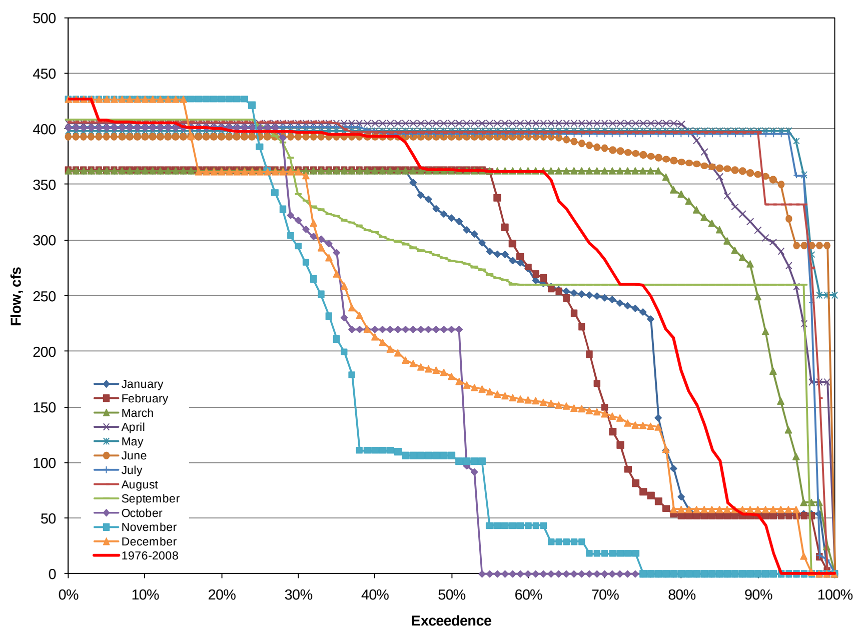


Figure 6.2.1-73. Halsey Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Wise Powerhouse

Modeled annual and monthly flow duration curves for Wise Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-74. Regulated flows at this location are measured by PG&E gage YB-254.

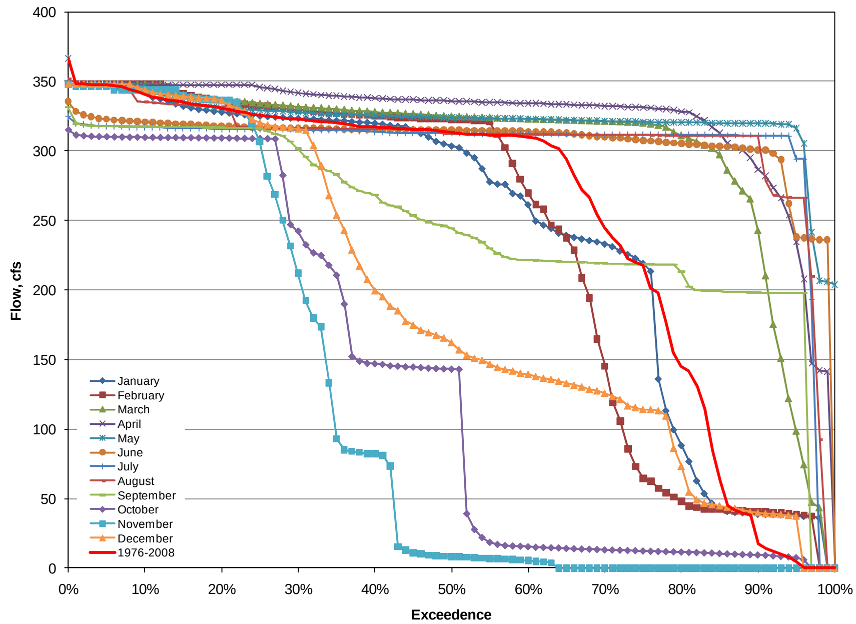


Figure 6.2.1-74. Wise Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

Wise No. 2 Powerhouse

Modeled annual and monthly flow duration curves for Wise No. 2 Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-75. Regulated flows at this location are measured by PG&E gage YB-291.

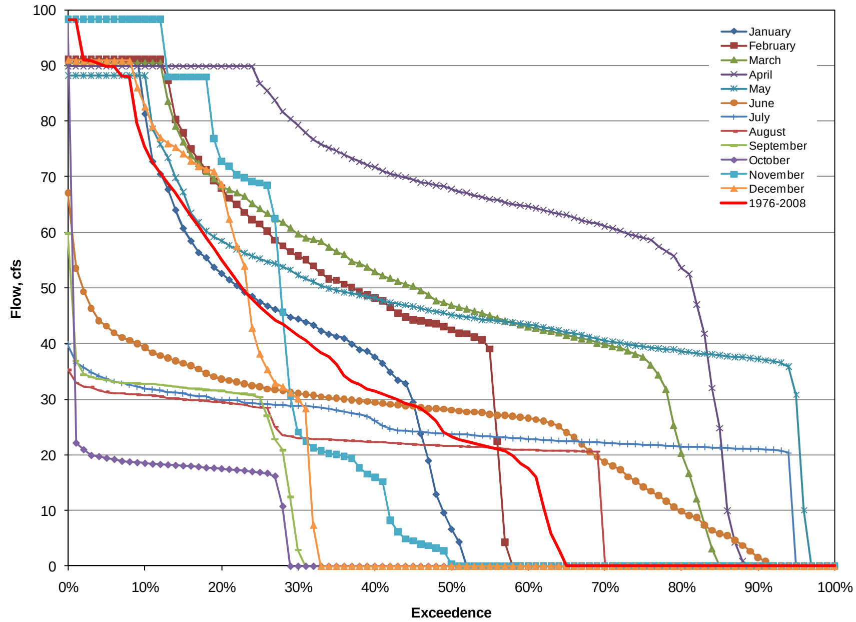


Figure 6.2.1-75. Wise No. 2 Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

<u>Newcastle Powerhouse</u>

Modeled annual and monthly flow duration curves for Newcastle Powerhouse, for water years 1976 to 2008, are provided in Figure 6.2.1-76. Regulated flows at this location are measured by PG&E gage YB-289.

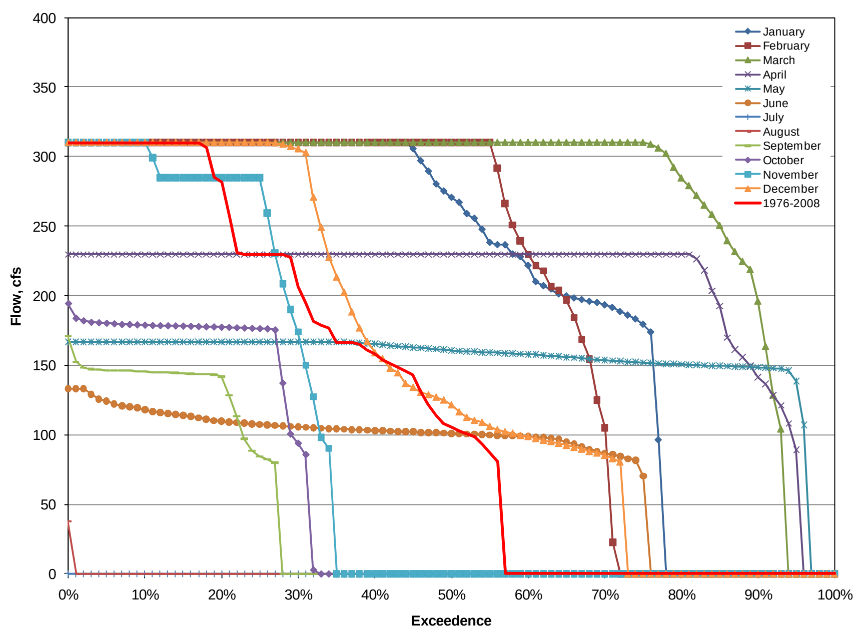


Figure 6.2.1-76. Newcastle Powerhouse modeled monthly flow duration curves and the period of record under the Licensees' Proposed Projects Operations Model.

6.2.1.2 Water Quality

6.2.1.2.1 Regulatory Context

Central Valley Basin Plan

The CVRWQCB's *Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin Rivers* was initially adopted in 1998 and was most recently revised in 2009 (CVRWQCB 1998). The Basin Plan formally designates surface water beneficial uses and water quality objectives for the Central Valley Region, including the Yuba and Bear rivers (Table 6.2.1-2).

Table 6.2.1-2. Beneficial uses of the rivers in the vicinity of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project as designated by the Central Valley Regional Water Quality Control Board and listed in the Basin Plan (Source: CVRWQCB 1998).

Designated Beneficial Use from Basin Plan	Description from Basin Plan	Designated Use by Watersheds from Basin Plan			
		Middle/ South Yuba Rivers	Bear River	North Fork American River	Sacramento River Basin[1]
Municipal and Domestic Supply (Municipal: MUNICIPAL AND DOMESTIC SUPPLY)	Uses of water for community, military or individual water supply systems including, but not limited to, drinking water supply.	Existing	Existing	Existing	Existing
Agricultural Supply (Agriculture: IRRIGATION AND STOCK WATERING)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.	Existing	Existing	Existing	Existing
Hydropower Generation (Industry: POW)	Uses of water for hydropower generation.	Existing	Existing	--	--
Water Contact Recreation (Recreation: REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.	Existing	Existing	Existing	Existing
Non-Contact Water Recreation (Recreation: REC-2)	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach-combing, camping, boating, tide-pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	Existing	Existing	Existing	Existing
Warm Freshwater Habitat[2] (Freshwater Habitat: WARM)	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	--	Existing	Potential	Potential
Cold Freshwater Habitat[2] (Freshwater Habitat: COLD)	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	Existing	Existing	Existing	Existing

Table 6.2.1-2. (continued)

Designated Beneficial Use from Basin Plan	Description from Basin Plan	Designated Use by Watersheds from Basin Plan			
		Middle/ South Yuba Rivers	Bear River	North Fork American River	Sacramento River Basin[1]
Migration of Aquatic Organisms (Migration: WARM[3])	Uses of water that supports habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.	--	Potential	--	Existing
Migration of Aquatic Organisms (Migration: COLD[4])	Uses of water that supports habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.	--	Potential	--	Existing
Spawning (Spawning: WARM[3])	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	--	Potential	Existing	Existing
Spawning (Spawning: COLD)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	Existing	Potential	Existing	Existing
Wildlife Habitat	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	Existing	Existing	--	Existing

1 Project facilities in the Sacramento River Basin are limited to the Auburn Ravine, Dry Creek and Rock Creek watersheds.
2 Resident does not include anadromous. Any hydrologic unit with both WARM and COLD beneficial use designations will be considered COLD water bodies by the SWRCB for the application of water quality objectives.
3 Striped bass, sturgeon and shad.
4 Salmon and Steelhead.

The CVRWQCB has adopted water quality objectives to protect the beneficial uses identified above. Provided in Table 6.2.1-3, water quality objectives are specific to the intended uses and can be numeric or qualitative. For example, the Basin Plan's water quality objectives for the drinking water beneficial use are the State's numeric drinking water standards (See "Chemical Consituents" in Table 6.2.1-3), while the Basin Plan's water quality objectives for the aquatic life beneficial use are both numeric, as is in the case of the pH water quality objective, and narrative, as in the case of the toxicity water quality objective.

Table 6.2.1-3. Water quality objectives to support beneficial uses in the vicinity of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project as designated by the Central Valley Regional Water Quality Control Board and listed in the Basin Plan (Source: CVRWQCB 1998)

Parameter[1,2]	Water Quality Objective Protective of Designated Beneficial Uses
Bacteria	In waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 [MPN]/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400 [MPN]/100 ml.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.
Color	Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen	The dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time. Waters designated WARM .... 5.0 mg/L Waters designated COLD .... 7.0 mg/L Waters designated SPWN .... 7.0 mg/L
Floating Material	Waters shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or that otherwise adversely affect beneficial uses.
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in California Code of Regulations, Title 22.

Table 6.2.1-3. (continued)

Parameter[1,2]	Water Quality Objective Protective of Designated Beneficial Uses	
pH	The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.	
Sediment and Settleable Material	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.	
Taste & Odor	Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies [MUN] or to fish flesh or other edible products of aquatic origin, or that cause nuisance or adversely affect beneficial uses.[3]	
Temperature	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of any COLD water be increased by more than 0.5°F above natural receiving water temperature.	
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: • Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU. • Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent. • Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs. • Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.	
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.	
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in Title 22 of the California Code of Regulations.	
	Aluminum	Primary MCL of 1 mg/L
	Arsenic	Primary MCL of 0.05 mg/L
	Cadmium	Primary MCL of 5 µg/L
	Chromium	Primary MCL of 50 µg/L
	Copper	Primary MCL of1.3 mg/L
	Lead	Primary MCL of 15 µg/L
	Mercury (total)	Primary MCL of 2 µg/L
	Nickel[7]	Primary MCL of 100 µg/L
	Sodium	Primary MCL of 250 µg/L
	Selenium	Primary MCL of 50 µg/L

Units:
mg/L: milligrams per liter
µg/L: micrograms per liter
MCL: maximum contaminant level
MPN: most probable number
MUN: municipal supply
NTU: Nephelometric Turbidity Unit

1 Methylmercury, radioactivity, and suspended material objectives do not apply to the projects.
2 There is no waterbody specific salinity objective that applies to the vicinity of the projects. Salinity is therefore addressed the chemical constituents objective.
3 Tastes and Odors limits for drinking water are provided as secondary MCLs in Title 22 of the California Code of Regulations.

When water quality objectives are narrative, other numeric regulatory standards, criteria, and literature sources are used to help with data interpretation. For example, because the Basin Plan does not include specific water quality objectives for aquatic toxicity applicable to the Bear, Yuba and NF of NF American rivers, the criteria from EPA (2000) California Toxics Rule (CTR), though applicable to point-source discharge compliance, provide a "benchmark" by which measured constituent concentrations can be compared (Table 6.2.1-4).

Table 6.2.1-4. Examples of narrative Water Quality Objectives and their corresponding benchmarks

Water Quality Objective	Numeric standards, criteria and benchmarks	
Toxicity. All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in … aquatic life.	The California Toxics Rule (CTR) provides numeric water quality criteria for California's inland surface water.[1] Examples of aquatic life protective criteria are:	
	Arsenic	CTR CCC of 0.15 mg/L; CTR CMC of 0.34 mg/L
	Cadmium[2]	CTR CCC of 0.41 µg/L; CTR CMC of 0.35 µg/L
	Chromium[2]	CTR CCC of 27.0 µg/L; CTR CMC of 83.25 µg/L
	Copper[2]	CTR CCC of1.25 µg/L; CTR CMC of 1.54 µg/L
	Lead	CTR CCC of1.9 µg/L; CTR CMC of 5.0 µg/L
	Mercury (total)	CTR of 0.050 µg/L
	Selenium	CTR CCC of 5 µg/L; CTR CMC of 20 µg/L
	Nickel[2]	CTR CCC of 7.4 µg/L; CTR CMC of 66.9 µg/L
	Silver[2]	CTR instantaneous of 0.07 µg/L
	Zinc[2]	CTR CCC of 16.79 µg/L; CTR CMC of 16.66 µg/L
Chemical Constituents. Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.	California's Office of Environmental Health Hazard Assessment (OEHHA) issues fish tissue ingestion advisories for mercury.	
	Mercury (total)	fish tissue concentration of 0.07 mg/kg wet-weight[8]

<u>Units:</u>
mg/L: milligrams per liter
µg/L: micrograms per liter
CCC: criterion continuous concentration
CMC: criterion maximum concentration
CTR: California Toxics Rule
MUN: municipal supply

1 Aquatic life protective criteria specified in the California Toxics Rule (CTR) can be applied under both the toxicity objective and the chemical constituents' objective, but are provided only under the toxicity category here for simplicity.
2 CTR criteria for this metal assume dissolved sample fraction and hardness of 10 mg/L as $CaCO_3$. MCLs are for total fraction.
4 California Office of Environmental Health Hazard Assessment Advisory Tissue Level (Klasing and Brodberg 2008).

Two of the Basin Plans objectives, Temperature and Turbidity, include, at least in part, a criterion limiting changes to receiving water. The Temperature objective states that "natural receiving waters" should not be warmed by more than 0.5°F, and the Turbidity objective provides restrictions for increases in turbidity. These objectives are difficult to apply to a hydroelectric project because one cannot easily identify "natural receiving waters" or ambient conditions as one could with, for instance, a point source discharge. The analysis in this document makes a good faith effort to apply the intent of the Basin Plans Temperature and Turbidity objectives to the basins and sub-basins in which the two projects are located.

In addition, application of the Basin Plan's Temperature and Dissolved Oxygen (DO) objectives to reservoirs is difficult due to reservoir stratification. For instance, a reservoir may comply entirely with the Basin Plan DO objective throughout the entire water column except in the thin layer of water near the bottom, which may have no effect on beneficial uses. Again, the analysis in this document makes a good faith effort to apply the intent of the Basin Plan's Temperature and DO objectives to Project reservoirs.

California List of Impaired Waters

Section 303(d) of the CWA requires that every 2 two years each State submit to the United States EPA a list of rivers, lakes and reservoirs in the State for which pollution control or requirements have failed to adequately provide for water quality. Currently, the two sections of river in the basin and sub-basins in which the two projects are located have been listed under Section 303(d) as impaired: 1) the Bear River from and including Rollins Reservoir to Lake Combie (for mercury); and 2) Kanaka Creek, a tributary to the Middle Yuba River (for arsenic). (SWRCB 2006). Total Maximum Daily Load (TMDL) plans for mercury in the Bear River between Rollins Dam and Lake Combie and for Rollins Reservoir are scheduled for development in 2011 and 2012, respectively, and a TMDL Plan for arsenic in Kanaka Creek is scheduled for development in 2020. (SWRCB 2006).

In 2009, the CVRWQCB recommended designating the section of the South Yuba River from Spaulding Dam to the USACE's Englebright Reservoir impaired for mercury and water temperature, and recommended designating the entire Middle Yuba River as impaired for mercury. (CVRWQCB 2009). These recommendations were considered and adopted by the SWRCB at the August 3, 2010 Board meeting and were advanced forward for approval by the United States EPA at that time (Azimi-Gaylon, pers. comm., 2010). At the time of this license application, the recommendations have not been approved by the EPA.

Fish Ingestion Advisories

Within the basins and sub-basins in which the two projects are located, the California Office of Environmental Health Hazard Assessment (OEHHA) has issued a fish ingestion advisory for channel catfish in Rollins Reservoir due to the concentration of mercury in their tissue. Specifically, OEHHA recommends that women of childbearing age (17-45 years of age) and children 17 years old and younger limit meals to two per month of channel catfish (from Rollins Reservoir), and that men 17 years old and older and women older than childbearing age (older than 45 years old) limit meals to four per month of channel catfish (from Rollins Reservoir). (OEHHA 2009.)

6.2.1.2.2 General Water Quality Conditions

Two of Licensees' studies support the water quality assessment, the Water Quality Study and the Water Temperature Monitoring Study.

The Water Quality Study focused on areas that would most likely be affected by Project O&M and recreation during periods when effects were expected to be most pronounced, if they were to occur. Conducted in 2008 and 2009, the study consisted of a multi-season[6] survey of water quality within, upstream and downstream of the major Project reservoirs (Jackson Meadows, Bowman Lake, Fordyce Lake, Lake Spaulding, and Rollins Reservoir) as well as selected stream sites located below terminal Project releases. In addition, near-shore samples were collected for bacteria and total petroleum hydrocarbons adjacent to recreation facilities identified through the recreation facility condition reconnaissance. Over the course of this study, Licensees collected

[6] Water quality samples were collected in 2008 from all but one location during spring runoff (i.e., June/July) and summer low-flow (i.e., August/early-September) conditions; the final location was sampled in 2009. Reaches downstream of impoundments and reservoirs were also sampled for a third time in the fall 2008 (October).

over 250 general water quality samples about half of which were analyzed for 34 general physical water quality parameters, metals and nutrients, while the other half were analyzed for bacteria and hydrocarbons.

The Water Temperature Monitoring Study (Study 2.2.2) consisted of collecting reservoir water temperature, DO, and pH vertical profiles in seven Project reservoirs: Sawmill Lake, Bowman Lake, Rollins Reservoir, Meadow Lake, Fordyce Lake, Lake Valley Reservoir and Lake Spaulding. (NID and PG&E 2010b). Data were collected in 2008 and 2009 using a Hydrolab multi-parameter water quality monitoring sonde. Data were recorded in the deepest part of the reservoir at approximately 10ft intervals, except near the thermocline, where smaller intervals were used. Water temperature and dissolved oxygen profiles were plotted with elevation in order to accurately compare profiles taken on different dates and to describe water temperatures and dissolved oxygen in proximity to the elevation of each reservoir's low-level outlet.

Licensees' studies confirm the conclusions of drinking water Source Water Assessments, conducted every 5 years over the last 15 years, which found surface waters in the basins to be suitable for drinking with little or no treatment (NID and PCWA 1996; Black & Veatch 2002; Starr and Palencia 2007). Licensees found general water quality in the vicinity of the two projects is high (i.e., most analytes were reported as non-detect by the water quality laboratories performing the analysis to just above reporting limit concentrations) and did not find a pattern of increasing chemical concentrations downstream of the projects' reservoirs. Further, of the 14 Basin Plan Water Quality Objectives, no inconsistencies are observed for the following seven objectives at any single location: Biostimulatory Substances, Chemical Constituents, Color, Pesticides, Sediment and Settable Solids, Floating Material, and Oil & Grease; a few inconsistencies were observed for the remaining Basin Plan Objectives.

This Section discusses Basin Plan Objectives, and provides a list of study locations where Licensees' Water Quality Study (Study 2.2.1) suggested inconsistencies with these Objectives. Below, in the discussion of the Proposed Project's potential effects, the information is presented on a reach-by-reach basis (Section 6.2.2.1.2 (Yuba-Bear Hydroelectric Project) and Section 6.2.2.2.2 (Drum-Spaulding Project)).

Dissolved Oxygen

Measured DO levels were above the Basin Plan's minimum numerical limit of 7.0 milligrams per liter (mg/L) for cold water fisheries in all but twelve of the more than 100 synoptic samples collected by Licensees. The twelve samples were collected from eight locations; four streams and four reservoirs. In streams, DO levels were less than 7.0 mg/L at: Greenhorn Creek, upstream of the Project's Rollins Reservoir (6.7 mg/L) in the spring 2008 sample; Bloody Creek below Lake Sterling Dam (6.3 mg/L, 6.9 mg/L) in both spring and summer 2008; the South Yuba River below Spaulding Dam (2.8 mg/L) in fall 2008; and Rock Creek below Rock Creek Reservoir (6.7 mg/L) in summer 2009. In reservoirs, DO levels were less than 7 mg/L at: the hypolimnion of Jackson Meadows Reservoir in summer 2008 (6.3 mg/L) and fall 2009 (1.7 mg/L); Rollins Reservoir in summer (6.8 mg/L) 2008 and fall (0.9 mg/L) 2009; Blue Lake in the summer 2008 (6.4 mg/L); and Lake Spaulding in the summer (5.9 mg/L) and fall (0.3 mg/L) of 2009.

In addition to the synoptic water quality sampling discussed above, Licensees also collected vertical DO profiles in eight Project reservoirs as part of the Water Temperature Monitoring Study (NID and PG&E 2010b). Table 6.2.1-5 shows the range of DO concentrations recorded by month at each reservoir. Only Meadow Lake had DO concentrations that were all above the Basin Plan Objective of 7.0 mg/L, likely attributed to its relatively shallow depth and lack of defined thermocline. The other seven reservoirs had concentrations that ranged below the 7.0 mg/L objective occurring mostly in the hypolimnion, which is consistent with expected DO concentrations in deeper reservoirs in the Sierra Nevada. Detailed vertical DO profiles for each of the seven reservoirs can be found Section 6.2.2 of this Exhibit E.

Table 6.2.1-5. Dissolved oxygen concentrations measured in Projects reservoir profiles

Reservoir	Maximum Water Surface Elevation (ft)	Dissolved Oxygen (mg/L)					
		Year	June	July	August	September	October
YUBA-BEAR HYDROELECTRIC PROJECT							
Jackson Meadows Reservoir[1]	6,033	2009	8.1 – 9.8	5.4 – 9.8	1.2 – 9.9	1.9 – 7.8	3.3 – 8.2
Sawmill Lake	5,860	2008	--	5.7 – 7.5	--	--	--
		2009	--	7.2 – 8.9	--	--	--
Bowman Lake	5,562	2008	--	7.1 – 8.9	6.7 – 8.0	7.0 – 7.6	9.1 – 9.2
		2009	4.7 – 8.4	7.1 – 8.3	6.7 – 8.1	6.2 – 7.7	7.8 – 8.0
Rollins Reservoir	2,171	2008	7.1 – 8.6	6.7 – 7.4	3.6 – 6.9	5.2 – 8.6	1.1 – 8.5
		2009	7.2 – 11.8	6.8 – 9.5	2.5 – 8.7	0.5 – 8.2	7.5 – 8.1
DRUM-SPAULDING PROJECT							
Meadow Lake[1]	7,282	2009	--	--	--	7.1 – 7.3	--
Fordyce Lake	6,405	2008	--	7.7 – 9.0	--	6.8 – 9.2	4.5 – 9.8
		2009	--	7.4 – 9.6	7.4 – 9.9	5.2 – 9.9	9.1 – 9.7
Lake Valley Reservoir	5,785	2008	--	--	1.2 – 8.0	--	--
		2009	8.8 – 11.3	--	2.6 – 9.2	--	--
Lake Spaulding	5,014	2008	--	7.7 – 8.4	4.5 – 8.0	0.8 – 7.2	--
		2009	8.3 – 9.3	5.4 – 9.2	3.3 – 8.5	1.3 – 8.4	0.3 – 8.2

[1] Data collected in 2009 only
-- Data not available or required by FERC study
ft feet
mg/L milligrams per liter

pH

Measured pH values were within the Basin Plan criteria of 6.5 to 8.5 standard units (su) in all but five of the more than 100 samples collected by Licensees. The five samples were from three streams and two reservoirs. All three stream samples that were outside of the Basin Plan criteria were between 6.4 and 6.0 su. In spring 2008, measured pH levels in streams were less than 6.5 su in the Bear River below the Chicago Park Powerhouse (6.2 su), in Fordyce Creek below Fordyce Dam (6.4 su), and in an unnamed creek below Fuller Dam (6.4 su). In the reservoirs, pH levels were less than 6.5 su in one sample from the hypolimnion of Blue Lake (6.0 su) in summer 2008, and above 8.5 su near the bottom of Lake Spaulding (8.7 su) in fall 2009.

Tastes and Odors

Measured iron concentrations were within the Basin Plan criteria of 0.3 mg/L, a secondary Maximum Contaminant Level (MCL), in all but six of the more than 100 samples collected. All were from stream samples. In 2008, iron levels were greater than 0.3 mg/L in Mormon Ravine Reach in spring (0.327 mg/L), South Yuba River below Spaulding Dam in summer (0.409 mg/L) and fall (0.974 mg/L), Bear River Canal Diversion Dam Reach below the Bear River Canal Diversion dam in fall (0.362 mg/L). In 2009 iron levels exceeded the Basin Plan criteria at Rock Creek below Rock Creek Reservoir in both spring (0.464 mg/L) and summer (0.437 mg/L).

Toxicity

The Basin Plan does not include numeric water quality objectives for aquatic toxicity applicable to the Bear and Yuba rivers.[7] Hence, Licensee's Water Quality Study (NID and PG&E 2010a), preferentially used the criteria from EPA (2000) *California Toxics Rule* (CTR) for this evaluation. When a CTR criterion was unavailable for a particular analyte, an aquatic life protective benchmark was selected from Marshack (2008) *A Compilation of Water Quality Goals* and other sources.

Licensees' study found only aluminum and copper (dissolved) concentrations above benchmark levels. Aluminum was found greater than the aquatic benchmark of 0.087 mg/L in three streams reaches and one reservoir. The stream reaches were the Bear River below the Bear River Canal Diversion Dam (0.2 mg/L) in fall 2008, in Dry Creek below Halsey Afterbay Dam (0.089 mg/L) in spring 2008, and in Mormon Ravine (0.14 mg/L, 0.302 mg/L) in spring 2008. In reservoirs, aluminum levels were greater than 0.087 mg/L in the hypolimnion of Jackson Meadows Reservoir (0.139 mg/L) in spring 2008.

Copper (dissolved) was found throughout the basins, both upstream and downstream of the projects' influence, however, there is evidence that the filters used for collection of dissolved metals samples contributed to reported copper (dissolved) concentrations.

In spring 2008, four of the 49 samples analyzed by Licensees exhibited copper (dissolved) concentrations above the hardness-dependent aquatic life protective benchmark (measured concentration range of 1.09 µg/L [micrograms per liter] to 1.37 µg/L; compared to CTR Criterion Continuous Concentrations [CCC] range of 0.87 µg/L to 1.12 µg/L at the sample specific hardness measured). In summer 2008, 23 of the 49 samples collected by Licensees exhibited copper (dissolved) concentrations above the hardness-dependent aquatic life protective benchmark (concentration range of 0.31 to 5.27 µg/L; CTR CCC range of 0.3 µg/L to 3.0 µg/L). In fall 2008, one of the 10 samples exhibited copper (dissolved) concentrations above the hardness-dependent aquatic life protective benchmark (Fordyce Lake Dam Reach; concentration of 0.48 µg/L; CTR 0.47 µg/L).

Measured copper (dissolved) concentrations, however, were routinely greater than their corresponding copper (total) concentration, which was often not detected, and, when field blank results were reviewed, these trace detections were attributed to the filters used for in-field sample filtration. Whereas, field blank results for dissolved (filtered) copper concentrations ranged from not detected at 0.1 µg/L to 1.3 µg/L, results for total (unfiltered) copper concentrations were non-detect (less than 0.1 µg/L).

[7] Though the Basin Plan includes methylmercury objectives for some water bodies in the Central Valley region, it does not provide a methylmercury objective for waters in basins and sub-basins in which the projects are located. Hence, toxicity as it may relate to bioaccumulation of mercury in fish tissue is discussed separately in this document.

Turbidity

As described above, the numeric portion of the Basin Plan Turbidity objective is difficult to apply to hydroelectric projects because it establishes unacceptable changes to ambient conditions, and ambient conditions for hydroelectric projects are difficult to quantify. In general, Licensees' Water Quality Study found that the basins and sub-basins in which the projects are located have low turbidity (~0 to about 3 NTU, and generally less than 10 NTU year round), except in four reaches. One exception to this general trend of low turbidity occurs in the Bear River below Rollins Dam where turbidity increased to more than 20 NTU in spring and fall 2008. Other uncharacteristic locations of relatively higher turbidity levels included Halsey Afterbay Dam Reach (27.2 NTU) and Mormon Ravine Reach (23.6 NTU) in spring 2008, and Wise Powerhouse Overflow Reach in fall 2008 (11.1 NTU).

While the SWRCB ultimately may or may not consider these levels of turbidity to be inconsistent with Basin Plan objectives, Licensees have taken a conservative approach and discussed these levels in Section 6.2.2.1.2 below.

Bacteria

In 2008, Licensees analyzed water in the vicinity of 20 recreation areas for total coliform, fecal coliform and *Escherichia coli* (*E. coli*). All of the sites had fecal coliform and *E. coli* counts less than the Basin Plan's benchmarks for these parameters, and 15 of the sites had total coliform counts less than the Basin Plan's objective for this parameter. The five sites that exceeded the total coliform objective (geometric mean of 5 samples <240 MPN per 100 mL) were near the north shore campsites at Carr Lake, near the informal campground boat launch at Lower Lindsey Lake; and near three campgrounds (Long Ravine, Orchard Springs and Greenhorn) at Rollins Reservoir. Licensees re-sampled the five sites in 2009 with the same results, and two of the five samples collected from Long Ravine Campground showed *E. coli* levels that were greater than the discrete benchmark (<235 MPN per 100 mL in any single sample).

6.2.1.2.3 Water Temperatures in Streams

Licensees' Water Temperature Monitoring Study is the most comprehensive source of water temperature information for streams in the basins and sub-basins potentially affected by the two projects. In the study, Licensees continuously monitored water temperature in streams and conduits from May through October in 2008 and 2009 using thermographs at 72 stream sites, which ranged in elevation from the highest to the lowest Project facility in each Project-affected reach. Seven sites located within Project conduits are also included below for reference. In 2010, the Licensees monitored water temperatures at a subset of the original locations to better inform and calibrate the various water temperature models. Refer to the Water Temperature Monitoring Technical Memorandum (NID and PG&E 2010b) for detailed sub-daily observed data collected at each location described below in 2008 and 2009.[8] Where a full month of temperature data were collected, temperature statistics are provided below. Table 6.2.1-6 presents the minimum

[8] Data were also collected in 2010 at several locations; these locations are called out in Table 6.2.1-46 below. The detailed data supporting these statistics are also available in the Water Temperature Monitoring Technical Memorandum, filed with this FLa in Appendix E12.

and maximum mean daily water temperatures by month at each of the 72 stream and 7 conduit water temperature monitoring sites.

Table 6.2.1-6. 2008, 2009 and 2010 minimum and maximum daily average stream temperatures (°C) by month.

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
MIDDLE YUBA RIVER SUB-BASIN														
MYR below Jackson Meadows Dam	46.7	2009	No Data	No Data	5.5	6.4	5.9	7.0	6.3	7.3	7.0	8.0	6.9	8.5
Wilson Creek above Wilson Creek Diversion Dam[1]	0.3	2008	No Data	No Data	6.3	11.5	10.7	12.8	10.7	13.1	7.4	10.6	5.8	8.9
		2009	No Data	No Data	7.5	11.7	9.6	13.2	9.5	13.3	6.6	11.4	4.0	6.6
MYR below Milton Diversion Dam	44.4	2008	No Data	No Data	9.2	11.9	11.5	12.9	10.6	14.8	8.7	11.4	8.5	9.2
		2009	No Data	No Data	8.3	11.7	10.3	12.5	9.5	12.7	8.0	11.3	6.4	7.9
MYR above East Fork Creek	34.6	2008	No Data	No Data	No Data	No Data	12.8	14.1	12.4	13.7	10.0	12.1	9.1	10.1
		2009	No Data	No Data	9.9	13.4	12.0	14.1	11.8	14.0	10.0	12.3	6.0	9.6
East Fork Creek above MYR[1]	34.6	2008	No Data	No Data	No Data	No Data	12.2	14.9	11.9	15.0	10.0	12.8	5.6	11.0
		2009	No Data	No Data	8.9	14.3	12.5	15.4	12.2	15.2	8.7	13.0	6.8	8.9
MYR above Wolf Creek	26.9	2008	No Data	No Data	11.8	18.1	18.0	**20.3**	18.1	**20.5**	14.0	17.6	7.5	13.1
		2009	11.0	13.4	11.2	18.0	16.7	**20.6**	17.0	**20.5**	12.7	17.7	10.1	12.2
Wolf Creek above MYR[1]	26.9	2008	No Data	No Data	10.6	15.7	15.0	17.2	14.4	17.3	11.6	14.6	6.2	13.2
		2009	10.7	13.3	10.6	14.9	12.7	16.7	13.0	16.4	10.1	14.7	7.5	9.5
MYR above Kanaka Creek	17.5	2008	9.4	13.5	13.5	**21.1**	**21.0**	**23.4**	**20.6**	**23.5**	18.0	**20.0**	No Data	No Data
		2009	12.6	15.6	13.1	**21.3**	19.4	**23.9**	18.9	**23.6**	13.9	**20.3**	10.7	13.0
Kanaka Creek above MYR[1]	17.5	2008	9.8	16.7	13.7	**20.0**	19.5	**21.9**	19.0	**21.8**	14.9	18.6	7.8	16.1
		2009	13.9	17.4	13.2	19.9	17.5	**22.3**	17.1	**21.7**	13.3	18.8	10.1	12.5
MYR above Our House Diversion Impoundment	12.8	2008	10.1	14.4	14.3	**21.9**	**21.8**	**24.2**	**21.5**	**24.4**	16.8	**21.1**	8.6	16.4
		2009	12.5	16.5	13.9	**22.2**	**20.4**	**25.0**	**20.1**	**24.6**	15.3	**21.4**	11.9	14.4
		2010	7.0	10.6	9.4	18.8	17.6	**23.6**	**20.2**	**22.5**	No Data	No Data	No Data	No Data
DEER CREEK SUB-BASIN														
South Fork Deer Creek [1] above Deer Creek PH	3.0	2008	No Data	No Data	10.8	12.2	12.1	15.8	16.0	18.4	14.6	16.6	10.6	14.7
		2009	9.9	11.9	9.4	14.1	12.0	16.1	12.0	15.8	8.8	13.3	6.5	14.1
South Fork Deer Creek below Deer Creek PH	3.0	2008	6.8	10.4	8.8	14.6	14.1	16.0	13.3	15.9	10.1	15.1	5.5	14.8
		2009	6.9	10.1	8.1	13.1	14.0	18.6	14.0	16.7	No Data	No Data	No Data	No Data
CANYON CREEK SUB-BASIN														
Canyon Creek above Faucherie Reservoir	17.1	2008	No Data	No Data	9.0	15.4	10.5	17.4	14.8	17.5	11.7	15.3	11.5	15.1
		2009	2.2	11.6	9.7	16.5	14.6	18.3	13.9	18.2	9.6	14.9	8.5	11.1
Canyon Creek above Sawmill Lake	14.8	2008	No Data	No Data	11.1	14.2	16.0	18.6	17.2	19.5	15.4	19.1	13.1	15.5
		2009	No Data	No Data	12.4	16.7	14.5	18.0	14.3	18.5	14.4	19.2	9.2	13.9
Canyon Creek above Bowman Lake	13.3	2008	No Data	No Data	9.4	16.9	12.4	18.0	17.0	19.8	15.9	19.7	13.6	15.8
		2009	No Data	No Data	13.0	15.5	12.1	16.3	14.0	19.1	15.0	19.1	10.5	14.8

Table 6.2.1-6. (continued)

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
CANYON CREEK SUB-BASIN (continued)														
Jackson Creek below Prairie Creek and above Bowman Lake	0.3	2008	No Data	No Data	8.4	11.1	10.3	11.5	10.4	11.9	9.4	11.0	8.6	10.2
		2009	No Data	No Data	8.5	10.9	9.8	12.1	9.7	11.9	8.7	11.2	7.6	9.5
Milton-Bowman Tunnel at outfall to Bowman Lake	--	2008	No Data	No Data	6.8	8.6	8.3	9.3	8.6	14.5	8.0	10.5	8.7	9.9
		2009	No Data	No Data	6.9	9.1	8.2	9.6	7.7	12.2	8.2	10.2	7.2	9.0
Canyon Creek below Bowman-Spaulding Diversion Dam	9.7	2008	No Data	No Data	9.7	13.6	11.0	12.6	11.1	15.7	14.0	15.7	13.1	14.9
		2009	6.1	7.6	7.4	12.9	10.2	12.6	11.1	14.1	13.0	15.3	11.2	13.4
Bowman-Spaulding Conduit below BSC Diversion Dam	--	2008	No Data	No Data	8.1	8.9	8.8	10.5	10.6	15.1	15.2	16.1	14.3	15.3
		2009	6.8	7.1	7.1	14.9	7.9	10.1	10.2	13.6	13.7	15.5	12.9	15.5
Texas Creek below Culbertson Lake	4.3	2008	No Data	No Data	10.2	14.5	14.5	17.7	15.5	18.2	13.5	16.8	10.9	14.0
		2009	No Data	No Data	9.9	14.8	13.8	18.6	13.7	18.9	14.1	17.8	8.6	13.8
Lindsey Creek above Texas Creek confluence	0.1	2008	No Data	No Data	9.8	13.4	12.5	14.7	11.9	14.7	9.5	12.9	8.8	10.8
		2009	10.2	13.0	9.7	14.4	11.8	15.8	12.1	16.3	9.6	15.9	5.7	10.0
Texas Creek above Lindsey Creek confluence	1.2	2008	No Data	No Data	10.3	14.0	12.8	15.3	12.3	14.9	9.0	12.6	8.1	10.5
		2009	10.9	13.2	8.7	14.4	11.4	15.5	10.7	15.2	10.5	12.9	No Data	No Data
Canyon Creek above Texas Creek confluence	6.2	2008	No Data	No Data	No Data	No Data	14.3	17.4	13.7	17.5	12.4	15.3	11.4	13.8
		2009	No Data	No Data	11.2	15.4	13.7	17.4	14.0	17.4	12.7	15.4	8.6	11.8
Little Canyon Creek above Canyon Creek[1]	1.2	2008	No Data	No Data	No Data	No Data	No Data	No Data	15.2	17.3	13.7	16.0	8.8	14.8
		2009	10.8	13.8	10.8	14.7	13.3	17.2	14.4	16.9	13.0	16.0	10.5	12.6
Canyon Creek above SYR	0.1	2008	9.5	16.2	13.3	19.4	19.2	**21.7**	17.6	**21.8**	14.6	18.7	7.9	15.9
		2009	7.5	12.5	11.4	19.6	17.3	**22.2**	17.4	**21.9**	13.8	19.0	10.5	12.8
FALL CREEK SUB-BASIN														
Clear Creek above B-S Canal[1]	0.9	2008	No Data	No Data	7.7	12.6	12.4	15.2	11.7	14.5	10.4	13.0	No Data	No Data
		2009	8.5	10.6	7.9	13.4	11.6	15.6	12.4	15.5	No Data	No Data	No Data	No Data
Trap Creek above B-S Canal[1]	0.1	2008	No Data	No Data	6.6	11.1	11.0	14.1	14.1	14.6	No Data	No Data	No Data	No Data
		2009	7.4	9.0	7.6	11.6	10.9	15.9	12.1	15.8	No Data	No Data	No Data	No Data
Fall Creek above SYR confluence	0.2	2008	8.3	13.4	9.8	16.2	14.7	17.9	12.8	17.3	11.4	13.8	11.1	13.5
		2009	11.4	14.4	10.3	15.5	13.1	17.9	13.7	17.5	11.2	15.3	8.5	11.0
Fall Creek above Fall Creek Diversion Dam	2.1	2008	No Data	No Data	7.5	12.9	12.4	15.2	12.9	16.8	9.2	12.8	8.2	10.4
		2009	7.3	10.3	8.4	13.7	11.7	16.0	11.5	15.7	9.1	13.2	6.2	8.7
RUCKER CREEK SUB-BASIN														
Rucker Creek above Rucker Lake	2.3	2008	No Data	No Data	12.4	18.4	18.4	**20.8**	19.4	**21.0**	16.9	18.8	15.4	16.9
		2009	12.9	16.1	14.3	18.6	18.1	**21.8**	19.8	**21.8**	14.9	16.7	19.6	12.7
Rucker Creek above B-S Canal	1.4	2008	No Data	No Data	13.4	18.2	17.3	19.9	17.5	**20.4**	14.1	17.8	11.7	15.1
		2009	14.5	15.9	13.4	18.7	16.8	19.1	17.1	19.4	14.6	19.5	10.5	13.6

Table 6.2.1-6. (continued)

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
B-S Canal at Rucker Creek	--	2008	No Data	No Data	8.6	9.8	9.4	10.9	11.0	12.6	14.8	15.9	14.1	15.3
		2009	7.8	8.4	7.3	15.3	8.5	10.6	10.6	13.6	13.8	15.4	12.2	14.9
Rucker Creek above SYR	0.1	2008	No Data	No Data	9.5	14.4	14.0	16.4	14.1	16.3	12.0	14.3	11.0	13.2
		2009	8.5	10.6	7.9	13.4	11.6	15.6	12.4	15.5	9.2	13.3	7.5	11.7
FORDYCE CREEK SUB-BASIN														
Unnamed Tributary above Fordyce Lake (Meadow Lake Dam Reach)	0.1	2008	No Data	No Data	12.3	14.7	13.7	16.5	13.2	15.3	12.4	15.6	10.1	13.1
		2009	No Data	No Data	8.7	14.7	12.2	17.2	11.7	17.1	8.9	14.9	No Data	No Data
White Rock Creek below White Rock Dam	2.0	2008	No Data	No Data	12.7	15.0	14.4	16.7	14.2	17.4	8.4	15.1	9.1	12.1
		2009	No Data	No Data	4.0	15.3	14.2	18.4	15.7	18.5	12.7	15.8	7.6	12.2
North Creek above Fordyce Lake	0.1	2008	No Data	No Data	13.0	15.9	14.8	17.4	14.4	17.2	10.4	13.9	8.0	11.2
		2009	No Data	No Data	6.0	15.1	13.7	18.9	12.7	19.1	8.5	16.2	4.8	8.0
Bloody Creek above Fordyce Lake	0.1	2008	No Data	No Data	12.9	14.3	13.3	16.5	13.1	16.8	12.4	17.1	11.8	14.3
		2009	No Data	No Data	10.0	13.2	12.4	17.4	14.0	17.5	9.2	14.7	7.4	10.7
Fordyce Creek below Fordyce Dam	10.3	2008	No Data	No Data	7.3	7.4	7.5	8.0	7.5	8.8	8.6	14.3	13.6	14.4
		2009	1.9	5.2	5.2	6.8	6.2	7.7	7.8	15.8	14.2	17.0	9.7	13.7
Fordyce Creek above Lake Spaulding	0.3	2008	No Data	No Data	12.6	16.4	15.3	17.8	9.9	16.9	9.9	14.5	12.5	14.4
		2009	No Data	No Data	8.3	15.0	9.2	14.8	11.2	19.4	14.6	19.5	10.0	13.6
SOUTH YUBA RIVER SUB-BASIN														
SYR above Lake Spaulding	43.4	2009	No Data	No Data	10.9	19.4	19.2	**22.3**	16.9	**22.2**	12.6	18.5	8.8	11.8
SYR below Spaulding Main Dam	40.8	2008	No Data	No Data	No Data	No Data	9.2	10.7	8.7	10.8	8.4	9.5	6.8	9.8
		2009	5.4	7.9	6.5	9.1	8.2	10.7	8.7	10.3	7.6	9.8	7.2	8.8
SYR above Jordan Creek	40.3	2008	No Data	No Data	8.7	11.8	10.5	12.4	9.7	12.2	8.5	10.2	8.2	10.5
		2009	5.6	9.1	7.0	10.5	9.3	12.0	9.5	11.8	7.9	10.6	7.1	8.7
		2010	4.8	5.7	5.8	10.2	7.6	12.5	10.7	12.0	No Data	No Data	No Data	No Data
B-S Canal below Fuller Lake	--	2008	No Data	No Data	10.2	14.4	11.4	12.4	12.6	16.2	15.4	16.3	14.5	15.8
		2009	8.4	10.7	8.3	11.2	10.4	12.7	11.9	14.7	8.4	18.3	4.4	14.2
Jordan Creek above SYR	0.2	2008	No Data	No Data	11.5	16.3	15.6	17.9	16.2	18.8	14.0	17.2	12.3	14.9
		2009	8.3	13.2	11.4	15.7	14.9	18.3	14.4	18.2	13.0	16.7	10.5	13.1
		2010	6.1	9.3	7.2	13.7	13.1	15.9	13.0	16.9	12.6	15.7	11.2	15.2
Diamond Creek above SYR[1]	33.2	2008	No Data	No Data	13.3	17.1	16.9	18.7	18.1	**20.0**	15.4	18.1	14.4	16.2
		2009	7.4	13.9	11.3	13.8	14.4	17.4	14.1	15.3	12.2	14.9	11.5	12.5
SYR above Canyon Creek	32.5	2008	10.6	16.9	15.4	**21.0**	**21.1**	**23.4**	**20.2**	**23.4**	15.7	19.6	9.2	16.9
		2009	7.5	15.3	12.6	**21.5**	19.3	**23.8**	18.6	**23.5**	14.5	**20.3**	11.3	13.6
Spring Creek above SYR[1]	14.9	2008	11.3	17.2	12.2	17.8	16.0	19.0	15.2	18.6	12.2	14.4	6.8	14.3
		2009	10.3	16.3	13.2	17.1	14.2	19.3	14.7	18.7	10.5	16.2	8.1	10.3

Table 6.2.1-6. (continued)

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
SOUTH YUBA RIVER SUB-BASIN (continued)														
Rock Creek above SYR[1]	10.1	2008	13.5	18.9	14.8	19.7	18.5	**20.9**	17.6	**20.0**	13.3	16.8	7.8	14.8
		2009	14.6	19.6	16.0	**20.3**	17.2	**21.3**	16.9	**21.0**	12.4	17.4	9.7	11.5
SYR above Poorman Creek	28.1	2008	11.3	17.9	16.0	**21.8**	**21.8**	**24.0**	**21.3**	**23.9**	15.5	**20.6**	9.9	17.4
		2009	8.0	15.4	13.4	**22.2**	**20.2**	**24.8**	19.9	**24.6**	15.9	**21.5**	12.5	15.0
Poorman Creek above SYR[1]	28.1	2008	8.1	12.6	12.2	18.5	18.2	**20.6**	17.7	**20.8**	13.7	17.6	7.2	15.4
		2009	6.6	15.6	11.8	18.2	15.7	**20.8**	15.7	**20.5**	12.0	17.6	9.0	11.3
SYR above Humbug Creek	19.6	2008	11.6	17.9	16.4	**22.8**	**22.7**	**25.0**	**21.7**	**24.6**	15.9	**21.0**	15.2	17.6
		2009	11.2	16.4	14.6	**23.2**	**20.9**	**25.5**	**20.4**	**25.1**	15.5	**21.5**	11.9	14.5
Humbug Creek above SYR[1]	19.6	2008	9.9	16.6	11.8	17.9	16.8	19.3	16.2	19.2	12.8	16.3	12.4	14.8
		2009	11.0	15.5	12.3	17.1	14.4	19.5	15.0	19.2	11.8	16.4	8.9	10.9
SYR above Rush Creek	6.2	2008	13.7	**20.1**	17.9	**23.7**	**23.1**	**25.4**	**22.4**	**24.9**	16.7	**21.6**	10.2	18.5
		2009	9.6	17.2	16.4	**24.1**	**21.4**	**25.8**	**21.2**	**25.6**	16.0	**21.7**	12.5	14.9
Rush Creek above SYR[1]	6.2	2008	No Data	No Data	15.5	18.3	17.4	19.5	17.6	19.7	14.6	17.5	9.5	16.3
		2009	11.4	18.1	15.0	18.5	16.2	19.9	16.8	19.7	13.7	17.7	11.2	12.9
Shady Creek above SYR[1]	5.0	2008	14.7	**21.0**	17.1	**22.9**	**21.4**	**24.9**	**21.0**	**24.6**	18.2	**22.3**	15.5	**21.1**
		2009	12.3	**25.2**	16.7	**21.6**	18.8	**24.1**	**20.1**	**24.2**	17.3	**22.5**	12.0	19.2
SYR above Englebright Reservoir	1.0	2008	14.7	**21.3**	18.7	**22.2**	**23.6**	**25.9**	**23.0**	**25.7**	17.5	**22.4**	11.1	19.5
		2009	12.6	19.3	17.8	**24.9**	**22.2**	**26.5**	**21.9**	**26.2**	17.2	**22.4**	12.0	16.1
		2010	9.7	13.9	11.9	**20.1**	19.0	**26.5**	**20.2**	**24.2**	17.9	**21.9**	16.1	19.9
BEAR RIVER SUB-BASIN														
Bear River above Drum Canal Waste Gate	35.1	2008	No Data	No Data	10.0	13.0	12.5	14.0	13.4	15.5	12.9	14.7	11.9	12.0
		2009	8.6	11.0	9.4	11.6	10.5	12.1	10.4	11.8	9.2	11.4	8.6	9.9
Bear River at Hwy 20 crossing (YB-198)	34.0	2008	No Data	No Data	9.3	12.0	11.6	14.2	14.1	16.6	13.1	15.0	12.4	13.8
		2009	9.2	11.9	9.0	12.5	11.3	14.5	12.5	15.1	12.7	15.0	11.2	13.1
Bear River above Drum Afterbay	27.4	2008	7.5	13.1	11.3	16.1	15.6	17.5	14.5	18.0	12.2	15.1	10.9	13.6
		2009	7.8	13.9	10.3	16.2	13.6	17.8	13.1	17.4	10.2	15.1	8.1	10.6
Bear River below Drum Afterbay	25.1	2008	6.8	8.1	8.1	10.8	11.0	15.0	15.1	17.7	13.1	16.3	12.1	14.6
		2009	6.7	7.9	7.4	10.8	10.9	14.7	14.2	16.6	12.1	17.1	10.7	14.5
		2010	5.4	6.9	6.6	9.2	8.6	11.9	11.8	14.0	No Data	No Data	No Data	No Data
Bear River above Dutch Flat Afterbay	23.8	2008	No Data	No Data	No Data	No Data	15.7	17.9	16.4	19.4	13.5	16.8	7.8	14.9
		2009	No Data	No Data	11.9	15.5	14.1	18.0	14.6	17.9	14.6	17.1	8.0	13.4
		2010	6.3	10.9	7.5	15.5	12.6	16.7	14.1	16.5	No Data	No Data	No Data	No Data
Little Bear River below PCWA's Lower Boardman Canal (YB-98)	1.8	2008	8.0	16.2	10.3	13.3	13.1	15.7	15.8	19.0	15.0	16.9	13.2	17.2
		2009	10.3	**21.7**	9.7	14.4	12.6	16.3	14.0	17.2	14.0	17.4	10.8	13.8

Table 6.2.1-6. (continued)

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
BEAR RIVER SUB_BASIN (continued)														
Bear River below Dutch Flat Afterbay Dam	21.3	2009	7.1	8.2	7.8	11.2	11.1	14.4	14.5	16.4	15.7	16.7	12.5	15.5
		2010	6.2	6.9	7.1	8.9	8.7	12.0	12.0	13.9	No Data	No Data	No Data	No Data
Bear River above Chicago Park PH	16.1	2008	8.2	10.2	9.4	18.8	18.1	**20.2**	18.5	**21.3**	16.0	19.3	15.4	16.7
		2009	12.6	17.4	14.0	19.5	18.1	**21.3**	18.0	**21.0**	14.4	19.5	12.8	14.5
		2010	8.9	13.8	13.8	19.4	17.7	**20.7**	16.6	19.7	No Data	No Data	No Data	No Data
Steephollow Creek above Bear River[1]	15.5	2008	12.4	18.2	15.4	17.1	18.4	**20.5**	No Data	No Data	15.7	18.5	15.2	16.4
		2009	9.3	17.8	14.3	19.5	18.0	**20.7**	17.8	**20.4**	15.2	18.8	12.1	15.1
Bear River above Steephollow Creek	15.7	2008	No Data	No Data	10.0	10.8	12.9	16.4	16.6	19.0	16.2	18.1	14.6	16.9
		2009	6.6	8.6	8.0	13.7	11.9	16.1	15.2	18.4	15.2	18.2	13.9	15.3
		2010	5.8	7.4	7.4	9.6	9.3	9.6	14.9	16.1	15.4	17.4	14.9	19.8
Greenhorn Creek above Rollins Reservoir[1]	--	2008	13.0	**21.1**	16.4	**22.0**	**20.6**	**24.8**	18.9	**23.9**	14.9	**20.8**	14.9	17.9
		2009	10.6	19.2	14.7	**21.0**	18.7	**23.5**	17.7	**22.5**	13.5	**20.9**	10.9	14.0
Bear River above Rollins Reservoir	15.3	2008	No Data	No Data	10.8	12.0	13.3	16.1	16.3	18.6	16.3	17.9	14.2	17.0
		2009	7.4	10.0	8.9	12.6	12.6	15.5	14.1	17.5	15.2	17.9	10.5	15.2
Bear River below BRC Diversion Dam (YB-196)	10.0	2008	7.2	10.0	10.1	11.5	11.6	14.2	14.4	18.0	18.1	18.8	18.7	18.8
		2009	7.2	11.9	9.7	10.9	10.9	13.7	13.9	17.2	17.2	18.1	16.4	18.0
		2010	8.9	11.3	9.8	12.1	9.9	12.2	12.3	13.7	No Data	No Data	No Data	No Data
Bear River near Milk Ranch Road	5.5	2008	No Data	No Data	13.4	14.9	14.9	16.7	16.8	17.6	18.0	19.2	16.1	18.9
		2009	8.0	12.5	10.8	15.1	12.7	16.8	15.4	18.7	16.5	19.6	14.0	17.0
Bear River above Lake Combie	0.5	2008	No Data	No Data	14.9	16.8	16.7	18.0	17.9	**20.4**	17.9	**20.2**	17.3	18.9
		2009	8.2	12.2	11.9	17.4	13.4	18.5	16.4	19.5	18.1	**20.2**	No Data	No Data
		2010	No Data	No Data	11.7	13.4	12.1	17.4	16.8	17.4	No Data	No Data	No Data	No Data
Bear River Canal at YB-58 (Placer Hills Road)	--	2008	9.1	10.5	10.6	12.2	12.3	12.6	16.2	18.3	18.0	18.8	18.4	18.7
		2009	7.3	10.1	9.8	11.8	11.8	14.3	14.4	17.4	17.4	18.2	16.1	17.6
NORTH FORK AMERICAN RIVER SUB-BASIN														
NFNFAR above Lake Valley Canal Diversion	14.5	2008	7.6	12.2	11.9	18.7	17.1	19.8	16.4	**20.1**	13.9	18.4	12.3	16.1
		2009	8.0	11.5	8.9	18.7	15.5	19.9	13.0	19.3	11.4	17.8	11.1	13.4
NFNFAR above Fulda Creek and East Branch American River (below Lake Valley Canal Diversion Dam	7.1	2008	No Data	No Data	13.2	16.8	16.0	18.6	15.5	19.0	12.2	16.1	6.5	14.1
		2009	8.7	14.7	10.2	18.1	14.9	19.8	13.9	19.2	10.4	16.6	7.5	10.7
Canyon Creek above Towle Diversion Inflow (YB-280)	9.3	2008	7.0	9.0	8.1	11.1	11.2	12.8	11.8	14.8	10.8	13.7	9.9	12.8
		2009	6.9	9.3	8.0	11.0	10.0	12.8	10.1	13.5	8.9	13.8	6.6	9.6
COON CREEK SUB-BASIN														
Dry Creek above Halsey Afterbay[1]	--	2008	15.3	**21.6**	17.2	**21.2**	14.5	**24.0**	15.6	**24.2**	18.7	**22.2**	18.0	19.9
		2009	9.3	**21.0**	12.6	**23.2**	12.5	**24.1**	17.0	**22.5**	14.7	**21.4**	12.6	15.1

Table 6.2.1-6. (continued)

Location	River Mile	Year(s)	May		June		July		August		September		October	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Wise Canal below Halsey Afterbay (YB-61)	--	2008	9.5	11.2	11.3	12.9	13.0	15.6	15.7	16.6	18.5	19.2	18.3	19.1
		2009	7.6	10.8	10.3	13.0	12.5	14.9	15.0	17.7	17.2	18.5	15.8	17.5
AUBURN RAVINE SUB-BASIN														
Auburn Ravine above Wise Powerhouse[1]	27.6	2008	14.6	**20.3**	16.0	**20.2**	19.1	**22.1**	19.2	**22.1**	16.6	**20.5**	16.3	18.9
		2009	15.5	**20.2**	16.8	**21.8**	18.9	**22.6**	18.6	**21.9**	14.7	**20.6**	12.6	15.1
South Canal below Wise Powerhouse	--	2008	10.2	12.4	12.6	14.4	14.5	16.7	16.9	17.9	18.7	19.8	18.3	19.6
		2009	8.4	12.6	11.4	15.1	14.0	16.5	16.0	18.7	17.3	19.3	15.6	17.6

Shaded cells highlight values equal to or greater than 20.0°C.
[1] Thermograph location outside of the influence of the projects.

Based on Licensee's Water Temperature Monitoring Study, water temperature in streams in the vicinity of the projects is generally cold (i.e., mean daily water temperature of less than 20.0°C), with several exceptions including in the lower elevation sections of the Middle Yuba River, South Yuba River and the Bear River. Except in the lower sections of the Middle Yuba River, South Yuba River and the Bear River, local stream fish populations are almost entirely composed of trout, which require cold water (see Section 6.3 of Licensees' Exhibit E).

Like the Turbidity objective, the Basin Plan includes a quantitative temperature objective that is difficult to apply to hydroelectric projects. Specifically, the objective limits warming in "natural receiving waters." Therefore, it was assumed for this analysis that the most significant Basin Plan beneficial use related to temperature was protection of Cold Freshwater Habitat, and that this use would be supported in streams if the mean daily water temperature in the stream remained below 20.0°C, which is generally considered to be near the upper limit of the optimum temperature range for rainbow trout. Moyle (2002) states that the optimal temperatures for growth of rainbow trout are around 15° to 18°C, and Behnke (1992) reports that other fish species may gain competitive advantage over trout as water temperatures approach 21.0°C.

Licensee's Water Temperature Study found that mean daily water temperatures in 2008 or 2009 or both years exceeded 20.0°C in the six stream reaches discussed below.

Middle Yuba River Below Wolf Creek (Milton Diversion Dam Reach)

From June through August in 2008 and 2009, about 14 miles of the Middle Yuba River from immediately above Wolf Creek to YCWA's Our House Diversion Dam had mean daily water temperatures that exceed 20.0°C. Table 6.2.1-7 provides for each thermograph maintained by Licensees in this lower section of the Middle Yuba River the total number of days sampled, the number of days the mean daily temperature exceeded 20.0°C, and the number of days the instantaneous water temperature exceeded 25°C. Mean daily water temperatures at the thermograph maintained by Licensees upstream of this location did not exceed 20.0°C, and Licensees did not maintain any water temperature recorders downstream of YCWA's Our House Diversion Dam.

Table 6.2.1-7. Summary of number of days mean daily water temperatures exceeded 20.0°C and instantaneous water temperature exceeded 25°C in the Middle Yuba River.

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
MYR Above East Fork Creek	34.6	238	0	0
MYR above Wolf Creek confluence	26.9	289	12 (20.59)	0
MYR above Kanaka Creek confluence	17.5	277	124 (23.94)	19 (26.07)
Kanaka Creek above MYR confluence[1]	17.4	312	58 (22.25)	0
MYR above Our House Diversion Impoundment	12.8	313	149 (25.01)	73 (27.47)

[1] Water temperature station located outside of the affect of the projects.

Rucker Creek below Blue and Rucker Lakes (Blue Lake Dam and Rucker Lake Dam Reaches)

Licensees found that mean daily water temperatures were greater than 20.0°C in Rucker Creek below Blue Lake in July and August 2008 and 2009, and from Rucker Lake to the Bowman-Spaulding Conduit in August 2009 (Table 6.2.1-8). Table 6.2.1-8 provides for the three thermographs maintained by Licensees in Rucker Creek and for the one thermograph at Bowman-Spaulding Conduit at Rucker Creek the total number of days sampled, the number of days the mean daily temperature exceeded 20°C, and the number of days the instantaneous water temperature exceeded 25°C. The table also includes data from the thermograph Licensees maintained in Rucker Creek below the Bowman-Spaulding Conduit, where mean daily water temperatures did not exceed 20.0°C.

Table 6.2.1-8. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in Rucker Creek from Rucker Lake to the Bowman-Spaulding Conduit.

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
RUCKER CREEK SUB-BASIN				
Rucker Creek above Rucker Lake	2.3	276	66 (21.8)	0
Rucker Creek above B-S Canal	1.4	207	4 (20.4)	0
Bowman-Spaulding Conduit at Rucker Creek	1.2	225	0	0
Rucker Creek at SYR Confluence	0.1	243	0	0

South Yuba River above Canyon Creek Confluence (South Yuba Reach No. 3)

Of the four thermographs Licensees maintained in the South Yuba River between Lake Spaulding and the confluence with Canyon Creek in 2008 and 2009, only the thermograph located at the most downstream site located immediately upstream of the Canyon Creek confluence registered mean daily water temperatures over 20.0°C (Table 6.2.1-9). Of the 350 total days monitored at that thermograph, 128 days (occurring in June – September) had a mean daily water temperature over 20.0°C, with 23.8°C the highest mean daily water temperature. Six days had a maximum temperature above 25°C, with 25.6^{o}C being the highest recorded value.

Table 6.2.1-9. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in the South Yuba River from Spaulding Dam to above Canyon Creek Confluence.

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
SOUTH YUBA RIVER SUB-BASIN				
South Yuba River below Spaulding Dam	40.8	305	0	0
Jordan Creek above South Yuba River	0.2	275	0	0
South Yuba River above Jordan Creek	40.3	280	0	0

Table 6.2.1-9. (continued)

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
SOUTH YUBA RIVER SUB-BASIN (continued)				
South Yuba River above Canyon Creek	32.5	348	128 (23.8)	6 (25.6)

Canyon Creek above South Yuba River Confluence (Canyon Creek below Texas Creek Confluence Reach)

Of the three thermographs Licensees maintained in Canyon Creek downstream of Bowman Lake Dam in 2008 and 2009, only the thermograph located at the most downstream site located 0.1 miles upstream of the South Yuba River confluence registered mean daily water temperatures over 20.0°C. Of the 350 days monitored at that thermograph, 60 days (occurring in July – August) had a mean daily water temperature over 20.0°C, with 22.2°C the highest mean daily water temperature. The instantaneous maximum water temperature never exceeded 25.0°C (Table 6.2.1-10).

Table 6.2.1-10. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in Canyon Creek from below Texas Creek to above confluence with the South Yuba River.

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
CANYON CREEK SUB-BASIN				
Canyon Creek below Bowman Lake	9.7	325	0	0
Canyon Creek above Texas Creek	6.2	238	0	0
Canyon Creek above South Yuba River	0.1	350	60 (22.2)	0

Bear River Above Chicago Park Powerhouse (Dutch Flat Afterbay Dam Reach)

In July and August in 2008 and 2009, Licensees' study found that mean daily water temperature in the Bear River immediately upstream of the Chicago Park Powerhouse had mean daily water temperatures above 20.0°C. Licensees maintained two thermographs in the Bear River between Dutch Flat Afterbay Dam and Chicago Park Powerhouse, and one thermograph in Steephollow Creek that enters the Bear River near the powerhouse. Table 6.2.1-11 provides for each of the thermographs the total number of days sampled, the number of days the mean daily temperature exceeded 20°C, and the number of days the instantaneous water temperature exceeded 25°C.

Table 6.2.1-11. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in the Bear River between Dutch Flat Afterbay Dam and Chicago Park Powerhouse.

Location	River Mile	Total Number of Days Sampled in 2008 and 2009	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Instantaneous Maximum above 25°C (Max value, °C)
BEAR RIVER SUB-BASIN				
Bear River below Dutch Flat Afterbay Dam[1]	21.3	170	0	0
Bear River above Chicago Park PH inflow	16.1	300	39 (21.28)	0
Steephollow Creek above Bear River confluence[2]	15.5	249	14 (20.74)	0

1 Water temperature data collected in 2009 only.
2 Water temperature station located outside of the affect of the Yuba-Bear Hydroelectric Project.

6.2.1.2.4 Water Temperature Conditions in Reservoirs

Together, the two projects have 40 reservoirs or impoundments. There are seven main storage reservoirs: Jackson Meadows Reservoir, French Lake, Bowman Lake, Rollins Reservoir, Lake Valley Reservoir, Fordyce Lake and Lake Spaulding. Twenty-four of the reservoirs are very small diversion impoundments with no appreciable storage (i.e., <1,000 ac-ft), and 28 of the 40 reservoirs occur at elevations over 5,000 ft. Normally, all of the reservoirs ice over in winter except for Jackson Meadows Reservoir, Bowman Lake, Drum Afterbay, Dutch Flat Afterbay, Rollins Reservoir, Halsey Afterbay, Rock Creek Reservoir and the forebays of both projects.

As part of Licensees' Water Temperature Monitoring Study (NID and PG&E 2010b), Licensees collected reservoir water temperature vertical profiles in eight of the larger reservoirs: Jackson Meadows Reservoir, Sawmill Lake, Bowman Lake, Rollins Reservoir, Meadow Lake, Fordyce Lake, Lake Valley Reservoir and Lake Spaulding. Table 6.2.1-12 summarizes the results of Licensees' reservoir water temperature profiling and provides other information regarding the Project reservoirs, including retention time (i.e., the amount of time needed to refill the reservoir with normal inflow if the reservoir was empty) that may be pertinent to water temperature.

Table 6.2.1-12. Summary of thermal stratification information in Yuba-Bear Hydroelectric Project and Drum-Spaulding Project reservoirs.

Project Reservoir	River Mile (RM)	NMWSE[1] (ft)	Useable Storage (ac-ft)	Maximum Depth (ft)	Retention Time (days)	Maximum Release (cfs)	Temp Range (°C)	Thermal Stratification Characteristics
MIDDLE YUBA RIVER SUB-BASIN								
Jackson Meadows Reservoir	47.1	6,044.5	64,641	147	150.9	760	5.0 – 20.5	Strong thermal stratification with a 25- to 50-foot deep epilimnion
Milton Diversion Dam Impoundment	44.9	5,690.0	275	Unknown	0.6	113	Unknown	Unknown
CANYON CREEK SUB-BASIN								
Jackson Lake	3.0	6,596.0	975	54	163.8	59	Unknown	Unknown
French Lake	18.4	6,665.0	13,940	60	226.0	657	Unknown	Unknown
Faucherie Lake	16.5	6,131.0	3,740	42	44.6	289	Unknown	Unknown

Table 6.2.1-12. (continued)

Project Reservoir	River Mile (RM)	NMWSE[1] (ft)	Useable Storage (ac-ft)	Maximum Depth (ft)	Retention Time (days)	Maximum Release (cfs)	Temp Range (°C)	Thermal Stratification Characteristics
CANYON CREEK SUB-BASIN (continued)								
Sawmill Lake	14.1	5,865.0	3,030	55	18.7	80	13.0 – 21.7	Weak thermal stratification with a 20- to 25-foot deep epilimnion
Bowman Lake	10.7	5,567.0	68,363	163	186.9	1,000	7.2 – 19.7	Strong thermal stratification with a 30-foot deep epilimnion
Upper Rock Lake	16.8	6,717.1	207	17	69.5	8.4	Unknown	Unknown
Lower Rock Lake	10.5	6,627.8	48	8.5	13.6	7.3	Unknown	Unknown
Culbertson Lake	20.0	6,440.2	953	16	138.3	23.1	Unknown	Unknown
Upper Lindsey Lake	8.0	6,485.4	18	7	6.5	6.5	Unknown	Unknown
Middle Lindsey Lake	9.5	6,438.2	110	7	19.6	11.3	Unknown	Unknown
Lower Lindsey Lake	16.6	6,239.1	293	13	28.6	28.1	Unknown	Unknown
FALL CREEK SUB-BASIN								
Feeley Lake	22.6	6,727.6	739	17	124.4	16.8	Unknown	Unknown
Carr Lake	18.8	6,667.7	150	16	27.2	82.7	Unknown	Unknown
RUCKER CREEK SUB-BASIN								
Blue Lake	25.0	5,935.6	1,159	160	292.5	18	Unknown	Unknown
Rucker Lake	22.0	5,468.2	570	17	20.0	15	Unknown	Unknown
SOUTH YUBA RIVER SUB-BASIN								
Fuller Lake	39.0	5,343.5	1,127	30	123.2	25	Unknown	Unknown
Meadow Lake	38.0	7,286.2	4,841	38	139.8	50	15.9 – 17.3	Does not thermally stratify
White Rock Lake	10.0	7,824.0	570	10	30.7	18.6	Unknown	Unknown
Lake Sterling	25.0	6,988.7	1,764	55	116.6	31.9	Unknown	Unknown
Fordyce Lake	156.0	6,406.6	49,453	156	79.1	590	6.3 – 18.9	Strong thermal stratification with a 30- to 40-foot deep epilimnion
Kidd Lake	14.0	6,631.4	1,505	28	88.7	25	Unknown	Unknown
Upper Peak Lake	39.0	6,611.4	1,736	35	183.1	100	Unknown	Unknown
Lower Peak Lake	29.0	6,583.4	494	21	25.0	86.7	Unknown	Unknown
Lake Spaulding	276.0	5,016.1	75,912	205	45.9	16	6.2 – 20.4	Strong thermal stratification with a 125-foot deep epilimnion
NORTH FORK OF NORTH FORK AMERICAN RIVER SUB-BASIN								
Kelly Lake	23.5	5,910.2	336	Unknown	48.0	25	Unknown	Unknown
Lake Valley Reservoir	30.0	5,789.9	7,902	57	134.4	50	8.4 – 21.5	Weak thermal stratification with a 25-foot deep epilimnion
BEAR RIVER SUB-BASIN								
Drum Afterbay	102.0	3,385.0	321	78	3.4	1,100	Unknown	Unknown
Dutch Flat Afterbay	21.3	2,755.0	1359	Unknown	16.9	700	6.4 – 21.2	Unknown
Rollins Dam	10.5	2,187.5	54,453	206	112.6	2,000	8.3 – 23.0	Strong thermal stratification with a 100-foot deep epilimnion
COON CREEK SUB-BASIN								
Halsey Afterbay	38.0	1,499.0	96	24	4.2	0	Unknown	Unknown
Rock Creek Reservoir	36.0	1,445.1	482	22	49.2	80		Unknown

[1] Normal maximum water surface elevation.

Licensee's Water Temperature Monitoring Study also estimated the amount of usable cold water (i.e., water at or below the 5°C, 10°C and 15°C isotherms) in six of the larger storage reservoirs (NID and PG&E 2010b). Licensees found that under current conditions there was no usable storage below the 5°C isotherm in any of the reservoirs. The amount of usable cold water between the 5°C and 10°C isotherms and 10°C and 15°C isotherms varied by time of year. Table 6.2.1-13 shows that, under Licensees' current operations, the cold water pool between the 5°C and 10°C isotherms is depleted by October in all five reservoirs, and the cold water pool between the 10°C and 15°C isotherms is depleted in Lake Valley and Rollins reservoirs. The only reservoirs in which a significant amount (i.e., greater than 1,000 acre-feet) of water between the 10°C and 15°C isotherms is not depleted under current operations are Bowman Lake, Fordyce Lake, Jackson Meadows and Lake Spaulding.

Table 6.2.1-13. Estimated usable storage in major Project reservoirs at the 10°C and 15°C isotherms, based on observed data. No usable storage occurred at any of these reservoirs below the 5°C isotherm.

Reservoir	Estimated Usable Storage below 15°C Isotherm (ac-ft)				Estimated Usable Storage below 10°C Isotherm (ac-ft)			
	2008		2009		2008		2009	
	July	October	July	October	July	October	July	October
YUBA-BEAR HYDROELECTRIC PROJECT								
Jackson Meadows	No Data	No Data	36,552	38,176	No Data	No Data	29,628	4,855
Bowman Lake	28,000	30,954	30,900	41,217	8,300	0	7,600	0
Rollins Reservoir	23,000	1,300	14.426	0	1,500	800	800	0
DRUM-SPAULDING PROJECT								
Fordyce Lake	27,600	21,621	18,600	3,700	20,600	1,400	12.300	3,709
Lake Spaulding	19,800	N/A	29,400	50,952	0	N/A	0	500
Lake Valley Reservoir[1]	5,600	30	4,800	600	0	0	1,500	0

[1] Lake Valley Reservoir data were collected in June and August rather than July and October.

As described above, application of a single Basin Plan Temperature objective to reservoirs is difficult due to stratification within the water column, and resulting variability in water temperatures throughout the reservoir. However, using the 20.0°C criteria described above for streams and assuming that reservoir temperatures at intakes are most relevant to conformance with Basin Plan criteria, Licensees found that portions of six of the projects' reservoirs, each of which is discussed below, had water temperatures warmer than 20.0°C.

Jackson Meadows Reservoir

Jackson Meadows Reservoir is a large (useable storage capacity of 67,260 ac-ft), deep (maximum depth of 144 feet), high elevation (El. 6,044.5 ft) oligotrophic reservoir that supports a cold water fishery dominated by trout. Licensees' Water Temperature Monitoring Study (NID and PG&E 2010b) showed that in July, August and September 2009, a thermocline was present between 25 and 45 ft below the water surface. The October profile shows a decline in temperatures from top to bottom, with a less definitive thermocline. Data also showed that the uppermost layer (~10-20 ft) of water in the reservoir can at times be slightly above 20.0°C in summer, but the large majority of the reservoir contains water colder than 20°C (Figure 6.2.1-1).

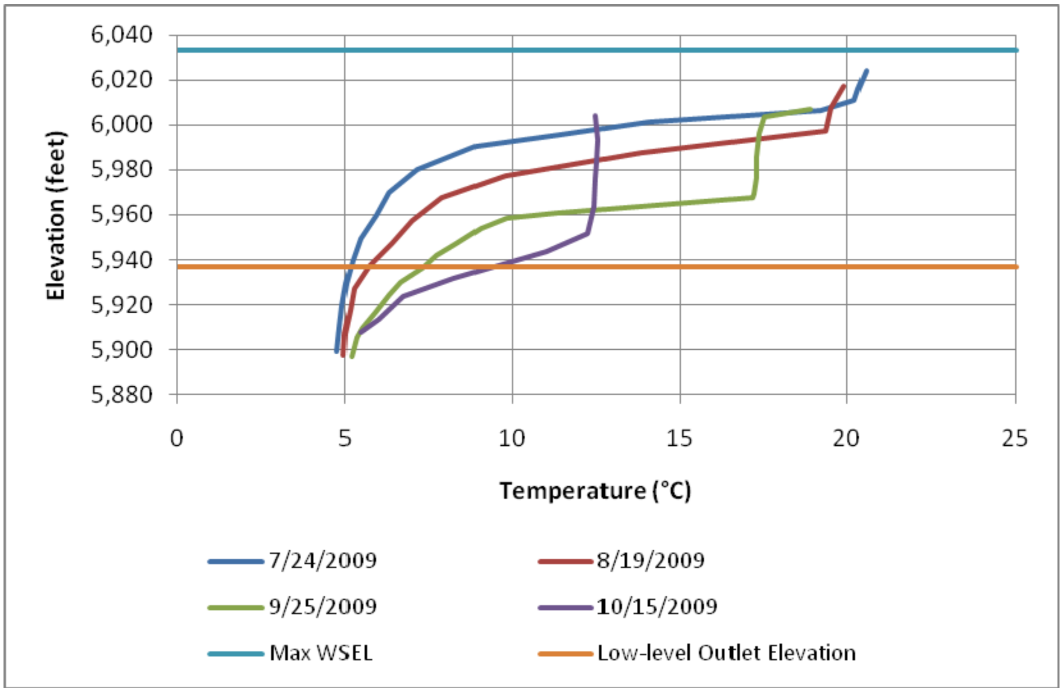


Figure 6.2.1-1. Jackson Meadows Reservoirs monthly water temperature profiles from July through October 2009.

Sawmill Lake

While not as large as Jackson Meadows Reservoir, Sawmill Lake is a high elevation (El. 5,865 ft), relatively deep (55 ft) oligotrophic reservoir that is known to support a coldwater fishery. Licensees collected one temperature profile in Sawmill Lake approximately two weeks after the reservoir stopped spilling in late July 2008 and in late July 2009. A weak thermocline was present 30 ft below the water surface in 2008 and 20 ft below the water surface in 2009 (Figure 6.2.1-2).

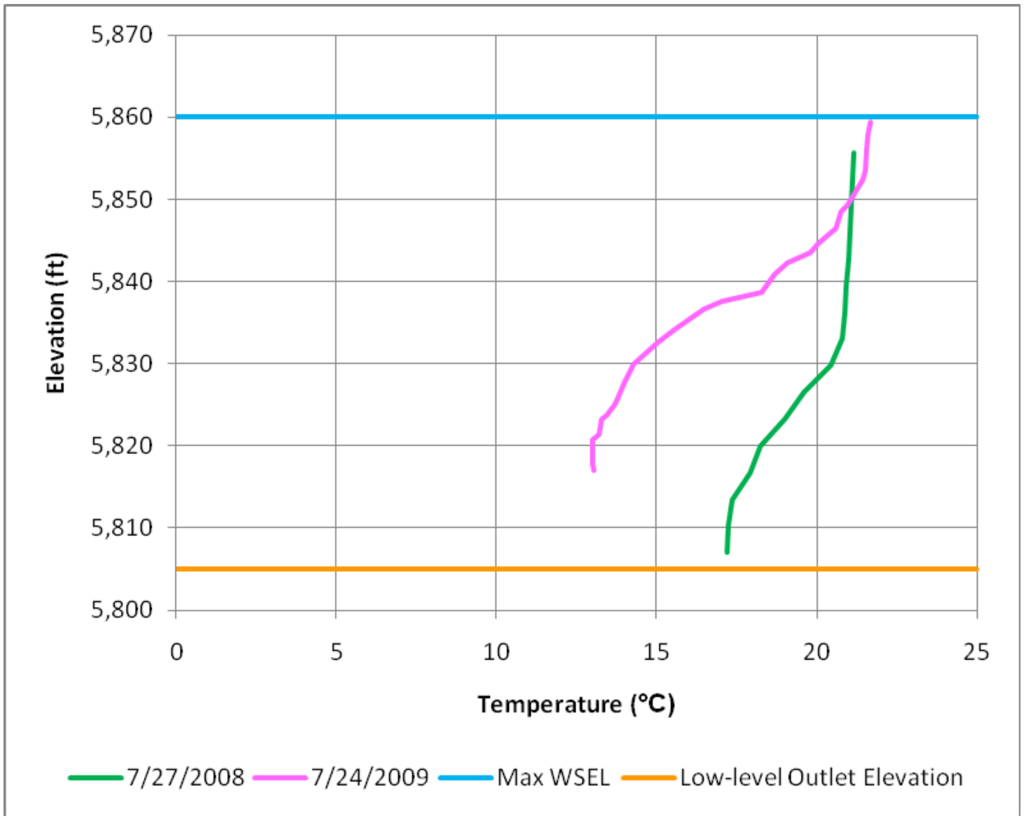


Figure 6.2.1-2. Sawmill Lake water temperature profiles in July 2008 and July 2009.

Lake Valley Reservoir

Lake Valley Reservoir is a high elevation (El. 5,784.9 ft), relatively deep (57 ft) oligotrophic reservoir with a storage capacity of 7,902 ac-ft, and is known to support a coldwater fishery. Licensees collected two profiles in the reservoir at a location near the dam in 2008 and 2009. In June 2008, a maximum temperature of 15.8°C at the surface and a minimum of 10.7°C at the bottom were observed. The August 2008 sample had a more definite thermocline occurring approximately 25 ft below the water surface. Temperatures in 2008 ranged from 21.5°C at the surface to 12.8°C at the bottom, with temperatures exceeding 20.0°C only occurring in the August survey. In 2009, thermoclines were present in both June and August, starting at approximately 15 ft and 30 ft below the water surface, respectively. Surface water temperature was 15.4°C in June and 21.1°C in August; water temperature at the bottom was 8.4°C in June and 10.9°C in August (Figure 6.2.1-3).

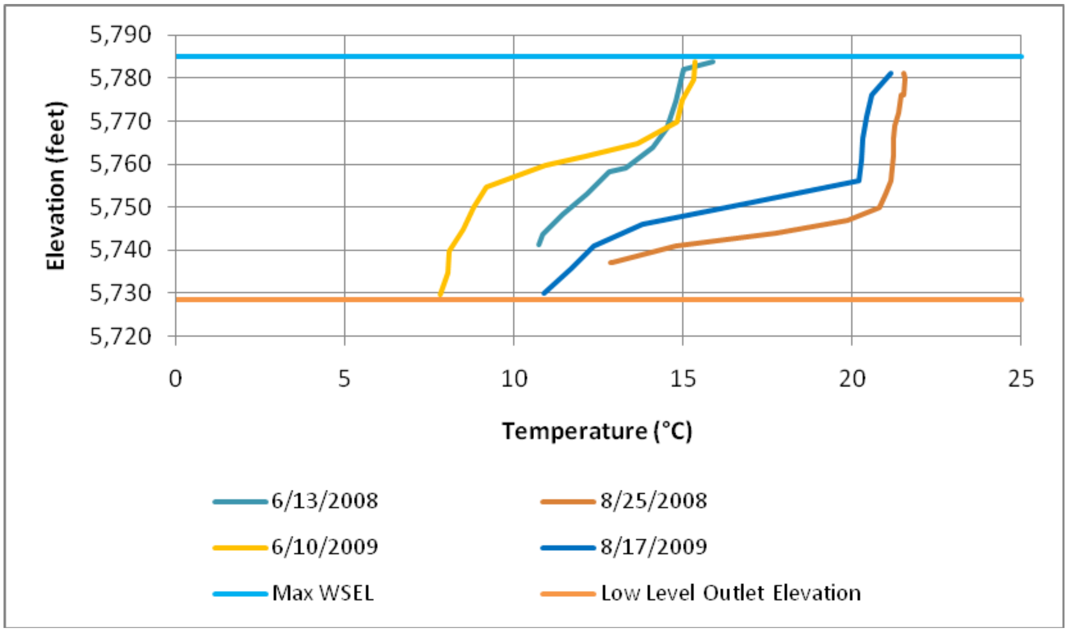


Figure 6.2.1-3. Lake Valley Reservoir monthly water temperature profiles in June and August 2008 and June and August 2009.

Lake Spaulding

Lake Spaulding has a useable storage capacity of 75,912 ac-ft, is at an elevation of 5,014.6 feet, and supports a rainbow and brown trout coldwater fishery (Section 6.3). Licensees' Water Temperature Monitoring Study showed that, for brief periods of time in the summer, surface water in Lake Spaulding may slightly exceed 20°C As shown in Figures 6.2.1-4 through 6.2.1-7, water temperature above 20°C only occurred in about the top 10 feet of the reservoir, with a maximum temperature of 21.5°C, and only during the July 2009 monitoring effort. In 2008, a thermocline was present near the dam each month occurring between 20 ft (July) and 90 ft (September) below the water surface. In 2009, a thermocline was present near the dam each month as well, occurring between 30 ft (July) and 185 ft (September and October) below the water surface (NID and PG&E 2010b). In 2008, a weak thermocline was present at the mid-point in the reservoir in July and August. The thermoclines at the mid-point in the reservoir are present for all four months in 2009 and much more definite than they were in 2008, starting between 30 ft (July) and 170 ft (October) below the water surface.

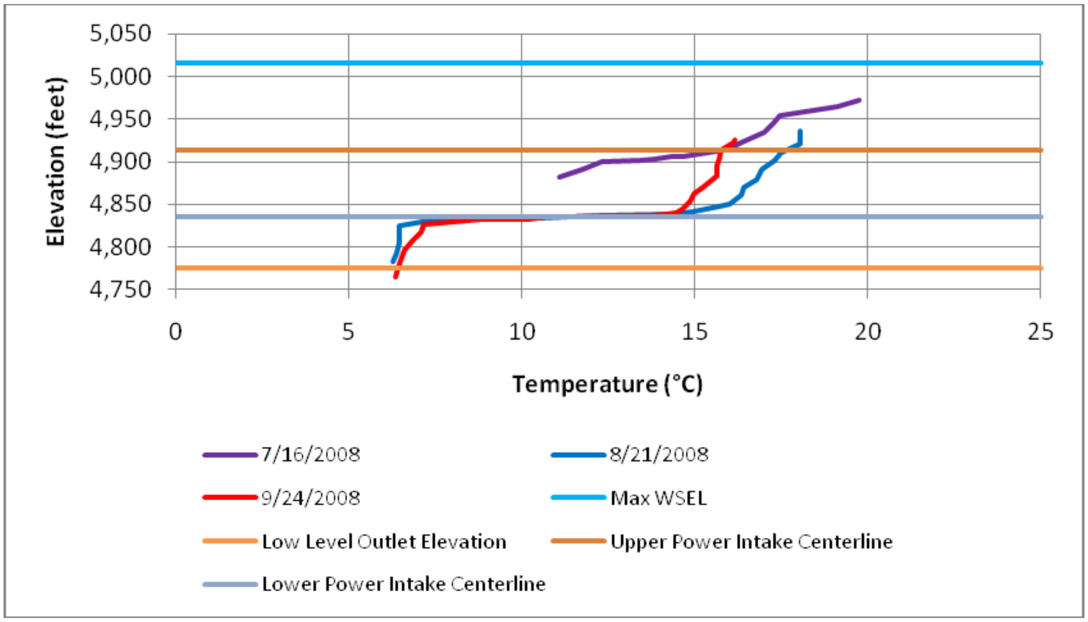


Figure 6.2.1-4. Lake Spaulding near dam monthly water temperature profiles from July through September 2008.

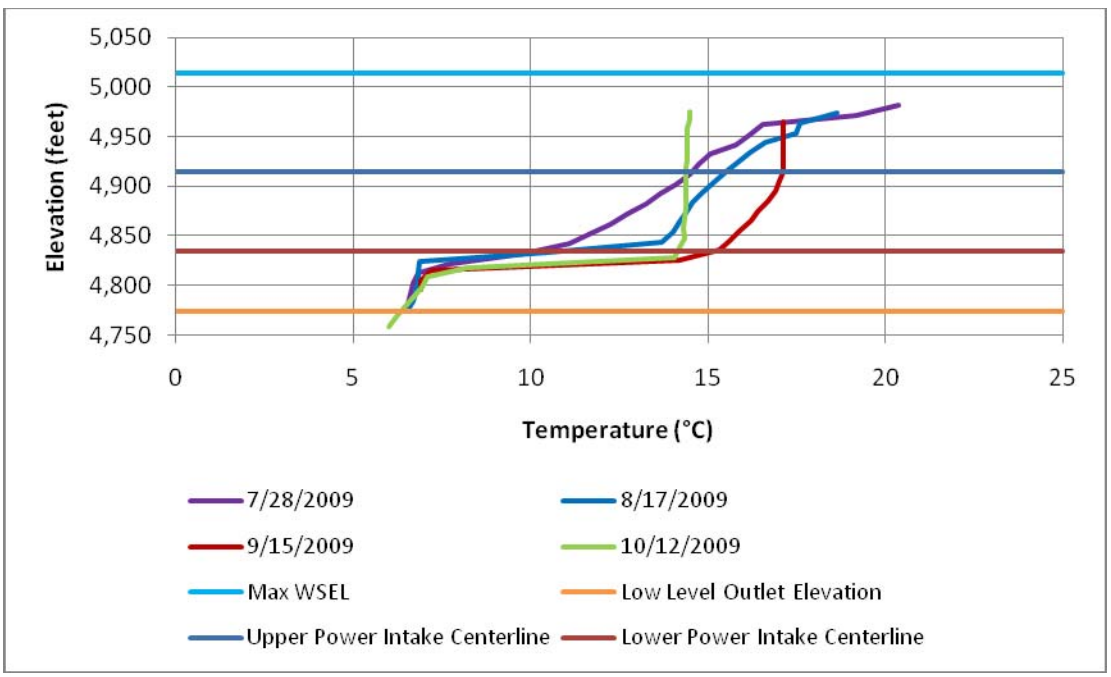


Figure 6.2.1-5. Lake Spaulding near dam monthly water temperature profiles from July through October 2009.

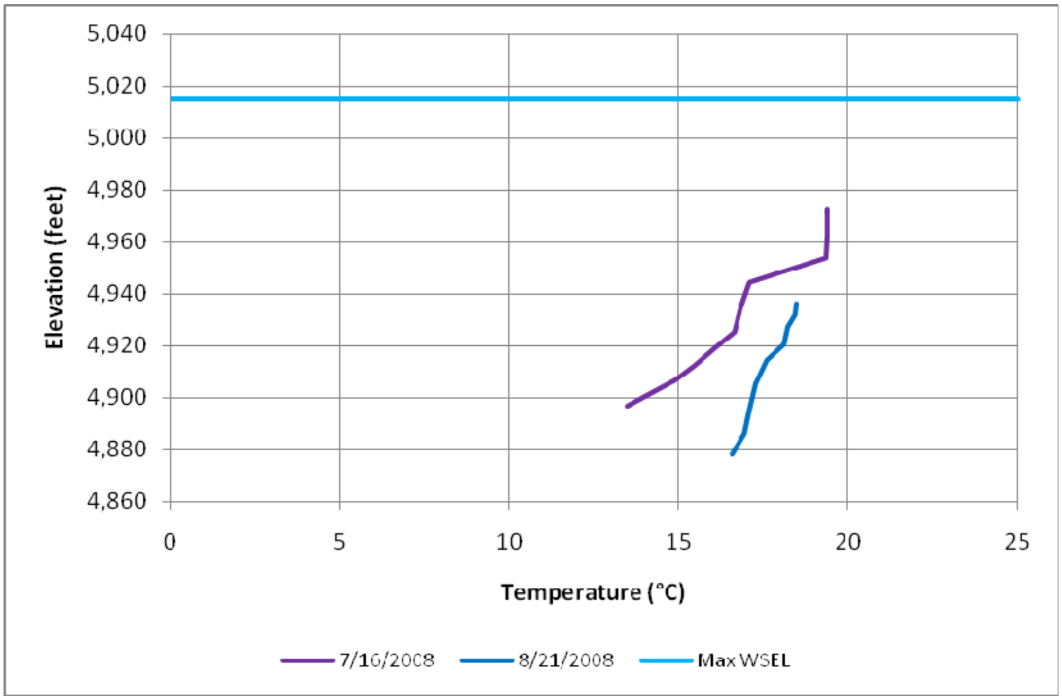


Figure 6.2.1-6. Lake Spaulding at mid-reservoir monthly water temperature profiles in July and August 2008.

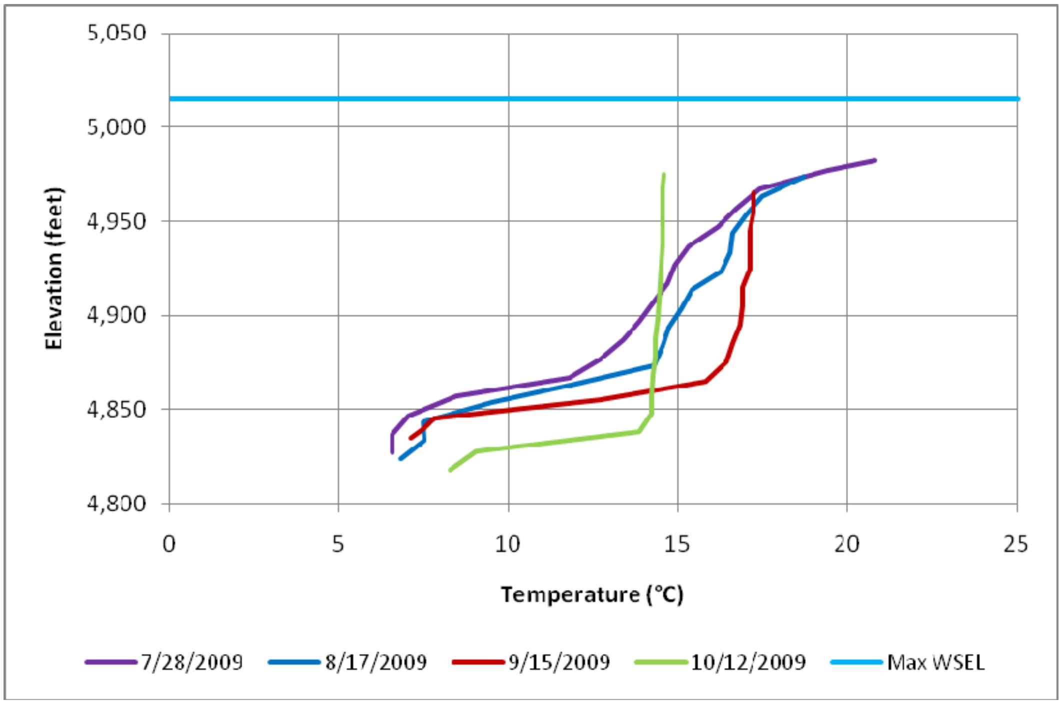
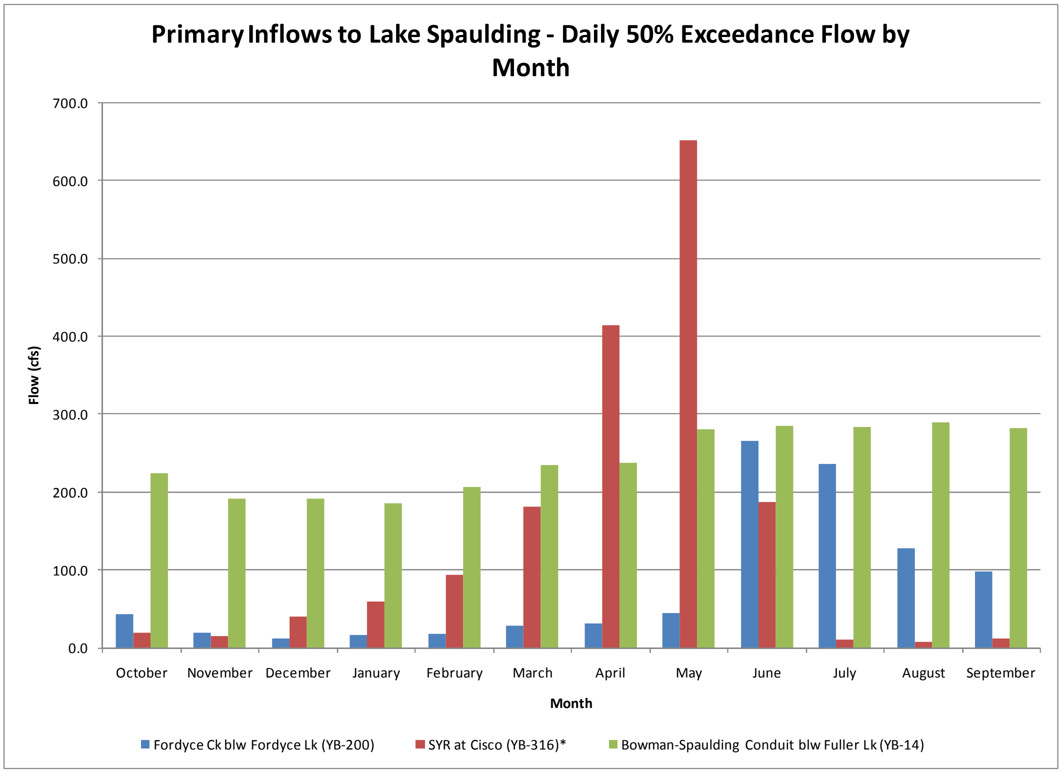


Figure 6.2.1-7. Lake Spaulding at mid-reservoir monthly water temperature profiles from July through October 2009.

Fordyce Creek, the upper South Yuba River, and the Bowman-Spaulding Conduit are the primary sources of inflow to Lake Spaulding. Figure 6.2.1-8 shows the monthly regulated 50 percent exceedance flows into Lake Spaulding for these three sources of inflow for the Period of Record (water years 1976 to 2008).



* - Regulated flows include data from YB-316, supplemented with modeled-regulated data for missing data in the 1995-1998 periods.

Figure 6.2.1-8. Primary Inflows to Lake Spaulding: Daily 50% Exceedance Flow by Month.

Lake Spaulding Thermal Underflow/Stratification Analysis

The following information is taken from Section 3.5 of Licensees' Water Temperature Monitoring Technical Memorandum (NID and PG&E 2010b).

Velocity data collected during the ADCP survey in Lake Spaulding on August 29, 2008 were entered into a 3-dimensional model of the reservoir utilizing bathymetric contours surveyed in 2008. The velocity vectors were left in absolute magnitudes, rather than normalized to a given plane, to evaluate the presence of any circulation currents. The 3-dimensional model was then utilized to interpolate velocity fields across the area of interest, from the submerged confluence of Fordyce Creek and the South Yuba River to a location approximately 2,000 feet downstream. Longitudinal cross-sections were then generated at regular intervals within this field to evaluate velocity profiles within the reservoir. These profiles are shown in Figures 6.2.1-9 through 6.2.1-12.

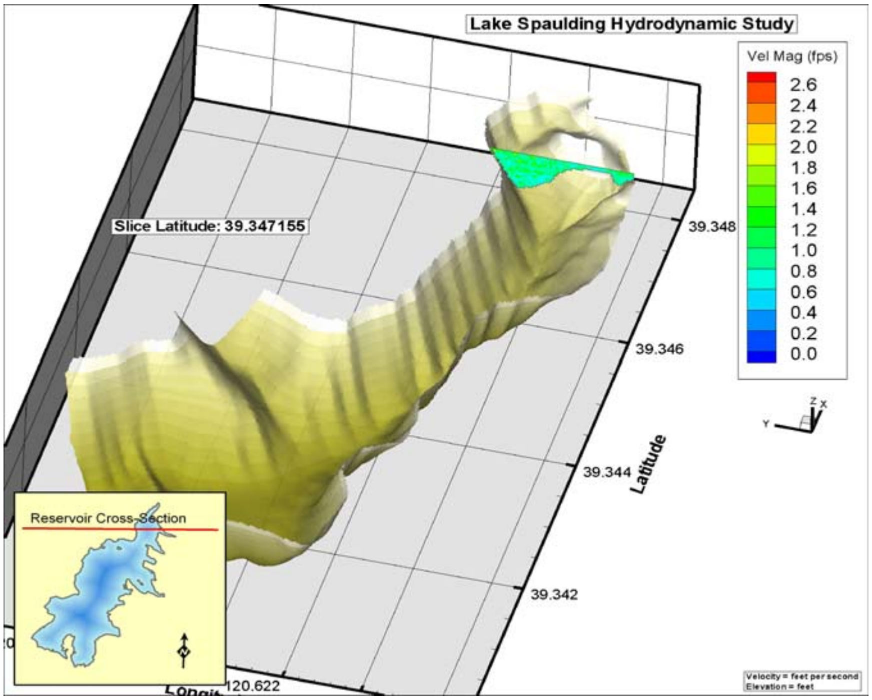


Figure 6.2.1-9. Lake Spaulding velocity profile at Bathymetry Study Station 119+00 (submerged confluence of Fordyce Creek and South Yuba River).

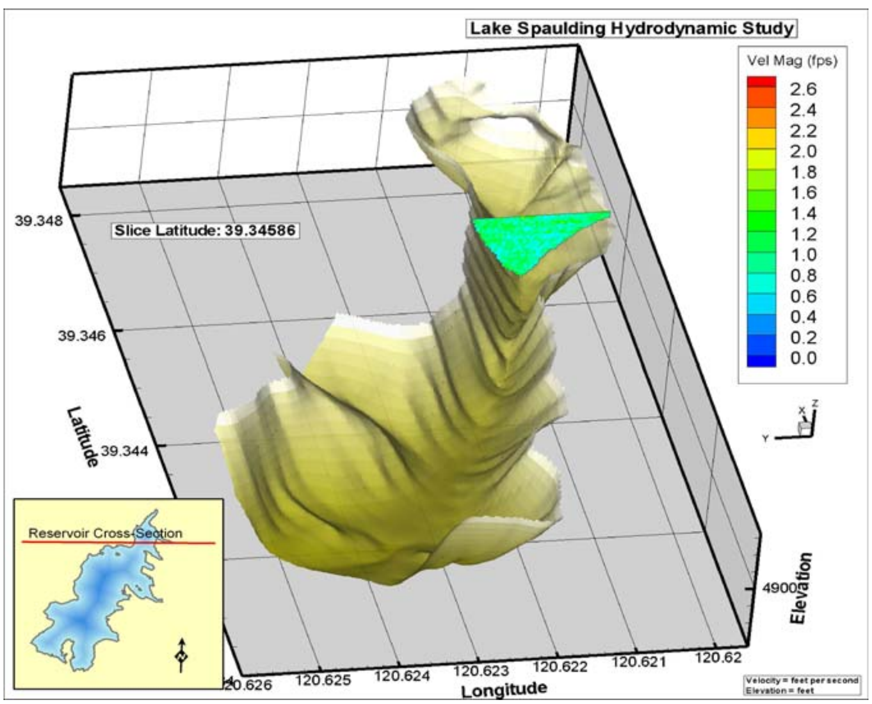


Figure 6.2.1-10. Lake Spaulding velocity profile at Bathymetry Study Station 115+00.

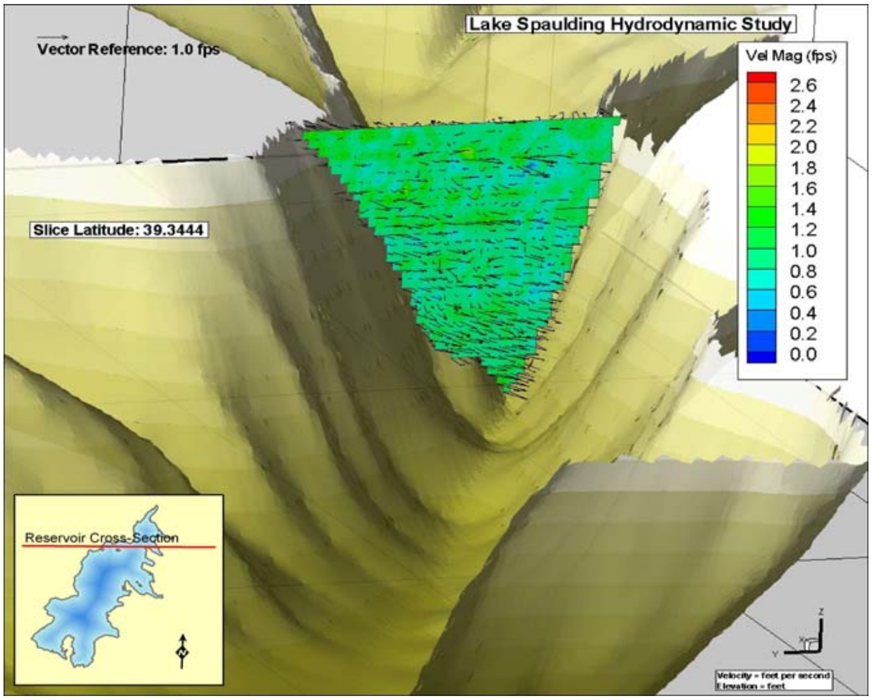


Figure 6.2.1-11. Lake Spaulding velocity profile at Bathymetry Study Station 110+00, along with velocity vectors. Note that velocities were generally oriented towards Spaulding Dam No. 1.

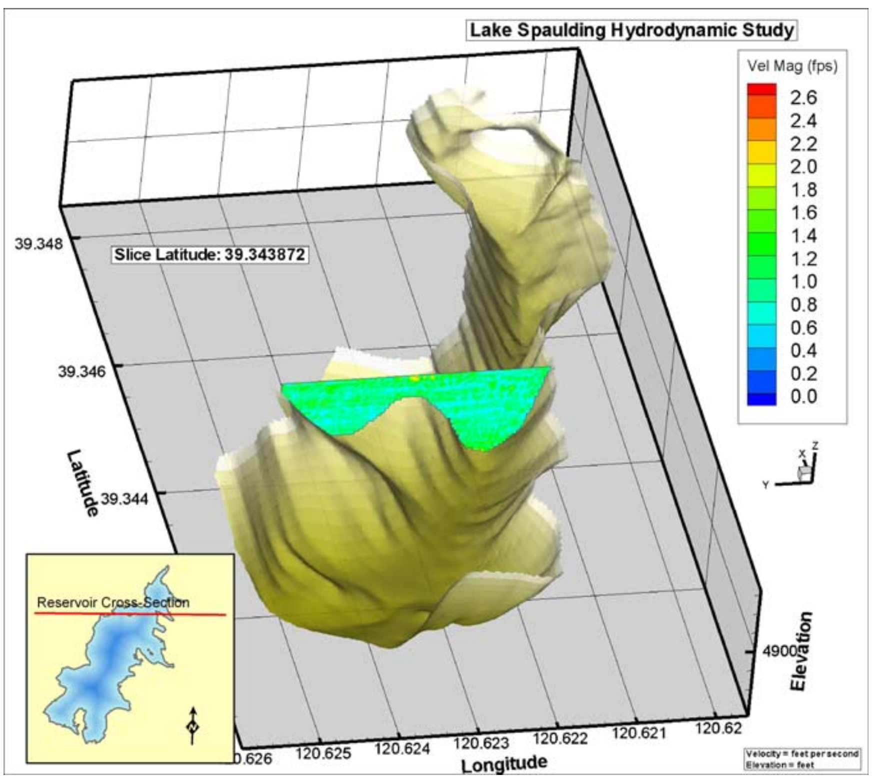


Figure 6.2.1-12. Lake Spaulding velocity profile at Bathymetry Study Station 100+00.

In addition to velocity measurements, a thermal analysis was also performed. In 2008, five profiles were taken from the mouth of Fordyce Creek to Lake Spaulding bathymetric survey Station 110+00, along with a sixth point at the mouth of the South Yuba River, which provided a control to compare against the colder inflows of Fordyce Creek. In 2009, profiles were taken at two locations within the submerged Fordyce Creek channel thalweg during both low flow (32 cfs) and high flow (449 cfs) conditions, observed before and during a whitewater boating survey flow event in August. Figures 6.2.1-13 and 6.2.1-14 provide the results of these surveys in 2008 and 2009, respectively.

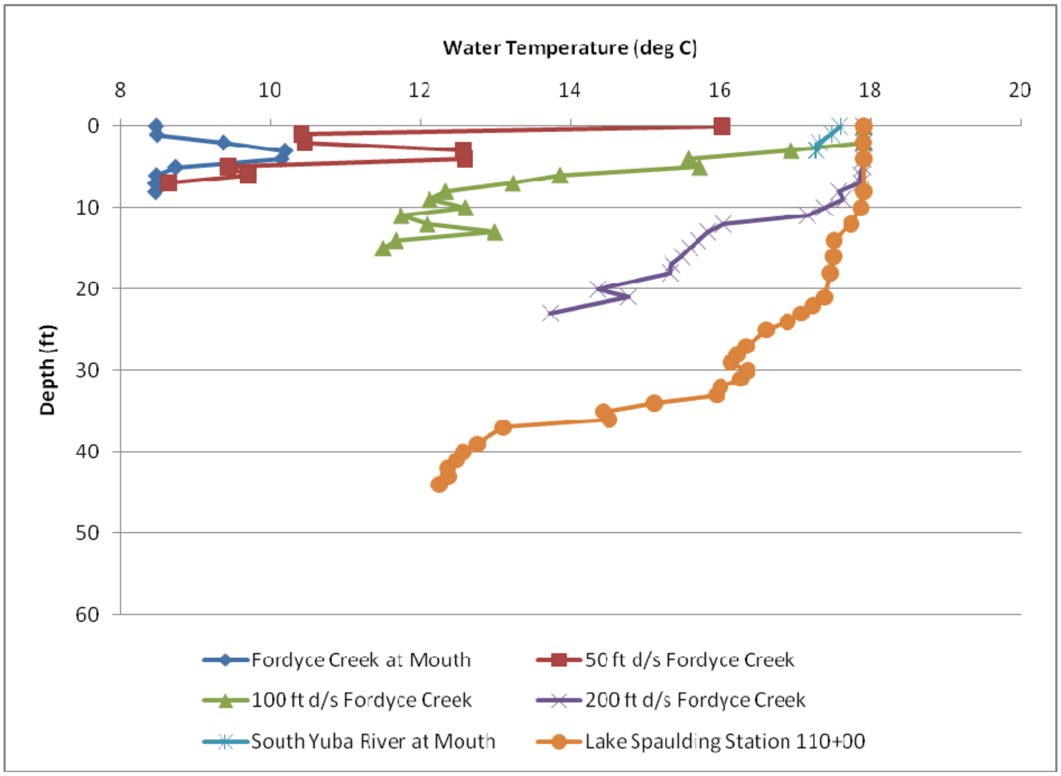


Figure 6.2.1-13. Water temperature profiles near mouths of Fordyce Creek and South Yuba River, August 2008.

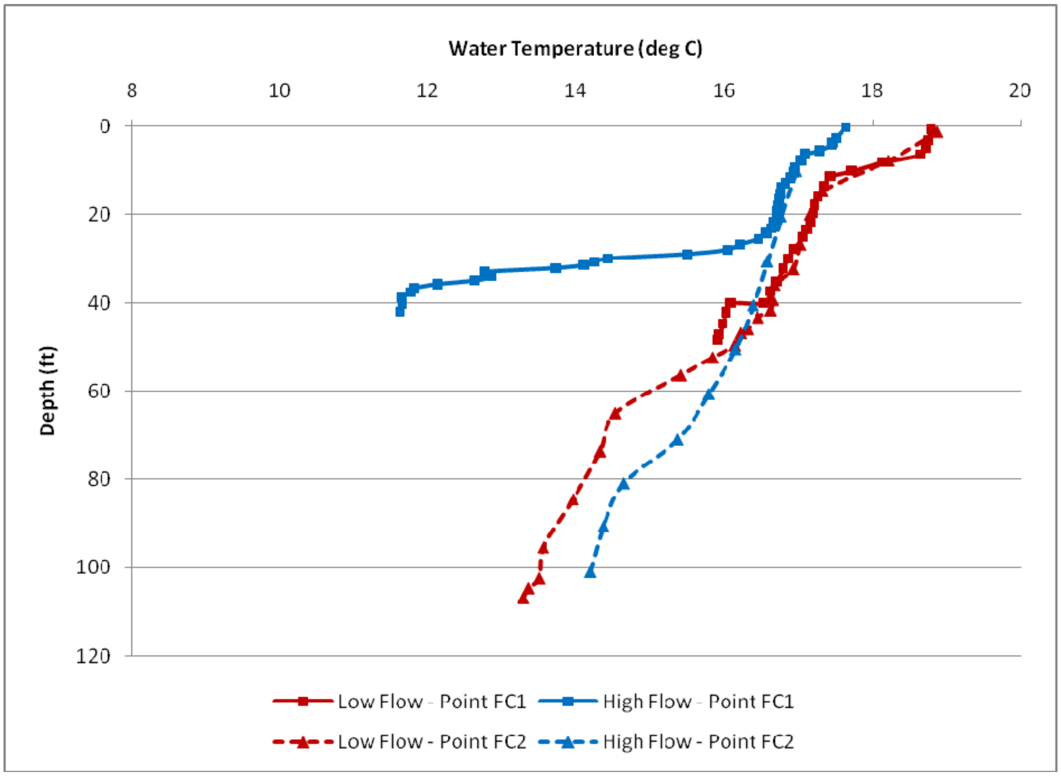


Figure 6.2.1-14. Water temperature profiles of submerged Fordyce Creek thalweg, August 2009. Low flow survey (32 cfs) conducted on August 5, 2009 and high flow survey (449 cfs) conducted on August 16, 2009.

Based on velocity and thermal profiles taken in 2008 and 2009, no discernible thermal underflow was found to extend from the Fordyce Creek channel thalweg to the downstream reservoir body towards Spaulding Dam. Partial to complete mixing of colder Fordyce Creek flows was observed within the first few hundred feet downstream of the mouth of the Fordyce Creek. The distance of the thermal underflow plume was affected by the magnitude of Fordyce Creek inflows, which can be seen by comparing data collected at point FC-1 during the August 2009 survey data shown in Figure 6.2.1-14. It is likely that turbulence at the mouth of the creek entry into Lake Spaulding, along with the physical complexity of the submerged Fordyce Creek channel, led to mixing of the thermal layers and diminishing the potential for persistence of a cold-water underflow current.

An additional set of transects were taken near the tailrace of Spaulding No. 3 Powerhouse. However, due to unsteady velocities and a high level of entrained air in the water column, ADCP results were not reliable and are therefore not presented. ADCP velocity measurements were taken at a transect approximately 150 feet downstream of the Spaulding No. 3 Powerhouse inflow to Lake Spaulding (i.e. towards the dam); these measurements resulted in a similar distribution of velocities across the channel with no discernible velocity core at any point in the water column.

Lake Spaulding Power Intakes - Variable Operations Analysis

The following information is taken from Section 3.6 of Licensees' Water Temperature Monitoring Technical Memorandum (NID and PG&E 2010b).

From August 16 through September 5, 2009, PG&E operated the upper and lower powerhouse intake butterfly valves (BFV) at Spaulding Dam No. 1 in an alternating fashion. Specifically on August 16, 2009, the lower intake BFV was closed, and all tunnel flows were provided by the upper intake. This operation proceeded until August 24 when PG&E opened the lower intake BFV and closed the upper intake BFV. The operations were again reversed on September 1, and carried through until September 5. On September 6, operation of the Spaulding intake BFVs were returned to the typical mixed approach utilizing both intake BFVs in parallel.

To characterize the effects of these operating approaches, temperature profile data were collected at Lake Spaulding in the vicinity of the intakes, and downstream water temperatures were recorded at the head of the Drum and South Yuba canals downstream of Spaulding Nos. 1 and 2 powerhouses, respectively. Figure 6.2.1-15 provides the data collected at these sites. In addition, plots of the daily average temperature and flow data recorded in the Drum and South Yuba canals are presented in Figure 6.2.1-16.

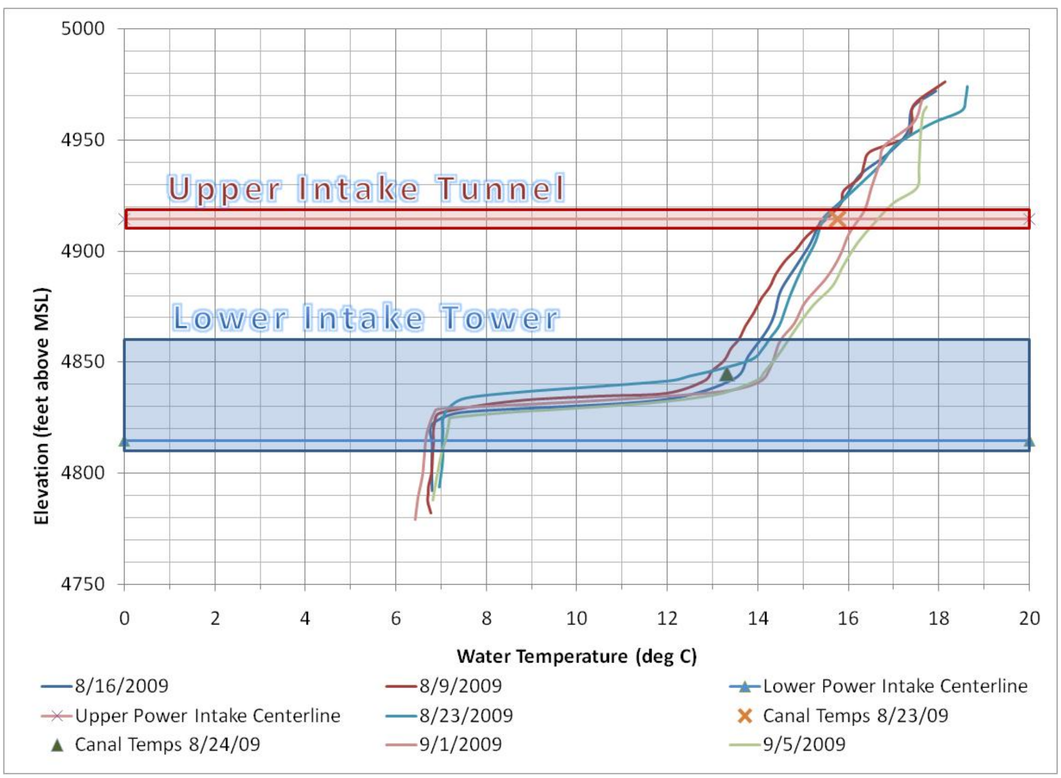


Figure 6.2.1-15. Temperature profiles taken near Spaulding Dam No. 1, along with synoptic South Yuba and Drum Canal temperatures during variable operation of Spaulding intake BFVs.

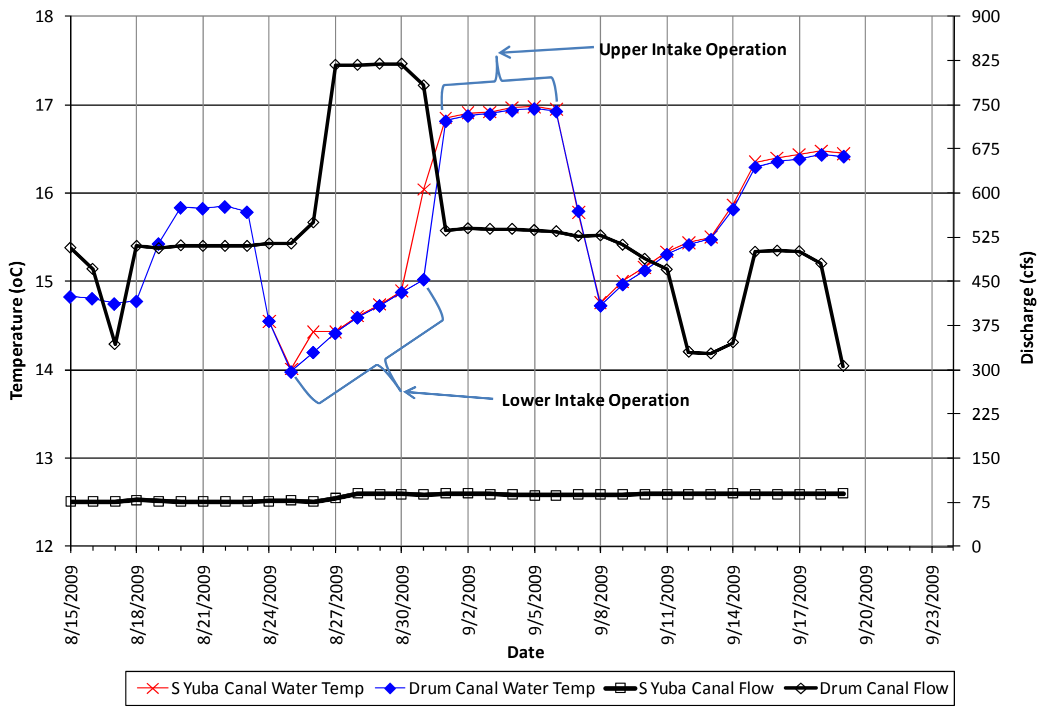


Figure 6.2.1-16. Downstream canal temperatures and flow rates during variable operation of Spaulding intake BFVs.

The variable operation of the intake BFVs at Spaulding Dam No. 1 had a measureable effect on both reservoir stratification and downstream canal temperatures. Recorded canal water temperatures reached steady state condition within a few hours of each intake change, and showed clear correlation with the portions of the water column that supply water to each intake. This was validated by plotting the intake elevation zones against the reservoir temperature profiles taken concurrent with the downstream canal temperature recordings; these are represented by the shaded pink (upper intake tunnel) and blue (lower intake tower) portions of Figure 6.2.1-15 above. The synoptic canal temperature data generally matched reservoir temperatures coincident with the respective intake being operated (see points representing each canal temperature survey plotted against the reservoir profile in Figure 6.2.1-15 above). For the lower intake BFV operation, canal temperatures were roughly 1^{o}C cooler than what would have been expected given a uniform withdrawal of water from both intake BFVs. For the upper intake BFV operation, canal temperatures were roughly 1^{o}C warmer than what would have been expected given a uniform withdrawal of water from both intake BFVs.

In addition, the weekly operation of only the upper intake BFV between August 16th and August 23rd led to an increase in the depth and volume of the hypolimnion within Lake Spaulding (see August 16, 2009 temperature profile in Figure 6.2.1-15), as water was not being extracted from the bottom of the lake during this period with the exception of a small volume through the low level outlet structure. In contrast, the operation of only the lower intake BFV between August 24 and September 1 led to a minor decrease in depth and volume of the hypolimnion (see September 1, 2009 temperature profile).

Dutch Flat Afterbay

Dutch Flat Afterbay is located at an elevation of 2,740 ft and has a useable storage capacity of 676 ac-ft. NID collected water temperatures in Dutch Flat Afterbay from May through October 2008 and 2009. Due the lack of storage and the common fluctuations in reservoir level, the reservoir exhibits weak and intermittent stratification. The maximum observed water surface temperature was 21.2°C; on this date, the Bear River experienced temperatures upstream and downstream of Dutch Flat Afterbay of 19.4°C and 17°C, respectively.

Rollins Reservoir

Rollins Reservoir is the lowest of the projects' storage reservoirs at an elevation of 2,171 ft and has a useable storage capacity of 54,498 ac-ft. NID collected water temperature profiles in Rollins Reservoir from May through October 2008 and 2009. In 2008, a thermocline was present in each of the sampling months, but was the most definite during June, July, August, and September at depths of approximately 10 ft, 20 ft, 30 ft, and 150 ft, respectively. Surface water temperatures ranged from 16.3°C in October to 23.0°C in August. Water temperatures near the bottom ranged from 8.3°C in May, July, and August to 9.3°C in June (Figure 6.2.1-17).

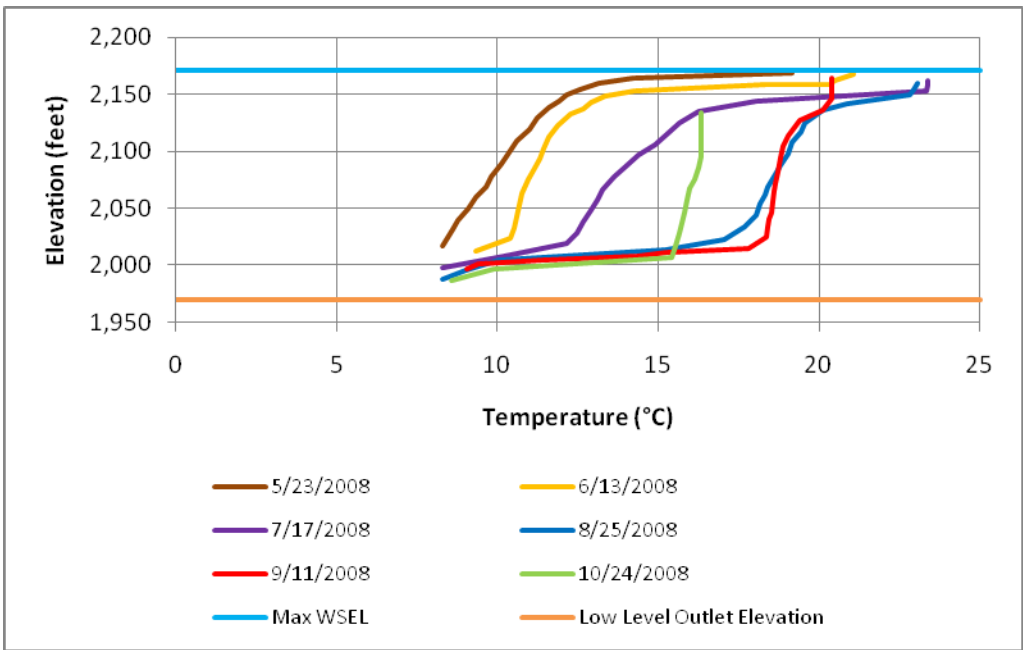


Figure 6.2.1-17. Rollins Reservoir monthly water temperature profiles from May through October 2008.

In 2009, a thermocline was also present in Rollins Reservoir in each of the sampling months and was again most definite during June, July, August, and September at depths of approximately 0 ft, 10 ft, 20 ft, and 150 ft, respectively. Surface water temperatures ranged from a minimum of

13.5°C in May to a high of 24.8°C in July. Water temperatures near the bottom ranged from 7.6°C in June to 17.6°C in October (Figure 6.2.1-18).

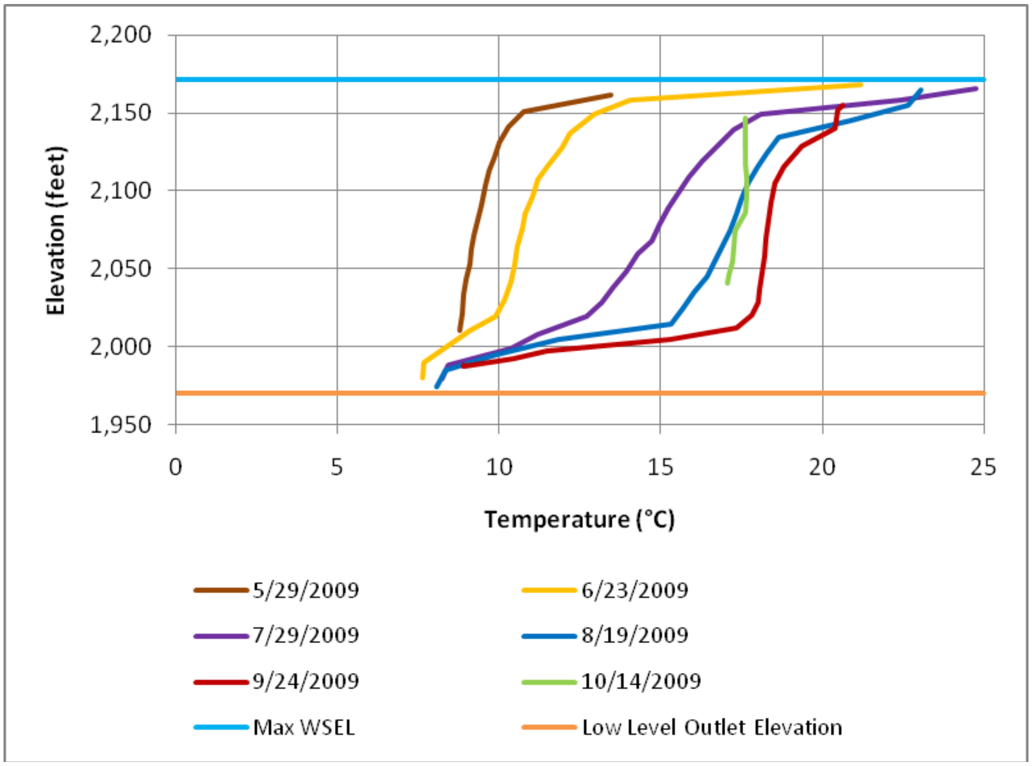


Figure 6.2.1-18. Rollins Reservoir monthly water temperature profiles from May through October 2009.

6.2.1.2.5 Mercury Bioaccumulation in Fish

Since the early 1990s, the legacy of mercury in the South Yuba River and Bear River basins has been studied by the University of California, Davis (UC Davis), USGS, and the SWRCB (Alpers et al. 2005, Hunerlach et al. 1999, May et al. 2000, and Davis et al. 2009). As part of these studies, fish tissue was collected and analyzed from Kidd Lake, South Yuba River Reach #2, Fuller Lake, Feeley Lake, South Yuba River Reach #4, the South Yuba River between Lake Spaulding and USACE's Englebright Reservoir, Deer Creek, Bear River Reach #2, Drum Afterbay Dam Reach, Dutch Flat Afterbay Reach, Dutch Flat Afterbay and Rollins Reservoir. The species sampled included bullhead, brown trout, rainbow trout, black crappie, bluegill, channel catfish, largemouth bass and/or smallmouth bass. Overall, the studies reported mercury concentrations ranging from 0.03 - 0.56 parts per million (ppm) wet-weight, in the individual or composite samples, and nine of the 12 locations had at least one fish with mercury concentrations that exceeded OEHHA's advisory tissue levels (ATL) of 0.07 ppm methylmercury wet-weight[9]. OEHHA's ATLs were developed to assist public health managers with the decision to pursue fish ingestion advisory development for a water body under their jurisdiction (Klasing and Brodberg 2008).

In 2009, Licensees supplemented historic studies by analyzing 66 fish for mercury bioaccumulation from five Project reservoirs: Jackson Meadows Reservoir, Faucherie Lake, Bowman Lake, Fordyce Lake and Lake Spaulding (NID and PG&E 2010c). The species examined included rainbow trout, brown trout, kokanee, and Chinook salmon. Mercury concentrations ranged from 0.014 to 2.5 ppm wet-weight (NID and PG&E 2010c). Of the five reservoirs and four species sampled by Licensees, only rainbow trout in Bowman Lake had mercury tissue concentrations below OEHHA's 0.07 ppm ATL in the five fish collected. All other reservoir-species combinations had a majority of individual fish with mercury concentrations greater than the ATL.

6.2.2 Environmental Effects

6.2.2.1 NID's Yuba-Bear Hydroelectric Project

This Section includes a description of the anticipated effects of NID's Proposed Project, which includes NID's proposed PM&E measures (Appendix E3) on water quantity and water quality. The discussion is divided into the following sections: 1) effects on water quanity and use; 2) general water quality; 3) effects on water temperature; and 4) effects on mercury bioaccumulation in fish.

6.2.2.1.1 Effects on Water Quantity and Use

NID's Proposed Project includes operations related to water quantity that are generally similar to historical operations. However, NID does propose to increase minimum instream flows in eight stream reaches affected by the Project and proposes new minimum instream flows for three reaches affected by the Project that previously had no minimum flow requirement (Measure YB-AQR1 in Appendix E3). The minimum instream flows were developed to provide enhancement for aquatic resources, while avoiding impacts on the Project's ability to meet water supply demands. These minimum instream flow increases have a less than significant effect on water quantity, when compared to existing conditions in all NID reservoirs and stream reaches.

See Exhibit B for a summary of regulated hydrology in Project-affected stream reaches and water conveyances, along with Project reservoir storage statistics under NID's Proposed Project.

[9] Of the total amount of mercury found in fish muscle tissue, methylmercury comprises more than 95 percent (ATSDR 1999; Bloom 1992). Hence, consistent with SWAMP BOG protocols, it was assumed that methylmercury could be represented by total mercury concentrations.

6.2.2.1.2 Effects on General Water Quality

Yuba-Bear Project consists of 11 reservoirs and 15 stream reaches (Table 2.2.2-1, Table 5.1.1-2). As described in Section 6.2.1.2, under existing conditions, general water quality in Yuba-Bear Hydroelectric Project reservoirs and downstream of Project facilities meets Basin Plan water quality objectives, with few exceptions. The exceptions were observed in the following reservoirs and reaches (watershed listed in parentheses):

- Jackson Meadows Reservoir and Jackson Meadows Reservoir Dam Reach (Middle Yuba River)
- Sawmill Lake (Canyon Creek)
- Bowman Lake (Canyon Creek)
- Bowman-Spaulding Canal below Fuller Dam (Jordan Creek watershed)
- Chicago Park Powerhouse Reach (Bear River)
- Rollins Reservoir and Bear River Canal Diversion Dam Reach (Bear River)

A discussion of each reservoir and stream reach where water quality objectives were exceeded is provided below. A discussion of relevant measures under the Proposed Project follows the reach-specific discussions.

Jackson Meadows Reservoir and Jackson Meadows Reservoir Dam Reach (Middle Yuba River)

Licensees 2008 and 2009 studies identified two parameters that did not meet the Basin Plan Objectives in Jackson Meadows Reservoir, toxicity and DO, and one parameter in Jackson Meadows Reservoir Dam Reach, DO (NID and PG&E 2010a and 2010b).

Toxicity

In spring 2008, Licensees' Water Quality Study found aluminum concentrations of 0.139 mg/L in the hypolimnion of Jackson Meadows Reservoir, greater than the aquatic benchmark of 0.087 mg/L (NID and PG&E 2010a). NID does not release any materials that contain aluminum, and is unaware of any other party that releases materials with aluminum to surface waters that drain into Jackson Meadows Reservoir. Therefore, the source of aluminum in the reservoir is likely a result of natural conditions (e.g., aluminum minerals in the geology of the watershed). In addition, the inconsistency with the Basin Plan is slight and was found only in the bottom of the reservoir, and not downstream of the reservoir. NID is unaware of any indications or reports that would indicate toxicity in aquatic life in Jackson Meadows Reservoir or downstream of the reservoir. Last, the aluminum toxicity benchmark itself is likely overly protective, as many waters with much higher aluminum concentrations support thriving aquatic life (Marshack 2008). For these reasons, the existing inconsistencies with the Basin Plan's Toxicity objective is considered less than significant, and does not adversely affect designated beneficial uses.

NID does not propose any changes in reservoir operations (as compared to the No-Action Alternative) and an increase in toxicity with the Proposed Project is not expected. If the condition occurs with the Proposed Project, for the reasons stated above, this inconsistency with the Basin Plan's Toxicity objective would be less than significant and designated beneficial uses would not be adversely affected.

Dissolved Oxygen

The Basin Plan's DO objective was not met in the hypolimnion of Jackson Meadows Reservoir during 2009. Figure 6.2.2-1 shows four DO profiles illustrating that the concentrations near the bottom of the reservoir were below the Basin Plan DO objective of 7.0 mg/L. Concentrations near the low level outlet elevation of 5,937 ft were at or below the DO objective for four of the five months profiles were taken, the exception being June, for which DO levels remained above the 7.0 mg/L benchmark throughout the entire water column.

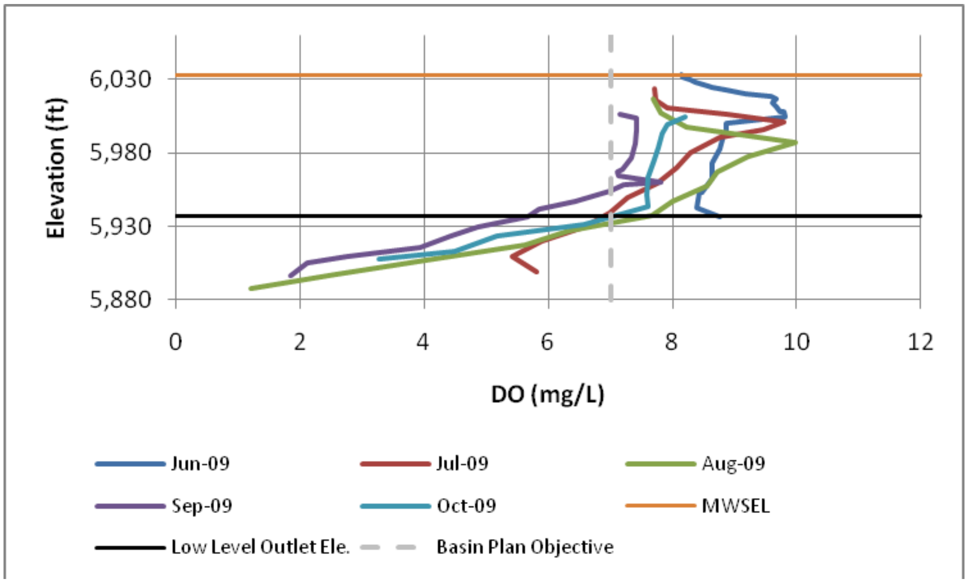


Figure 6.2.2-1. Jackson Meadows Reservoir monthly dissolved oxygen profiles from June through October 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and NID is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, NID is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Since NID does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with NID's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both 2008 and 2009, downstream DO concentrations measured in the Middle Yuba River downstream of Jackson Meadows Dam were above the 7.0 mg/L objective in all samples collected, ranging from 8.2 to 10.2 mg/L. Hence, under current conditions, DO levels are consistent with the Basin Plan objective. Under NID's Proposed Project, minimum flows in Jackson Meadows Dam Reach will increase. DO levels are not expected to decrease with the Proposed Project's minimum flows. The outlet at Jackson Meadows Dam releases a dispersed jet of water from the dam which falls onto a long cliff face prior to consolidating in the stream channel. This dispersal and agitation should provide sufficient aeration to limit any chance of low DO water being released into the stream. For this reason, beneficial uses would not be adversely affected by the Proposed Project.

Sawmill Lake (Canyon Creek)

Licensees 2008 and 2009 studies identified one parameter that did not meet the Basin Plan Objective in Sawmill Lake, dissolved oxygen (NID and PG&E 2010a and 2010b). Downstream, samples collected from the Sawmill Lake Diversion Dam Reach were consistent with all objectives (NID and PG&E 2010a and 2010b).

Dissolved Oxygen

Figure 6.2.2-2 shows two DO profiles collected near the dam at Sawmill Lake in 2008 and 2009, in relation to the 7.0 mg/L DO water quality objective. In July 2008, despite DO concentrations somewhat less than 7.0 mg/L near the bottom, the concentrations near the low level outlet elevation of 5,825ft are above the DO objective. The July 2009 values were above the Basin Plan Objective throughout the profile.

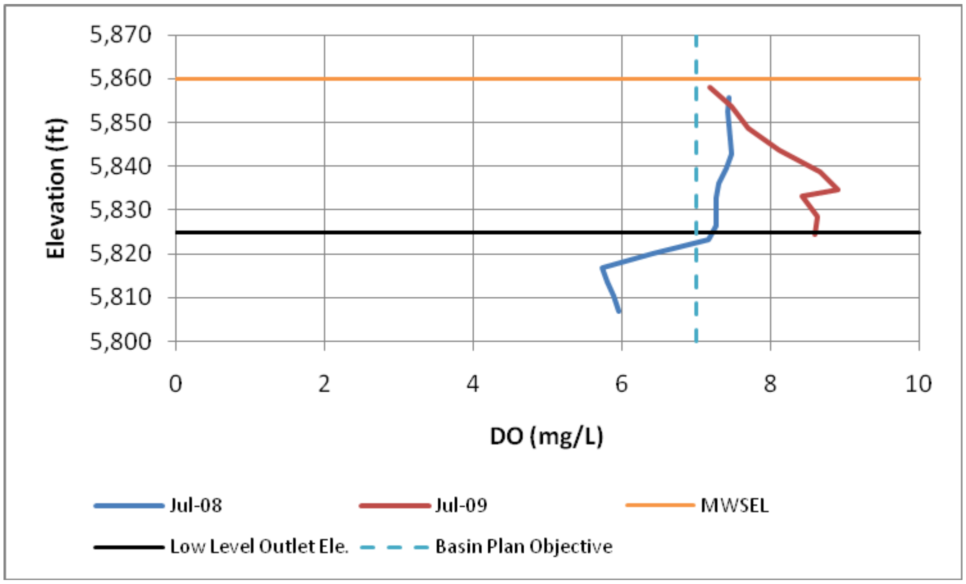


Figure 6.2.2-2. Sawmill Lake monthly dissolved oxygen profiles for July 2008 and 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and NID is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, NID is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Since NID does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with NID's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both 2008 and 2009, DO concentrations in Sawmill Lake Dam Reach, downstream of Sawmill Lake, were above the 7.0 mg/L objective in all samples collected. Hence, under current conditions, DO levels are consistent with the Basin Plan objective. Under NID's Proposed Project, minimum flows in Sawmill Lake Dam Reach will increase. Increased minimum flows from the high elevation oligotrophic reservoir are not expected to adversely affect water quality. The combination of high gradient and cold water are likely to keep this stream at or near oxygen-saturation levels year round regardless of flow. Because NID does not propose any changes in reservoir operations (as compared to the No-Action Alternative) and increased downstream flows would not impair downstream water quality, designated beneficial uses would not be adversely affected by the Proposed Project.

Bowman Lake (Canyon Creek)

Licensees 2008 and 2009 studies identified one parameter that did not meet the Basin Plan Objective in Bowman Lake, dissolved oxygen (NID and PG&E 2010a and 2010b). Downstream, samples collected from the Bowman-Spaulding Diversion Dam Reach were consistent with all objectives (NID and PG&E 2010a and 2010b).

<u>Dissolved Oxygen</u>
Figures 6.2.2-3 and 6.2.2-4 show nine DO profiles collected in Bowman Lake in 2008 and 2009, in relation to the 7.0 mg/L DO water quality objective. In 2008, August and September DO levels approached, or fell slightly below, the DO objective in the hypolimnion. In 2009, DO concentrations in the hypolimnion were further depressed below the DO objective for the months of August, September, and October. Despite DO concentrations less than 7.0 mg/L near the low level outlet elevation of 5,400 ft, these lower DO concentrations were not observed in Canyon Creek below the dam in the Bowman-Spaulding Diversion Dam Reach (see below).

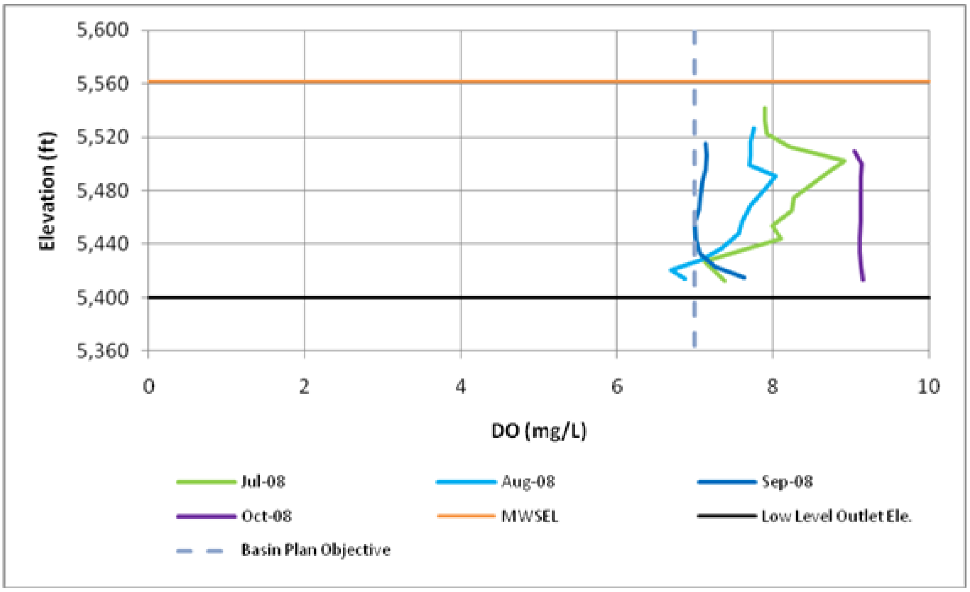


Figure 6.2.2-3. Bowman Lake monthly dissolved oxygen profiles from July through October 2008.

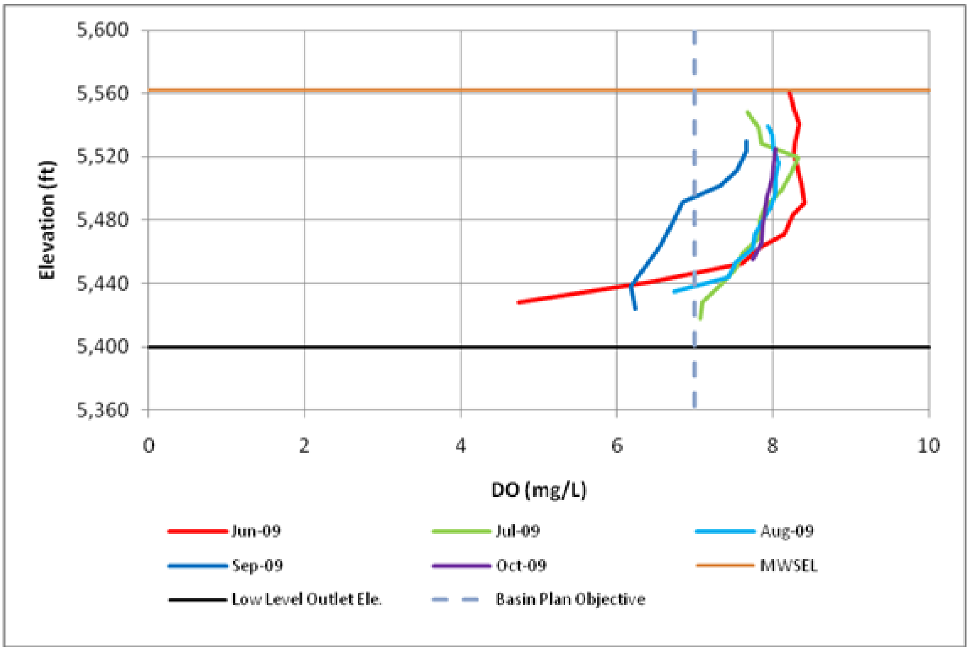


Figure 6.2.2-4. Bowman Lake monthly dissolved oxygen profiles from June through October 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and NID is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, NID is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Since NID does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with NID's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both 2008 and 2009, DO concentrations in Bowman-Spaulding Diversion Dam Reach, downstream Bowman Lake, were above the 7.0 mg/L objective in all samples collected (7.7 to 9.0 mg/L). Hence, under current conditions, DO levels are consistent with the Basin Plan objective. Under NID's Proposed Project, minimum flows in Sawmill Lake Dam Reach will increase. Increased minimum flows from the high elevation oligotrophic reservoir are not expected to adversely affect water quality. Bowman Lake only showed a slight depression in DO levels during the warmest months of the year, a condition that would be quickly remedied by the aeration potential associated with the steep gradient downstream of the dam. Because NID does not propose any changes in reservoir operations (as compared to the No-Action Alternative) and increased downstream flows would not impair downstream water quality, designated beneficial uses would not be adversely affected by the Proposed Project.

Bowman-Spaulding Canal below Fuller Dam (Jordan Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees sampled water from Fuller Lake flows into Fuller Lake Dam Reach and the Bowman-Spaulding Canal below Fuller Lake. Licensee found one parameter that did not meet the Basin Plan Objective or established benchmark in the Bowman-Spaulding Canal below Fuller Lake, pH.

The Basin Plan's pH water quality objective between 6.5 and 8.5 su was not met in the Bowman-Spaulding Canal below Fuller Lake, 6.4 su in the spring of 2008. No distressed fish were observed in this section of stream during NID's studies nor is NID aware of any reports of distressed fish due to pH levels. Because NID does not propose any changes in operations (as compared to the No-Action Alternative) the existing pH levels may occur with the Proposed Project, however, the Proposed Project is not expected to change pH. The inconsistencies with the Basin Plan pH objectives should they occur with the Proposed Project are considered less than significant, and designated beneficial uses would not be adversely affected.

Chicago Park Powerhouse Reach (Bear River)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found one parameter that did not meet the Basin Plan Objective in the Bear River below Chicago Park Powerhouse reach, pH.

The Basin Plan water quality objective for pH, between 6.5 and 8.5 su, was not met at 6.2 su, in spring 2008. Should the existing pH levels continue to occur under the Proposed Project, the reading of 6.2 su is only slightly below the Basin Plan's minimum objective of 6.5 su, and this pH level should not affect aquatic biota or overall water quality. No distressed fish were observed in this section of stream during NID's studies nor is NID aware of any reports of distressed fish due to pH levels. Chicago Park Powerhouse has no minimum release requirement (although minimum release below NID's Dutch Flat Afterbay Dam is conveyed through this reach), however if this condition persists with the Proposed Project, for the reasons stated above, this inconsistency with the Basin Plan's pH objective would be less than significant and designated beneficial uses would not be adversely affected.

Rollins Reservoir and Bear River Canal Diversion Dam Reach (Bear River)

Licensees 2008 and 2009 studies identified two parameters that did not meet the Basin Plan Objective in Rollins Reservoir, bacteria and dissolved oxygen, and two in the Bear River Canal Diversion Dam Reach, turbidity and toxicity (NID and PG&E 2010a and 2010b).

<u>Bacteria</u>
Licensees' Water Quality Study found that the geometric mean of total coliform samples collected in Rollins Reservoir near Long Ravine Campground (471 and 1,753 MPN/100mL in 2008 and 2009, respectively), Orchard Springs Campground (309 and 328 MPN/100mL in 2008 and 2009, respectively) and Greenhorn Campground 1,051 and 638 MPN/100mL in 2008 and 2009, respectively) were greater than the benchmark of 240 MPN/100mL. However, only fecal coliform carries a Basin Plan Objective and these counts were well below recommended numeric criteria (200 MPN/100mL) for fecal coliform in both 2008 and 2009 in at these sites.

E. coli levels, which indicate human related impacts more so than total coliform levels, were greater than the discrete benchmark (<235 MPN per 100 mL in any single sample) in the five samples collected from Long Ravine Campground. The samples were collected on July 16 and July 22, 2009 and both had E. coli counts of 1120 MPN per 100 mL. This indicates that observed bacteria levels at this location may be related to human activity. However, these samples were collected mid-week and could also be due to birds and other wildlife; geese inhabit this area year-round. By way of comparison, the sample collected over the July 4th weekend had an E. coli count of 7.3 MPN per 100 mL. NID does not propose to modify existing operations of Rollins Reservoir. Therefore, operations under the Proposed Project would not lead to increased bacteria in Rollins Reservoir.

<u>Dissolved Oxygen</u>
Figures 6.2.2-5 and 6.2.2-6 show twelve DO profiles collected near the dam in 2008 and 2009, in relation to the 7.0 mg/L DO water quality objective. In 2008, concentrations near the low level outlet elevation of 2,020 ft were at or below the DO objective. In the months of June and October, much of the water column exhibited DO levels below 7.0 mg/L, while July DO levels fell short throughout the entire profile. In 2009, Rollins Reservoir exhibited DO levels of less than 7.0 mg/L in deepest sections of the profile each month of sampling with the exception of October, which exhibited DO levels above 7.0 mg/L throughout the entire water column. These low DO conditions were not observed in the DO readings collected in the Bear River downstream of Rollins Dam (7.9 to 8.1 mg/L).

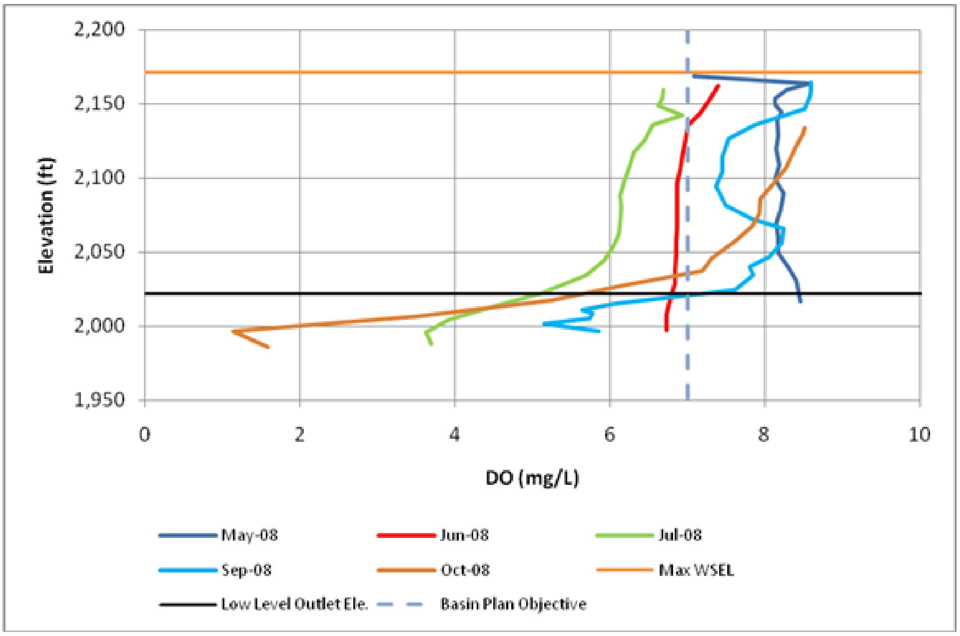


Figure 6.2.2-5. Rollins Reservoir monthly dissolved oxygen profiles from May through October 2008.

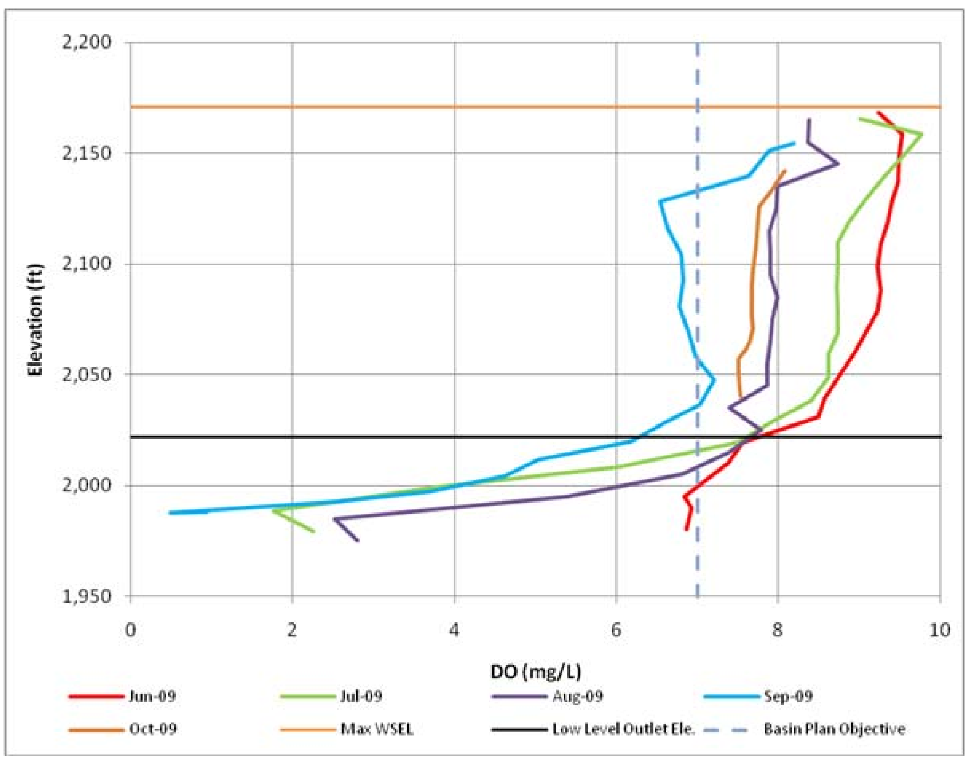


Figure 6.2.2-6. Rollins Reservoir monthly dissolved oxygen profiles from June through October 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and NID is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, NID is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Since NID does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with NID's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both spring and summer 2008, DO concentrations in Bear River Canal Diversion Dam Reach, downstream of Rollins Reservoir, were above the 7.0 mg/L objective in all samples collected (7.4 to 8.1 mg/L). Hence, under current conditions, DO levels are consistent with the Basin Plan Objective in this reach. Under NID's Proposed Project, NID does not propose any changes to downstream flows; water quality and designated beneficial uses would not be adversely affected by the Proposed Project.

Turbidity

Turbidity in the Bear River downstream of Rollins Dam appears higher than turbidity upstream of the reservoir (20-30 NTU downstream versus about 10 NTU upstream), which could be construed to be an inconsistency with the Basin Plan. NID does not propose to change how it operates Rollins Reservoir and proposes to maintain current minimum flow releases. Hence, turbidity levels should not be different than under existing conditions. The existing condition, if it is considered by the SWRCB to be an inconsistency with the Basin Plan Turbidity objective, is less than significant, and designated beneficial uses would not be adversely affected for the reasons described below.

NID is unaware that existing turbidity levels result in a nuisance or adversely affect beneficial uses in the Bear River below the Bear River Canal Diversion Dam. Source water assessments published by NID in 1996, 2002 and 2007 document that downstream water treatment plants consistently meet water turbidity drinking water standards (average <0.3 NTU at the tap), so the turbidity does not affect drinking water (NID & PCWA 1996, Black & Veatch 2002, Starr & Palencia 2007). Also, as described in Section 6.3, fish downstream of Rollins Reservoir appear to be in good condition (average relative condition factor of 1.03 – 1.10). Turbidity levels of 20-30 NTU are known to not adversely affect rainbow and brown trout, which are the primary game fish below the reservoir. Researchers have found at high turbidity levels (40 - 70 NTU) that feeding success does not reduce, but diet shifts to larger prey (White and Harvey 2007; Arndt et al. 2002). Therefore, turbidity levels below the dam do not affect trout condition or feeding. Also, Licensees' Benthic Macroinvertebrates Study (Section 6.3) did not document impairment in the Bear River below Bear River Canal Diversion Dam. Last, NID is unaware of any adverse effects on recreation due to turbidity in this section of the river.

Toxicity

In fall 2008, Licensees' found aluminum concentrations above the aquatic benchmark of 0.087 mg/L in the Bear River below the Bear River Canal Diversion Dam (0.2 mg/L). NID does not release any materials that contain aluminum, and is unaware of any other party that releases materials with aluminum to surface waters that drain into the Bear River. Therefore, the source of aluminum in the stream reach is likely a result of natural conditions (e.g., aluminum minerals in the geology of the watershed). In addition, NID is unaware of any indications or reports that would indicate toxicity in aquatic life in the Bear River below the Bear River Canal Diversion Dam. Last, the aluminum toxicity benchmark itself is likely overly protective, as many waters with much higher aluminum concentrations support thriving aquatic life (Marshack 2008). For these reasons, the existing inconsistency with the Basin Plan's Toxicity objective is considered less than significant, and does not adversely affect designated beneficial uses.

NID does not propose any changes in Project operations for this reach (as compared to the No-Action Alternative) and an increase in toxicity with the Proposed Project is not expected. If the condition occurs with the Proposed Project, for the reasons stated above, this inconsistency with the Basin Plan's Toxicity objective would be less than significant and designated beneficial uses would not be adversely affected.

Tastes and Odors

Existing iron concentrations the Bear River below PG&E's Bear River Canal Diversion Dam are greater than secondary MCL levels, which can result affect in taste and odor problems.

However, NID does not propose any changes to existing Project operations that would increase iron concentrations in these reservoirs or streams. Further, NID does not make any releases that contain iron to surface waters, and are unaware of any complaints regarding taste or odor in these streams. Therefore, the existing inconsistencies with the Basin Plan's Tastes and Odors objective should they occur under the proposed projects would be considered less than significant, and would not adversely affect designated beneficial uses.

Proposed Project Activities that Could Affect Water Quality

Each measure proposed below would protect or enhance water quality under the new license.

Use of Pesticides and Herbicides

Use of pesticides on NFS lands and public lands administered by BLM has the potential to affect water quality if the pesticide enters the water course. Currently, NID contracts with a licensed vegetation management specialist to use herbicides. Typically, NID applies herbicides once in early summer at upper elevation (>5,000 feet) Project facilities and once each in early summer and fall at lower elevation (<5,000 feet) Project facilities. Accord is the only herbicide used on NFS land, and used only with prior approval by the Forest Service. Herbicide applications are usually on downstream dam faces and at foot of dams and in the immediate vicinity of Project facilities. No herbicides are used in water conduits, or near active streams.

NID's proposed measure would restrict the use of pesticides on NFS lands and public lands administered by BLM to those pesticides, locations, and period of use approved by the Forest Service or BLM, as appropriate (YB-TR3 in Appendix E3). Specifically, the measure requires that NID notify the Forest Service and BLM, as appropriate, of proposed uses of pesticides on NFS lands and public lands administered by BLM and obtain the appropriate agencies approval prior to application. The measure also provides that NID may provide to the Forest Service or BLM, an Integrated Pest Management Plan that describes the planned regular use of pesticides, but submittal of the plan does not release Licensee of notification requirements.

Construction Effects on Hazardous Materials

The Proposed Project would include a new powerhouse adjacent to the existing Rollins Powerhouse (the Rollins Upgrade) and upgrades to various recreation facilities, construction of each of which have the potential to affect water quality. NID is required to consult with the agencies with authority over public trust resources that may be affected by construction, and to obtain all necessary permits and approvals related to the construction prior to any ground disturbing activities. In addition, NID has included in the Proposed Project the requirement to develop in consultation with appropriate agencies and file with FERC construction hazardous materials spill prevention, control and countermeasure plans for the Rollins Upgrade and recreation facilities work prior to any ground disturbing activity (YB-WR1 and YB-WR2 in Appendix E3).

Construction Erosion Control and Site Rehabilitation Plan

The Proposed Project also includes measures regarding erosion control during construction of the Rollins Upgrade and various recreation facilities (YB-G&S1 and YB-G&S2 in Appendix E3). The measures would require that NID develop in consultation with appropriate agencies and file with FERC construction erosion control and site restoration plans for the Rollins Upgrade and recreation facilities work prior to any ground disturbing activity.

Erosion due to Road Use

NID's Proposed Project includes a Transportation Management Plan under which NID would maintain all primary Project roads in good condition, which would minimize erosion runoff into surface waters from Project roads (YB-LU1 in Appendix E3).

Minimum Instream flow Requirements

NID's Proposed Project includes adopting or increasing minimum flows for 11 of the 15 Project affected reaches (Measure YB-AQR1 in Appendix E3). The minimum instream flows were developed to provide enhancement for aquatic resources. The reaches affected are:

- Jackson Meadows Reservoir Dam Reach (Middle Yuba River)
- Milton Diversion Dam Reach (Middle Yuba River)
- French Lake Dam Reach (Canyon Creek)
- Faucherie Lake Dam Reach (Canyon Creek)
- Sawmill Lake Dam Reach (Canyon Creek)
- Bowman-Spaulding Diversion Dam Reach (Canyon Creek)

- Texas Creek Diversion Dam Reach (Canyon Creek)
- Fall Creek Diversion Dam Reach (Fall Creek)
- Rucker Creek Diversion Dam Reach (Rucker Creek)
- Dutch Flat Afterbay Dam Reach (Bear River)
- Chicago Park Powerhouse Reach (Bear River)

Water quality under the Proposed increased flows would either remain the same or improve for all constituents, including DO. At most locations increased minimum flows from the high elevation oligotrophic reservoirs and steep gradients downstream of Project dams are likely to cause DO to approach oxygen saturation shortly after release. At other locations, cold water and the shape of the release valves ensure aerated water enters the stream. Because NID does not propose any changes in reservoir operations (as compared to the No-Action Alternative) and increased downstream flows would not impair downstream water quality, designated beneficial uses would not be adversely affected by the Proposed Project.

6.2.2.1.3 Effects on Water Temperature

As described above, under existing conditions, water temperature in Yuba-Bear Hydroelectric Project reservoirs and in surface waters downstream of Project facilities meets the Basin Plan water temperature objective except in a few areas. NID's proposed minimum flow regime and reservoir operations restrictions are not likely to result in warmer water, thereby causing areas that currently meet the Basin Plan objective to not meet the objective. Therefore, the analysis below focuses on areas where the Basin Plan's water temperature objective is not currently met. This includes four streams reaches and four Project reservoirs.

In order to perform a quantitative assessment of the effects of Licensees' Proposed Projects (and additional Project operations proposals) on water temperature, Licensees developed reservoir and stream water temperature models in the following reservoirs and Project-affected reaches (modeling platform utilized is listed in parentheses):

Middle Yuba River

- Jackson Meadows Reservoir (CE-QUAL-W2)
- Jackson Meadows Reservoir Dam Reach (HFAM)
- Milton Diversion Dam Reach (HFAM)

Canyon Creek

- Bowman Reservoir (CE-QUAL-W2)
- Bowman-Spaulding Diversion Dam Reach (HFAM)

South Yuba River

- South Yuba River reaches #4 through #6 (HFAM)

Bear River

- Dutch Flat Afterbay Dam Reach (SSTEMP)
- Rollins Reservoir (CE-QUAL-W2)
- Bear River Canal Diversion Dam Reach (SSTEMP)

See Licensees' Water Temperature Modeling Technical Memorandum (2-3) for a description of the various modeling platforms used in the development of the water temperature models referenced above.

Middle Yuba River Below Wolf Creek (Milton Diversion Dam Reach)

Under existing conditions, mean daily water temperatures in the Middle Yuba River from about Wolf Creek downstream to YCWA's Our House Diversion Impoundment (~14 mi) exceed 20.0°C (Table 6.2.1-4). NID proposes to increase minimum flow releases from the Milton Diversion Dam into the Middle Yuba River from 3 cfs to 3-25 cfs, depending on water year type.

Figures 6.2.2-7 and 6.2.2-8 present results of water temperature model runs under a range of flow release conditions from Jackson Meadows and Milton Diversion dams. Based in part on these results, NID has proposed a minimum instream flow below Milton Diversion Dam during the summer months of Above Normal and Wet water years of 25 cfs. This is predicted to provide an additional six miles of river reach in the Middle Yuba River with average daily temperatures below 20^{o}C during the summer months, extending downstream of the Wolf Creek confluence.

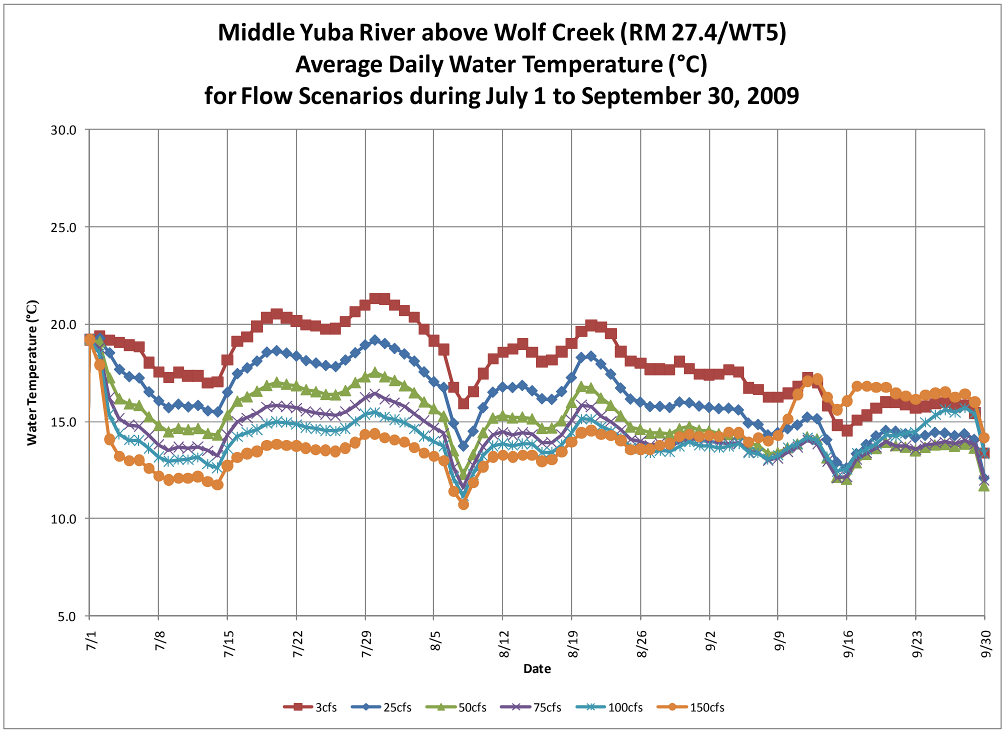


Figure 6.2.2-7. Modeled water temperatures in the Middle Yuba River above Wolf Creek (Milton Diversion Dam Reach) based on 2008 hydrological and 2009 meteorological conditions.

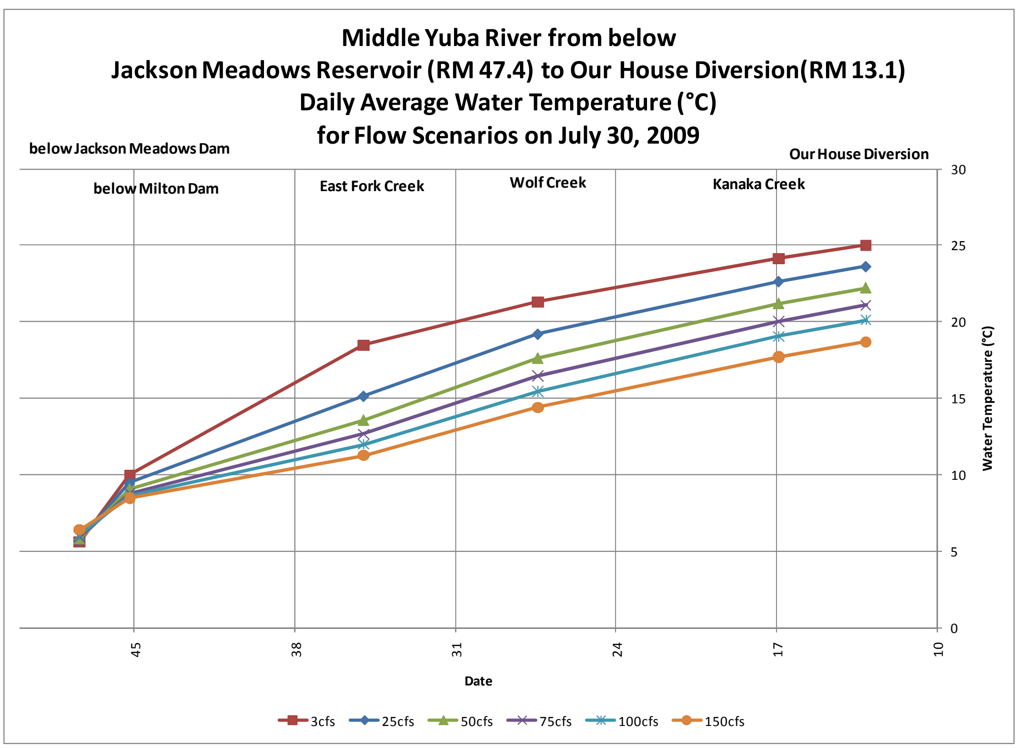


Figure 6.2.2-8. Modeled water temperatures in the entire Milton Diversion Dam Reach based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

Canyon Creek Above South Yuba River Confluence (Canyon Creek below Texas Creek Confluence Reach)

Mean daily water temperatures in the lower portion of Canyon Creek under existing conditions occasionally exceed 20.0°C (Table 6.2.3-1). NID proposes to increase minimum flow releases from the Bowman-Spaulding Conduit Diversion Dam from 2.5-3 cfs to 3-5 cfs.

Figures 6.2.2-9 and 6.2.2-10 present results of water temperature model runs under a range of flow release conditions from Bowman North and Bowman-Spaulding Conduit Diversion dams. Based in part on these results, NID has proposed a minimum instream flows from Bowman-Spaulding Conduit Diversion Dam during the summer months of Above Normal and Wet water years of 5 cfs. This is predicted to provide an additional mile of river reach in Canyon Creek with average daily temperatures below 20° C during the summer months, extending downstream to approximately River Mile 3.0.

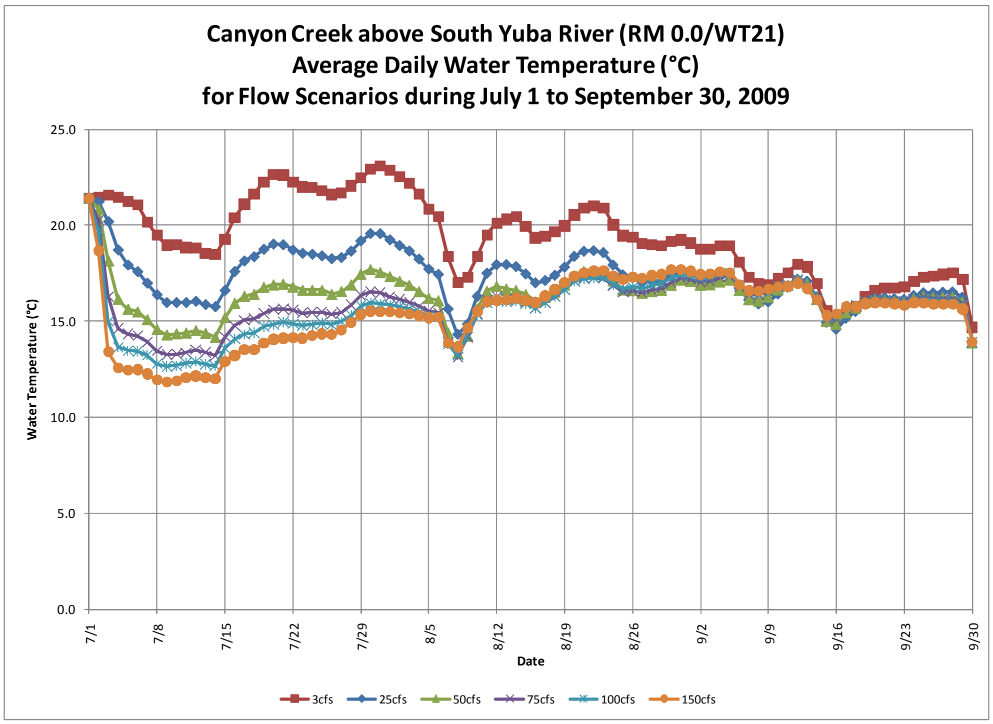


Figure 6.2.2-9. Modeled water temperatures in Canyon Creek above the South Yuba River (Bowman-Spaulding Conduit Diversion Dam Reach) based on 2008 hydrological and 2009 meteorological conditions.

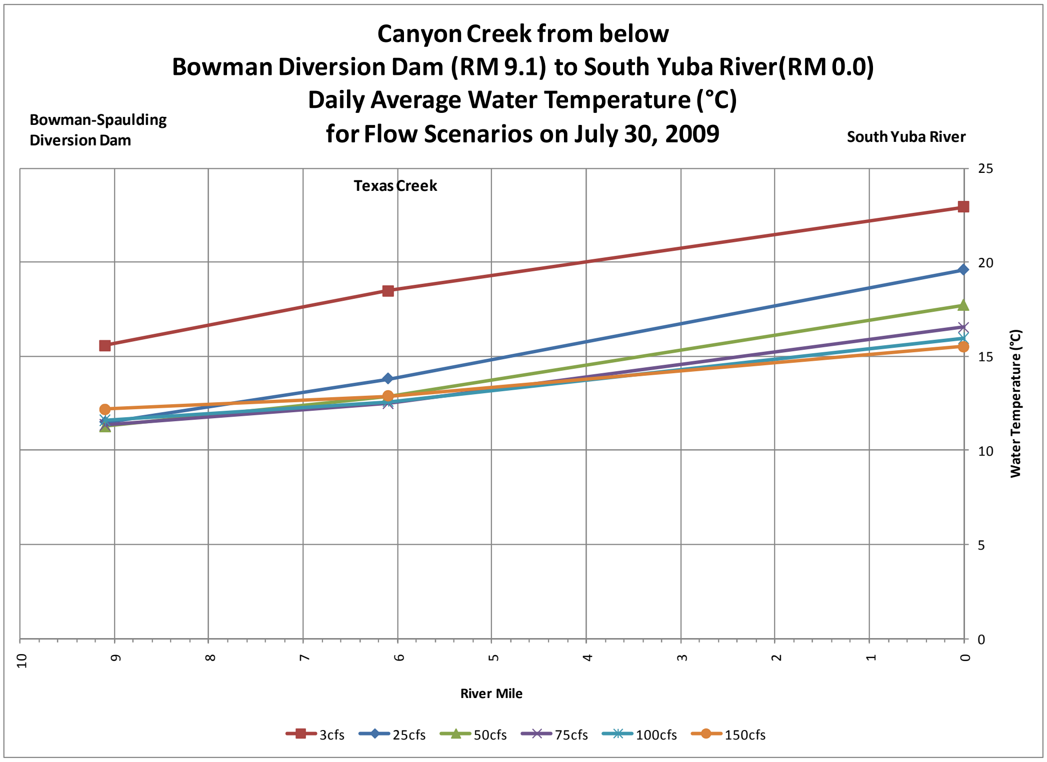


Figure 6.2.2-10. Modeled water temperatures in the entire Bowman-Spaulding Conduit Diversion Dam Reach based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

It is important to note that even under existing conditions, a coldwater fishery dominated by trout occurs in the lower section of Canyon Creek upstream of the South Yuba River confluence (See Section 6.3). Therefore, regardless of existing water temperature conditions, this section of stream supports a Cold Freshwater Habitat designated beneficial use.

Bear River Above Chicago Park Powerhouse (Dutch Flat Afterbay Dam Reach)

In July and August in 2008 and 2009, mean daily water temperatures in the Bear River immediately upstream of the Chicago Park Powerhouse exceeded 20.0°C. Elevated water temperatures are largely an artifact of hydraulic mining debris in this reach, as the debris has artificially widened the channel and exposed the streamflow to greater air-water convective heating and solar radiation. NID does not propose to increase the existing minimum flow in July or August.

As with Canyon Creek, even under existing conditions, a coldwater fishery dominated by trout occurs in the Bear River upstream of Chicago Park Powerhouse (See Section 6.3). Therefore, regardless of existing water temperature conditions, this section of stream currently supports a Cold Freshwater Habitat designated beneficial use.

Bear River below Bear River Canal Diversion Dam (Bear River Canal Diversion Dam Reach)

In over 239 days of monitoring water temperature in the Bear River below PG&E's Bear River Canal Diversion Dam in 2008 and 2009, licensees recorded only 11 days with mean daily water temperatures over 20.0°C, and the highest mean daily water temperature was barely greater than 20.0°C (20.4°C). By late summer and early fall of drier water years, NID's Rollins Reservoir (immediately upstream of PG&E's Bear River Canal Diversion Dam) temperatures approach 20.0°C, due primarily to very warm air temperatures at the reservoir surface (frequently in excess of 30.0°C) and a lack of cold water inflows.

Figures 6.2.2-11 and 6.2.2-12 present results of water temperature model runs under a range of flow release conditions in the Bear River below NID's Rollins Reservoir and PG&E's Bear River Canal Diversion Dam. The results indicate that this reach of the Bear River relies on existing minimum flows, along with consumptive water deliveries, in order to maintain temperatures below 20°C. Any substantial reductions in flows to this reach (i.e., from diversions out of the Middle and South Yuba rivers) during the summer months will eliminate the ability to maintain temperatures below 20°C.

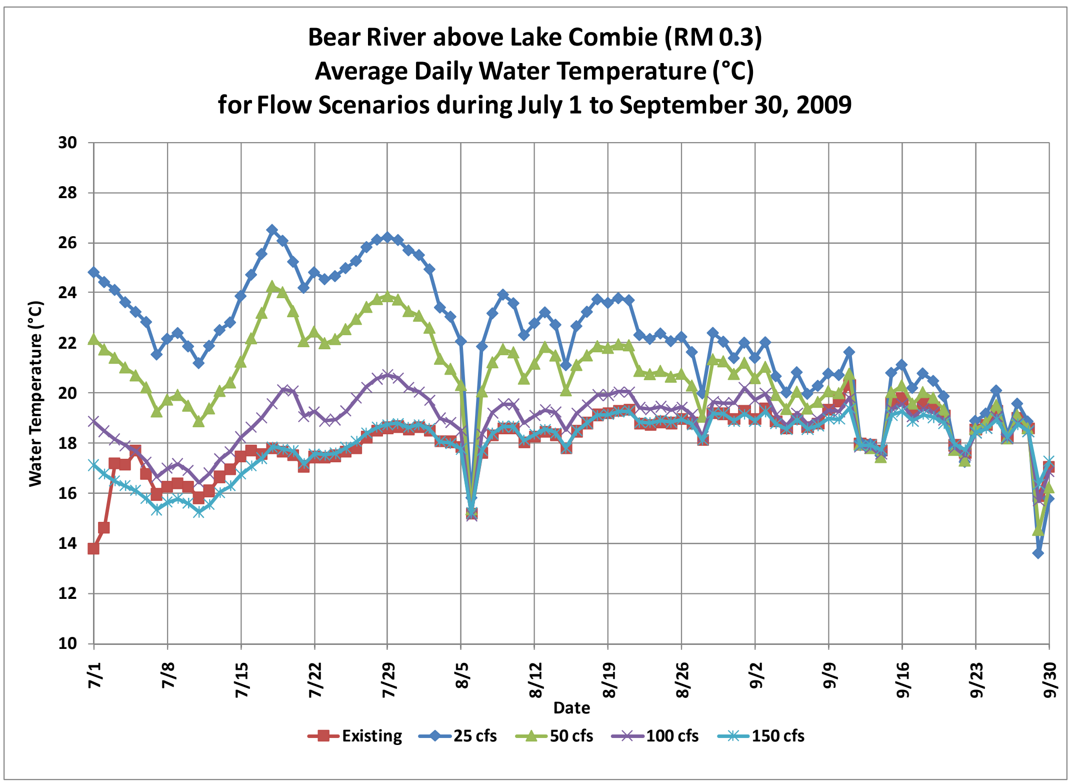


Figure 6.2.2-11. Modeled water temperatures in the Bear River below Bear River Canal Diversion Dam (Bear River Canal Diversion Dam Reach) based on 2008 hydrological and 2009 meteorological conditions.

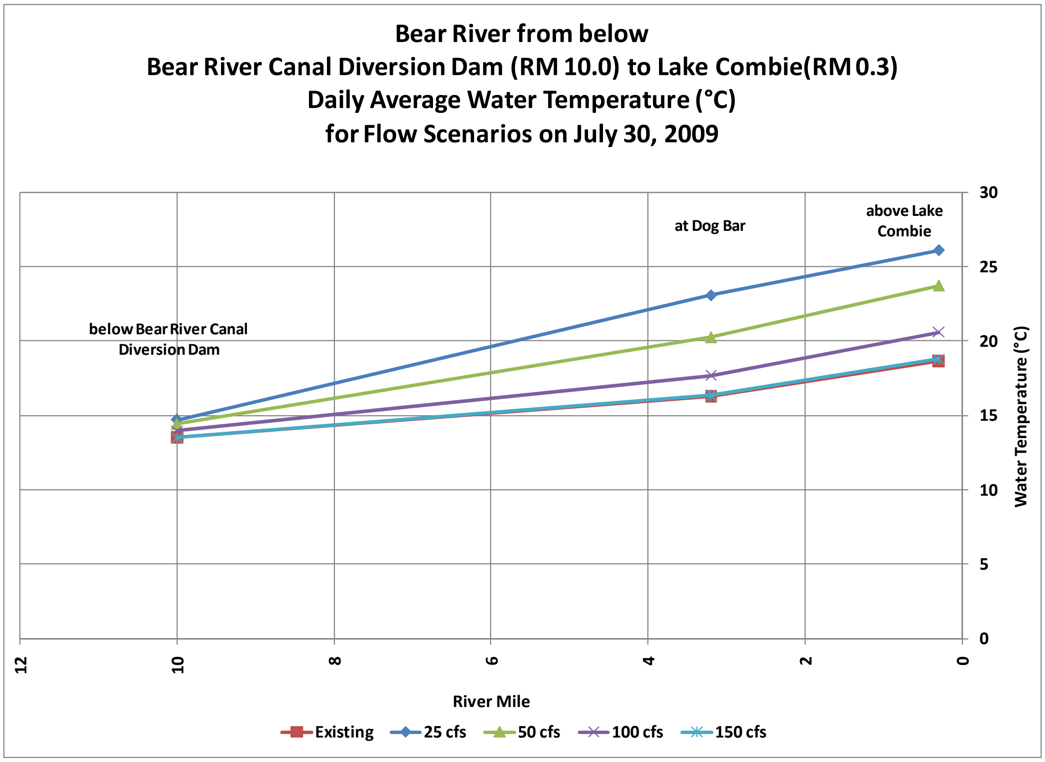


Figure 6.2.2-12. Modeled water temperatures in the entire Bear River Canal Diversion Dam Reach based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

As with Canyon Creek and the Bear River above Chicago Park Powerhouse, even under existing conditions, a coldwater fishery dominated by trout occurs in the Bear River upstream of Lake Combie (See Section 6.3). Therefore, regardless of existing water temperature conditions, this section of stream currently supplies Cold Freshwater Habitat.

Jackson Meadows Reservoir

Under existing conditions, summer water temperatures in Jackson Meadows Reservoir range from 5°C - 21°C, with a strong thermocline due to the topography of the reservoir bottom and seasonality of inflows.

Under the Licensees' Proposed Projects, increased minimum instream flows below Jackson Meadows Dam are not anticipated to significantly affect either seasonal storage or seasonal stratification in Jackson Meadows Reservoir, as compared to the No-Action Alternative. See Table 6.2.2-1 below for modeled results of thermal conditions in Jackson Meadows Reservoir under these two operating scenarios.

Table 6.2.2-1. Estimated usable storage in Jackson Meadows Reservoir at the 10°C and 15°C isotherms, based on Operations Model and CE-QUAL-W2 temperature model results under 2008 and 2009 meteorology.

Operations Scenario	Estimated Usable Storage below 15°C Isotherm (ac-ft)				Estimated Usable Storage below 10°C Isotherm (ac-ft)			
	2008		2009		2008		2009	
	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct
No-Action Alternative	36,061	9,007	34,366	8,650	28,724	6,547	28,180	6,648
Licensees' Proposed Projects	32,931	6,555	31,569	7,052	25,473	5,260	24,873	5,373

Sawmill Lake

Reservoir water temperatures exceeded 20.0°C at depths of 10-30 feet below the reservoir surface in July 2008 and 2009. However, water temperatures near the low level outlet were never measured to be greater than approximately 17°C in either year.

NID proposes to increase the minimum instream flows below French and Faucherie dams upstream of Sawmill Lake, as well as the minimum instream flow below Sawmill Lake Dam into Bowman Lake, from 2.5 cfs to 5 cfs below each dam. The increased instream flows will likely have the effect of decreasing inflow temperatures into Sawmill Lake in the summer months. These proposed instream flow changes are not likely to affect water temperatures within Bowman Lake downstream.

Dutch Flat Afterbay

Reservoir surface water temperatures exceeded 20.0°C in the summer months of 2008 and 2009. However, stream temperatures collected in the Bear River immediately upstream and downstream of Dutch Flat Afterbay showed that the afterbay has a net cooling effect on the stream during the summer months due to the small amount of thermal stratification that exists within the reservoir. NID does not propose to modify the afterbay operations, or increase the existing minimum flow below Dutch Flat Afterbay Dam during the summer months.

Rollins Reservoir

Under existing conditions, summer water temperatures in Rollins Reservoir range from 8°C - 23°C, with a strong thermocline due to the topography of the reservoir bottom and relatively cool inflow temperatures.

Under the Licensees' Proposed Projects, modified inflows into Rollins Dam are not anticipated to significantly affect either seasonal storage or seasonal stratification in Rollins Reservoir, as compared to the No-Action Alternative. See Table 6.2.2-2 below for modeled results of thermal conditions in Rollins Reservoir under these two operating scenarios.

Table 6.2.2-2. Estimated usable storage in Rollins Reservoir at the 10°C and 15°C isotherms, based on Operations Model and CE-QUAL-W2 temperature model results under 2008 and 2009 meteorology.

Operations Scenario	Estimated Usable Storage below 15°C Isotherm (ac-ft)				Estimated Usable Storage below 10°C Isotherm (ac-ft)			
	2008		2009		2008		2009	
	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct
No-Action Alternative	27,362	1,360	30,037	1,354	1,532	1,036	1,548	1,036
Licensees' Proposed Projects	27,280	1,365	30,013	1,349	1,529	1,035	1,545	1,035

6.2.2.1.4 Effects on Mercury Bioaccumulation in Fish

Fish with mercury concentrations that exceed OEHHA's ATL of 0.07 ppm methylmercury wet-weight were found in five Yuba-Bear Hydroelectric Project reservoirs: Jackson Meadows Reservoir, Faucherie Lake, Bowman Lake, Dutch Flat Afterbay and Rollins Reservoir (NID and PG&E 2010c; May et al. 2000). Under NID's Proposed Project, these reservoirs would be operated as they have historically been operated. The existing Project has no effect on the bioaccumulation of mercury in fish, nor will the Proposed Project for the reasons stated below.

First, the Project does not make any releases of mercury-containing substances to the reservoirs, nor will NID do so in the future.

Second, the Project has not disturbed sediment in reservoirs, and NID will not disturb sediment in reservoirs as part of the Proposed Project. Therefore, as proposed, the Project is not performing any actions associated with the release or methylation of mercury.

Third, mercury is found throughout California and its sources include natural mineral deposits, historic mine tailings, aerial deposition originally from remote industrial sources and local forest fires that release mercury sequestered in terrestrial biomass (DWR 2007, Davis et al 2009). In fact, in two recent northern California and State-wide lake and reservoir surveys, mercury was detected in fish tissue above the OEHHA ATL of 0.07 ppm wet-weight in 88 percent of the 172 California lakes sampled, including high elevation lakes in pristine surroundings (DWR 2007, Davis et al 2009).

Fourth, the Project is located in one of the major historic gold mining districts of northern California, where mercury was used extensively to amalgamate gold as part of the extraction process (Alpers and Hunerlach 2000). Mercury has been found in the tissue of fish from both upstream and downstream of Project facilities (May et al. 2000; Hunerlach et al. 1999), and in concentrations greater than 0.07 ppm methylmercury wet-weight in reservoirs and stream reach reference sites identified by the United States Geological Survey (USGS) as above the influence of historic mining operations (May et al. 2000).

Last, based on research at Davis Creek Reservoir in the Berryessa/Clear Lake historic mercury mining district west of the Project in the Coastal Range, one could presume that seasonally anoxic bottom waters for a reservoir could provide an annual pulse of methylmercury to the reservoir food chain (Jones & Slotton 1996). However, as described above, Jackson Meadows Reservoir, Faucherie Lake and Bowman Lake do not experience anoxic conditions (NID and PG&E 2010b).

6.2.2.2 PG&E's Drum-Spaulding Project

This Section summarizes effects of the existing Drum-Spaulding Project on water resources. If it is concluded that the existing Project adversely affects a specific water resources, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect. In that case, the measure is listed and the reader is directed to Appendix E7 for the complete text of the measure and a rationale for the measure.

6.2.2.2.1 Water Quantity and Use

Under the Proposed Project, Project reservoirs will be operated as they have been operated historically, and PG&E will continue the existing Fordyce Lake minimum pool condition in the existing license (Measure DS-AQR2 in Appendix E7). As such, no significant changes to storage will occur (as shown in reservoir elevation comparisons between the No-Action Alternative and the Licensees' Proposed Projects under Sections 6.3 and 6.6 of Exhibit E).

PG&E proposes to increase minimum instream flows in 10 stream reaches affected by the Project (Measure DS-AQR1 in Appendix E7). These minimum instream flow increases will have a beneficial effect on water quantity in Project-affected stream reaches, when compared to existing conditions in all PG&E reservoirs and stream reaches.

See Appendix E11 for a summary of historical regulated hydrology in Project-affected stream reaches and water conveyances, along with Project reservoir storage statistics based on PG&E's historical Drum-Spaulding Project operations.

6.2.2.2.2 Effects on General Water Quality

The Drum-Spaulding Project consists of 29 reservoirs, 37 dams, and 34 Project-affected reaches. As described in Section 6.2.1.2, under existing conditions, the general water quality in Drum-Spaulding Hydroelectric Project reservoirs and downstream of Project facilities meets Basin Plan water quality objectives, with a few exceptions. The exceptions were observed in the following reservoirs and stream reaches (watershed listed in parentheses):

- Fordyce Lake and Fordyce Dam Reach (Fordyce Creek watershed)
- Carr Lake (Fall Creek watershed)
- Lower Lindsey Lake (Lindsey Creek watershed)
- Blue Lake (Rucker Creek watershed)
- Lake Valley Reservoir (NF of NF American River watershed)

- Lake Spaulding and South Yuba River below Spaulding Dam Reach (South Yuba River watershed)
- Lake Sterling Dam Reach (Bloody Creek watershed)
- Halsey Afterbay Dam Reach (Dry Creek watershed)
- Rock Creek Dam Reach (Rock Creek watershed)
- Wise Powerhouse Overflow Reach (Auburn Ravine watershed)
- Mormon Ravine Reach (Mormon Ravine watershed)

A discussion of each reservoir and stream reach where water quality objectives were exceeded is provided below. A discussion of relevant measures under the Proposed Project follows the reach-specific discussions.

Fordyce Lake and Fordyce Creek Dam Reach (Fordyce Creek watershed)

Licensees 2008 and 2009 studies identified one parameter that did not meet the Basin Plan Objective in Fordyce Lake, DO, and one in Fordyce Lake Dam Reach, pH (NID and PG&E 2010a and 2010b).

Dissolved Oxygen

Figures 6.2.2-13 and 6.2.2-14 show six DO profiles collected near Fordyce Dam in 2008 and 2009, in relation to the 7.0 mg/L DO water quality objective. As shown, the July and September measurements were greater than 7.0 mg/L, while the October measurements exhibited some lower DO readings. In October 2008, DO concentrations less than 7.0 mg/L were observed near the surface of Fordyce Lake, but not near the low level outlet elevation of 6,291 ft, while in October 2009, DO concentrations greater than 7.0 mg/L were observed near the surface, but not near the low level outlet. These DO data are consistent with historical data with respect to the timing of reservoir turn-over, which is expected around October of each year.

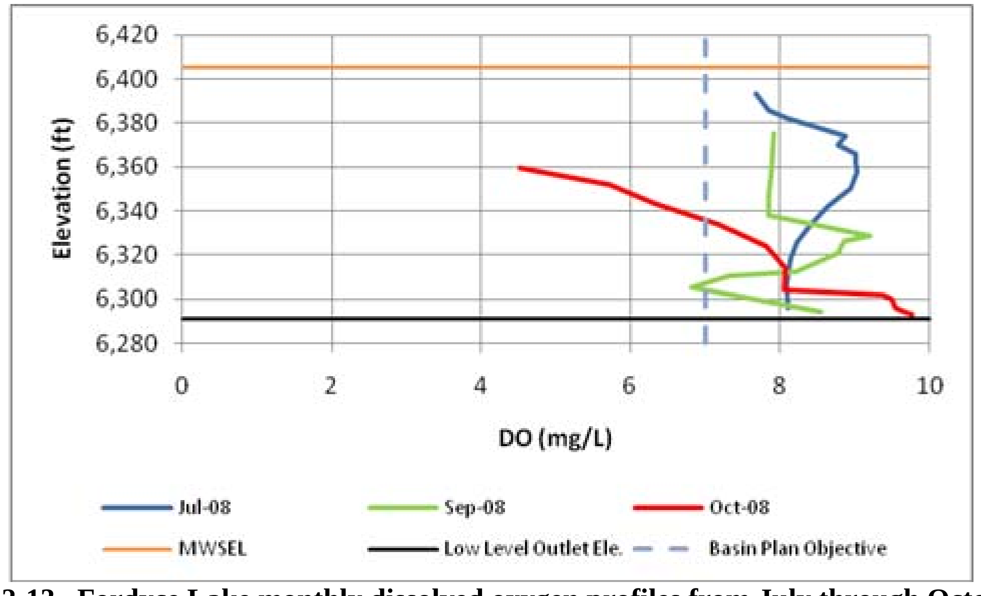


Figure 6.2.2-13. Fordyce Lake monthly dissolved oxygen profiles from July through October 2008.

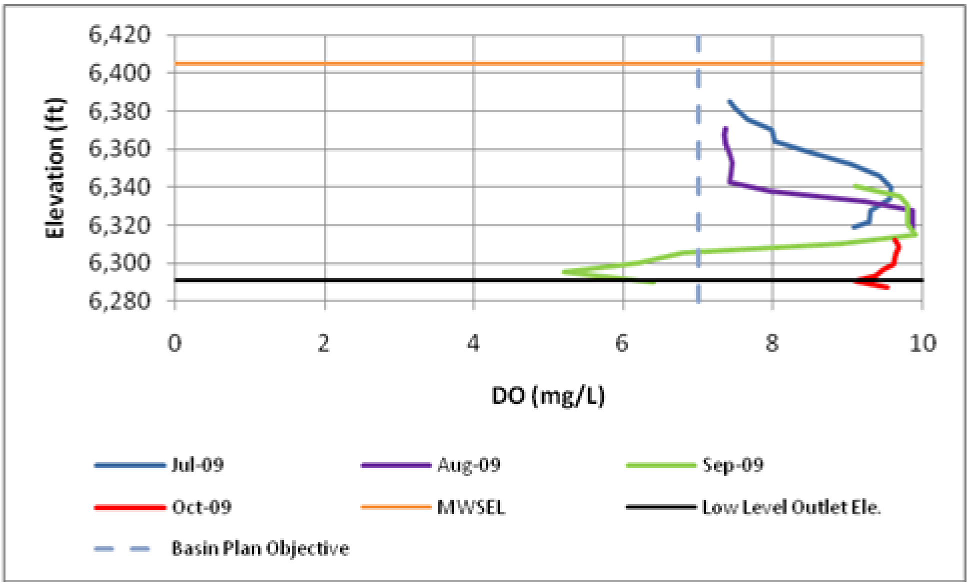


Figure 6.2.2-14. Fordyce Lake monthly dissolved oxygen profiles from July through October 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and PG&E is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, PG&E is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Because PG&E does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with PG&E's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both 2008 and 2009, downstream concentrations in Fordyce Creek Dam Reach were above the 7.0 mg/L objective in all samples collected, ranging from 7.6 to 7.9 mg/L. Hence, under current conditions, DO levels are consistent with the Basin Plan objective. Under PG&E's Proposed Project, minimum flows in Fordyce Lake Dam Reach will increase. DO levels are not expected to decrease with the Proposed Project's minimum flows. Water released through a cone type outlet valve is highly aerated on release and should quickly approach oxygen saturation levels. The high gradient of the downstream reach is likely to keep this stream at near saturation levels year round. For this reason, beneficial uses would not be adversely affected by the Proposed Project.

pH

The Basin Plan's pH water quality objective between 6.5 and 8.5 su was not met in Fordyce Creek below Fordyce Dam (6.4 su) in Licensee's Spring 2008 sample collected on July 16, at the end of spring snowmelt. Under PG&E's Proposed Project, minimum flows in Fordyce Lake

Dam Reach will increase. The existing low pH conditions may occur with the Proposed Project, but the Proposed Project is not expected to cause pH to be lower than under existing conditions. The inconsistencies with the Basin Plan pH objectives should they occur with the Proposed Project are considered less than significant, and designated beneficial uses would not be adversely affected.

Carr Lake (Fall Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), fecal coliform counts were well below the Basin Plan Objective (200 MPN/100mL) in both 2008 and 2009. At the same time, the geometric mean of total coliform samples collected adjacent to Carr Lake Campground (284 and 324 MPN/100mL in 2008 and 2009, respectively) were greater than the recreation-related benchmark of 240 MPN/100mL. Because e. coli was either absent or 1 MPN in all samples, the total coliform observed was likely due to wildlife and not human related. PG&E does not propose to modify existing operations of Carr Lake; therefore, operations under the Proposed Project would not lead to increased bacteria levels as compared to the No-Action Alternative. Because PG&E does not propose any changes in reservoir operations (as compared to the No-Action Alternative) designated beneficial uses would not be adversely affected by the Proposed Project.

Lower Lindsey Lake (Lindsey Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found one parameter that did not meet the Basin Plan Objective or established benchmark in Lower Lindsey Lake – bacteria. Licensees' Water Quality Study found fecal coliform counts were well below the Basin Plan Objective (200 MPN/100mL) in both 2008 and 2009. At the same time, the geometric mean of total coliform samples collected adjacent to Lower Lindsey Lake Campground (306 and 294 MPN/100mL in 2008 and 2009, respectively) was greater than the recreation-related benchmark of 240 MPN/100mL. Because *e. coli* was either absent or 1 MPN in all samples, the total coliform observed was likely due to wildlife and not human related.

Under PG&E's Proposed Project, operation of Lower Lindsey Lake will remain the same. Because PG&E does not propose any changes in reservoir operations (as compared to the No-Action Alternative), designated beneficial uses would not be adversely affected by the Proposed Project.

Blue Lake (Rucker Creek watershed)

Licensee's 2008 study identified two parameters that did not meet the Basin Plan Objective in Blue Lake, pH and dissolved oxygen (NID and PG&E 2010a and 2010b). Downstream, samples collected from the Blue Lake Dam Reach were consistent with all objectives (NID and PG&E 2010a and 2010b).

pH

The Basin Plan's pH water quality objective between 6.5 and 8.5 su was not met in Blue Lake hypolimnion during summer 2008 sampling (8.7). PG&E does not propose any significant change to reservoir operations; consequently, the the Proposed Project is not expected to change pH. The inconsistencies with the Basin Plan pH objectives should they occur with the Proposed Project are considered less than significant, and designated beneficial uses would not be adversely affected.

Dissolved Oxygen

Licensees' studies indicate that the Basin Plan's DO water quality objective (≥7.0 mg/L) was not met in Blue Lake's hypolimnion during summer 2008 sampling (6.4 mg/L); however, concentrations above 7.0 mg/L were observed downstream in Blue Lake Dam Reach (Rucker Creek).

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and PG&E is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, PG&E is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Because PG&E does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with PG&E's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both spring and summer 2008, DO concentrations in Blue Lake Dam Reach were above the 7.0 mg/L objective in all samples collected (7.4 to 8.3 mg/L). Hence, under current conditions, DO levels are consistent with the Basin Plan objective. Under PG&E's Proposed Project, minimum flows in Blue Lake Reach will increase from 0.2 to 0.3 cfs (target flows increase from 0.5 to 0.75 cfs). Water quality of the oligotrophic reservoir is high (i.e. analytes non-detect or close to non-detect) and increasing the minimum flows are not expected to decrease DO levels in this reach. Because PG&E does not propose a significant change in reservoir operations (as compared to the No-Action Alternative) and the increased downstream flows would not impair downstream water quality, designated beneficial uses would not be adversely affected by the Proposed Project.

Lake Valley Reservoir (NF of NF American River watershed)

Licensees 2008 and 2009 studies identified one parameter that did not meet the Basin Plan Objective in Lake Valley Reservoir, dissolved oxygen (NID and PG&E 2010a and 2010b). Figure 6.2.2-15 shows three DO profiles collected near the Lake Valley Reservoir Dam in August 2008, June 2009, and August 2010, in relation to the 7.0 mg/L DO water quality objective. As shown, DO concentrations less than 7.0 mg/L were observed in the hypolimnion, including near the low level outlet elevation of 5,728 ft, in both years. Despite DO concentrations less than 7.0 mg/L near the low level outlet elevation, DO concentrations were above 7.0 mg/L in NF of the NF American River below the dam in the Lake Valley Reservoir Dam Reach (about 3 miles downstream).

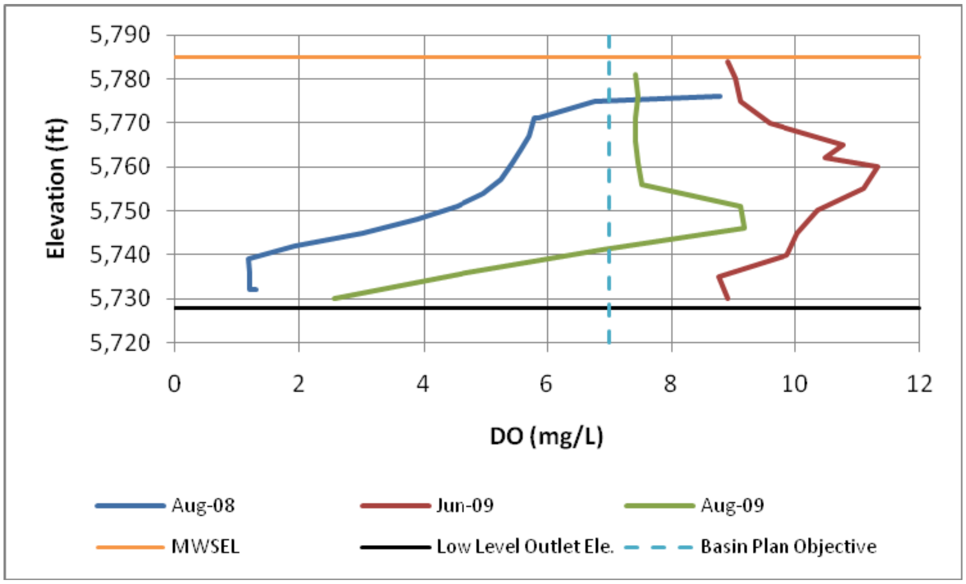


Figure 6.2.2-15. Lake Valley Reservoir monthly dissolved oxygen profiles August 2008, June, 2009 and August 2009.

Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and PG&E is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. Additionally, PG&E is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses. Because PG&E does not propose a significant change in how it operates these reservoirs, these conditions may occur with the Proposed Project; however, the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective (should they occur with PG&E's Proposed Project) would be considered less than significant, and designated beneficial uses would not be adversely affected.

In both the spring and the fall of 2008, downstream concentrations in the NF of the NF American River were above the 7.0 mg/L objective in all samples collected, ranging from 8.3 to 8.6 mg/L. Under PG&E's Proposed Project, minimum flows in Lake Valley Reach will increase. Increasing the minimum flows is not expected to decrease DO levels in this reach. For this reason, beneficial uses would not be adversely affected by the Proposed Project.

Lake Spaulding and South Yuba Below Spaulding Dam Reach (South Yuba River watershed)

Licensee's 2008 and 2009 water quality studies identified two parameters that did not meet the Basin Plan Objectives in Lake Spaulding, pH and dissolved oxygen, and two in the South Yuba Below Spaulding Dam Reach, dissolved oxygen, and taste (iron) and odor (NID and PG&E 2010a and 2010b).

pH
The Basin Plan's pH water quality objective, between 6.5 and 8.5 su, was not met near the bottom of Lake Spaulding, 8.7 su in fall 2009. PG&E does not propose any significant change to reservoir operations; consequently, the existing pH levels may occur with the Proposed Project. However, the Proposed Project is not expected to change pH. The inconsistencies with the Basin Plan pH objectives, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Dissolved Oxygen
Licensees' studies indicate that the Basin Plan's DO water quality objective (≥7.0 mg/L) was not met in the hypolimnion of Lake Spaulding, including near the low level outlet elevation of 4,774 ft, in 2008 and 2009 (Figures 6.2.2-16 and 6.2.2-17). In addition, DO concentrations in the South Yuba River, immediately downstream of Spaulding Dam were 2.8 mg/L during fall 2008 sampling.

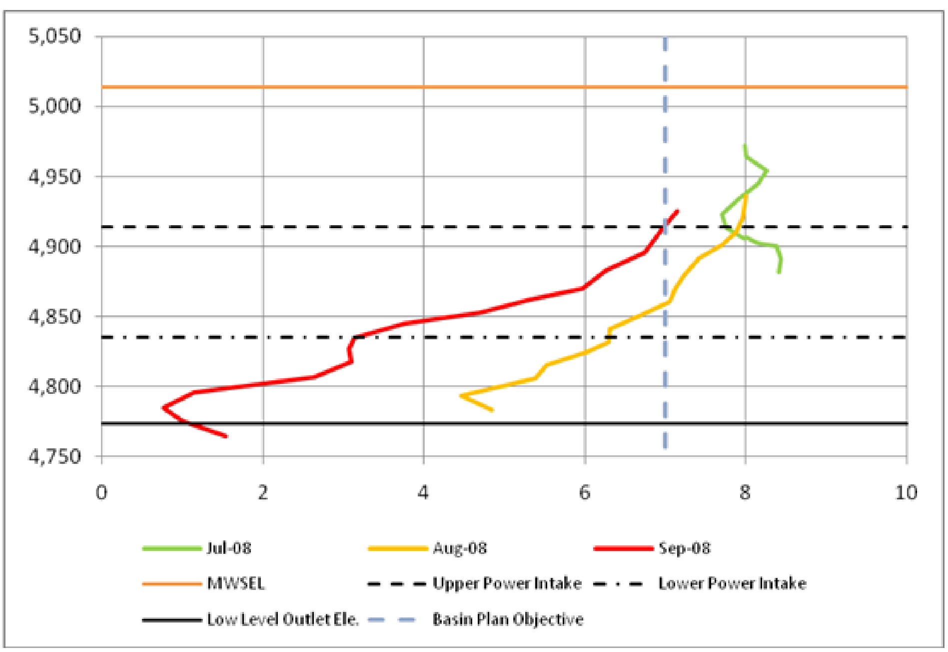


Figure 6.2.2-16. Lake Spaulding monthly dissolved oxygen profiles from July through September 2008.

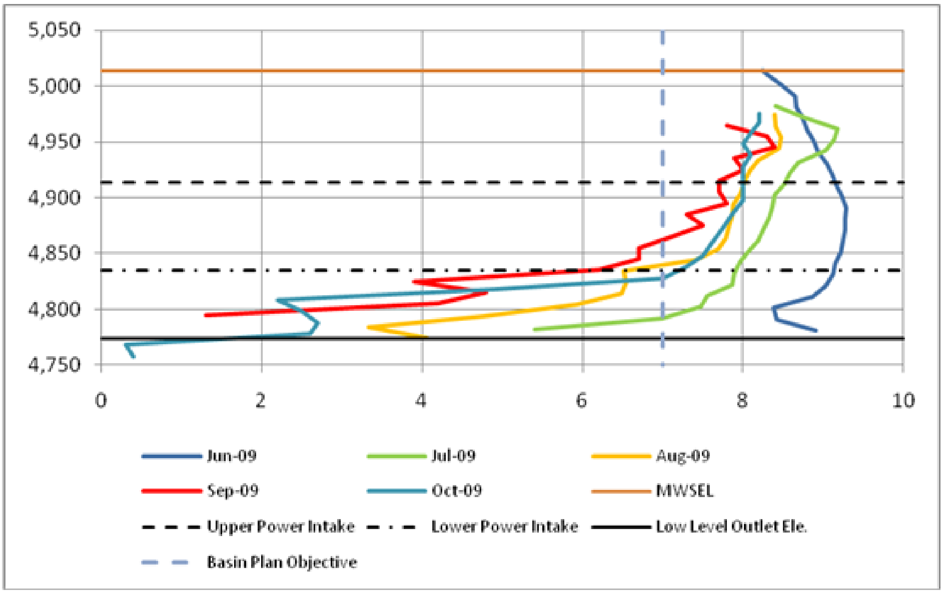


Figure 6.2.2-17. Lake Spaulding monthly dissolved oxygen profiles from June through October 2009.

Low DO levels in the hypolimnion of deep Sierra Nevada reservoirs are not uncommon and should not have adverse effects on aquatic biota in the reservoir. Most fish and aquatic organisms utilize the upper portions of the reservoir, and can easily avoid the low DO areas. Because PG&E does not propose any changes in reservoir operations (as compared to the No-Action Alternative) the existing reservoir conditions of low DO may occur with the Proposed Project, but the Proposed Project is not expected to cause DO to be lower than under existing conditions.

As pointed out above, DO concentrations in the South Yuba River, immediately downstream of Spaulding Dam were 2.8 mg/L during fall 2008 sampling. The low DO levels downstream of the dam do not persist throughout the reach – at the next sampling station, located about 8 miles downstream (above Canyon Creek), DO was measured at 7.3 mg/L and 8.4 mg/L during the same time period. This phenomenon is also common in Sierra Nevada streams, due to high levels of turbulence and air entrainment from frequent high gradient channel features. Coldwater fish populations were found below the dam with the density of rainbow trout ranging from 862 to 1,392 fish/mi. BMI within the reach had a lower IBI and MMI scores (17 and 22, respectively), but that was primarily attributed to high gradient habitat and boulder substrate. Under PG&E's Proposed Project, minimum flows in the South Yuba River below Spaulding Dam Reach will increase. DO levels are not expected to decrease with the Proposed Project's minimum flows. Cold water is highly aerated on release and should reach oxygen saturation levels. The combination of high gradient and cold water are likely to keep this stream at near saturation levels year round regardless of flow. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Taste and Odors

In 2008, iron levels were greater than 0.3 mg/L in South Yuba River below Spaulding Dam in summer (0.409 mg/L) and fall (0.974 mg/L), which can affect taste and odor. PG&E does not propose any changes to existing Project operations that would increase iron concentrations in this stream. Further, PG&E does not make any releases that contain iron to surface waters, and is unaware of any complaints regarding taste or odor in these streams. Therefore, the existing inconsistencies with the Basin Plan's Tastes and Odors objective should they occur under the Proposed Project would be considered less than significant, and would not adversely affect designated beneficial uses.

Lake Sterling Dam Reach (Bloody Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found one parameter that did not meet the Basin Plan Objective or established benchmark in the Lake Sterling Dam Reach, dissolved oxygen.

Licensees' studies indicate that the Basin Plan's DO water quality objective (≥7.0 mg/L) was not met in the Lake Sterling Dam Reach during spring and summer 2008 sampling (6.3 mg/L and 6.9 mg/L respectively). These levels are only slightly below the Basin Plan objective, and would not affect aquatic biota and PG&E is unaware of any indications or reports of stress in aquatic life due to low DO in Lake Sterling Dam Reach.

Because PG&E does not propose any changes in operations (as compared to the No-Action Alternative) the existing low DO conditions may occur with the Proposed Project, but the Proposed Project is not expected to cause DO to be lower than under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective should they occur with the Proposed Project are considered less than significant, and designated beneficial uses would not be adversely affected.

Halsey Afterbay Dam Reach (Dry Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found two parameters that did not meet the Basin Plan Objective or established benchmark in Dry Creek below Halsey Afterbay, toxicity and turbidity.

Toxicity

Licensees' found aluminum concentrations above the aquatic benchmark of 0.087 mg/L in Dry Creek below Halsey Afterbay Dam (0.089 mg/L) in spring 2008. PG&E does not release any materials that contain aluminum, and is unaware of any other party that releases materials with aluminum to surface waters. Therefore, the source of aluminum is likely a result of natural conditions (e.g., aluminum minerals in the geology of the watershed). In addition, PG&E is unaware of any indications or reports that would indicate toxicity in aquatic life in any of the above stream reaches. Last, the aluminum toxicity benchmark itself is likely overly protective, as many waters with much higher aluminum concentrations support thriving aquatic life (Marshack 2008). Under PG&E's Proposed Project, minimum instream flows in Dry Creek

Below Halsey Afterbay Dam will be set. If the condition occurs with the Proposed Project, for the reasons stated above, this inconsistency with the Basin Plan's Toxicity objective is considered less than significant. Designated beneficial uses would not be adversely affected.

Turbidity

In spring 2008, Dry Creek below Halsey Afterbay had a turbidity of 27.2 NTU, which could be construed to be an inconsistency with the Basin Plan. The existing condition, if it is considered by the SWRCB to be an inconsistency with the Basin Plan Turbidity objective, is less than significant, and designated beneficial uses would not be adversely affected for the reasons described below.

Due to the soil types that exist in these lower watersheds, relatively high turbidity values are common during rainfall events. Study results did not demonstrate that existing turbidity levels resulted in a nuisance or adversely effect beneficial uses in Dry Creek below Halsey Afterbay. Turbidity levels of 20-30 NTU are known to not adversely affect rainbow and brown trout, which are the primary game fish below the Afterbay. Researchers have found that at high turbidity levels (40 - 70 NTU) feeding success does not reduce, but diet shifts to larger prey (White and Harvey 2007; Arndt et al. 2002). Therefore, turbidity levels below the dam do not affect trout condition or feeding. Last, PG&E is unaware of any adverse effects on recreation due to turbidity in this section of the creek.

Under PG&E's Proposed Project, minimum flows in Dry Creek below Halsey Afterbay will be set. Turbidity levels are not expected to increase with the Proposed Project's minimum flows. Hence, these existing inconsistencies with the Basin Plan's turbidity objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Rock Creek Dam Reach (Rock Creek watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found two parameters that did not meet the Basin Plan Objective or established benchmark in Rock Creek below Rock Creek Reservoir, dissolved oxygen and tastes/odors (iron).

Dissolved Oxygen

Licensees' studies indicate that the Basin Plan's DO water quality objective (≥7.0 mg/L) was not met in Rock Creek below Rock Creek Reservoir during summer 2008 sampling (6.7 mg/L). These levels are only slightly below the Basin Plan objective, and would not affect aquatic biota. Under PG&E's Proposed Project, minimum flows in the Rock Creek below Rock Creek Reservoir will be set, and DO levels are not expected to decrease with the Proposed Project's minimum flows. For the reasons stated above, these existing inconsistencies with the Basin Plan's DO objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

<u>Tastes and Odors</u>
Iron concentrations of 0.464 mg/L and 0.437 mg/L (spring and summer 2008 respectively) were observed and are greater than secondary MCL levels of 0.3 mg/L, which can affect taste and odor. PG&E does not make any releases that contain iron to surface waters, and is unaware of any complaints regarding taste or odor in these streams. Therefore, the existing inconsistencies with the Basin Plan's Tastes and Odors objective are considered less than significant, and would not adversely affect designated beneficial uses. Under PG&E's Proposed Project, minimum flows in Rock Creek below Rock Creek Reservoir will be set, and iron levels are not expected to increase with the Proposed Project's minimum flows. Hence, these existing inconsistencies with the Basin Plan's iron objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Wise Powerhouse Overflow Reach (Auburn Ravine watershed)

During the Water Quality study (NID and PG&E 2010a), Licensees found one parameter that did not meet the Basin Plan Objective or established benchmark in Auburn Ravine, turbidity.

In fall 2008, Wise Powerhouse Overflow Reach in Auburn Ravine had a turbidity value of 11.1 NTU, which could be construed to be an inconsistency with the Basin Plan. The sources of this turbidity may have been due to a combination of turbidity within Rollins Reservoir and turbidity created by increased flow rates in upstream Project canals following a maintenance outage. Due to the soil types that exist in these lower watersheds, relatively high turbidity values are common during rainfall events. Turbidity levels of 20-30 NTU are known to not adversely affect rainbow and brown trout, which are the primary game fish below the powerhouse. Researchers have found at high turbidity levels (40 - 70 NTU) that feeding success for trout is not reduced, but that their diet shifts to larger prey (White and Harvey 2007; Arndt et al. 2002). Therefore, turbidity levels in Auburn Ravine below Wise and Wise No. 2 Powerhouse are unlikely to affect trout.

Because PG&E does not propose any changes in operations (as compared to the No-Action Alternative) the existing turbidity conditions may occur with the Proposed Project, but the Proposed Project is not expected to cause turbidity to increase above under existing conditions. For the reasons stated above, these existing inconsistencies with the Basin Plan's turbidity objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Mormon Ravine Reach (Mormon Ravine watershed)

During the Water Quality and Water Temperature Monitoring studies (NID and PG&E 2010a and 2010b), Licensees found three parameters that did not meet the Basin Plan Objective or established benchmark in Mormon Ravine; toxicity, turbidity, and tastes and odors (iron).

<u>Toxicity</u>
Licensee found aluminum concentrations above the aquatic benchmark of 0.087 mg/L in Mormon Ravine (0.14 mg/L, 0.302 mg/L) in spring and fall 2008. First, PG&E does not release any materials that contain aluminum, and is unaware of any other party that releases materials

with aluminum to surface waters. Therefore, the source of aluminum is likely a result of natural conditions (e.g., aluminum minerals in the geology of the watershed). Second, PG&E is unaware of any reports that would indicate toxicity in aquatic life in the above stream reaches. Last, the aluminum toxicity benchmark itself is likely overly protective, as many waters with much higher aluminum concentrations support thriving aquatic life (Marshack 2008). Because PG&E does not divert water from Mormon Ravine and will only periodically utilize the reach to make spill releases from the Newcastle Powerhouse Header Box, an increase in toxicity with the Proposed Project is not expected. If the condition occurs with the Proposed Project, for the reasons stated above, this inconsistency with the Basin Plan's Toxicity objective is considered less than significant. Designated beneficial uses would not be adversely affected.

Turbidity

In spring 2008, Mormon Ravine Reach had a turbidity of 23.6 NTU. In summer 2008, Mormon Ravine Reach had a turbidity value of 0.5 NTU.

Due to the soil types that exist in these lower watersheds, increased turbidity is common following rainfall events. Water treatment plant raw water data (2001–2005) suggests that water between Lake Spaulding and Rollins Reservoir remained below 10 NTUs year-round, while Rollins Reservoir's turbidity increased after rain events, affecting downstream turbidities throughout winter and spring (Starr & Palencia 2007). Therefore, Project operations are not likely to be the primary source of the inconsistencies with the Basin Plan turbidity objective.

For the reasons stated above, these existing inconsistencies with the Basin Plan's turbidity objective, should they occur with the Proposed Project, are considered less than significant, and designated beneficial uses would not be adversely affected.

Tastes and Odors

Iron concentrations of 0.327 mg/L (spring 2008) were observed in Mormon Ravine and are greater than secondary MCL levels of 0.3 mg/L, which can affect taste and odor. PG&E does not propose any changes to existing Project operations that would increase iron concentrations in this stream. Further, PG&E does not make any releases that contain iron to surface waters, and is unaware of any complaints regarding taste or odor in these streams. Therefore, the existing inconsistencies with the Basin Plan's Tastes and Odors objective, should they occur under the Proposed Project, would be considered less than significant, and would not adversely affect designated beneficial uses.

Potential Effects of the Proposed Project on Water Quality

Minimum Instream Flow Changes

PG&E proposes to increase minimum instream flows in 10 stream reaches affected by the Project (Measure DS-AQR1 in Appendix E7). The minimum instream flows were developed to provide enhancement for aquatic resources. The reaches affected are:

- Lower Lindsey Lake Dam Reach (Lindsey Creek)
- Blue Lake Dam Reach (Rucker Creek)
- Rucker Lake Dam Reach (Rucker Creek)
- Meadow Lake Dam Reach (unnamed tributary to Fordyce Lake)
- Fordyce Lake Dam Reach (Fordyce Creek)
- South Yuba below Spaulding Dam Reach (South Yuba River)
- Lake Valley Reservoir Dam Reach (NF of NF American River)
- Kelly Lake Dam Reach (Sixmile Creek)
- Halsey Afterbay Dam Reach (Dry Creek)
- Rock Creek Dam Reach (Rock Creek)

Water quality under the Proposed increased flows would either remain the same or improve for all constituents, including DO. Relatively low DO readings at the bottom of oligotrophic reservoirs in the Sierra Nevada is a common occurrence and PG&E is unaware of any reports of stress to aquatic life in the Project reservoirs or stream reaches below Project reservoirs due to low DO. Most fish and aquatic organisms utilize the upper portions of the reservoir, where low DO levels are typically not prevalent. In Project reservoirs, the lowest DO values found during 2008 and 2009 sampling was about 5 mg/L; all DO values in streams during stream fish population surveys were greater than 7 mg/L. Additionally, PG&E is unaware of any DO-related problems in the Project reservoirs or in streams below the reservoirs that affect designated beneficial uses.

At other locations where Licensee does not propose changes in minimum streamflows, cold water and the type of release valves provide aerated water in the streams. Because PG&E does not propose any changes in reservoir operations at these locations (as compared to the No-Action Alternative), designated beneficial uses would not be adversely affected by the Proposed Project.

6.2.2.2.3 Effects on Water Temperature

As described above, under existing conditions, water temperature in Drum-Spaulding Project reservoirs and in surface waters downstream of Project facilities meets the Basin Plan water temperature objective except in a few areas. PG&E's proposed minimum flow regime and reservoir operations restrictions are not likely to result in warmer water, thereby causing areas that currently meet the Basin Plan objective to not meet the objective. Therefore, the analysis below focuses on areas where the Basin Plan's water temperature objective is not currently met.

In order to perform a quantitative assessment of the effects of Licensee's Proposed Project (and additional Project operations proposals) on water temperature, Licensees developed reservoir and stream water temperature models in the following reservoirs and Project-affected reaches (modeling platform utilized is listed in parentheses):

South Yuba River

- Lake Spaulding (CE-QUAL-W2)
- South Yuba below Spaulding Dam Reach (HFAM)

- South Yuba below Spaulding No. 2 Powerhouse Reach (HFAM)
- South Yuba River reaches #1 through #6[10] (HFAM)

Bear River

- Drum Afterbay Dam Reach (SSTEMP)

See Licensees' Water Temperature Modeling Technical Memorandum (2-3) for a description of the various modeling platforms used in the development of the water temperature models referenced above.

Rucker Creek below Blue Lake and Rucker Creek below Rucker Lake (Blue Lake Dam Reach and Rucker Lake Dam Reach)

Under existing conditions, mean daily water temperatures in Rucker Creek below Blue and Rucker lakes exceed 20.0°C (Table 6.2.2-1). It should be noted that the natural drainage of Rucker Creek at Blue Lake Dam is small (0.24 sq mi) and that the Drum-Spaulding Project does not divert any water from either the Blue Lake Dam Reach or the Rucker Lake Dam Reach. It is likely that Rucker Creek would be ephemeral in its natural condition between Blue and Rucker lakes.

PG&E proposes to increase target flows in Rucker Creek below Blue Lake and Rucker Lake dams from 0.5 cfs to 0.75 cfs, which has the potential to reduce summer water temperatures in these reaches. In each reach, operations under the Proposed Project would not lead to increased temperatures in these reaches. Even if the condition continues under the Proposed Project, this inconsistency with the Basin Plan's temperature objectives is considered less than significant, and designated beneficial uses would not be adversely affected.

South Yuba River above Lake Spaulding (Upper South Yuba Reach No. 2)

Under existing conditions, mean daily water temperatures in the South Yuba River above Lake Spaulding exceed 20.0°C, with a maximum daily temperature of 22.3°C in July 2009 (Table 6.2.2-1).

PG&E proposes to maintain the existing streamflow requirement of 5 cfs as measured at the Cisco Grove gage on the Upper South Yuba River. PG&E does not divert, and only augments, flows in the Upper South Yuba River during the summer months. Flows are augmented through releases from Kidd, Upper and Lower Peak lakes, located on tributaries to the Upper South Yuba River. As such, PG&E's operations reduce water temperatures in the Upper South Yuba River as compared to the unimpaired condition. Even if the condition continues under the Proposed Project, this inconsistency with the Basin Plan's temperature objectives is considered less than significant, and designated beneficial uses would not be adversely affected.

[10] South Yuba River Reaches #4 through #6 are addressed in Section 6.2.3.2 below (Cumulative Effects).

South Yuba River Reach No. 3

Under existing conditions, mean daily water temperatures in the South Yuba River between Lake Spaulding and the confluence with Canyon Creek exceeded 20°C the summer months of 2008 and 2009, with a maximum daily temperature of 23.8°C in July 2009 (Table 6.2.2-3).

Table 6.2.2-3. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in the South Yuba River from PG&E's Lake Spaulding Dam to the confluence with Canyon Creek.

Location	River Mile	Total Number of Days Sampled	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Daily Maximum above 25°C (Max value, °C)
SYR Above Jordan Creek	40.3	280	0	0
SYR above Canyon Creek confluence	32.5	348	128 (23.8)	6 (25.6)

Figure 6.2.2-18 presents results of water temperature model runs under a range of flow release conditions from Spaulding Dam into the South Yuba River. PG&E proposes to increase minimum flow releases from Lake Spaulding Dam into the South Yuba River from 5 cfs to 5-16 cfs, depending on water year type. This is predicted to provide an additional mile of river reach in the South Yuba River with average daily temperatures below 20°C during the summer months of Above Normal and Wet water years, extending to approximately River Mile 34.0.

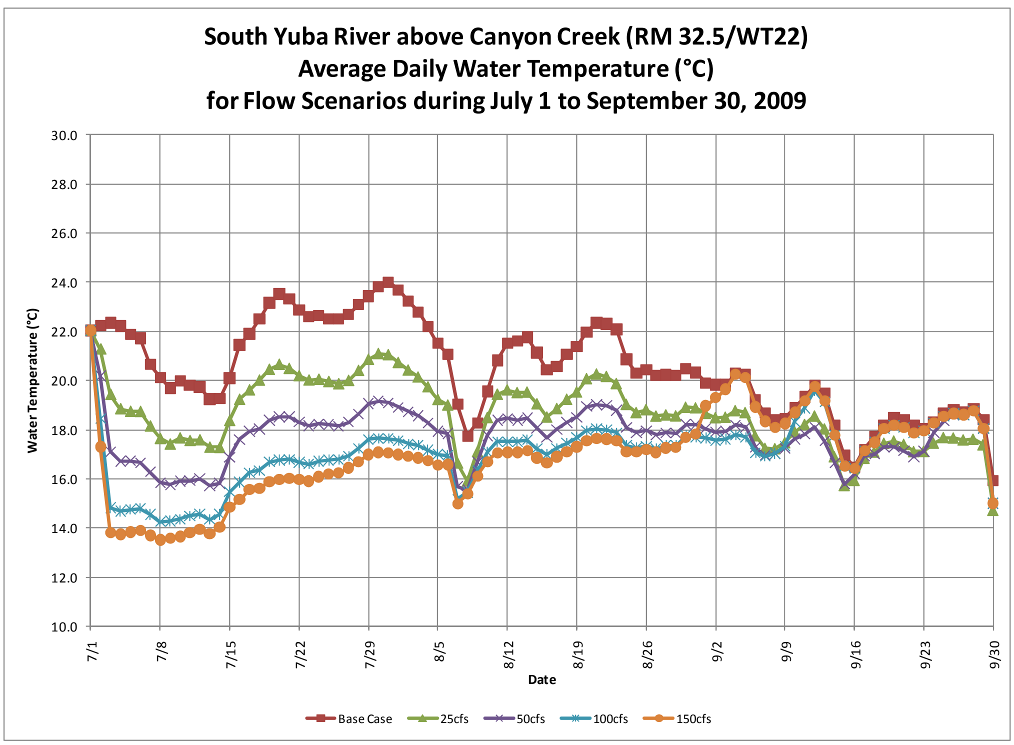


Figure 6.2.2-18. Modeled water temperatures in the South Yuba River above Canyon Creek based on 2008 hydrological and 2009 meteorological conditions.

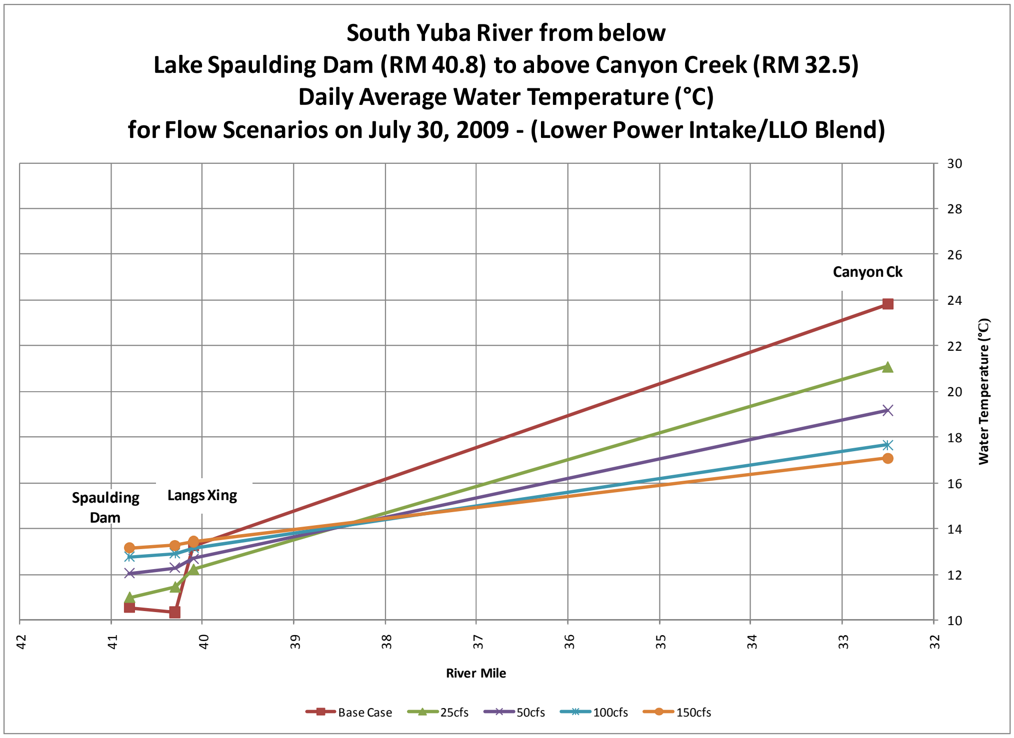


Figure 6.2.2-19. Modeled water temperatures in the South Yuba River between Spaulding Dam and the confluence with Canyon Creek based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

Lake Valley Reservoir

Surface water temperatures in PG&E's Lake Valley Reservoir exceeded 20.0°C in August 2008 and 2009 to a depth of 25-35 feet. However, these exceedance were relatively slight (maximum surface temperature of 21.5°C in August 2008), and water temperatures in the North Fork of the North Fork American River immediately below Lake Valley Reservoir Dam never exceeded 20.0°C during the two years of temperature monitoring.

PG&E does not propose to modify existing operations of Lake Valley Reservoir. Therefore, operations under the Proposed Project would not lead to increased temperatures in this reservoir. Even if the condition continues under the Proposed Project, this inconsistency with the Basin Plan's temperature objectives is considered less than significant, and designated beneficial uses would not be adversely affected.

North Fork of the North Fork American River below Lake Valley Reservoir (Lake Valley Reservoir Dam Reach)

Under existing conditions, mean daily water temperatures in the North Fork of the North Fork American River below Lake Valley Reservoir exceeded 20.0°C, with a maximum mean daily temperature of 20.1°C in August 2009 (Table 6.2.2-4).

PG&E proposes to increase the minimum streamflow requirement in the North Fork of the North Fork American River below Lake Valley Reservoir Dam from 1 cfs to 3 cfs during the months of June through September, which may have the effect of reducing water temperatures in this reach as compared to the existing condition. Even if the condition continues under the Proposed Project, this inconsistency with the Basin Plan's temperature objectives is considered to be less than significant, and designated beneficial uses would not be adversely affected.

Lake Spaulding

Under existing conditions, summer water temperatures in Lake Spaulding range from 7°C - 21°C, with a weak thermocline due to the magnitude of inflows and outflows through the reservoir. Surface temperatures drop below 20°C in September.

Under the Licensees' Proposed Projects, modified inflows into Lake Spaulding and minimum instream flows below Spaulding Dam are not anticipated to significantly affect either seasonal storage or seasonal thermal stratification in Lake Spaulding, as compared to the No-Action Alternative. See Table 6.2.2-4 below for modeled results of thermal conditions in Lake Spaulding under these two operating scenarios.

Table 6.2.2-4. Estimated usable storage in Lake Spaulding at the 10°C and 15°C isotherms, based on Operations Model and CE-QUAL-W2 temperature model results under 2008 and 2009 meteorology.

Operations Scenario	Estimated Usable Storage below 15°C Isotherm (ac-ft)				Estimated Usable Storage below 10°C Isotherm (ac-ft)			
	2008		2009		2008		2009	
	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct	15-Jul	15-Oct
No-Action Alternative	24,175	6,821	21,370	6,610	7,960	502	6,441	502
Licensees' Proposed Projects	23,867	6,862	20,738	6,494	7,619	470	6,084	470

6.2.2.2.4 Effects on Mercury Bioaccumulation in Fish

Fish with mercury concentrations that exceed OEHHA's ATL of 0.07 ppm methylmercury wet-weight have been found in three Drum-Spaulding Project reservoirs: Fordyce Lake, Lake Spaulding and Fuller Lake (NID and PG&E 2010c; May et al. 2000). Under PG&E's Proposed Project, these reservoirs will be operated as they have historically been operated.

The existing Project has no effect on the bioaccumulation of mercury in fish, nor will the Proposed Project for the reasons stated below.

First, the Project does not make any releases of mercury-containing substances to the reservoirs, and will not do so in the future.

Second, mercury is found throughout California and its sources include natural mineral deposits, historic mine tailings, aerial deposition originally from remote industrial sources and local forest fires that release mercury sequestered in terrestrial biomass (CDWR 2007, Davis et al 2009). In fact, in two recent northern California and State-wide lake and reservoir surveys, mercury was detected in fish tissue above the OEHHA ATL of 0.07 ppm wet-weight in 88 percent of the 172 California lakes sampled, including high elevation lakes in pristine surroundings (DWR 2007, Davis et al 2009).

Third, the Project is located in one of the major historic gold mining districts of northern California, where reactive mercury was used in the gold extraction process (Alpers and Hunerlach 2000). Mercury has also been found in the tissue of fish from both upstream and downstream of Project facilities (May et al. 2000; Hunerlach et al. 1999), and in concentrations greater than 0.07 ppm methylmercury wet-weight in reservoirs and stream reach reference sites identified by the USGS as above the influence of historic mining operations (May et al. 2000).

Last, based on research at Davis Creek Reservoir in the Berryessa/Clear Lake historic mercury mining district west of the Project in the Coastal Range, one could presume that seasonally anoxic bottom waters for a reservoir could provide an annual pulse of methylmercury to the reservoir food chain (Jones and Slotton 1996). However, as described above, Fordyce Lake, Lake Spaulding and Fuller Lake do not experience anoxic conditions (NID and PG&E 2010b).

See Sections 6.2.2.1.3 and 6.2.2.2.3 above for a description of predicted reservoir and stream water temperature impacts under the Licensees' Proposed Projects.

6.2.3 Cumulative Effects

Water resources in the Yuba River and Bear River basins have been affected by water and land management practices since the mid 1850s. In fact, many of the Projects' facilities and the roads used to construct these facilities trace their origins to this period. The first inter-basin diversion of Bear River water began in 1851 via the Bear River Canal that diverted water for water supply and milling operations. The Upper Boardman and South Yuba canals began diverting water in 1852-53. French and Jackson dams were constructed by gold miners in 1859, and Bowman and Faucherie dams were constructed in 1872 to support hydraulic mining. Spaulding Dam was constructed in 1892 and enlarged to its present size in 1913. In 1905, the federal government created the TNF to manage timber harvesting and other resources, which led to the construction of numerous roads in the basins for timbering, which in turn attracted recreationists to the area. Private companies, such as Sierra Pacific Industries, cleared trees from slopes and built roads to meet the increasing demand for timber supplies in the early and mid 1900s. The California Debris Commission constructed Daguerre Point Dam near Marysville in 1910 to capture sediment, much of it laden with mercury from mining, washing down from the upper river. This effectively blocked anadromous fish from entering the upper Yuba River except for a brief period from 1924 to 1928 when fish ladders operated at the dam. In 1926, Milton Diversion Dam, Milton-Bowman and Bowman-Spaulding conduits were constructed to divert water from the Middle Yuba River to the Bear River and Deer Creek to support developing communities in Nevada and Placer County. In 1941, the Debris Commission constructed a second dam, Englebright, in the lower Yuba River to capture mercury-laden sediment.

These past activities had profound effects on water quantity and quality in the Yuba and Bear rivers long before the Yuba-Bear Hydroelectric Project received its power licenses and began generating electricity in 1965.

More recently, as California's population increases and spreads into the Sierra Nevada foothills, including the expansion of the Sacramento metropolitan area, the importance of Yuba and Bear rivers for water supply and to support recreation has substantially increased. Water delivery systems have expanded as have reservoir and stream recreation uses. Water at the tap for drinking and water to irrigate crops, which was a novelty in the late 1800s and early to mid 1900s, is now critical for the continued viability and expansion of the local foothill communities.

6.2.3.1 Cumulative Effects to Water Quantity

With regard to water quantity, Licensees' and historical studies have shown that flows in the Middle Yuba River, Canyon Creek, South Yuba River, Bear River and many of their tributaries have experienced re-regulation and diversion of flows since the late 19th century. Of particular significance is the history of water diversion from the Middle and South Yuba River basins into the Bear River Basin; these diversions were originally constructed to provide additional flows for hydraulic mining, and their use was transformed into agricultural and domestic purposes from the late 19th century into the early 20th century.

The largest lasting change in the Yuba and Bear river basins related to water quantity is the large amount of hydraulic mining debris that remains in many of the stream reaches. This debris has the potential to retain and release streamflow during wetter and drier periods of the year, respectively, and also can be carried into projects' reservoirs during high runoff events. These pulses of debris have resulted in a significant reduction in storage capacity at several of the projects' reservoirs (e.g., Dutch Flat Afterbay and Rollins Reservoir).

Under Licensees' Proposed Projects, diversions out of the Middle Yuba River, Canyon Creek and the South Yuba River by NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project will be reduced, due primarily to increased minimum instream flows below NID's Milton Diversion Dam, NID's Bowman-Spaulding Conduit Diversion Dam, and PG&E's Spaulding Dam. This would primarily have the effect of reducing diversions into the Bear River, affecting hydropower generation and other beneficial uses of the flows in each of the Project-affected reaches of the river.

Increased Water Deliveries

To assess the cumulative effects of Licensees' Proposed Projects and projected water deliveries on water resources, Licensees modeled their Proposed Projects with Projected Future (2062) Water Deliveries and compared the model results to the results of the Licensees' Proposed Projects, which assumed existing water deliveries. A summary of the model scenarios is provided in Exhibit E, Section 3.

Comparing the two model results, Licensees found that in 2062, the elevation of major Project reservoirs (e.g., Jackson Meadows and Rollins reservoirs) in summer would be much lower (in the case of Rollins Reservoir, between 20 and 60 feet lower) than they are today, and that the reduction is attributable to deliveries to meet NID and PCWA's increased water supply projections. Reduced reservoir elevations due to increased water supply delivery could affect reservoir and stream temperatures. Licensees' proposed minimum flow and reservoir pool requirements have a minor effect when compared to the effect of Projected Future (2062) Water Deliveries.

See Tables 6.2.3-2 through 6.2.3-6 for predicted impacts on the five largest reservoirs (by usable storage capacity) based on the Licensees' Proposed Projects with Projected Future (2062) Water Deliveries.

Table 6.2.3-2. Summary of predicted reservoir elevation impacts, by water year type, of Licensees' Proposed Projects coupled with Projected (2062) Future Water Deliveries at Jackson Meadows Reservoir.

Jackson Meadows Reservoir											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Critically Dry	-7.0	-7.9	-8.9	-11.0	-12.6	-12.0	-11.0	-8.6	-5.6	-3.0	-2.1
Dry	-8.1	-7.6	-10.0	-11.5	-13.8	-15.9	-18.4	-19.3	-21.0	-19.5	-14.0
Below Normal	-6.1	-3.8	-0.8	-1.2	-2.9	-4.4	-6.1	-6.3	-6.5	-6.8	-7.1
Above Normal	0.0	0.0	0.0	-0.5	-1.6	-3.1	-4.7	-4.8	-5.0	-5.1	-5.3
Wet	0.0	-0.1	0.0	0.0	-0.5	-1.4	-2.9	-3.0	-3.1	-3.1	-2.7

Table 6.2.3-3. Summary of predicted reservoir elevation impacts, by water year type, of Licensees' Proposed Projects coupled with Projected (2062) Future Water Deliveries at Bowman Lake.

Bowman Lake											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Critically Dry	-2.1	-1.9	-3.5	-3.3	-2.2	-3.4	-5.7	-8.8	-15.9	-39.4	-28.3
Dry	1.4	3.1	0.4	-1.6	0.4	2.2	4.1	3.9	2.2	-2.0	-8.1
Below Normal	0.1	0.1	-0.3	-0.2	0.0	0.9	2.4	1.8	1.0	0.4	0.0
Above Normal	-4.6	-2.7	-0.1	0.0	0.1	0.7	1.4	0.6	-0.5	-0.9	-2.8
Wet	-2.5	-0.2	0.0	-0.1	0.0	0.8	1.3	0.3	-0.8	-1.3	-2.3

Table 6.2.3-4. Summary of predicted reservoir elevation impacts, by water year type, of Licensees' Proposed Projects coupled with Projected (2062) Future Water Deliveries at Fordyce Lake.

Fordyce Lake[1]											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Critically Dry	-4.6	-5.1	-6.3	-8.7	-11.7	-14.4	-10.3	-11.3	-13.9	-16.9	-17.8
Dry	-1.5	-2.1	-0.6	-2.7	-4.9	-2.1	0.0	0.1	0.5	0.6	-0.8
Below Normal	-0.9	-0.8	-0.3	0.0	-1.7	0.0	0.0	0.2	0.4	0.5	-1.4

Table 6.2.3-4. (continued)

Fordyce Lake[1]											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Above Normal	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	-0.5	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.3	-0.4	0.0

[1] In fall of 1977 under Licensees' Proposed Projects with Projected Future (2062) Water Deliveries, Fordyce Lake modeled reservoir storage falls below PG&E's proposed minimum pool.

Table 6.2.3-5. Summary of predicted reservoir elevation impacts, by water year type, of Licensees' Proposed Projects coupled with Projected (2062) Future Water Deliveries at Lake Spaulding.

Lake Spaulding											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Critically Dry	0.2	1.0	5.3	10.3	7.3	7.7	-2.7	-2.7	-2.2	-2.2	-4.4
Dry	0.1	0.6	0.4	4.4	7.8	4.7	2.1	2.6	2.9	2.5	3.1
Below Normal	-3.3	0.0	0.0	-0.1	1.9	0.0	0.3	0.6	0.6	0.6	0.9
Above Normal	-2.5	-2.5	0.0	0.0	0.2	0.0	-0.7	-1.5	-2.6	-3.1	-3.9
Wet	0.0	0.0	0.0	0.0	0.0	0.1	-0.7	-1.3	-0.6	-0.6	-3.0

Table 6.2.3-6. Summary of predicted reservoir elevation impacts, by water year type, of Licensees' Proposed Projects coupled with Projected (2062) Future Water Deliveries at Rollins Reservoir.

Rollins Reservoir											
Licensees' Proposed Projects w/ 2062 Water Supply (Operations Model Scenario Name: L030311-P) Reservoir Elevation Differences (as compared to No-Action Alternative)											
Median Reservoir Level by Date and Water Year Type (ft)											
Water Year Type	**1-May**	**15-May**	**1-Jun**	**15-Jun**	**1-Jul**	**15-Jul**	**1-Aug**	**15-Aug**	**1-Sep**	**15-Sep**	**30-Sep**
Critically Dry	-6.2	-4.4	-4.0	-9.7	-15.9	-23.4	-40.8	-51.4	-56.2	-66.1	-45.7
Dry	0.0	0.0	-0.2	-3.9	-9.6	-14.9	-22.5	-29.4	-37.9	-47.7	-85.3
Below Normal	0.0	0.0	0.0	-0.3	-4.8	-9.6	-16.3	-22.2	-30.6	-35.3	-64.2
Above Normal	0.0	0.0	0.0	0.0	-0.7	-0.9	-0.6	-0.9	-2.5	-1.8	-11.1
Wet	-0.1	0.0	0.0	0.0	0.0	-0.6	-0.1	-0.3	-4.2	-6.7	-16.4

South Yuba River below Canyon Creek (South Yuba Reaches No. 4 through No. 6)

NID and PG&E each divert and re-regulate flows into and out of the South Yuba River and therefore both projects affect the South Yuba River below Canyon Creek due to their respective upstream facilities; these diversions are primarily made in the winter and spring months, with minimal to no net diversions in the summer months. See Exhibit E, Section 6.5 for more details on out-of-basin transfers. See Exhibit E, Appendix E11 for a comparison of synthesized unimpaired and estimated historical regulated hydrology in the South Yuba River below Canyon Creek.

Bear River below Bear River Canal Diversion Dam (Bear River Canal Diversion Dam Reach)

NID re-regulates flows into, and PG&E diverts flows into and out of the Bear River at Bear River Canal Diversion Dam via their respective upstream facilities. PG&E imports water from both projects into the Bear River watershed via Drum Canal, and diverts water from the watershed via Bear River Canal. NID regulates the hydrology in the reach below through water imported from Canyon Creek and the Middle Yuba River and storage in Rollins Reservoir primarily for consumptive water deliveries at Lake Combie. See Exhibit E, Appendix E11 for a comparison of synthesized unimpaired and observed historical regulated hydrology in the Bear River below Bear River Canal Diversion Dam.

6.2.3.2 Cumulative Effects to Water Quality

With regards to water quality, Licensees' and historical studies have shown that, with the exception of mercury, general water quality in the Yuba, Bear and North Fork American river basins is good and meets Basin Plan standards for the majority of constituents in the majority of locations. The presence of mercury, a legacy from the long history of gold mining, has led to concerns regarding mercury concentrations in edible fish (see Section 6.2.2.1.4 and Section 6.2.2.2.4 above). However, these concerns occur throughout the basins as they do in most California streams where gold mining occurred, and the potential to bioaccumulate mercury in fish is not exacerbated by the projects. OEHHA, the California agency responsible for advising the public of health concerns, and have issued fish ingestion advisories in the basins (see Section 6.2.1.2.5 above).

The projects, in combination with past activities, also affect water temperature. Impoundment of water, which has occurred in the basins since the mid 1800s, generally results in higher late spring through early fall temperatures in the surface of the impoundments than would occur in the same reach if the stream was free-flowing. However, as Licensees' studies demonstrate, except for Rollins Reservoir, Project reservoirs today are cold enough to support coldwater fisheries dominated by trout. Rollins Reservoir has a stocked cold water fishery, and also supports a popular warmwater fishery.

South Yuba River below Canyon Creek (South Yuba Reaches No. 4 through No. 6)

From June through September in 2008 and 2009, about 30 miles of the South Yuba River from below Canyon Creek to the USACE's Englebright Reservoir had mean daily water temperatures that exceeded 20.0°C based on Licensees' Water Temperature Monitoring Study (Table 6.2.3-7). Licensees maintained five thermographs in the South Yuba River from immediately upstream of Canyon Creek to the USACE's Englebright Reservoir Dam. Licensees also maintained thermographs in four tributaries to South Yuba River: Canyon Creek, Poorman Creek, Rock Creek and Shady Creek. Table 6.2.3-7 provides for each of the thermographs the total number of days sampled, the number of days the mean daily temperature exceeded 20°C, and the number of days the instantaneous water temperature exceeded 25°C. Mean daily water temperatures at the thermograph maintained by Licensees upstream of this location (i.e., at Jordan Creek) did not exceed 20.0°C.

Table 6.2.3-7. Summary of number of days mean daily water temperatures exceeded 20°C and instantaneous water temperature exceeded 25°C in the South Yuba River from below Canyon Creek to the USACE's Englebright Reservoir.

Location	River Mile	Total Number of Days Sampled	Number of Days with Daily Mean above 20°C (Max value, °C)	Number of Days with Daily Maximum above 25°C (Max value, °C)
SYR above Poorman Creek confluence	28.1	316	150 (24.8)	35 (27.15)
Poorman Creek above SYR confluence[1]	28.0	334	21 (20.79)	0
SYR above Humbug Creek confluence	19.6	297	164 (25.46)	35 (26.92)
Rock Creek above SYR confluence[1]	10.1	323	25 (21.31)	0
SYR above Rush Creek confluence	6.2	334	186 (25.82)	52 (27.25)
Shady Creek above SYR confluence[1]	5.0	296	186 (24.9)	126 (35.3)
SYR above Englebright Reservoir	0.1	305	189 (26.5)	107 (29.6)

[1] Water temperature station located outside of the effect of the two projects.

Figures 6.2.2-20 and 6.2.2-21 below present results of water temperature model runs under a range of flow release conditions from Spaulding and Bowman-Spaulding Conduit Diversion dams into the South Yuba River and Canyon Creek, respectively.

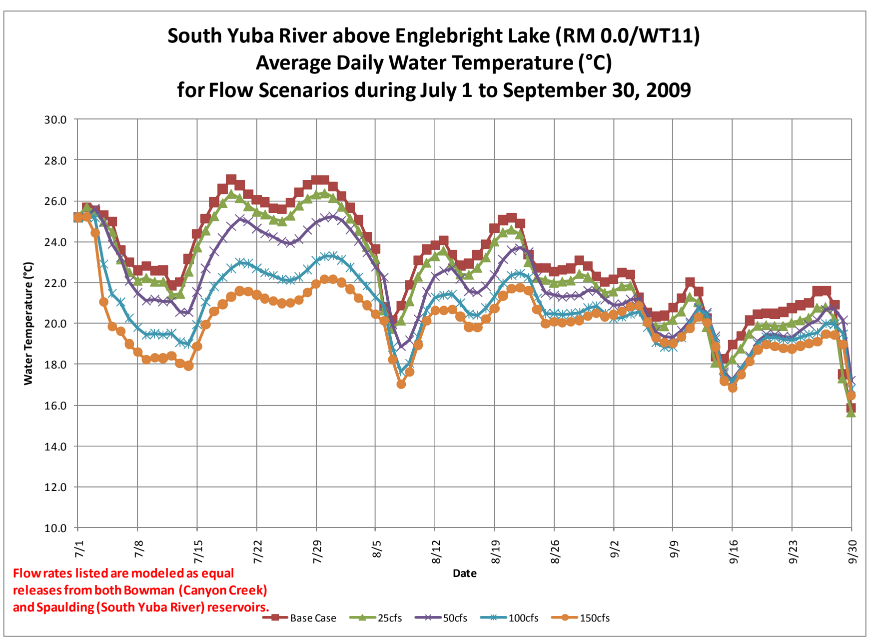


Figure 6.2.2-20. Modeled water temperatures in the South Yuba River above Englebright Reservoir (South Yuba River reaches #4 through #6) based on 2008 hydrological and 2009 meteorological conditions.

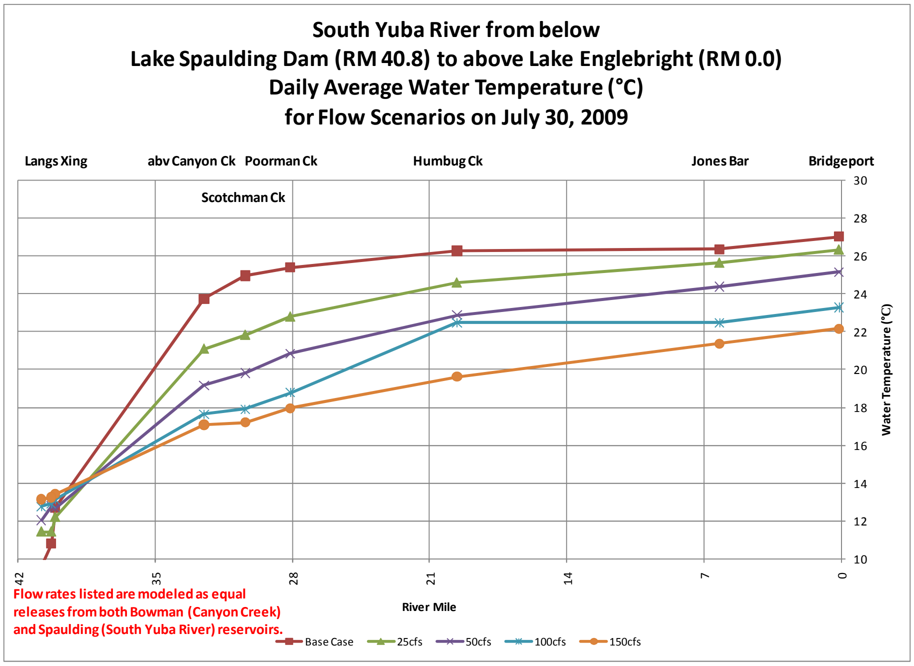


Figure 6.2.2-21. Modeled water temperatures in the entire Project-affected reach of the South Yuba River based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

PG&E and NID propose to increase minimum flows in the South Yuba River below Lake Spaulding and Canyon Creek below Bowman-Spaulding Conduit, respectively, which will result in increased minimum streamflows in the South Yuba River below Canyon Creek from 8 cfs under existing conditions (3 cfs minimum flow from NID's Bowman-Spaulding Diversion Dam into Canyon Creek, and 5 cfs minimum flow from PG&E's Spaulding Dam into the South Yuba River) to between 8 and 21 cfs[11], depending on water year type. PG&E has proposed a minimum instream flow below Spaulding Dam during the summer months of Dry water years of 8 cfs, Below Normal water years of 12 cfs, and Above Normal and Wet water years of 16 cfs. This is predicted to provide an additional mile of river reach in the South Yuba River with average daily temperatures below 20°C during the summer months of Above Normal and Wet water years, extending to approximately River Mile 34.0.

Auburn Ravine below Wise Powerhouses

With respect to the effects on water resources of the Drum-Spaulding Project in combination with other entities and past, present and reasonably foreseeable future actions in Auburn Ravine, refer to Section 6.5 of this Exhibit E.

[11] These minimum flows do not include minimum flows from Project-affected tributaries of Canyon Creek and the South Yuba River, which would contribute an additional 1-3 cfs to the flows of the South Yuba River below Canyon Creek.

6.2.4 Proposed Measures

6.2.4.1 Yuba-Bear Hydroelectric Project

6.2.4.1.1 NID's Proposed Measures

NID has included in its Proposed Project the measures listed below that pertain to water resources. While not all of the measures are discussed in detail in this Section, each one is related to NID's overall approach to protecting and enhancing water quality.

- Proposed Measure YB-GEN1: Annual Consultation with Forest Service and BLM
- Proposed Measure YB-GEN2: Annual Employee Training
- Proposed Measure YB-GEN4: Consultation Regarding New Ground Disturbing Activities
- Proposed Measure YB-GEN5: Consultation Regarding New Facilities on Federal Land
- Proposed Measure YB-GEN6: Development and Implementation of Coordinated Operations Plan for Yuba-Bear Hydroelectric Project and Drum-Spaulding Project
- Proposed Measure YB-G&S1: Development and Implementation of Rollins Upgrade Construction Erosion Control and Restoration Plans
- Proposed Measure YB-G&S2: Development and Implementation of Recreation Facilities Construction Erosion Control and Restoration Plans
- Proposed Measure YB-G&S3: Implement Trap Creek Stabilization Plan
- Proposed Measure YB-WR1: Development and Implementation of Rollins Upgrade Construction Hazardous Materials Spill Prevention, Control and Countermeasure Plan
- Proposed Measure YB-WR2: Development and Implementation of Recreation Facilities Construction Hazardous Materials Spill Prevention, Control and Countermeasure Plan
- Proposed Measure YB-AQR1: Streamflows
- Proposed Measure YB-AQR3: Jackson Meadows Reservoir Minimum Pool
- Proposed Measure YB-AQR4: Milton Diversion Impoundment Normal Pool
- Proposed Measure YB-AQR5: Rollins Reservoir Minimum Pool
- Proposed Measure YB-AQR6: Faucherie Lake Minimum Pool
- Proposed Measure YB-TR3: Pesticide and Herbicide Use Restrictions on Federal Land
- Proposed Measure YB-LU1: Implement Transportation Management Plan
- Proposed Measure YB-LU2: Implement Fire Prevention and Response Plan on Federal Land

Refer to Appendix E3 for the full text of each measure.

6.2.4.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Provide Increased Streamflows[12]

FWN recommended in its letter a general minimum instream flow schedule that included water temperature targets in the Middle Yuba River, South Yuba River and Canyon Creek and shaping the descending limb of the spring hydrograph.

In general, FWN recommended:

> At a minimum, the PG&E and NID FLA's should include a proposed flow regime using some combination of Fall, Rucker, Trap, Clear, and Canyon Creeks to convey cold water to the South Yuba River below Spaulding Reservoir. (p. 26)
>
> The NID FLA should include higher minimum flows [in Canyon Creek below Bowman Dam and Bowman-Spaulding Diversion Dam] than those proposed in the DLA. (p. 51)
>
> The NID FLA should include higher instream flows for the Middle Yuba River below Milton Diversion Dam than those proposed in the DLA. (p. 52)
>
> The NID FLA should increase minimum instream flows to increase wetted perimeter in Upper Milton Diversion reach in order to enhance Macroinvertebrates. (p. 53)
>
> Higher instream flows also inundate riparian vegetation and reduce riparian encroachment to enhance FYLF breeding sites on open cobble bars. (p. 53)
>
> The PG&E [*sic*] FLA should include higher minimum instream flows [in the Dutch Flat Afterbay Dam Reach] than those proposed in the DLA. (p. 58)
>
> NID's FLA should include higher minimum instream flows [in the Chicago Park Powerhouse Reach] than proposed in the DLA in order to enhance rainbow trout life stages. (p. 59)
>
> The NID FLA should include minimum instream flows for the Bear River below Rollins that are higher than those proposed in its DLA. (p. 59)

[12] NID discusses FWN's streamflow proposal at three locations in Section 6 of Exhibit E. In this Water Resources section, NID discusses FWN's proposal as it pertains to water quantity and water temperature. NID discusses FWN's streamflow proposal as the proposal relates to aquatic and recreation resources in Sections 6.3.4.1 and 6.6.3.1, respectively.

With respect to water temperature, FWN proposed:

> The FLA's should include a flow regime that converts the Bear River below the Bear River Diversion Canal from a warm-water fishery to the Basin Plan mandated cold-water fishery. (p. 26)
>
> Increased minimum streamflows should meet the following temperature thresholds in Canyon Creek:

Water Year Type	Months	Temperature	Compliance Point
All water year types	July – Septem ber	19 degrees C average daily temperature	Confluence with South Yuba

(p. 51)

> The NID FLA should develop a minimum instream flow measure for the Middle Yuba River below Milton that meets the following temperature criteria:

Water Year Type	Months	Temperature	Compliance Point
Wet, AN, Below Normal, and Dry	July – September	19 degrees C average daily temperature	5 miles downstream of Wolf Creek confluence with the Middle Yuba River
Critically Dry and Extreme Critical Dry	July – September	19 degrees C average daily temperature	Wolf Creek confluence

(p. 52)

> The NID FLA should include minimum instream flows for the Bear River below Rollins that are higher than those proposed in the DLA.
>
> The minimum instream flows should meet the following temperature criteria to meet the SWRCB Basin designation of this reach as coldwater reach:

Water Year Type	Months	Temperature	Compliance Point
All Water Year Types	July – Septem ber	18 degrees C average daily temperature	To be determined

(p. 59)

For the descending limb of the spring hydrograph, FWN proposed several flows and recession rates in the Middle Yuba River, Canyon Creek and the South Yuba River. Refer to Exhibit E, Section 6.3 for full description of these proposed measures.

Subsequent to filing of its comment letter, FWN stated that it could provide a more detailed flow proposal that would incorporate the concepts in FWN's DLA comment letter and that would supersede FWN's flow proposal request in its comment letter. Licensees agreed to consider the more detailed flow proposal, which was provided to Licensees on February 23, 2011, at analyze the flow proposal in their Exhibit E. Refer to Appendix E12 for FWN's Proposed Project and Licensees' Operations Model scenario run of the proposal.

NID has not adopted FWN's Proposed Project as its Proposed Project for one main reason – the environmental benefits are not consistent with the impacts on water deliveries and power generation. See Exhibit E, Sections 3.6.2.3 and 3.6.2.4 for a discussion of consumptive water delivery and hydropower generation impacts based on FWN's Proposed Project operations, with both existing and projected future consumptive water demand.

NID considers the water delivery and power generation costs for these marginal gains in environmental benefit to be too great. As described in Section 3.6.2.3, under FWN's Flow Proposal, water deliveries are affected in almost every year in the period of record, reservoir elevations are considerably lower in many of the major Project reservoirs, and the Project's power generation is reduced by 23.2 percent.

Include Water Quality Monitoring Plan

In their joint letter, the Forest Service, BLM, NPS and CDFG recommended the following measure:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion: Stream fish populations, Foothill Yellow-legged Frog, Western Pond Turtle, Sierra Nevada Yellow-legged Frog, Benthic Macroinvertebrates, Geomorphology, Riparian, Water Temperature, Water Quality, Wildlife Escape Facilities Effectiveness, Wildlife Passage Structure Effectiveness, Invasive Species -- Terrestrial and Aquatic, Recreation: See the recreation comments for specifics, Special-Status Plants, Special-Status Wildlife (Page 51-52).

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

NID has not adopted the request because NID already routinely monitors the intake to their drinking water treatment plants, NID does not release pollutants into surface water, and NID does not propose any Project activities that would impair water quality. For these reasons, water quality monitoring over the term of the new license is not warranted.

Include Water Temperature Monitoring Plan

In their joint letter, the Forest Service, BLM, NPS and CDFG recommended the following measure:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion: Stream fish populations, Foothill Yellow-legged Frog, Western Pond Turtle, Sierra Nevada Yellow-legged Frog, Benthic Macroinvertebrates, Geomorphology, Riparian, Water Temperature, Water Quality, Wildlife Escape Facilities Effectiveness, Wildlife Passage Structure Effectiveness, Invasive Species -- Terrestrial and Aquatic, Recreation: See the recreation comments for specifics, Special-Status Plants, Special-Status Wildlife (Page 51-52).

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

Licensees have not adopted the agencies' request because NID has not proposed temperature-based minimum instream flows.

Conduct Additional Water Temperature Monitoring in 2011

In their joint letter, the Forest Service, BLM, NPS and CDFG recommended the following study proposal:

> Work with relicensing participants to develop a proposal to perform additional test flows and collect water temperature data and meteorological data for the Water Temperature Modeling Study (Page 2) Although this study plan was completed, resource agency personnel strongly recommend (see modeling discussion below) that additional test flows be conducted in 2011 to assure that the models can accurately predict changes in temperature with increased flows in the mainstem Middle Yuba River. Concurrent with additional test flows during the summer of 2011, water temperature and meteorological data should be collected. The resource agencies recommend that the licensees and Relicensing Participants collaborate during winter/spring of 2011 to develop a monitoring and testing plan before the summer of 2011 (Pages 6 and 13)

Based on calibration results for the Middle Yuba River HFAM model, NID feels that data collected from 2007-2010 have proven adequate for the purposes of water temperature modeling in the Jackson Meadows Reservoir Dam and Milton Diversion Dam reaches, including the evaluation of increased flow rates and predicted impacts on stream temperatures.

Install Streamflow Gages, Forecast Streamflows and Report Real-time Data / Forecasts

FWN had several requests relating to streamflow gages and streamflow data forecasting and reporting. These included requests relating to specific flow compliance points, timelines for gage installation, flow forecasting and real-time reporting of flows to non-Licensee data sources or websites:

> PG&E's FLA should include a condition that online gauge information will be 15-minute data. The condition should also say that both instantaneous and historical data should also be posted online. (p. 69)
>
> In the past two years information from a dozen gauges has become available. These gauges should be included in the FLA. (p. 69)
>
> The Network recommends that PG&E and NID's FLA's should schedule installation of gauges no later than the third year after license issuance. (p. 69)
>
> The Network requests that the Licensees' FLA's include a condition for weekly forecasting of flows on below Milton diversion, Bowman Reservoir, Spaulding Reservoir, Drum Afterbay, Dutch Flat Afterbay, and Rollins Reservoir to facilitate angler, boater, and trail crossing recreational use. (p. 69)
>
> The PG&E FLA should also include installation of staff gauges and flow warning signs at the sections of the Bear Valley where anglers fish to provide warning and information as to sudden and high flow fluctuations. (p. 70)

In general, Licensees have not adopted these proposals relating to gages because they believe these issues are most appropriately handled in a gaging plan developed once the magnitude, timing and location of required flows is known. Licensees believe any such gaging plan would be best developed after the new Project licenses containing flow requirements are issued.

6.2.4.2 Drum-Spaulding Project

6.2.4.2.1 <u>PG&E's Proposed Measures</u>

PG&E has included in its Proposed Project the following measures related to water resources:

- Proposed Measure DS-GEN1: Annual Consultation with Forest Service, BLM and BOR
- Proposed Measure DS-GEN3: Develop and Implement Coordinated Operations Plan for the Drum-Spaulding Project and the Yuba-Bear Hydroelectric Project
- Proposed Measure DS-AQR1: Streamflows (Part 1: Minimum and Target Streamflows; Part 2: Water Year Type; Part 3: Consecutive Dry Water Years; Part 4: Ramping Rates; Part 5: Streamflow Measurement)
- Proposed Measure DS-AQR2: Fordyce Lake Minimum Pool

Refer to Appendix E7 for the full text of each of these measures and the related rationale.

6.2.4.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measures or new study requests in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E was therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as otherwise required by the regulations. However, some commenters made requests or proposals that provided PG&E with enough information that PG&E could address at least components of the request (including whether the proposal was consistent with study results). Below PG&E has made its best effort to capture each of these proposals (and PG&E's response to each proposal) that relate to this resource area.

Provide Increased Streamflows[13]

FWN recommended, in its February 1, 2011 letter, a general minimum instream flow schedule.

FWN stated:

> The PG&E FLA should include higher minimum instream flows [in the South Yuba River below Spaulding Dam] than in the DLA. (p. 46)
>
> The PG&E FLA should include higher minimum instream flows than those proposed in the DLA. (p.58)

[13] In this Water Resources section, PG&E discusses FWN's proposal as it pertains to water quantity and water temperature. PG&E discusses FWN's streamflow proposal as it relates to aquatic and recreation resources in Sections 6.3 (Aquatic Resources) and 6.6 (Recreation Resources), respectively of this Exhibit E.

With respect to water temperature, FWN proposed:

> The FLA's should include a flow regime that converts the Bear River below the Bear River Diversion Canal from a warm-water fishery to the Basin Plan mandated cold-water fishery. (p. 26)
>
> The PG&E FLA should include minimum instream flows [in the South Yuba River below Lake Spaulding Dam] that meet the following temperature criteria:

Water Year Type	Months	Temperature	Compliance Point
Wet, AN, Below Normal, and Dry	July – September	19 degrees C average daily temperature	Humbug Creek confluence with South Yuba
Critically Dry and Extreme Critical Dry	July – September	19 degrees C average daily temperature	Poorman Creek confluence with South Yuba

(p. 47)[14]

For the descending limb of the spring hydrograph, FWN proposed several flows and recession rates in the South Yuba River. Refer to Exhibit E, Section 6.3 for full description of these proposals.

With respect to FWN's proposed water temperature criteria in the South Yuba River, Licensees utilized water temperature models developed for the reach to determine the feasibility of the proposed criteria. Extrapolating from the results shown in Figure 6.2.2-19 above, Licensees estimate that a minimum instream flow of about 175 cfs from both NID's Bowman Lake into Canyon Creek and PG&E's Lake Spaulding into the South Yuba River (resulting in a combined minimum instream flow of about 350 cfs) would be necessary to achieve the 19^{o}C temperature criteria recommended by FWN in the South Yuba River at the Humbug Creek confluence during the summer months.

PG&E has not adopted FWN's instream flow proposals (including their recommendations for specific temperature criteria). As described further in Exhibit E, Section 3 (Cumulative Effects), under FWN's Flow Proposal, consumptive water deliveries are affected in almost every year in the period of record, the major Project reservoirs are drawn down to significantly lower levels, and the Projects' power generation is reduced by approximately 20 percent. Licensees' studies did not demonstrate the need for the instream flows recommended by FWN, which would have dramatic and inconsistent consequences on a variety of resource areas (in addition to the substantial loss of hydroelectric generation).

Include Water Quality and Water Temperature Monitoring Plans

In their joint letter dated January 28, 2011, the Forest Service, BLM, NPS and CDFG recommended the following:

[14] FWN made similar comments on page 31 of its letter.

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion. [The resources agencies' list included water temperature and water quality] (Page 51-52).

The agencies have not provided sufficient detail or justification for PG&E to perform an in-depth analysis of the recommendation, or for PG&E to estimate the cost associated with implementing the recommendation (which is primarily a request to have further discussions). PG&E is not proposing to accept this request for a new monitoring plan for a variety of reasons including; NID and PCWA already routinely monitor the intakes to their drinking water treatment plants; Licensee does not release pollutants into surface water; and Licensee does not propose any Project activities that would impair water quality. In addition, the resource agencies did not explain what environmental benefits would be achieved from implementing this proposal and did point to any information that was gathered during the studies that demonstrate such a proposal is necessary. For these reasons, water quality monitoring over the term of the new license is not warranted.

Finally, Licensee is not proposing minimum instream flows based on temperature criteria, thereby eliminating need for long-term temperature monitoring in Project-affected reaches and reservoirs.

Include Infrastructure Improvements to Spaulding Dam

FWN requested three infrastructure improvements to the Spaulding dams and facilities:

> The PG&E FLA should include three infrastructure improvements and complete deferred maintenance to Spaulding Reservoir and Dam, which will enhance the South Yuba River. These are 1) Improve automatic gate control at Spaulding Dam 2) increase capacity to release higher flows when water is not on the gates, and 3) Repair leaks on the face of or through the rock at Spaulding Saddle Dams to cool water temperatures in Jordan Creek and in turn, the South Yuba River. (p. 48).

FWN did not provide PG&E with sufficient detail or justification to support their request. FWN also did not provide an economic analysis regarding their suggestion. As a result, PG&E cannot fully evaluate this recommendation, including the costs, as required for FERC. In addition, Licensee has not adopted the request to alter automatic control at the Spaulding Dam spillway because the spillway gates are already on automatic control. Some of the fluctuation FWN cites as an issue of spillway gate regulation is natural diurnal fluctuation of inflows into Lake Spaulding, which occurs in springtime when significant snowmelt happens during the daytime.

FWN has not established why higher flows would be necessary or appropriate and has not explained what environmental benefits would occur as a result of the implementation of their recommendation. Because Licensee is not adopting the FWN higher proposed flows, greater flow capacity at Spaulding Dam is not necessary.

Finally, FWN acknowledges that it is hypothesizing regarding whether leakage at the face of Spaulding Dam might be increasing water temperatures in Jordan Creek. This hypothesis is highly speculative and not supported by any study results. In addition, streamflows estimated (as measured by a level logger) in Jordan Creek above its confluence with the South Yuba River in 2009 as a part of Licensee's Water Temperature Monitoring study did not show a correlation with Lake Spaulding reservoir levels over the course of the summer, including when reservoir levels dropped below the base of Spaulding No. 2 and No. 3 dams. Thus, Licensee has not adopted this suggestion. It should be noted that Licensee complies with all required dam safety inspection and repairs.

Include minimum flow and year-round ramping rate in Auburn Ravine

In the FWN comment letter, there were numerous requests related to minimum flows and ramping rate recommendations in Auburn Ravine. These suggestions are unclear and presented throughout pages 61 through 64 of FWN's letter.

Licensee has proposed a ramping rate for hydroelectric-related spill flows into Auburn Ravine, but has not adopted FWN's other proposed measures. PG&E does not divert water from Auburn Ravine. The measures specified by FWN are not specific enough to evaluate (e.g., the requests do not provide a specific flow rate for the suggested minimum flow and do not provide cost estimates). Additionally, some of the requests related to instream flows for irrigation purposes or infrastructure during outages would necessarily deal with non-Project facilities (such as the PCWA American River Pump Station, as FWN notes) and would require commitments from third parties and are therefore not within the purview of this relicensing process. Licensees describe these and other issues related to flow control and outages in Auburn Ravine in detail in Section 6.5 (Threatened and Endangered Species) of this Exhibit E. In addition, PG&E discusses operations and related constraints in Appendix E9 (Wise Powerhouse Operations) of this Exhibit E.

Install Streamflow Gages, Forecast Streamflows and Report Real-time Data / Forecasts

FWN also made several requests relating to streamflow gages and streamflow data forecasting and reporting:

> PG&E's FLA should include a condition that online gauge information will be 15-minute data. The condition should also say that both instantaneous and historical data should also be posted online. (p. 69).

> In the past two years information from a dozen gauges has become available. These gauges should be included in the FLA. (p. 69)
>
> The Network recommends that PG&E and NID's FLA's should schedule installation of gauges no later than the third year after license issuance. (p. 69)
>
> The Network requests that the Licensees' FLA's include a condition for weekly forecasting of flows on below [sic] Milton diversion, Bowman Reservoir, Spaulding Reservoir, Drum Afterbay, Dutch Flat Afterbay, and Rollins Reservoir to facilitate angler, boater, and trail crossing recreational use. (p. 69)
>
> The PG&E FLA should also include installation of staff gauges and flow warning signs at the sections of the Bear Valley where anglers fish to provide warning and information as to sudden and high flow fluctuations. (p. 70)

FWN has not explained what environmental benefits would be achieved by implementing these recommendations. FWN also did not provide cost estimates for their proposals. In general, Licensees have not adopted these requests relating to gages because they believe these issues are most appropriately handled in a gaging plan developed once the magnitude, timing and location of required flows is known. Licensees believe any such gaging plan would be best developed after the new Project licenses, containing flow requirements, are issued.[15]

6.2.5 Unavoidable Adverse Impacts

6.2.5.1 Yuba-Bear Hydroelectric Project

Yuba-Bear Hydroelectric Project dams will continue to truncate high flows and augment low summertime flows, which will affect water quantity. However, these storages and diversions are primarily related to delivery of consumptive water, and would occur with or without the Project since NID has stated that the facilities are necessary to meet water supply demands now and into the future. For that reason, Project effects on water quantity are considered minor and cumulative.

Some Basin Plan Water Quality Objectives are not met now and will not be met in the future. However, excluding water temperature, as discussed above, these inconsistencies with Basin

[15] FWN also made a brief suggestion stating, "PG&E and NID's FLA should include a loading order for emergency outages, which prioritizes water deliveries." (p. 45). However, FWN did not explain where this would apply, how water should be prioritized, what environmental benefit this request would have or what studies have demonstrated the need for this order. PG&E therefore could not fully evaluate this request and did not adopt it. It should be noted that in emergency situations, PG&E strives to provide minimal sustainable quantities of water for water supply and endeavors to return to normal operations as soon as possible.

Plan Objectives do not affect designated Beneficial Uses. For this reason, the inconsistencies are considered minor.

With regards to the Basin Plan Water Temperature criteria, under existing conditions, the criterion is not met in the lower Middle Yuba River, an din a few other locations. NID's Proposed Project includes increased minimum flow releases which will extend the cool water, but the lower portions of the reaches will still not meet the criteria. This is considered an indirect, minor effect since the criteria would not be met even if the Project was not in place.

6.2.5.2 Drum-Spaulding Project

Drum-Spaulding Project dams will continue to truncate high flows and augment low summertime flows, which will affect water quantity. However, these storages and diversions are primarily related to delivery of consumptive water, and would occur with or without the Project because PCWA and NID (and others) have stated that the facilities are necessary to meet water supply demands now and into the future.

Some Basin Plan Water Quality Objectives are not met now and will not be met in the future. However, excluding water temperature, as discussed above, these inconsistencies with Basin Plan Objectives do not affect designated Beneficial Uses. For this reason, the inconsistencies are considered indirect and minor.

With regards to the Basin Plan Water Temperature criteria, under existing conditions, the criterion is not met in the lower South Yuba River; however, the Basin Plan criteria would not be met in the unimpaired condition. PG&E's Proposed Project includes increased minimum flow releases from Spaulding Dam, which in combination with releases by NID, will extend the cool water, but the lower portion of the river will still not meet the criterion. This is considered an indirect, minor effect because the criterion would not be met even if the Project was not in place.

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6.3 Aquatic Resources

The discussion of aquatic resources is broken into six sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding aquatic resources. Second, the affected environment is discussed in Section 6.3.1. Third, the environmental effects of the projects are located in Section 6.3.2. Fourth, cumulative effects are discussed in Section 6.3.3. Fifth, proposed measures are listed in Section 6.3.4. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3 and further discussed below. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.3.5.

Where existing, relevant, and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on aquatic resources, Licensees developed and conducted, or are conducting, the 16 studies listed in Table 6.3-1.

Table 6.3-1. Aquatic resources studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	**Study Name**	**Tech Memo Number**	**Study in Progress[1]**	**Study Complete**	**Date Study is Scheduled to be Complete**
2.3.1	Stream Fish Populations	3-1	--	9/17/10	--
2.3.2	Instream Flow	3-2	9/22/10	--	10/31/11
2.3.3	None. This was a Fish Habitat Suitability Criteria (HSC) Study proposed by Licensees in their PADs that was withdrawn by Licensees on 2/19/09 and incorporated into the Instream Flow Study (Study 2.3.2) by FERC on 2/23/09.				
2.3.4	Fish Passage	3-4	--	4/15/10	--
2.3.5	Fish Entrainment	3-5	2/20/10	--	10/31/11
2.3.6	Special-Status Amphibians – FYLF Surveys	3-6	--	10/21/10	--
2.3.7	Special-Status Amphibians – FYLF Habitat Modeling	3-7	--	2/1/11	--
2.3.8	Special-Status Amphibians – SNYLF	3-8	--	10/27/10	--
2.3.9	Special-Status Reptiles – WPT	3-9	--	4/21/10	--
2.3.10	Aquatic Macroinvertebrates	3-10	--	6/14/10	--
2.3.11	Special-Status Mollusks	3-11	--	7/12/10	--
2.3.12	Reservoir Fish Populations	3-12	--	7/14/10	--
2.3.13	Western Placer County Streams	3-13	8/5/10	--	10/31/11
2.3.14	Western Pond Turtle Basking	3-14	--	9/15/10	--
2.3.15	2010 Dutch Flat No. 2 Entrainment Netting	3-15	--	10/27/10	--
2.3.16	Fish Barriers	3-16	4/1/11	--	10/31/11
2.3.17	2011 Dutch Flat No. 2 Entrainment Netting	3-17	--	--	9/30/11

[1] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, five studies listed in Table 6.3-1 are in progress. The most recent version of the interim technical memorandum for each of these studies and the final technical memorandum for each of the 11 completed studies have been posted to the Relicensing Website and the technical memoranda are filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; and lists of variances to the FERC-approved study;

attachments to the technical memorandum; and references. The status of each of the five studies in progress, including the expected completion, is described below.

- Instream Flow (Study 2.3.2). Licensees completed all tasks in the FERC-approved study and posted to the Relicensing Website what was expected to be the final Instream Flow Technical Memorandum (3-2) on September 22, 2010. However, in its comments on the DLAs, FERC directed Licensees to use a different Base Case than used by Licensees in their DLAs (in the DLAs Licensees' Base Case included projected future water demand). The Base Case (including projected future water demand) was also used by Licensees in the Instream Flow Technical Memorandum (3-2) to perform some time series analysis regarding existing habitat conditions. Therefore, Licensees plan to revise the Instream Flow Technical Memorandum using the Base Case condition directed by FERC. This change does not affect the instream flow models or the static Weighted Usable Area (WUA) versus flow relationships presented in the technical memorandum posted to the Public Website on September 22, 2010. In addition, the time series analysis in this Exhibit E uses the Base Case modeled regulated flows as directed by FERC in its comments on the DLA. Licensees are revising the originally posted technical memorandum so that the time series analysis in the final technical memorandum will be consistent with the time series analysis in this Exhibit E. Licensees plan to file the final technical memorandum with FERC by October 31, 2011.
- Fish Entrainment (Study 2.3.5). Licensees completed all aspects of the FERC-approved Fish Entrainment Study with three exceptions: 1) performing hydroacoustic sampling near the intake in Drum-Spaulding Project's Fordyce Lake at night in early June 2011, during the day and night in late June 2011, and in early August 2011; 2) estimating the level of entrainment at the Drum-Spaulding Project's Dutch Flat No. 1 Conduit Intake based on the level of entrainment at the Dutch Flat No. 2 Conduit Intake; and 3) estimating the level of entrainment at the Yuba-Bear Hydroelectric Project's Chicago Park Powerhouse based on the level of entrainment at the Dutch Flat No. 2 Intake. An interim technical memorandum was posted to the Relicensing Website on February 20, 2010. Because fieldwork will not be complete until late August 2011, the study is expected to be complete, including filing a final technical memorandum with FERC by October 31, 2011.
- Western Placer County Streams (Study 2.3.13). PG&E posted what it expected to be the final Western Placer County Streams Technical Memorandum (3-13) to the Relicensing Website on August 5, 2010 (i.e., all tasks in FERC-approved study complete and technical memorandum issued). However, PG&E now plans to reissue the technical memorandum to include some clarifications PG&E believes would be useful based on comments received on the Drum-Spaulding Project's DLA. These clarifications have been included in this Exhibit E in Section 6.5 (Threatened and Endangered Species). PG&E expects to file the revised technical memorandum with FERC by October 31, 2011.
- Fish Barriers (Study 2.3.16). The FERC-approved study requires Licensees assess the ability of adult rainbow trout to pass upstream of an abandoned diversion dam (non-Project) in the lower South Yuba River. If it is determined that fish can pass upstream of the abandoned dam, the FERC-approved study requires Licensees assess the ability of fish to pass upstream of two natural barriers downstream of the abandoned diversion dam. Licensees have collected field data at the abandoned diversion dam at a low and mid flow. Licensees also

collected field data at the two potential natural barriers at low flow. Licensees plan to collect high flow data at all three sites in spring 2011. If it is determined that fish can pass upstream of the abandoned diversion dam, Licensees will collect mid flow data at the two potential natural barriers in summer 2011. Licensees posted an interim technical memorandum to the Relicensing Website on April 1, 2011, and expect to complete the study including filing a final technical memorandum with FERC by October 31, 2011.

- 2011 Dutch Flat No. 2 Entrainment Netting Sampling (Study 2.3.17). On October 8, 2010, NID filed with FERC a study plan to sample fish entrained in the Dutch Flat No. 2 Conduit from mid-April through mid-July 2011. NID anticipates completing the study, including filing of a technical memorandum with FERC, by September 30, 2011.

6.3.1 Affected Environment

This Section describes existing aquatic resources conditions in six general areas: 1) fishes; 2) amphibians; 3) aquatic turtles; 4) mollusks; 5) benthic macroinvertebrates; and 6) algae. The discussion of fish is divided into the following areas: 1) special-status and important fish species; 2) reservoir fish; 3) stream fish; 4) fish entrainment; 5) fish stranding; 6) fish passage barriers; 7) distribution of fish as related to water temperature; and 8) fish habitat-flow relationships The sections on amphibians, turtles, mollusks, and benthic macroinvertebrates are each divided into two general areas: 1) special-status species; and 2) distribution and abundance.

6.3.1.1 Fishes

6.3.1.1.1 Special-Status[1,2] and Important Fish Species

Only one special-status fish species occurs in the vicinity of the projects: hardhead (*Mylopharodon conocephalus*), which is listed by the Forest Service as a Sensitive Species and by the California Department of Fish and Game (CDFG) as a California Species of Special Concern. Hardhead may occur in lower elevation stream sections of the Middle and South Yuba rivers and in lower Auburn Ravine, however, hardhead was not found in any reservoirs or stream reaches during Licensees' studies. Rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) support recreational fisheries in the area of the projects.

Hardhead is a large, native minnow that is generally found in undisturbed areas of larger low- to middle-elevation streams (i.e., elevation between 30 and 4,760 ft) in the Sacramento River Basin. Its range in California extends from the Kern River in the south to the Pit River in the north.

[1] For the purpose of this document, a special-status aquatic species is considered one that is: found on NFS land and is listed by the Forest Service as a Sensitive Species or Management Indicator Species; found on public land administered by BLM and listed by BLM as a Sensitive Species; listed by CDFG as a California Species of Special Concern; or listed under the Endangered Species Act (ESA) as Proposed or a Candidate for listing. Note that aquatic species listed as endangered or threatened under the ESA are discussed separately in this document in Section 6.5.

[2] Two salmonid species - Central Valley spring-run Chinook salmon (*O. tshawytscha*) and Central Valley steelhead (*O. mykiss*) - listed as endangered under the ESA may have occurred in the Middle and South Yuba rivers over 70 years ago and steelhead are reported to occur in Auburn Ravine in western Placer County. Refer to Section 6.5 for a detailed discussion of these fish and potential Project effects.

Hardhead inhabit areas that have clear, deep pools with sandy, gravel/boulder substrates and slow water velocities (i.e., less than 0.05 ft/sec). Hardhead co-occurs with Sacramento pikeminnow (*Ptycholeilus grandis*) and usually with Sacramento sucker (*Catastomus occidentalis*), and tends to be absent from streams where introduced species, especially centrarchids, predominate. Hardhead generally prefer warmwater, occurring in streams that reach summer water temperatures greater than 20 degrees Centigrade (°C). Under laboratory conditions, their reported optimum water temperature range is 24°C to 28°C (Moyle 2002). Hardhead in the Pit River selected the warmest natural thermal plumes available (e.g., 17°C to 21°C) (Baltz et al. 1987).

Rainbow trout is the trout species native to most west-side watersheds, and was historically found below an elevation of 4,900 ft, but has been introduced throughout the western Sierra Nevada including most of the area of the projects. Rainbow trout spawn in the spring, although the specific spawning time is influenced by factors such as the genetic strain of the fish, photoperiod, and water temperature. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Females excavate a nest, or "redd," in the gravel and, after spawning, cover the eggs with gravel. After hatching, the fry remain in the gravel until their yolk sacs are absorbed. The fry then venture into open water, feeding on plankton and aquatic macroinvertebrates. As they mature, they begin to feed on aquatic and terrestrial insects, and large trout also feed on fish and crayfish.

A number of studies have been conducted on the optimum thermal conditions for rainbow trout. The studies generally report a range of preferred temperature, because the ability of trout to grow or tolerate unfavorable temperatures varies based on physiological and ecological conditions (McEwan 2001). A study by Myrick and Cech (2001) was conducted on two strains of rainbow trout from Eagle Lake and Mt. Shasta - common strains of rainbow trout planted in California streams and reservoirs. The study examined water temperatures between 10°C and 25°C. Myrick and Cech found that optimal growth rates occurred at 19°C, and that rainbow trout continued to grow at reasonably healthy rates up to 22°C. Growth rates declined rapidly as temperatures increased from 22°C to 25°C. Water temperature below 12°C results in lowered growth rates and metabolic processes (Dickson and Kramer 1971). Literature sources on upper incipient lethal temperature (UILT) for rainbow trout are primarily from laboratory studies (e.g., Eaton et al. 1994, Cherry et al. 1977, Raleigh et al. 1984, Currie et al. 1998 and Coutant 1977), and indicate that the UILT for rainbow trout ranges from 24° to 30°C. Myrick and Cech (2001) reported critical thermal maximum (CTM) tolerances as high as 32°C for Eagle Lake rainbow trout that were acclimated to 25°C water temperature conditions. The lower incipient lethal temperature for rainbow trout is 0°C (Raleigh et al. 1984).

Brown trout is an introduced species in California, and occurs mainly in low- to mid-elevation streams. Brown trout spawn in the fall, although the specific spawning time is influenced by factors such as the genetic strain of the fish, photoperiod, and water temperature. Spawning usually occurs in gravel riffles or gravel pockets. Despite differences in timing, the spawning and rearing characteristics of brown trout are similar to rainbow trout. Brown trout can be found in tributaries, rivers, lakes, and reservoirs. Adults generally remain near the bottom of pools, while juveniles can be found in riffles as well as in pools. Temperature preferences for brown trout are similar to those for rainbow trout. Brown trout compete with native trout species for resources, and are generally more piscivorous than rainbow trout and often prey on small rainbow trout.

6.3.1.1.2 Reservoir Fish

Together, the projects include 40 reservoirs. Twenty-four of the reservoirs are very small diversion impoundments with no appreciable storage (i.e., <1,000 ac-ft), and 28 of the reservoirs occur at elevations over 5,000 ft. Normally, all of the reservoirs ice over in winter except for Jackson Meadows Reservoir, Bowman Lake, Drum Afterbay, Dutch Flat Afterbay, Rollins Reservoir, Halsey Afterbay and Rock Creek Reservoir.

Based on historical information and data collected by Licensees in 2009, and reported in Technical Memorandum 3-2, 27 fish species have occurred or currently occur in the projects' reservoirs, of which only five species are native to California. Four species (and one subspecies) of game fish were stocked by CDFG from 2002 through 2007. Table 6.3.1-1 shows by year the species stocked by CDFG by Project reservoirs. Table 6.3.1-2, which was developed using existing and reasonably available information, shows the historic distribution of fishes in Project reservoirs not directly sampled by Licensees. Table 6.3.1-3 shows fishes that occurred or historically occur in the five reservoirs sampled by Licensees in 2009. In each of the five reservoirs Licensees performed three 2-day surveys, once each during high-, mid-, and low-pool elevations. Methods included boat electrofishing and gill net sampling, except at Fordyce Lake where hydroacoustic surveys and gill net sampling were performed (NID and PG&E 2010m).

Table 6.3.1-1. Fish planting records by species and year from CDFG for the years 2002 through 2007 for lakes and reservoirs in Project reservoirs (CDFG 2007a).

Reservoir	Year					
	2002	2003	2004	2005	2006	2007
YUBA-BEAR HYDROELECTRIC PROJECT						
Jackson Meadows Reservoir	RT, ELT, BN, BK	RT, ELT, BN	RT, ELT, BN	RT	RT, ELT	RT
French Lake	RT	--	--	--	RT	RT
Faucherie Lake	RT, BN	RT, BN	RT, BN	RT, BN	RT, ELT, BN	RT, ELT, BN
Sawmill Lake	--	--	--	--	RT	RT
Bowman Lake	ELT, CHN	ELT, CHN	RT, CHN	RT, CHN	ELT	RT
Rollins Reservoir	RT, BN	RT, BN	RT, BN	RT, BN, CHN	RT, BN, CHN	RT, BN, CHN
DRUM-SPAULDING PROJECT						
Upper Rock Lake	--	--	--	--	RT	RT
Lower Rock Lake	--	--	--	--	RT	RT
Culbertson Lake	--	--	--	--	RT	RT
Upper Lindsey Lake	--	--	--	--	RT	RT
Lower Lindsey Lake	--	--	--	--	RT, BN	RT, BN
Halsey Forebay	RT, ELT	RT	RT	RT	RT	RT
Lake Valley Reservoir	RT, ELT	--	CHN	--	--	RT
Fuller Lake	RT, ELT,BN	RT, BN	RT	RT	RT, BN	RT, ELT, BN
Fordyce Lake	--	--	--	--	RT	RT
Lake Spaulding	--	--	CHN	CHN	CHN	CHN

Abbreviations: RT = Rainbow Trout; BN = Brown Trout; BK – Brook Trout ; ELT = Eagle Lake Rainbow Trout; CHN = Chinook Salmon

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Table 6.3.1-2. Current and historical presence of fish species in the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project reservoirs not sampled in 2009.

Reservoir*	Rainbow Trout N[a]	Brown Trout I	Brook Trout I	Cutthroat Trout I[b]	Mountain Whitefish I[b]	Kokanee I	Chinook salmon I[c]	Arctic Grayling I	Lake Trout (*Salvelinus namaycush*) I	Common Carp (*Cyprinus carpio*) I	Sacramento Pikeminnow N	Tui Chub N	Lahontan Redside I[b]	Speckled Dace N	Golden Shiner I	Sacramento Sucker N	Largemouth Bass I	Smallmouth Bass I	Crappie I	Redear Sunfish I	Green Sunfish I	Bluegill I
Milton Diversion Dam Impoundment	●[1,9,14]	●[1, 14]	●[1,9,14]			●[9.13,14]						●[9,14]	●[9,14]							●[1,9,14]		
Jackson Lake	●[9]											●[9]										
French Lake	●[5,9,15]		●[9]									●[4.9]										
Faucherie Lake	●[1,9,15]		●[1,9,11,15]	●[9,11]								●[1]	●[11]									
Sawmill Lake	●[1,9,11,15]		●[1,9,11]	●[9]					▲[9]			●[4,9]								●[4,9]		
Upper Rock Lake	●[8,15]		■[1]	●[1,3,9,11]																●[9]		
Lower Rock Lake	●[4,15]		■[1]	●[1,3,4,9,11]																●[9]		
Culbertson Lake	●[1,3,8,11,15]			●[1,3,8,11]																		
Upper Lindsey Lake	●[4,8,11,15]		●[4,8]	●[3,4,8]		▲[4]			▲[4]				●[9,11]							●[4,9,11]		
Middle Lindsey Lake	●[3,4,9]			●[1,3,9]									●[1,9,12]							●[1,9]		
Lower Lindsey Lake	●[3,4,9,11,15]		●[3,4,9,11,15]	●[1,3,9]							●[4,9]		●[1]							●[1,11]		
Feeley Lake	●[1,3,9]		■[4]	●[1,9]																●[4,9]		
Carr Lake	●[3,9]		▲[5,9]	●[1,9]																●[9]		
Blue Lake	●[2,9]				▲[9]															●[2,9]		
Rucker Lake	●[1,3,9]	▲[1,2,3,9]	●[1,3]											●[1,2,3,9]	●[2,3,9,12]	●[3]		●[12]	●[2,3,9]	●[2,3,9]		
Fuller Lake	●[1,3,9,15]		●[1,3,9,15]	●[3,9]			●[9]															
Meadow Lake	●[1,3,9]		●[3,9]	●[3,9]		●[1,3,9]														●[4]		
White Rock Lake	■[3]			●[3,9]		▲[3,9]														■[9]		
Lake Sterling	●[3,9]		●[3,9]	●[3,9]		▲[3,9]																
Kidd Lake	●[3,5,9]		●[3,5,9]	●[1,3,9]		■[3,9]								●[9]						●[3,9]		
Upper Peak Lake	●[3,9]			●[3,9]		▲[3,9]																
Lower Peak Lake	●[3,9]			●[3,9]		▲[3,9]																
Deer Creek Forebay	●[1,3,8,9]		●[1,3,8,9]	●[8,9]						●[8,9]												●[8,9]
Drum Forebay	●[1,3,9]		●[1,3,9]					●[3]		●[3,9]					●[1]					●[9]	■[1]	●[3]
Drum Afterbay	●[3,9]		●[3,9]	●[9]						●[9]								●[9]		●[9]		●[3,9]
Halsey Forebay	●[1,3,9]		●[3,9]																			●[3,9]
Halsey Afterbay	●[3,9,15]		●[9]	●[9]									●[9]					●[9]				●[3]
Rock Creek Reservoir	●[3]		●[9]											●[9]	●[9]		●[9]		●[9]	●[9]	●[9]	●[3]
Lake Valley Reservoir	●[3,5,8,9,15]		●[3,5,9]	●[8,9]			●[9]	●[3,15]			●[8,9]							●[8,9]	●[3]	●[3,8,9]		
Kelly Lake	●[3,9,10]			●[3,9,10]							●[8,9]		●[9,10]					●[9,10]	●[9]	●[3,8,9]		
Alta Forebay	●[3,5]		●[3,5]											●[5]								■[3]

References: : 1=Shaffer (2005), 2=Bacher (2002), 3=Samford (2007), 4=Gerstung (1970-1975), 5=CDFG (1930-1959), 6=Hiscox (1981), 7=CDFG (1974-1983), 8=CDFG (1958-1980), 9=Hiscox (2007), 10=Richard (1968), 11=Kundargi (2005), 12=PG&E (1997a), 13=Trails.com (2007), 14=Hiscox (1986-1993), 15=CDFG (2009a).
Symbols: ● = known to be present, ■= may occur due to historical presence, but current status is uncertain, ▲ = historically present, but likely extirpated, Highlighted cells = Stocking Record (2002-2009), I = Introduced, N = Native.
a = Several nonnative strains of rainbow trout have been planted into Project waters or waters that drain into the Project reservoirs.
b = Indigenous to Sierra Nevada, but not to the Project vicinity (transplanted).
c = Non-migratory Chinook salmon have been planted in some reservoirs.
*Note: Wise Forebay, Dutch Flat Forebay, Dutch Flat Afterbay, and Chicago Park Forebay are relatively small diversion pools that did not have any historical information on fish populations and are not presented in the table above.

Table 6.3.1-3. Current and historical presence of fish species in Yuba-Bear Hydroelectric Project and Drum-Spaulding Project reservoirs sampled for fish presence in 2009, including the numbers of fish captured.

Reservoir	Attributes	Rainbow Trout N[a]	Brown Trout I	Brook Trout I	Cutthroat Trout I[b]	Mountain Whitefish I[b]	Kokanee I	Chinook I[c]	Arctic Grayling I	Lake Trout I	Common Carp I	Sacramento Pikeminnow N	Tui Chub N	Lahontan Redside I[b]	Speckled Dace N	Golden Shiner I	Sacramento Sucker N	Large-mouth Bass I	Small-mouth Bass I	Crappie I	Redear Sunfish I	Green Sunfish I	Blue-gill I	Brown Bullhead I	Channel Catfish I	White Catfish I	Threadfin Shad (*Dorosoma petenense*) I	Pond Smelt I
Jackson Meadows Reservoir	Expected Presence	● [1,8,12]	● [1,8,12]	● [2,8,12]	● [4,8,10]				▲ [8,11]				● [4,8]	● [4,8]	● [4,8]									● [2,8]				
	# Captured During 2009 Study	92	37	6	2								1	1,050	60									0				
Bowman Lake	Expected Presence	● [1,8,9,12]	● [1,8,9]				● [1,8,9,12]							● [1,8]		● [4,8]						■ [4]		● [1,8]				
	# Captured During 2009 Study	16	123				23							342	51	0						0		0				
Rollins Reservoir	Expected Presence	● [1,8,12]	● [1,8,12]				● [1,8,12]				● [1,8]		● [6,8]		● [4,8]	● [6,8]		● [1,8]	● [1,8]	● [1,8]	● [1,6]	● [6,8]	● [1,6,8]	● [6,8]	● [1,8]		● [6,8]	● [6,8]
	# Captured During 2009 Study	1	54				0				0	52	0		0	3	6	24	264	1	2	6	114	2	20	6	0	31
Fordyce Lake	Expected Presence	● [3,5,8,12]	● [3,5,8]	● [3,8]	■ [3,5,8]					● [3,8]			● [5]	● [5]														
	# Captured During 2009 Study	17	16	2	1					0			13	0														
Lake Spaulding	Expected Presence	● [1,3,8]	● [1,3,7,8]	● [3,7]		■ [1]		● [3,8,12]		● [3,8]		● [1,3,8]																● [3,6,8]
	# Captured During 2009 Study	10	32	1		0		6		0		192		9			1		7									69

References: 1=Shaffer (2005), 2=Bacher (2002), 3=Samford (2007), 4=Gerstung (1970-1975), 5=Hiscox (1981), 6=CDFG (1974-1983), 7=CDFG (1958-1980), 8=Hiscox (2007), 9=Kundargi (2005), 10=Trails.com (2007), 11=Hiscox (1986-1993), 12=CDFG (2009a).
Symbols: ● = known to be present, ■ = may occur due to historical presence, but current status is uncertain, ▲ = historically present likely extirpated, Highlighted cells = Stocking Record (2002-2009), I = Introduced, N = Native.
a = Several nonnative strains of rainbow trout have been planted into Project waters or waters that drain into the Project reservoirs.
b = Native to Sierra Nevada, but not to the Project vicinity (transplanted).
c = Non-migratory Chinook have been planted in some reservoirs.

Based on existing information and Licensees' study, rainbow trout, brook trout (*Salvelinus fontinalis*), and cutthroat trout (*O. clarki*) are the more commonly occurring species in most Project reservoirs. Redear sunfish (*Lepomis microlophus*) is the most common warm water fish in the reservoirs, and common forage fish include Lahontan redside (*Richardsonius egregius*), tui chub (*Gila bicolor*), and speckled dace (*Rhinichthys osculus*). Other game fish species, such as smallmouth bass (*Micropterus dolomieu*) and kokanee (*O. nerka*), occur with moderate frequency. The remaining historically documented fishes have been infrequently reported and appear sporadically throughout the smaller reservoirs.

CDFG manages most of the larger projects' reservoirs as Put-and-Grow and Catchable fisheries for rainbow and brown trout. Within the past 5 years, CDFG has stocked trout (e.g., rainbow and brown trout, Chinook, Eagle Lake trout, and Kokanee) in most of the larger reservoirs. Most of the smaller projects' reservoirs are considered unmanaged fisheries by CDFG, with the exception of Milton Diversion Impoundment, which is managed by CDFG as a Self-Sustaining Fishery for rainbow trout.

Refer to Licensees' Reservoir Fish Populations Technical Memorandum (3-12) in Appendix E12 of this Exhibit E for a detailed discussion of fish in the projects' reservoirs.

6.3.1.1.3 <u>Stream Fish</u>

In 2008 and 2009, Licensees sampled fish in project-affected stream reaches using both qualitative (Level I) and quantitative (Level II) approaches. Level I sampling was used to broadly characterize the composition of the fish community. Level II sampling was used to develop statistical metrics of fish populations, including detailed information on the density, biomass, relative composition, spatial distribution, population size and age-class structure, and fish condition.

In 2008, Licensees conducted Level I sampling at 44 sites and Level II sampling at 26 sites. In 2009, Licensees repeated Level II sampling at the same 26 sites sampled in 2008 and added eight Level II sites that were sampled as Level I sites in 2008. No level I sampling was conducted in 2009. During the 2008 Level I and Level II sampling conducted from July through October, a total of 4,218 fish representing 15 species were collected or observed (i.e., through snorkeling). A total of 4,742 fish representing 12 species were collected or observed during Level II sampling in July and August 2009.

Based on existing information and Licensees' study, 25 fish species may occur in stream reaches affected by the projects (Table 6.3.1-4). Only nine of the species are native to California. The distribution of fish species by stream reach, and including recent historic presence as well as data collection by Licensees is presented in Table 6.3.1-4. Table 6.3.1-5 shows estimated fish abundance by Level II sampling sites in 2008 and 2009. Abundance for both electrofished and snorkeled sites and biomass for electrofished sites only are provided for rainbow trout, brown trout, Sacramento sucker, Sacramento pikeminnow, and a combination (i.e., less than 5 percent of the total catch by site) of the other fish collected.

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Table 6.3.1-4. Summary of fish species documented or potentially occurring in the Yuba-Bear and Drum-Spaulding project-affected stream reaches. Note, symbols and highlight are identified at base of table.

Stream	Stream Reach	Sampled in 2008-2009	Common Fish																							
			Rainbow Trout	Brook Trout	Brown Trout	Cutthroat Trout	Lahontan Cutthroat	Steelhead	Chinook salmon	Sculpin spp.	Sucker spp.	Sacramento Sucker	Sacramento Pikeminnow	California Roach	Lahontan Redside	Golden Shiner	Speckled Dace	Hardhead	Mosquitofish	Hitch	Channel Catfish	Brown Bullhead	Largemouth Bass	Smallmouth Bass	Green Sunfish	Pumpkinseed Sunfish	Bluegill
MIDDLE YUBA RIVER SUB-BASIN																											
Middle Yuba River	Jackson Meadows Dam Reach	Yes	▲[5]	▲[5]	▲[5]	▲[5]																					
	Milton Diversion Dam Reach	Yes	●[1,4]	●[1]	●[1,4]	▲[5]	■[8]					●[1,4]	●[1,4]					●[4]						●[4]			
Wilson Creek	Wilson Creek Diversion Reach	Yes																									
DEER CREEK SUB-BASIN																											
S. Fork Deer Creek	Deer Creek Powerhouse Reach	Yes	■[1]		■[1]							●[1]															
CANYON CREEK SUB-BASIN																											
Jackson Creek	Jackson Lake Dam Reach	Yes	●[1]		●[1]																						
Canyon Creek	French Lake Dam Reach	Yes	▲[5]	▲[5]	▲[5]																						
	Faucherie Lake Dam Reach	Yes	●[1]	▲[5]	▲[5]																						
	Sawmill Lake Dam Reach	Yes	●[1]	▲[5]	●[1]																						
	Bowman-Spaulding Diversion Dam Reach	Yes																									
	Canyon Creek below Texas Creek Confluence Reach	No	■[2]	■[11]	■[2]																						
Texas Creek	Upper Rock Lake Dam Reach	Yes		▲[5]																							
	Lower Rock Lake Dam Reach #1 and #2	Yes	●[2,11]	●[11]	●[2]																						
	Texas Creek Diversion Dam Reach	Yes	▲[5]	▲[5]	▲[5]																						
Unnamed Creek	Culbertson Lake Dam Reach	Yes	●[11]	●[11]																							
Lindsey Creek	Upper Lindsey Lake Dam Reach	Yes	▲[5]	▲[5]	▲[5]																						
	Middle Lindsey Lake Dam Reach	Yes	●[11]	▲[5]												●[12]											
	Lower Lindsey Lake Dam Reach	Yes	●[2]	▲[5]	●[2,11]																						
FALL CREEK SUB-BASIN																											
Clear Creek	Clear Creek Diversion Reach	Yes	●[1,2]	●[2]	▲[5]																						
Lake Creek	Feeley Lake Dam Reach	Yes	▲[5]	●[11]																							
	Carr Lake Dam Reach #1	Yes	●[1,2,11]	●[1,11]	●[2,11]											●[11]											
Fall Creek	Carr Lake Dam Reach #2	Yes	●[1]	●[2]	●[1]																						
	Fall Creek Diversion Dam Reach	Yes	●[1,2]	●[1]	●[1,2]																						
Trap Creek	Trap Creek Diversion Reach	Yes	●[1]		▲[5]																						
RUCKER CREEK SUB-BASIN																											
Rucker Creek	Blue Lake Dam Reach	Yes	▲[5]																								
	Rucker Lake Dam Reach	Yes	●[11]		●[11]																		▲[5]	▲[5]	●[11]		
	Rucker Creek Diversion Reach	Yes	▲[5]		▲[5]																						
SOUTH YUBA RIVER SUB-BASIN																											
Unnamed Creek	Fuller Lake Dam Reach	Yes	●[1]	▲[5]	▲[5]																						
Jordan Creek	Jordan Creek Diversion Reach	No	●[1]	▲[5]	▲[5]								▲[5]														
Unnamed Creek	Meadow Lake Dam Reach	Yes	▲[5]	▲[5]	▲[5]	▲[5]																					
White Rock Creek / North Creek	White Rock Lake Dam Reaches #1 and 2	Yes	●[1]	●[1]																							
Bloody Creek	Lake Sterling Dam Reach	Yes	▲[5]	▲[5]	▲[5]																						
Fordyce Creek	Fordyce Lake Dam Reach	Yes	●[1]	▲[5]	●[1]						●[1]																
Tributary to South Yuba River	Kidd Lake Dam Reach	Yes	▲[5]	▲[5]	▲[5]																		▲[5]				

Table 6.3.1-4. (continued)

Stream	Stream Reach	Sampled in 2008-2009	Common Fish																										
			Rainbow Trout	Brook Trout	Brown Trout	Cutthroat Trout	Lahontan Cutthroat	Steelhead	Chinook salmon	Sculpin spp.	Sucker spp.	Sacramento Sucker	Sacramento Pikeminnow	California Roach	Lahontan Redside	Golden Shiner	Speckled Dace	Hardhead	Mosquitofish	Hitch	Channel Catfish	Brown Bullhead	Largemouth Bass	Smallmouth Bass	Green Sunfish	Pumpkinseed Sunfish	Bluegill
South Yuba River	Upper South Yuba Reaches #1 and #2	Yes	▲[5]	▲[5]	▲[5]																						
	South Yuba River Below Spaulding No. 2 Powerhouse Reach	Yes	▲[5]	▲[5]	▲[5]								▲[5]														
	South Yuba Reaches #1 through #6	Yes	●[4]	▲[5]	▲[5]							●[4]	●[4]					●[4]							●[4]		
Bear River	Bear River Reach #1 and #2	Yes	●[1]																								
	Drum Afterbay Dam Reach	Yes	●[1]	▲[5]	●[1]								▲[5]												▲[5]		
	Dutch Flat Afterbay Dam Reach	Yes																									
	Chicago Park Powerhouse Reach	Yes																									
	Bear River Canal Diversion Dam Reach	Yes	●[6]		●[6]											▲[5]					●[8]		▲[5]	▲[5]	▲[5]		
Little Bear River	Alta Powerhouse Reach	Yes	▲[5]		▲[5]								▲[5]										▲[5]	▲[5]			
NF of NF American River	Lake Valley Reservoir Dam Reach	Yes	●[2,3]	▲[5]	●[3]																●[8]				●[3]		
	Lake Valley Canal Diversion Dam Reach	Yes	●[2,3]	▲[5]	●[2,3]																●[8]				●[3]		
Six Mile Creek	Kelly Lake Dam Reach	Yes	▲[5]	▲[5]																					▲[5]		
Canyon Creek (NF American tributary)	Canyon Creek Above Towle Canal Diversion Dam Reach	Yes																									
	Towle Canal Diversion Dam Reach	Yes																									
Mormon Ravine	Mormon Ravine Reach	Yes																									
Rock Creek	Rock Creek Dam Reach	Yes	▲[5]		▲[5]																▲[5]		●[8]	▲[5]			
Dry Creek	Halsey Afterbay Dam Reach	Yes	▲[5]	▲[5]	▲[5]											▲[5]									▲[5]		
Auburn Ravine[13]	Wise Powerhouse Overflow Reach	Yes	●[8]		●[7,8]					●[7]		●[7,9]	●[7,9]	●[9]		●[10]		●[9]	●[10]	●[7,9]	▲[5]		●[10]	▲[5]	●[7]	●[10]	●[10]

References: 1 = Tahoe National Forest (before 1998), 2 = Tahoe National Forest (1998 to Present), 3 = Studley, et al. (1989), 4 = Gast et al. (2005), 5 = Fish present in upstream reservoir, 6 = Shaffer (2005), 7 = CDFG (2008a), 8 = Teater (2007), 9 = CALFED (2000a), 10 = Bailey (2003a), 11 = Bailey (2003b), 12 = PG&E (1997a), 13 = Additional species known to be present: carp, lamprey spp., black bullhead, log perch, prickly sculpin, spotted bass, redear sunfish (CDFG 2008b and Bailey 2003a)
Symbols: ● = Known to be present, ■ = Known to be present in tributary to reach, ▲ = Fish possibly present in reach that may have originated from upstream lake or reservoir, Highlighted cells represent fish species that were captured during 2008-2009 studies.

Table 6.3.1-5. Estimated fish abundance and biomass at Level II quantitative fish population monitoring sites in the Yuba-Bear and Drum-Spaulding project-affected reaches during 2008 and 2009.

Stream	Stream Reach	Site	Date Sampled	Rainbow trout			Brown trout			Sacramento sucker			Sacramento pikeminnow			Other species[2]		
				Abundance (EF)[1] fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m
MIDDLE YUBA RIVER SUB-BASIN																		
Middle Yuba River	Jackson Meadows Dam Reach	RM 46.4	August 19, 2008	49	1,013	34	115	1,424	1	--	--	--	--	--	--	2	6	0
			August 18, 2009	44	252	29	63	1,716	0	--	--	--	--	--	--	0	0	25
	Milton Diversion Dam Reach	RM 43.6 (Upper)	August 4, 2008	85	2,247	205	103	3,235	0	--	--	--	--	--	--	--	--	--
			July 13, 2009*	39	942	43	14	365	17	--	--	--	--	--	--	--	--	--
		RM 26.6 (Middle)	August 5, 2008*	208	3,671	76	--	--	--	15	288	11	--	--	--	--	--	--
			July 14, 2009*	243	5,776	172	--	--	--	210	9,246	398	--	--	--	--	--	--
		RM 13.6 (Lower)	August 22, 2008	--	--	23	--	--	--	--	--	20	--	--	4	--	--	--
			July 23, 2009	--	--	17	--	--	--	--	--	117	--	--	0	--	--	--
CANYON CREEK SUB-BASIN																		
Canyon Creek	Bowman-Spaulding Diversion Dam Reach	RM 7.9 (Upper)	August 13, 2008	137	2,217	--	57	1,320	--	--	--	--	--	--	--	--	--	--
			June 29, 2009	52	1,398	--	14	608	--	--	--	--	--	--	--	--	--	--
		RM 1.3 (Lower)	July 28, 2008*	127	1,967	224	--	--	--	--	--	--	--	--	--	--	--	--
			June 30, 2009*	130	3,592	161	--	--	--	--	--	--	--	--	--	--	--	--
Texas Creek	Lower Rock Lake Dam Reach #2	RM 1.6	July 28, 2009	77	2,050	--	72	2,989	--	--	--	--	--	--	--	--	--	--
FALL CREEK SUB-BASIN																		
Fall Creek	Carr Lake Dam Reach #2	RM 2.1	July 27, 2009	121	1,638	--	26	1,088	--	--	--	--	--	--	--	--	--	--
	Fall Creek Diversion Dam Reach	RM 1.9	July 27, 2009	26	461	--	--	--	--	--	--	--	--	--	--	--	--	--
RUCKER CREEK SUB-BASIN																		
Rucker Creek	Rucker Lake Dam Reach	RM 1.4	July 28, 2009	13	407	--	9	371	--	--	--	--	--	--	--	--	--	--
SOUTH YUBA RIVER SUB-BASIN																		
Fordyce Creek	Fordyce Lake Dam Reach	RM 10.1 (Upper)	August 8, 2008*	23	464	4	2	371	4	--	--	--	--	--	--	2	7	0
			August 6, 2009*	30	768	22	3	161	4	--	--	--	--	--	--	0	0	0
		RM 6.2 (Middle)	August 12, 2008*	86	2,727	0	4	661	0	--	--	--	--	--	--	--	--	--
			August 7, 2009*	82	2,750	1	4	507	1	--	--	--	--	--	--	--	--	--
		RM 2.7 (Lower)	August 11, 2008*	54	770	11	8	345	2	--	--	--	--	--	--	--	--	--
			August 5, 2009*	56	904	13	345	546	2	--	--	--	--	--	--	--	--	--
South Yuba River	South Yuba River below Spaulding No. 2 Powerhouse Reach	RM 40.3	July 29, 2009*	23	251	13	1	138	3	--	--	--	--	--	--	--	--	--
	South Yuba Reaches #1 through #6	RM 39.5 (SY Reach #1)	August 18, 2008*	86	2,148	81	0	0	0	--	--	--	--	--	--	--	--	--
			July 24, 2009*	54	1,558	120	3	107	3	--	--	--	--	--	--	--	--	--
		RM 27.6 (SY Reach #5)	August 6, 2008*	81	2,002	238	--	--	--	5	289	2	--	--	--	--	--	--
			July 15, 2009*	57	1,733	262	--	--	--	30	461	549	--	--	--	--	--	--
		RM 14.9 (SY Reach #6)	August 7, 2008	--	--	22	--	--	--	--	--	2	--	--	88	--	--	--
			July 16, 2009	--	--	18	--	--	--	--	--	24	--	--	5	--	--	--
		RM 0.8 (SY Reach #6 @ Bridgeport)	July 30, 2009	--	--	1	--	--	--	--	--	--	--	--	7	--	--	53

[1] EF=Electrofishing; SN=Snorkeling. EF and SN abundance estimates were made independently for each section.
[2] Other species include those captured or observed in small numbers (i.e. less than 5% of the total catch by site). Represented species include: bluegill, California roach, golden shiner, green sunfish, mosquitofish, smallmouth bass, speckled dace, and spotted bass.
* For combined electrofishing and snorkel survey sites the snorkel section estimates are for a single deep pool, whereas electrofishing section estimates are for multiple representative habitat types excluding pools too deep to electrofish.

Table 6.3.1-5. (continued)

Stream	Stream Reach	Site	Date Sampled	Rainbow trout			Brown trout			Sacramento sucker			Sacramento pikeminnow			Other species[2]		
				Abundance (EF)[1] fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m	Abundance (EF) fish/100m	Biomass (EF) g/100m	Abundance (SN) fish/100m
BEAR RIVER SUB-BASIN																		
Bear River	Bear River Reach #2	RM 32.9 (Upper)	July 22, 2008	1	110	--	201	4,512	--	--	--	--	--	--	--	--	--	--
			July 1, 2009	1	2	--	252	5,292	--	--	--	--	--	--	--	--	--	--
		RM 30.7 (Middle)	July 22, 2008	116	2,848	--	32	1,741	--	--	--	--	--	--	--	--	--	--
			July 17, 2009	133	2,846	--	38	2,058	--	--	--	--	--	--	--	--	--	--
		RM 28.5 (Lower)	July 30, 2008	88	1,942	--	20	977	--	--	--	--	--	--	--	--	--	--
			July 2, 2009	50	1,355	--	8	340	--	--	--	--	--	--	--	--	--	--
	Drum Afterbay Dam Reach	RM 25.4	July 31, 2008	68	1,204	--	1	420	--	--	--	--	--	--	--	--	--	--
			August 3, 2009	81	1,616	--	0	0	--	--	--	--	--	--	--	--	--	--
	Dutch Flat Afterbay Dam Reach	RM 20.8 (Upper)	July 21, 2008*	75	1,525	7	0	0	--	--	--	--	--	--	--	5	13	0
			August 11, 2009*	102	787	206	1	30	--	--	--	--	--	--	--	10	38	0
		RM 19.3 (Lower)	July 24, 2008	7	141	--	--	--	--	--	--	--	--	--	--	7	16	--
			August 12, 2009	41	119	--	--	--	--	--	--	--	--	--	--	53	128	--
	Chicago Park Powerhouse Reach	RM 15.4	September 24, 2009	--	--	--	3	28	--	14	69	--	1	3	--	2	9	--
	Bear River Canal Diversion Dam Reach	RM 8 (Upper)	August 14, 2008	6	58	--	67	254	--	23	198	--	10	91	--	0	0	--
			August 17, 2009	72	125	--	23	111	--	26	149	--	7	44	--	93	521	--
		RM 3.4 (Lower)	August 17, 2008	--	--	5	--	--	2	--	--	2	--	--	1	--	--	--
			August 13, 2009	--	--	11	--	--	6	--	--	595	--	--	1	--	---	--
NORTH FORK AMERICAN RIVER SUB-BASIN																		
NF of NF American River	Lake Valley Reservoir Dam Reach	RM 14.3	July 30, 2008	35	810	--	49	1,381	--	--	--	--	--	--	--	--	--	--
			August 4, 2009	30	603	--	74	1,816	--	--	--	--	--	--	--	--	--	--
	Lake Valley Canal Diversion Dam Reach	RM 11.8 (Upper)	July 23, 2008	23	558	--	94	3,445	--	--	--	--	--	--	--	--	--	--
			August 10, 2009	35	967	--	92	3,682	--	--	--	--	--	--	--	--	--	--
		RM 10.3 (Lower)	July 23, 2008	55	1,379	118	17	212	11	--	--	--	--	--	--	--	--	--
			August 10, 2009	50	1,421	139	17	456	22	--	--	--	--	--	--	--	--	--
COON CREEK SUB-BASIN																		
Dry Creek	Halsey Afterbay Dam Reach	RM 1.7	August 14, 2009	--	--	--	69	1,292	--	--	--	--	--	--	--	9	191	--
NORTH YUBA RIVER SUB-BASIN																		
North Yuba River	North Yuba River (not a project-affected reach)	RM 55.2 (Upper)	July 29, 2008	259	5,882	--	1	35	--	--	--	--	--	--	--	--	--	--
			July 20, 2009	268	5,620	--	10	396	--	--	--	--	--	--	--	--	--	--
		RM 51.4 (Middle)	August 20, 2008	372	6,667	--	14	3,173	--	--	--	--	--	--	--	--	--	--
			July 21, 2009	195	3,734	--	6	267	--	--	--	--	--	--	--	--	--	--
		RM 22.3 (Lower)	August 21, 2008	--	--	105	--	--	--	--	--	29	--	--	147	--	--	--
			July 22, 2009	--	--	94	--	--	--	--	--	167	--	--	29	--	--	--

[1] EF=Electrofishing; SN=Snorkeling. EF and SN abundance estimates were made independently for each section.
[2] Other species include those captured or observed in small numbers (i.e. less than 5% of the total catch by site). Represented species include: bluegill, California roach, golden shiner, green sunfish, mosquitofish, smallmouth bass, speckled dace, and spotted bass.
* For combined electrofishing and snorkel survey sites the snorkel section estimates are for a single deep pool, whereas electrofishing section estimates are for multiple representative habitat types excluding pools too deep to electrofish.

Fish communities in most project-affected stream reaches are dominated by trout, as is common in most streams on the western slope of the Sierra Nevada. In general and with some exceptions (e.g., Sacramento suckers in the lower Middle Yuba River and brown trout in Bear River Reach #2), rainbow trout was the numerically dominant species. Rainbow trout was captured at all Level II sites except in the Halsey Afterbay Dam Reach in Dry Creek and in the Chicago Park Powerhouse Reach in the Bear River. Brown trout is distributed in several reaches, but is less common in the canyon reaches of the North, Middle, and South Yuba rivers and its distribution is more variable in the Bear River. Brook trout, the least abundant of the three trout species, is found only in the Jackson Lake, Lake Sterling, and White Rock Lake Dam reaches (>El. 6,000 ft). Licensees also found non-trout fishes that are typical of Sierra Nevada streams. These included Sacramento pikeminnow and Sacramento sucker, which occurred only in foothill and montane regions at generally less than 3,000 ft in elevation.

As described above, rainbow and brown trout populations are important components of the fish community, not just because they dominate the fish community in terms of numbers and biomass, but also because they support valuable fisheries. Licensees' study showed that individual rainbow and brown trout are generally in good condition (i.e., fish exhibited robust bodies based on Condition Factor, were free of visible disease, parasites, and lesions, and exhibited normal behavioral patterns), and that rainbow and brown trout populations by river or creek are self-supporting; that is, natural reproduction supports the stream populations (i.e., no stocking). In most reaches, age-class distribution is typical of what would be expected in healthy viable and self-sustaining populations, though in some reaches young-of-year, or YOY (i.e., fish less than 1 year of age) numbers were low. There were few instances where lower trout densities were observed at individual sampling sites, but results for the overall stream reach (e.g., the entire section of stream below a Project facility) indicated self-sustaining populations within the river. Individual fish showed reasonable growth rates for the region.

The abundance and biomass of rainbow trout trended towards being highest in upper and mid elevation sites (Table 6.3.1-5). Trout were less abundant at lower elevation sites than at upper elevation sites. The abundance of rainbow and brown trout appeared to be inversely related; so, if relatively higher numbers of rainbow trout were present, lower numbers of brown trout were generally found and *vice-versa*. The South Yuba River below Spaulding No. 2 Powerhouse Reach, Dutch Flat Afterbay Dam Reach – Lower, and the Bear River Canal Diversion Dam Reach – Upper all had relatively low abundance and biomass of rainbow or brown trout (Table 6.3.1-5). The proximity to Project release facilities may influence the low numbers in two of the three sites; however, the Dutch Flat Afterbay Dam Reach – Lower site had homogenous low gradient habitat that did not favor fish, but resulted in high numbers of incidental foothill yellow-legged frog (FYLF) observations. It is important to note that snorkeling in deep pools was required at 11 sites and, as a result, the biomass for those habitat units was not measured (marked with an asterisk in Table 6.3.1-5). Only biomass in the electrofished habitat was calculated and presented.

With one exception, CDFG manages most of the stream reaches as Catchable Fisheries for rainbow and brown trout. The section of the Middle Yuba River from Jackson Meadows Dam to

Milton Diversion Dam is managed by CDFG as Trophy Trout Waters[3] and a Self-Sustaining Fishery for rainbow trout.

Refer to Licensees' Stream Fish Populations Technical Memorandum (3-1) in Appendix E12 of this Exhibit E for a detailed discussion of fish in the projects' reservoirs.

6.3.1.1.4 Fish Entrainment

Together, the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project include approximately 70 locations where water is diverted from a stream or reservoir to another location (i.e., downstream of a dam, out-of-basin, to another reservoir, or through a powerhouse). For most of the diversions, the potential to adversely affect stream or reservoir fish populations is low. However, some locations have a reasonable potential to affect fish populations. To assess existing entrainment conditions at these locations, Licensees conducted fish entrainment assessments in 2009 and 2010. The type of sampling employed at each diversion intake is described in Table 6.3.1-6, and the results of the sampling are discussed below by location. Except for the Dutch Flat No. 2 Conduit, refer to Licensees' Fish Entrainment Technical Memorandum (3-5) in Appendix E12 of this Exhibit E for a detailed discussion of fish entrainment. For fish entrainment into the Dutch Flat No. 2 Conduit, refer to Technical Memorandum 3-5 and the 2010 Dutch Flat No. 2 Entrainment Netting Technical Memorandum (3-15).

Table 6.3.1-6. Type of entrainment sampling by intake location for fish entrainment assessments conducted in 2009 and 2010.

Type of Sampling	Yuba-Bear Hydroelectric Project	Drum-Spaulding Project
Quantitative and Qualitative Fish Sampling in Streams Upstream of the Conduit Intake	Five feeder diversions to the Bowman-Spaulding Conduit: Texas, Fall and Rucker creeks (qualitative and quantitative sampling) and Clear and Trap creeks (qualitative sampling only)	--
Qualitative Fish Sampling in the Reservoir Upstream of Intake	--	Fordyce Lake
Net Sampling in the Canal	--	Lake Valley Canal Towle Canal
Electrofishing and Habitat/Passage Assessments in the Canal and the Surrounding Area	--	Bear River Canal
Acoustic Sampling in the Conduit	Milton-Bowman Conduit and Bowman-Spaulding Conduit	Drum Canal
Acoustic Sampling in the Conduit (2009) and Netting (2010)	Dutch Flat No. 2 Conduit	--
Extrapolation Based on Results of Dutch Flat No. 2 Flume Sampling	Chicago Park Flume	Dutch Flat No. 1 Tunnel

[3] CDFG defines "Trophy Trout Waters" as: "*Waters that have trout that exceed eighteen inches or greater in length and that are caught by anglers based on current survey information*." This only applies to cutthroat and rainbow trout not brown trout (CDFG 2010b).

Fordyce Lake

PG&E completed four planned and one modified single-beam hydroacoustic surveys near the upstream face of Fordyce Dam in 2009 (three daytime, two nighttime). The modified survey occurred during nighttime measurements due to safety concerns and had fewer transects. The daytime surveys showed little activity (measured as traceable objects), while the nighttime survey showed more activity. Table 6.3.1-7 shows the number of traceable object detections by depth during all five surveys. The traceable objects observed were generally in the upper 45 ft of water and not proximal to the low-level intake. Licensees Technical Memorandum 3-12, Reservoir Fish Populations Study, reported that rainbow, brown, brook, and cutthroat trout and Tui chub were collected in Fordyce Lake (Table 6.3.1-2); however, hydroacoustic surveys were not able to identify species, so species recorded as "detections" are unknown.

Table 6.3.1-7. Discrete object detections in Lake Fordyce in 2009 by survey and 5 meter depth bins. Water surface elevation at each survey is also presented for reference.

Depth (m)	June 15 (Day Survey) El. 6,384.9'	August 17 (Day Survey) El. 6,340.4'	August 17 (Night Survey) El. 6,340.4'	September 14 (Day Survey) El. 6,312.5'	September 14 (Night Survey) El. 6,312.5'	Total	%
0-5	0	6	23	0	217	246	11.0%
5-10	0	13	49	4	799	865	38.5%
10-15	0	6	22	15	1,081	1,124	50.1%
15-20	0	1	6	0	0	7	0.3%
20-25	0	0	2	0	0	3	0.1%
25-30	1	0	0	0	0	0	<0.1%

Dutch Flat No. 2 Intake

In 2009, NID's hydroacoustic sampling device in the Dutch Flat No. 2 intake recorded an average of 60.1 traceable objects per day. The sampling device monitored 24 hours a day, but select days (i.e., at approximate six day intervals) were sub-sampled and processed to determine an average rate of entrainment. The average rate calculated was then extrapolated to calculate an estimate of total fish entrained over the monitoring period. Extrapolation at Dutch Flat No. 2 equaled 7,212 traceable objects over the study period (~120 days). Upon review of hydroacoustic data, NID was doubtful of the reliability of the hydroacoustic results at this site. NID believed the traceable objects detected by the hydroacoustic equipment were false detections. There were two primary reasons for these false detections. First, the transducers were situated in such a way that they were unable to discern between the activity of fish milling behavior in front of the intake from fish actually being entrained into the intake. Second, the transducers had a very short linear distance with which to develop their acoustic signature due to the tight nature of the intake vault. As a result, the sonic waves must interact with a shaped concrete surface as they move downstream towards the intake gate within the vault, confounding real detections. NID believed these factors confused the hydroacoustic data collection system and the computer algorithm used to convert object traces to plausible fish detections. Therefore, NID concluded that use of the hydroacoustic results drastically overestimated the fish entrainment potential.

To address this issue, in 2010 NID deployed nets in the Dutch Flat No. 2 Flume. The nets were deployed on July 19 and fished each week for between 48 and 96 continuous hours through September 15, for a total of 551 hours over 59 days. The nets sampled the entire flow in the canal. In 551 hours of sampling, NID captured two brown trout and one rainbow trout, each one less than 150 mm FL, and one rainbow trout that appeared to have been dead for an extended period (i.e., the specimen was visibly desiccated). All the live fish were captured at night. Based on a catch rate of 0.005 fish/hr, estimated entrainment over the 59-day sampling period is 7.71 fish.

NID believes the 2010 netting data supports their position that the acoustics data grossly overestimated entrainment at this location. Using the netting survey data, about 7-8 fish are entrained in a 2-month period. In comparison, over the same months that netting occurred in 2010, the 2009 acoustics sampling estimated an entrainment rate of 2.50 fish/hr, for a total of 3,660 fish.

Chicago Park Flume Intake

The FERC-approved Fish Entrainment Study (Study 2.3.5) provided that NID would extrapolate the number of fish potentially entrained into the Chicago Park Flume Intake based on the results of the Dutch Flat No. 2 fish entrainment sampling (i.e., no direct sampling would occur at the Chicago Park Flow Intake). Due to the consistent nature of the diversion operations between Dutch Flat No. 2 Flume and Chicago Park Flume intakes, an extrapolation of estimated entrainment into Chicago Park Flume was performed on the basis of relative intake capacities and the number of fish collected in the Dutch Flat No. 2 Conduit during the entrainment netting in 2010. For the reasons described above, NID did not use the 2009 Dutch Flat No. 2 hydroacoustic monitoring data for the Chicago Park Flume extrapolation. Chicago Park Flume has a capacity of 1,100 cubic feet per second (cfs), which results in an extrapolation factor of 1.80 when compared to the capacity of the Dutch Flat No. 2 Flume (610 cfs) and the number of fish collected in the 2010 netting. Using this extrapolation factor results in an estimated entrainment over the 59-day sampling period of 13.88 fish in the Chicago Park Flume.

Dutch Flat No. 1 Tunnel Intake

The FERC-approved Fish Entrainment Study (Study 2.3.5) provided that PG&E would extrapolate the number of fish potentially entrained into the Dutch Flat No. 1 Tunnel Intake based on the results of the Dutch Flat No. 2 fish entrainment sampling (i.e., no direct sampling would occur at the Dutch Flat No. 1 Tunnel Intake). Due to the consistent nature of the diversion operations between Dutch Flat No. 2 Flume and Dutch Flat No. 1 Tunnel intakes, an extrapolation of estimated entrainment into Dutch Flat No. 1 Tunnel was performed on the basis of relative intake capacities and the number of fish collected in the Dutch Flat No. 2 Conduit during the entrainment netting in 2010. For the reasons described above, PG&E did not use the 2009 Dutch Flat No. 2 acoustic monitoring data for the Chicago Park Flume extrapolation. Dutch Flat No. 1 Tunnel has a capacity of 475 cfs, which results in an extrapolation factor of 0.78 when compared to the capacity of the Dutch Flat No. 2 Flume (610 cfs) and the number of fish collected in the conduit in 2010. Using this extrapolation factor results in an estimated entrainment over the 59-day sampling period of 6.01 fish in the Dutch Flat No. 1 Tunnel.

Milton-Bowman Conduit Intake

NID installed hydroacoustic devices at the intake of the Milton-Bowman Conduit. From May through August 2009, the devices recorded an average of 232.0 counts per day. The average was calculated from a subsample of analyzed days to calculate an overall average count. The average count, when extrapolated over the 120-day sampling period results in a total estimate of 27,840 counts (i.e., 232.0 counts times 120 days). The hydroacoustic devices are not able to discern species, but NID's sampling found rainbow trout, brown trout, and Sacramento sucker in the Middle Yuba River upstream of the diversion.

NID believes that the hydroacoustic devices significantly overestimated fish entrainment for a number of reasons. First, 2009 rainbow trout density in the Middle Yuba River 0.9 mile upstream and 1.2 miles downstream of the Milton-Bowman Conduit Intake were almost identical - 1,738.9 fish per mile and 1,731.9 fish per mile, respectively, indicating similar rainbow trout populations upstream and downstream of the intake. If over 27,000 fish were entrained into the intake, one would expect the upstream and downstream populations to be quite different.

Second, using NID's 2008 and 2009 fish population estimates, the total fish populations (e.g., rainbow trout, brown trout, and Sacramento sucker) in the 1.6 mile-long section of the river between Jackson Meadows Dam and the diversion intake ranges between 2,740 and 4,224 fish. Using the hydroacoustic device, over 27,000 fish are entrained - 7 to 9 times greater than the population in the stream. This seems unlikely.

Third, as described below, in Dutch Flat No. 2 Flume where Licensee had a similar concern and which is conducive to netting unlike the Milton-Bowman Conduit, NID found the hydroacoustics devices likely overestimated entrainment by a factor of about 460. While one cannot extrapolate directly, if the same bias was applied to the Milton-Bowman Conduit hydroacoustic sampling, the number of fish entrained in the sampling period would be closer to 60 fish (rather than 27,840).

Fourth, and the primary reason for the unrealistically high number of discrete detections, is the hydroacoustic transducers were placed in front of the intake and aimed across the leading edge of the intake into a slow water zone where fish mill in search of invertebrate food, as it is funneled and slowly drifts toward the intake. Trout are readily observed milling in this location during daylight hours from late spring through fall. The transducers were located and aimed in this manner due to challenging site conditions. Licensee was aware of a potential multiple-count error and relied on a post-processing algorithm to eliminate or minimize the multiple-count error. Licensee does not believe the algorithm performed as consistently and as accurately as it was intended.

Bowman-Spaulding Conduit Intake

In the Bowman-Spaulding Conduit, NID's acoustic sampling device recorded an average of 9.2 counts per day from subsampled monitoring data. Extrapolating the calculated average over the 120-day monitoring period (May through August 2009) resulted in a total of 1,104 counts. Hydroacoustic surveys were not able to identify fish species. As reference, based on Licensees' Technical Memorandum 3-5, Stream Fish Populations, rainbow trout populations in Canyon Creek 2.6 miles downstream of the Bowman-Spaulding Conduit Intake were 842.7 fish per mile. A comparison to upstream fish populations cannot be made since Bowman Lake, which is heavily stocked with fish, is immediately upstream of the intake. Bowman-Spaulding Conduit discharges into PG&E's Fuller Lake, which is also heavily stocked with fish.

Bowman-Spaulding Conduit Feeder Tributaries

Fish sampling on Clear and Trap creeks, two of the feeder tributaries to the Bowman-Spaulding Conduit, did not occur because the creeks were dry, which is typical in the late summer and early fall of most years. Late summer/early fall flows in Texas, Fall, and Rucker creeks are low, ranging from less than 1 cfs to a few cfs. Each of these creeks receives inflow from one or more small upstream reservoirs that are part of the Drum-Spaulding Project: Upper and Lower Rock lakes on Texas Creek, Carr and Feeley Lake on Fall Creek, and Blue and Rucker lakes on Rucker Creek. Without these contributions, Texas, Fall, and Rucker creeks may also be dry during late summer and early fall of drier than normal water years. NID found rainbow trout and brown trout populations in each of Texas, Fall, and Rucker creeks upstream of the Bowman-Spaulding Conduit. Green sunfish (*Lepomis cyanellus*) was also collected in Rucker Creek. The highest populations of rainbow trout occurred in Fall Creek (1,943 rainbow trout per mile), followed by Texas Creek (1,242 rainbow trout per mile), and Rucker Creek (208 rainbow trout per mile). Downstream of the Bowman-Spaulding Conduit, the gradient of these three creeks increases drastically from about 4-17 percent to 25-57 percent, and two of the creeks – Texas and Rucker - were dry as compared to a flow of 1 to 2 cfs flow upstream of the conduit. Rainbow trout were found in Fall Creek below the conduit (flow <1 cfs) at a density of 413 fish per mile.

Drum Canal

In the Drum Canal, PG&E conducted hydroacoustic sampling from April 23 through August 26, 2009. The sampling device monitored 24 hours a day, but data were processed for every sixth day or a nearby day if that specific day was not available and processed to determine an average rate of entrainment. Table 6.3.1-8 presents a summary of the hydroacoustic data averaged by month. The hydroacoustic sampling device recorded an overall extrapolated average of 28.1 counts per day. This equaled 3,372 counts when extrapolated over the 120-day period monitored from April through August 2009. Hydroacoustic surveys were not able to identify fish species. Fish species reported to occur in Drum Forebay include rainbow trout, brook trout, arctic grayling, common carp, golden shiner, redear sunfish, green sunfish, and bluegill (Table 3.1.1-1).

Table 6.3.1-8. Hydroacoustic survey results for Drum Canal in 2009.

Date	# of Days Sample Data Were Processed in the Month	Side aspect length < 6”		Side aspect length > 6”		Total	
		Avg. No. of Objects (Detected)	Avg. No. of Objects (Extrapolated)	Avg. No. of Objects (Detected)	Avg. No. of Objects (Extrapolated)	Avg. No. of Objects (Detected)	Avg. No. of Objects (Extrapolated)
April	2	0.5	1.5	0	0	0.5	1.5
May	5	2	7.4	0.2	0.8	2.2	8.2
June	4	0.25	0.75	0	0	0.25	0.75
July	5	4.8	20.6	13.4	55.2	18.2	75.8
August	5	2.4	7	7.2	26	9.6	33

Lake Valley Canal

PG&E conducted fish entrainment sampling in Lake Valley Canal over a 77 day period from May 5 to June 12, from September 9 to September 18, and October 5 to November 13, 2009. The canal was sampled with a fyke net installed in the canal immediately downstream of the diversion dam. The entire canal flow was sampled 24 hours per day generally four days per week during the sampling periods, resulting in 1,015 hrs or 42.3 days of sample effort. The canal was taken out of service for a typical seasonal outage from June 13 to September 8 and September 19 to October 4; no sampling was conducted during these periods. A total of 19 fish consisting of five species were collected, which equates to 0.45 fish per day. The five species consisted of brown trout (5), green sunfish (5), rainbow trout (3), brown bullhead (3), and golden shiner (3). The rainbow trout catch consisted of two adult fish and one juvenile fish. Assuming that on average 0.45 fish per day were entrained over the days that were monitored and 16 percent of the fish entrained are rainbow trout, the total extrapolated entrainment over a 120-day period would be nine rainbow trout. Total estimated entrainment over this 120-day period for the other species would have been about 45 fish: 14 brown trout, 14 green sunfish, 9 brown bullhead, and 9 golden shiner (note, this list sums to 46 due to rounding). The total extrapolated entrainment for all fish species for a 120-day period was 54 fish.

Towle Canal

PG&E conducted fish entrainment sampling in Towle Canal over a 126 day period from May 5 to May 16, 2009, and from May 28 to September 16, 2009. The canal was sampled with a fyke net installed in the canal immediately downstream of the diversion dam. The entire canal flow was sampled 24 hours per day generally four days per week during the sampling periods, resulting in 1,621 hrs or 67.5 days of sample effort. The canal was taken out of service for a typical seasonal outage from May 17 to May 27; no sampling was conducted during this period. A total of 141 fish consisting of two species were collected, which equates to 2.1 fish per day. The two species were rainbow trout (8) and brown trout (133). The rainbow trout catch consisted of one adult, one juvenile, and 6 young-of-the-year fish. Assuming that on average 2.1 fish per day were entrained over the days that were monitored and about 5.7 percent of the fish entrained are rainbow trout, the total extrapolated entrainment over a 120-day period would be 14 rainbow trout. Total estimated entrainment over this 120-day period for brown trout would have been about 238. The total extrapolated entrainment for all fish species for a 120-day period was 252 fish.

Bear River Canal

PG&E sampled fish in the Bear River Canal in both 2008 and 2009, and found primarily rainbow trout (93 percent and 97 percent of the catch in 2008 and 2009, respectively). Other species caught in 2008 and 2009 were brown trout (total of 74), smallmouth bass (1), channel catfish (1), and brown bullhead (1). In October of 2010, PG&E and NID sampled the outfall pool below Rollins Reservoir powerhouse during an outage and only collected rainbow trout (total of 13). Results of PG&E's Bear River Canal and outfall pool sampling, in conjunction with the stream and reservoir fish population sampling above and below Bear River Canal, indicate that the population of rainbow trout in Bear River Canal is the result of reproduction in the canal and not due to entrainment into the Bear River Canal. Velocities in the low-level gate release below the canal are too great for fish to move upstream into the canal. Results of fish population sampling in Rollins Reservoir upstream of Bear River Canal indicate that the potential for rainbow trout to be entrained through the reservoir intake is low: only one adult rainbow trout was found in the reservoir and no juvenile or smaller rainbow trout were found in the reservoir. Further, the amount of stream habitat between Rollins Powerhouse tailrace and Bear River Canal Intake is very short and does not contain habitat that could produce the number of fish found in the canal. Further sampling within that habitat produced relatively few fish, which were all rainbow trout. There are no tributaries flowing into the canal that could be a significant source of rainbow trout.

6.3.1.1.5 Fish Stranding

The only issue raised regarding fish stranding during the relicensings was CDFG stating it had reports of dead fish in the Jackson Meadows Dam spillway and in the Rollins Dam spillway after late spring spills at the reservoir. As described above, NID inspected both spillways in May 2009 after spills and found one fish mortality: an adult trout in a deep pool near the concrete spillway outfall into the Jackson Meadows Dam spill channel.

6.3.1.1.6 Fish Passage Barriers

Licensees found two historic studies regarding potential fish passage barriers in the Middle Yuba River and South Yuba River. In 2002, Vogel used aerial video taken by helicopter for initial barrier assessment of the mainstem of the Middle and South Yuba rivers upstream of USACE's Englebright Reservoir. In August 2003 and 2005, Vogel conducted field assessments of the potential barriers identified from the helicopter video. In general, Vogel applied the physical parameters of Powers and Osborn (1985) to determine how each potential barrier may affect upstream steelhead and salmon passage for spawning in spring. Based on this, Vogel identified four potential natural barriers in the mainstem of the Middle Yuba River between YCWA's Our House Diversion Dam and Milton Diversion Dam, and 14 barriers in the mainstem of the South Yuba River. Vogel considered low flows to be in the order of less than 100 to 200 cfs. The potential barriers identified by Vogel are described in Tables 6.3.1-9 and 6.3.1-10.

Table 6.3.1-9. Potential barriers to upstream passage by salmon and steelhead in the mainstem of the Middle Yuba River between YCWA's Our House Diversion Dam[1] and Milton Diversion Dam as identified by Vogel (2006).

Location (River Mile)	Feature	Comments
32.9	low-flow barrier	est. falls 8-10 feet high, plunge pool appears to have some blocking boulders, may be a low-flow barrier to salmon and steelhead but not a high-flow barrier
34.4	low & high-flow barrier	possible low-flow barrier to salmon and steelhead, falls appears about 8-10 feet high, probably a high-flow barrier
37.9	low-flow barrier	very difficult to see but appear falls may be at least 10 feet tall, probably low-flow barrier to salmon and steelhead but not high-flow barrier
38.9	low-flow barrier	very difficult to see but appear falls may be at least 10 feet tall, probably low-flow barrier to salmon and steelhead but not high-flow barrier

[1] YCWA's Our House Diversion Dam occurs at River Mile 12.4.

Table 6.3.1-10. Potential barriers to upstream passage by salmon and steelhead in the mainstem of the South Yuba River between USACE's Englebright Reservoir and Spaulding Dam as identified by Vogel (2006).

Location (River Mile)	Feature	Comments
5.1	low-flow barrier	est. height about 9 feet, complex falls/cascades over large boulders/bedrock with poor plunge pool, possible low-flow barrier but not high-flow barrier
5.9	low-flow barrier	site visit, 9.5-ft height, boulder at critical location in plunge pool, low-flow barrier but not high-flow barrier
19.6	low-flow barrier	site visit, low-flow barrier, not a barrier during high flows, measured height of 8 feet
35.4	low- & high-flow barrier	site visit, two falls, lower fall 13 feet, upper fall 7.5 feet, lower plunge pool very deep, depth of second plunge pool undetermined, both low and high-flow barrier
36.0	low- & high-flow barrier	site visit, measured height 17 feet, total (low and high-flow) barrier
37.9	low- & high-flow barrier	est. height more than 10 feet, poor plunge pool, cascades over bedrock, est. total barrier
38.4	low- & high-flow barrier	est. height of lower falls 15 feet, upper falls, 10 feet, total barrier
39.4	low- & high-flow barrier	est. height over 15 feet, poor plunge pool, total barrier
39.4	low- & high-flow barrier	est. height over 15 feet, poor plunge pool, falls and cascades over bedrock, total barrier
39.5	low- & high-flow barrier	est. height over 15 feet, poor plunge pool, falls and cascades over bedrock, total barrier
39.6	low- & high-flow barrier	est. height over 10 feet, total barrier
39.6	low- & high-flow barrier	est. height over 10 feet, total barrier
39.6	low- & high-flow barrier	complex series of falls est. height over 15-20 feet, cascades over bedrock, total barrier
39.8	low- & high-flow barrier	est. height over 10 feet, total barrier

In August and September 2004, Gast et al. (2005) conducted surveys in principal tributaries to the Middle Yuba River (i.e., Kanaka and Wolf creeks) and South Yuba River (i.e., Spring Creek, Humbug, Owl, Poorman, and McKilligan creeks). Surveys were conducted in the tributaries 1,000 to 2,000 feet upstream of the mainstem or to the first impassable fish barrier, whichever was encountered first. Gast et al. (2005) found potential natural barriers on five of the seven tributaries. These were Kanaka, Owl, Spring, Humbug, and McKilligan creeks.

To supplemented historic information, in 2008 and 2009 performed a study to identify and qualitatively assess potential barriers to upstream passage of resident adult rainbow trout in: 1) 10 tributaries within the normal maximum water surface elevation of six Project reservoirs; 2) 15 tributaries to the Middle Yuba, South Yuba, and Bear rivers; and, 3) mainstem sections of the Bear River (Bear River above Drum Afterbay), upper Auburn Ravine, and Dry Creek. A barrier was considered a single vertical rise of 3 feet in height or greater, or a thalweg depth of less than

0.3 foot for an extended distance (i.e., sheet flow for about 3 feet) (NID and PG&E 2010f). Refer to Licensees' Fish Passage Technical Memorandum (3-4) in Appendix E12 of this Exhibit E for a detailed discussion of study results.

As many as three potential barriers each were found within the lower 0.5 mile on most of the tributaries to the Middle Yuba and South Yuba rivers that were assessed. Potential barriers were found on East Fork, Bear, Wolf, Moores Flat, Bloody Run, and Indian creeks, which are tributaries to the Middle Yuba River. On tributaries to the South Yuba River, potential barriers were found on Canyon, Jefferson, Fish, Spring, and Missouri Canyon creeks. No barriers were found on Washington and Poorman creeks, tributaries to the South Yuba River, or on Steephollow Creek, a tributary to the Bear River.

No fish passage barriers were found in the tributaries within the normal maximum water surface elevations of the four Yuba-Bear Hydroelectric Project reservoirs surveyed. Potential barriers were found in two of the three tributaries within the normal maximum water surface elevations at the two Drum-Spaulding Project reservoirs surveyed (South Yuba River, tributary to Lake Spaulding, and North Creek, tributary to Fordyce Lake).

Licensees found potential natural barriers to fish passage in the mainstem of the Bear River upstream of Drum Afterbay and in upper Auburn Ravine. In the Bear River above Drum Afterbay 22 potential barriers were found between RM 28.3 and 32.2. In Auburn Ravine above PCWA's Auburn Ravine Tunnel three potential barriers were found between RM 26.5 and 27.3. No potential natural barriers to fish passage were found in the mainstem of Dry Creek, except for one beaver dam.

In 2010, Licensees began an assessment of a potential man-made barrier – an abandoned diversion dam (non-project) - on the South Yuba River at RM 9.7. Based on Licensees' measurements at low and middle calibration flows and of required leaping height, Licensees' preliminary assessment is that the abandoned diversion dam is not passable upstream to resident rainbow trout at flows of approximately 65 cfs (low flow) and 115 cfs (middle flow). Due to low flow conditions (60 cfs), and in the interest of completing the fish passage barrier assessments early in 2011, Licensees' conducted an additional field assessment and reconnaissance of two potential natural barriers at RM 5.1 and RM 5.9 at a low flow of 60 cfs in October 2010. Initial survey results indicate that at 60 cfs the RM 5.1 cascade is likely a barrier to resident rainbow trout. The potential barrier at RM 5.9 was observed and photographed from a helicopter at low elevation. The field observations and photographs reveal little evidence for a barrier to resident trout. Refer to Licensees' Fish Barriers Technical Memorandum (3-16) in Appendix E12 of this Exhibit E for a detailed discussion of study results to date.

While there are several potential barriers to upstream passage (primarily during low flows) in Western Placer County streams, none of those barriers are a result of the Drum-Spaulding Project. The Drum-Spaulding Project does not have any facilities on Lower Auburn Ravine, including any facilities that would serve as a barrier to anadromous fish. Prior habitat surveys in Lower Auburn Ravine conducted by Placer County (2002) found five barriers not associated with the Drum-Spaulding Project ranging from RM 11.3 to 26.4. Dry creek also has numerous diversion dams that form physical barriers over 2.5 feet high, and create backwater deposits and ponds that are also not associated with the Drum-Spaulding Project. Refer to PG&E's Western Placer County Streams Technical Memorandum (3-13) for a description of barriers in western Placer County streams potentially affected by the Drum-Spaulding Project.

6.3.1.1.7 Distribution of Stream Fish as Related to Water Temperature

General Distribution

As described in Section 6.3.1.1.3, Licensees found that trout were the dominant fish species in most project-affected stream reaches, with a shift to warmer water species (e.g., Sacramento sucker) in the lower elevation portions of the Middle Yuba River, South Yuba River and Bear River. The primary reason for this transition can be ascribed to water temperature. Based on Licensees' Technical Memorandum (2-2) Water Temperature Monitoring and Technical Memorandum Water Temperature Modeling (2-3), water temperature in the vicinity of the higher elevation projects' facilities is generally cold (i.e., mean daily water temperature of less than 20°C), with warming occurring in the lower portions of the Middle and South Yuba rivers, and to a lesser extent in the lower portions of the Bear River. Licensees found that mean daily water temperatures in the Middle Yuba River at YCWA's Our House Diversion Dam can be as high as 25°C, and in the South Yuba River the temperature of the inflow water into USACE's Englebright Reservoir are as high as 26°C. Mean daily water temperatures in the Bear River near the inflow to Lake Combie were generally 20°C or less. Refer to Section 6.2, Water Resources, for a detailed description of water temperature in project-affected stream reaches, including a description of Basin Plan water quality objectives.

Poorman Creek Refugia Investigation

As reported in Licensees' Fish Populations Technical Memorandum (3-1), Licensees performed a focused investigation into the potential for Poorman Creek to provide a thermal refuge for trout in the South Yuba River during normally hot summer weather conditions that warm the mainstem (NID and PG&E 2010d). The investigation consisted of two quantitative snorkeling surveys. The first survey was conducted in June 2008 when Poorman Creek and the South Yuba River in the vicinity of Poorman Creek were expected to be cool and relatively comparable in temperature. The second survey was conducted in August 2008 when stream temperatures in Poorman Creek were expected to be cool in relation to temperatures in the mainstem. On the days of the surveys, Poorman Creek was approximately 4°C cooler than the South Yuba River below Poorman Creek in June and August. Rainbow trout population estimates (i.e., all age classes observed) in the South Yuba River ranged from 2,367 to 441 trout/mi between the first and second survey. Estimates of rainbow trout in Poorman Creek ranged from 1,171 trout/mi in the first survey to 889 trout/mi in the second survey. A temperature recorder in the South Yuba River just above Poorman Creek showed that mean daily water temperatures in late June during the surveys were about 20°C whereas in late August during the surveys the mean daily water temperatures were about 22°C. A temperature recorder in Poorman Creek showed that mean daily water temperatures were about 16°C in late June and ranged from about 18 to 20°C throughout July and August.

There are several factors that may have resulted in the differences of fish populations between two surveys in the South Yuba River. Increases in water temperature, predation, fishing pressure, and observer ability, are a few potential factors that may have affected the numbers of fish observed between the surveys. The purpose of the Poorman Creek refugia assessment was to determine if trout were moving into the tributary during the summer when temperatures increased in the South Yuba River. The study findings suggest that rainbow trout were not moving from the mainstem South Yuba River to tributary habitat in Poorman Creek. Refer to Licensees' Stream Fish Populations Technical Memorandum (3-1) for a more detailed description of Licensee's Poorman Creek refugia assessment.

6.3.1.1.8 Fish Habitat-Flow Relationships

In 2008 and 2009, Licensees conducted instream flow studies on 52 stream reaches potentially affected by the projects. The location of the instream flow studies by the type of methods used, which are described below, are shown in Figure 6.3.1-1. Refer to Licensees' Instream Flow Technical Memorandum (3-2) in Appendix E12 of this Exhibit E for additional discussion.

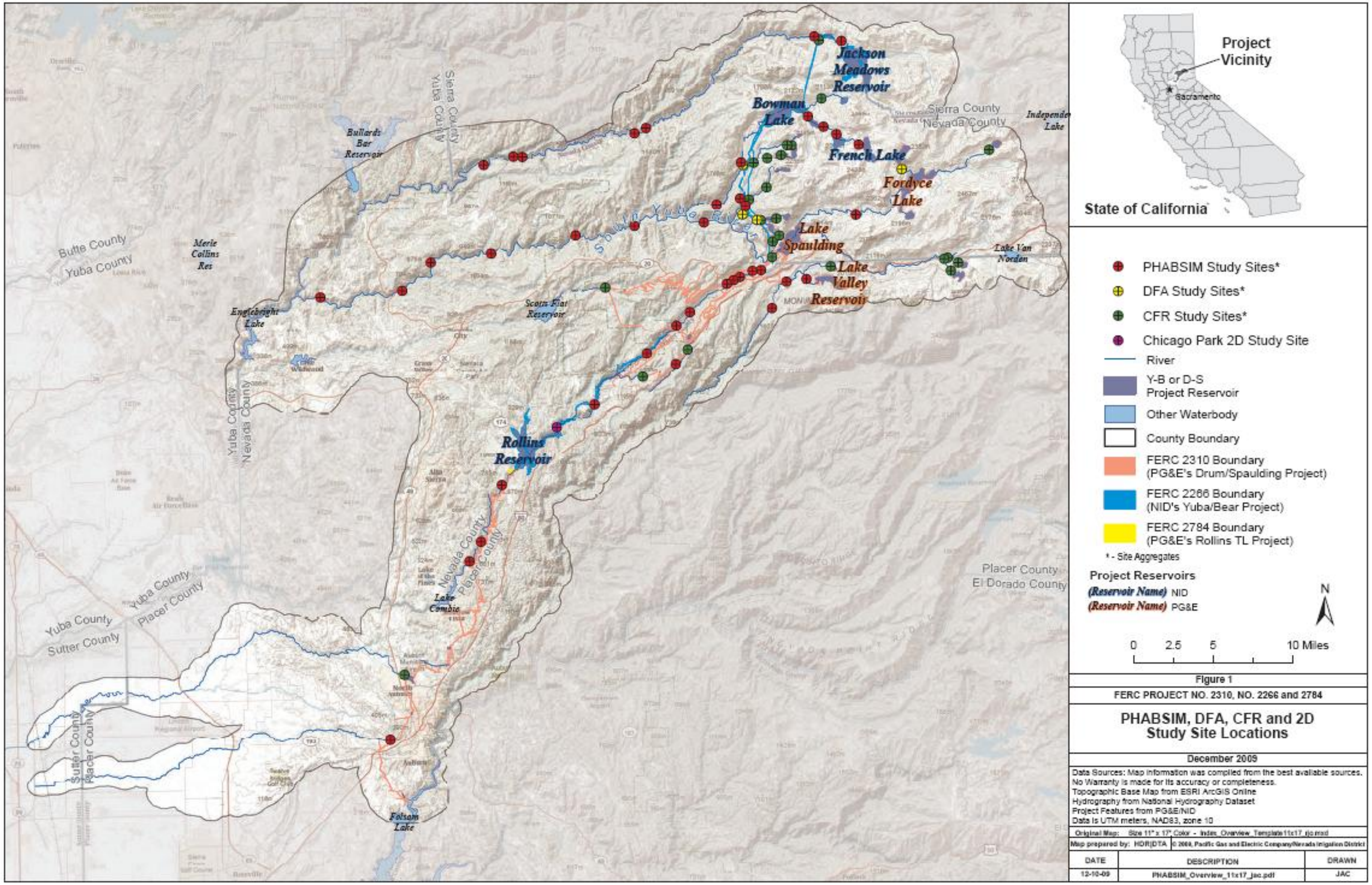

Figure 6.3.1-1. Map of instream flow studies by method used.

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1D PHABSIM and 2D Flow/Habitat Models

For 20 of the 52 stream reaches, Licensees developed flow-habitat relationships using the one-dimensional (1-D) Physical Habitat Simulation model (PHABSIM) and the River2D Habitat Simulation model by Steffler and Blackburn (2002). Table 6.3.1-11 lists the 20 reaches including target fish species. The models used one or more of three sets of rainbow trout juvenile and adult HSCs based on stream size: "large," "medium," and "small." Spawning rainbow trout Habitat Suitability Criteria (HSC) were also used. Where applicable, the models used HSC for adult and juvenile Sacramento sucker and a combined HSC for Sacramento pikeminnow/hardhead.

Table 6.3.1-11. Project-affected stream reaches and target species where 1D or 2D habitat simulation was applied.

Stream	Reach Name	Number of Sub-Reaches for PHABSIM or River2D Modeling Purposes	Stream Size for Adult and Juvenile Rainbow Trout HSC	Target Species and Life Stages[1]
1D PHABSIM HABITAT SIMULATION MODEL				
Middle Yuba River	Jackson Meadows Dam	1	Medium	Rainbow Trout
	Milton Diversion Dam	3	Medium – Upper Milton Sub-reach Large - Wolf and Kanaka Sub-reaches	Rainbow Trout, Sacramento Sucker, and Sacramento Pikeminnow in the entire reach and Hardhead in Kanaka Sub-reach only.
Canyon Creek (tributary to South Yuba River)	French Lake Dam	1	Medium	Rainbow Trout
	Faucherie Lake Dam	1	Small	Rainbow Trout
	Sawmill Lake Dam	1	Medium	Rainbow Trout
	Bowman-Spaulding Diversion Dam	1	Medium	Rainbow Trout
Clear Creek	Clear Creek Diversion	1	Small	Rainbow Trout
Fall Creek	Fall Creek Diversion Dam	1	Small	Rainbow Trout
Fordyce Creek	Fordyce Lake Dam	1	Medium	Rainbow Trout
South Yuba River	Jordan Creek Reach (includes South Yuba River from Lake Spaulding Dam to Englebright Reservoir)	4	Large	Rainbow Trout, Sacramento Sucker, and Sacramento Pikeminnow in the entire reach and Hardhead in Humbug Sub-reach only.
Bear River	Bear River #1[3]	1	Small	Rainbow Trout
	Bear River #2[3]	1	Small	Rainbow Trout
	Drum Afterbay Dam	1	Medium	Rainbow Trout
	Dutch Flat Afterbay Dam	1	Medium	Rainbow Trout
	Bear River Canal Diversion Dam	2	Large	Rainbow Trout, Sacramento Sucker and Sacramento Pikeminnow.
North Fork of North Fork American River	Lake Valley Reservoir Dam	1	Small	Rainbow Trout
	Lake Valley Canal Diversion Dam	1	Medium	Rainbow Trout and Sacramento Sucker
Canyon Creek (tributary to North Fork of North Fork American River)	Towle Canal Diversion Dam	1	Small	Rainbow Trout
Upper Auburn Ravine	Wise Powerhouse Overflow	1	Small	Rainbow Trout, Sacramento Sucker, Sacramento Pikeminnow and Hardhead
Subtotal	*19*	*25*	--	--

Table 6.3.1-11. (continued)

Stream	Reach Name	Number of Sub-Reaches for PHABSIM or River2D Modeling Purposes	Stream Size for Adult and Juvenile Rainbow Trout HSC	Target Species and Life Stages[1]
RIVER2D HABITAT SIMULATION MODEL				
Bear River	Chicago Park Powerhouse[2]	1	Large	Rainbow Trout, Sacramento Sucker and Sacramento Pikeminnow.
Subtotal	*1*	*1*	--	--
Total	**20**	**26**	--	--

[1] Four life stages of rainbow trout were targeted: fry, spawning, juvenile and adult. For Sacramento sucker and Sacramento pikeminnow/hardhead each, two life stages were targeted: juvenile and adult.
[2] A 1D PHABSIM model was not conducted for the Chicago Park Powerhouse Reach because, as a daily peaking operation, it is not conducive to such an analysis.
[3] With regard to Bear River Reaches #1 and #2, PG&E does not divert water from these reaches, and, aside from a stream gage, PG&E does not have any Project facilities in these reaches. PG&E believes that in the Proposed Projects, Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches with NID because water from both projects is anticipated to be periodically moved through the reaches as is currently the case. NID disagrees with PG&E for three reasons. First, NID's Yuba-Bear Hydroelectric Project has no facilities in this section of the Bear River. Second, under historic as well as current conditions, PG&E at its sole discretion and without request by NID, releases water from Drum Canal into the Bear River at RM 35.3. Third, at this time, NID has made no decision regarding whether releases from the Drum Canal into the Bear River at RM 35.3 might be beneficial to NID in the future, and has not requested that PG&E include such releases in PG&E's application for a new Drum-Spaulding Project license.

In order to develop weighted usable area (WUA) verses flow down to the proposed minimum discharge for some reaches or sub-reaches, Licensees needed to extrapolate beyond the normal 40 percent of the lowest calibration flow. This occurred in five of 19 1D PHABSIM reaches: 1) Bowman-Spaulding Diversion Dam Reach, 2) Fordyce Dam Reach, 3) Lake Valley Canal Diversion Dam Reach, 4) Lake Valley Reservoir Dam Reach, and 5) Jordan Creek Reach of the South Yuba River. In these cases, Licensees used a linear extrapolation from the 40 percent limit to zero habitat. In the Bowman-Spaulding Diversion Dam Reach, Lake Valley Canal Diversion Dam Reach and Lake Valley Reservoir Dam Reach each, this extrapolation was less than 1.5 cfs. For Fordyce Dam and Jordan Creek reaches, the amount of extrapolation beyond the 40 percent limit was 5.8 and 5.0 cfs, respectively. The method used to extrapolate to the lowest calibration flow and the amount of extrapolation in cfs each of the 19 1D PHABSIM reaches are shown in Table 6.3.1-12.

Table 6.3.1-12. Amount and method of extrapolation downward for 1D PHABSIM reaches.

1D PHABSIM Reach	Extrapolated Discharge	Licensees" Minimum Proposed Discharge	Extrapolation Method if Needed
Jackson Meadows Dam Reach	4.0	10.0	None
Milton Diversion Dam Reach	1.5	3.0	None
French Lake Dam Reach	2.0	5.0	None
Faucherie Lake Dam Reach	2.3	5.0	None
Sawmill Lake Dam Reach	3.0	5.0	None
Bowman- Spaulding Diversion Dam Reach	4.0	3.0	Linear
Clear Creek Diversion Dam Reach	0.8	None	--
Fall Creek Diversion Reach	1.1	0.2	Linear
Fordyce Lake Dam Reach	10.8	5.0	Linear
Jordan Creek Reach (South Yuba River)	10.0	5.0	Linear
Bear River Reach #1	1.0	Natural Flow	--
Bear River Reach #2	4.0	5.0	None

Table 6.3.1-12. (continued)

1D PHABSIM Reach	Extrapolated Discharge	Licensees" Minimum Proposed Discharge	Extrapolation Method if Needed
Drum Afterbay Dam Reach	5.0	5.0	None
Dutch Flat Afterbay Dam Reach	5.0	5.0	None
Bear River Canal Diversion Dam Reach	10.0	15.0	None
Lake Valley Reservoir Dam Reach	1.5	1.0	Linear
Lake Valley Canal Diversion Dam Reach	3.3	1.0	Linear
Towle Diversion Dam Reach	0.5	1.0	None
Wise Powerhouse Overflow Reach	1.0	Natural Flow	--

Provided below, as related to each Project, are the WUA versus flow curves for each of the reaches and sub-reaches.

6.3.1.1.8.1 Yuba-Bear Hydroelectric Project

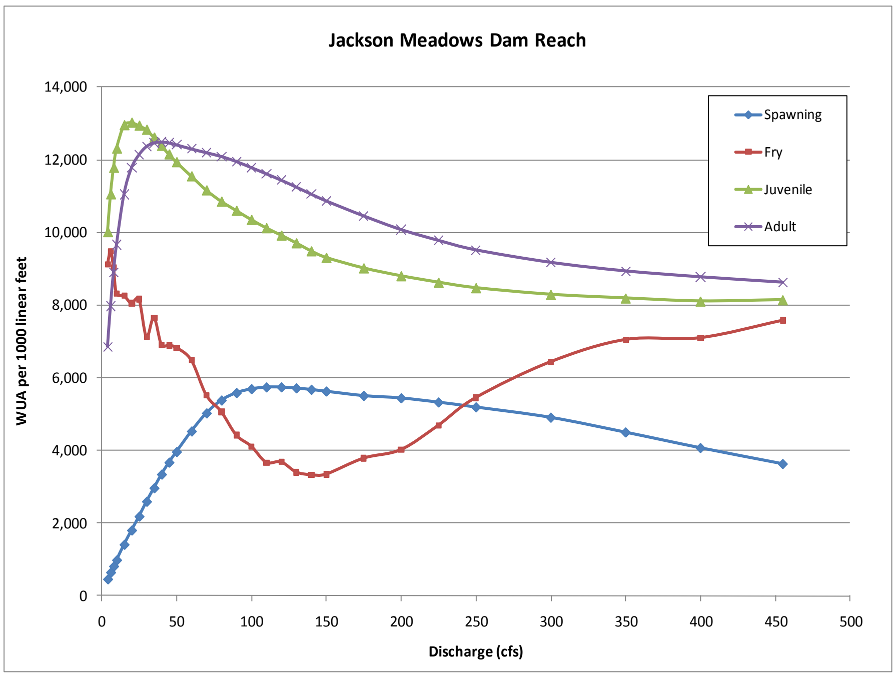

Figure 6.3.1-2. Modeled habitat suitability index (WUA) for rainbow trout, Jackson Meadows Dam Reach, Middle Yuba River.

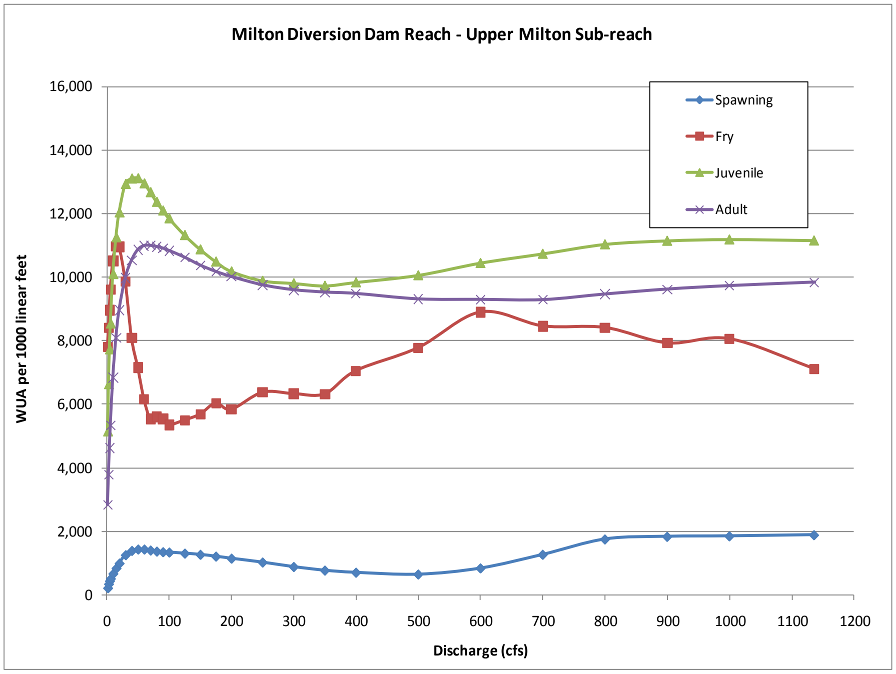

Figure 6.3.1-3. Modeled habitat suitability index (WUA) for rainbow trout, Milton Diversion Dam Reach, Upper Milton Sub-Reach, Middle Yuba River.

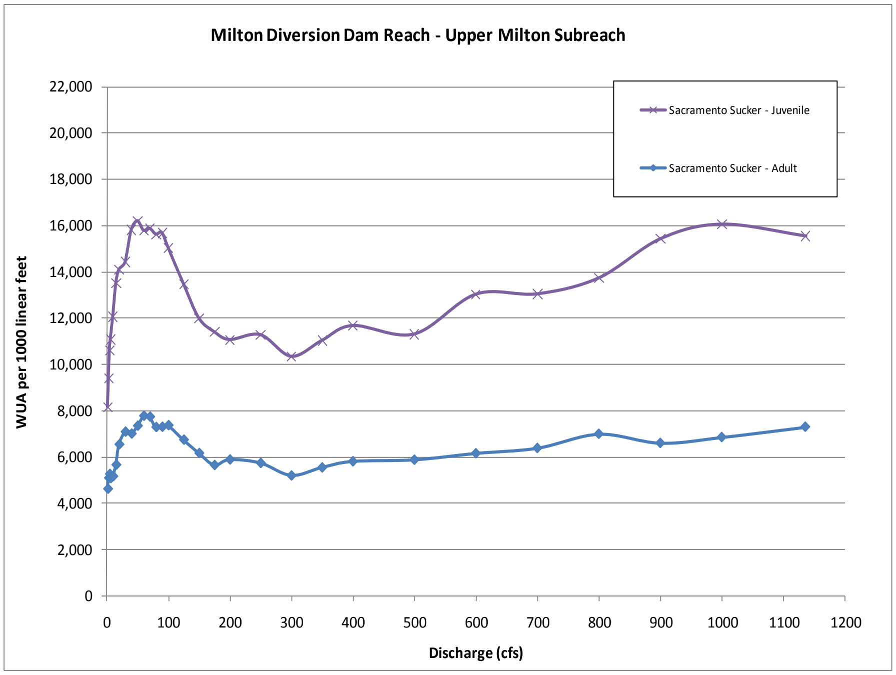

Figure 6.3.1-4. Modeled habitat suitability index (WUA) for Sacramento sucker, Milton Diversion Dam Reach, Upper Milton Sub-Reach, Middle Yuba River.

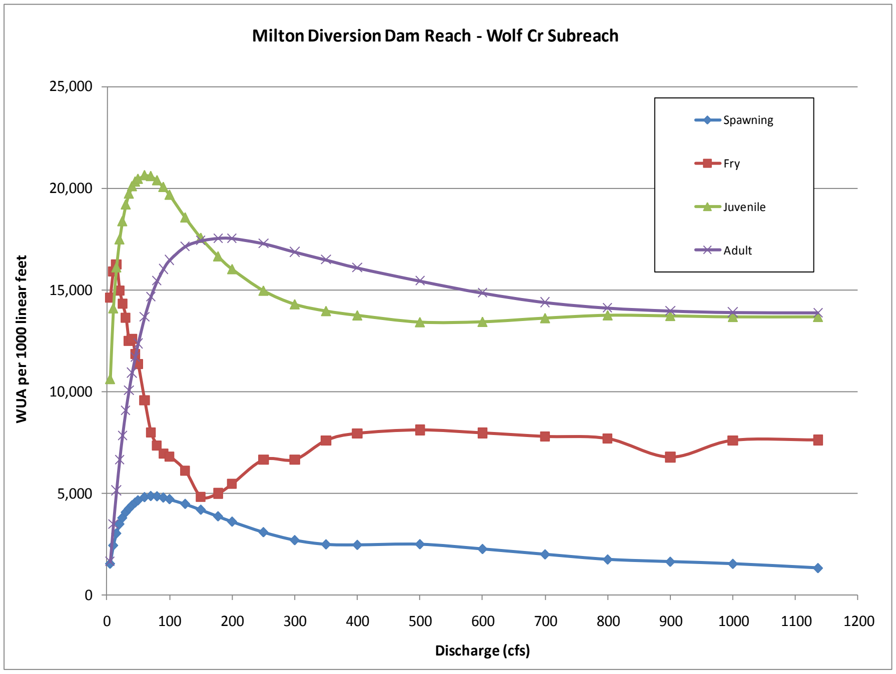

Figure 6.3.1-5. Modeled habitat suitability index (WUA) for rainbow trout, Milton Diversion Dam Reach, Wolf Creek Sub-Reach, Middle Yuba River.

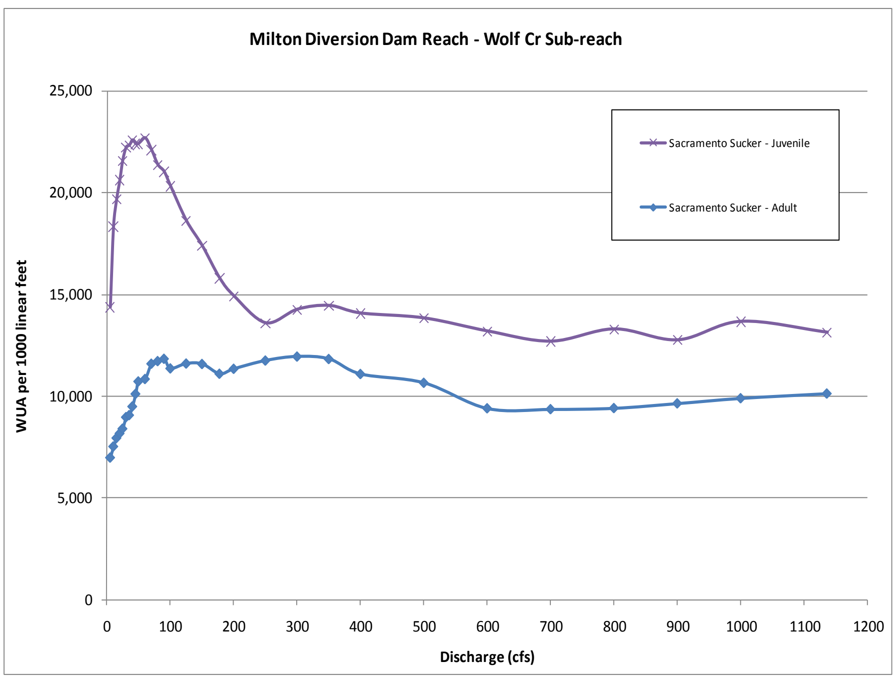

Figure 6.3.1-6. Modeled habitat suitability index (WUA) for Sacramento sucker, Milton Diversion Dam Reach, Wolf Creek Sub-Reach, Middle Yuba River.

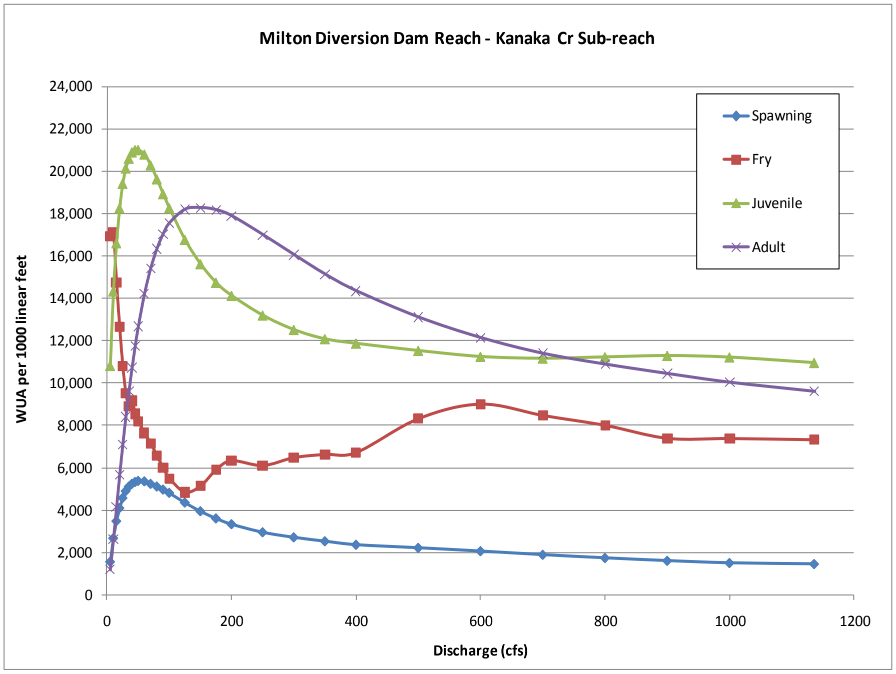

Figure 6.3.1-7. Modeled habitat suitability index (WUA) for rainbow trout, Milton Diversion Dam Reach, Kanaka Creek Sub-Reach, Middle Yuba River.

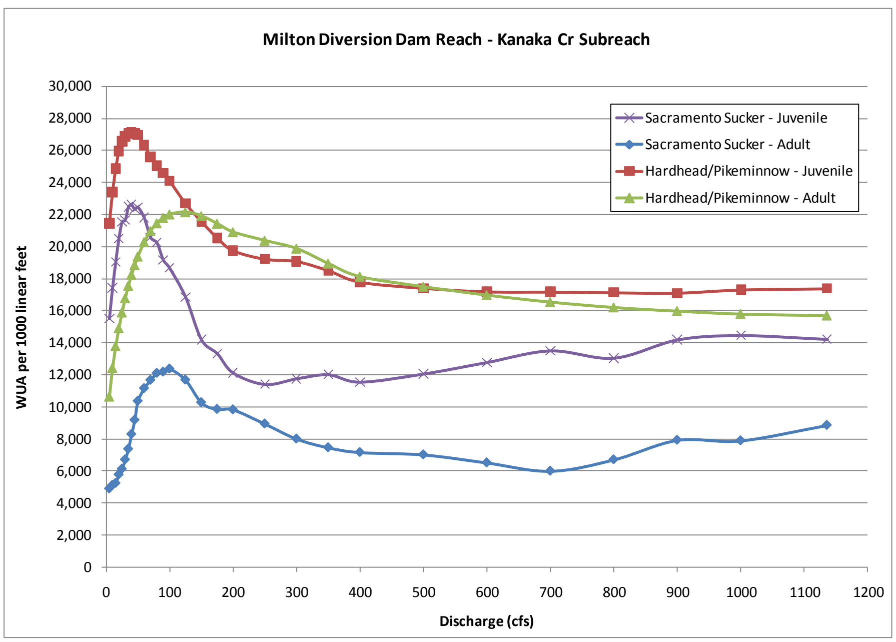

Figure 6.3.1-8. Modeled habitat suitability index (WUA) for Sacramento sucker, Milton Diversion Dam Reach, Kanaka Creek Sub-Reach, Middle Yuba River.

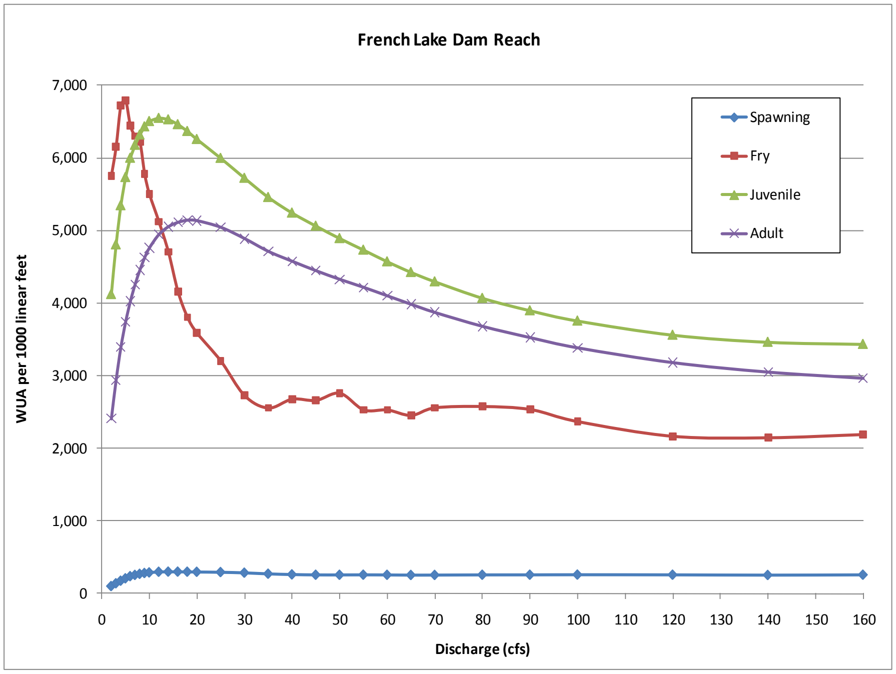

Figure 6.3.1-9. Modeled habitat suitability index (WUA) for rainbow trout, French Lake Dam Reach, Canyon Creek.

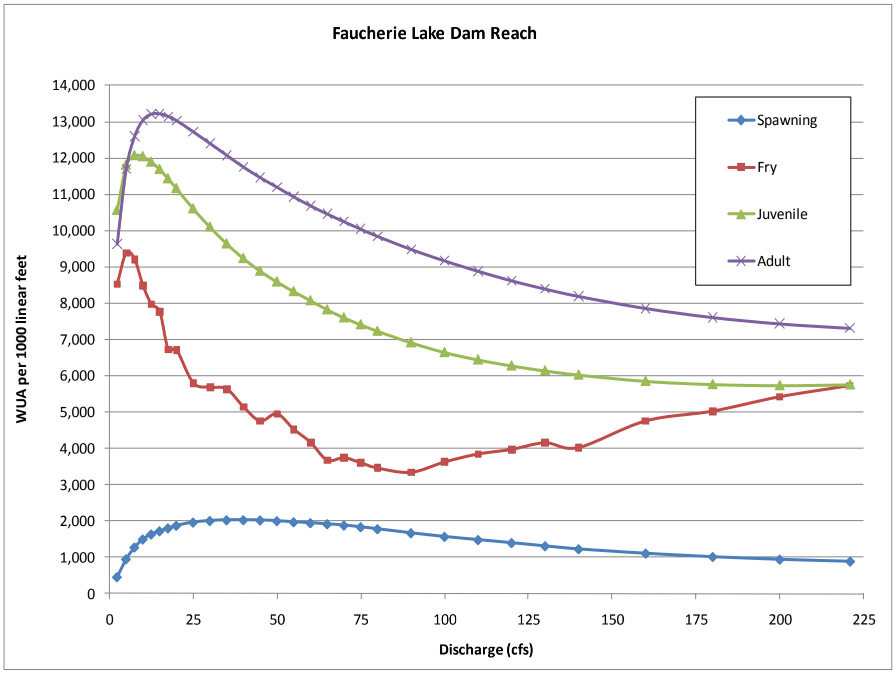

Figure 6.3.1-10. Modeled habitat suitability index (WUA) for rainbow trout, Faucherie Lake Dam Reach, Canyon Creek.

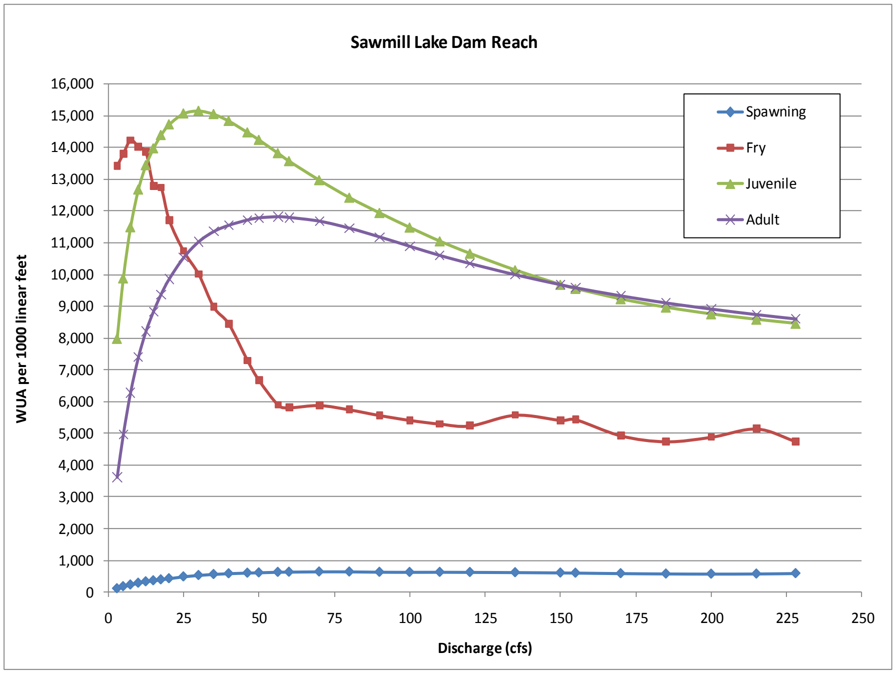

Figure 6.3.1-11. Modeled habitat suitability index (WUA) for rainbow trout, Sawmill Lake Dam Reach, Canyon Creek.

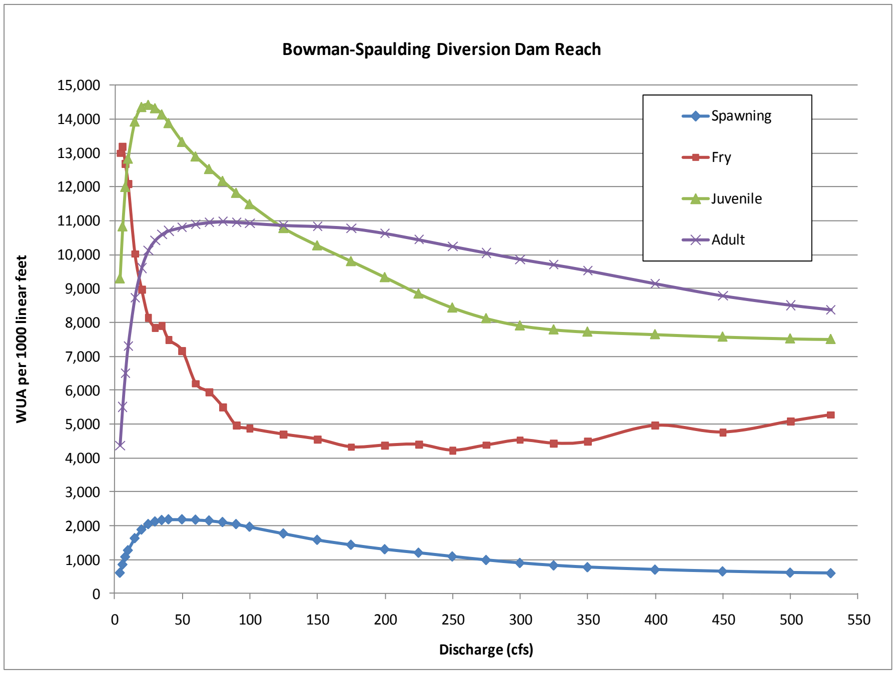

Figure 6.3.1-12. Modeled habitat suitability index (WUA) for rainbow trout, Bowman-Spaulding Diversion Dam Reach, Canyon Creek.

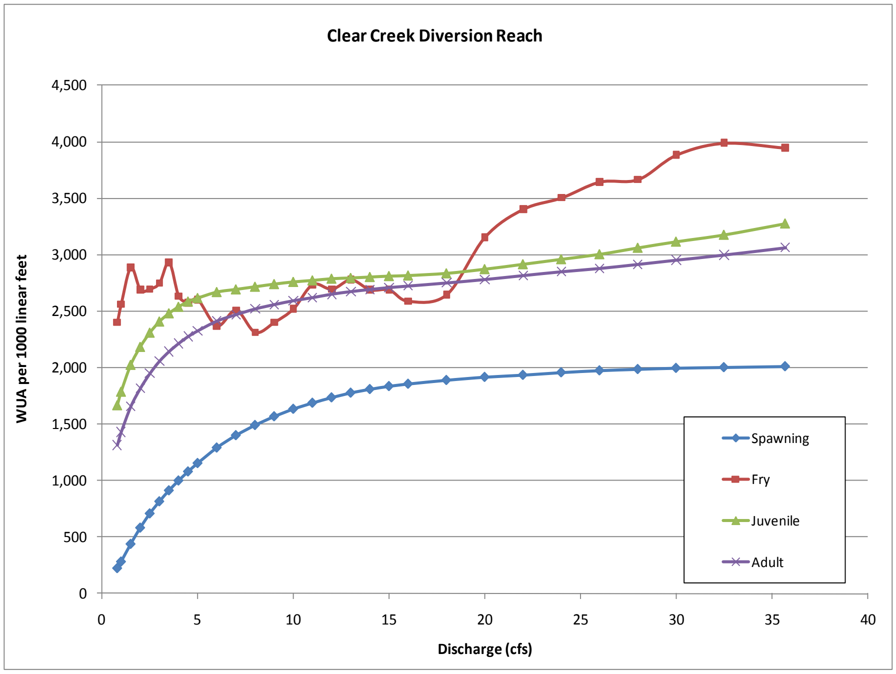

Figure 6.3.1-13. Modeled habitat suitability index (WUA) for rainbow trout, Clear Creek Diversion Dam Reach, Clear Creek.

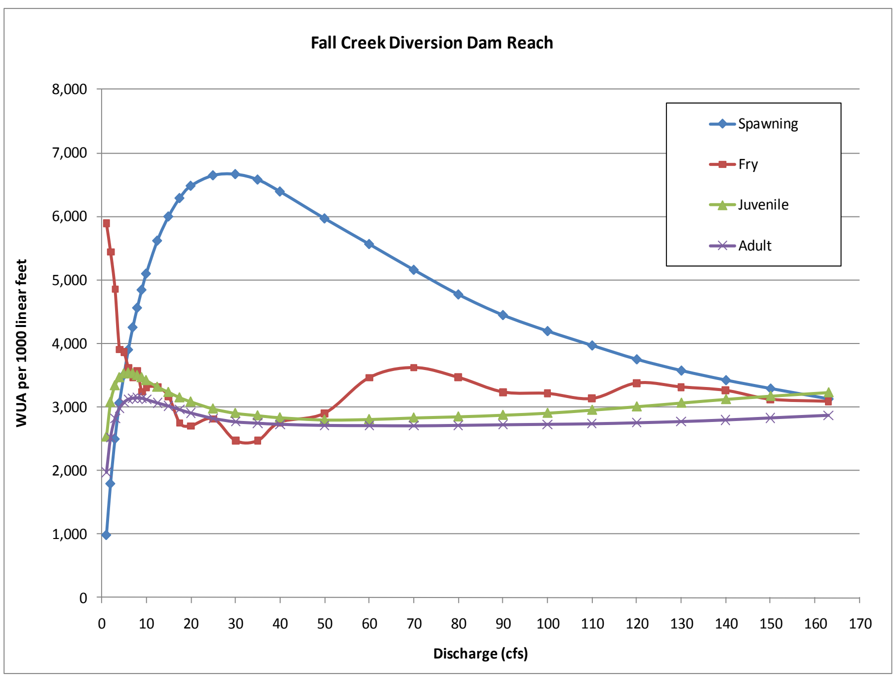

Figure 6.3.1-14. Modeled habitat suitability index (WUA) for rainbow trout, Fall Creek Diversion Dam Reach, Fall Creek.

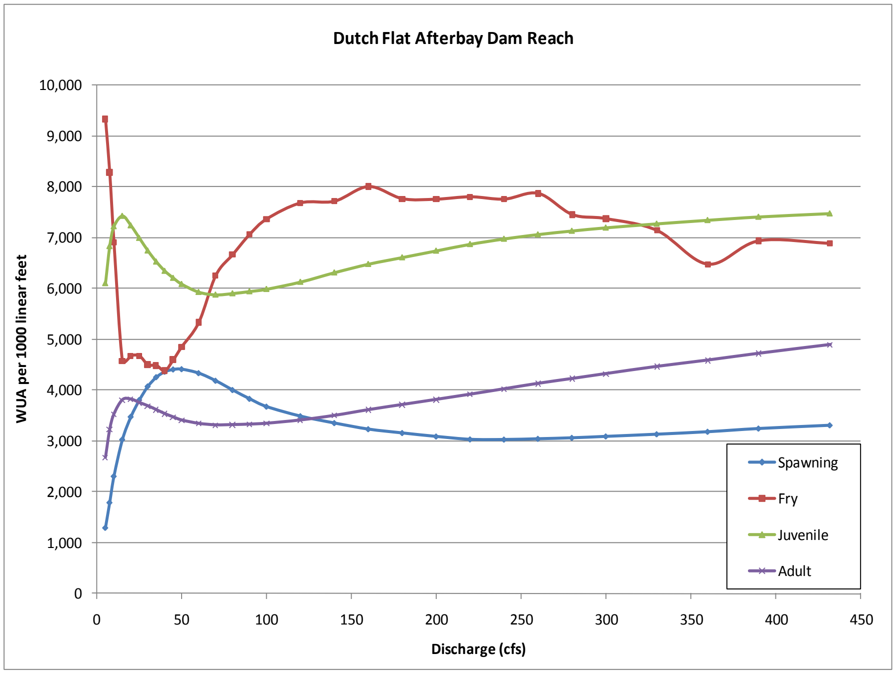

Figure 6.3.1-15. Modeled habitat suitability index (WUA) for rainbow trout, Dutch Flat Afterbay Dam Reach, Bear River.

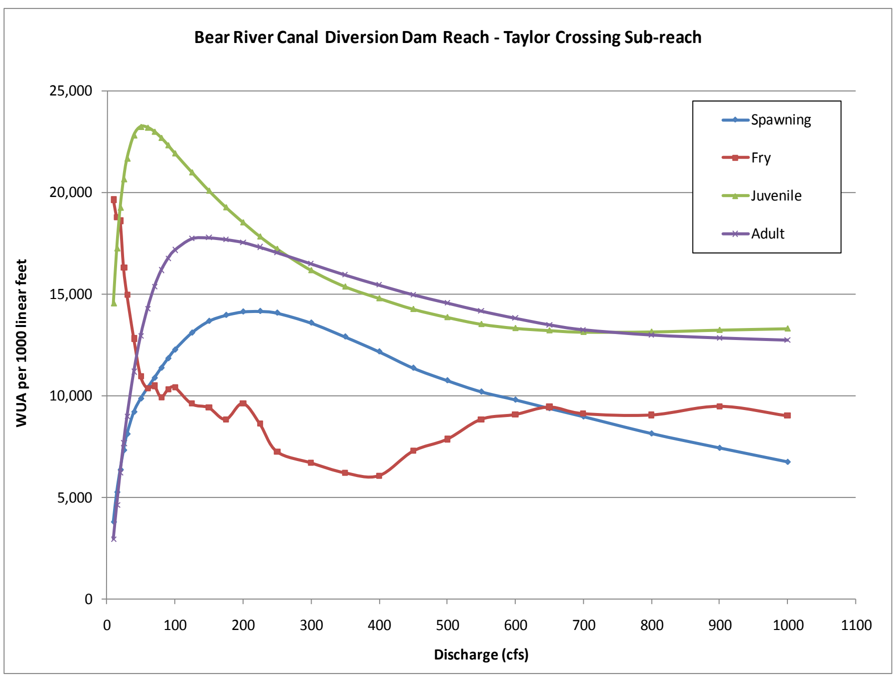

Figure 6.3.1-16. Modeled habitat suitability index (WUA) for rainbow trout, Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach, Bear River.

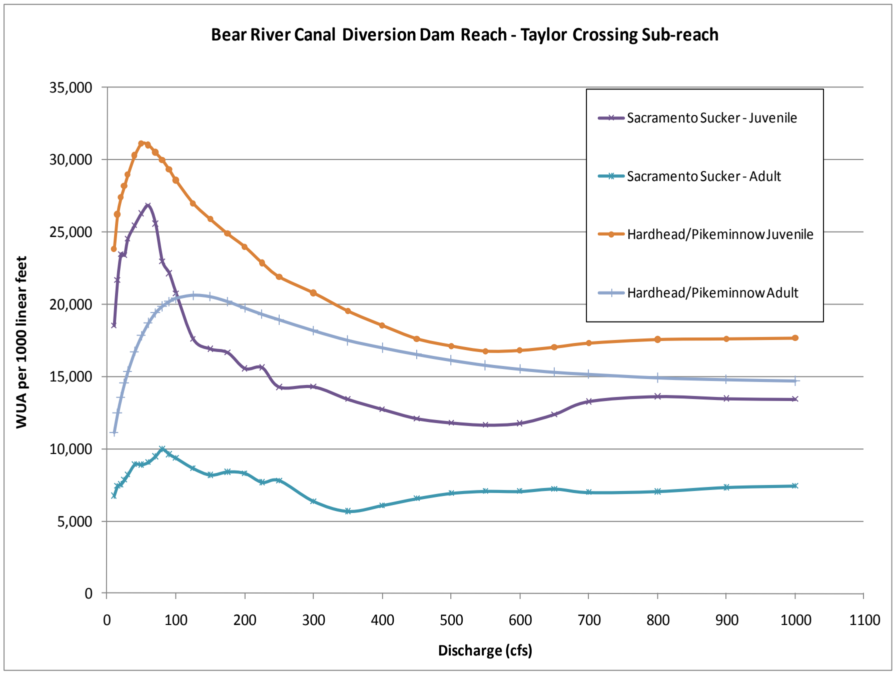

Figure 6.3.1-17. Modeled habitat suitability index (WUA) for Sacramento sucker and hardhead/pikeminnow, Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach, Bear River.

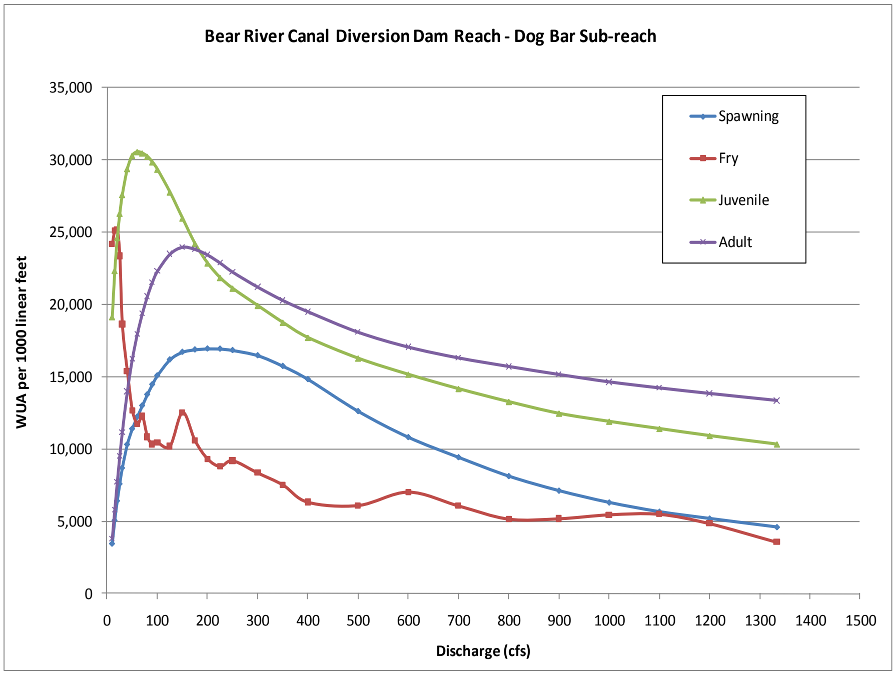

Figure 6.3.1-18. Modeled habitat suitability index (WUA) for rainbow trout, Bear River Canal Diversion Dam Reach, Dog Bar Sub-Reach, Bear River.

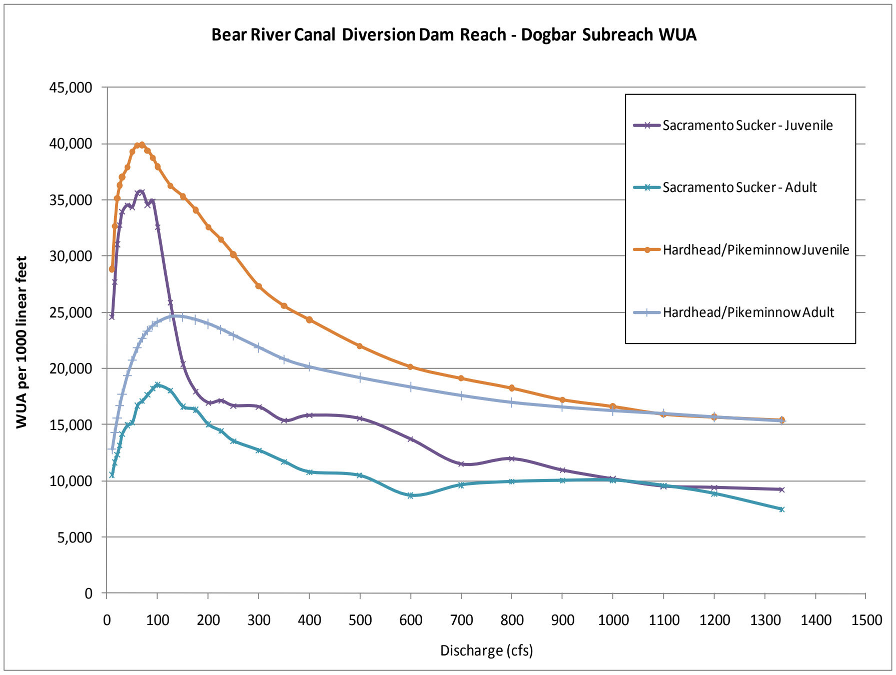

Figure 6.3.1-19. Modeled habitat suitability index (WUA) for Sacramento sucker and hardhead/pikeminnow, Bear River Canal Diversion Dam Reach, Dog Bar Sub-Reach, Bear River.

6.3.1.1.8.2 Drum-Spaulding Project

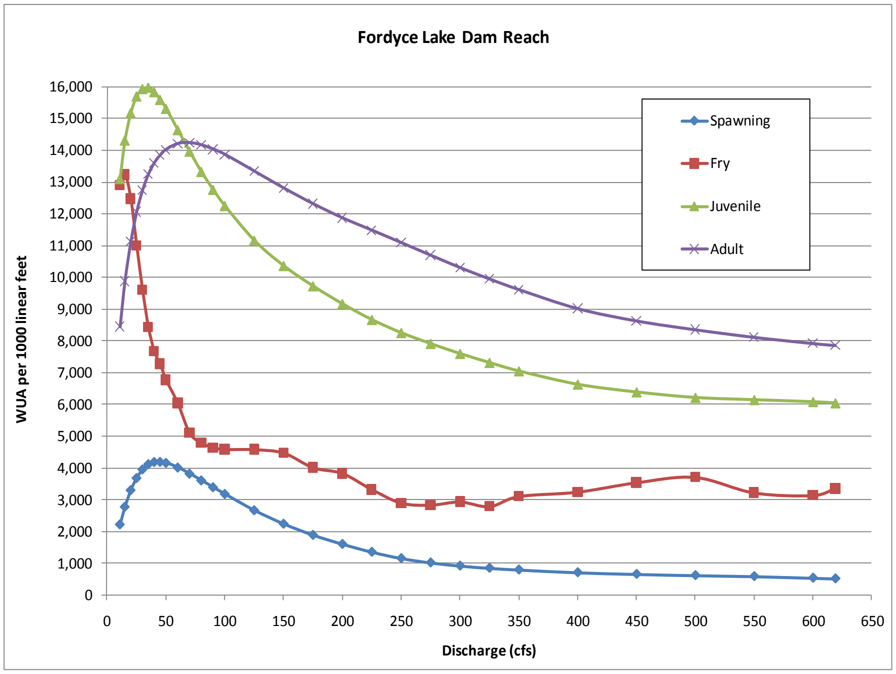

Figure 6.3.1-20. Modeled habitat suitability index (WUA) for rainbow trout, Fordyce Lake Dam Reach, Fordyce Creek.

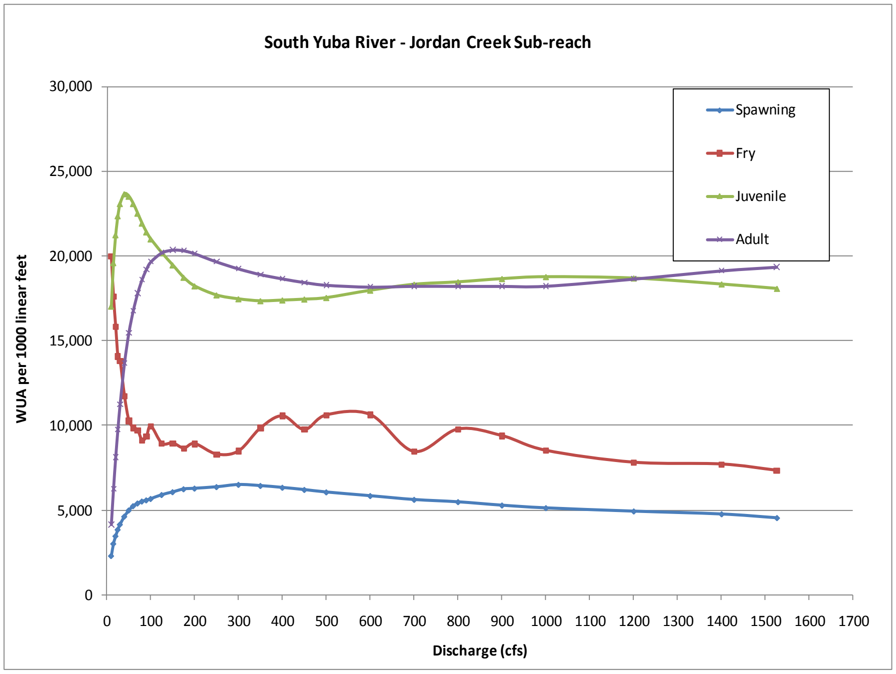

Figure 6.3.1-21. Modeled habitat suitability index (WUA) for rainbow trout, Lake Spaulding Reach, Jordan Creek Sub-Reach, South Yuba River.

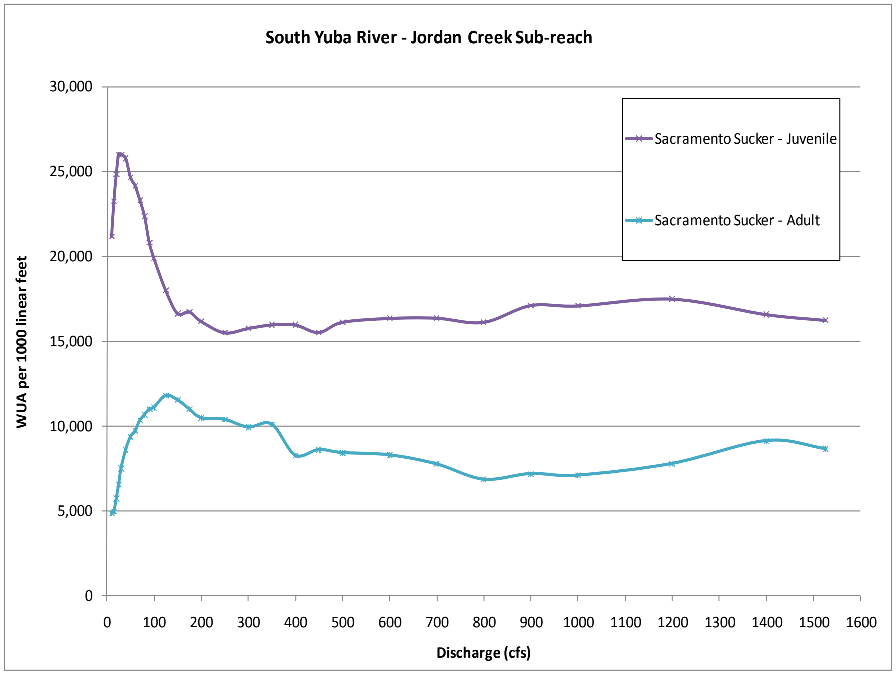

Figure 6.3.1-22. Modeled habitat suitability index (WUA) for Sacramento sucker, Lake Spaulding Reach, Jordan Creek Sub-reach, South Yuba River.

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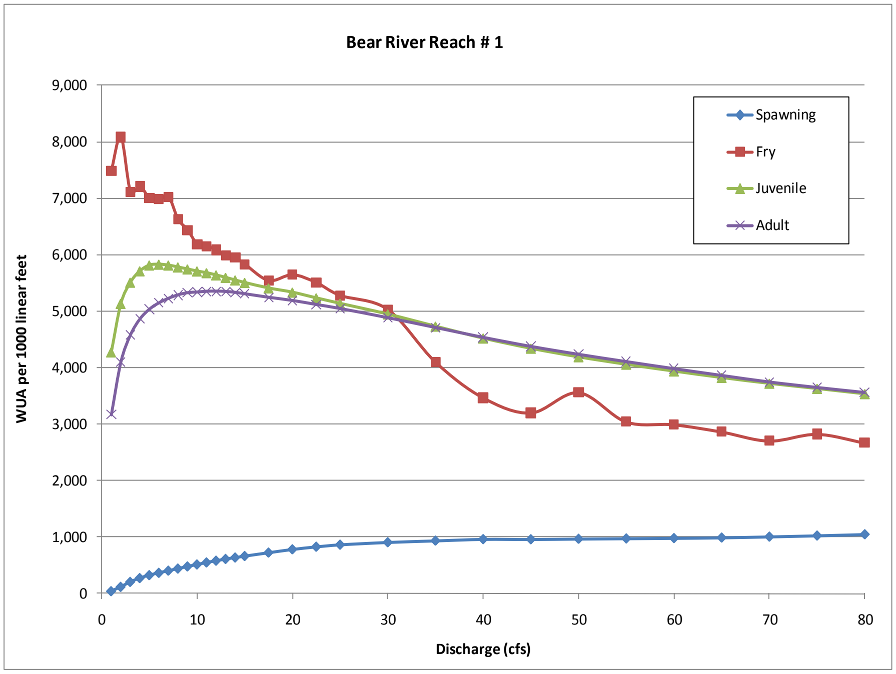

Figure 6.3.1-23. Modeled habitat suitability index (WUA) for rainbow trout, Bear River Reach #1, Bear River.

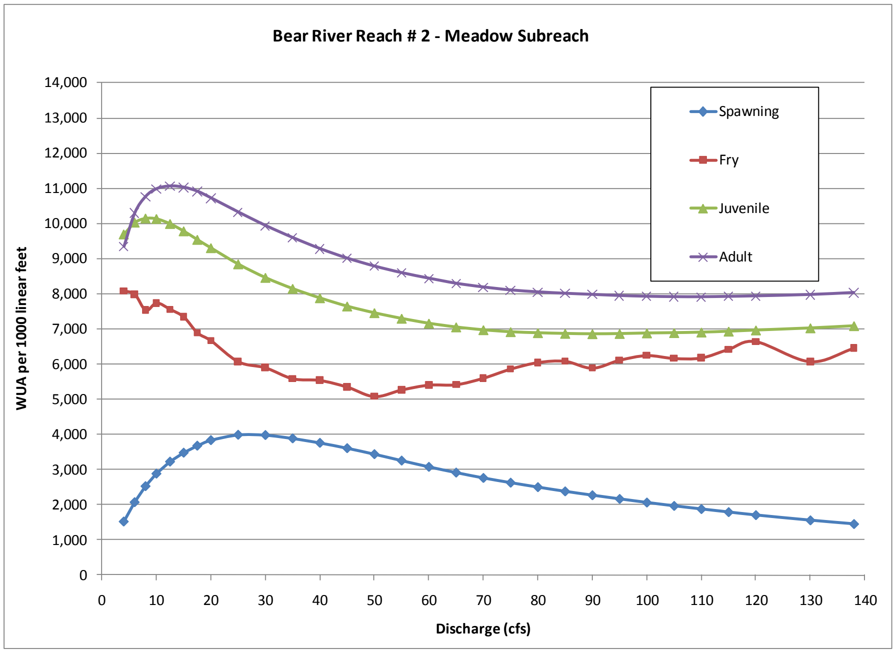

Figure 6.3.1-24. Modeled habitat suitability index (WUA) for rainbow trout, Bear River Reach #2, Meadow Sub-Reach, Bear River.

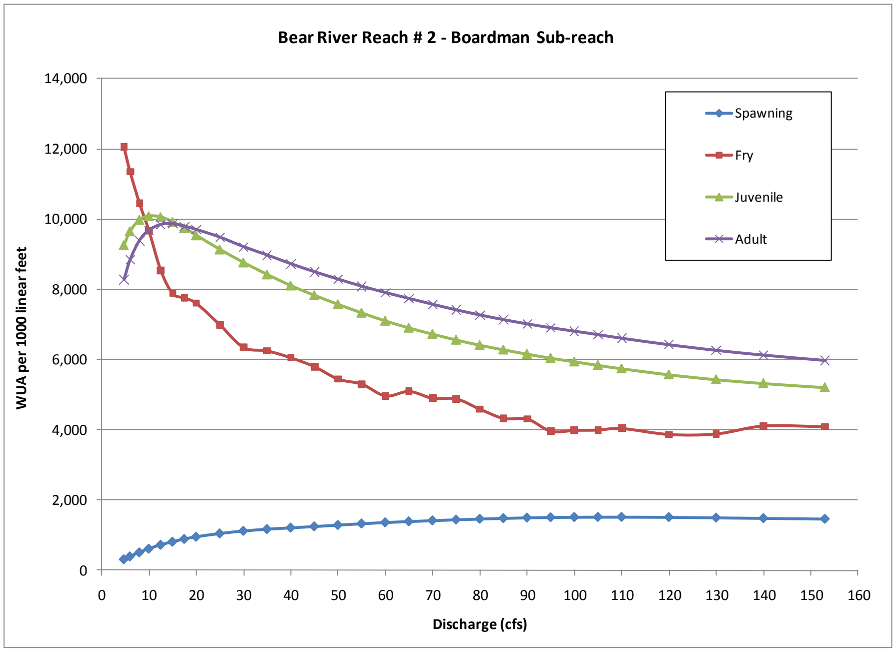

Figure 6.3.1-25. Modeled habitat suitability index (WUA) for rainbow trout, Bear River Reach #2, Boardman Sub-Reach, Bear River.

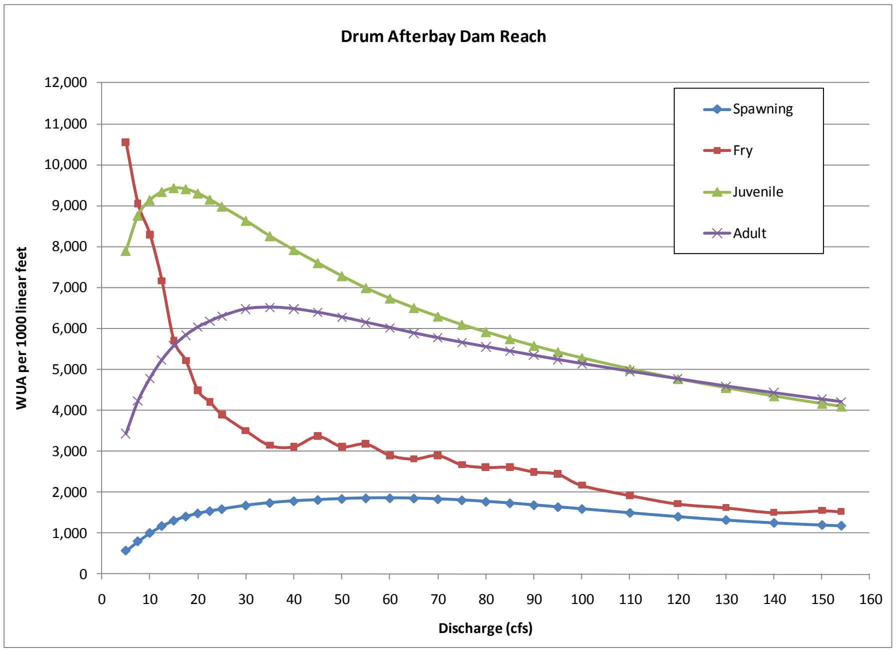

Figure 6.3.1-26. Modeled habitat suitability index (WUA) for rainbow trout, Drum Afterbay Dam Reach, Bear River.

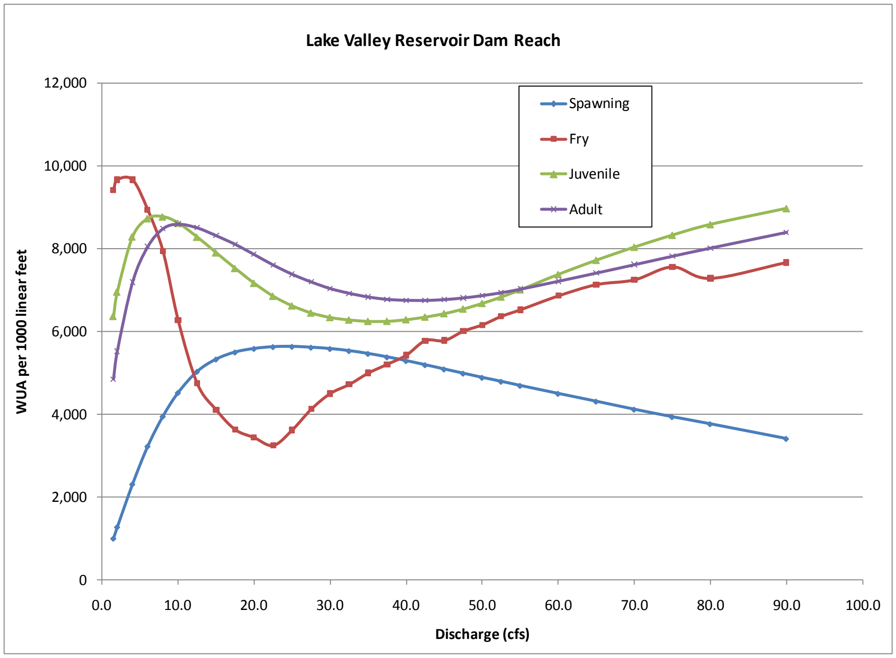

Figure 6.3.1-27. Modeled habitat suitability index (WUA) for rainbow trout, Lake Valley Reservoir Dam Reach, North Fork of the North Fork American River.

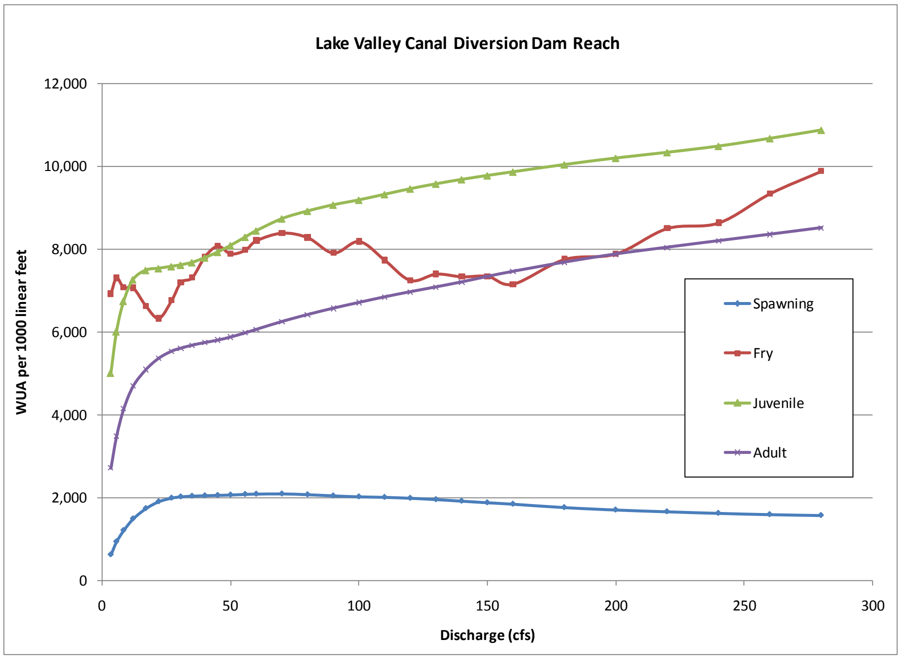

Figure 6.3.1-28. Modeled habitat suitability index (WUA) for rainbow trout, Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.

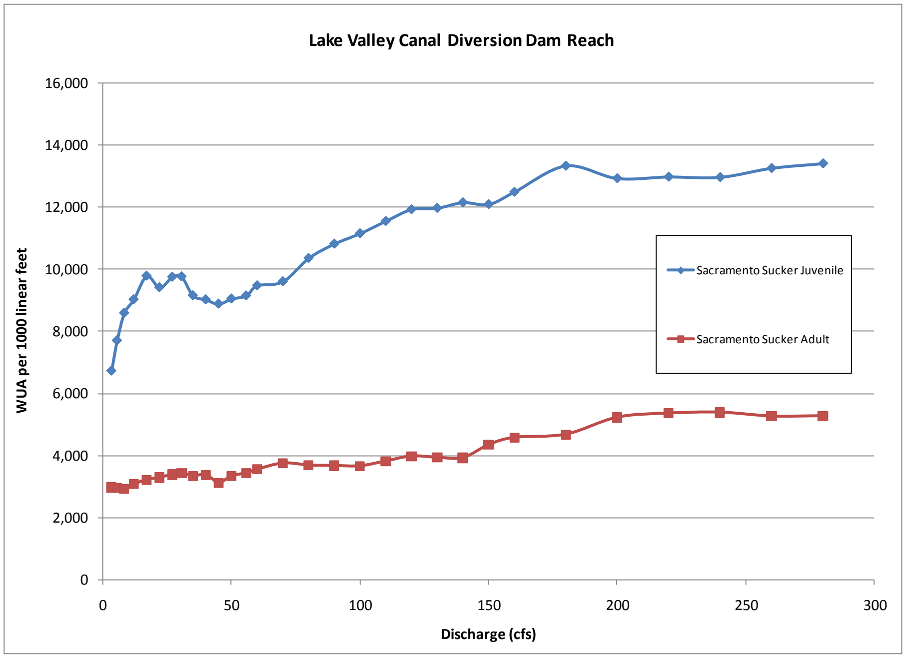

Figure 6.3.1-29. Modeled habitat suitability index (WUA) for Sacramento sucker, Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.

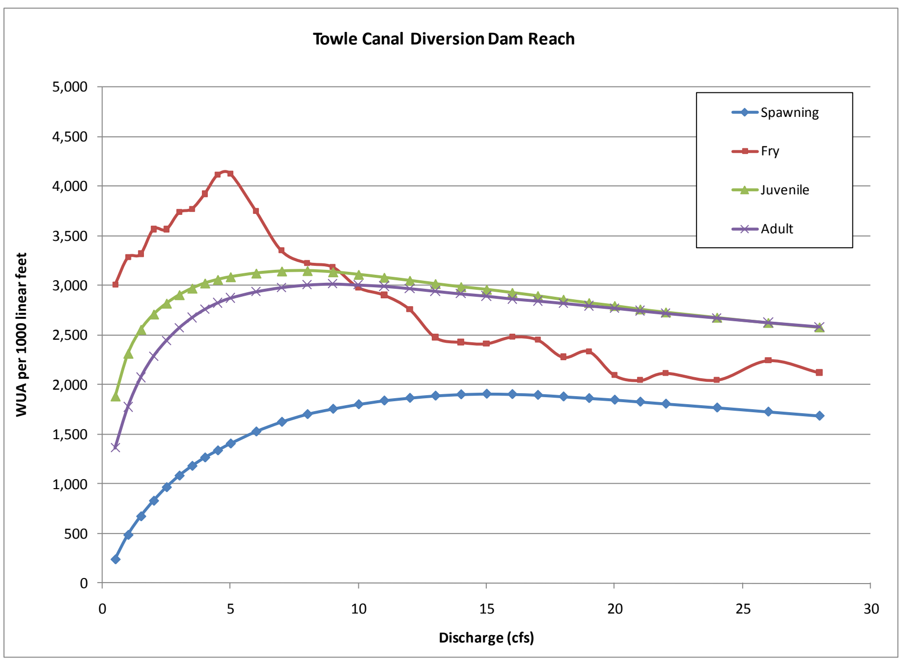

Figure 6.3.1-30. Modeled habitat suitability index (WUA) for rainbow trout, Towle Canal Diversion Dam Reach, Canyon Creek (tributary to the North Fork of the North Fork American River).

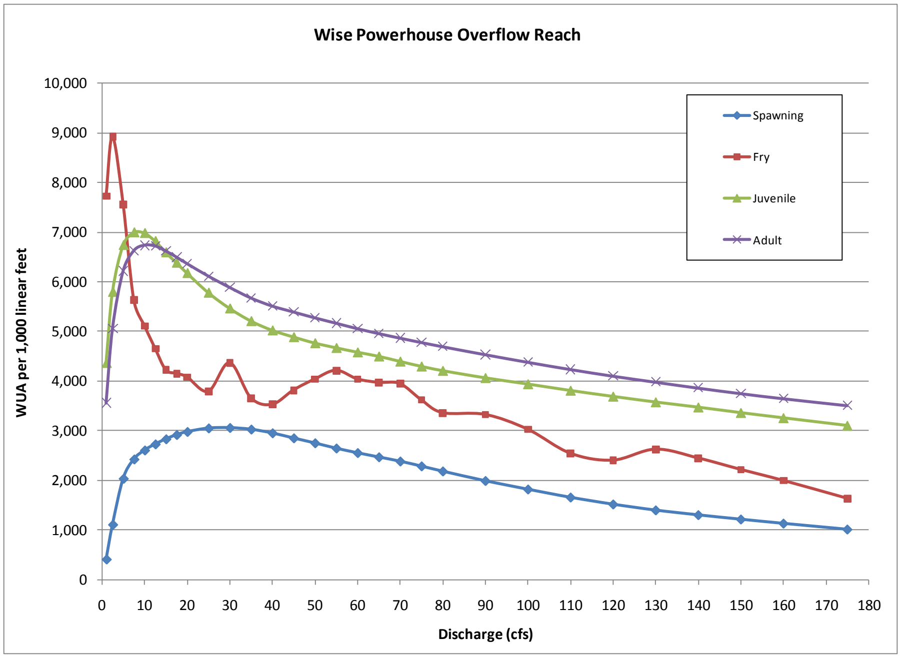

Figure 6.3.1-31. Modeled habitat suitability index (WUA) for rainbow trout, Wise Powerhouse Overflow Reach, Auburn Ravine.

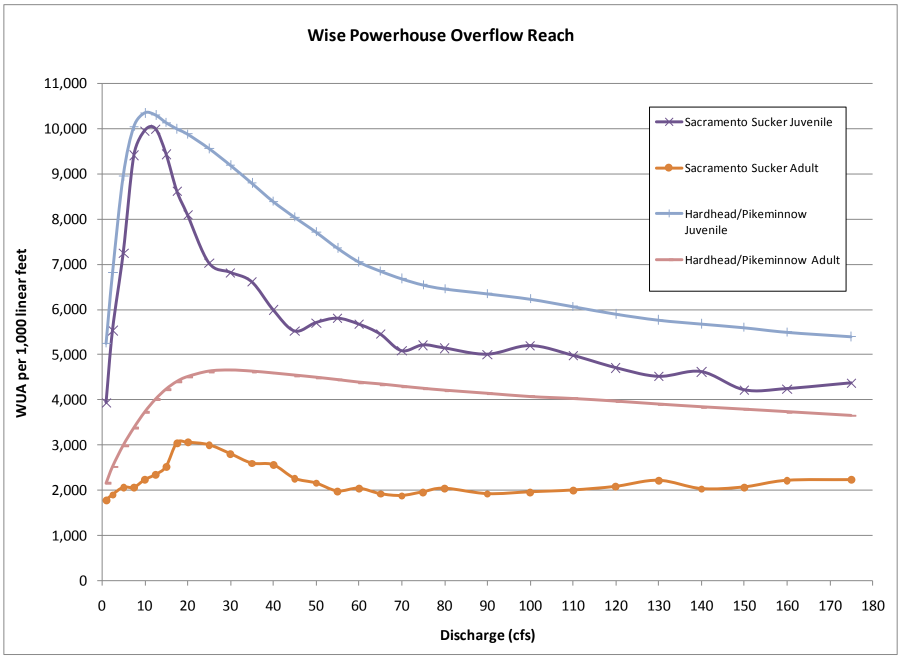

Figure 6.3.1-32. Modeled habitat suitability index (WUA) for Sacramento sucker and hardhead/pikeminnow, Wise Powerhouse Overflow Reach, Auburn Ravine.

6.3.1.1.8.3 Yuba-Bear Hydroelectric Project Habitat Exceedance Analysis

Because the WUA function is a static relationship between habitat suitability and flow magnitude, it does not represent flow-habitat relations over time. In order to evaluate the effects of alternative flow regimes on habitat over time, a time series of instream hydrologic data must be integrated with WUA, thus generating a "habitat time series." The habitat time series and the habitat duration analysis are the two primary methods used for such an evaluation. In instream flow determinations, these two analytical methods can be used alone or in combination.

Licensees conducted both types of analyses and found that the results are fairly similar. Only the habitat time series analysis, referred to as the Habitat Exceedance Analysis (HEA) is presented in this Exhibit E. The HEA uses mean daily instream hydrology, coupled with the WUA versus flow relationship developed as part of the Licensees' Instream Flow Study, to calculate monthly habitat exceedances for target species and life stages over the relicensing hydrologic period of record (WY1976 –WY2008).

For 12 of the 13 Yuba-Bear Hydroelectric Project sub-reaches for which a 1D PHABSIM analysis was performed, NID conducted an HEA at two or more hydrologic nodes: 1) "Node Zero" and 2) the "hydrologic mid-point" node.[4] [5] [6] At the hydrologic Node Zero, the HEA used the mean daily flows that would occur immediately below the dam or diversion that controls flow in the upstream portion of the sub-reach.[7] For unimpaired flow conditions, this was the estimated mean daily flows at the dam or diversion. For existing flow conditions, this was the sum of the releases at the dam, which may include minimum flow releases and discretionary releases, and spills. In summary, the Node Zero HEA estimates a habitat index using habitat data collected along the entire sub-reach, but assumes there is no accretion in the sub-reach.[8]

At each hydrologic mid-point node for each modeled sub-reach, the HEA takes into account a "reach-averaged" accretion in the sub-reach. To do this, for each day in the HEA run, NID calculated the total accretion in a given sub-reach and divided it by two (i.e., assumed half the accretion entered the reach upstream of a "hydrologic mid-point (i.e., node)" in the reach and half entered the reach downstream of the hydrologic mid point). This is a valid assumption since

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[4] NID did not perform a HEA analysis on the Clear Creek Diversion Dam Reach because Clear Creek is an ephemeral creek with no associated storage facilities – the creek runs dry each year both upstream and downstream of the Bowman-Spaulding Diversion Conduit. NID has not proposed a minimum flow release from Bowman-Spaulding Conduit to Clear Creek.

[5] Note that a sub-reach node may represent an entire reach, which occurs in 16 of the 19 reaches in which 1D PHABSIM was performed; or a portion of a reach, which occurred in three of the 19 reaches: Milton Diversion Dam Reach with three sub-reach nodes, Jordan Creek Reach with four sub-reach nodes, and Bear River Canal Diversion Dam Reach with two sub-reach nodes (Table 6.3.1-11).

[6] NID did not perform an HEA analysis for the Chicago Park Powerhouse Reach on which a River2D model was performed, because, as a daily peaking operation, Chicago Park Powerhouse Reach it is not conducive to such an analysis.

[7] Since Node Zero only occurs in sub-reaches that have at the top of the sub-reach a dam or diversion that controls flow in that sub-reach, there are 19 Node Zeros. Node Zero does not occur in six sub-reaches where a dam or other flow controlling facility do not occur at the top of the sub-reach (e.g., in the two lower elevation sub-reaches in Milton Diversion Dam Reach or the three lower elevation sub-reaches in the Jordan Creek Reach).

[8] NID does not believe the Node Zero HEA runs are informative because the runs assume no accretion occurs in a stream. However, the Node Zero HEA runs are included in the FLAs at the request of CDFG; CDFG said it felt one could not rely on accretion to occur in the future. NID notes that, if one cannot rely on accretion in the future, any flow modeling is useless (i.e., project reservoirs, even at the top of the system, would have no inflow - and no river).

the sub-reaches were defined to occur between major tributaries (i.e., tributaries with a mean annual flow of more than 10 percent of the mainstem mean annual flow), meaning that the majority of the inflow to the reach is diffuse. As an example, if the total accretion in a sub-reach was 22 cfs on May 12, 1986, the HEA run was made with an assumption of 11 cfs "average" accretion for the entire sub-reach (top to bottom) for the purposes of the HEA in the entire reach. Therefore, in comparison to Node Zero HEA, the sub-reach mid-point node HEA estimates a habitat index using habitat data collected along the entire sub-reach, but assumes an "average" amount of accretion occurs along the entire sub-reach.

At each node and for each day in the period of record regardless of water year type, NID calculated the available habitat, expressed as a percentage of the maximum static WUA shown on the static WUA curves for the adult rainbow trout, or in some cases for spawning rainbow trout. As an example, if the flow at the sub-reach node was 11 cfs on May 12, 1986, NID determined the percent of maximum WUA that would occur for adult rainbow trout on that day using the static WUA curve developed for the reach. This was done for every day in the period of record. This resulted in a series of percentages of maximum WUA (i.e., one percentage value for each day in the period of record), from which NID plotted monthly exceedance curves.

Figure 6.3.1-33 through Figure 6.3.1-41[9] provide monthly HEA exceedance curves[10] for rainbow trout adult and spawning life stages for four hydrologic scenarios for the 12 Yuba-Bear Hydroelectric Project sub-reaches. Each figure includes plots for each month. Figure 6.3.1-42 provides similar monthly HEA exceedance curves for the hardhead adult life stage in the Kanaka Creek Sub-reach in Middle Yuba River. The four hydrologic scenarios for which HEA curves are shown in Figures 6.3.1-33 through 6.3.1-42 are:

- The unimpaired flow condition (as synthesized by Licensees)
- The No-Action Alternative (i.e., existing conditions of Base Case)
- Licensees' Proposed Projects
- FWN's Proposed Projects

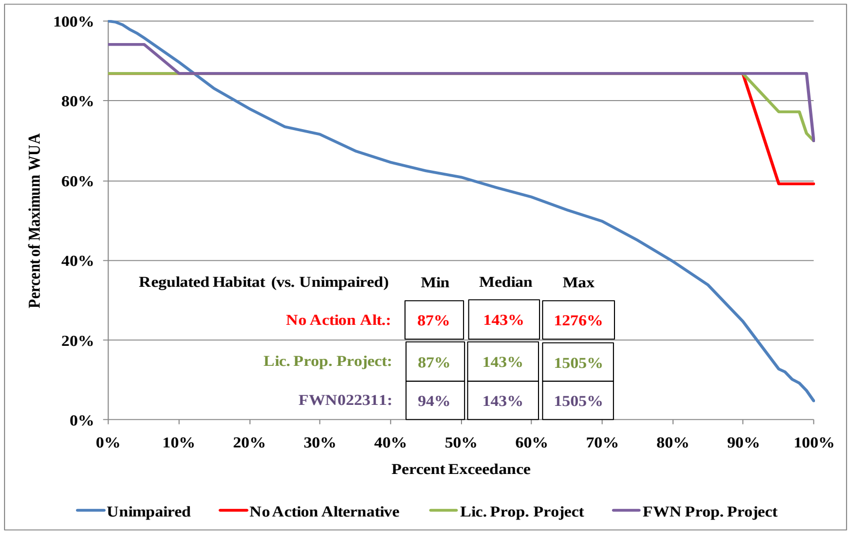
Refer to Section 2.5 of the Yuba-Bear Hydroelectric Project Exhibit B for a description of the No-Action Alternative, and to Sections 3.6.2.2 and 3.6.2.3 for a description of Licensees' Proposed Projects scenario and FWN's Proposed Projects scenario. For simplicity, NID has included in figures the results of the HEA analysis for Licensees' Proposed Projects scenario and FWN's Proposed Projects scenario, each of which is discussed in subsequent sections of this report. The mean daily flows at the nodes for each of the unimpaired flow conditions and each

9 Each figure includes 12 plots, one plot for each month from October through September.

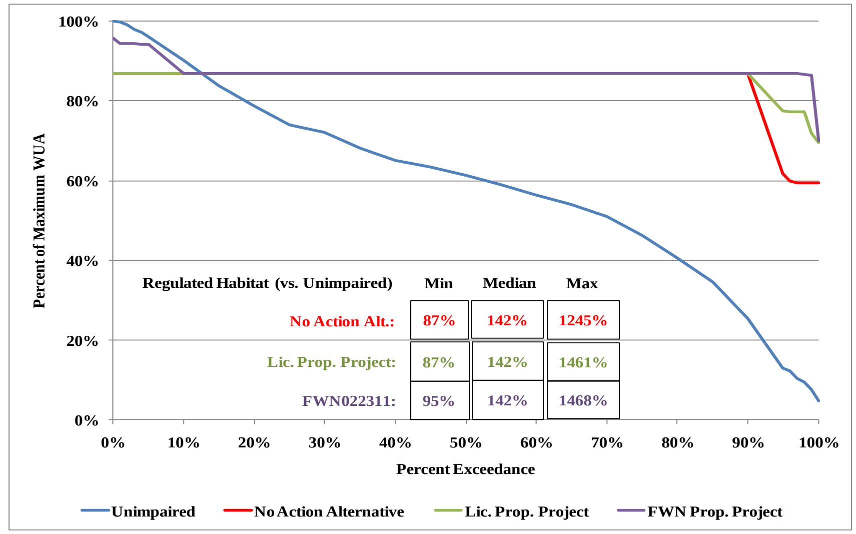
10 The target species and life stage in all nodes in Figures 6.3.1-1 through 6.3.1-17 is adult rainbow trout with the following exceptions. For the Yuba-Bear Hydroelectric Project-affected reaches, the target species and life stage is spawning rainbow trout from April through June in 1) Jackson Meadows Dam Reach, 2) Faucherie Lake Dam Reach, 3) Sawmill Lake Dam Reach, 4) Dutch Flat Afterbay Dam Reach and 5) Bear River Canal Diversion Dam Reach. NID selected spawning rainbow trout over adult rainbow trout in those reaches and months because the reach-specific static WUA curves show that the flow to achieve maximum WUA habitat for spawning is higher than the flow to achieve maximum WUA habitat for adults in those months, and Relicensing Participants identified April through June as the period for rainbow trout spawning.

of the three flow scenarios can be found on the Hydrology DVD in Appendix E12 of this Exhibit E.

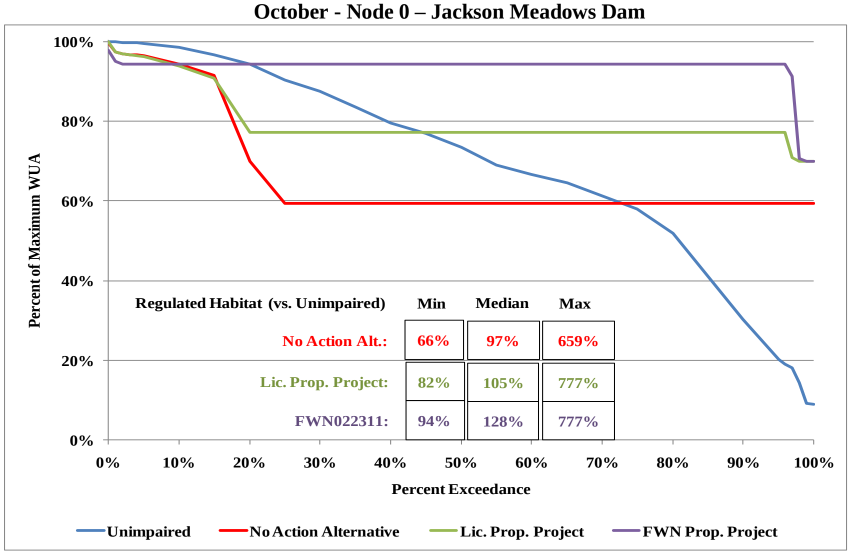
In addition, each of the monthly plots in Figures 6.3.1-33 through 6.3.1-42 provide the minimum, maximum and median percentage of maximum static WUA that each flow scenario would provide for the target species and life stage in comparison to the percentage of maximum static WUA that would be provided under the unimpaired flow condition. As explanation, the minimum value represents the greatest difference between the scenario curve and unimpaired flow curve - when the scenario curve provides less habitat than would be provided under unimpaired flow conditions. For instance, if the flow scenario provided half the percentage of maximum WUA that would be provided by the unimpaired condition, the percent difference would be 50 percent (i.e., the “min” percent shown on the plots). In comparison, if the flow scenario provided twice the percentage of maximum WUA than would be provided by the unimpaired flow condition, the percent difference would be 200 percent (i.e., the “max” percent shown on the plots). If the scenario provides the same amount of habitat as the unimpaired flow condition, the percent difference would be 100 percent. The phrase “amount of habitat” is used below when discussing percentage of maximum WUA. Although “percentage of maximum WUA” is not a direct reference to a specific amount (quantity) of habitat it is an index directly correlated to habitat area.



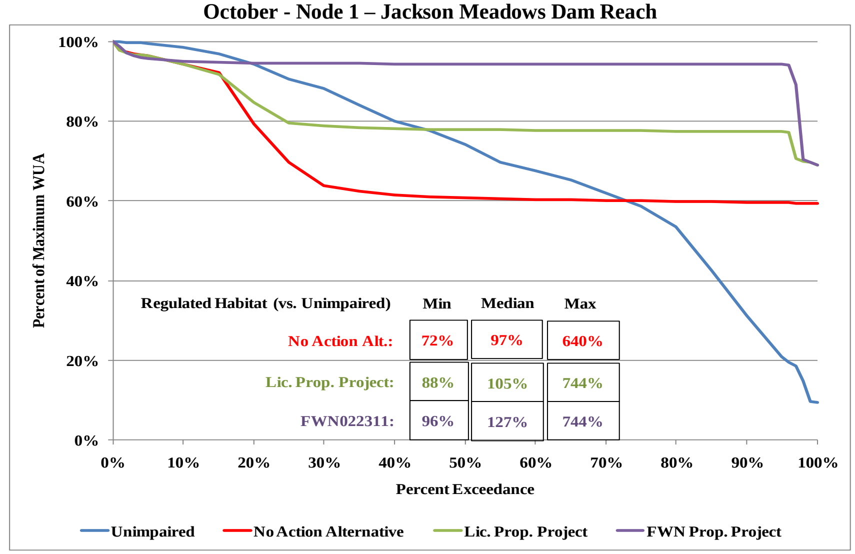
October - Node 0 – Jackson Meadows Dam



October - Node 1 – Jackson Meadows Dam Reach

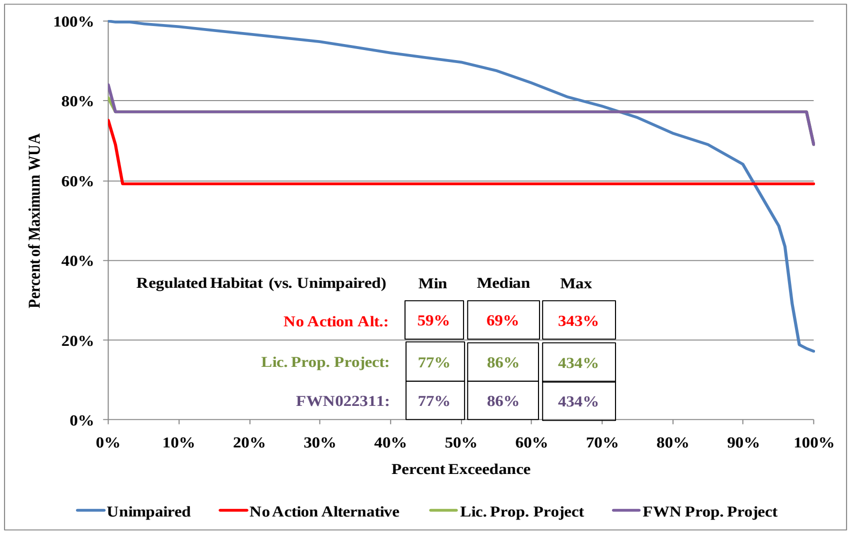


November - Node 0 – Jackson Meadows Dam

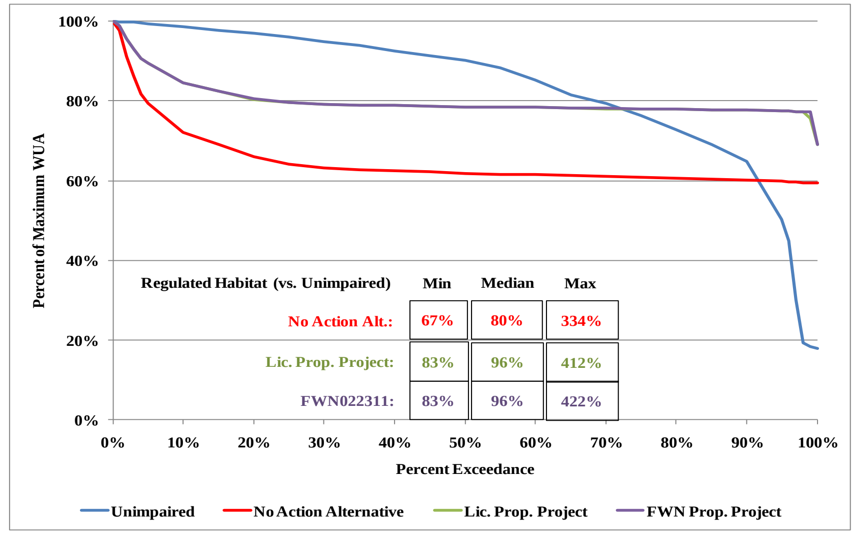


November - Node 1 – Jackson Meadows Dam Reach

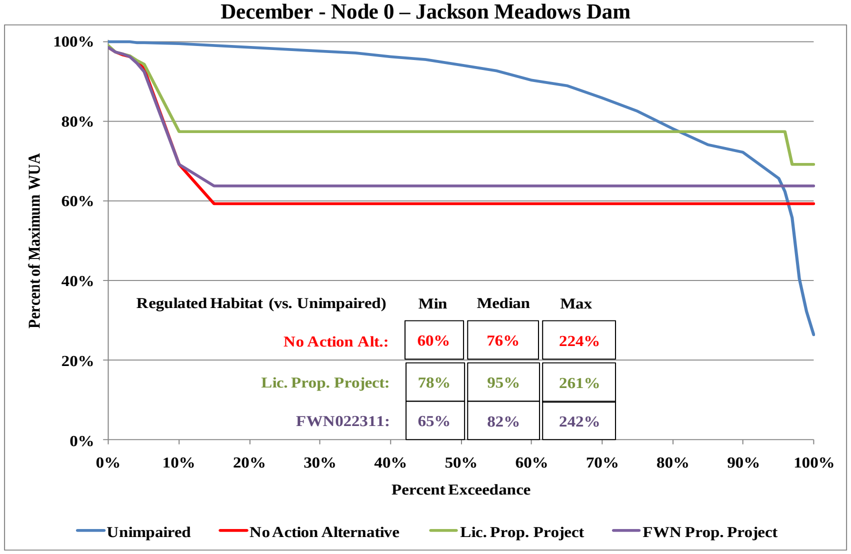
Figures 6.3.1-33a and 6.3.1-33b. HEA for adult rainbow trout during the months of October (a) and November (b) in Jackson Meadows Dam Reach, Middle Yuba River.



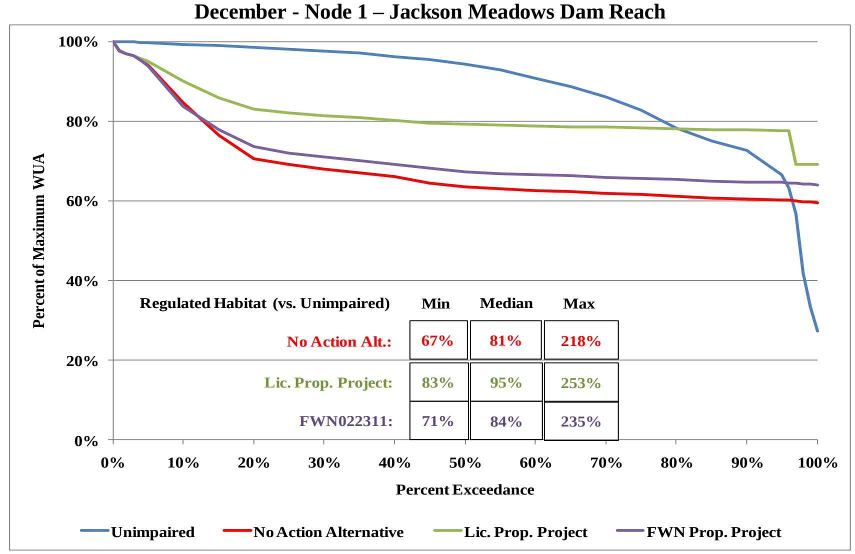
December - Node 0 – Jackson Meadows Dam



December - Node 1 – Jackson Meadows Dam Reach

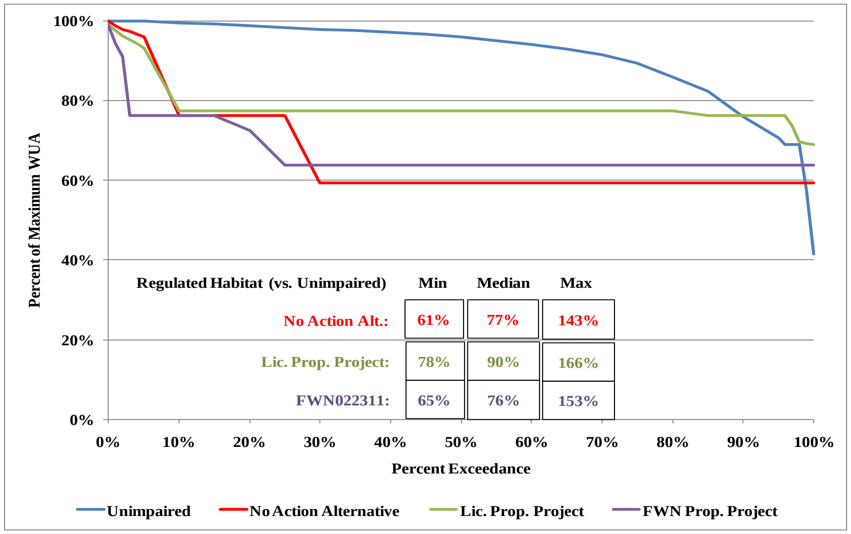


January - Node 0 – Jackson Meadows Dam

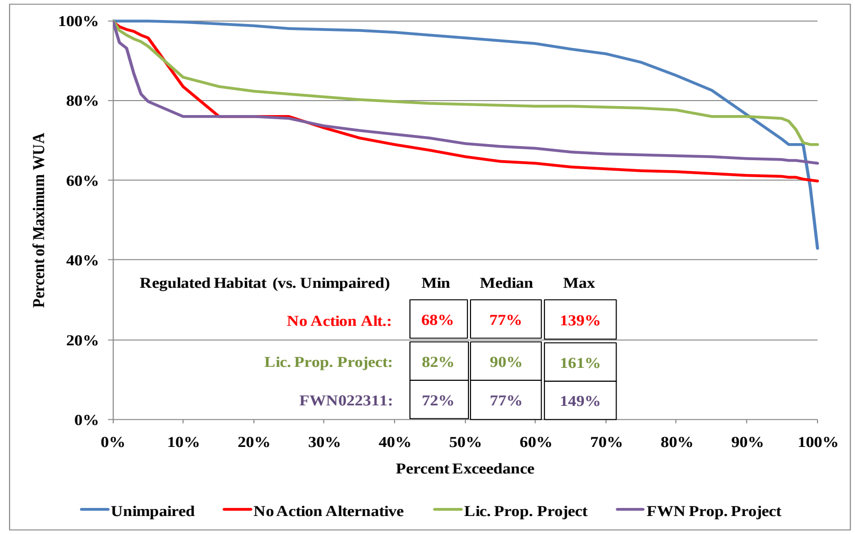


January - Node 1 – Jackson Meadows Dam Reach

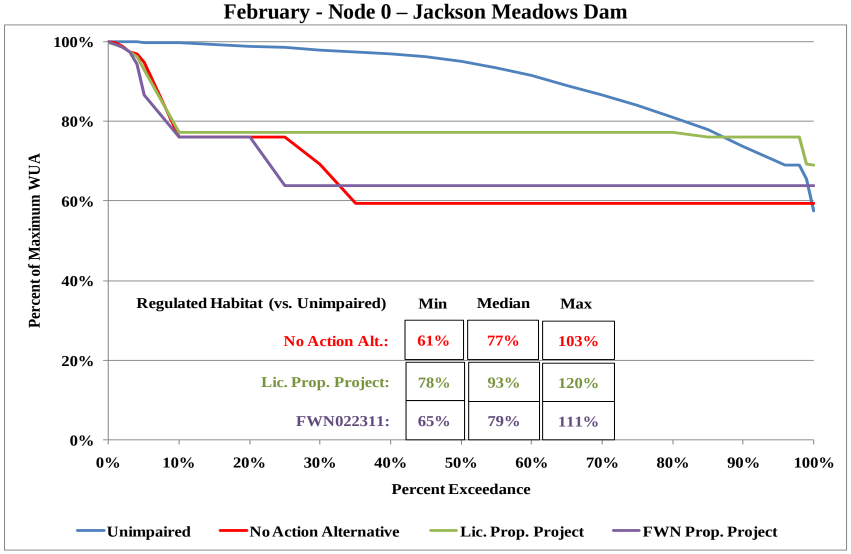
Figures 6.3.1-33c and 6.3.1-33d. HEA for adult rainbow trout during the months of December (c) and January (d) in Jackson Meadows Dam Reach, Middle Yuba River.



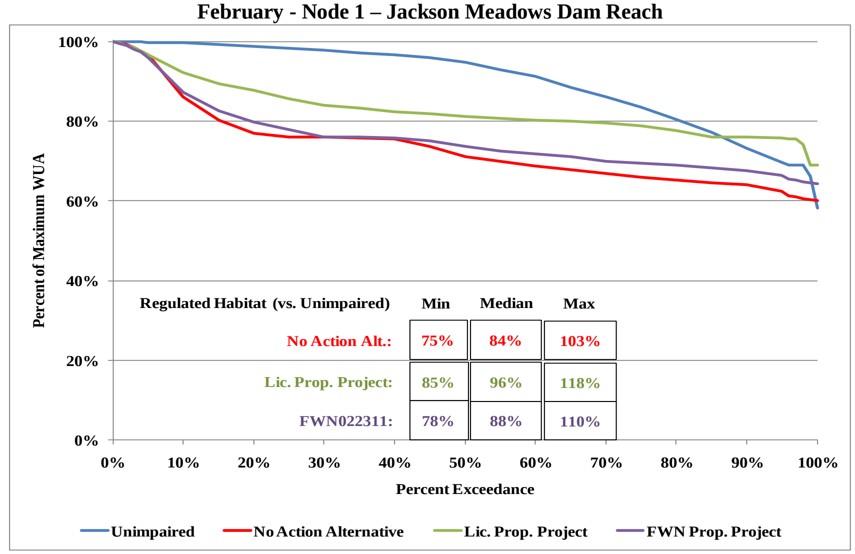
February - Node 0 – Jackson Meadows Dam



February - Node 1 – Jackson Meadows Dam Reach

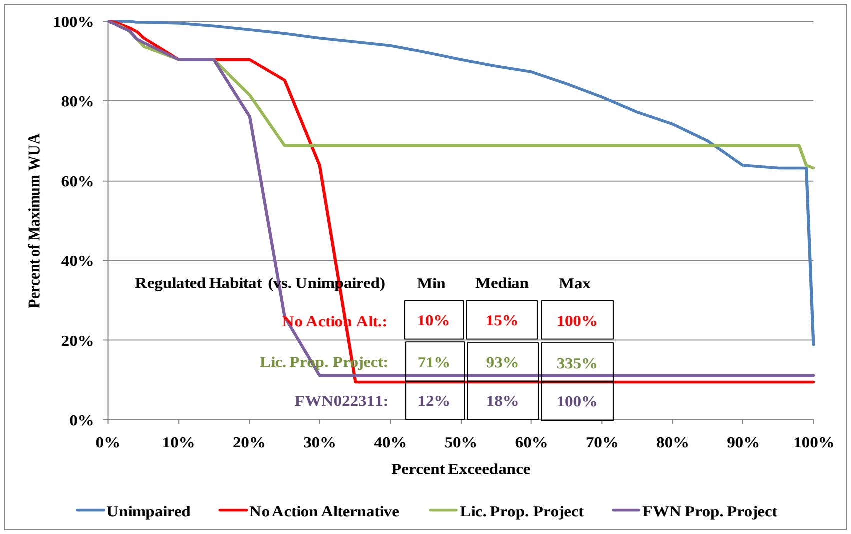


March - Node 0 – Jackson Meadows Dam

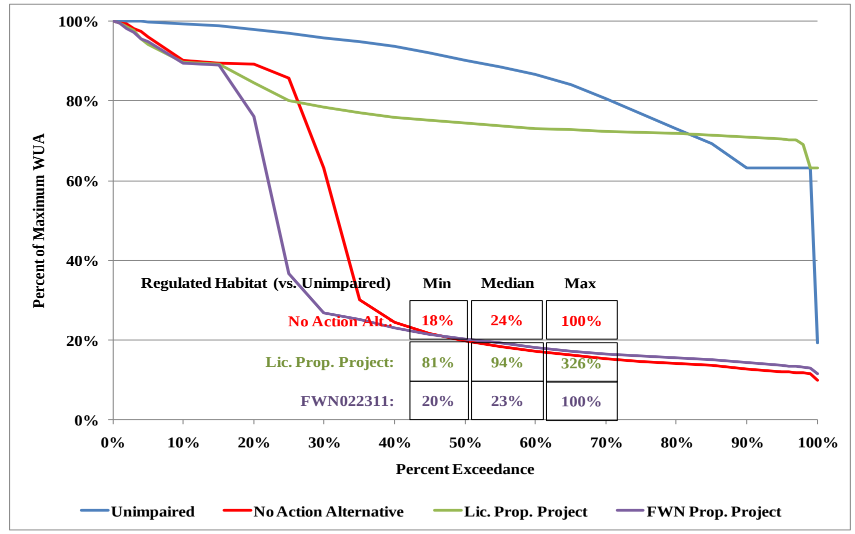


March - Node 1 – Jackson Meadows Dam Reach

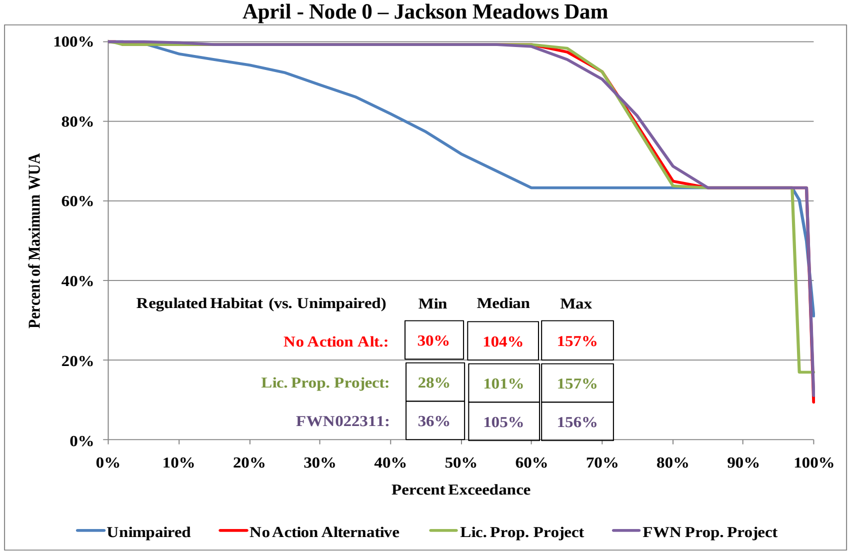
Figures 6.3.1-33e and 6.3.1-33f. HEA for adult rainbow trout during the months of February (e) and March (f) in Jackson Meadows Dam Reach, Middle Yuba River.



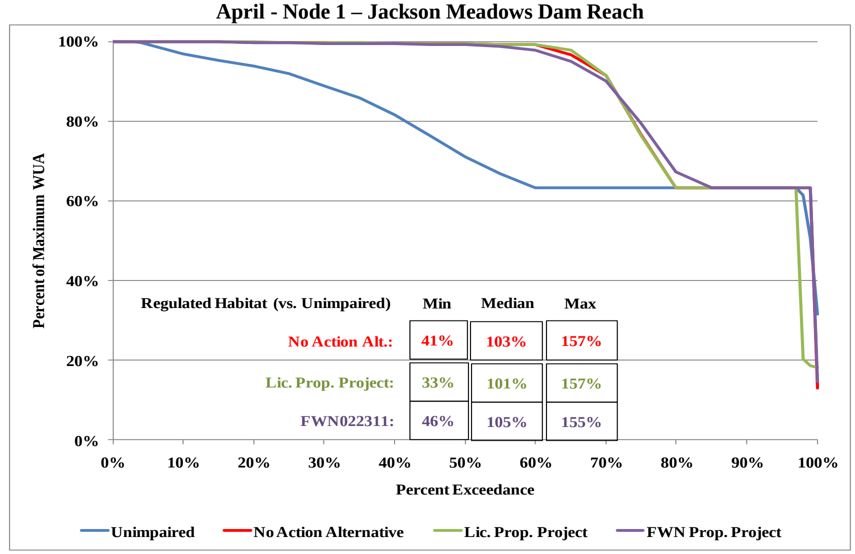
April - Node 0 – Jackson Meadows Dam



April - Node 1 – Jackson Meadows Dam Reach

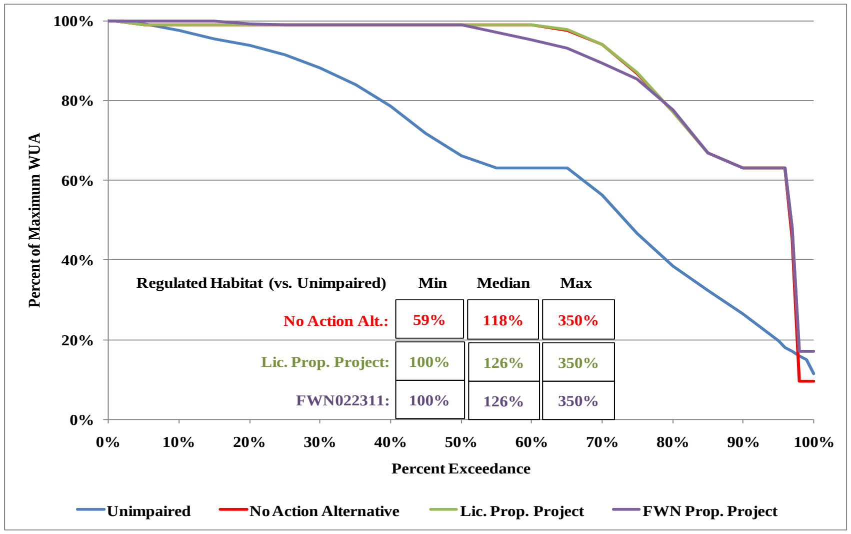


May - Node 0 – Jackson Meadows Dam

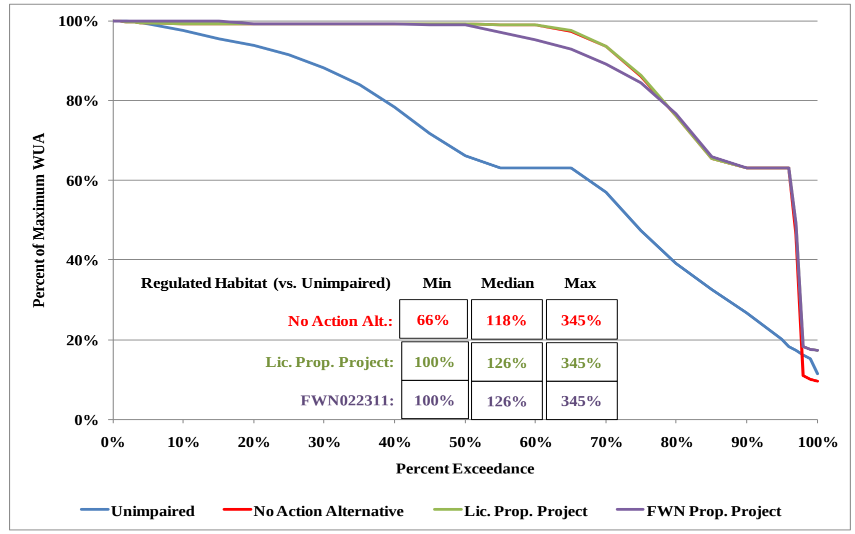


May - Node 1 – Jackson Meadows Dam Reach

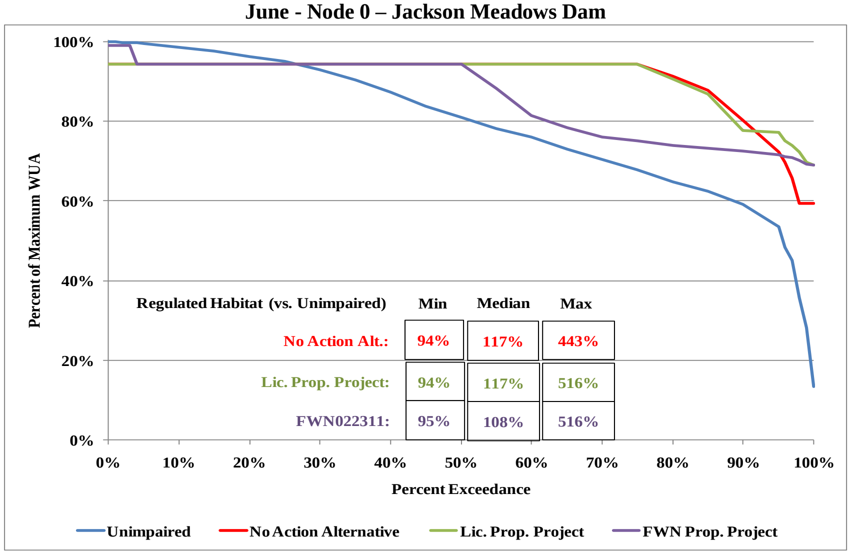
Figures 6.3.1-33g and 6.3.1-33h. HEA for spawning rainbow trout during the months of April (g) and May (h) in Jackson Meadows Dam Reach, Middle Yuba River.



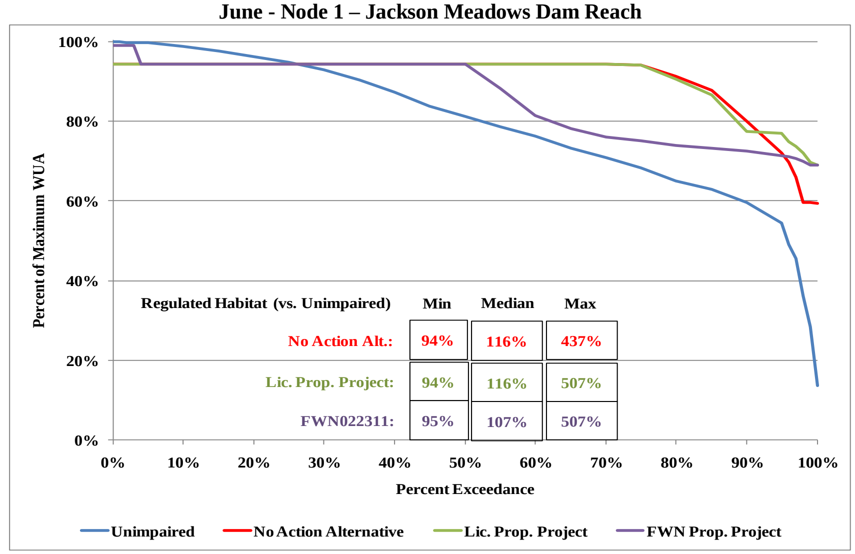
June - Node 0 – Jackson Meadows Dam



June - Node 1 – Jackson Meadows Dam Reach

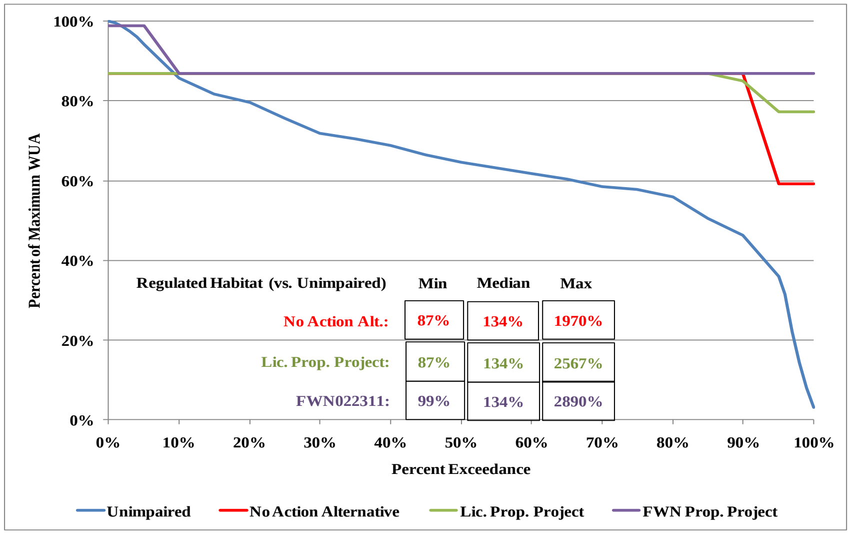


July - Node 0 – Jackson Meadows Dam

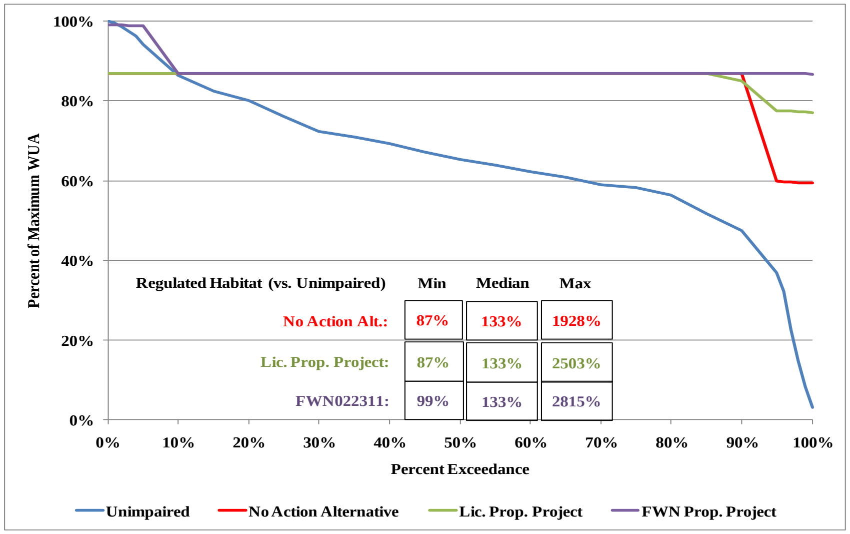


July - Node 1 – Jackson Meadows Dam Reach

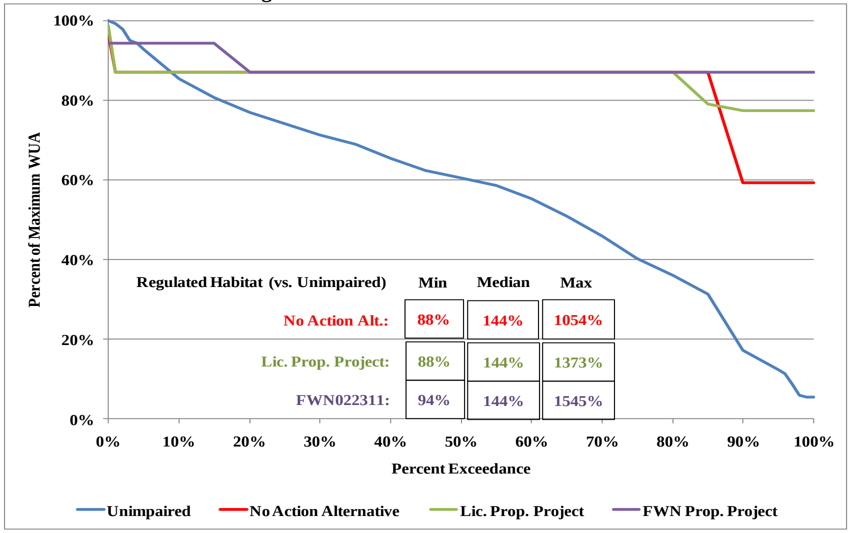
Figures 6.3.1-33i and 6.3.1-33j. HEA for spawning rainbow trout during the month of June (i) and adult rainbow trout during the month of July (j) in Jackson Meadows Dam Reach, Middle Yuba River.



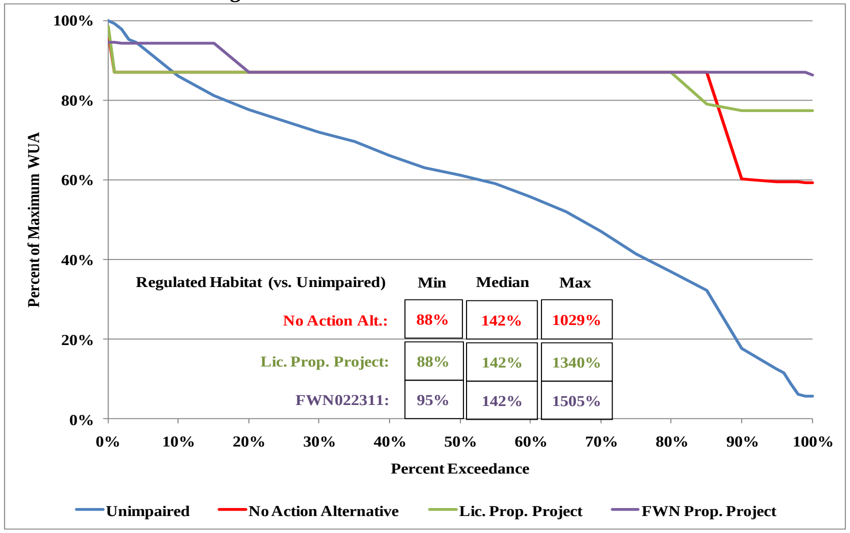
August - Node 0 – Jackson Meadows Dam



August - Node 1 – Jackson Meadows Dam Reach

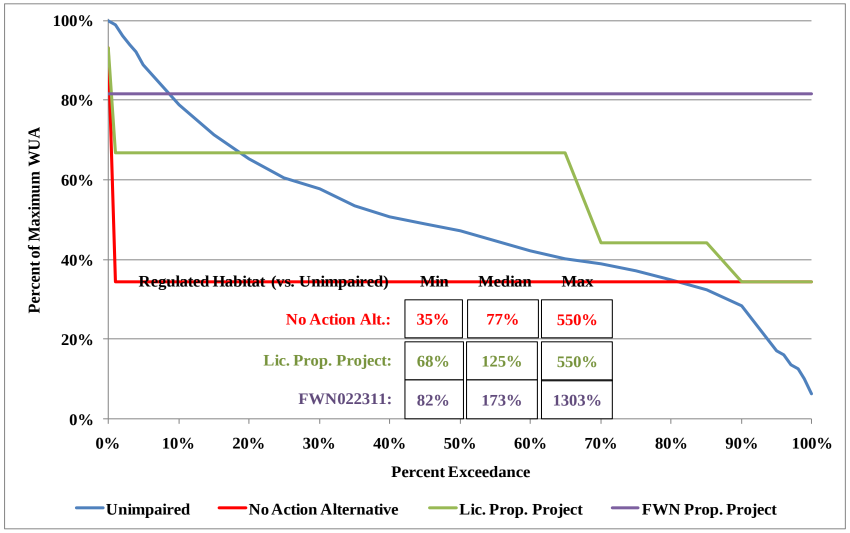


September - Node 0 – Jackson Meadows Dam

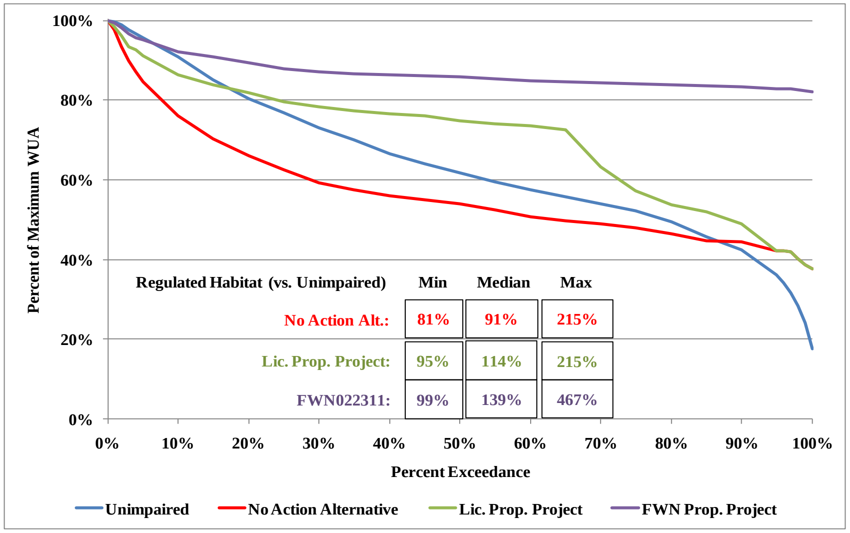


September - Node 1 – Jackson Meadows Dam Reach

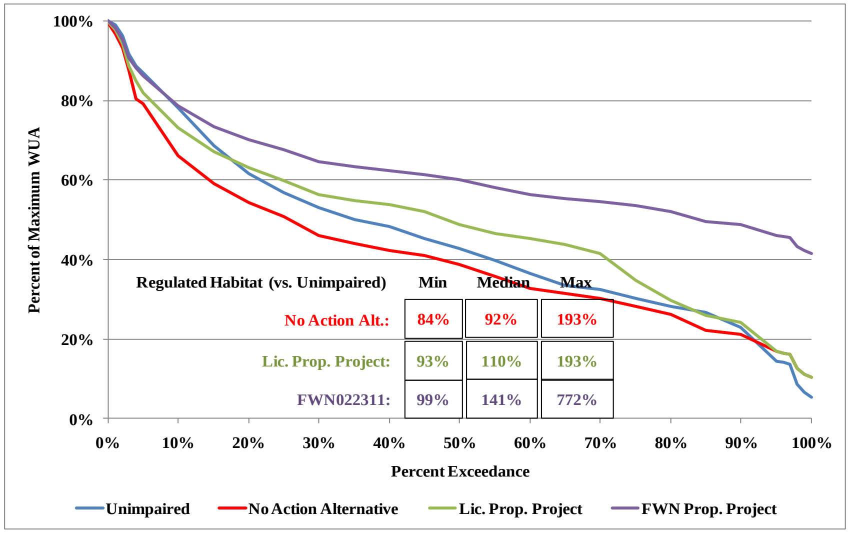
Figures 6.3.1-33k and 6.3.1-33l. HEA for adult rainbow trout during the months of August (k) and September (l) in Jackson Meadows Dam Reach, Middle Yuba River.



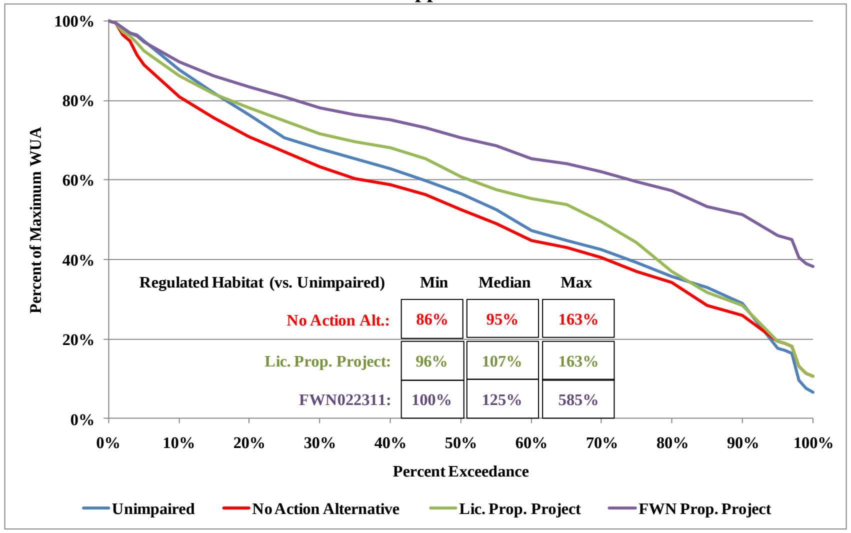
October - Node 0 – Milton Diversion Dam



October - Node 1 – Upper Milton Sub-Reach

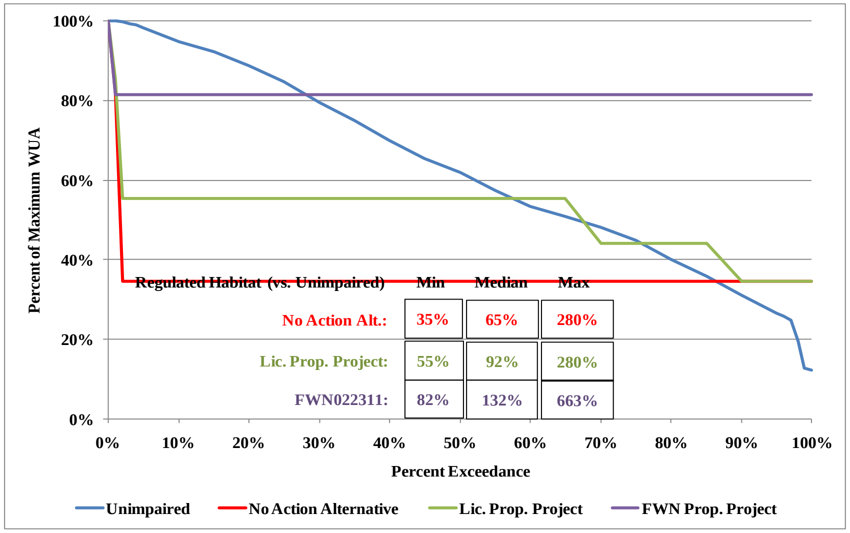


October – Node 2 – Wolf Creek Sub-Reach

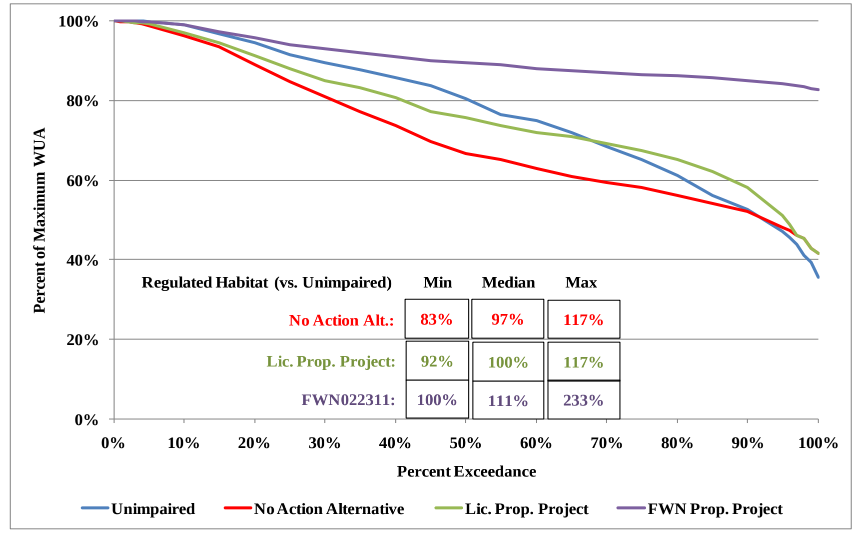


October - Node 3 – Kanaka Creek Sub-Reach

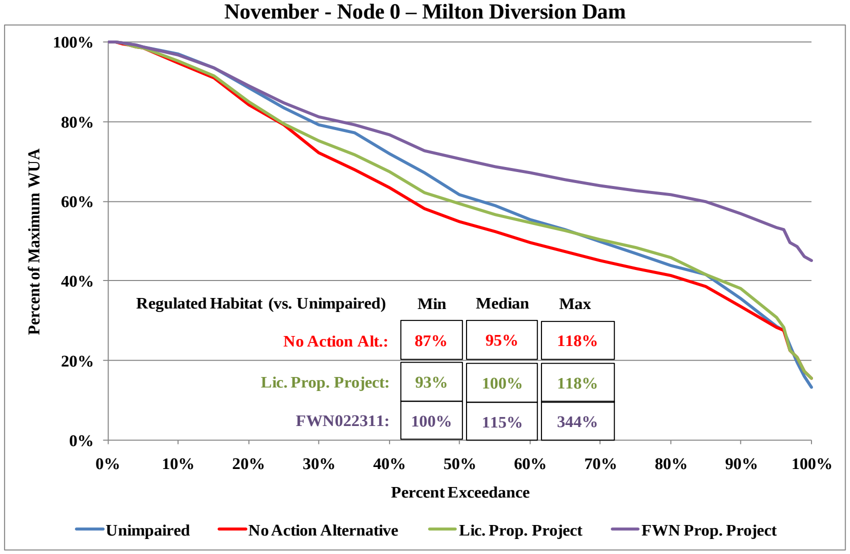
Figure 6.3.1-34a. HEA for adult rainbow trout during the month of October in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



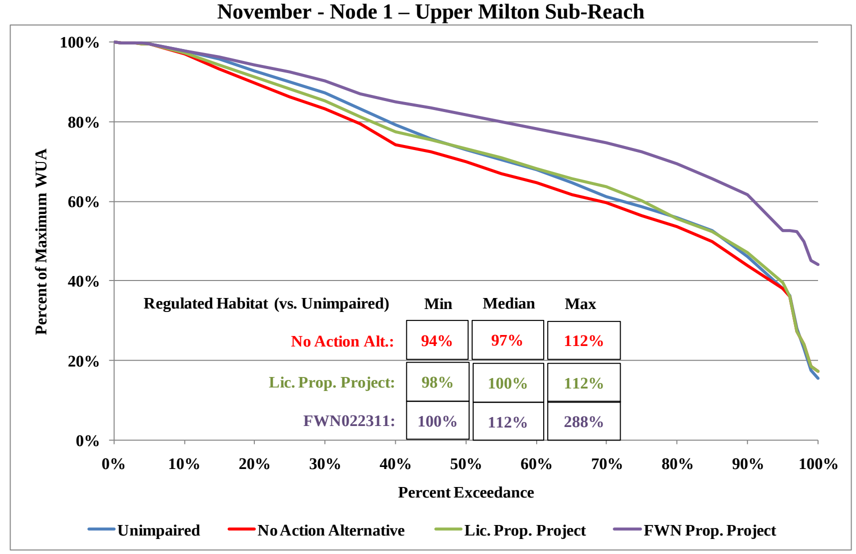
November - Node 0 – Milton Diversion Dam



November - Node 1 – Upper Milton Sub-Reach

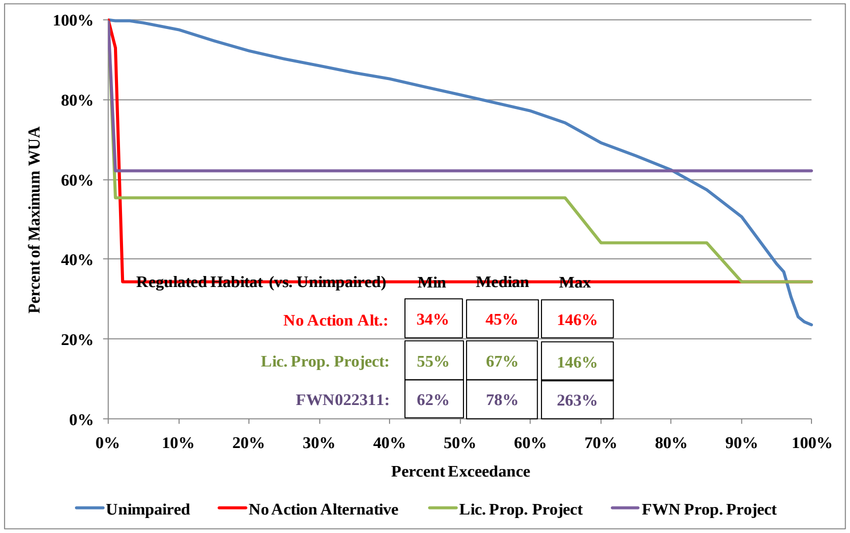


November – Node 2 – Wolf Creek Sub-Reach

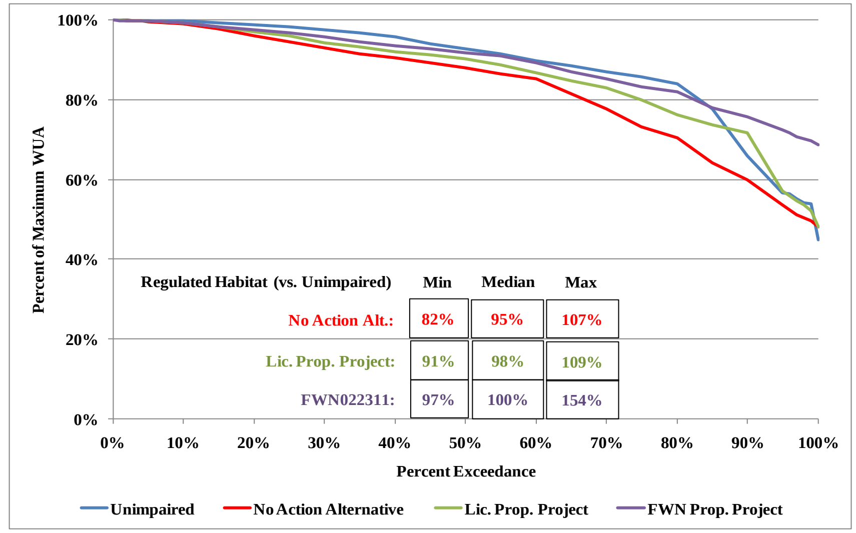


November - Node 3 – Kanaka Creek Sub-Reach

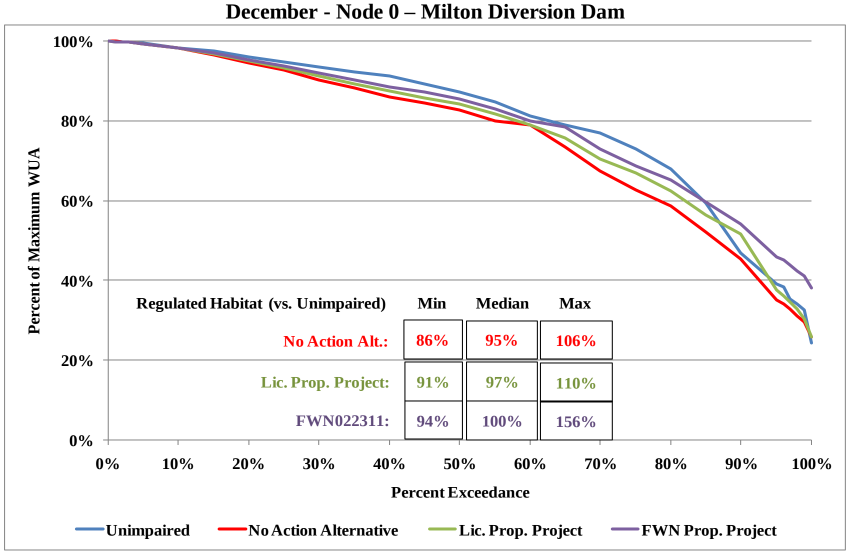
Figure 6.3.1-34b. HEA for adult rainbow trout during the month of November in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



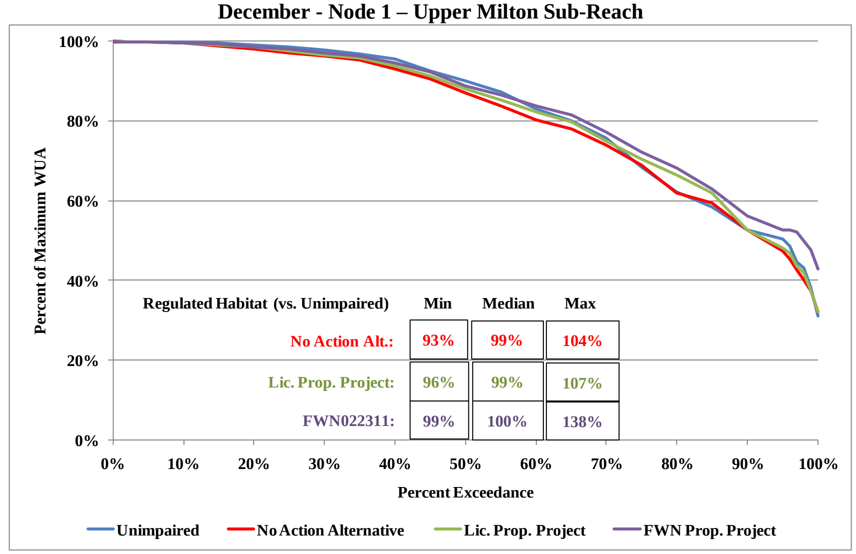
December - Node 0 – Milton Diversion Dam



December - Node 1 – Upper Milton Sub-Reach

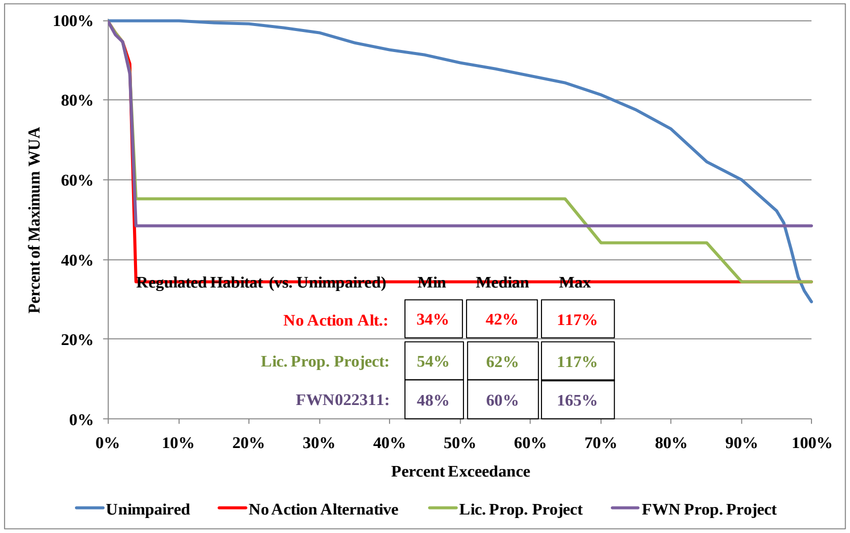


December – Node 2 – Wolf Creek Sub-Reach

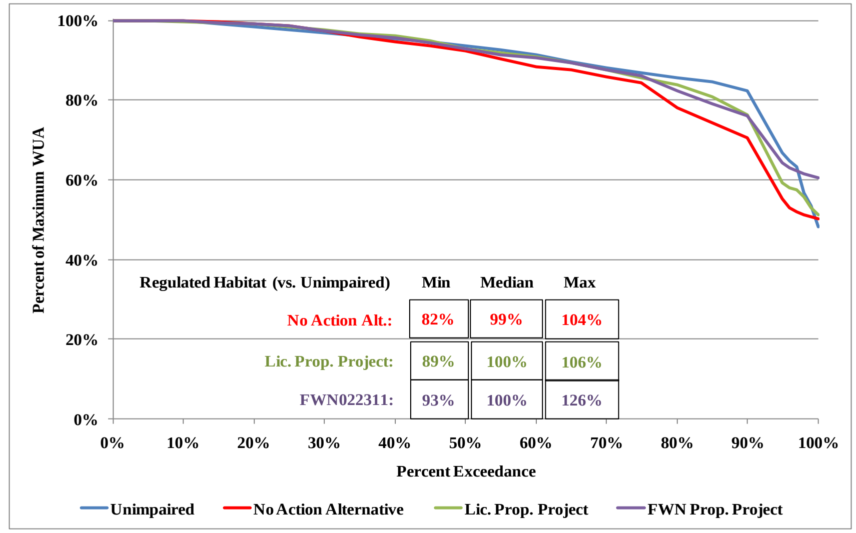


December - Node 3 – Kanaka Creek Reach

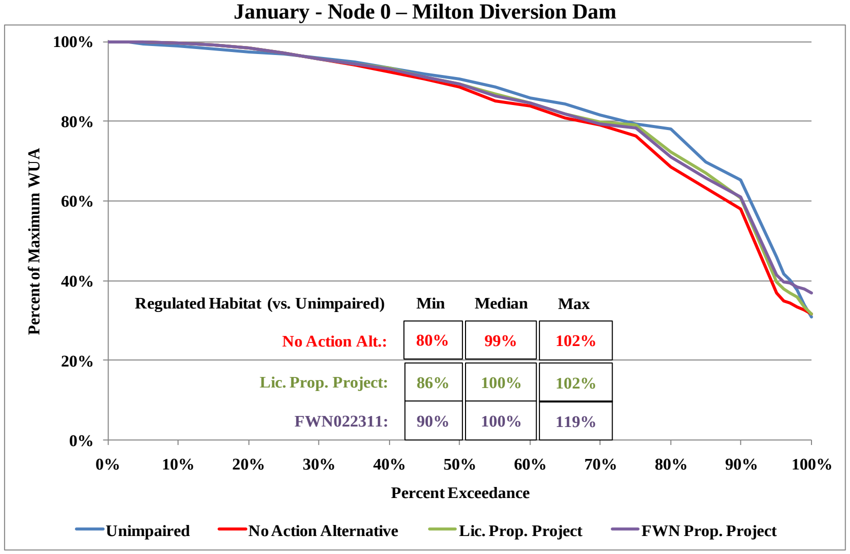
Figure 6.3.1-34c. HEA for adult rainbow trout during the month of December in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



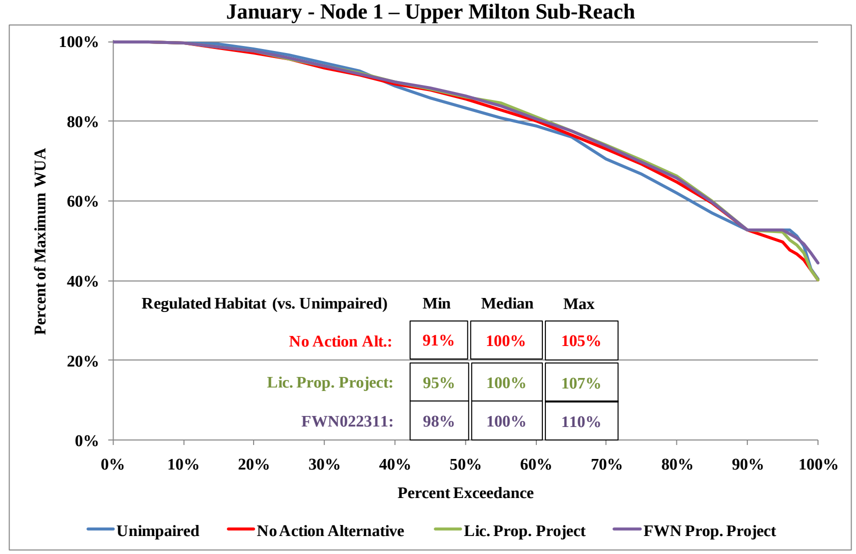
January - Node 0 – Milton Diversion Dam



January - Node 1 – Upper Milton Sub-Reach

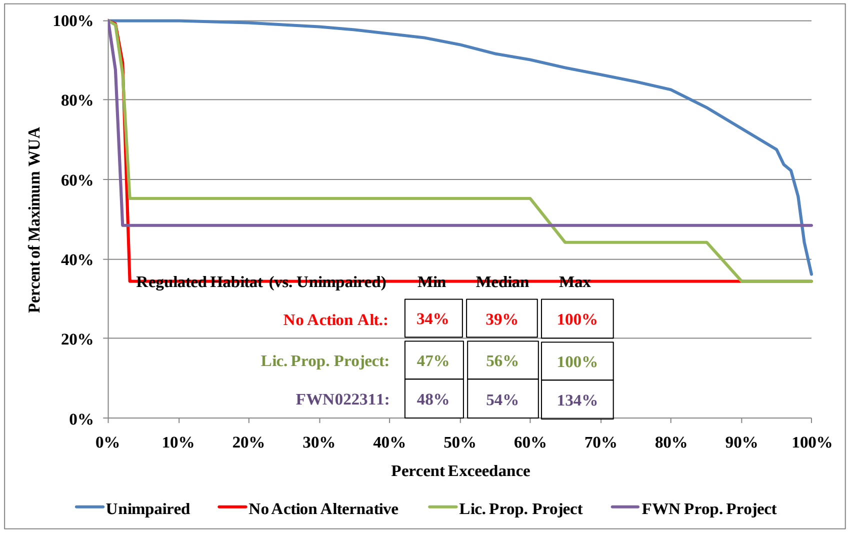


January – Node 2 – Wolf Creek Sub-Reach

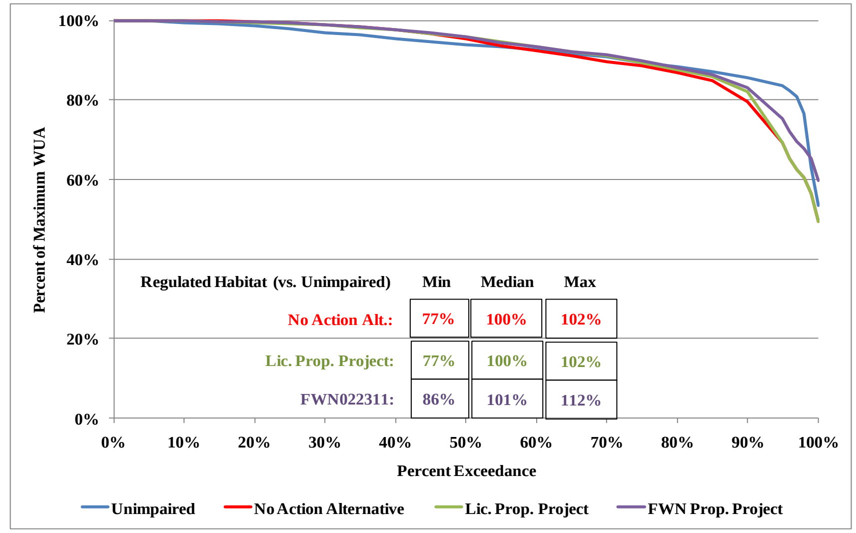


January - Node 3 – Kanaka Creek Sub-Reach

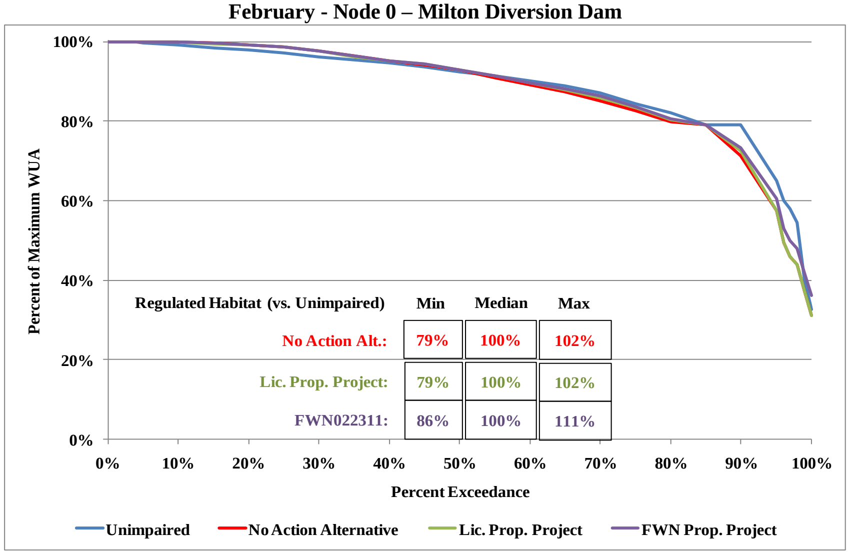
Figure 6.3.1-34d. HEA for adult rainbow trout during the month of January in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



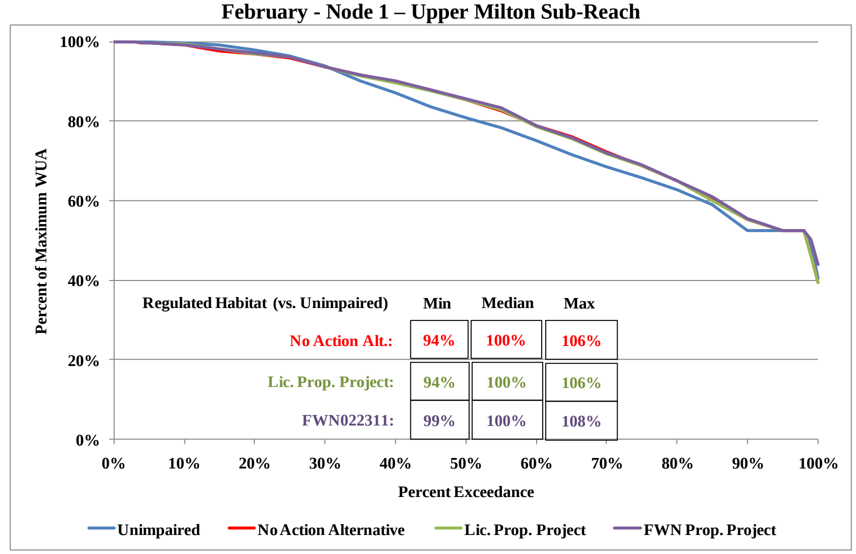
February - Node 0 – Milton Diversion Dam



February - Node 1 – Upper Milton Sub-Reach

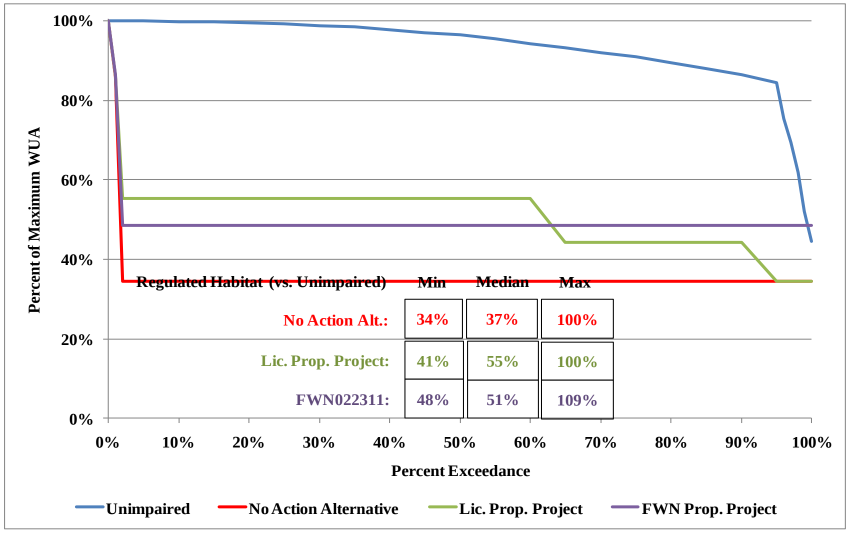


February – Node 2 – Wolf Creek Sub-Reach

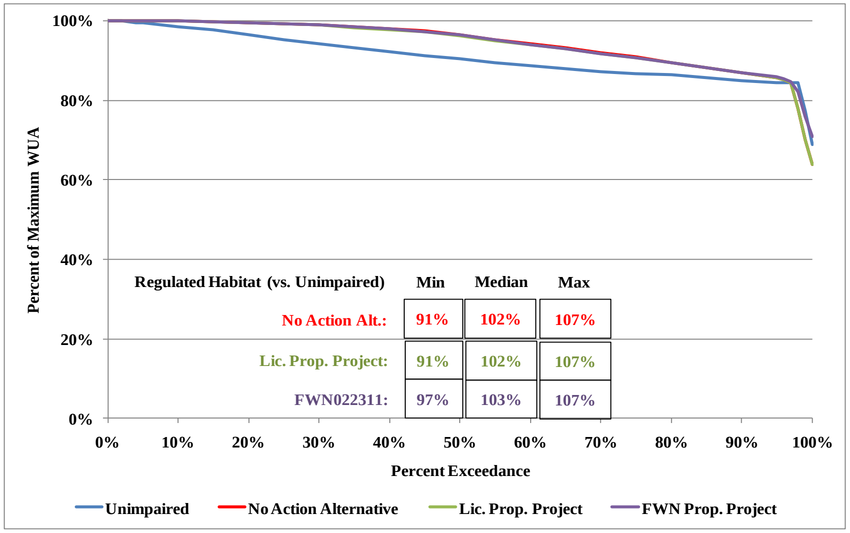


February - Node 3 – Kanaka Creek Sub-Reach

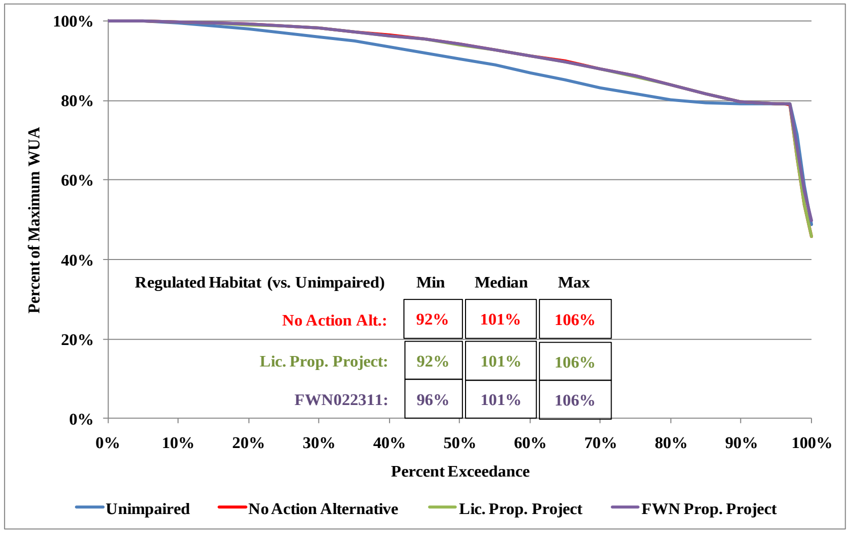
Figure 6.3.1-34e. HEA for adult rainbow trout during the month of February in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



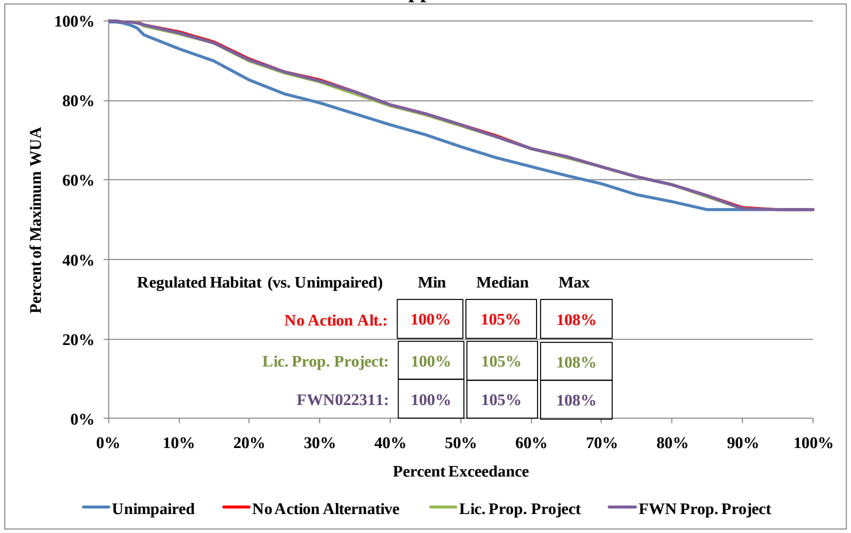
March - Node 0 – Milton Diversion Dam



March - Node 1 – Upper Milton Sub-Reach

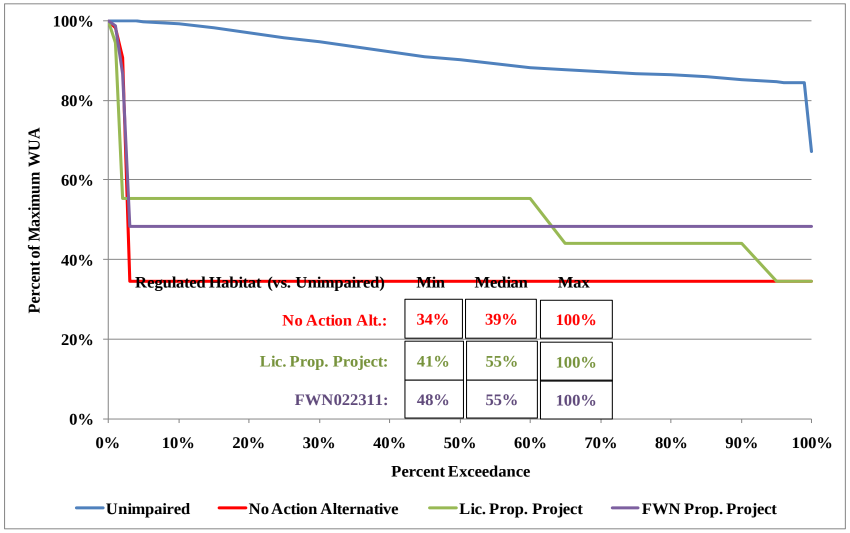


March – Node 2 – Wolf Creek Sub-Reach

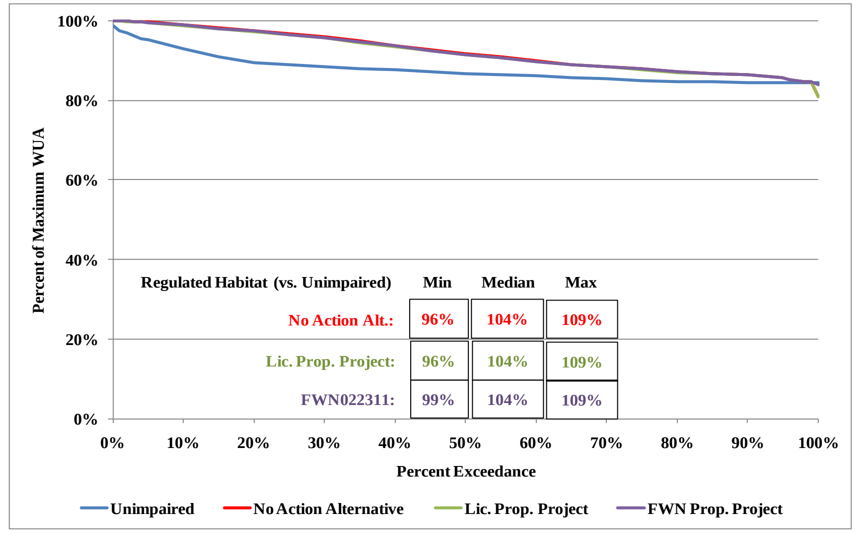


March - Node 3 – Kanaka Creek Sub-Reach

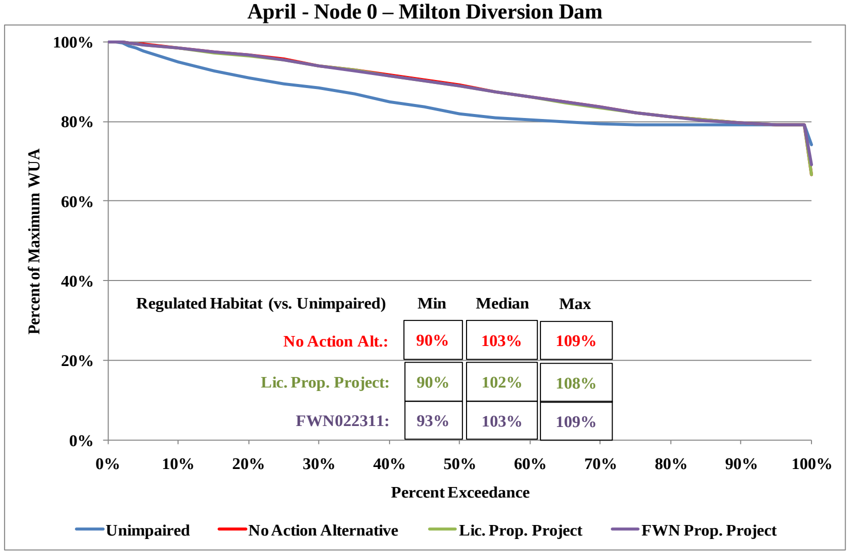
Figure 6.3.1-34f. HEA for adult rainbow trout during the month of March in Milton Diversion Dam Reach Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



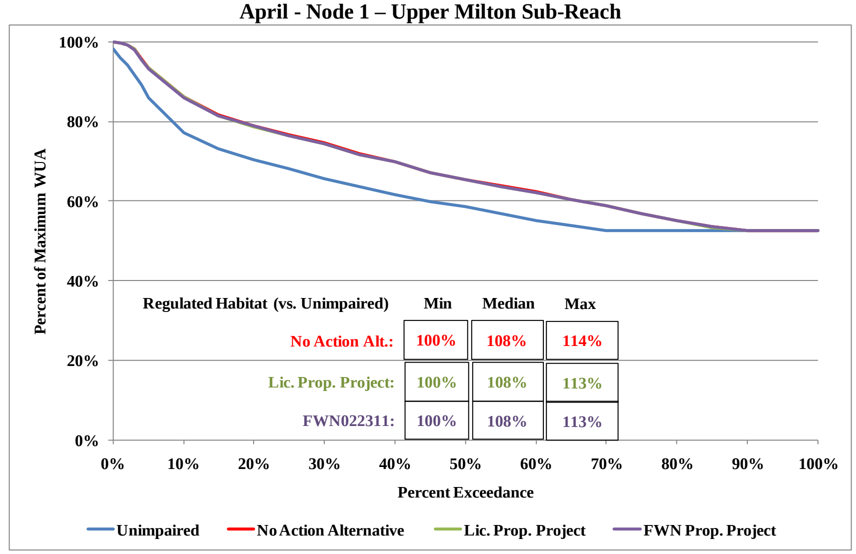
April - Node 0 – Milton Diversion Dam



April - Node 1 – Upper Milton Sub-Reach

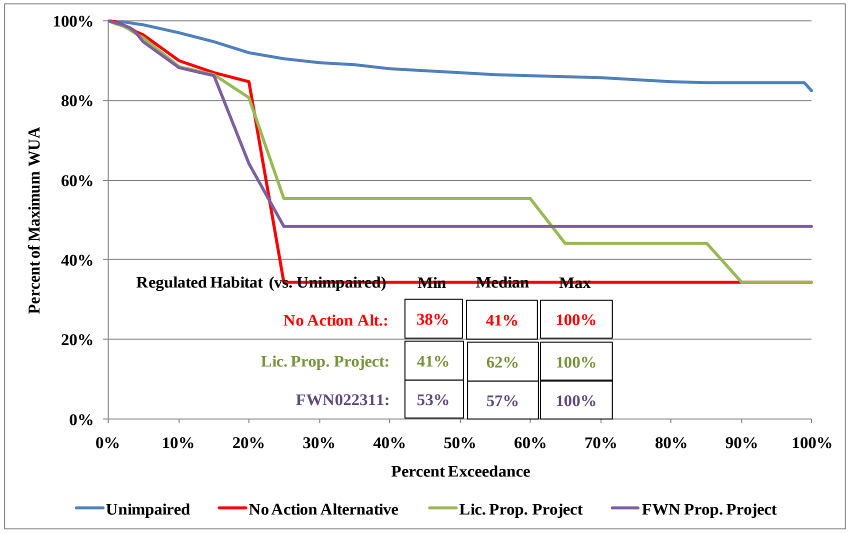


April – Node 2 – Wolf Creek Sub-Reach

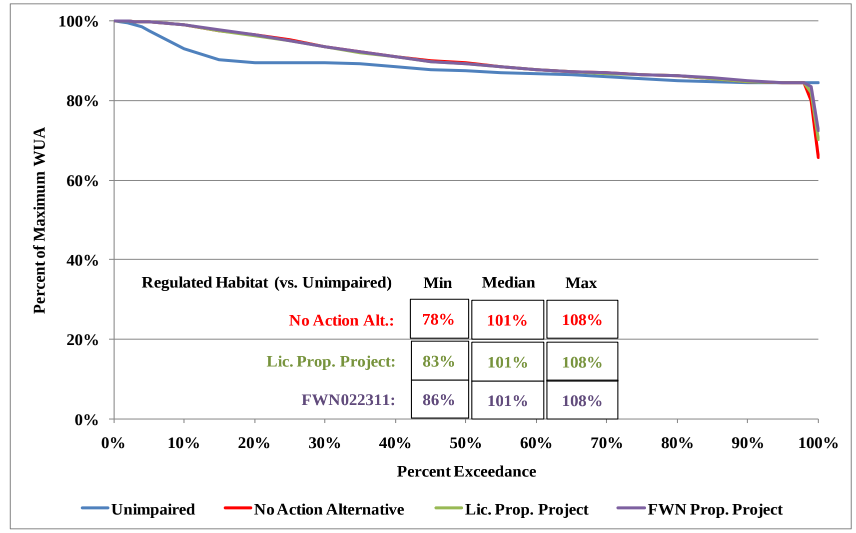


April - Node 3 – Kanaka Creek Sub-Reach

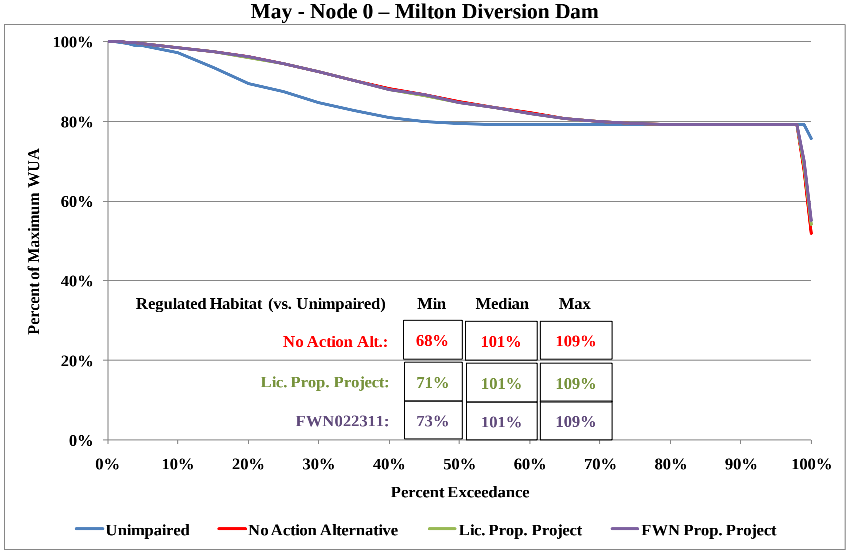
Figure 6.3.1-34g. HEA for adult rainbow trout during the month of April in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



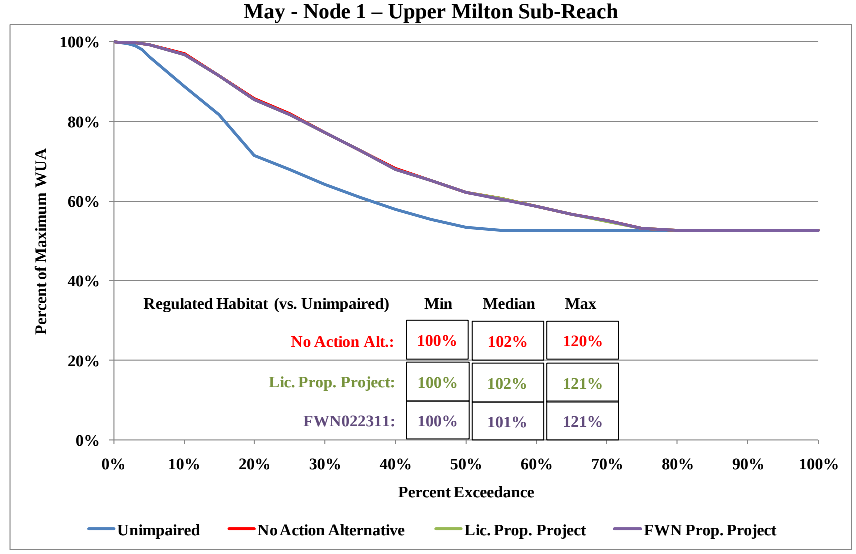
May - Node 0 – Milton Diversion Dam



May - Node 1 – Upper Milton Sub-Reach



May – Node 2 – Wolf Creek Sub-Reach



May - Node 3 – Kanaka Creek Sub-Reach

Figure 6.3.1-34h. HEA for adult rainbow trout during the month of May in Milton Diversion Dam Reach Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.

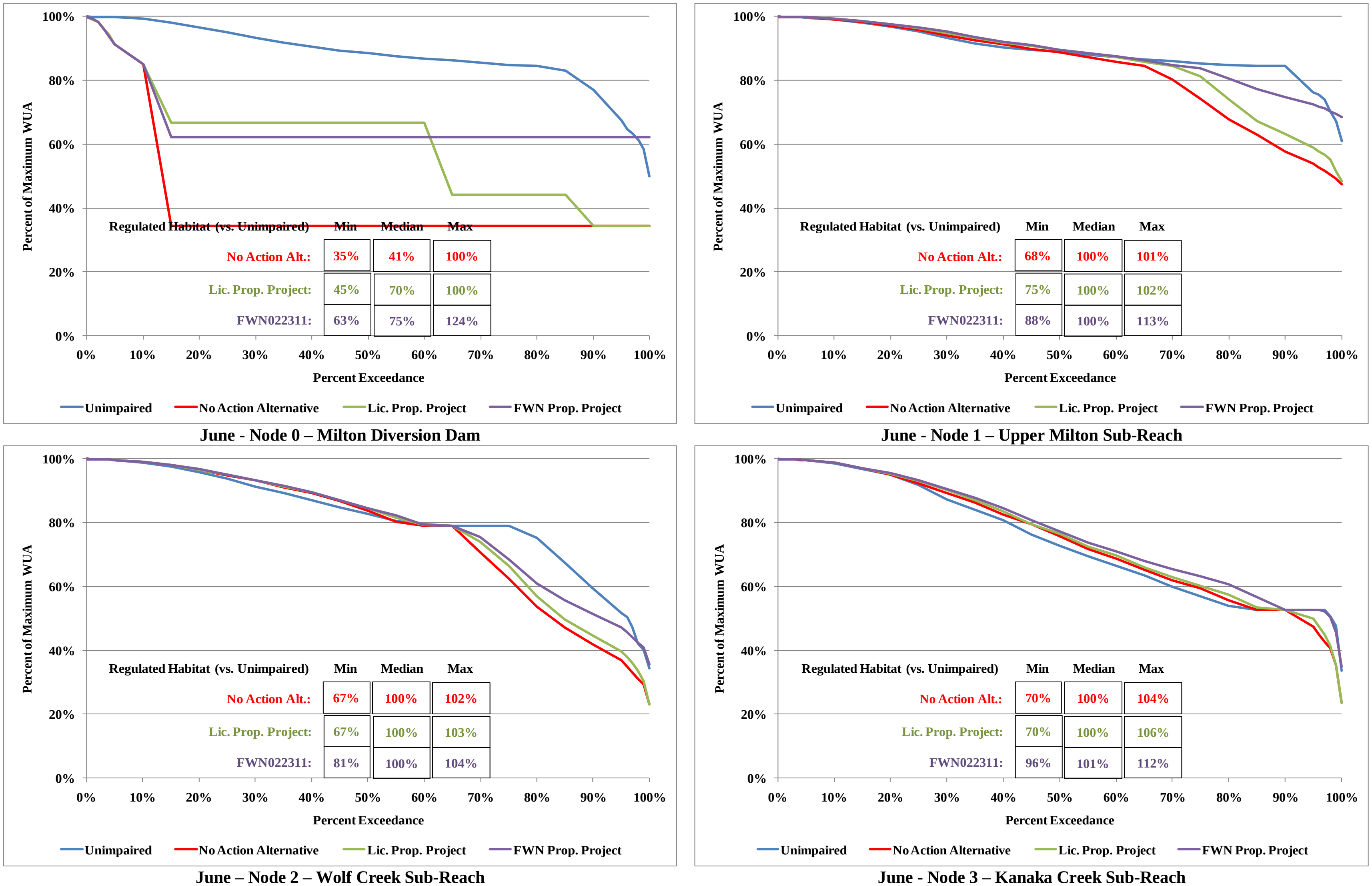
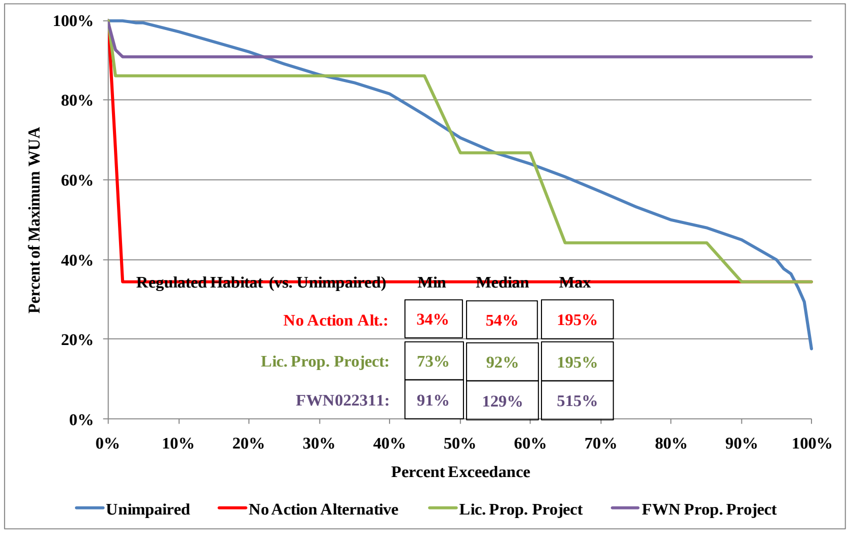
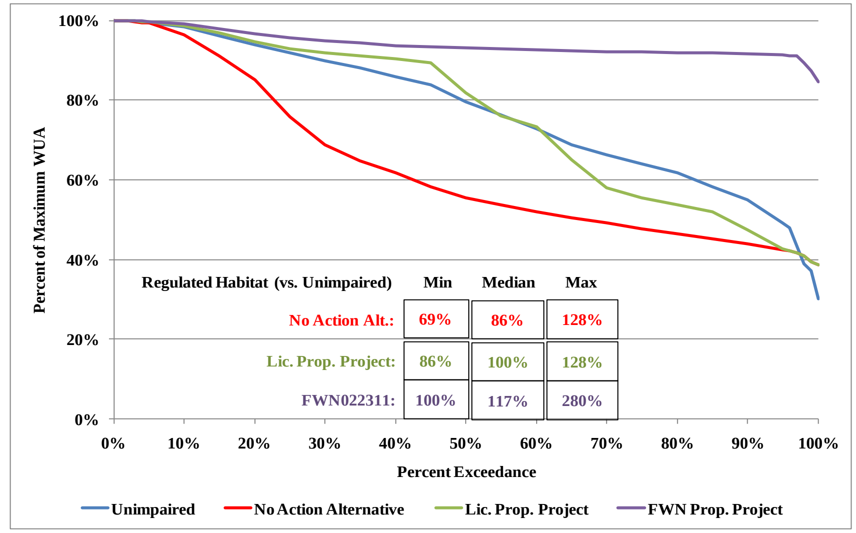


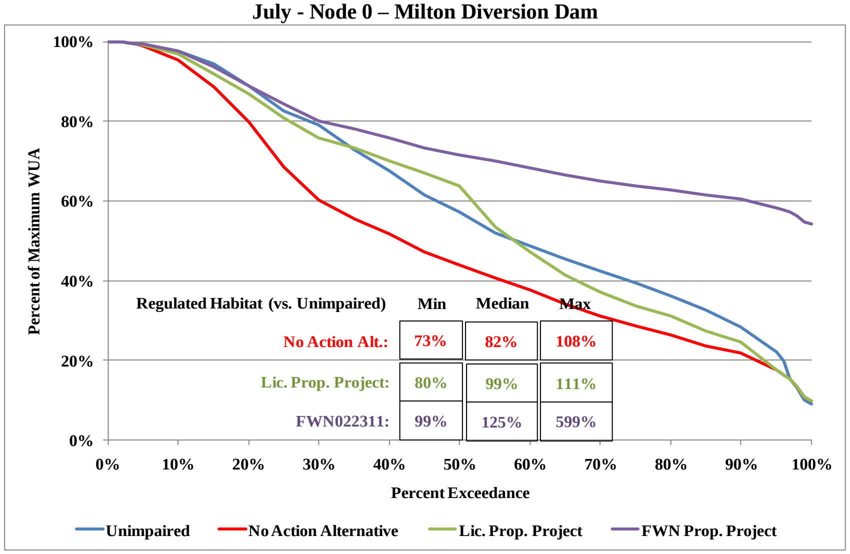
Figure 6.3.1-34i. HEA for adult rainbow trout during the month of June in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



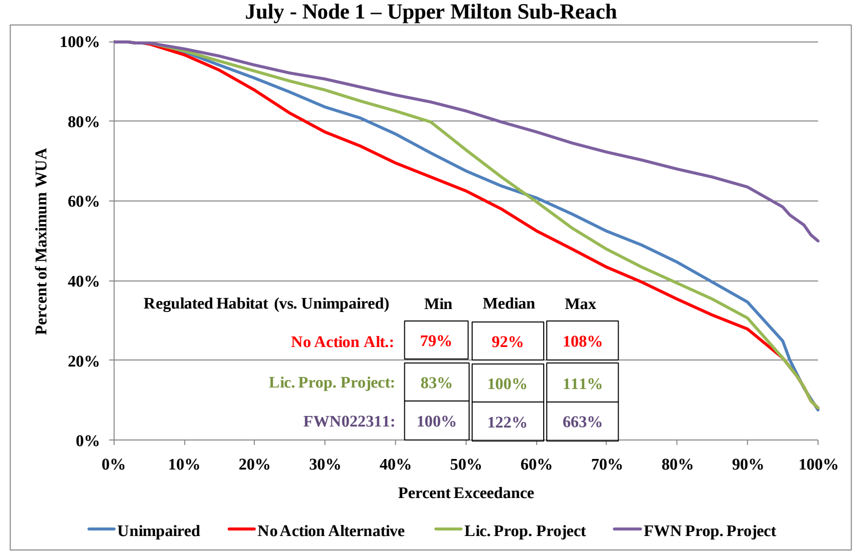
July - Node 0 – Milton Diversion Dam



July - Node 1 – Upper Milton Sub-Reach

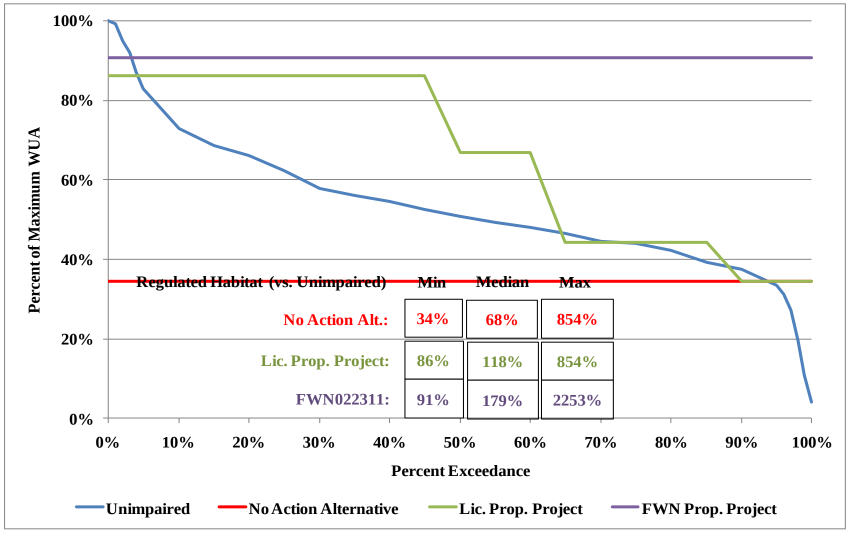


July – Node 2 – Wolf Creek Sub-Reach

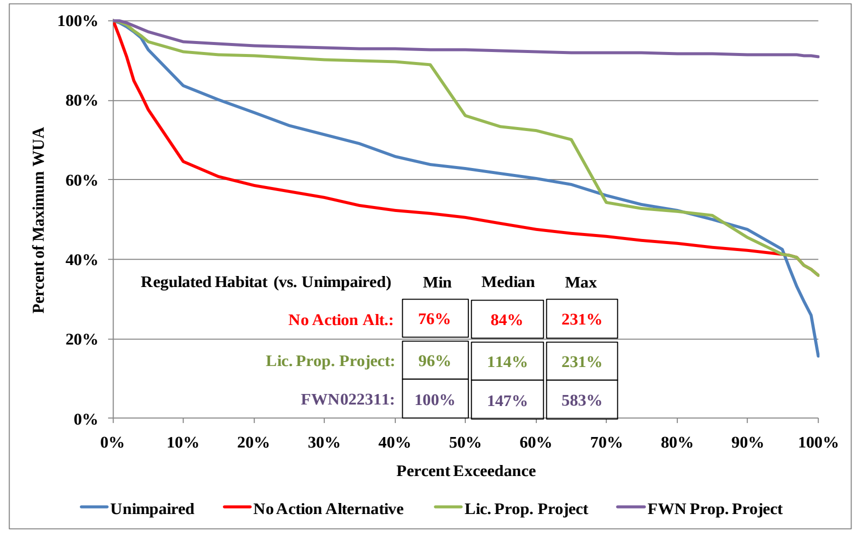


July - Node 3 – Kanaka Creek Sub-Reach

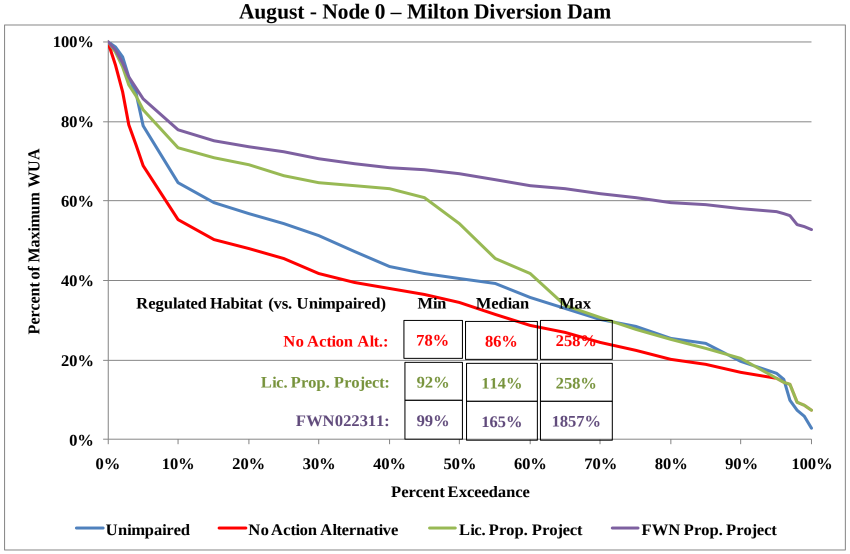
Figure 6.3.1-34j. HEA for adult rainbow trout during the month of July in Milton Diversion Dam Reach Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



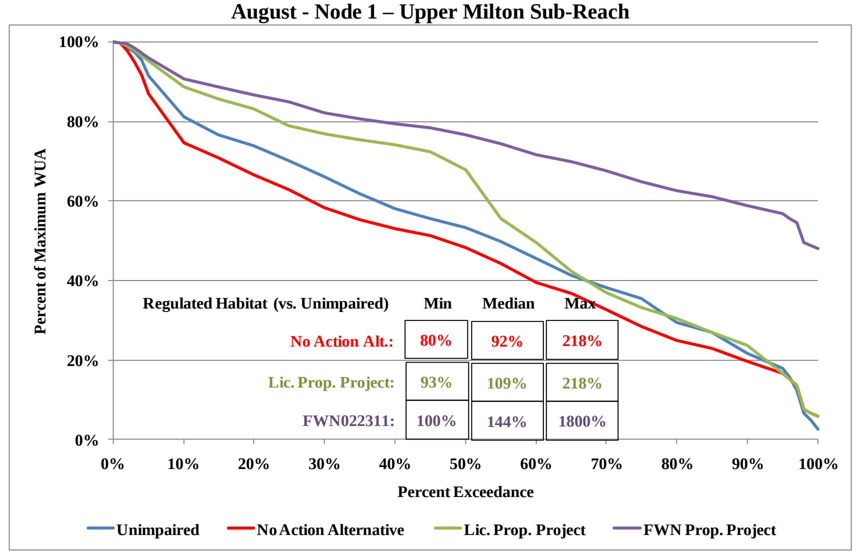
August - Node 0 – Milton Diversion Dam



August - Node 1 – Upper Milton Sub-Reach

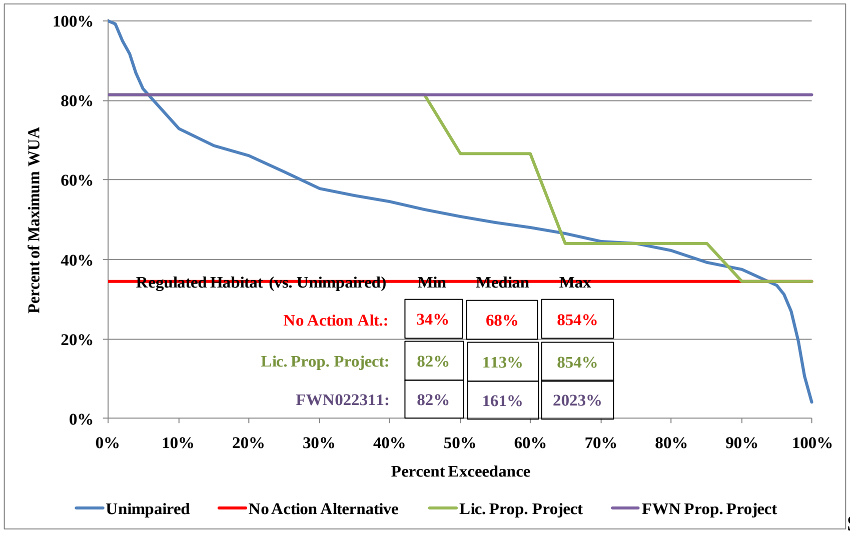


August – Node 2 – Wolf Creek Sub-Reach



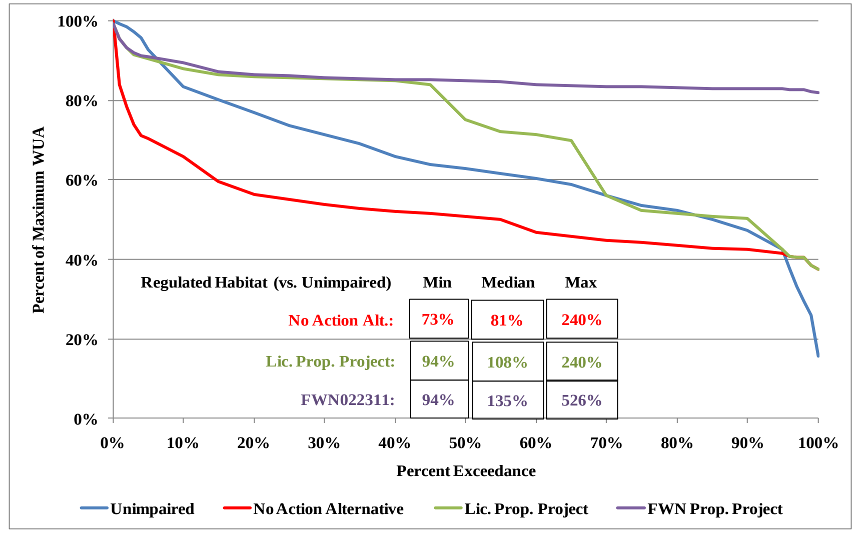
August - Node 3 – Kanaka Creek Sub-Reach

Figure 6.3.1-34k. HEA for adult rainbow trout during the month of August in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.

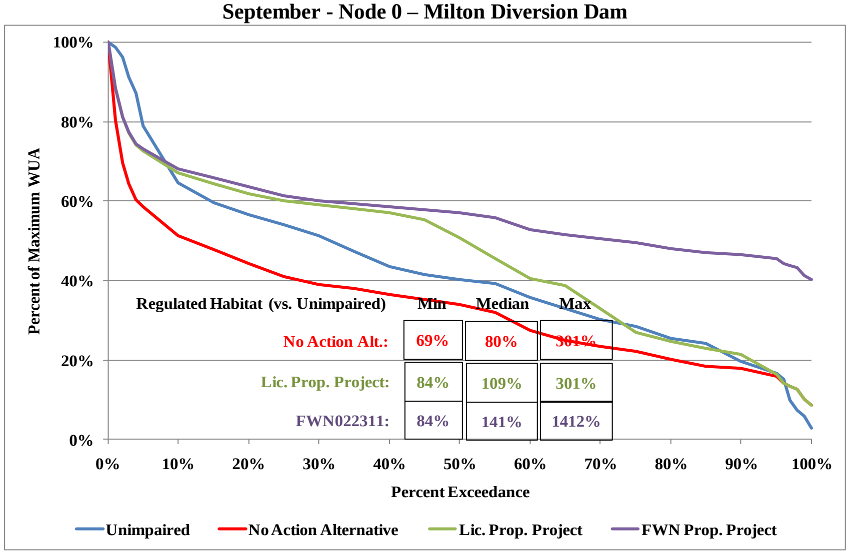


September - Node 0 – Milton Diversion Dam

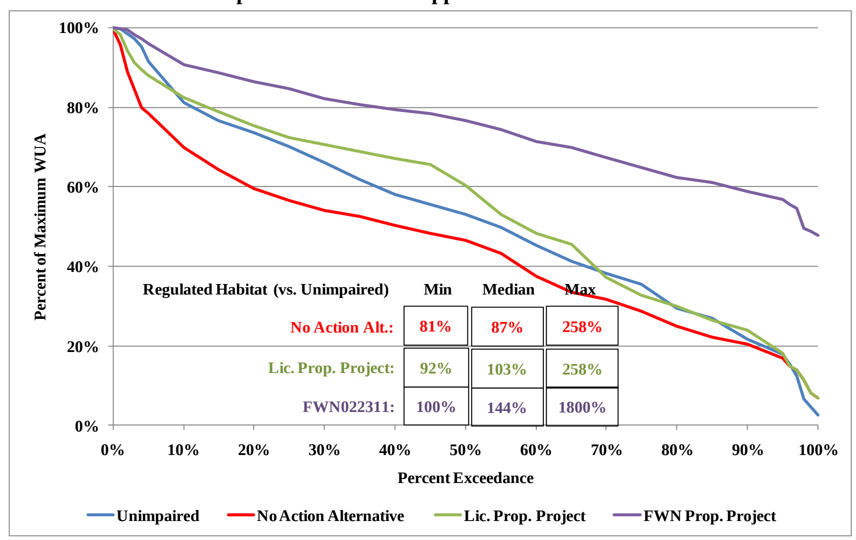
S



September - Node 1 – Upper Milton Sub-Reach

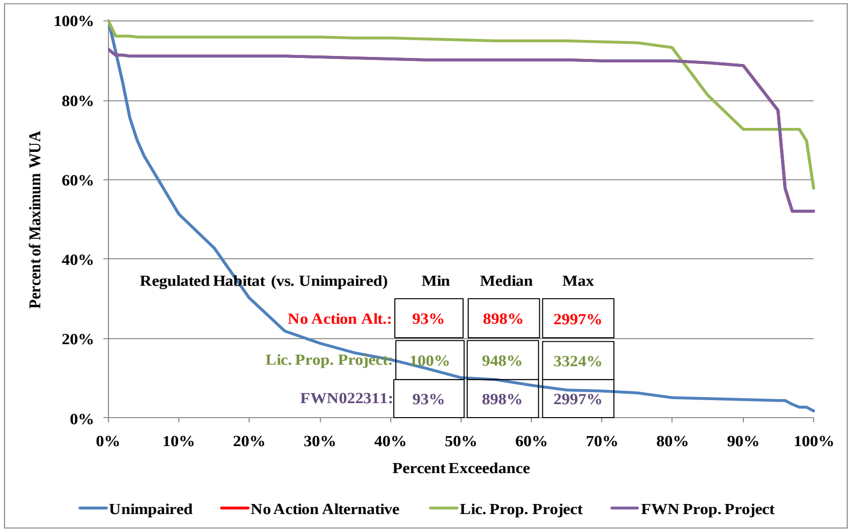


September – Node 2 – Wolf Creek Sub-Reach

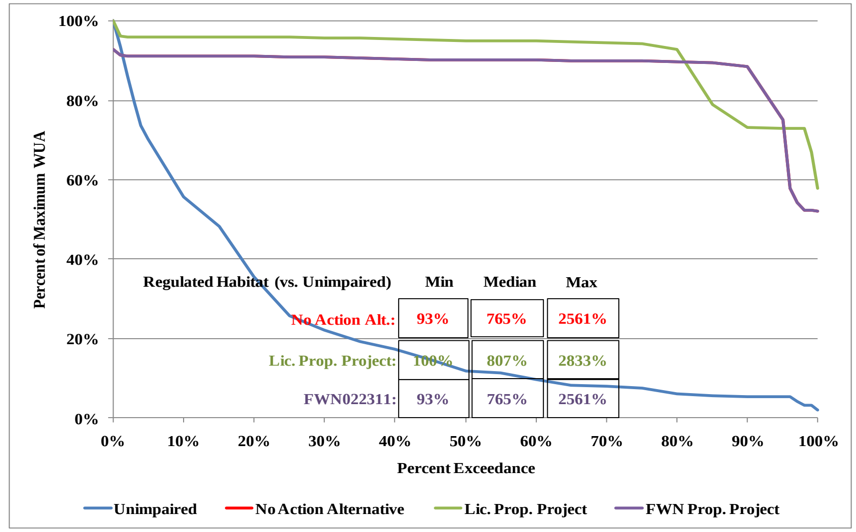


September - Node 3 – Kanaka Creek Sub-Reach

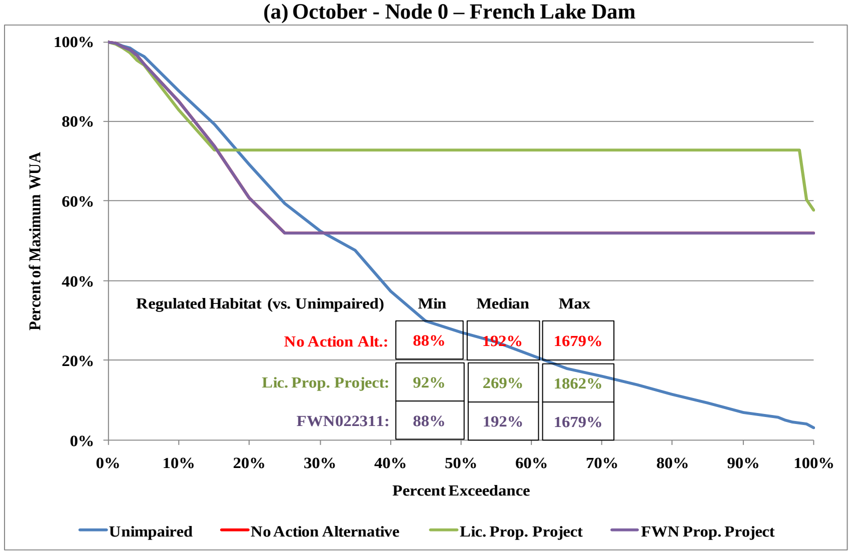
Figure 6.3.1-34l. HEA for adult rainbow trout during the month of September in Milton Diversion Dam Reach, Upper Milton Sub-Reach, Wolf Creek Sub-Reach and Kanaka Creek Sub-Reach, Middle Yuba River.



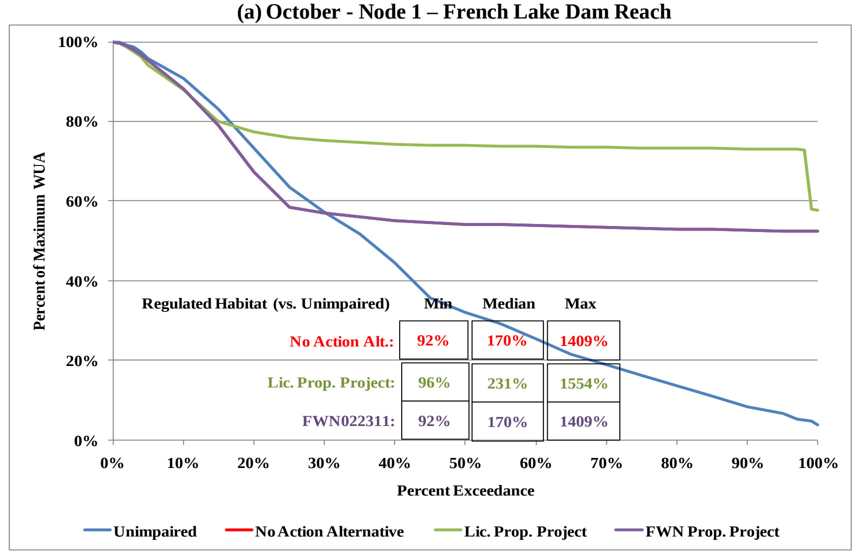
(a) October - Node 0 – French Lake Dam



(a) October - Node 1 – French Lake Dam Reach

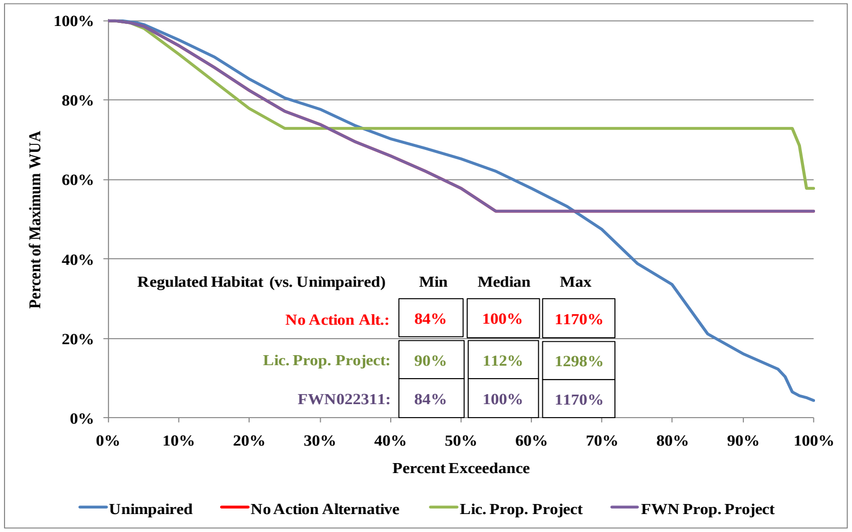


(b) November - Node 0 – French Lake Dam

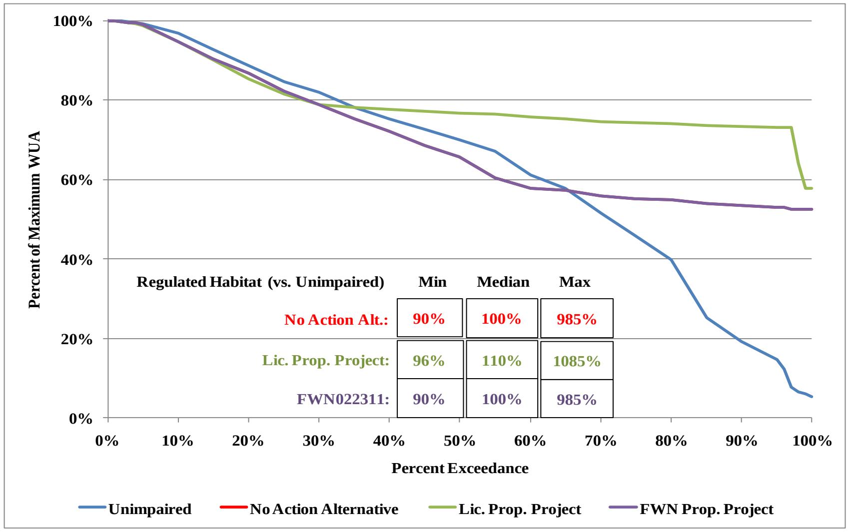


(c) November - Node 1 – French Lake Dam Reach

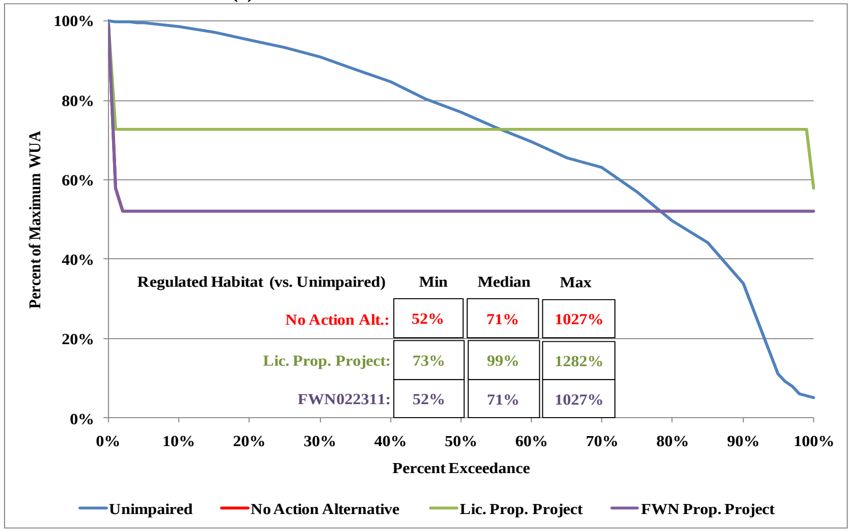
Figures 6.3.1-35a and 6.3.1-35b. HEA for adult rainbow trout during the months of October (a) and November (b) in French Lake Dam Reach, Canyon Creek.



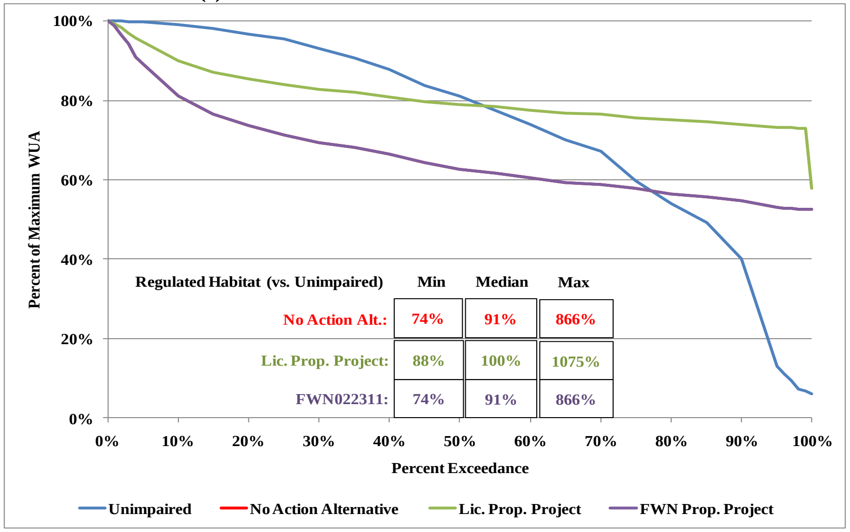
(c) December - Node 0 – French Lake Dam



(c) December - Node 1 – French Lake Dam Reach

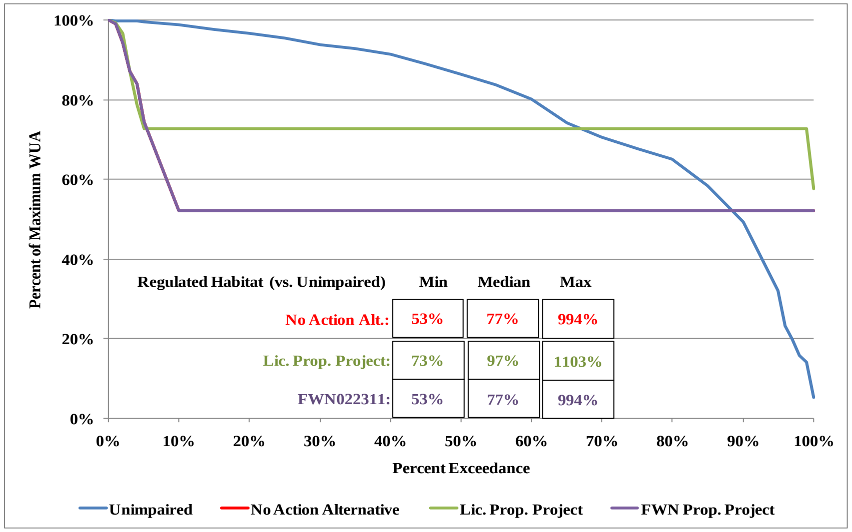


(d) January - Node 0 – French Lake Dam

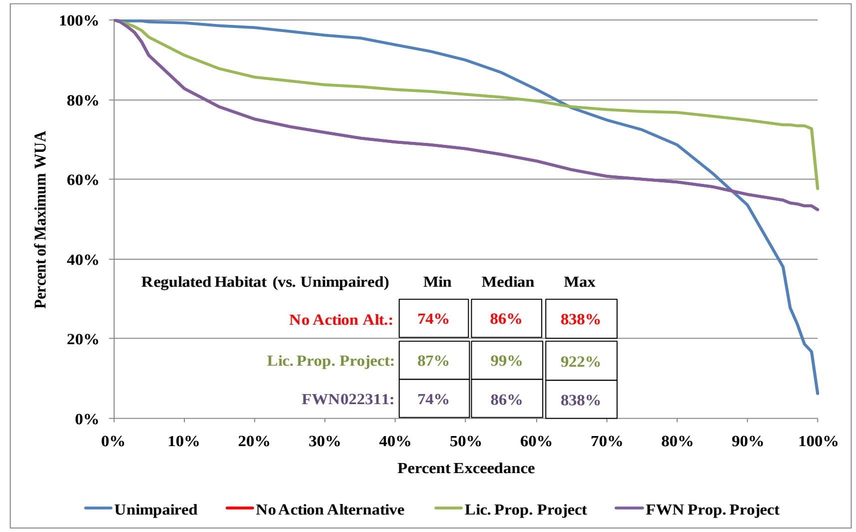


(d) January - Node 1 – French Lake Dam Reach

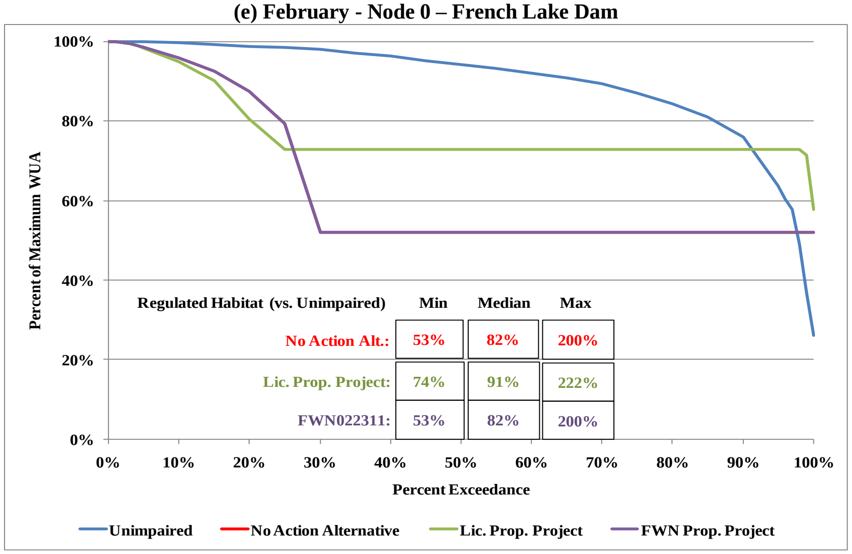
Figures 6.3.1-35c and 6.3.1-35d. HEA for adult rainbow trout during the months of December (c) and January (d) in French Lake Dam Reach, Canyon Creek.



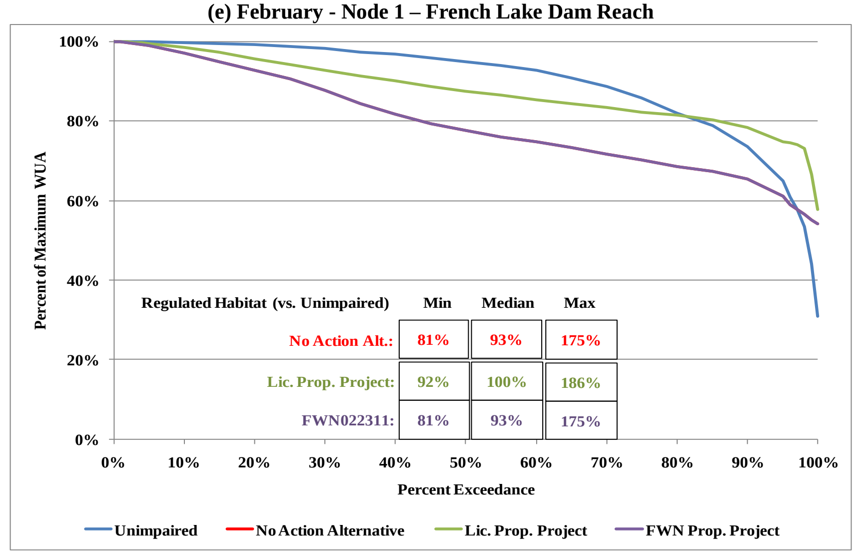
(e) February - Node 0 – French Lake Dam



(e) February - Node 1 – French Lake Dam Reach

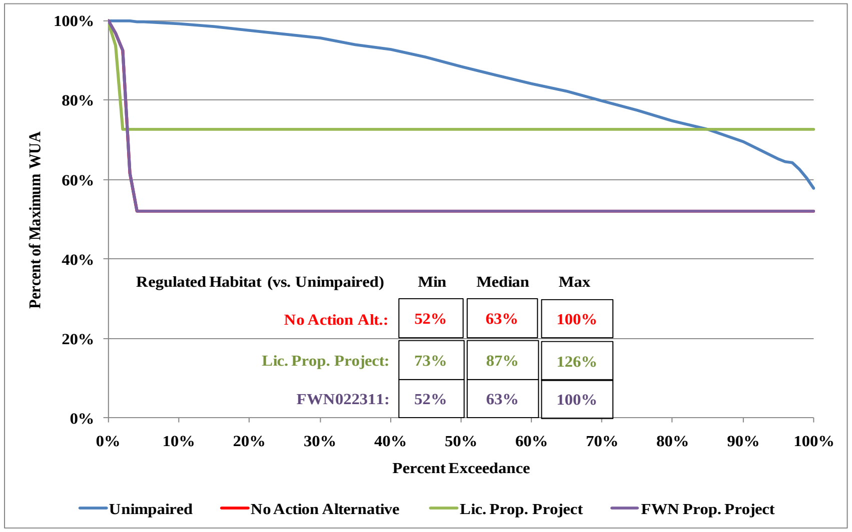


(f) March - Node 0 – French Lake Dam

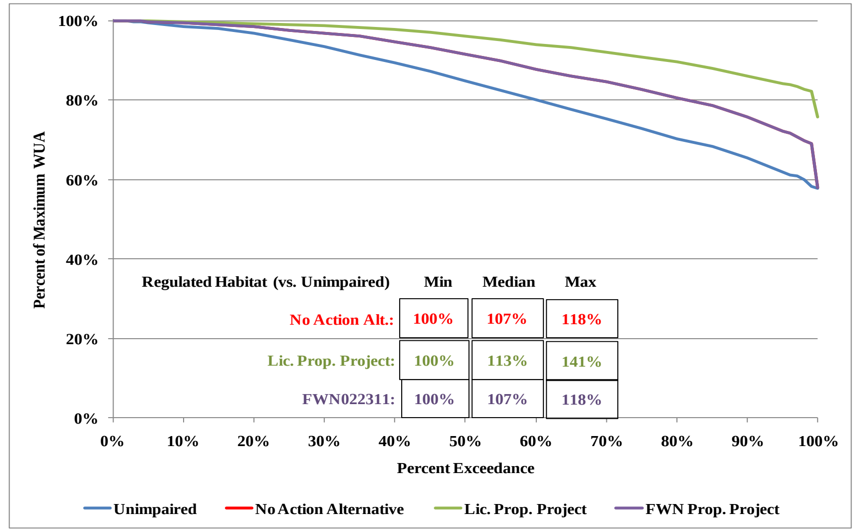


(f) March - Node 1 – French Lake Dam Reach

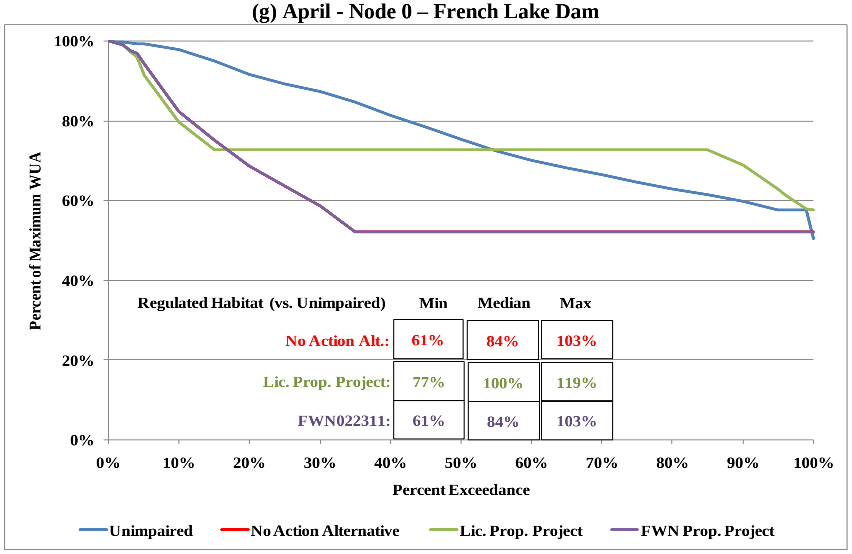
Figures 6.3.1-35e and 6.3.1-35f. HEA for adult rainbow trout during the months of February (e) and March (f) in French Lake Dam Reach, Canyon Creek.



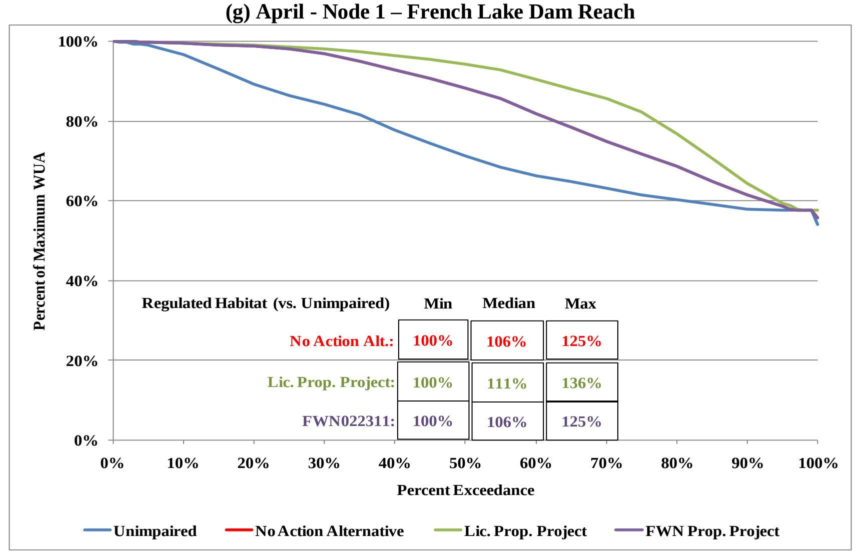
(g) April - Node 0 – French Lake Dam



(g) April - Node 1 – French Lake Dam Reach

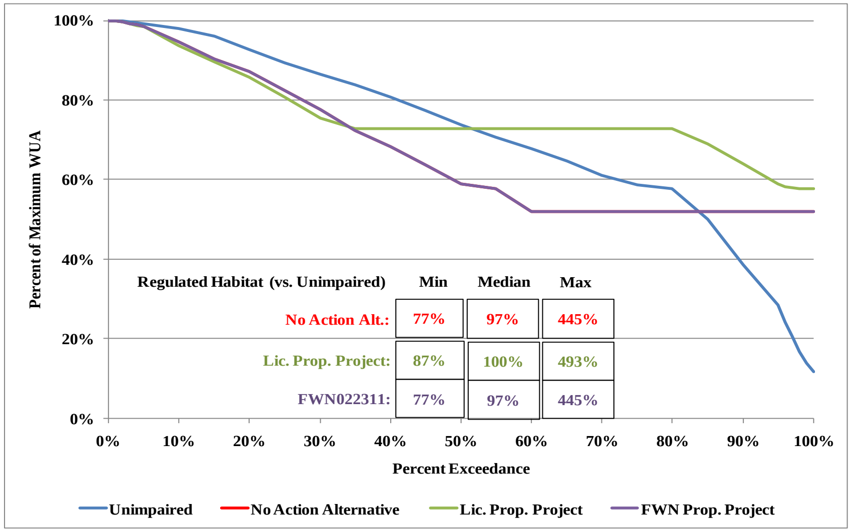


(h) May - Node 0 – French Lake Dam

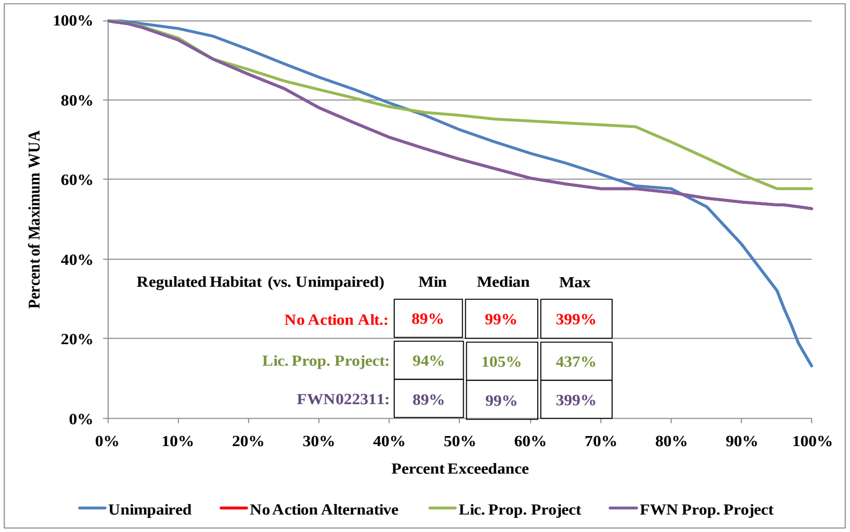


(h) May - Node 1 – French Lake Dam Reach

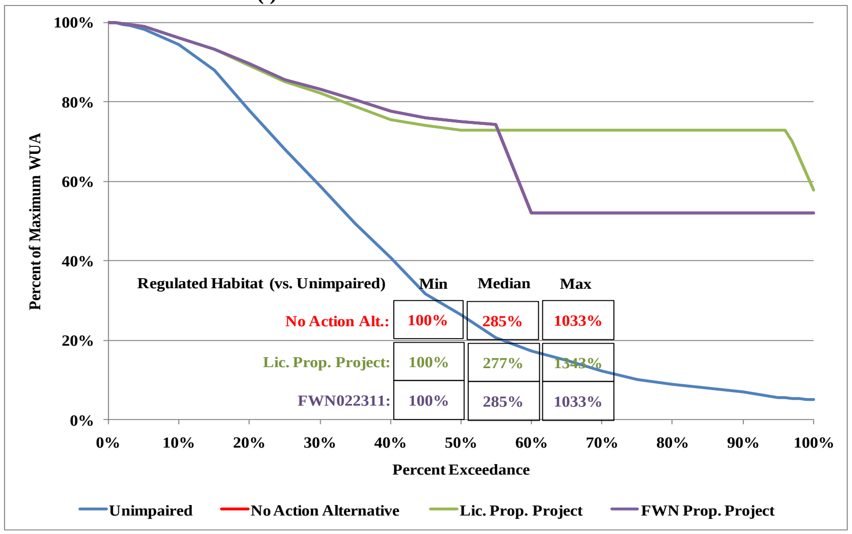
Figures 6.3.1-35g and 6.3.1-35h. HEA for adult rainbow trout during the months of April (g) and May (h) in French Lake Dam Reach, Canyon Creek.



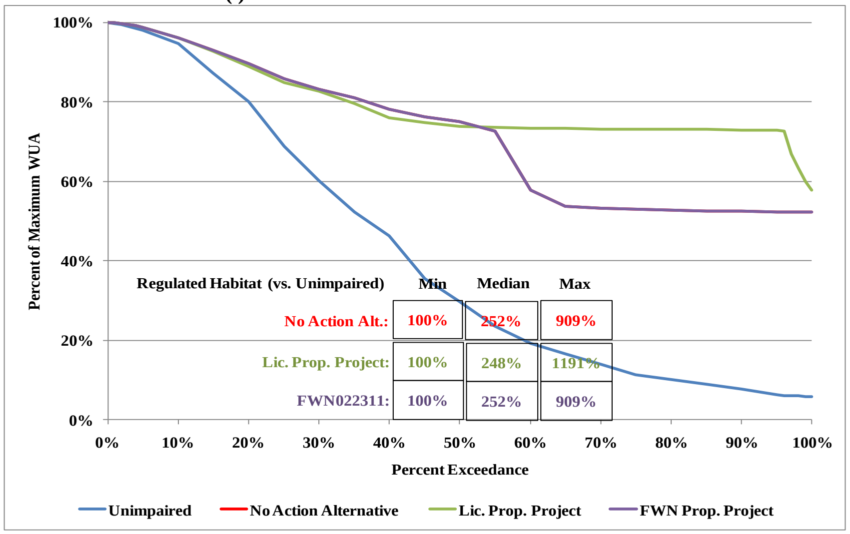
(i) June - Node 0 – French Lake Dam



(i) June - Node 1 – French Lake Dam Reach

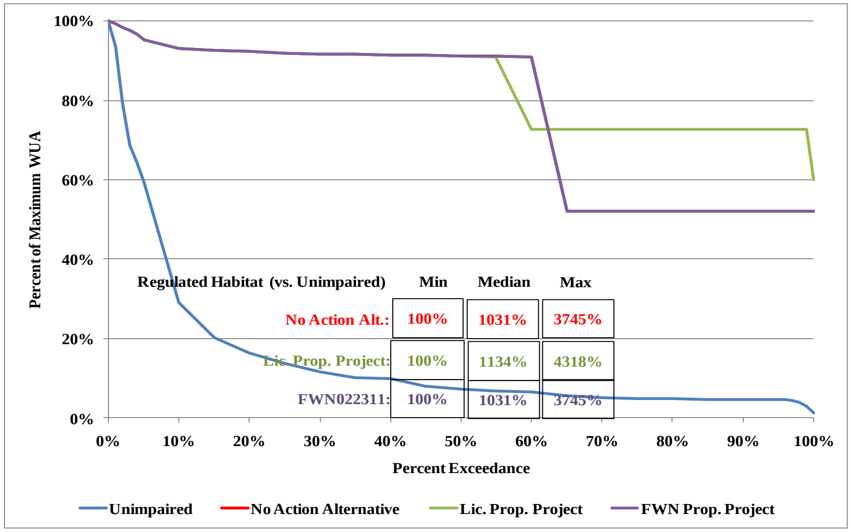


(j) July - Node 0 – French Lake Dam

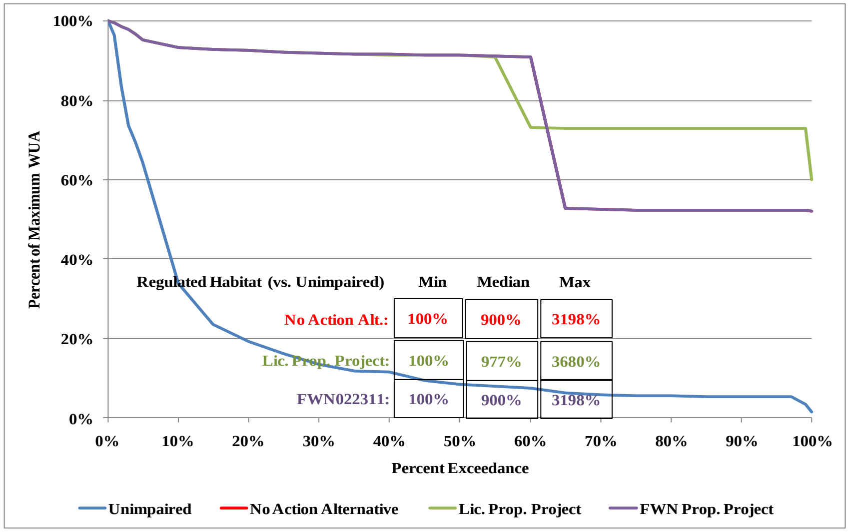


(j) July - Node 1 – French Lake Dam Reach

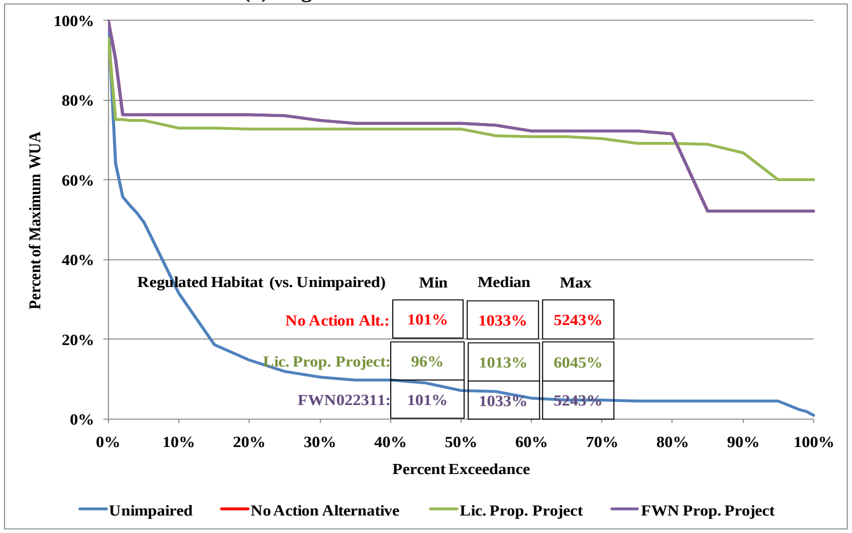
Figures 6.3.1-35i and 6.3.1-35j. HEA for adult rainbow trout during the months of June (i) and July (j) in French Lake Dam Reach, Canyon Creek.



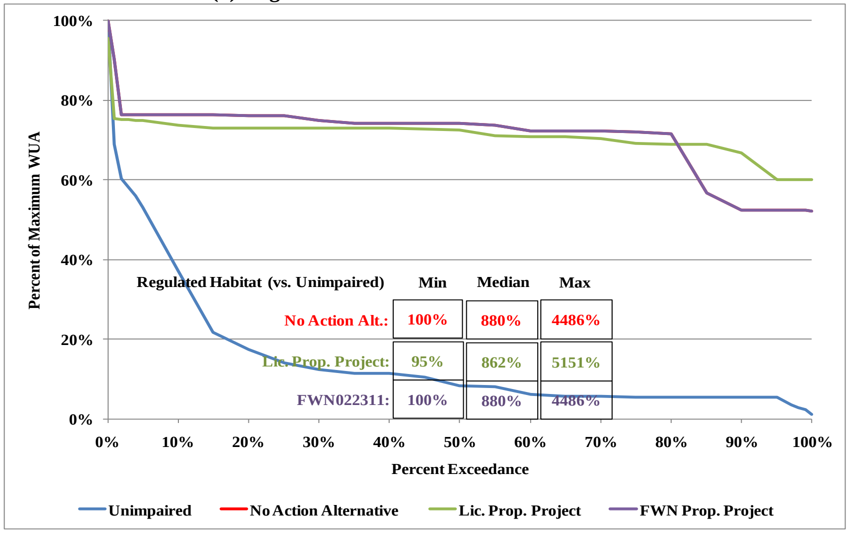
(k) August - Node 0 – French Lake Dam



(k) August - Node 1 – French Lake Dam Reach

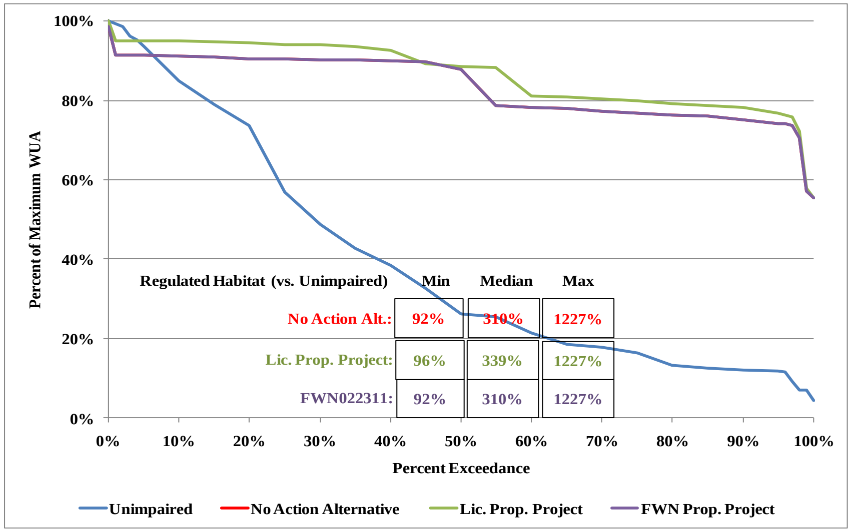


(l) September - Node 0 – French Lake Dam

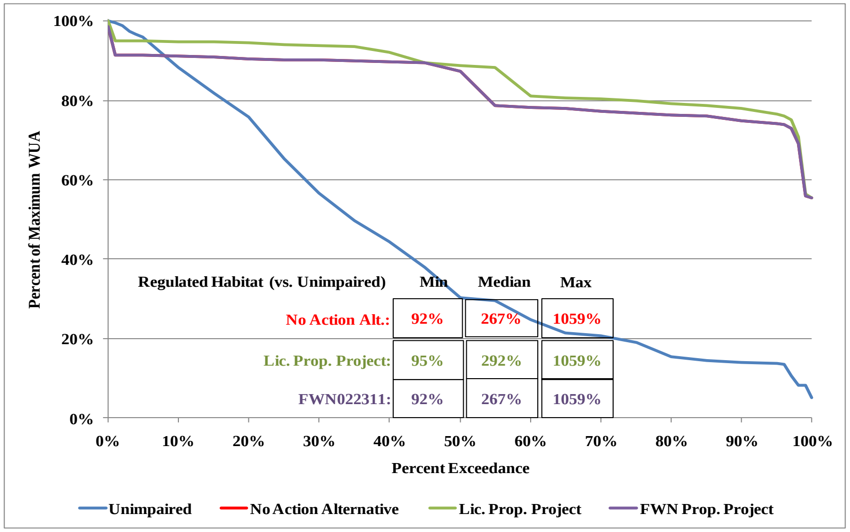


(l) September - Node 1 – French Lake Dam Reach

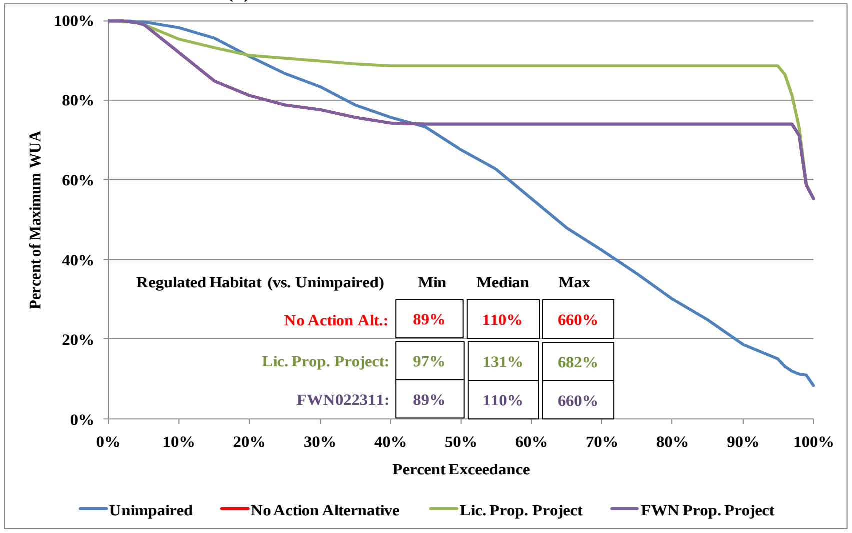
Figures 6.3.1-35k and 6.3.1-35l. HEA for adult rainbow trout during the months of August (k) and September (l) in French Lake Dam Reach, Canyon Creek.



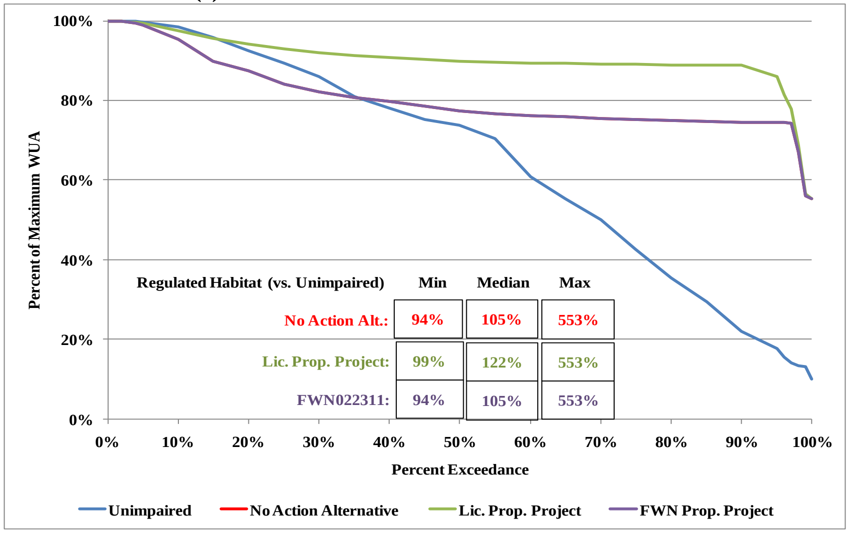
(a) October - Node 0 – Faucherie Lake Dam



(a) October - Node 1 – Faucherie Lake Dam Reach

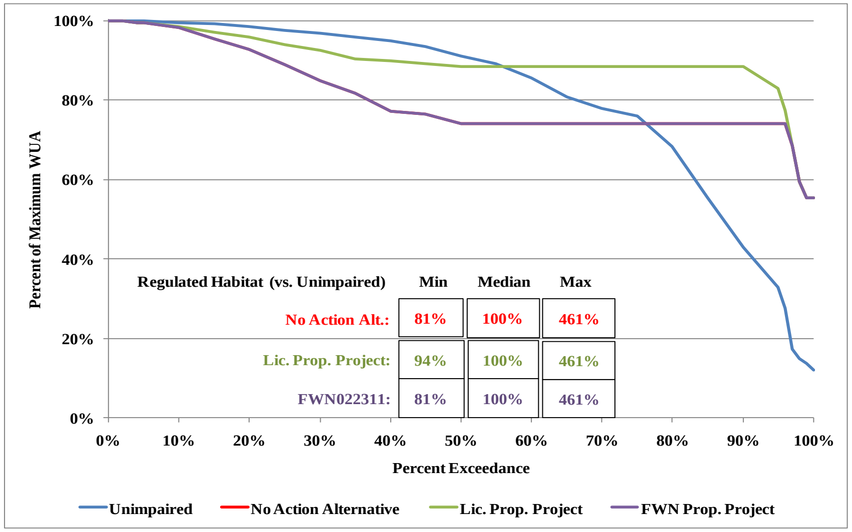


(b) November - Node 0 – Faucherie Lake Dam

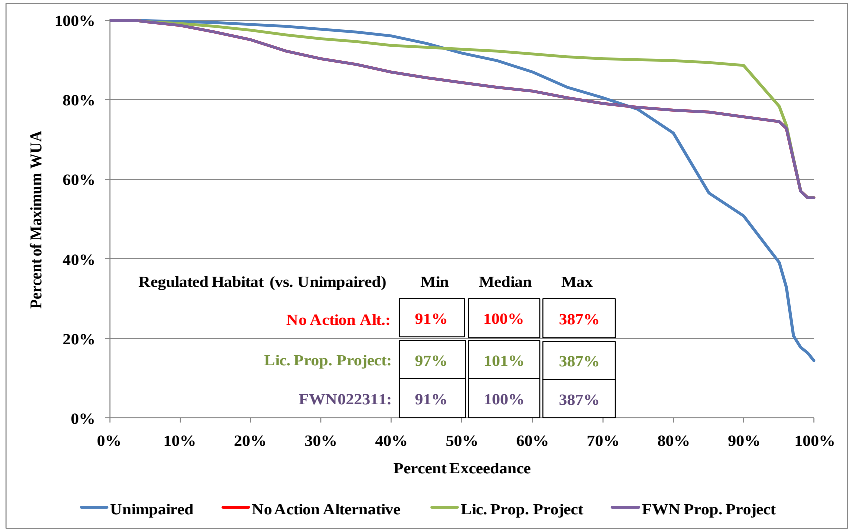


(b) November - Node 1 – Faucherie Lake Dam Reach

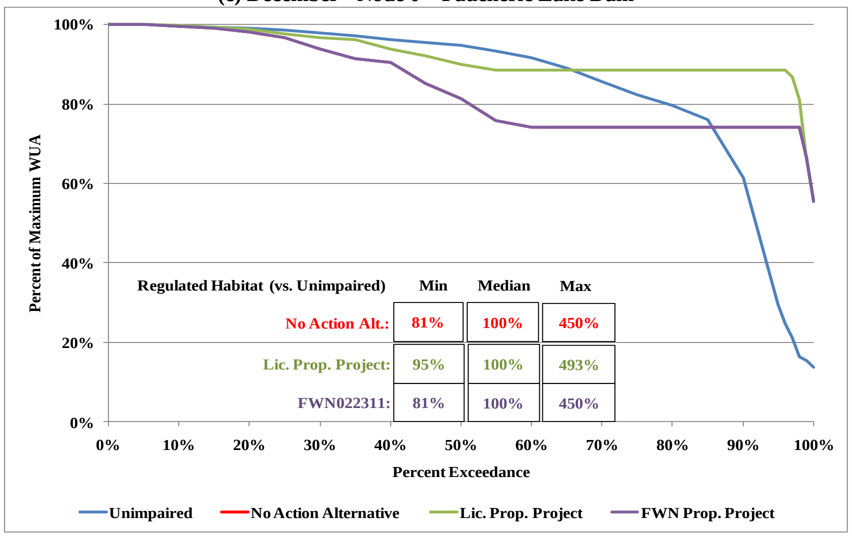
Figures 6.3.1-36a and 6.3.1-36b. HEA for adult rainbow trout during the months of October (a) and November (b) in the Faucherie Lake Dam Reach, Canyon Creek.



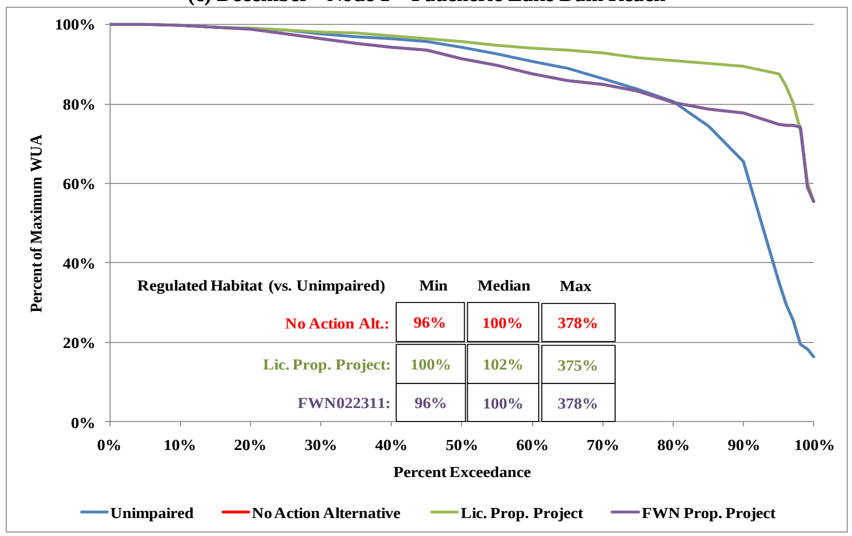
(c) December - Node 0 – Faucherie Lake Dam



(c) December - Node 1 – Faucherie Lake Dam Reach

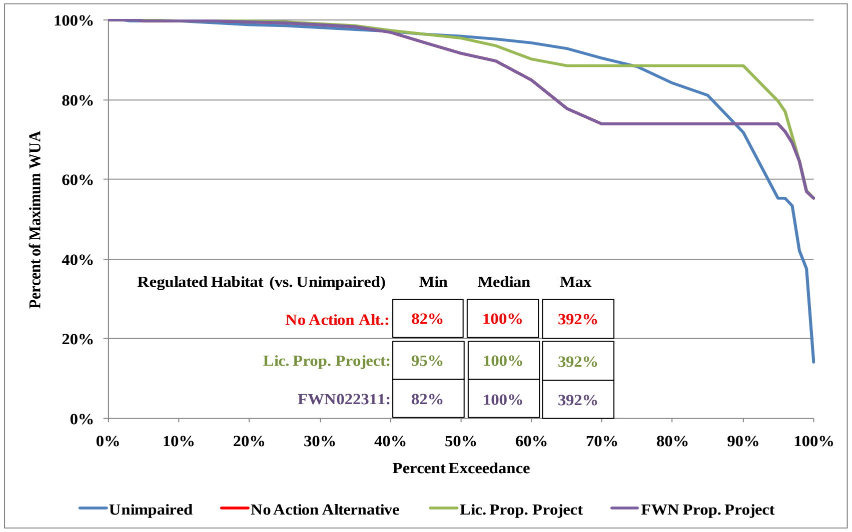


(d) January - Node 0 – Faucherie Lake Dam

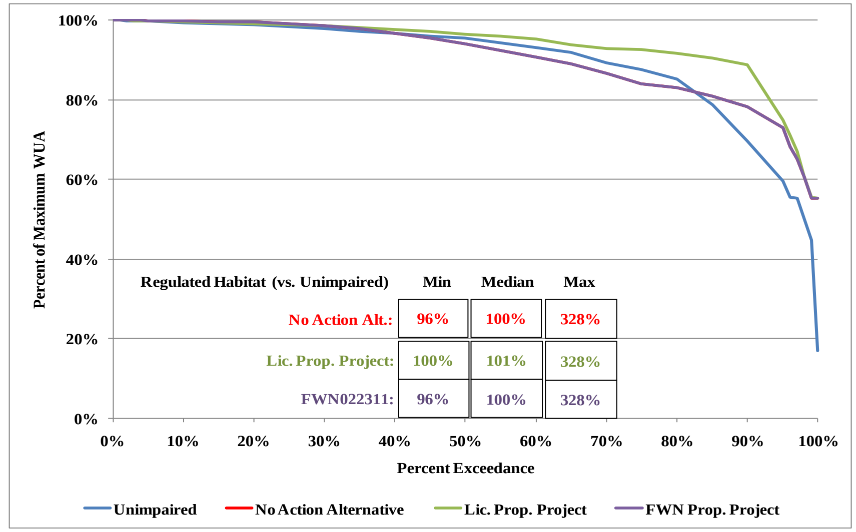


(d) January - Node 1 – Faucherie Lake Dam Reach

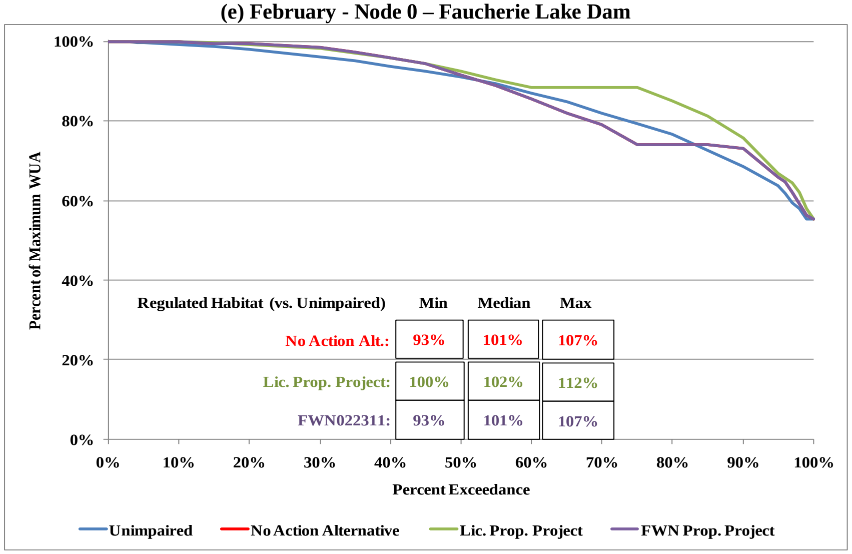
Figures 6.3.1-36c and 6.3.1-36d. HEA for adult rainbow trout during the months of December (c) and January (d) in the Faucherie Lake Dam Reach, Canyon Creek.



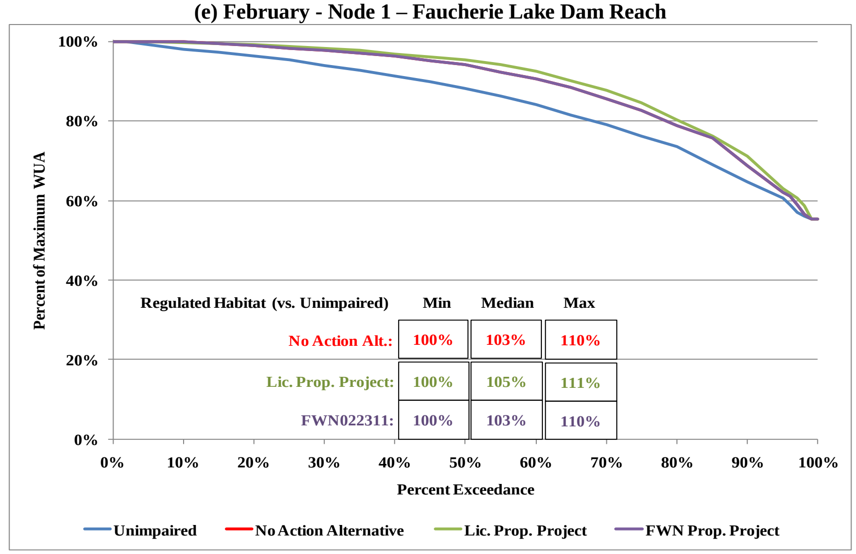
(e) February - Node 0 – Faucherie Lake Dam



(e) February - Node 1 – Faucherie Lake Dam Reach

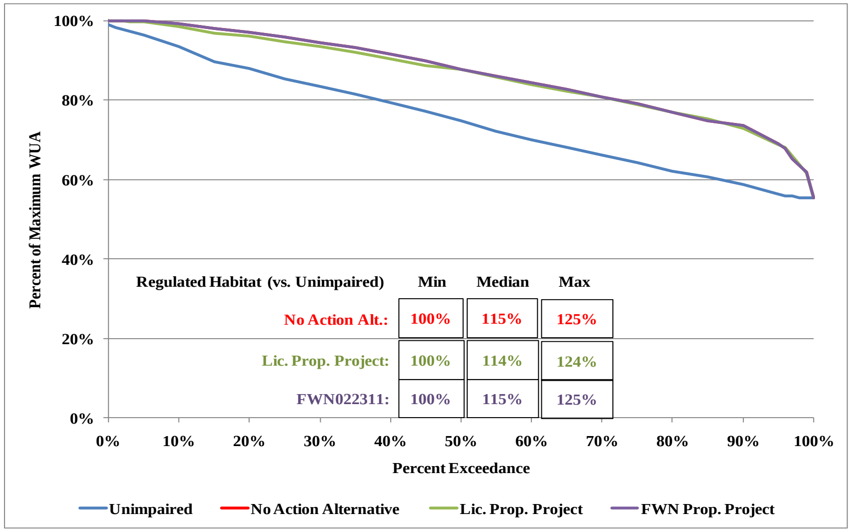


(f) March - Node 0 – Faucherie Lake Dam

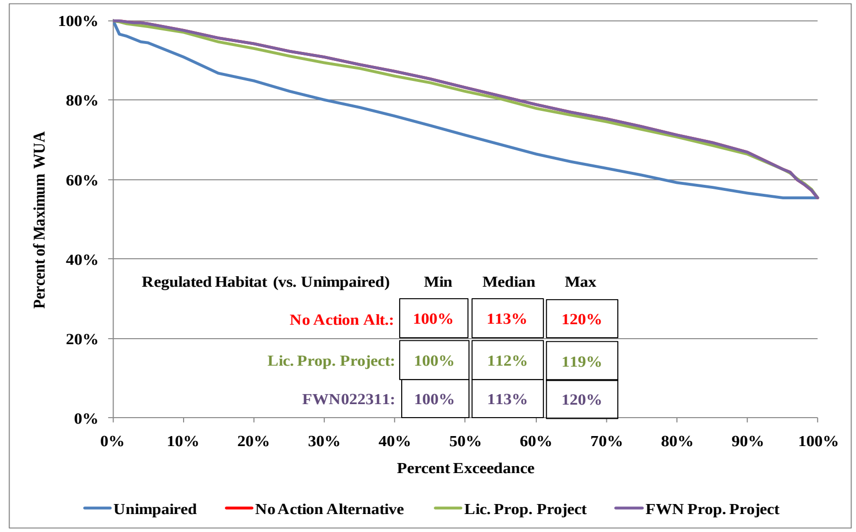


(f) March - Node 1 – Faucherie Lake Dam Reach

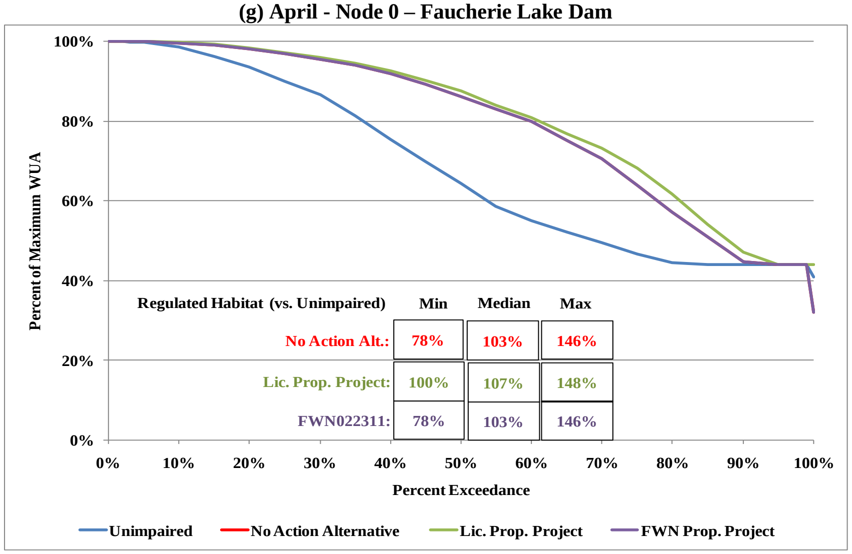
Figures 6.3.1-36e and 6.3.1-36f. HEA for adult rainbow trout during the months of February (e) and March (f) in the Faucherie Lake Dam Reach, Canyon Creek.



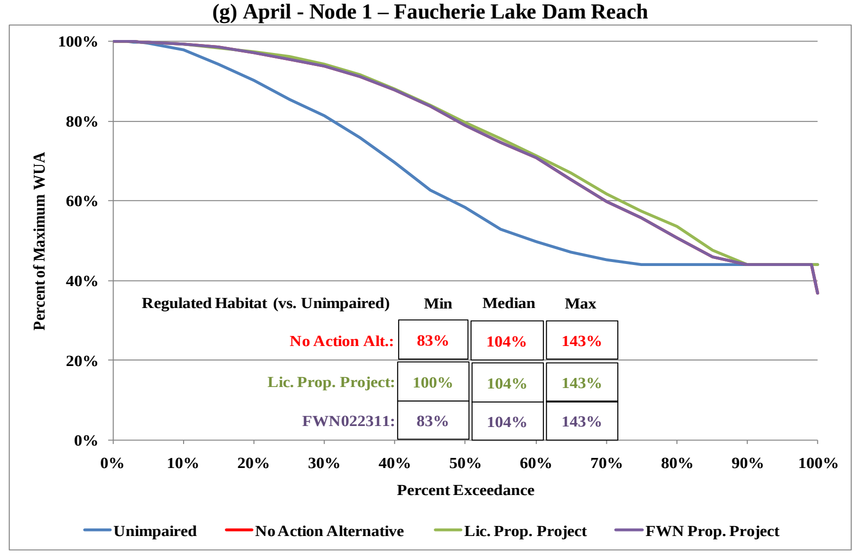
(g) April - Node 0 – Faucherie Lake Dam



(g) April - Node 1 – Faucherie Lake Dam Reach

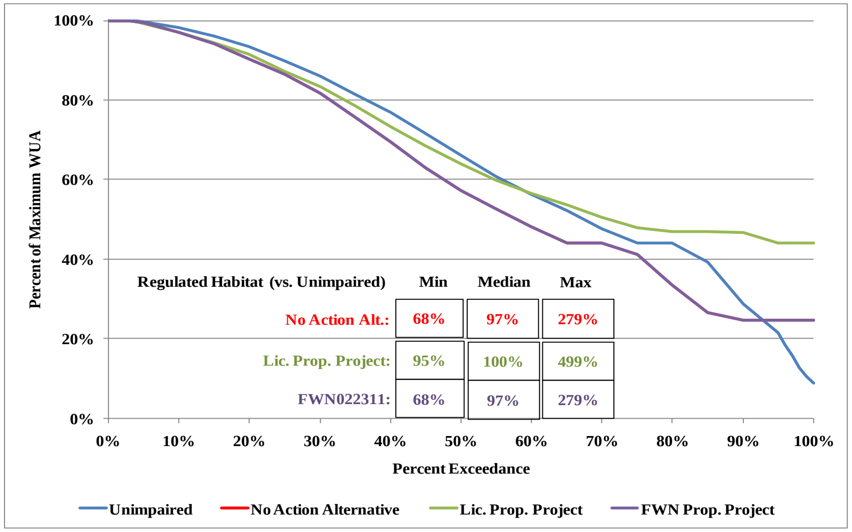


(h) May - Node 0 – Faucherie Lake Dam

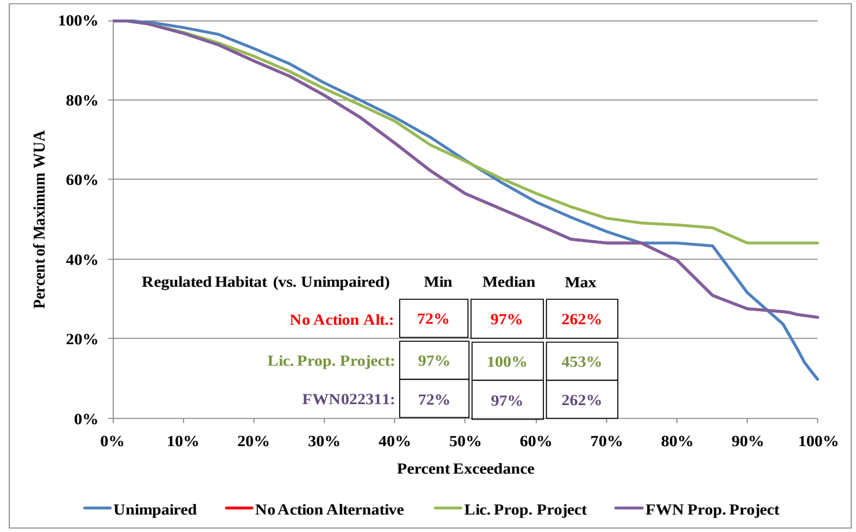


(h) May - Node 1 – Faucherie Lake Dam Reach

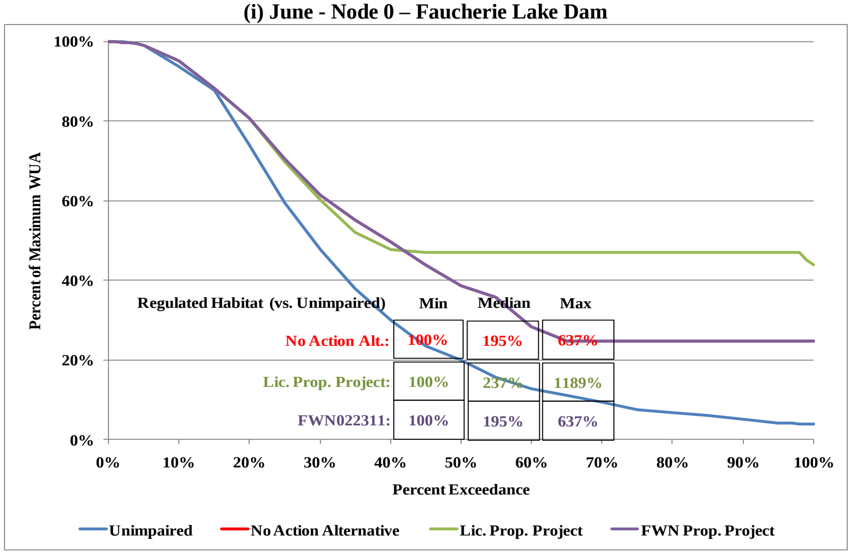
Figures 6.3.1-36g and 6.3.1-36h. HEA for spawning rainbow trout during the months of April (g) and May (h) in the Faucherie Lake Dam Reach, Canyon Creek.



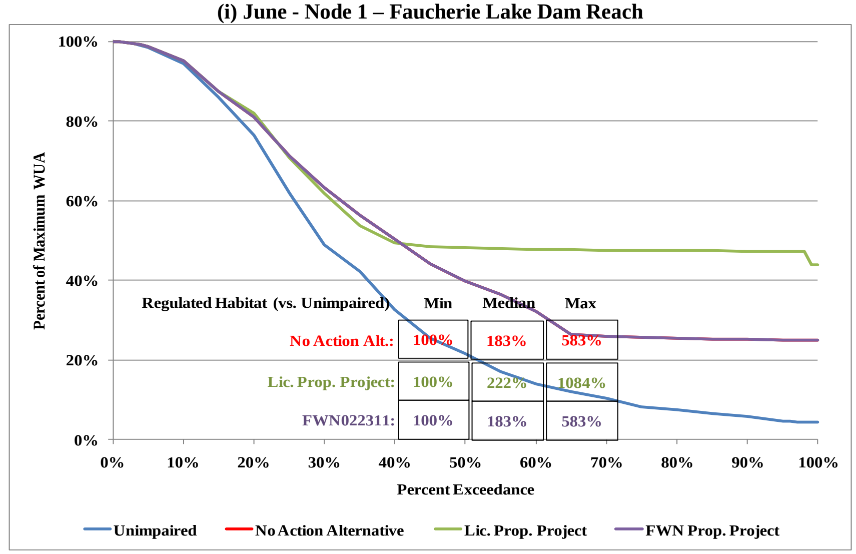
(i) June - Node 0 – Faucherie Lake Dam



(i) June - Node 1 – Faucherie Lake Dam Reach

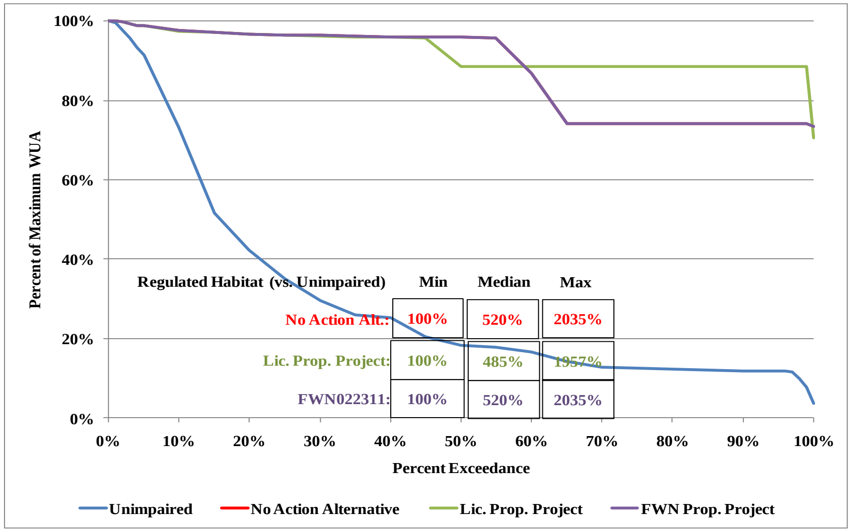


(j) July - Node 0 – Faucherie Lake Dam

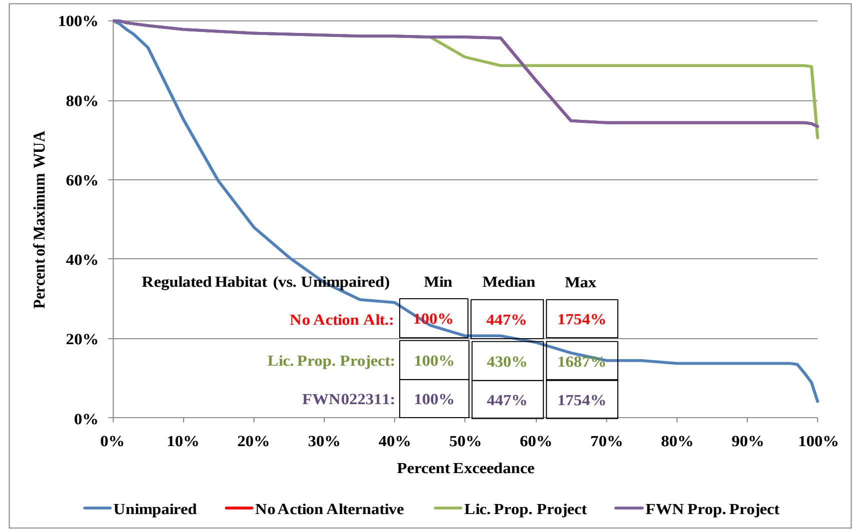


(j) July - Node 1 – Faucherie Lake Dam Reach

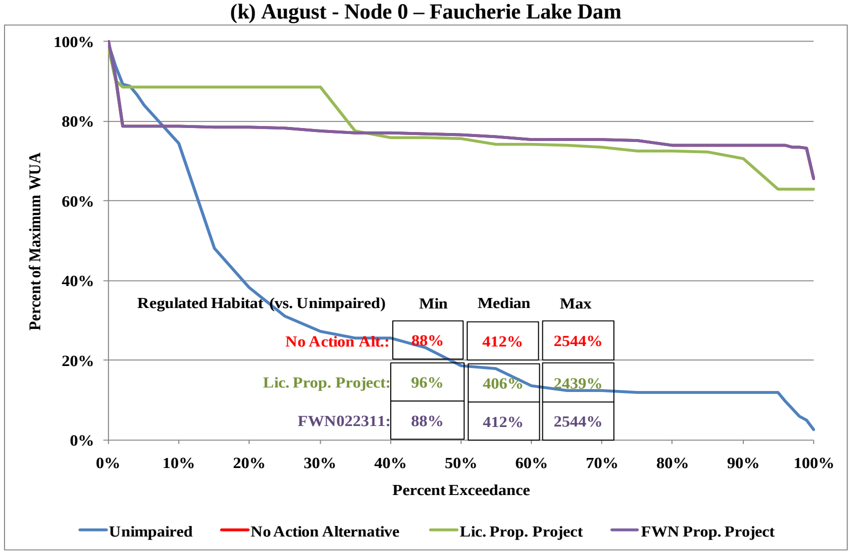
Figures 6.3.1-36i and 6.3.1-36j. HEA for spawning rainbow trout during the month of June (i) and adult rainbow trout during the month of July (j) in the Faucherie Lake Dam Reach, Canyon Creek.



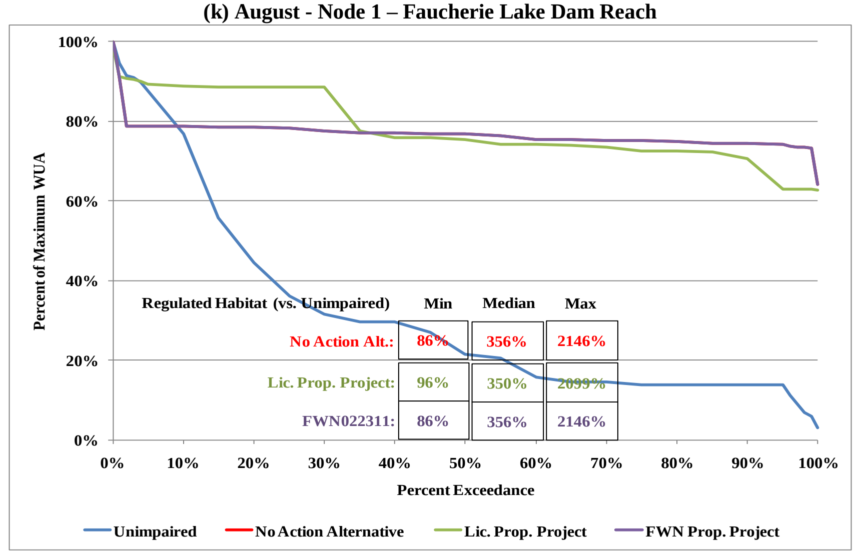
(k) August - Node 0 – Faucherie Lake Dam



(k) August - Node 1 – Faucherie Lake Dam Reach

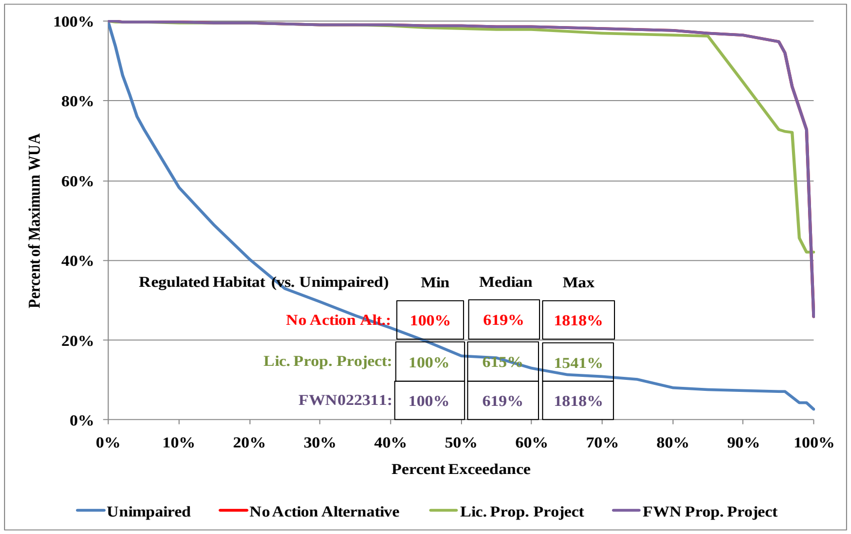


(l) September - Node 0 – Faucherie Lake Dam

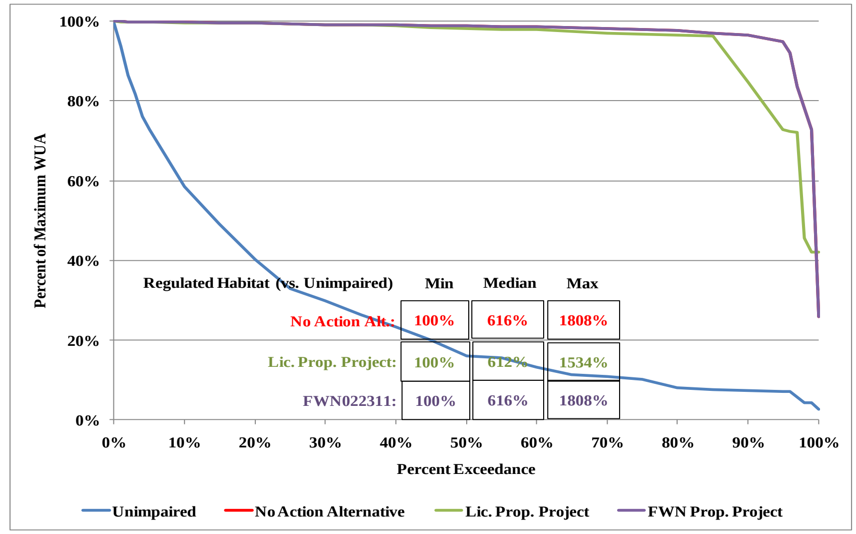


(l) September - Node 1 – Faucherie Lake Dam Reach

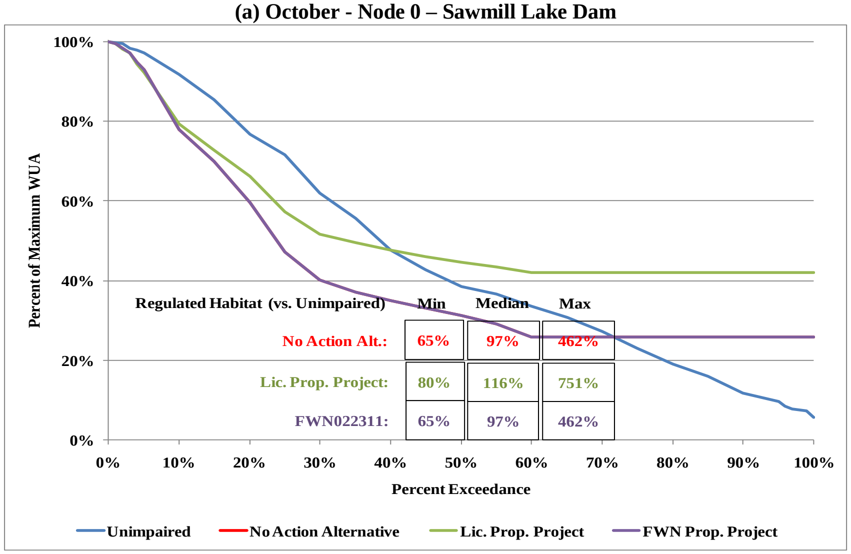
Figures 6.3.1-36k and 6.3.1-36l. HEA for adult rainbow trout during the months of August (k) and September (l) in the Faucherie Lake Dam Reach, Canyon Creek.



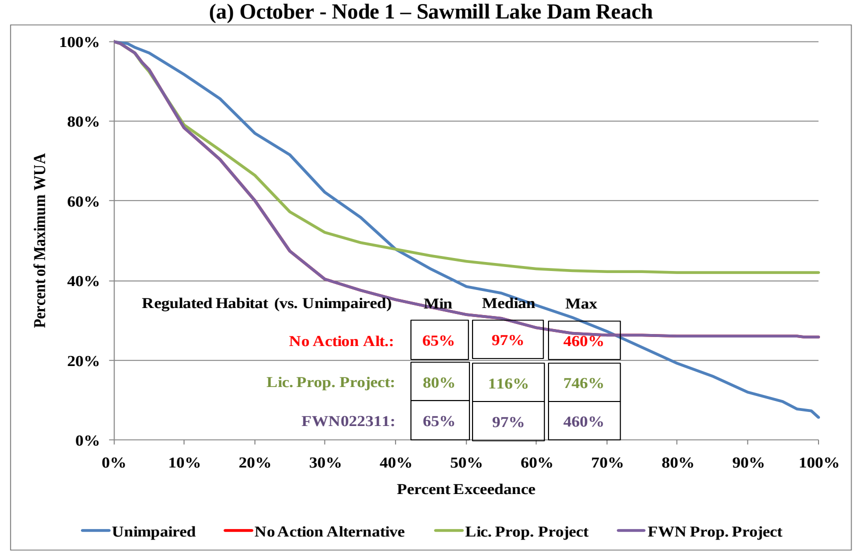
(a) October - Node 0 – Sawmill Lake Dam



(a) October - Node 1 – Sawmill Lake Dam Reach

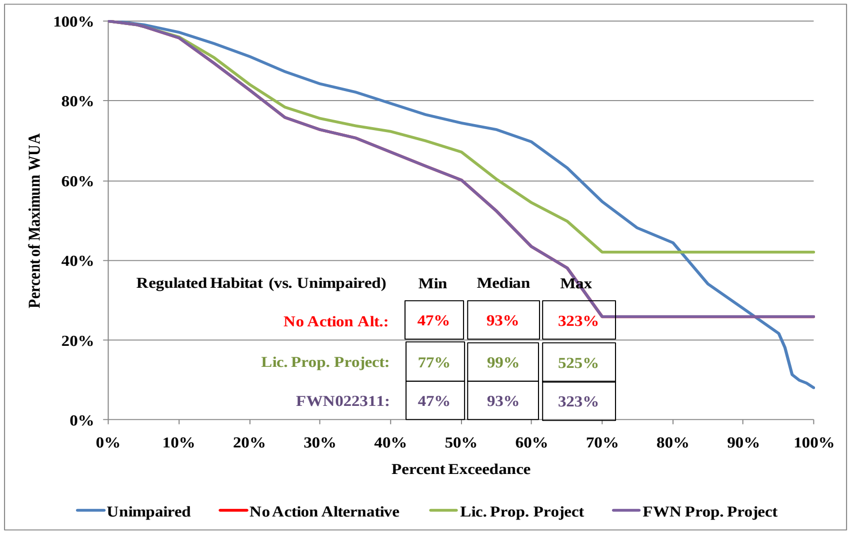


(b) November - Node 0 – Sawmill Lake Dam

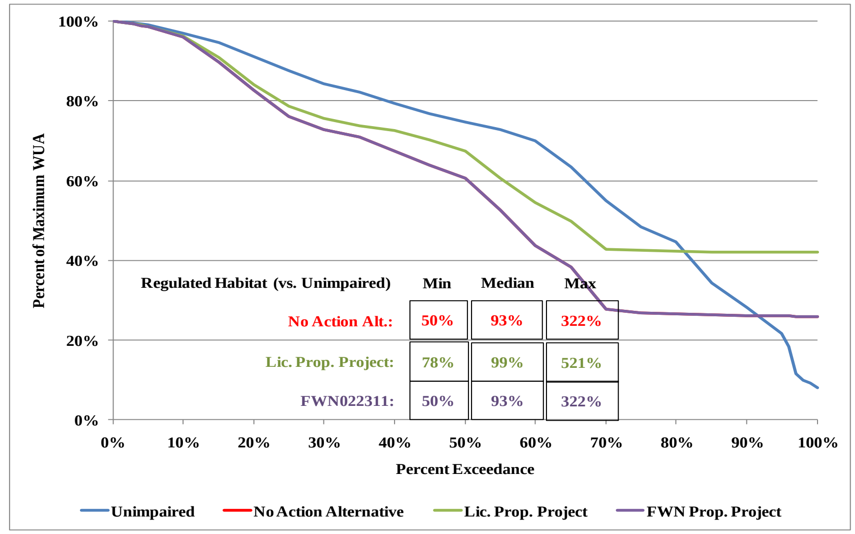


(b) November - Node 1 – Sawmill Lake Dam Reach

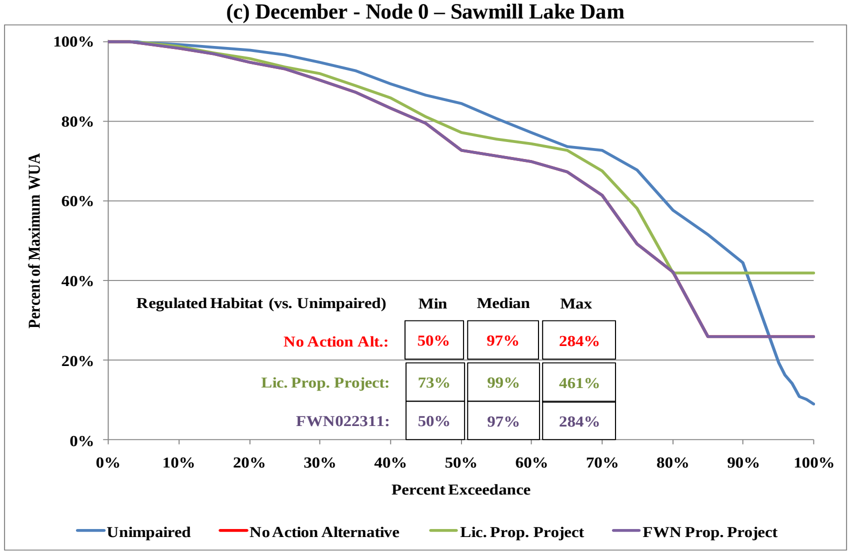
Figures 6.3.1-37a and 6.3.1-37b. HEA for adult rainbow trout during the months of October (a) and November (b) in Sawmill Lake Dam Reach, Canyon Creek.



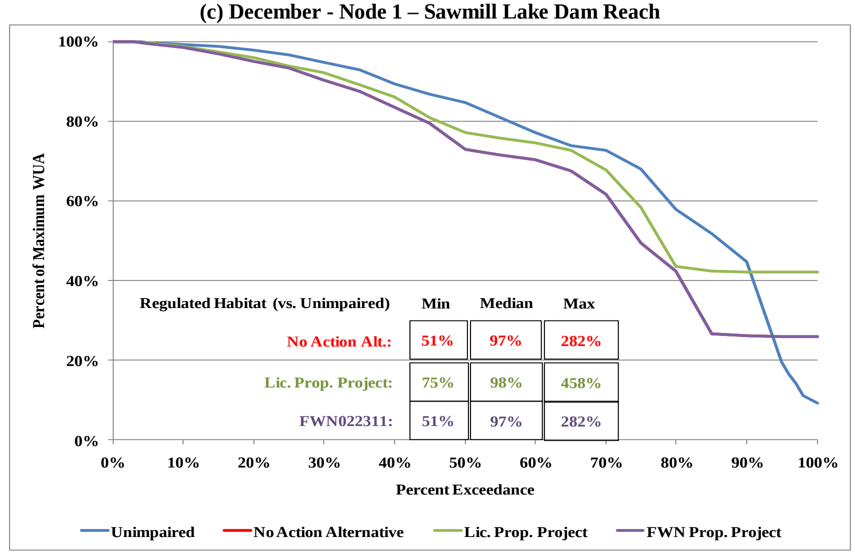
(c) December - Node 0 – Sawmill Lake Dam



(c) December - Node 1 – Sawmill Lake Dam Reach

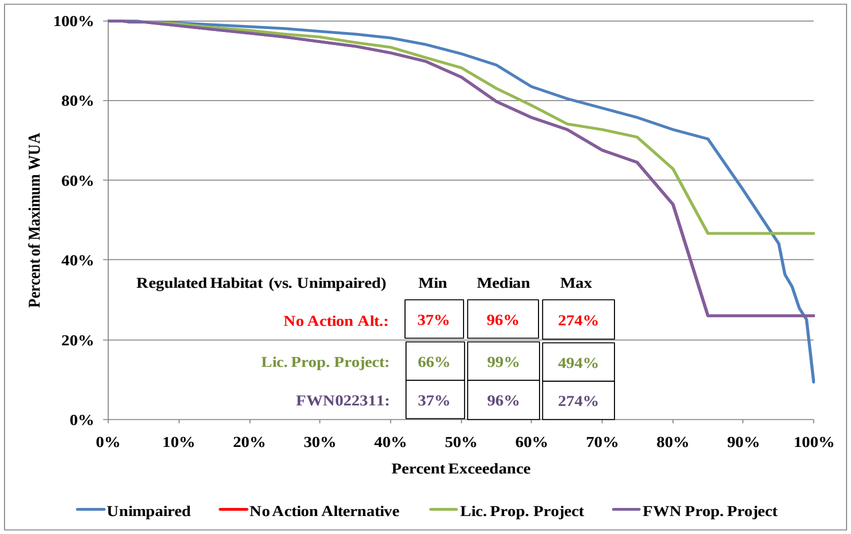


(d) January - Node 0 – Sawmill Lake Dam

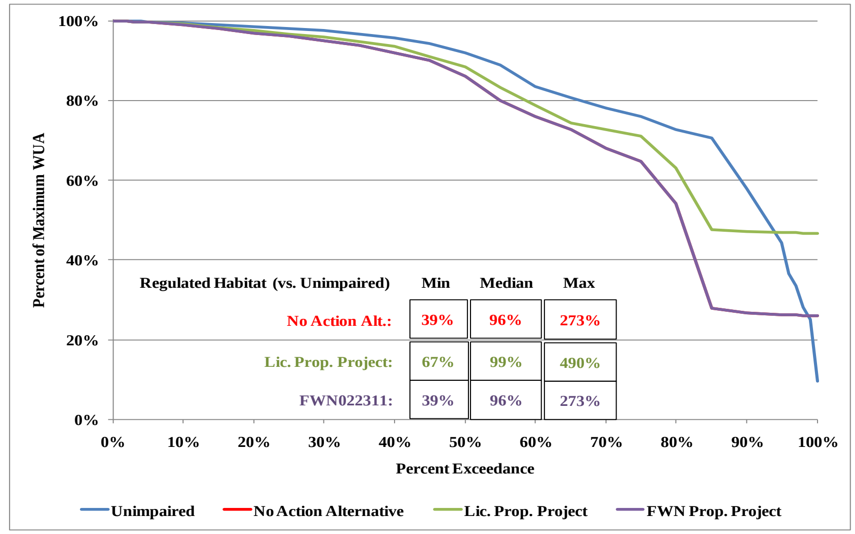


(d) January - Node 1 – Sawmill Lake Dam Reach

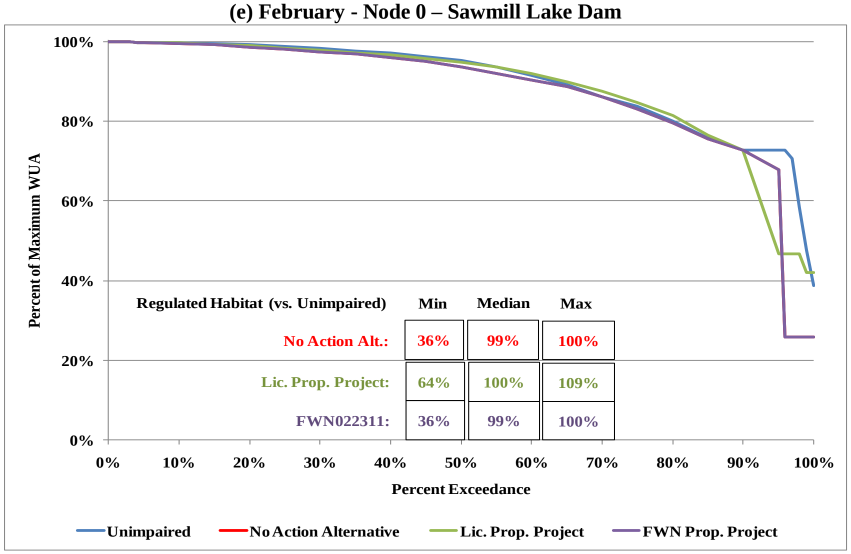
Figures 6.3.1-37c and 6.3.1-37d. HEA for adult rainbow trout during the months of December (c) and January (d) in Sawmill Lake Dam Reach, Canyon Creek.



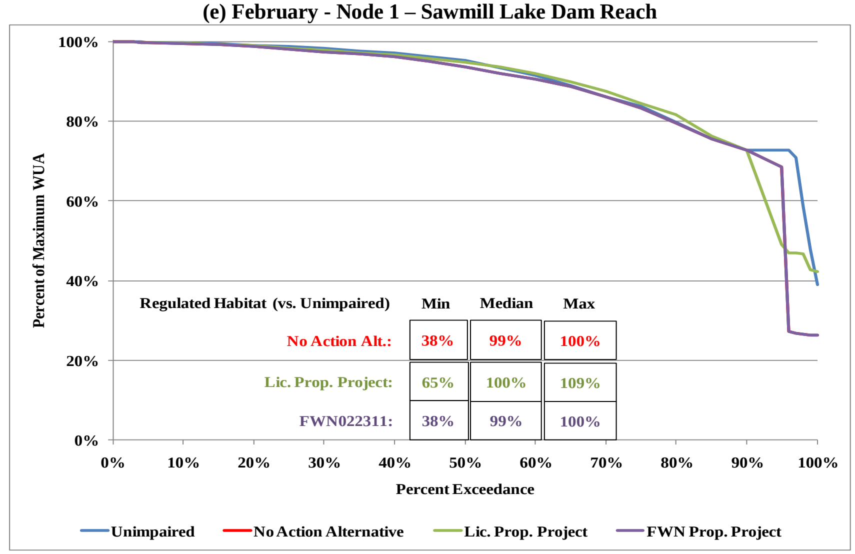
(e) February - Node 0 – Sawmill Lake Dam



(e) February - Node 1 – Sawmill Lake Dam Reach

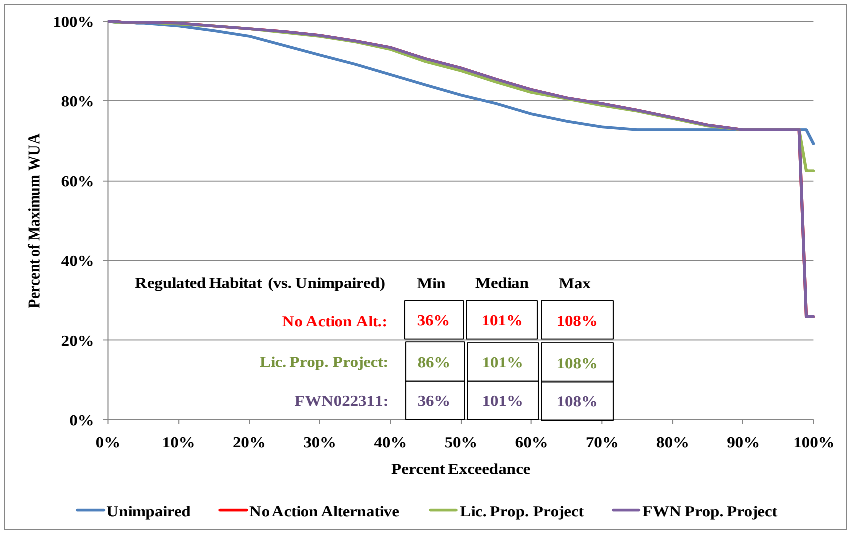


(f) March - Node 0 – Sawmill Lake Dam

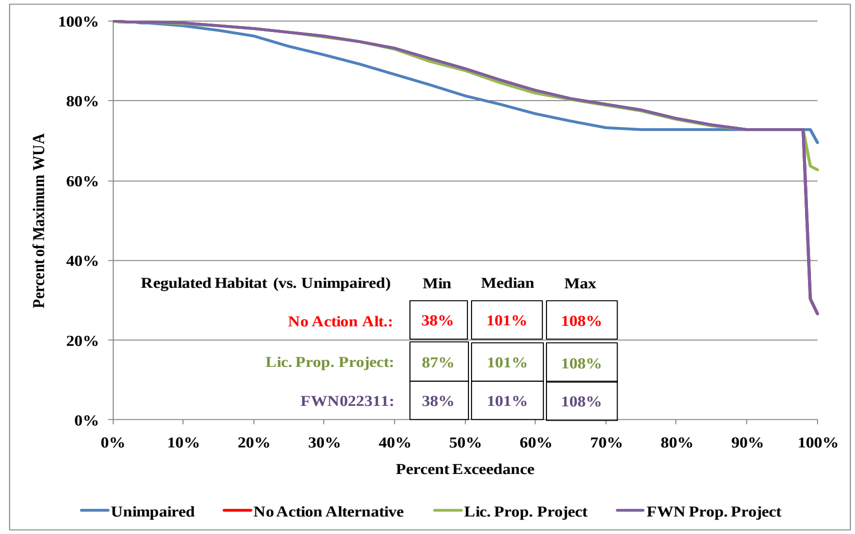


(f) March - Node 1 – Sawmill Lake Dam Reach

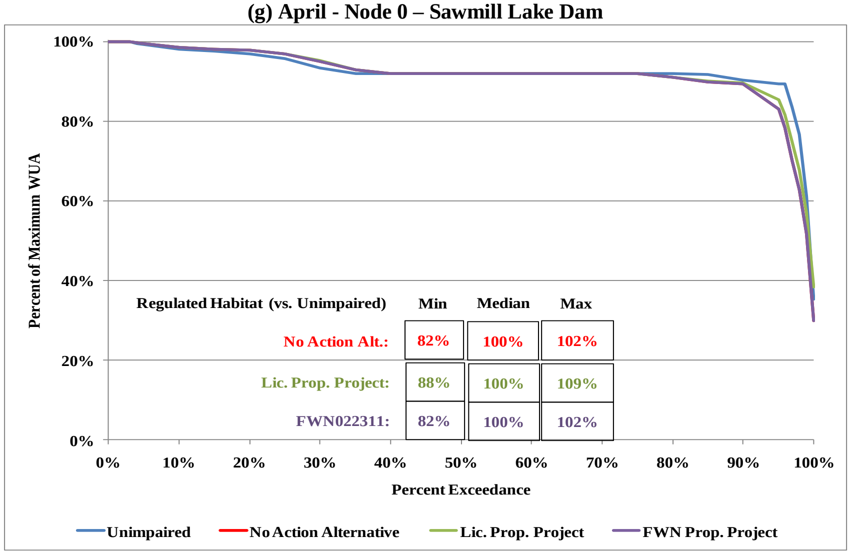
Figures 6.3.1-37e and 6.3.1-37f. HEA for adult rainbow trout during the months of February (e) and March (f) in Sawmill Lake Dam Reach, Canyon Creek.



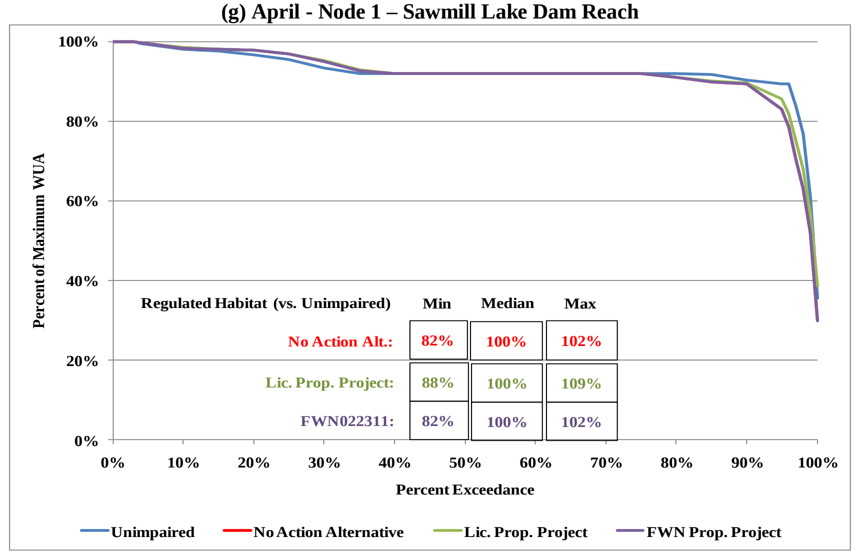
(g) April - Node 0 – Sawmill Lake Dam



(g) April - Node 1 – Sawmill Lake Dam Reach

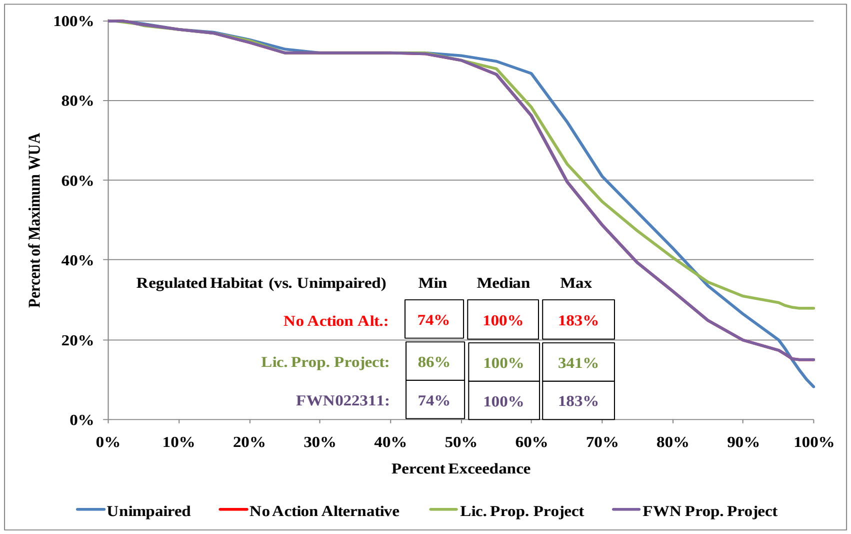


(h) May - Node 0 – Sawmill Lake Dam

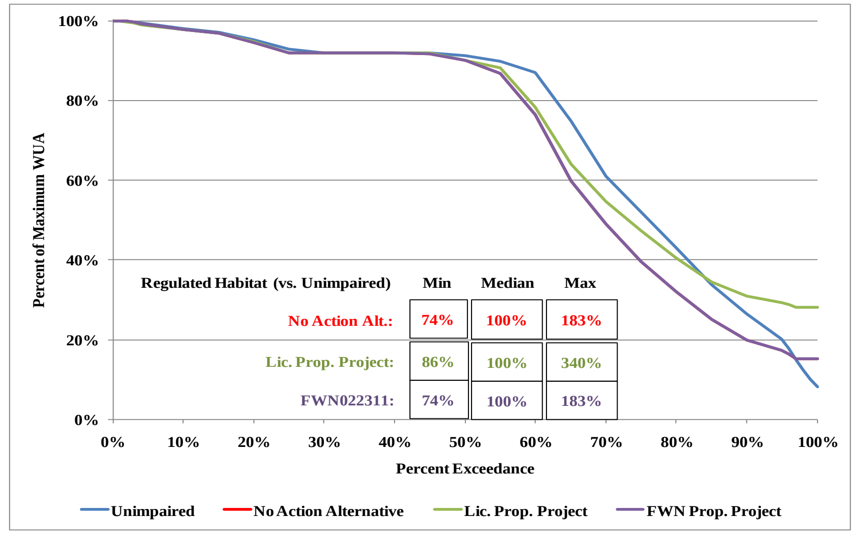


(h) May - Node 1 – Sawmill Lake Dam Reach

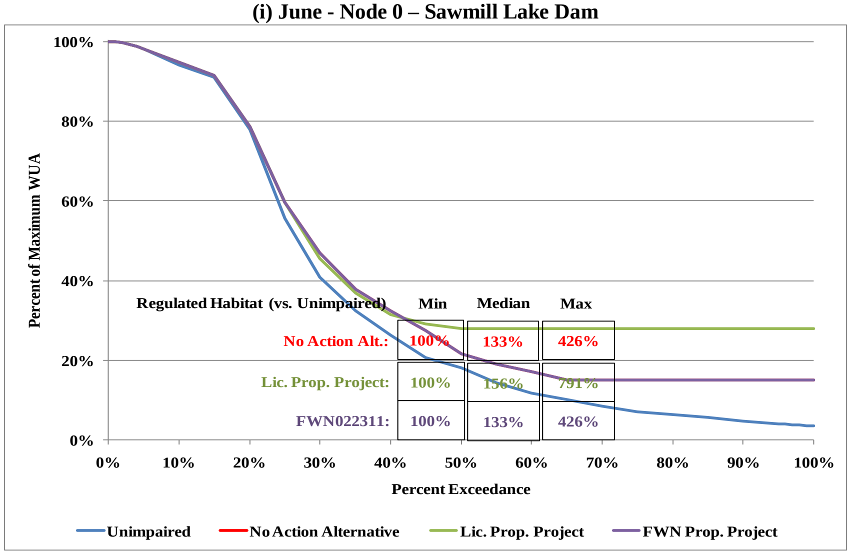
Figures 6.3.1-37g and 6.3.1-37h. HEA for spawning rainbow trout during the months of April (g) and May (h) in Sawmill Lake Dam Reach, Canyon Creek.



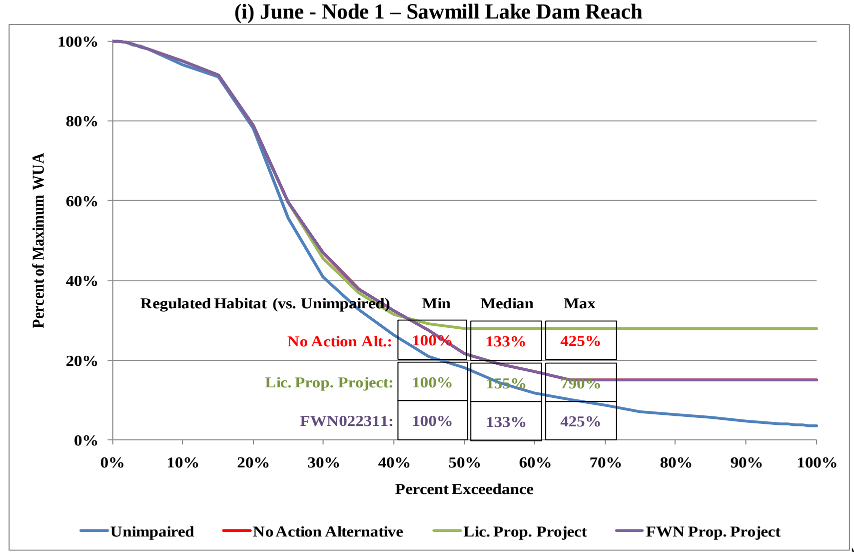
(i) June - Node 0 – Sawmill Lake Dam



(i) June - Node 1 – Sawmill Lake Dam Reach

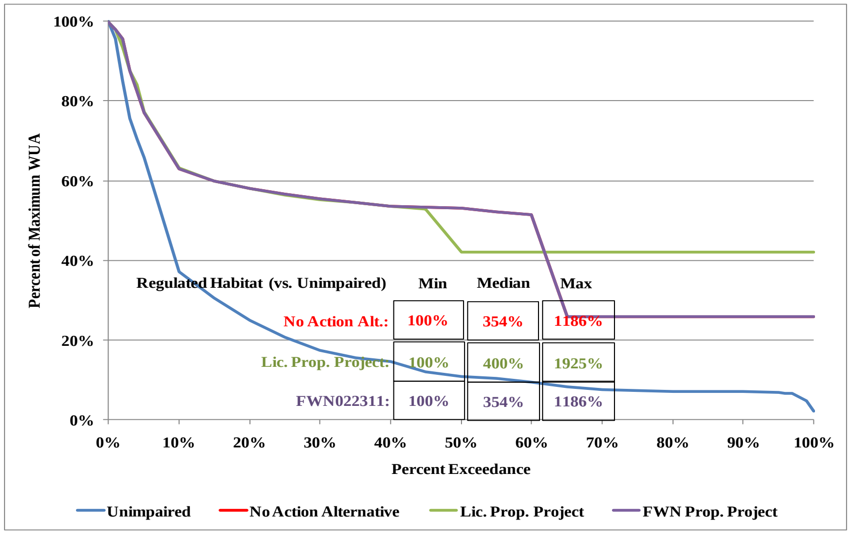


(j) July - Node 0 – Sawmill Lake Dam

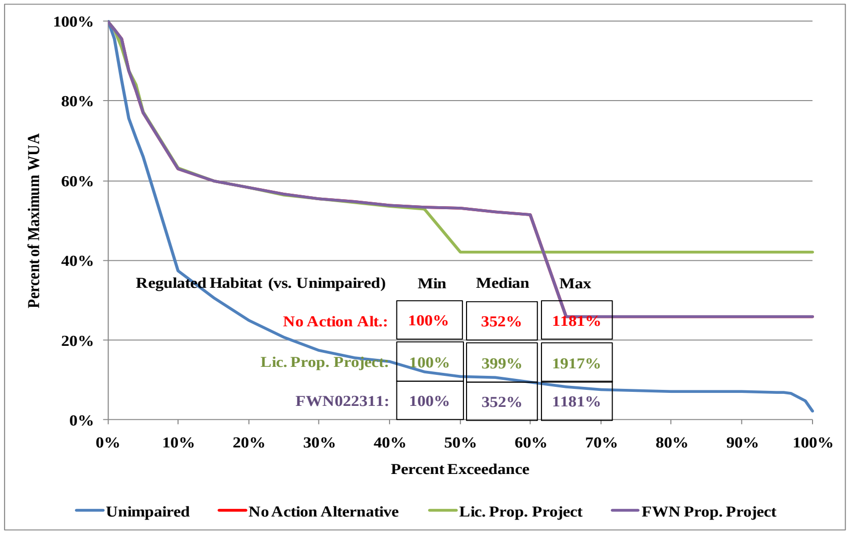


(j) July - Node 1 – Sawmill Lake Dam Reach

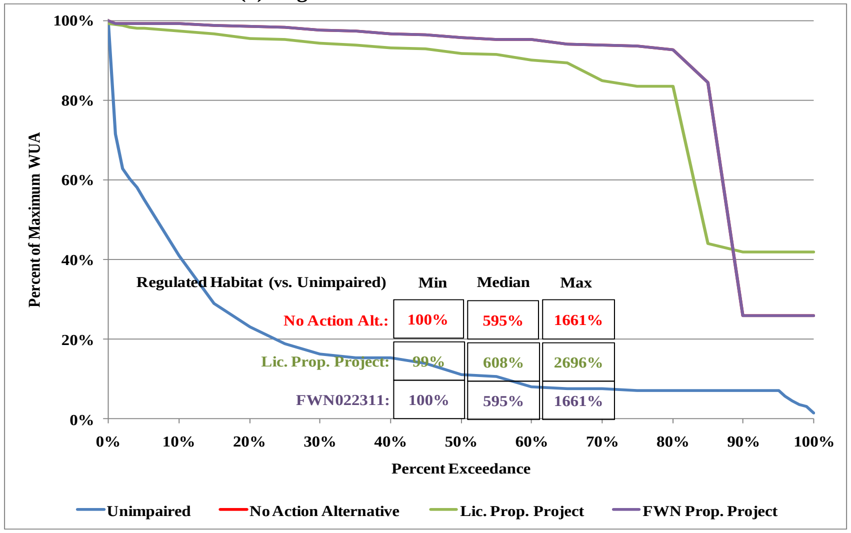
Figures 6.3.1-37i and 6.3.1-37j. HEA for spawning rainbow trout during the month of June (i) and adult rainbow trout during the month of July (j) in Sawmill Lake Dam Reach, Canyon Creek.



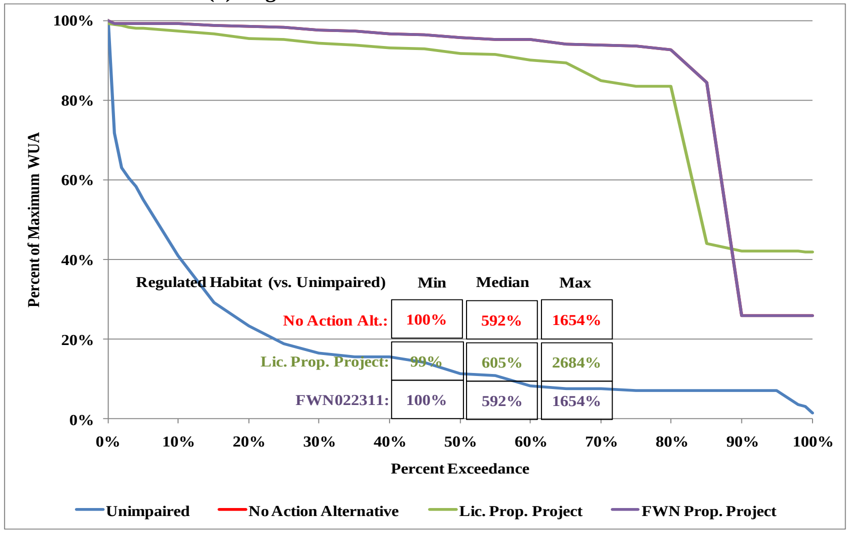
(k) August - Node 0 – Sawmill Lake Dam



(k) August - Node 1 – Sawmill Lake Dam Reach

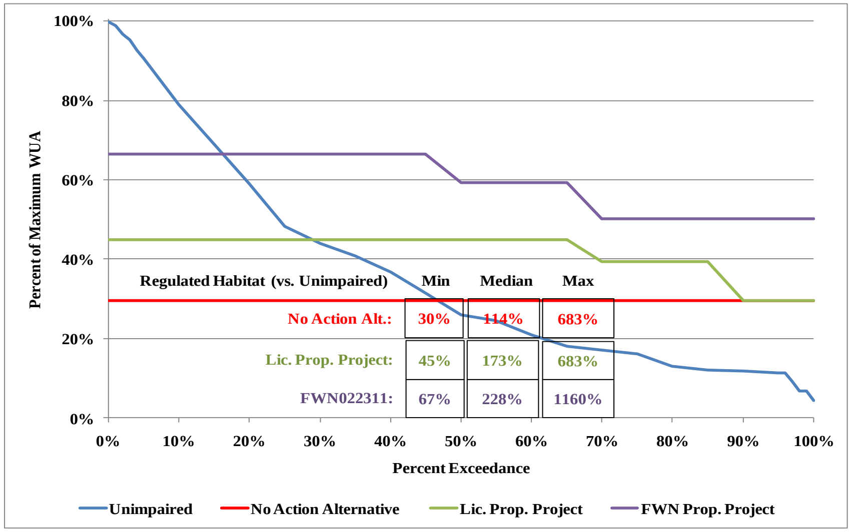


(l) September - Node 0 – Sawmill Lake Dam

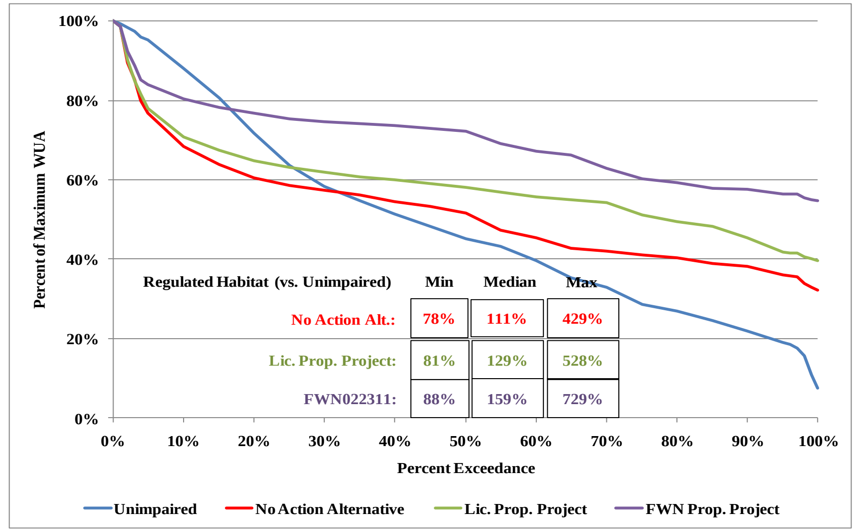


(l) September - Node 1 – Sawmill Lake Dam Reach

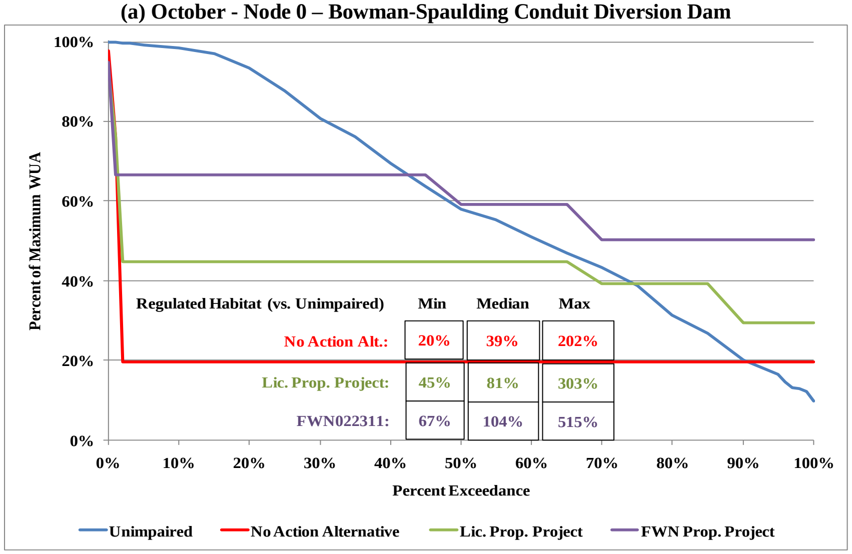
Figures 6.3.1-37k and 6.3.1-37l. HEA for adult rainbow trout during the months of August (k) and September (l) in Sawmill Lake Dam Reach, Canyon Creek.



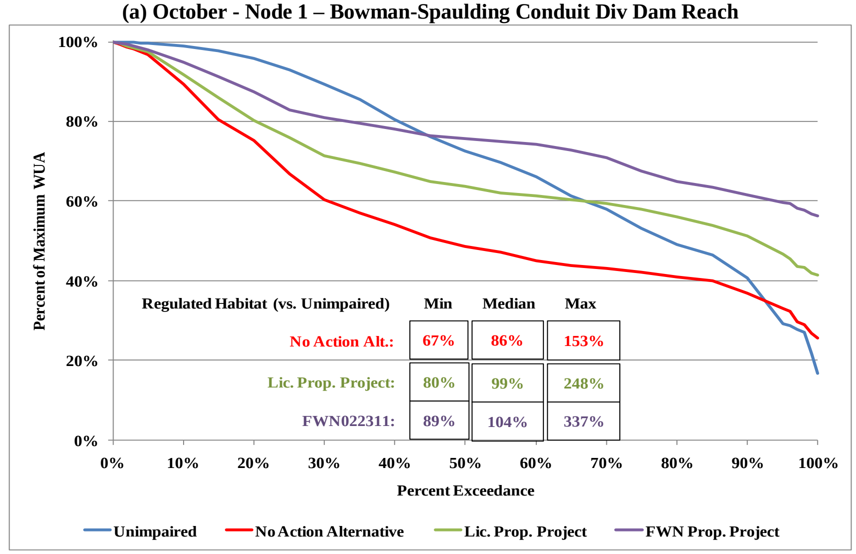
(a) October - Node 0 – Bowman-Spaulding Conduit Diversion Dam



(a) October - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

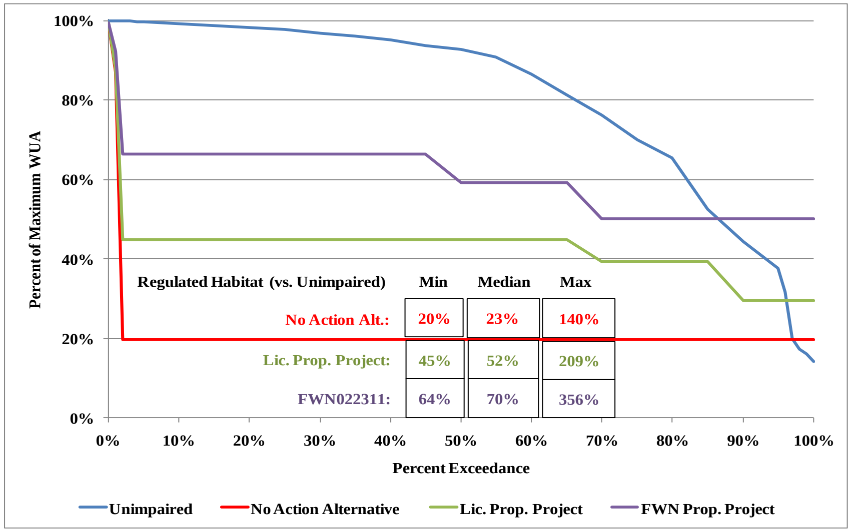


(b) November - Node 0 – Bowman-Spaulding Conduit Diversion Dam

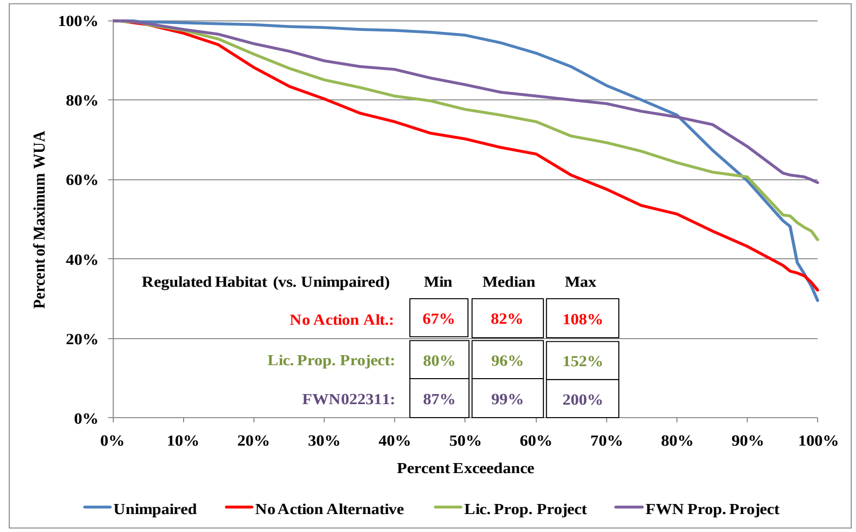


(b) November - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

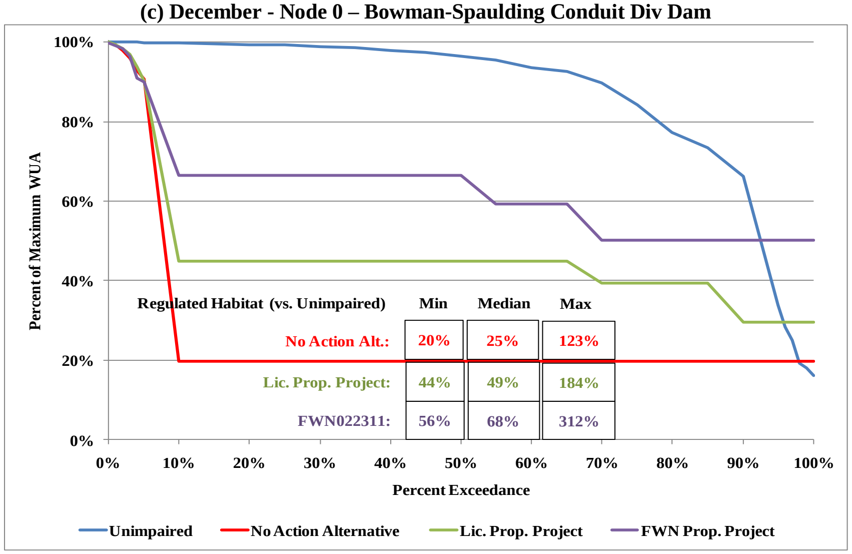
Figures 6.3.1-38a and 6.3.1-38b. HEA for adult rainbow trout during the months of October (a) and November (b) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



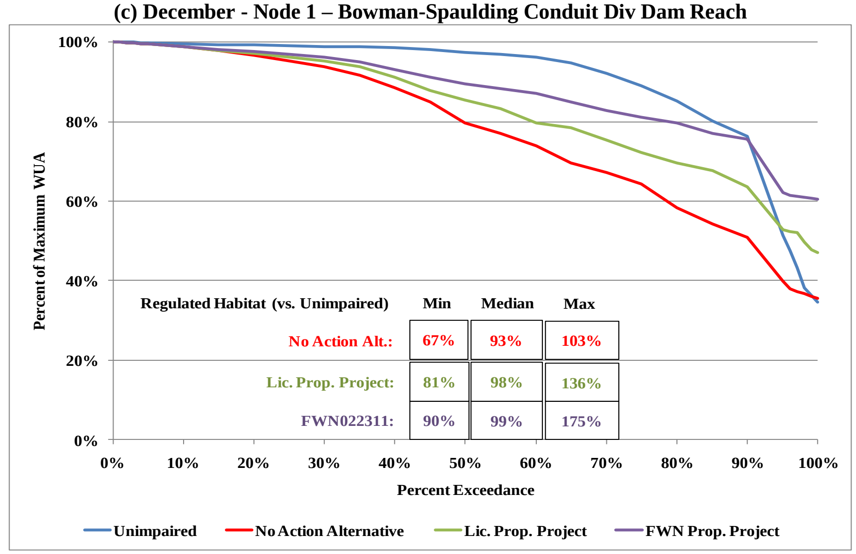
(c) December - Node 0 – Bowman-Spaulding Conduit Div Dam



(c) December - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

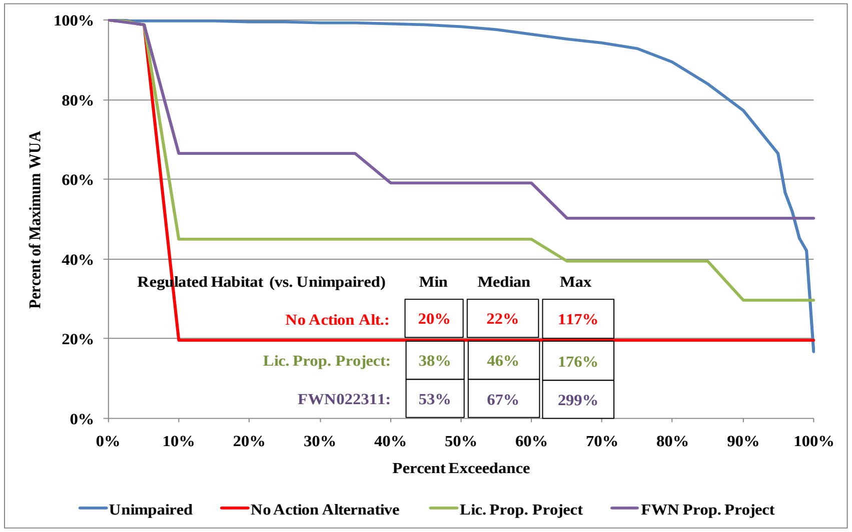


(d) January - Node 0 – Bowman-Spaulding Conduit Div Dam

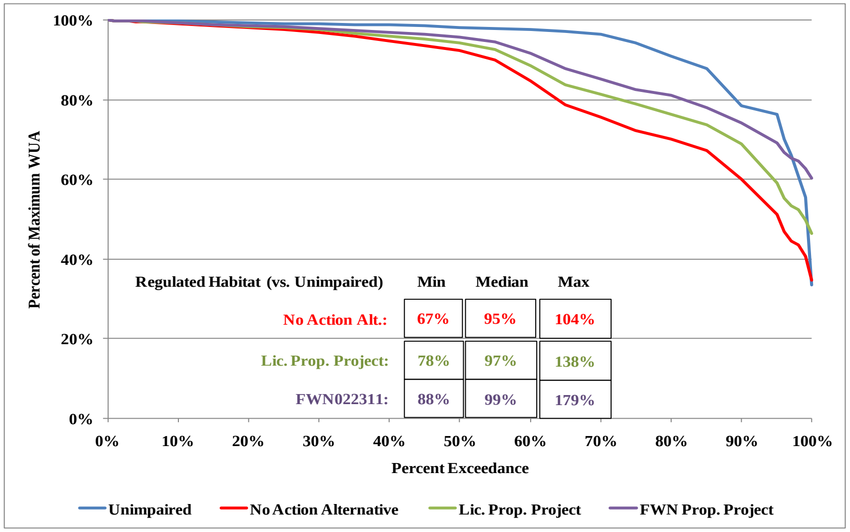


(d) January - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

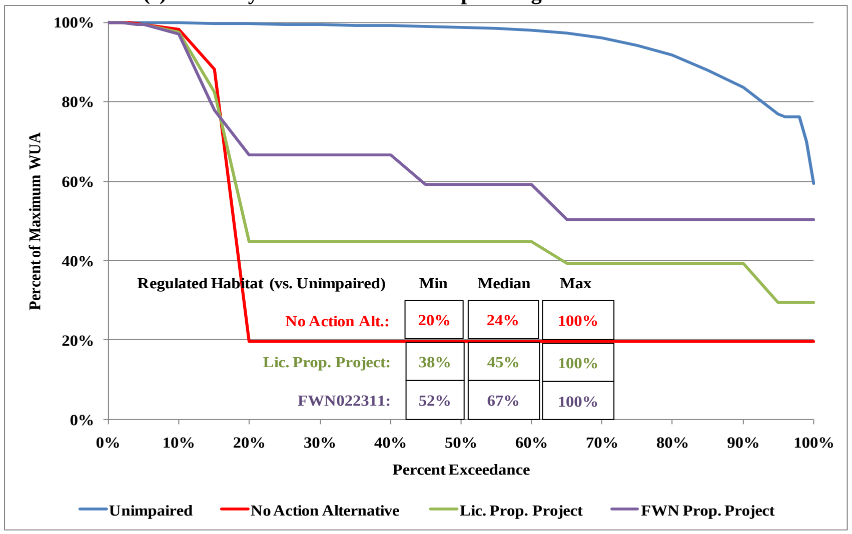
Figures 6.3.1-38c and 6.3.1-38d. HEA for adult rainbow trout during the months of December (c) and January (d) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



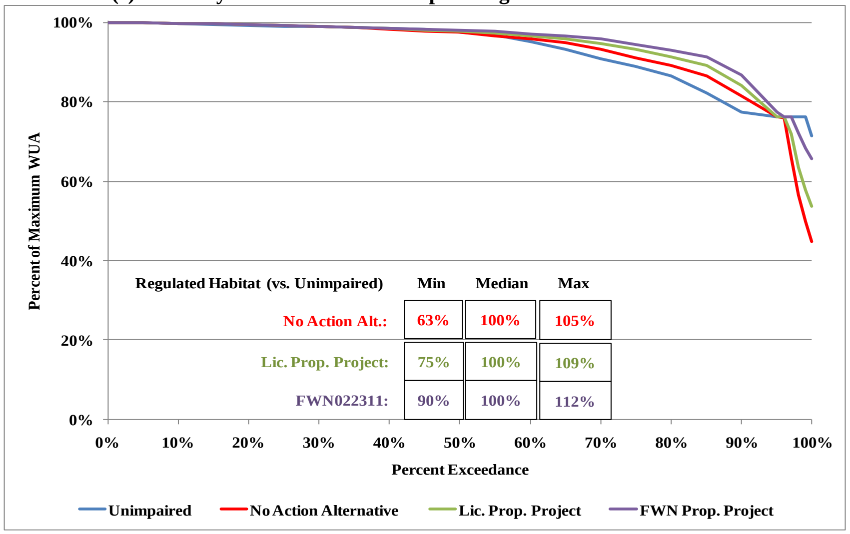
(e) February - Node 0 – Bowman-Spaulding Conduit Div Dam



(e) February - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

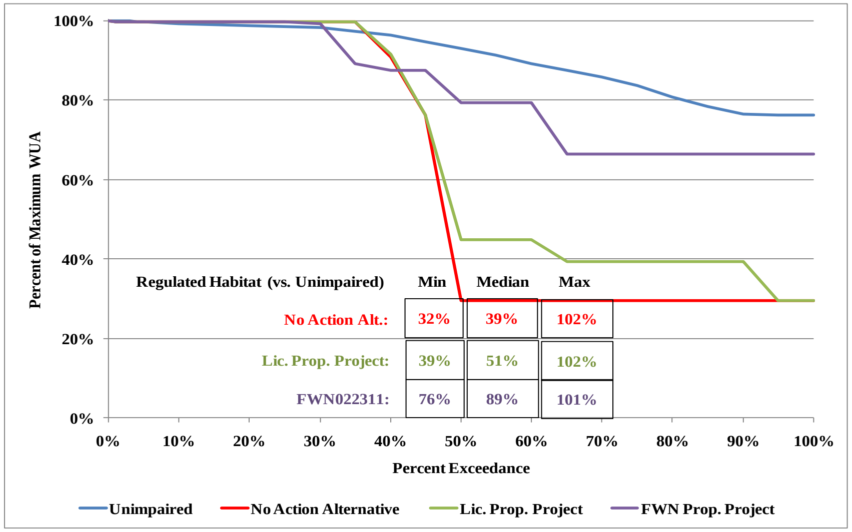


(f) March - Node 0 – Bowman-Spaulding Conduit Div Dam

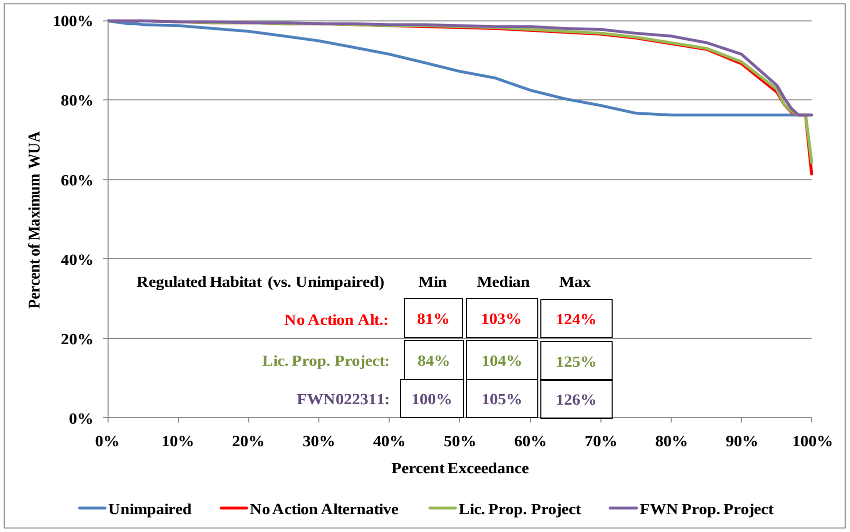


(f) March - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

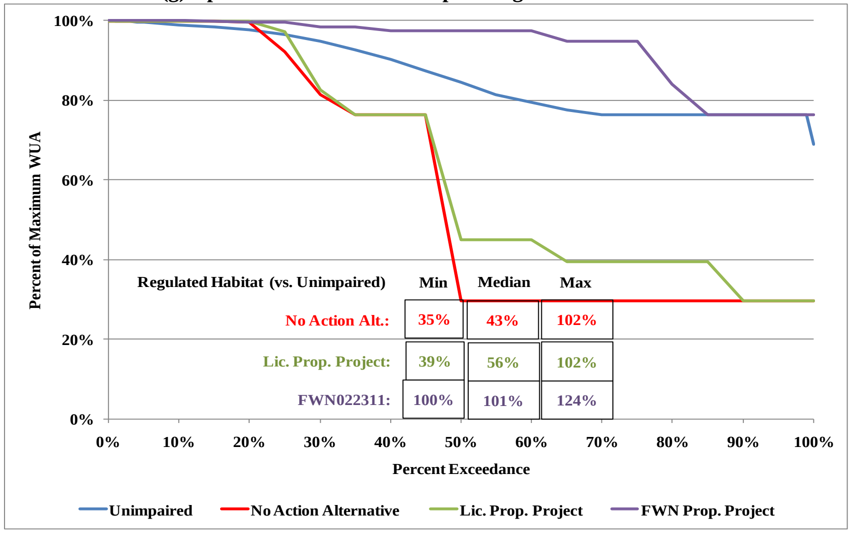
Figures 6.3.1-38e and 6.3.1-38f. HEA for adult rainbow trout during the months of February (e) and March (f) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



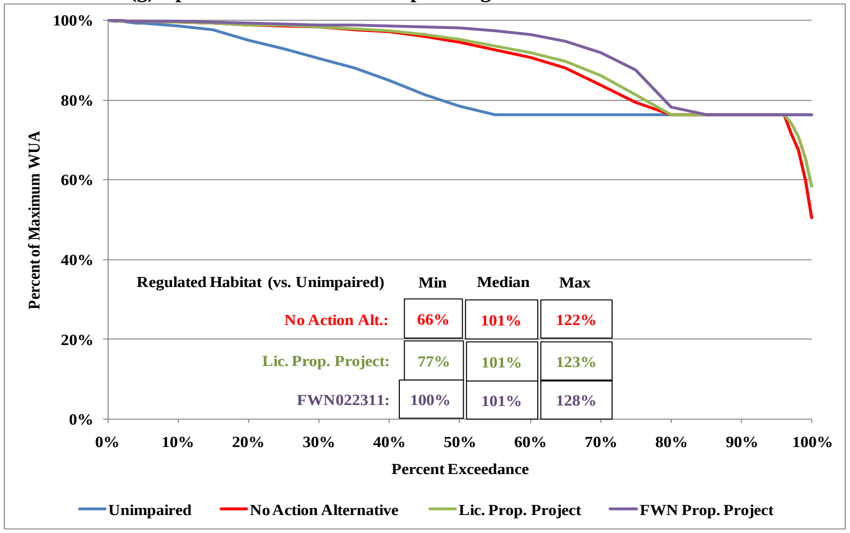
(g) April - Node 0 – Bowman-Spaulding Conduit Div Dam



(g) April - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

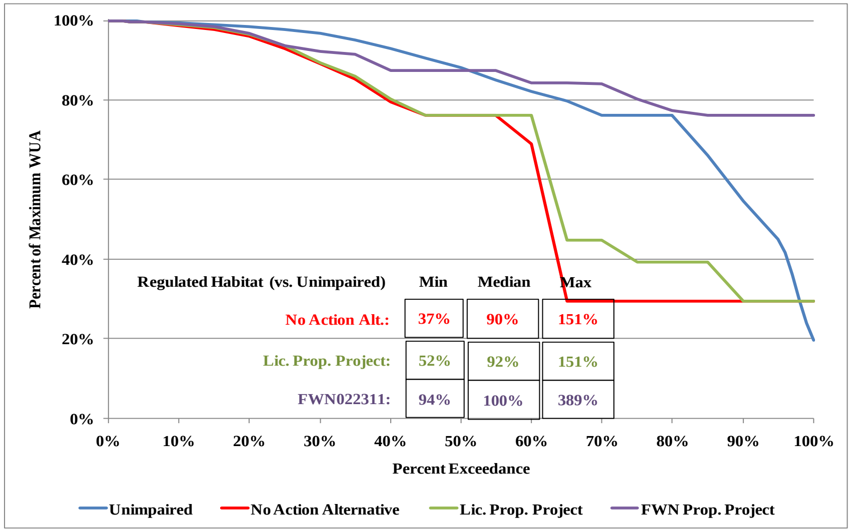


(h) May - Node 0 – Bowman-Spaulding Conduit Div Dam

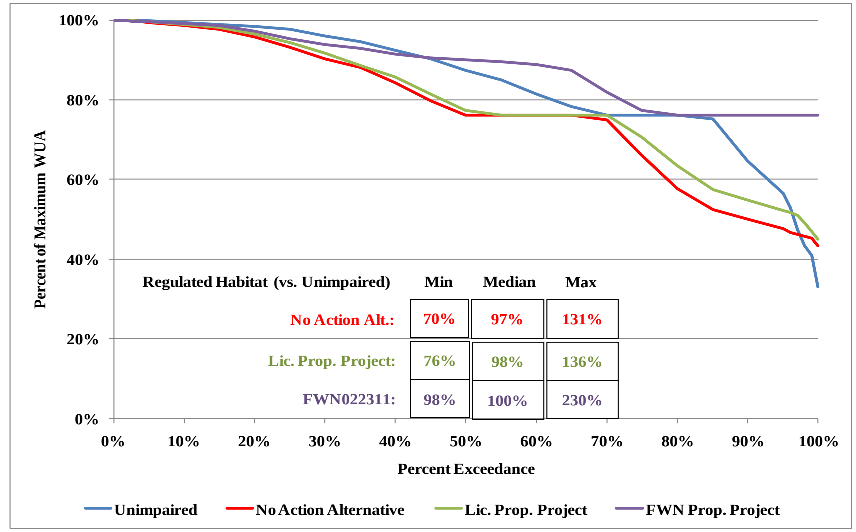


(h) May - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

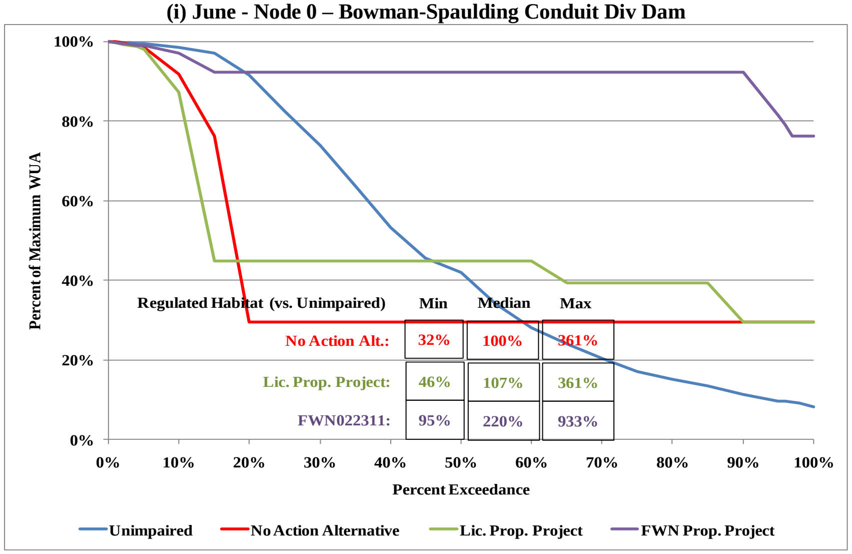
Figures 6.3.1-38g and 6.3.1-38h. HEA for adult rainbow trout during the months of April (g) and May (h) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



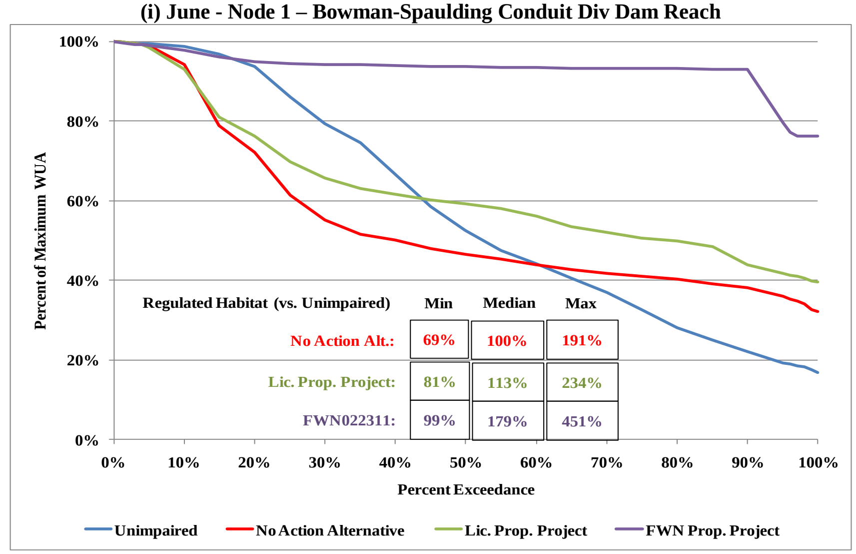
(i) June - Node 0 – Bowman-Spaulding Conduit Div Dam



(i) June - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

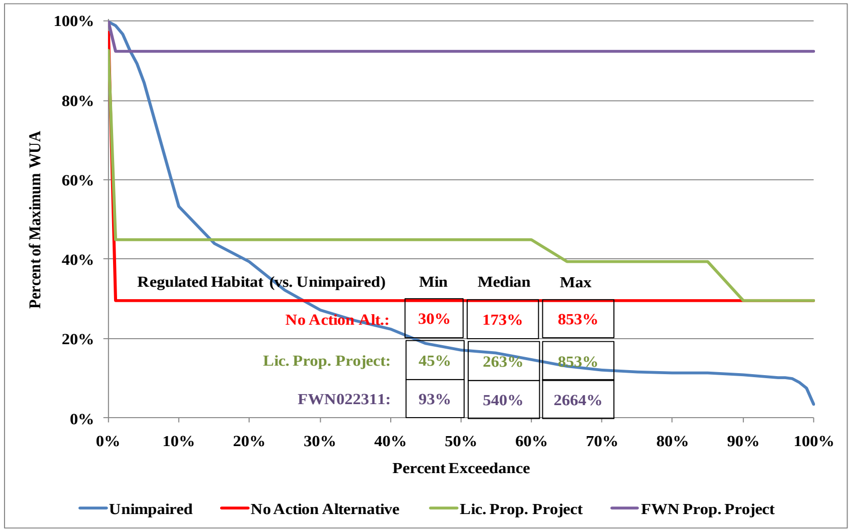


(j) July - Node 0 – Bowman-Spaulding Conduit Div Dam

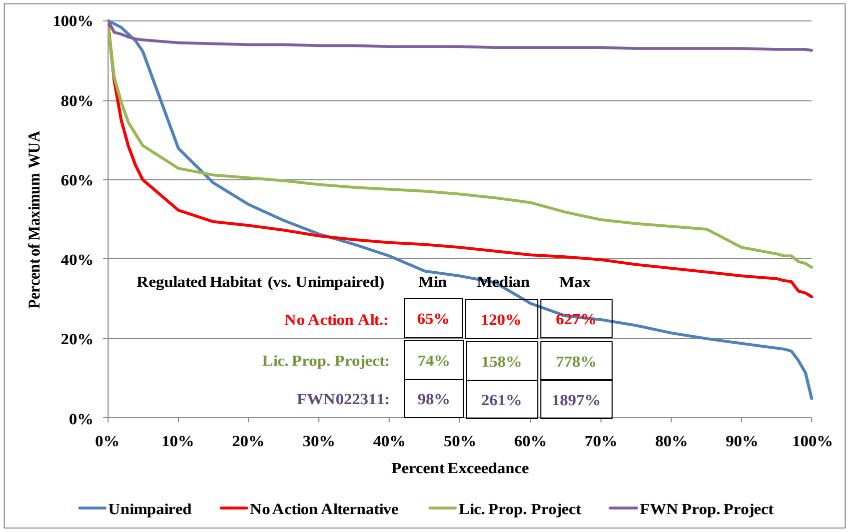


(j) July - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

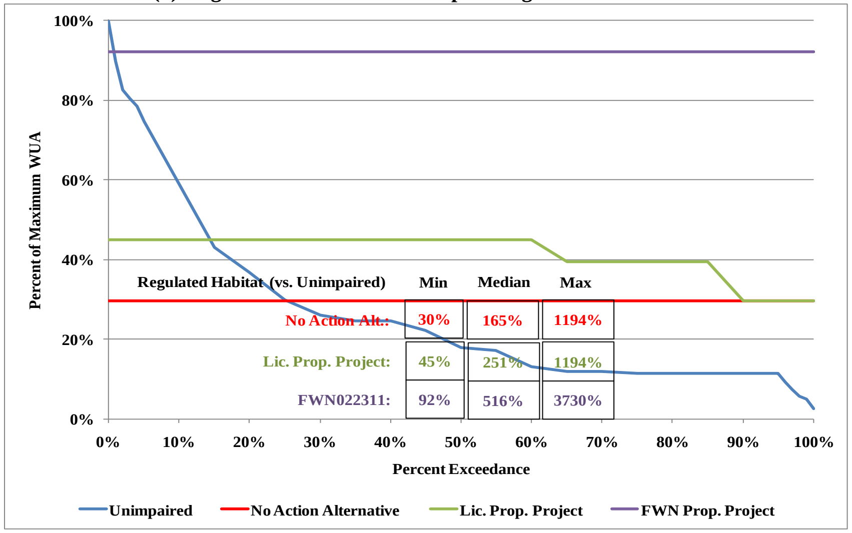
Figures 6.3.1-38i and 6.3.1-38j. HEA for adult rainbow trout during the months of June (i) and July (j) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



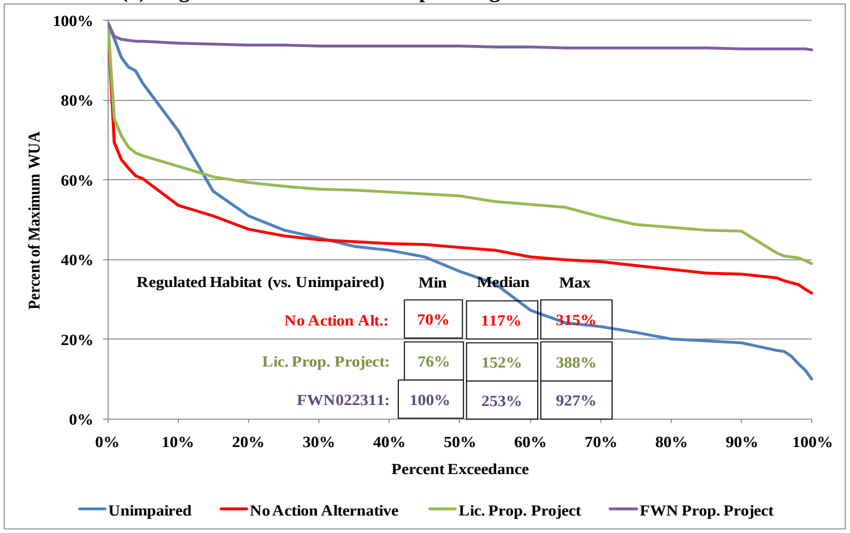
(k) August - Node 0 – Bowman-Spaulding Conduit Div Dam



(k) August - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

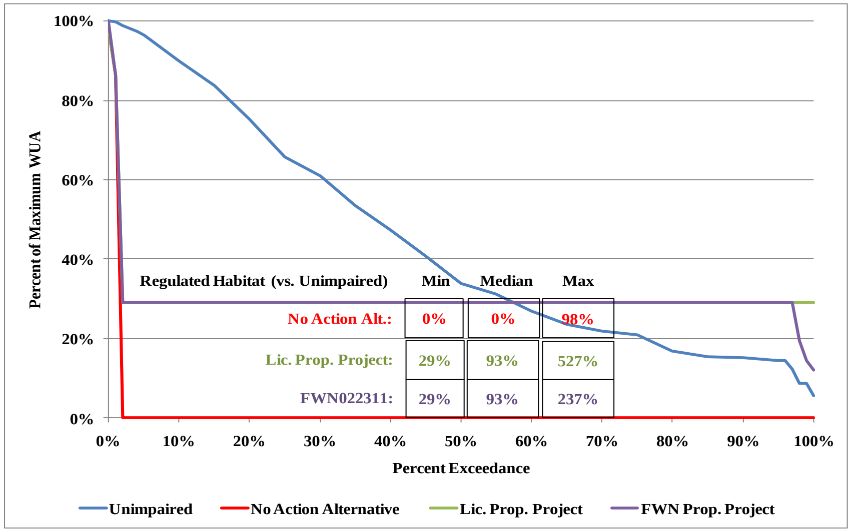


(l) September - Node 0 – Bowman-Spaulding Conduit Div Dam

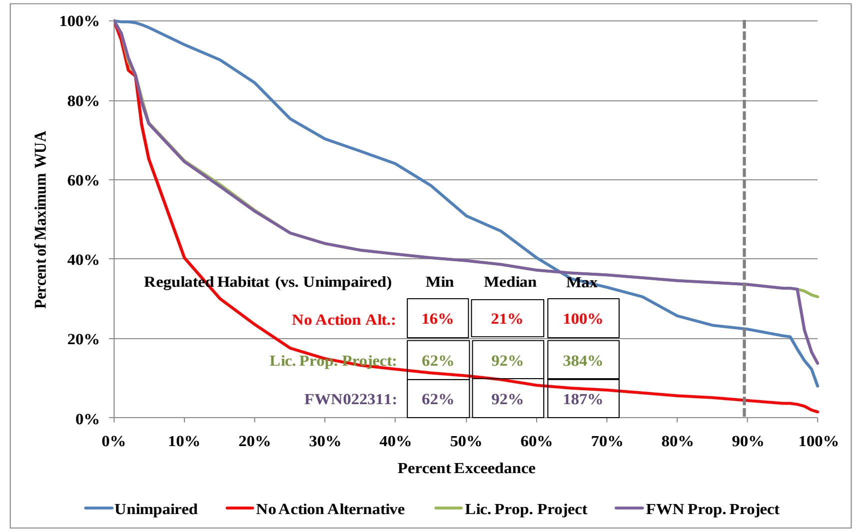


(l) September - Node 1 – Bowman-Spaulding Conduit Div Dam Reach

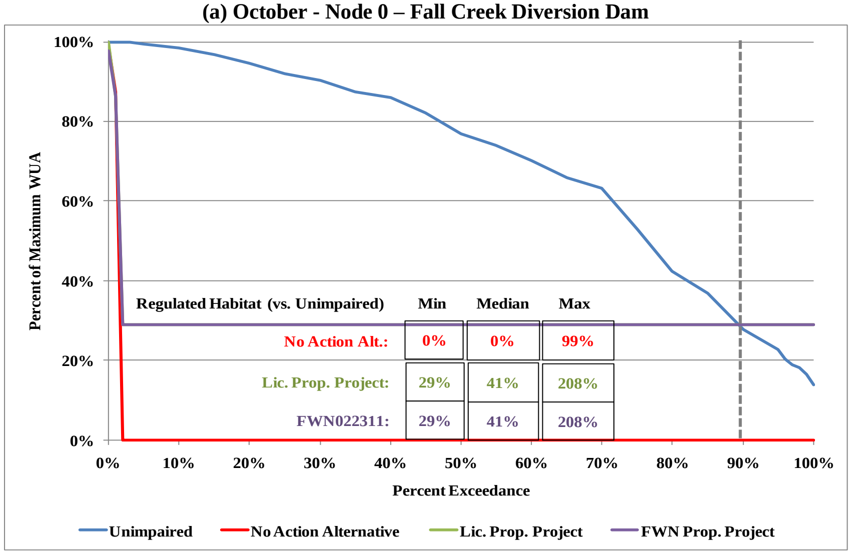
Figures 6.3.1-38k and 6.3.1-38l. HEA for adult rainbow trout during the months of August (k) and September (l) in Bowman-Spaulding Diversion Dam Reach, Canyon Creek.



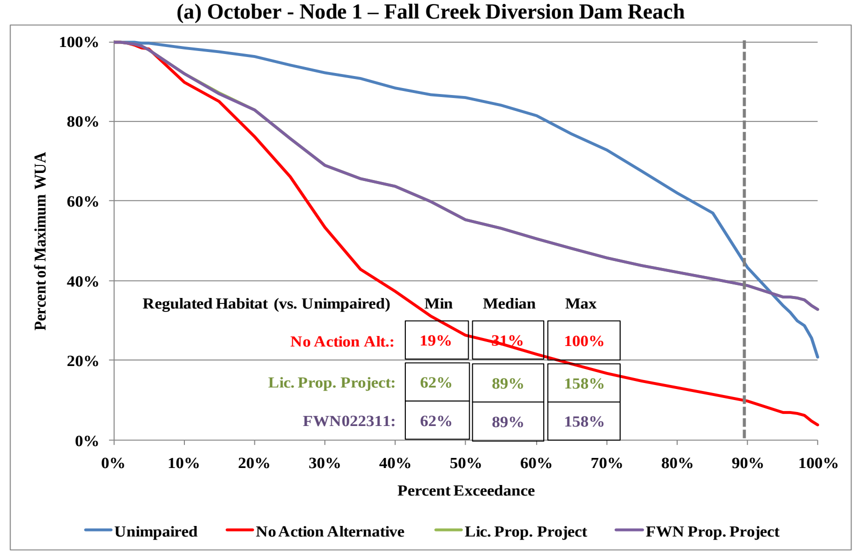
(a) October - Node 0 – Fall Creek Diversion Dam



(a) October - Node 1 – Fall Creek Diversion Dam Reach

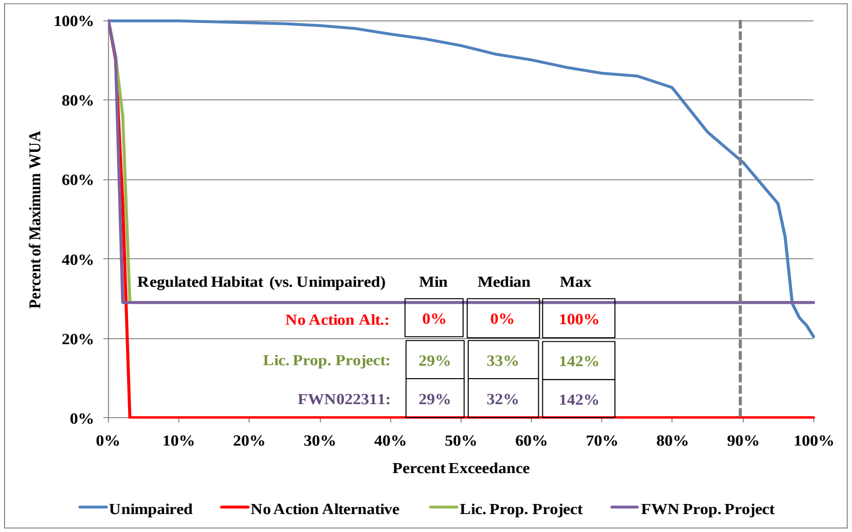


(b) November - Node 0 – Fall Creek Diversion Dam

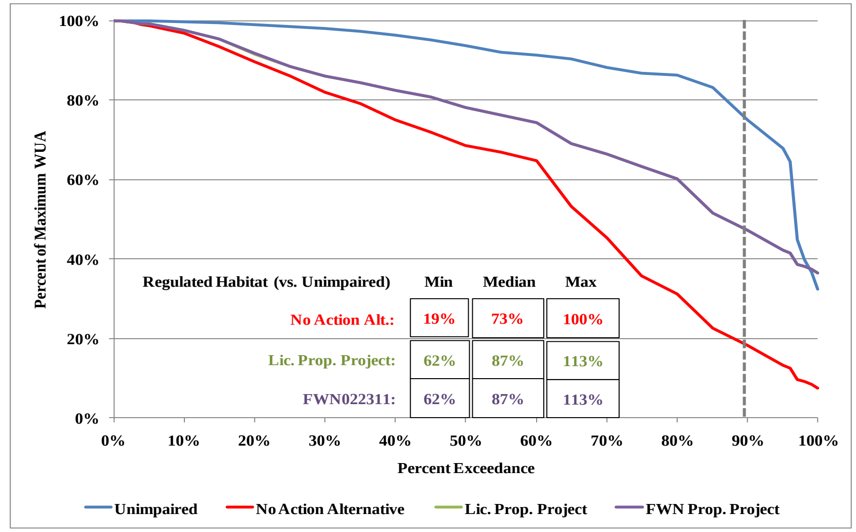


(b) November - Node 1 – Fall Creek Diversion Dam Reach

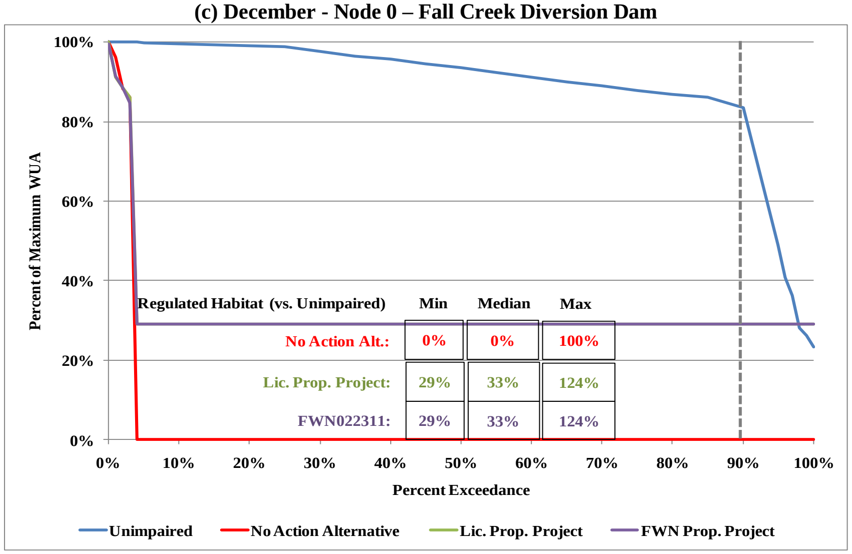
Figures 6.3.1-39a and 6.3.1-39b. HEA for adult rainbow trout during the months of October (a) and November (b) in Fall Creek Diversion Dam Reach, Fall Creek.



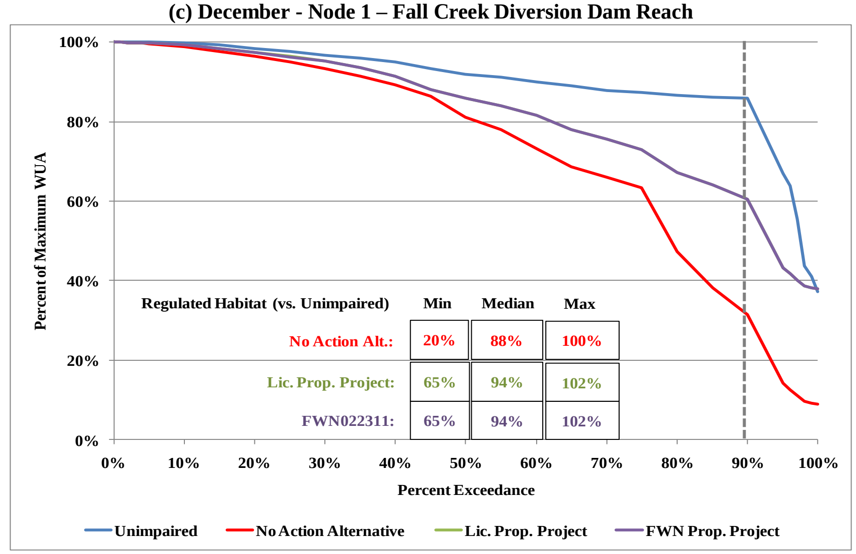
(c) December - Node 0 – Fall Creek Diversion Dam



(c) December - Node 1 – Fall Creek Diversion Dam Reach

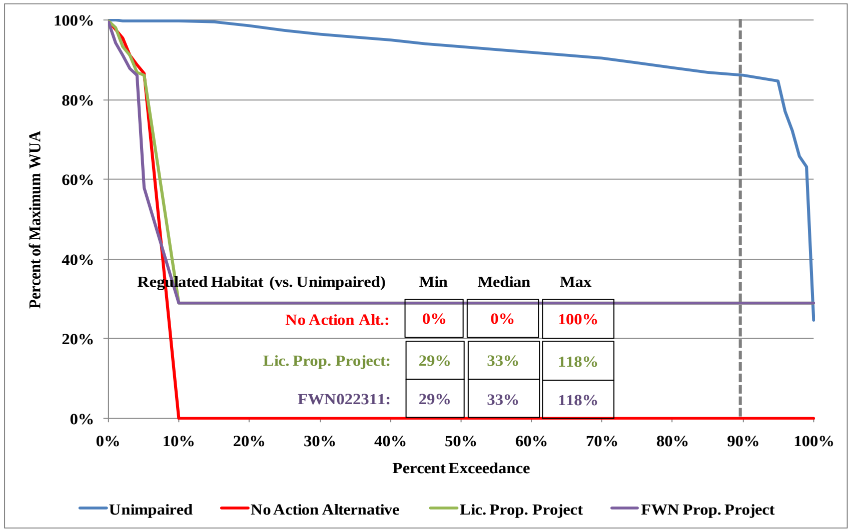


(d) January - Node 0 – Fall Creek Diversion Dam

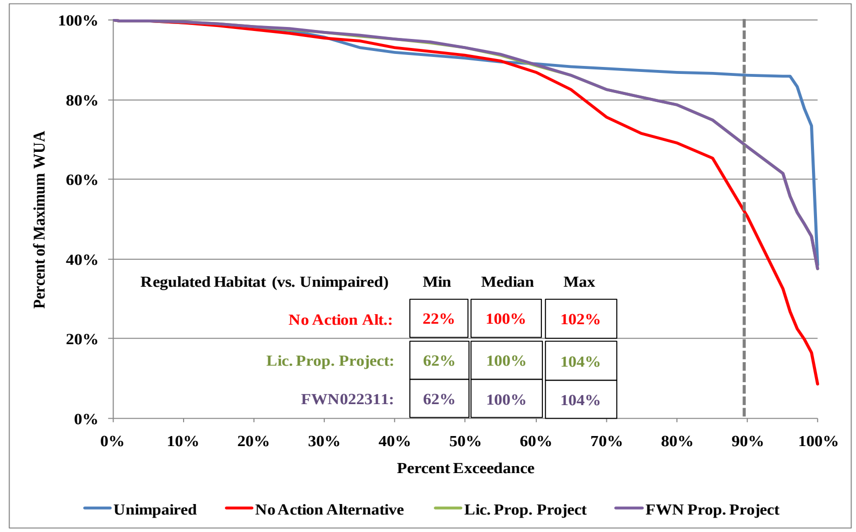


(d) January - Node 1 – Fall Creek Diversion Dam Reach

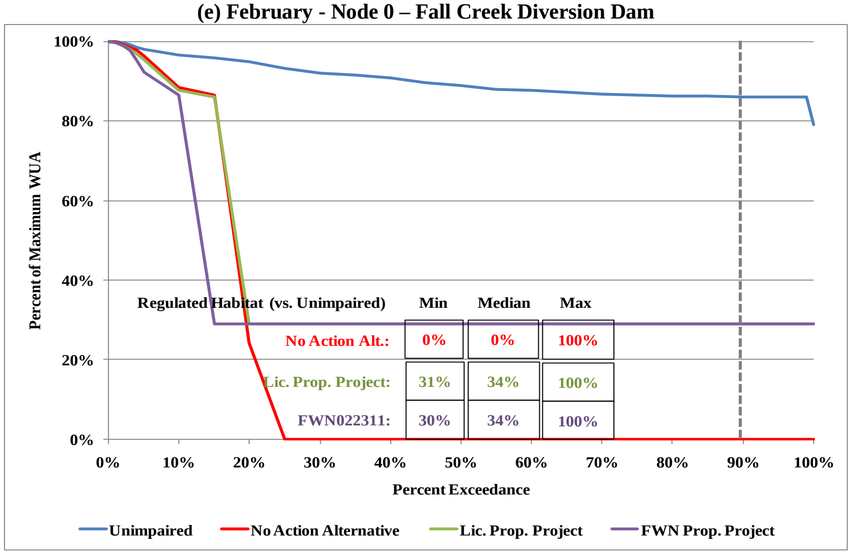
Figures 6.3.1-39c and 6.3.1-39d. HEA for adult rainbow trout during the months of December (c) and January (d) in Fall Creek Diversion Dam Reach, Fall Creek.



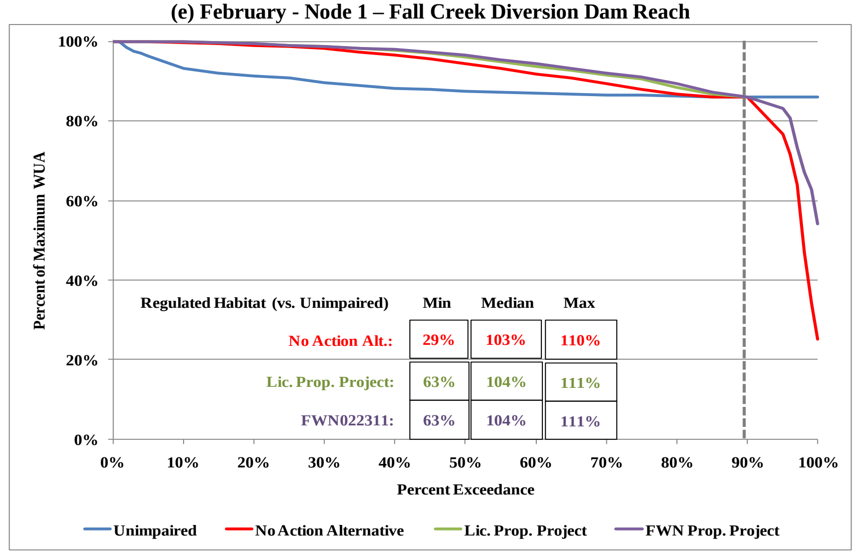
(e) February - Node 0 – Fall Creek Diversion Dam



(e) February - Node 1 – Fall Creek Diversion Dam Reach

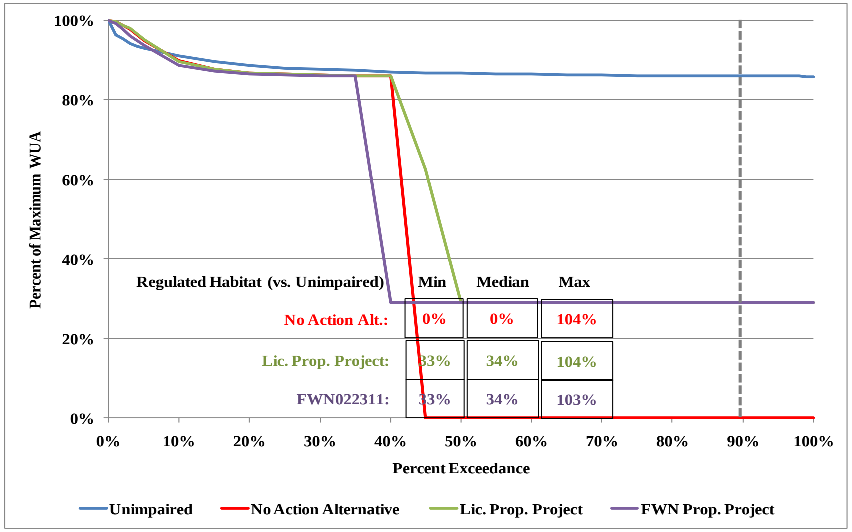


(f) March - Node 0 – Fall Creek Diversion Dam

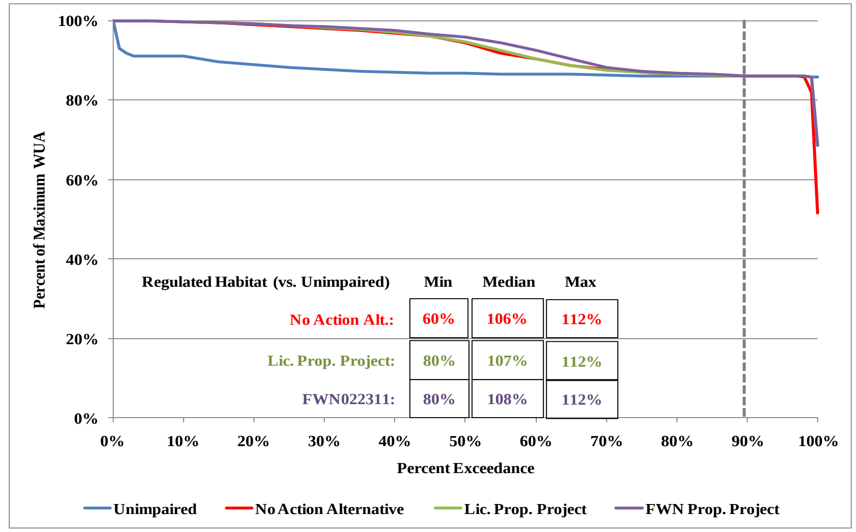


(f) March - Node 1 – Fall Creek Diversion Dam Reach

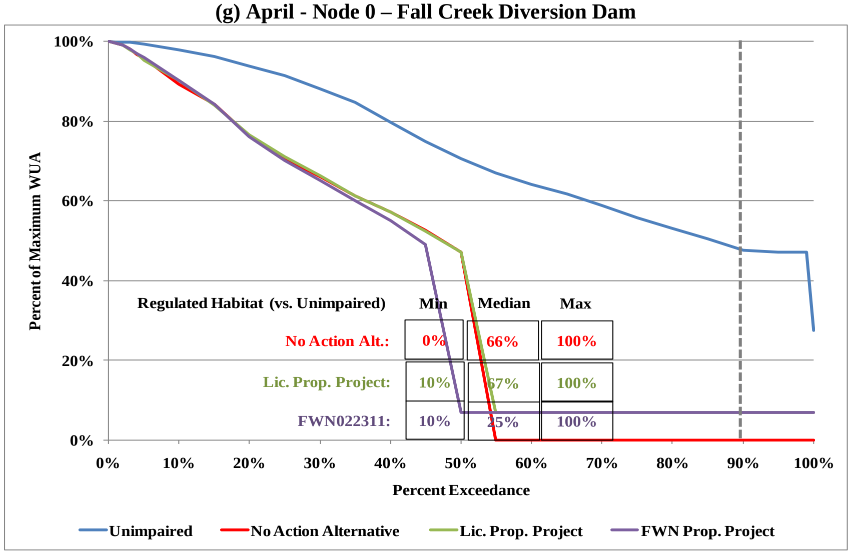
Figures 6.3.1-39e and 6.3.1-39f. HEA for adult rainbow trout during the months of February (e) and March (f) in Fall Creek Diversion Dam Reach. , Fall Creek.



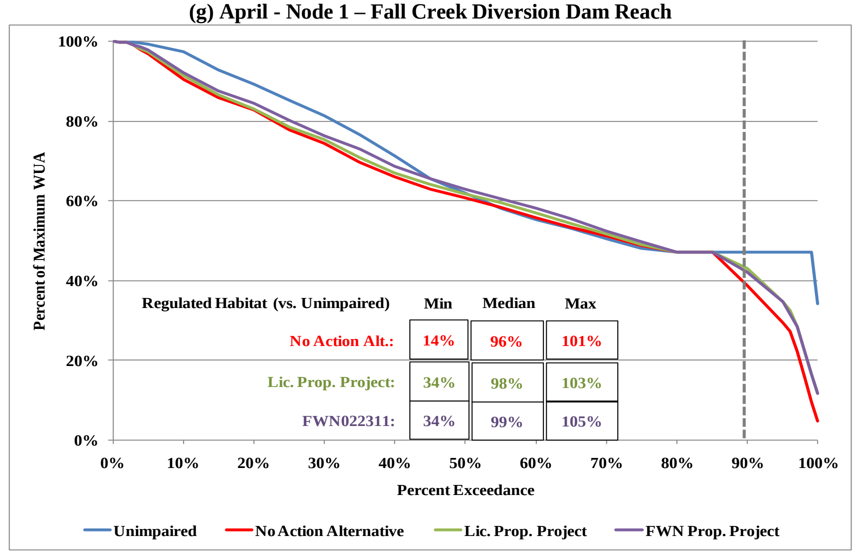
(g) April - Node 0 – Fall Creek Diversion Dam



(g) April - Node 1 – Fall Creek Diversion Dam Reach

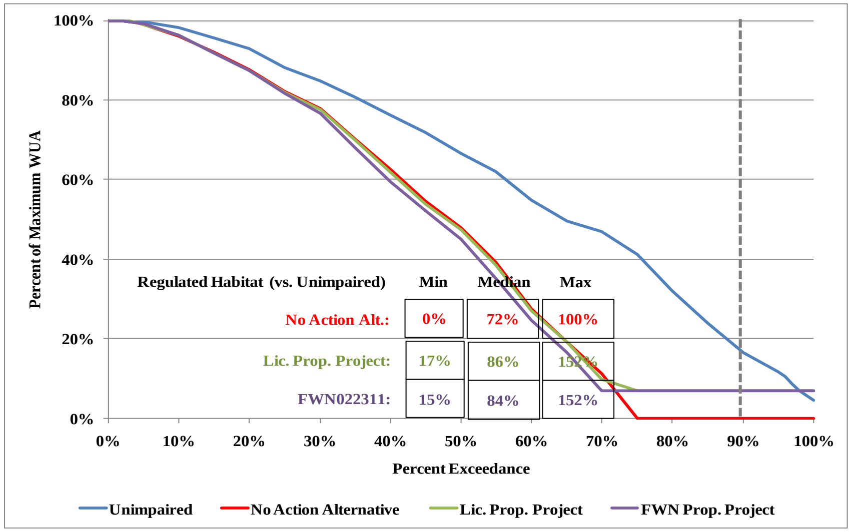


(h) May - Node 0 – Fall Creek Diversion Dam

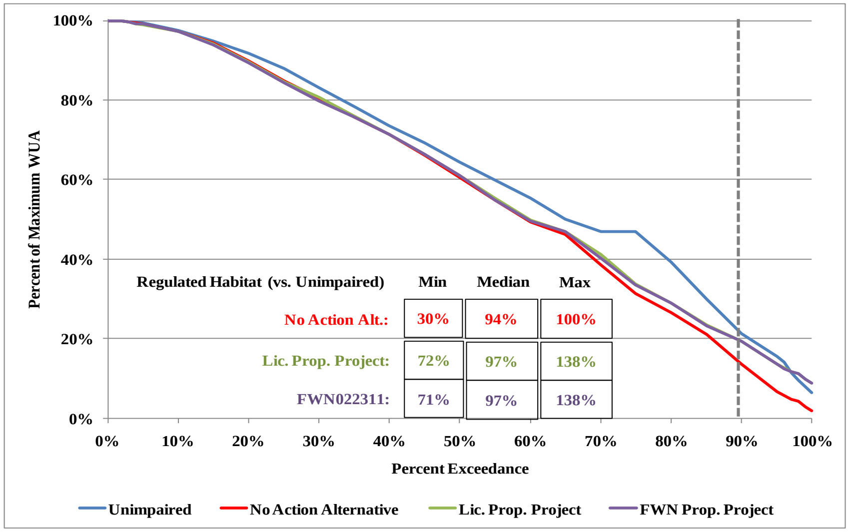


(h) May - Node 1 – Fall Creek Diversion Dam Reach

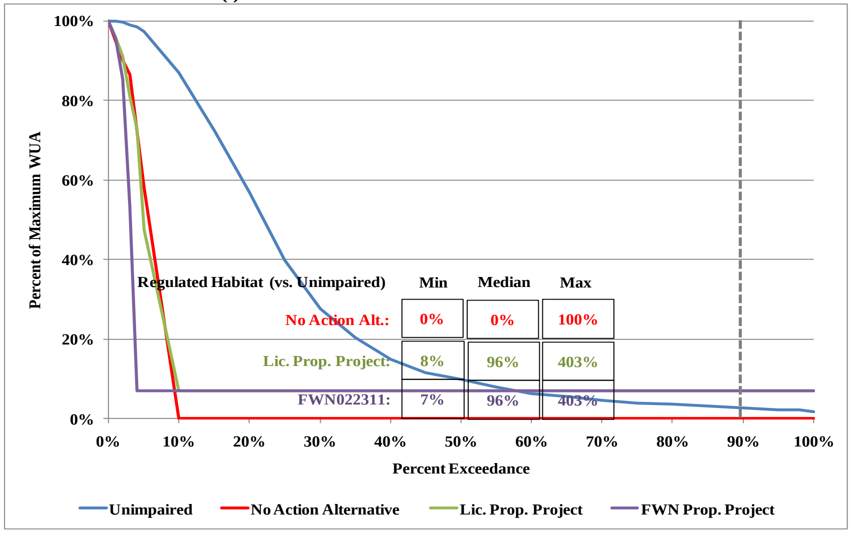
Figures 6.3.1-39g and 6.3.1-39h. HEA for adult rainbow trout during the months of April (g) and May (h) in Fall Creek Diversion Dam Reach, Fall Creek.



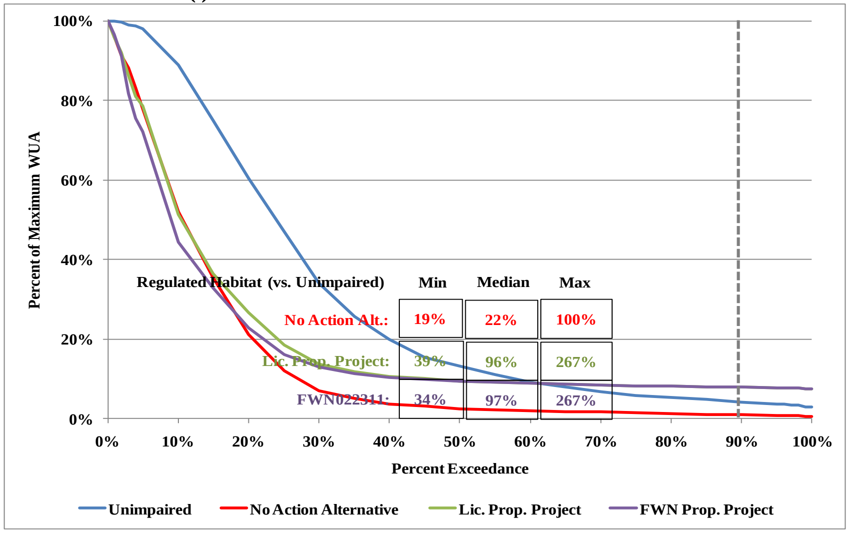
(i) June - Node 0 – Fall Creek Diversion Dam



(i) June - Node 1 – Fall Creek Diversion Dam Reach

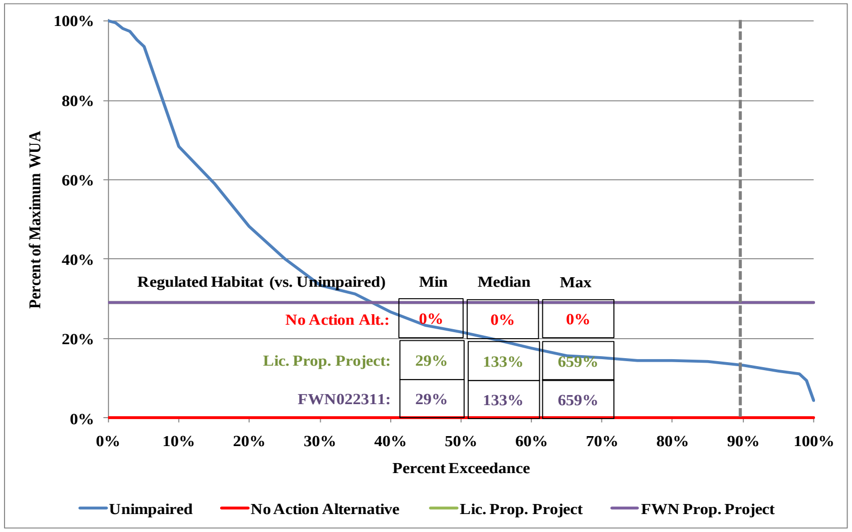


(j) July - Node 0 – Fall Creek Diversion Dam

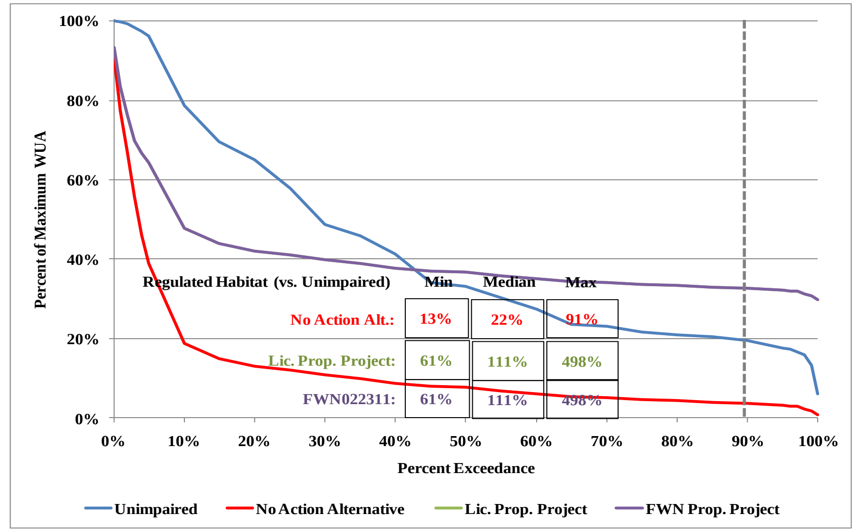


(j) July - Node 1 – Fall Creek Diversion Dam Reach

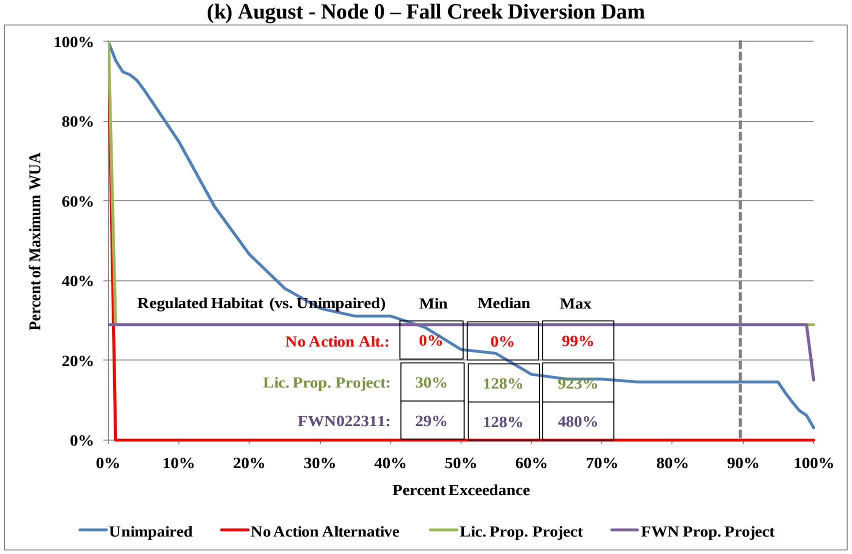
Figures 6.3.1-39i and 6.3.1-39j. HEA for adult rainbow trout during the months of June (i) and July (j) in Fall Creek Diversion Dam Reach, Fall Creek.



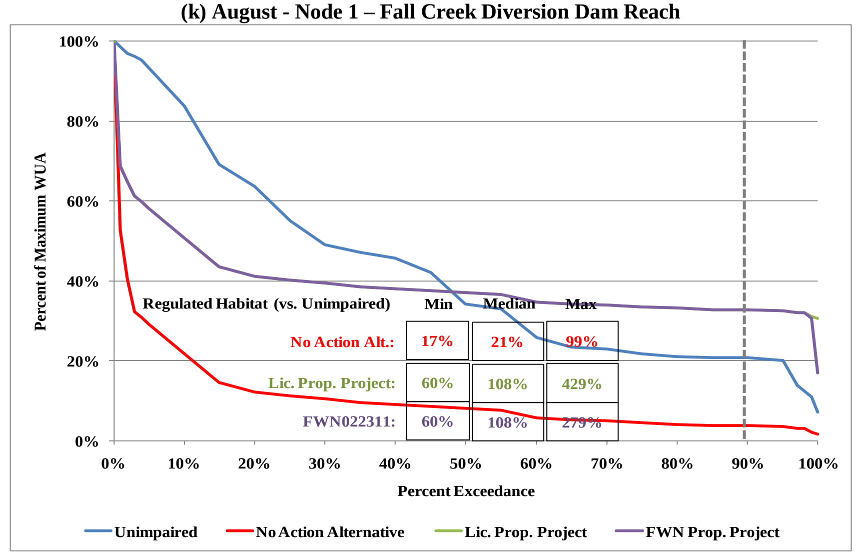
(k) August - Node 0 – Fall Creek Diversion Dam



(k) August - Node 1 – Fall Creek Diversion Dam Reach

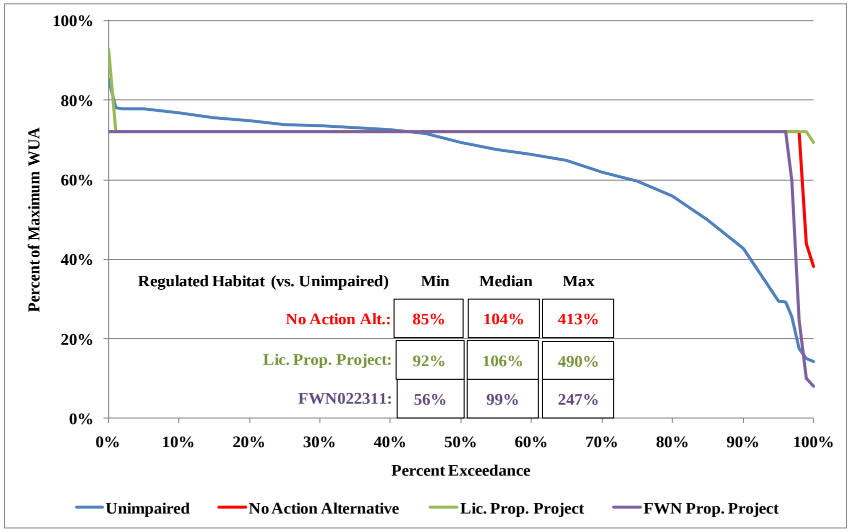


(l) September - Node 0 – Fall Creek Diversion Dam

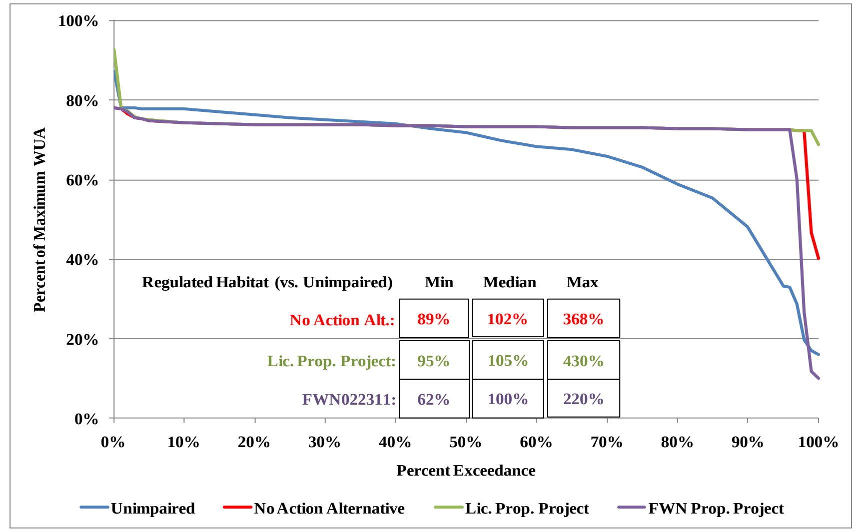


(l) September - Node 1 – Fall Creek Diversion Dam Reach

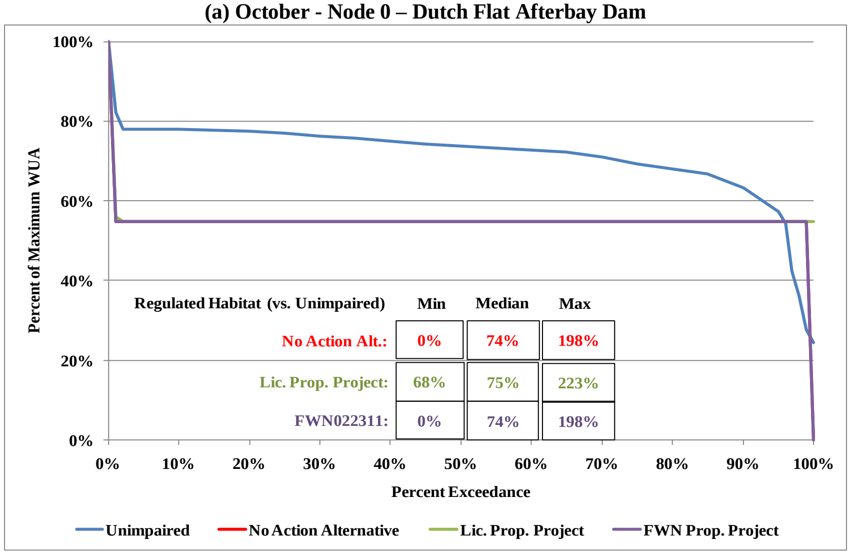
Figures 6.3.1-39k and 6.3.1-39l. HEA for adult rainbow trout during the months of August (k) and September (l) in Fall Creek Diversion Dam Reach, Fall Creek.



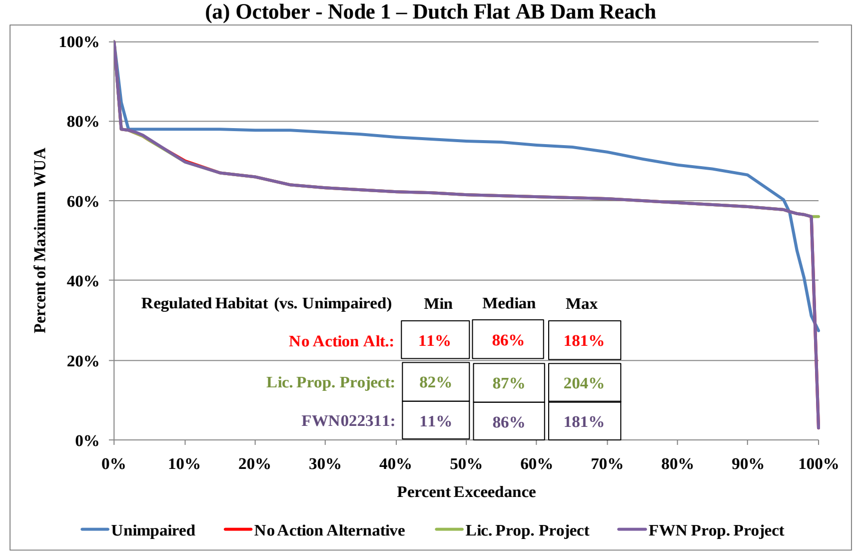
(a) October - Node 0 – Dutch Flat Afterbay Dam



(a) October - Node 1 – Dutch Flat AB Dam Reach

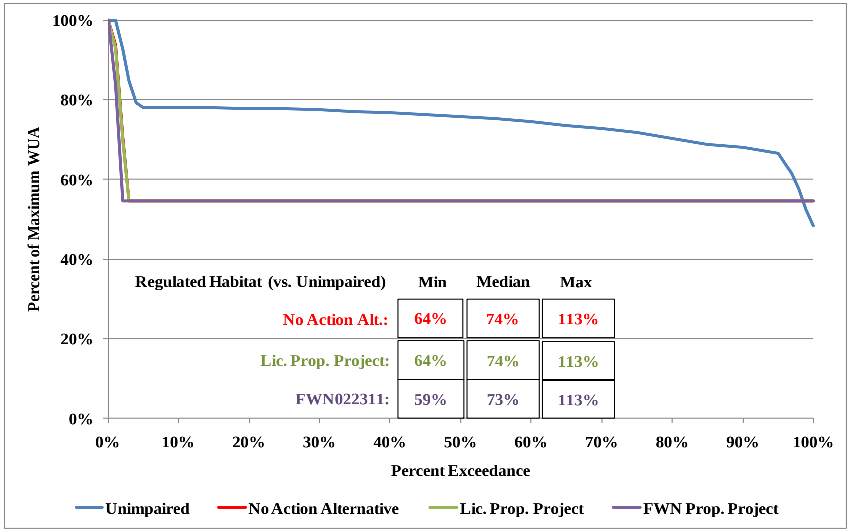


(b) November - Node 0 – Dutch Flat Afterbay Dam

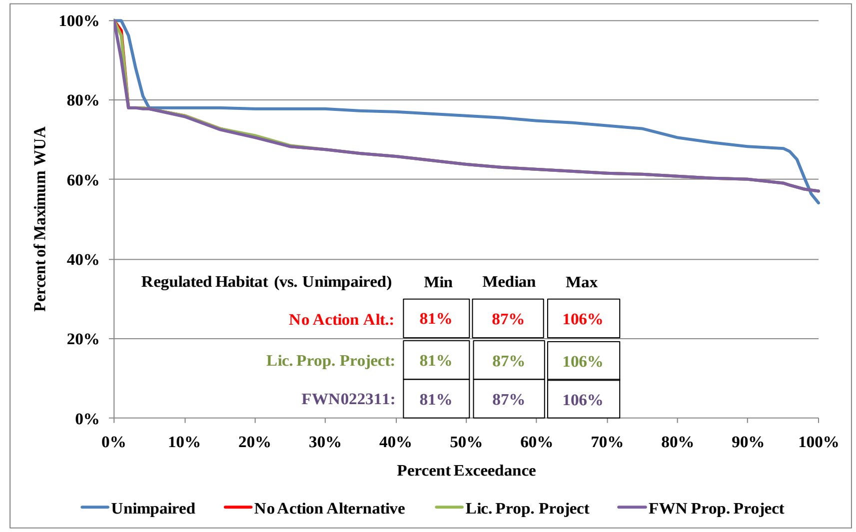


(b) November - Node 1 – Dutch Flat AB Dam Reach

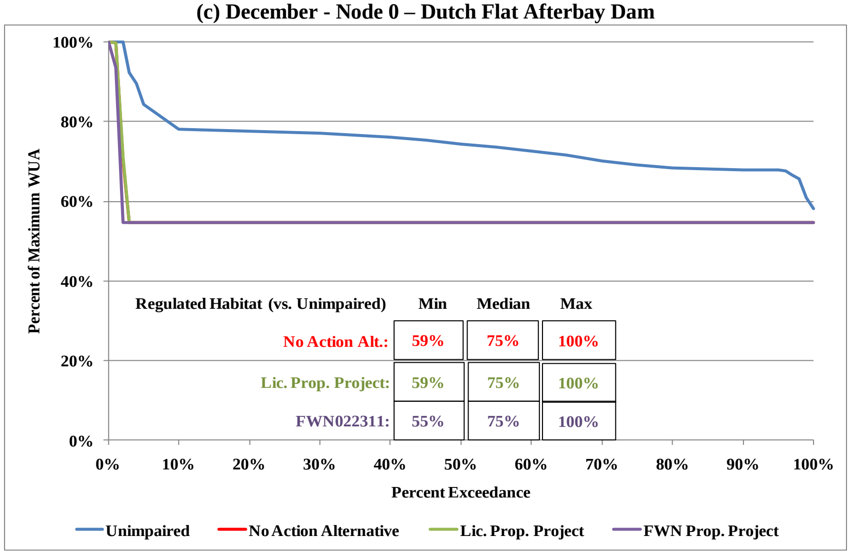
Figures 6.3.1-40a and 6.3.1-40b. HEA for adult rainbow trout during the months of October (a) and November (b) in Dutch Flat Afterbay Dam Reach, Bear River.



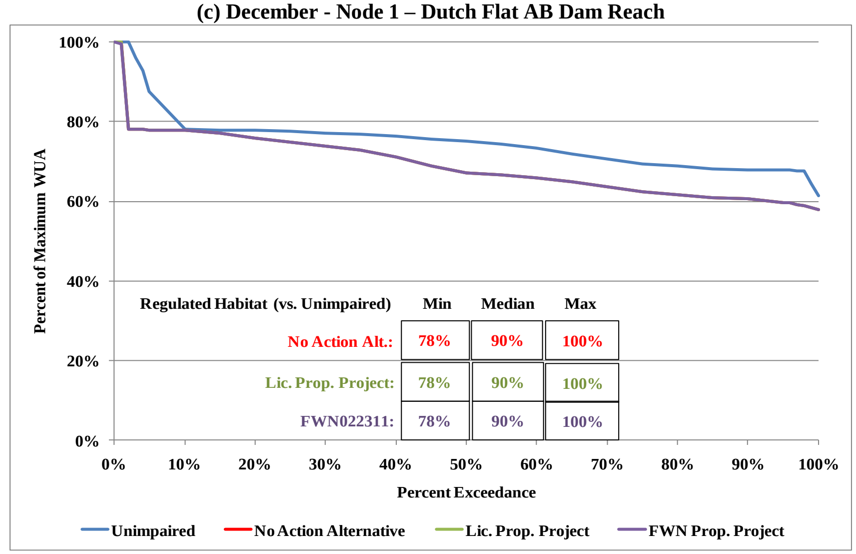
(c) December - Node 0 – Dutch Flat Afterbay Dam



(c) December - Node 1 – Dutch Flat AB Dam Reach

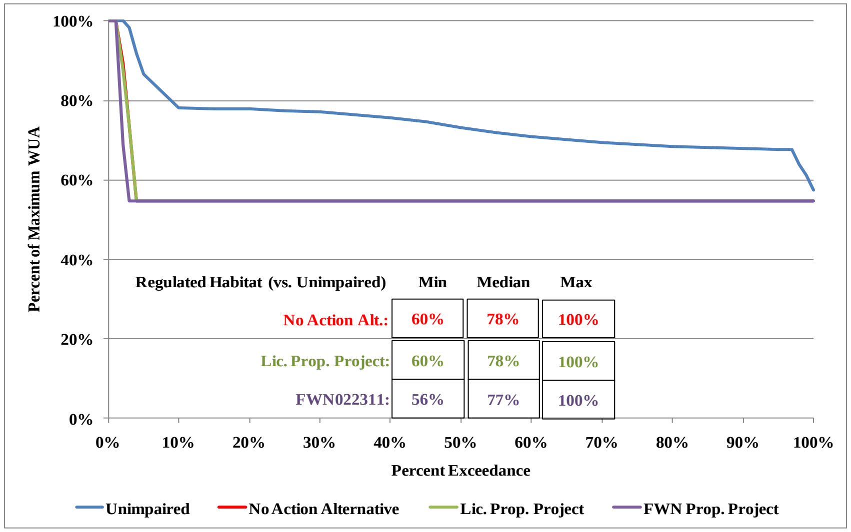


(d) January - Node 0 – Dutch Flat Afterbay Dam

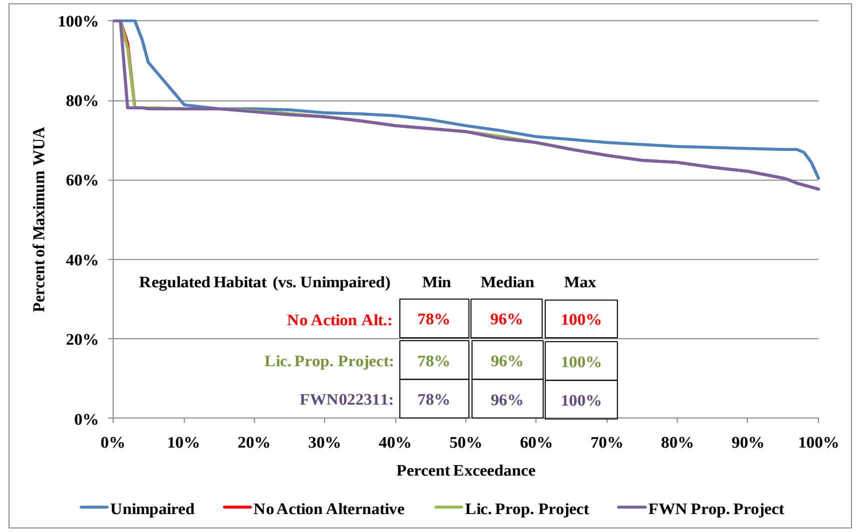


(d) January - Node 1 – Dutch Flat AB Dam Reach

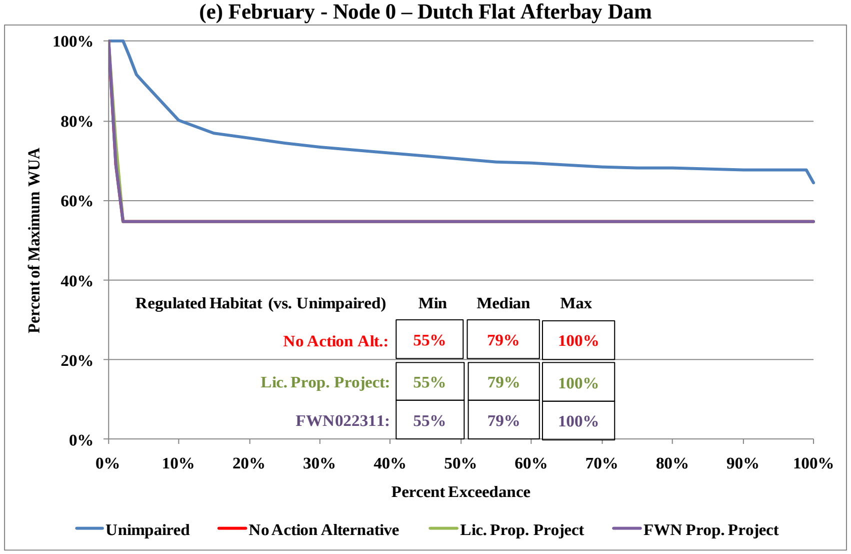
Figures 6.3.1-40c and 6.3.1-40d. HEA for adult rainbow trout during the months of December (c) and January (d) in Dutch Flat Afterbay Dam Reach, Bear River.



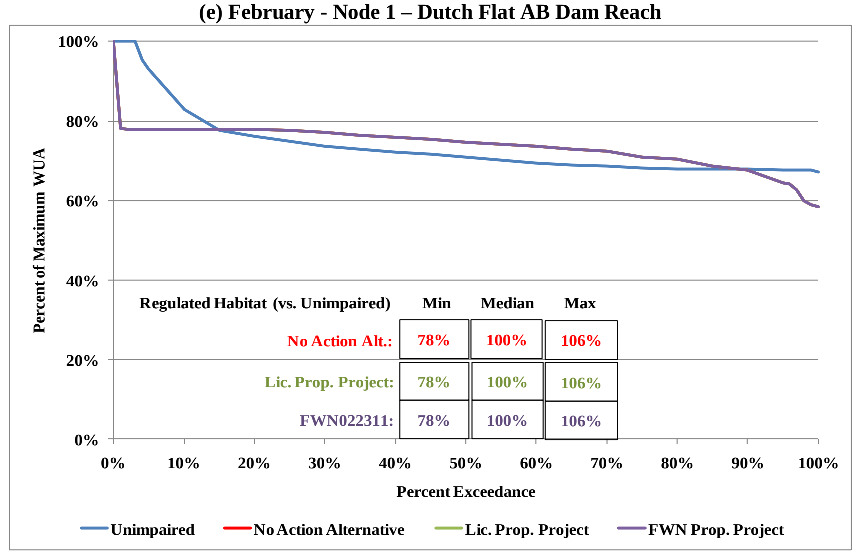
(e) February - Node 0 – Dutch Flat Afterbay Dam



(e) February - Node 1 – Dutch Flat AB Dam Reach

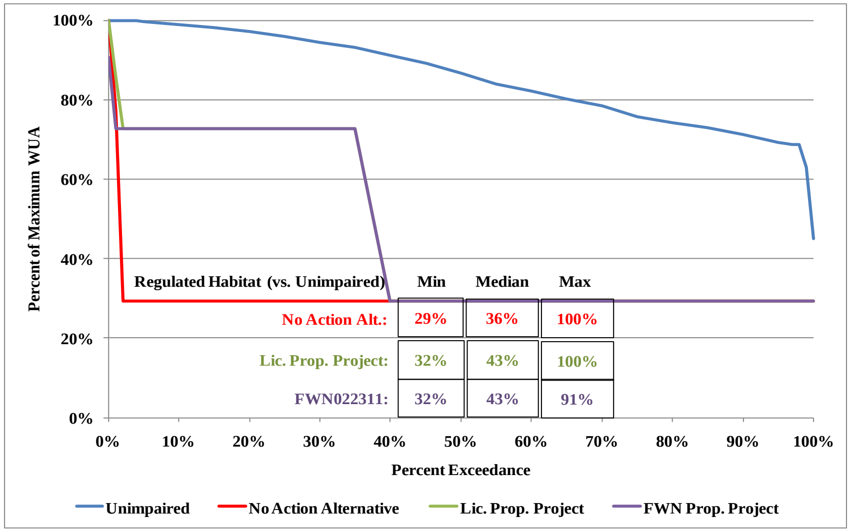


(f) March - Node 0 – Dutch Flat Afterbay Dam

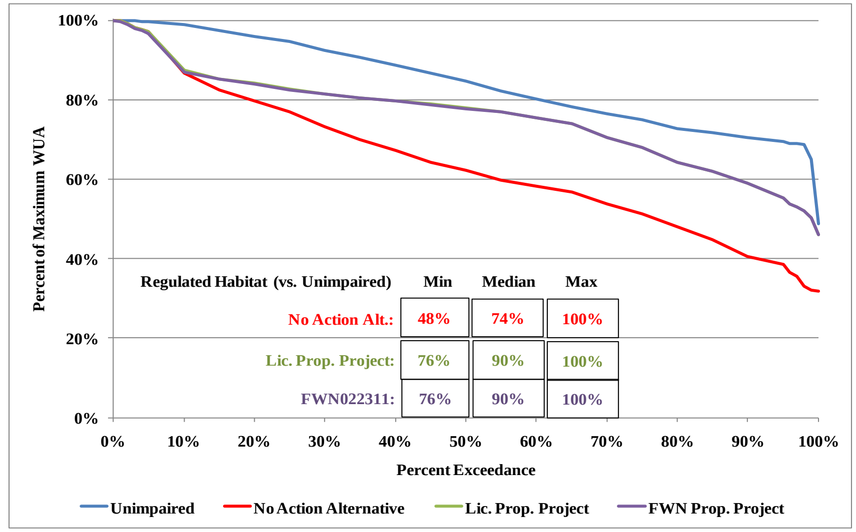


(f) March - Node 1 – Dutch Flat AB Dam Reach

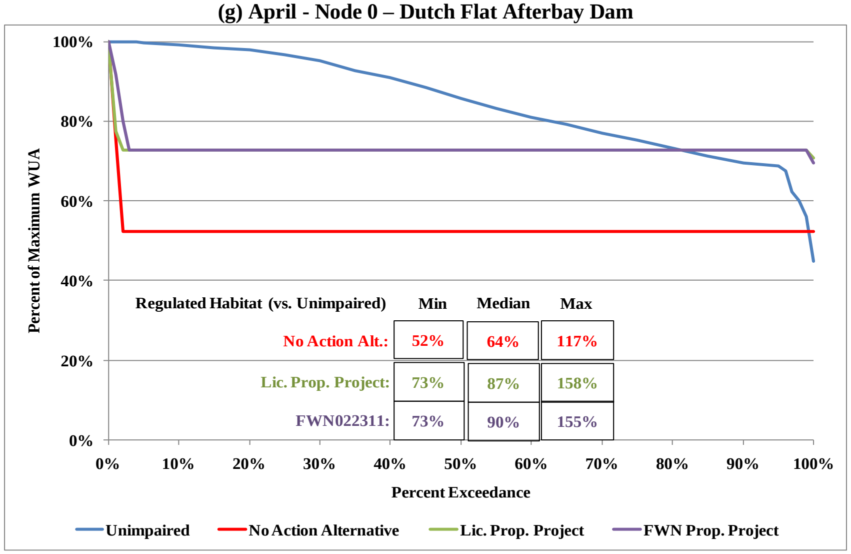
Figures 6.3.1-40e and 6.3.1-40f. HEA for adult rainbow trout during the months of February (e) and March (f) in Dutch Flat Afterbay Dam Reach, Bear River.



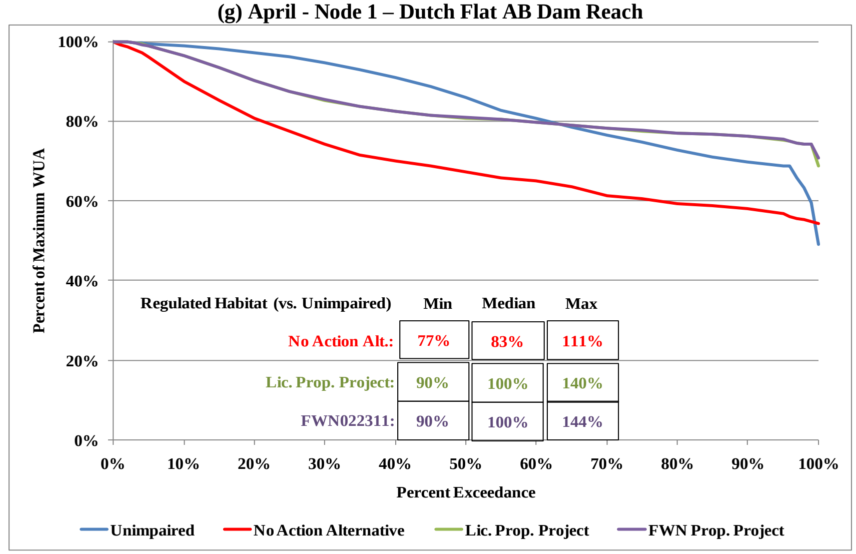
(g) April - Node 0 – Dutch Flat Afterbay Dam



(g) April - Node 1 – Dutch Flat AB Dam Reach

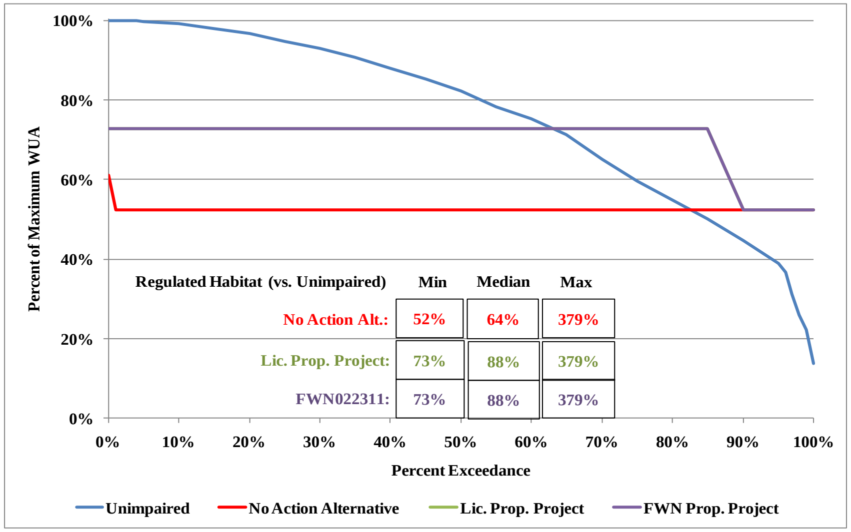


(h) May - Node 0 – Dutch Flat Afterbay Dam

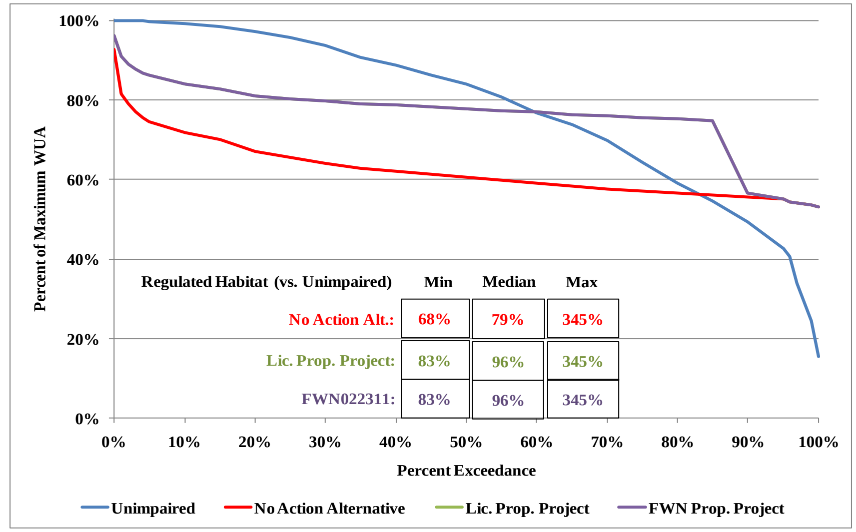


(h) May - Node 1 – Dutch Flat AB Dam Reach

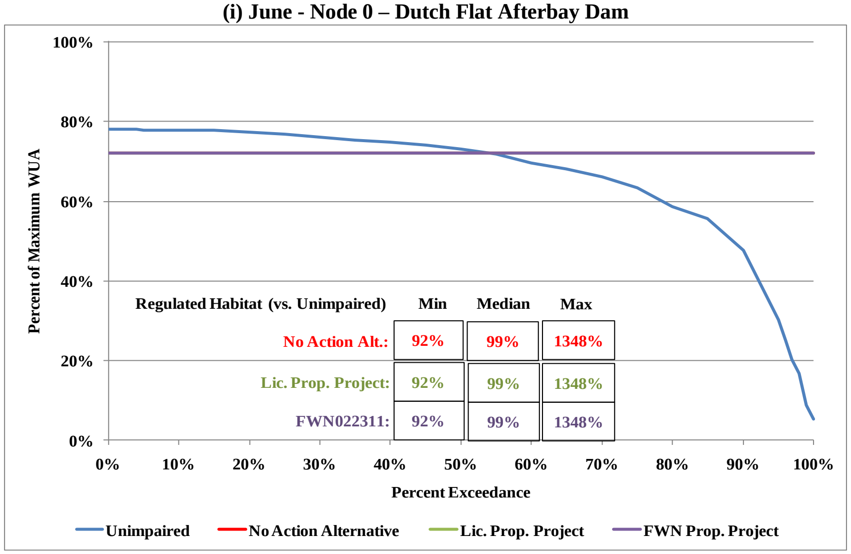
Figures 6.3.1-40g and 6.3.1-40h. HEA for spawning rainbow trout during the months of April (g) and May (h) in Dutch Flat Afterbay Dam Reach, Bear River.



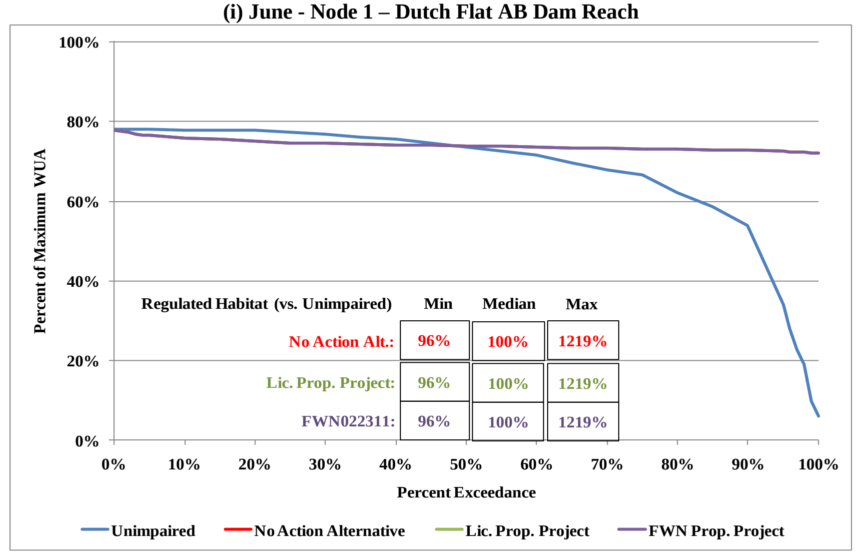
(i) June - Node 0 – Dutch Flat Afterbay Dam



(i) June - Node 1 – Dutch Flat AB Dam Reach

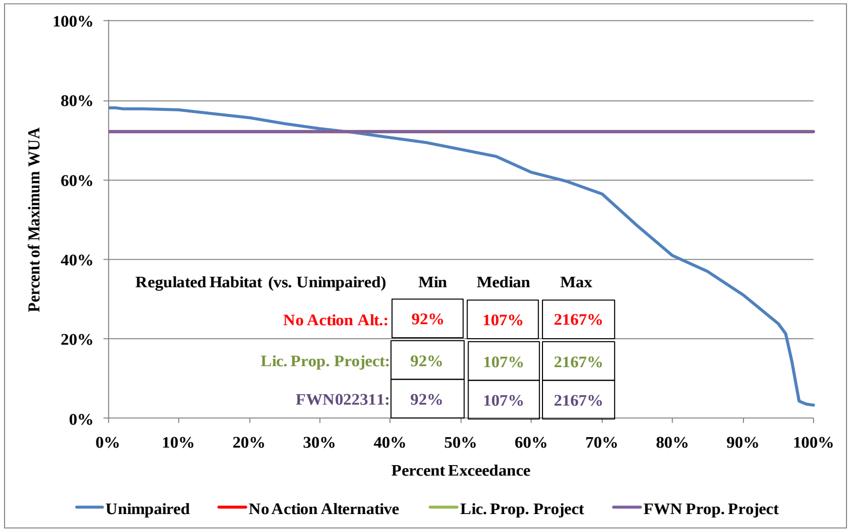


(j) July - Node 0 – Dutch Flat Afterbay Dam

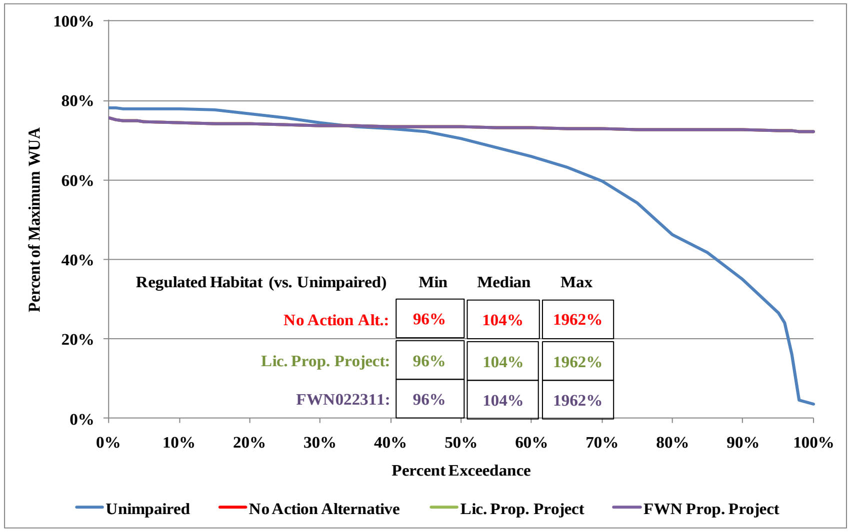


(j) July - Node 1 – Dutch Flat AB Dam Reach

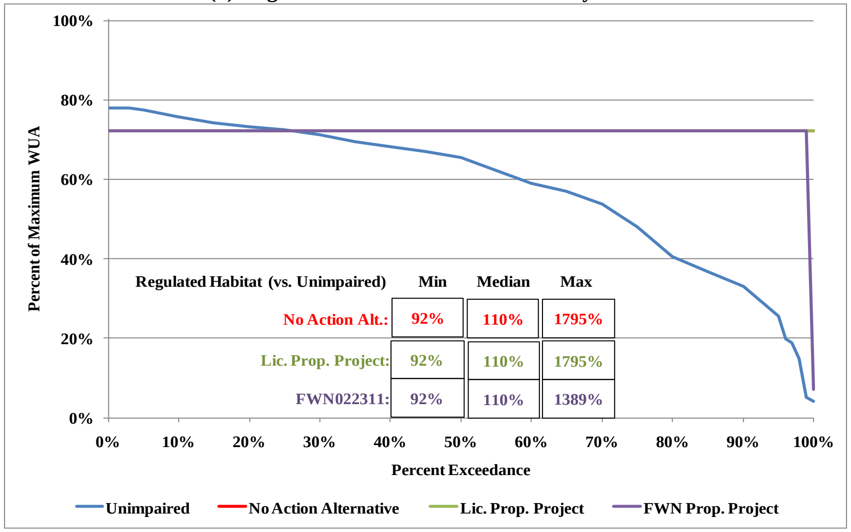
Figures 6.3.1-40i and 6.3.1-40j. HEA for spawning rainbow trout during the month of June (i) and adult rainbow trout during the month of July (j) in Dutch Flat Afterbay Dam Reach, Bear River.



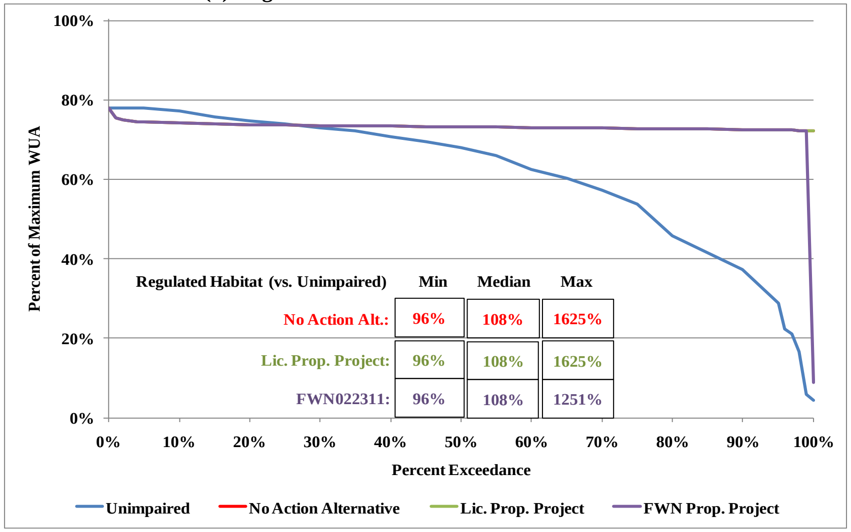
(k) August - Node 0 – Dutch Flat Afterbay Dam



(k) August - Node 1 – Dutch Flat AB Dam Reach

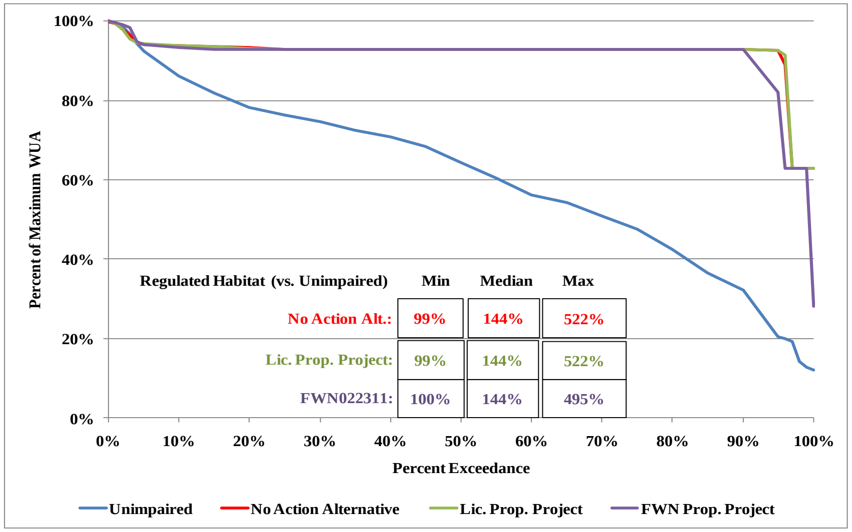


(l) September - Node 0 – Dutch Flat Afterbay Dam

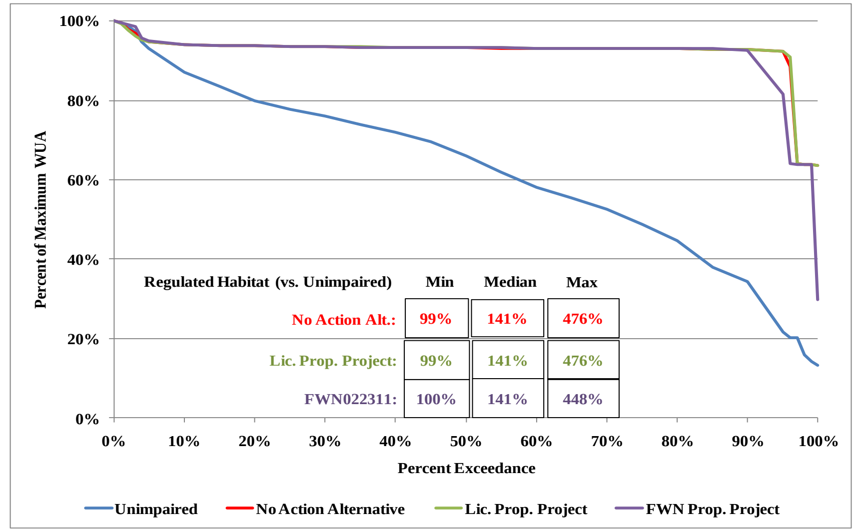


(l) September - Node 1 – Dutch Flat AB Dam Reach

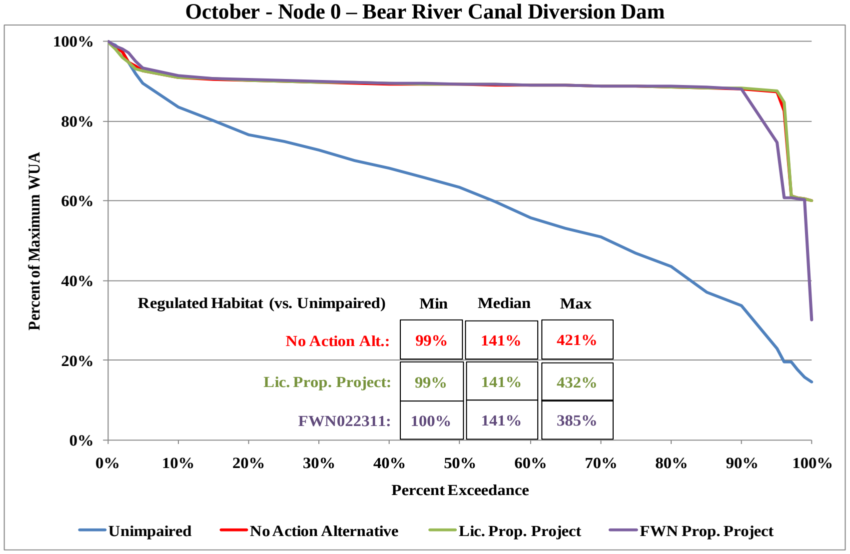
Figures 6.3.1-40k and 6.3.1-40l. HEA for adult rainbow trout during the months of August (k) and September (l) in Dutch Flat Afterbay Dam Reach, Bear River.



October - Node 0 – Bear River Canal Diversion Dam

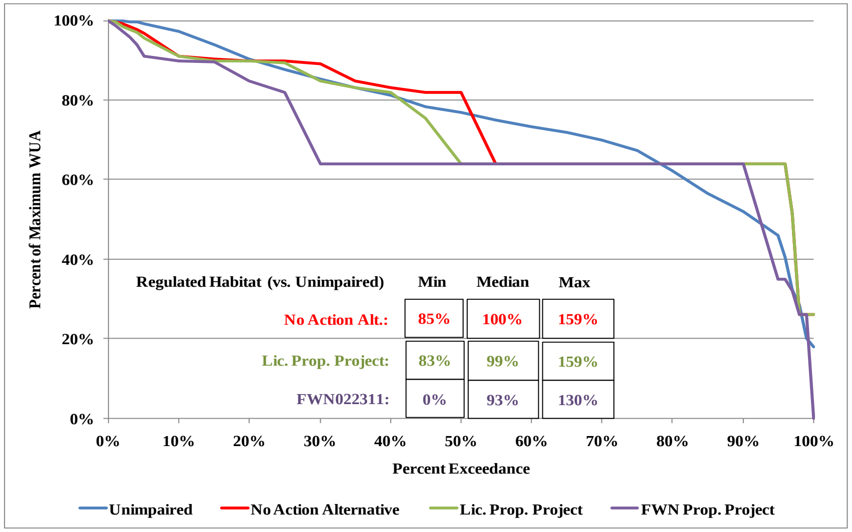


October - Node 1 – Taylor Crossing Sub-Reach

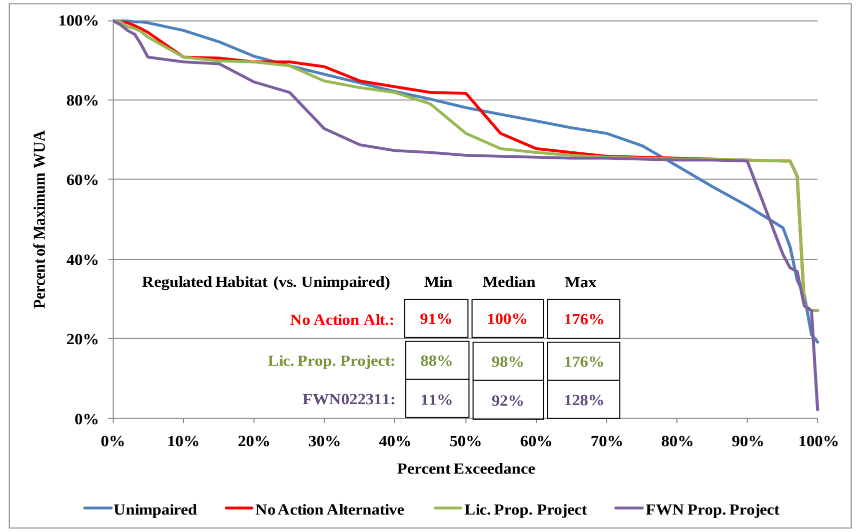


October – Node 2 – Dog Bar Sub-Reach

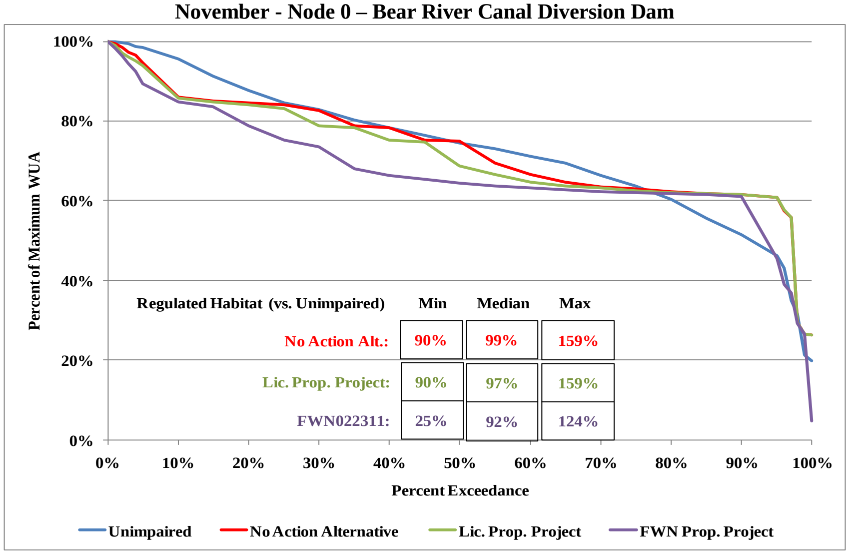
Figure 6.3.1-41a. HEA for adult rainbow trout during the month of October in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



November - Node 0 – Bear River Canal Diversion Dam

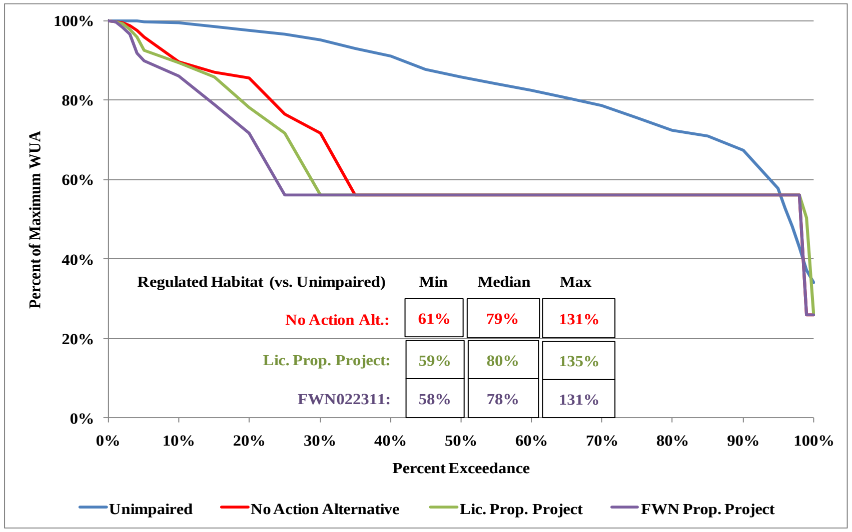


November - Node 1 – Taylor Crossing Sub-Reach

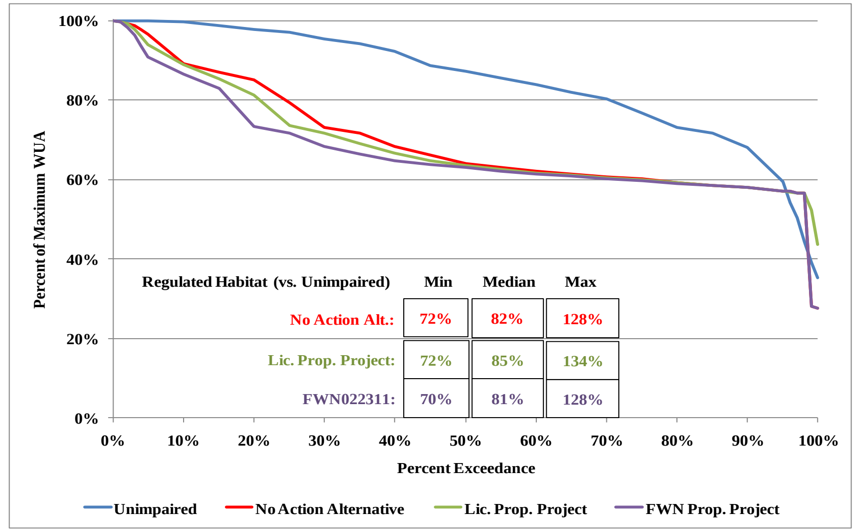


November – Node 2 – Dog Bar Sub-Reach

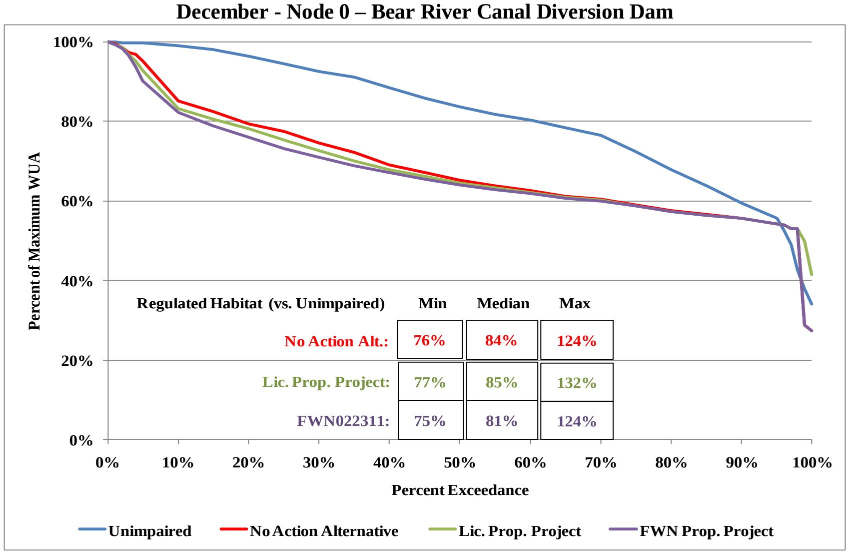
Figure 6.3.1-41b. HEA for adult rainbow trout during the month of November in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



December - Node 0 – Bear River Canal Diversion Dam

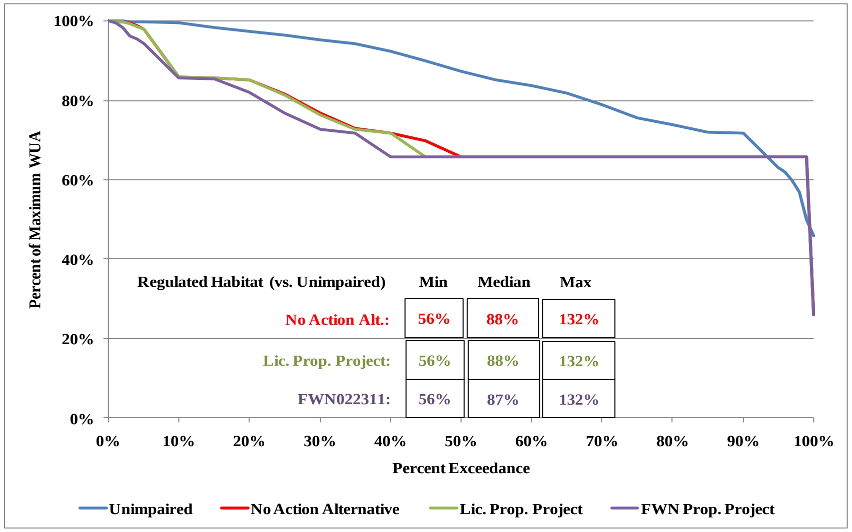


December - Node 1 – Taylor Crossing Sub-Reach

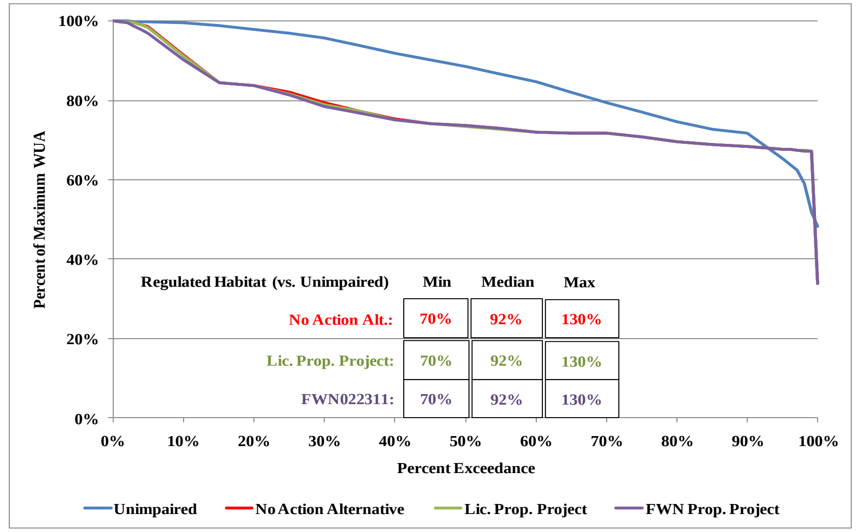


December – Node 2 – Dog Bar Sub-Reach

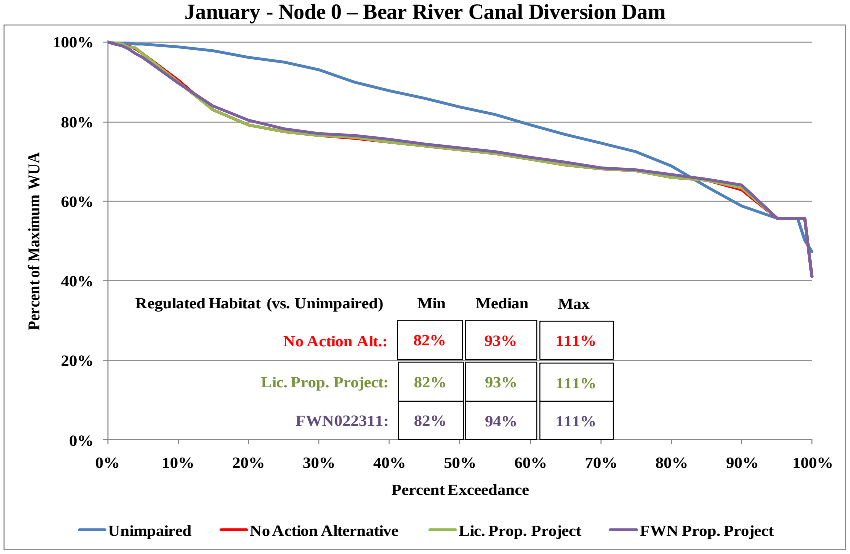
Figure 6.3.1-41c. HEA for adult rainbow trout during the month of December in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



January - Node 0 – Bear River Canal Diversion Dam

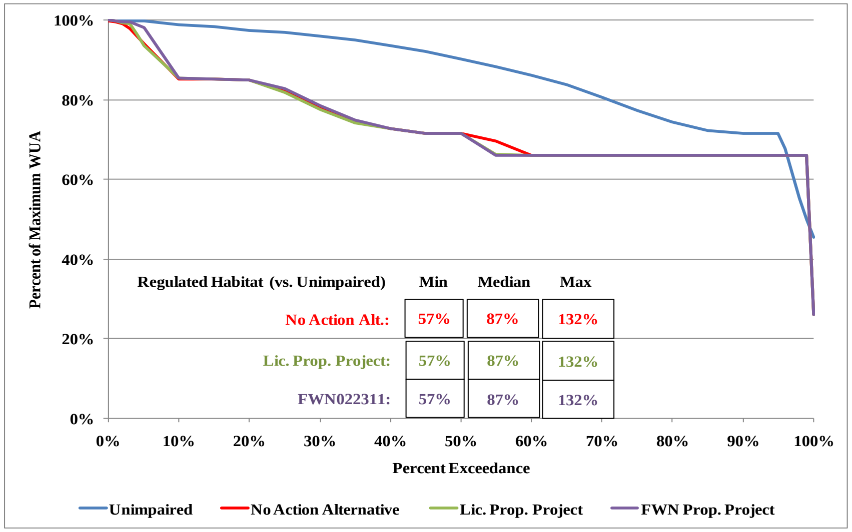


January - Node 1 – Taylor Crossing Sub-Reach

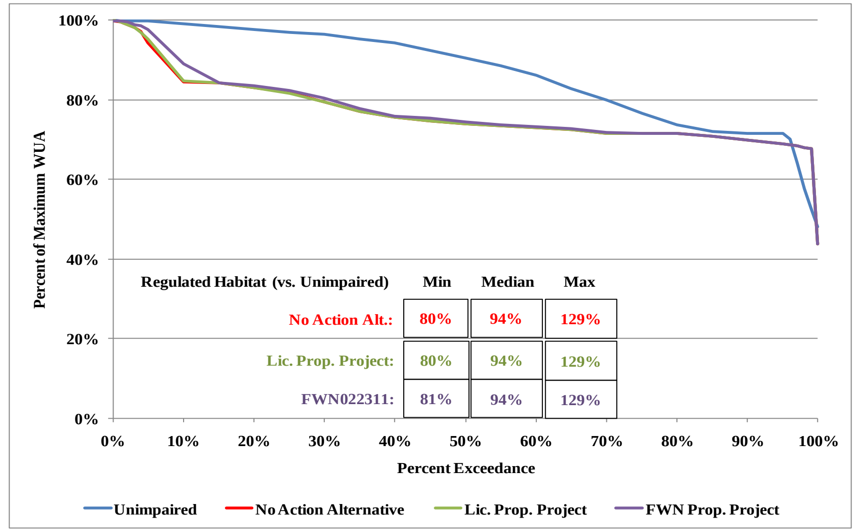


January – Node 2 – Dog Bar Sub-Reach

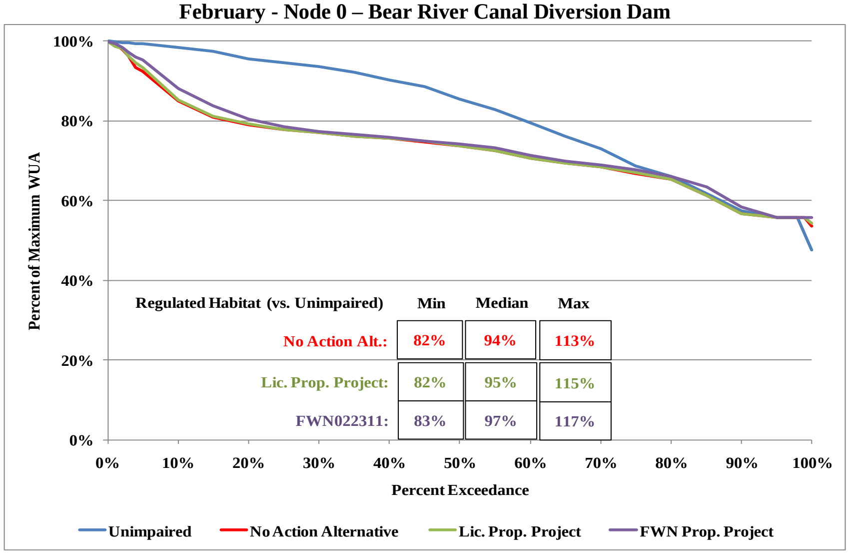
Figure 6.3.1-41d. HEA for adult rainbow trout during the month of January in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



February - Node 0 – Bear River Canal Diversion Dam

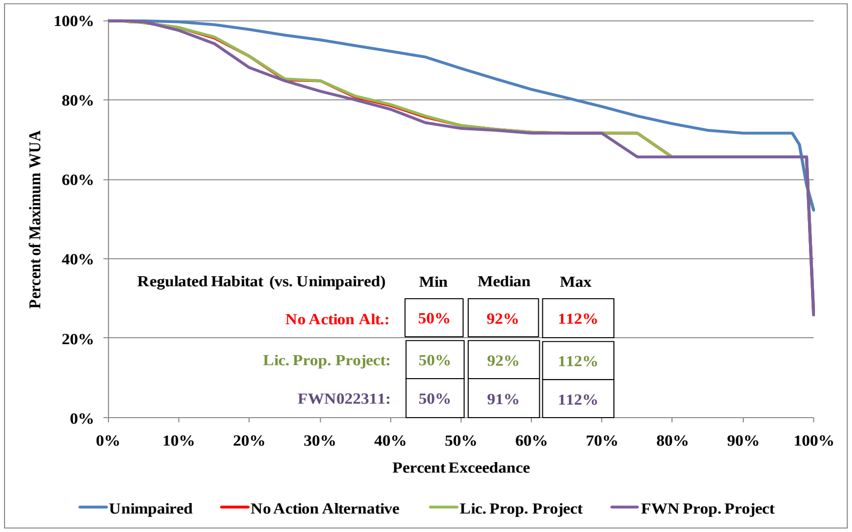


February - Node 1 – Taylor Crossing Sub-Reach

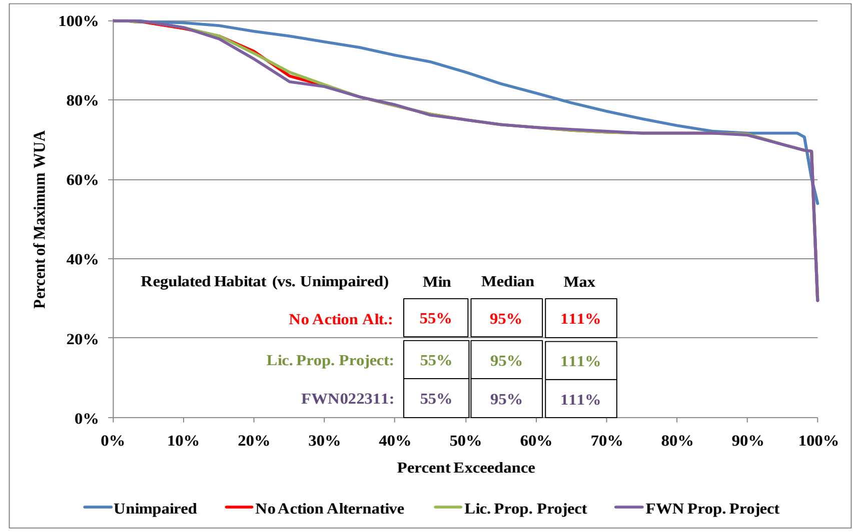


February – Node 2 – Dog Bar Sub-Reach

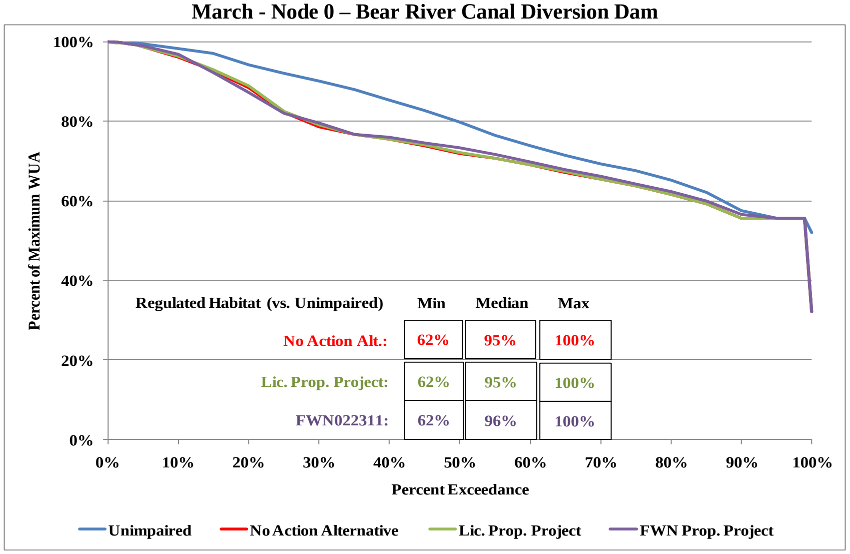
Figure 6.3.1-41e. HEA for adult rainbow trout during the month of February in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



March - Node 0 – Bear River Canal Diversion Dam

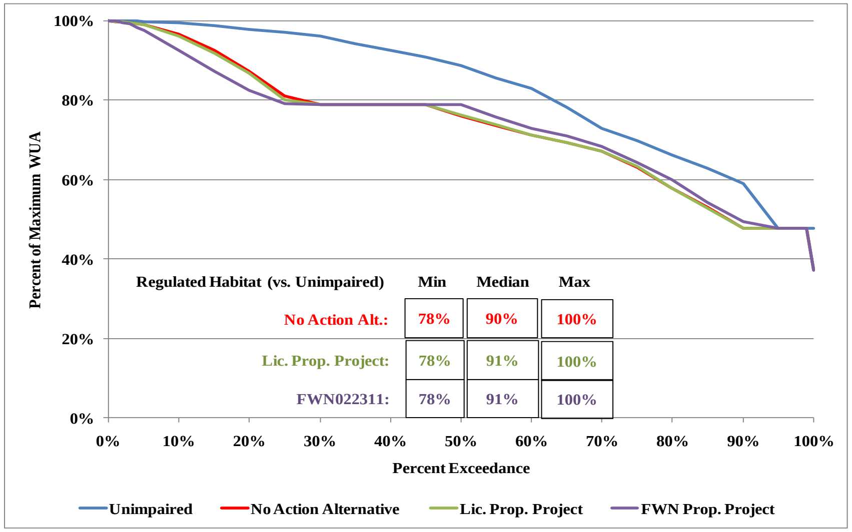


March - Node 1 – Taylor Crossing Sub-Reach

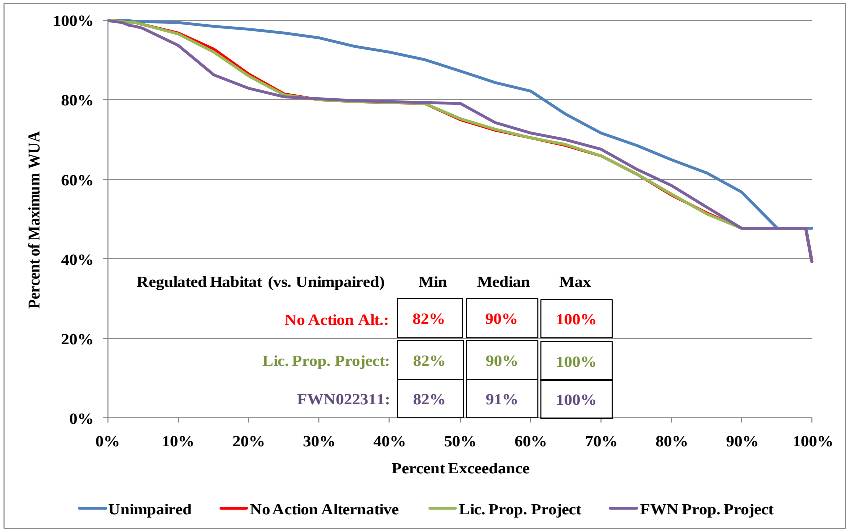


March – Node 2 – Dog Bar Sub-Reach

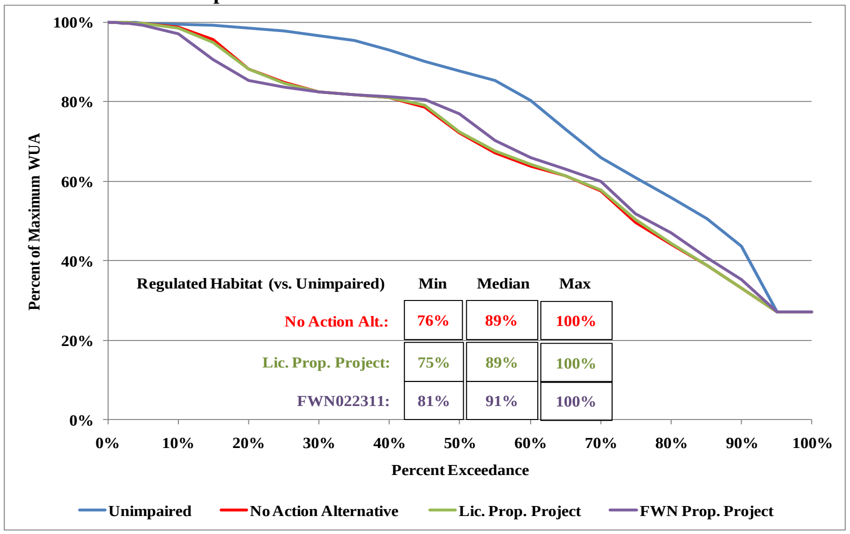
Figure 6.3.1-41f. HEA for adult rainbow trout during the month of March in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



April - Node 0 – Bear River Canal Diversion Dam

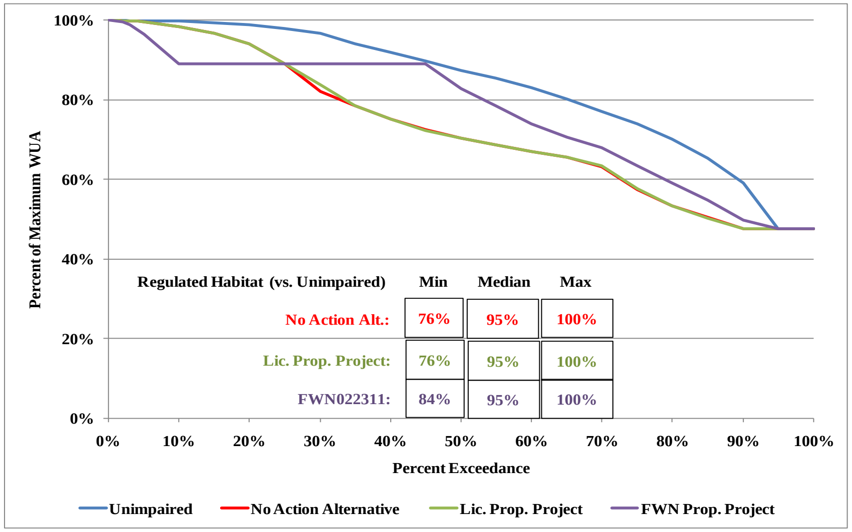


April - Node 1 – Taylor Crossing Sub-Reach

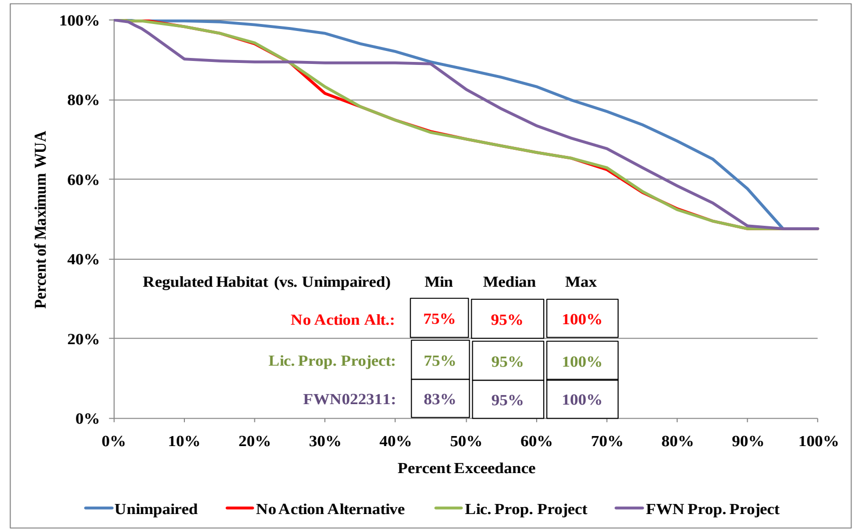


April – Node 2 – Dog Bar Sub-Reach

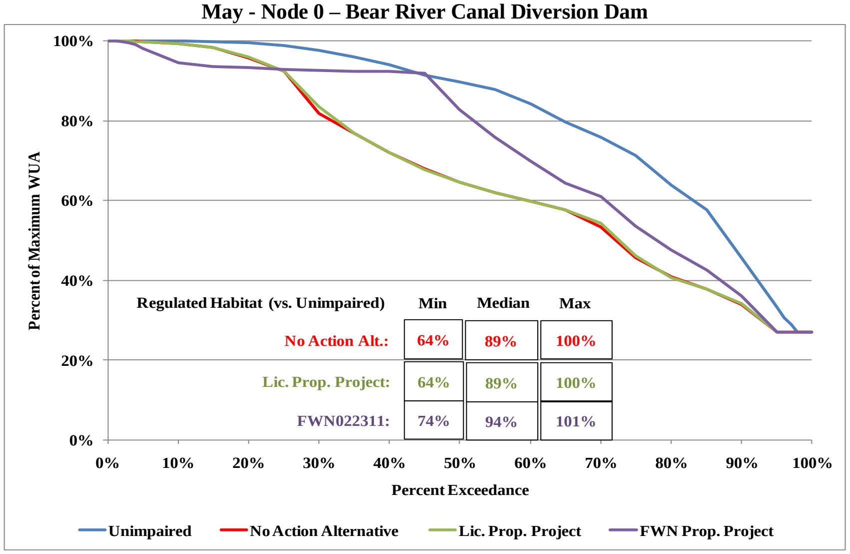
Figure 6.3.1-41g. HEA for spawning rainbow trout during the month of April in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



May - Node 0 – Bear River Canal Diversion Dam

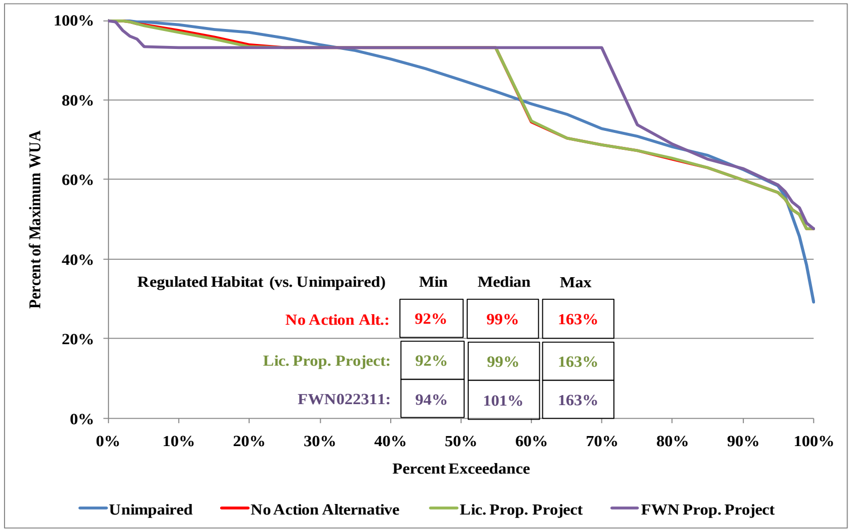


May - Node 1 – Taylor Crossing Sub-Reach

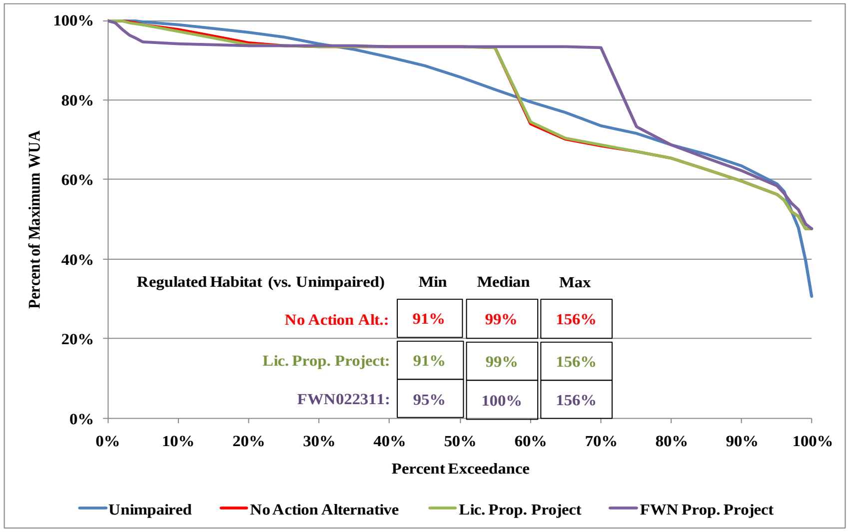


May – Node 2 – Dog Bar Sub-Reach

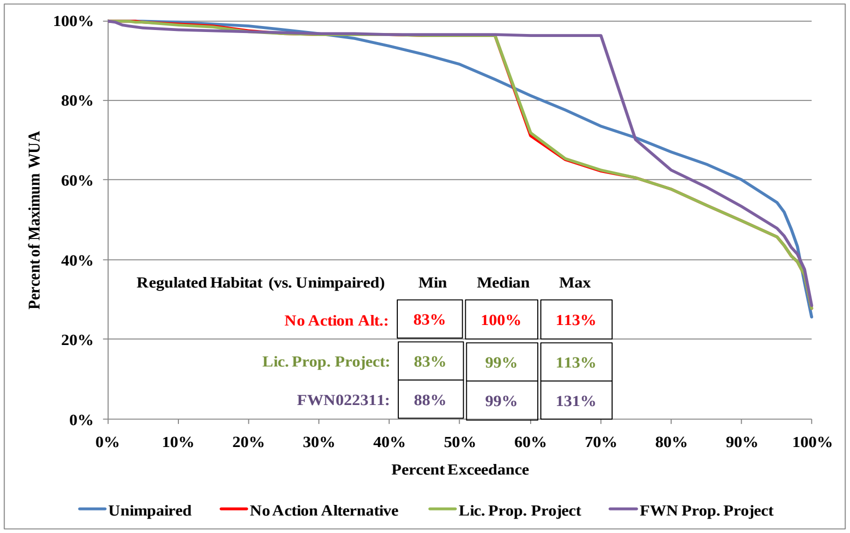
Figure 6.3.1-41h. HEA for spawning rainbow trout during the month of May in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



June - Node 0 – Bear River Canal Diversion Dam

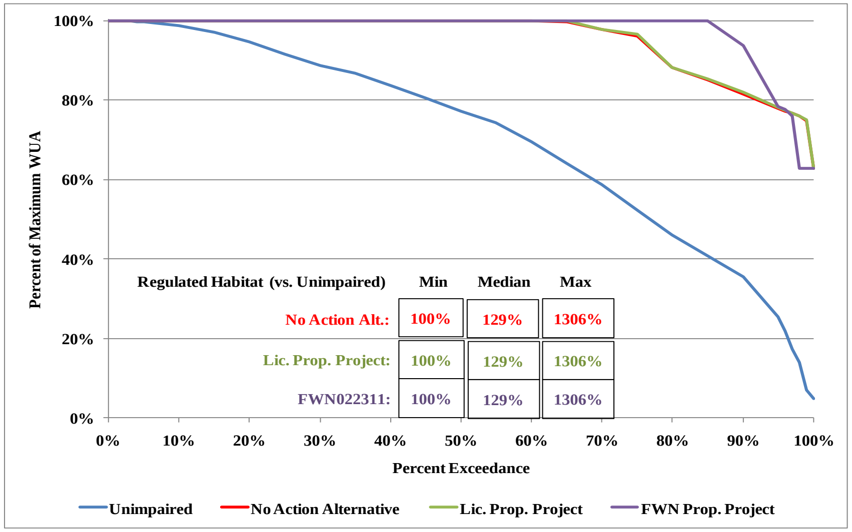


June - Node 1 – Taylor Crossing Sub-Reach

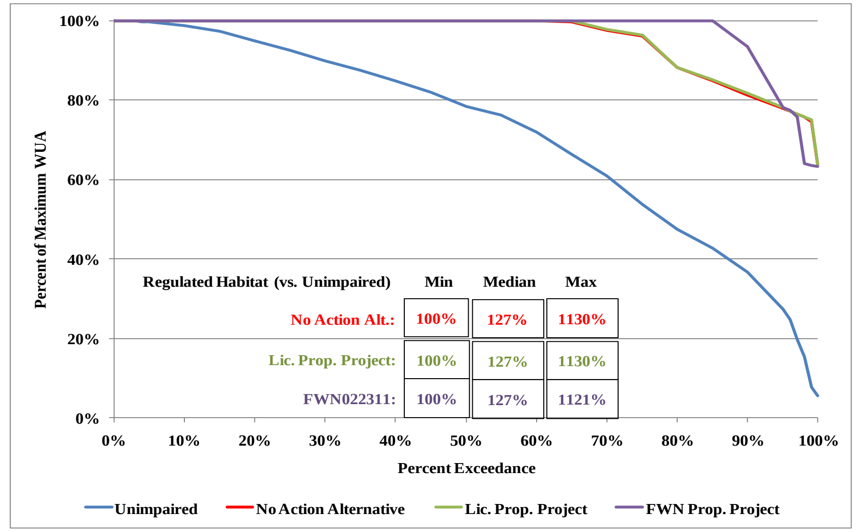


June – Node 2 – Dog Bar Sub-Reach

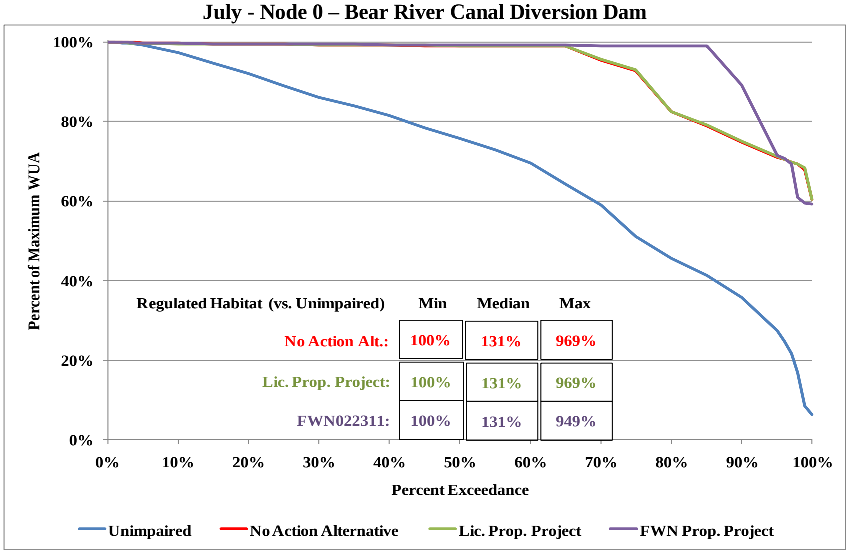
Figure 6.3.1-41i. HEA for spawning rainbow trout during the month of June in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



July - Node 0 – Bear River Canal Diversion Dam

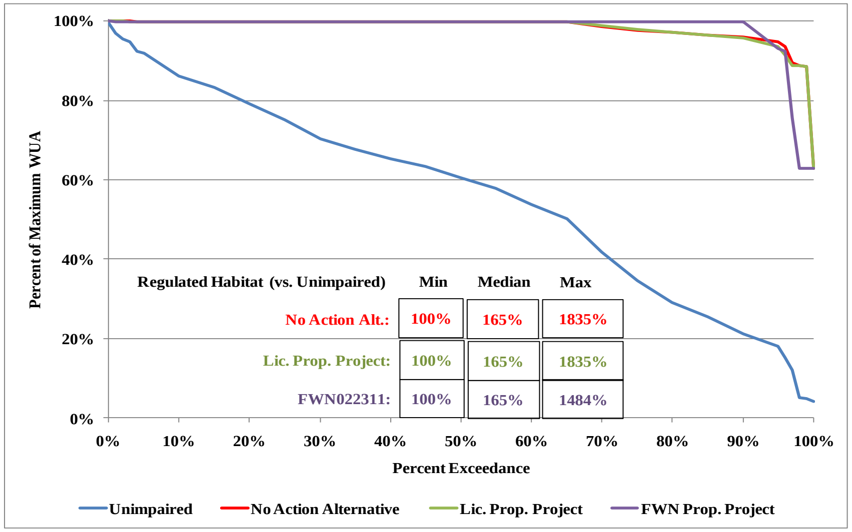


July - Node 1 – Taylor Crossing Sub-Reach

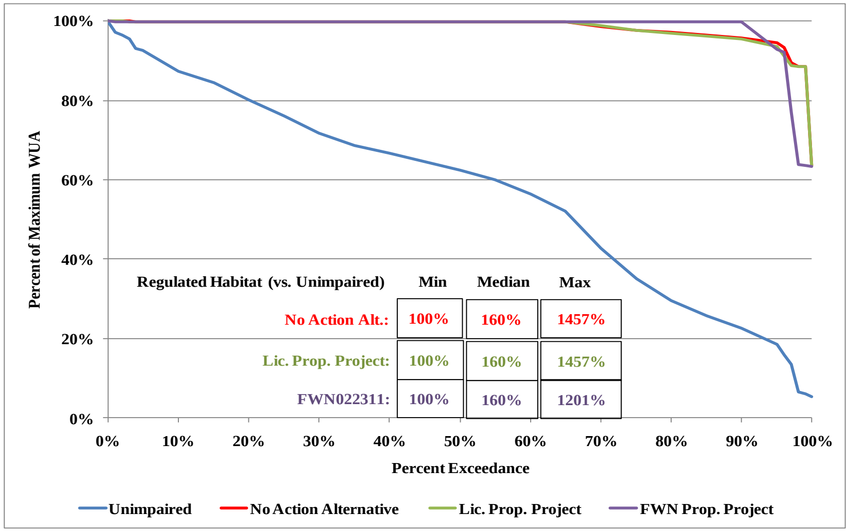


July – Node 2 – Dog Bar Sub-Reach

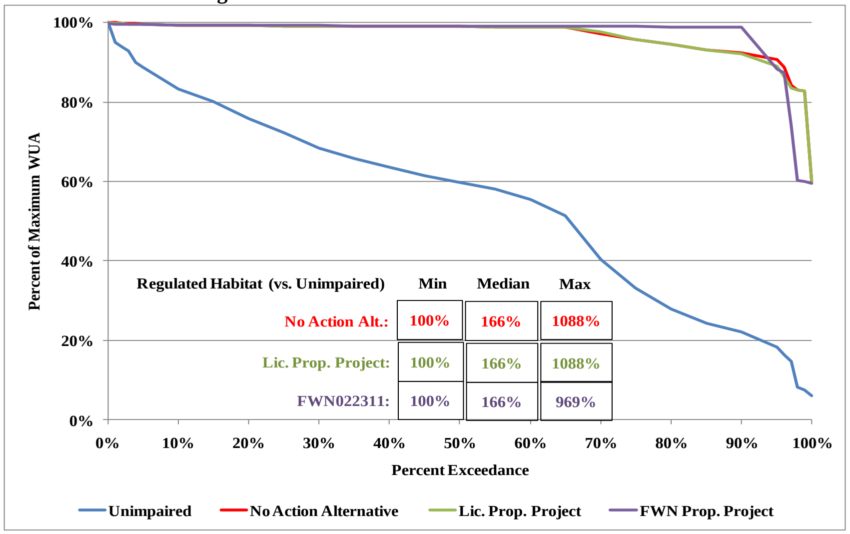
Figure 6.3.1-41j. HEA for adult rainbow trout during the month of July in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



August - Node 0 – Bear River Canal Diversion Dam

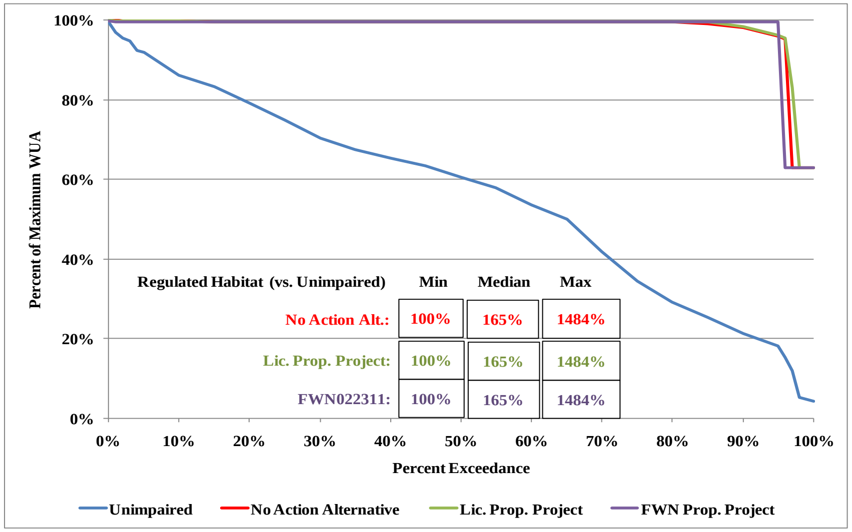


August - Node 1 – Taylor Crossing Sub-Reach

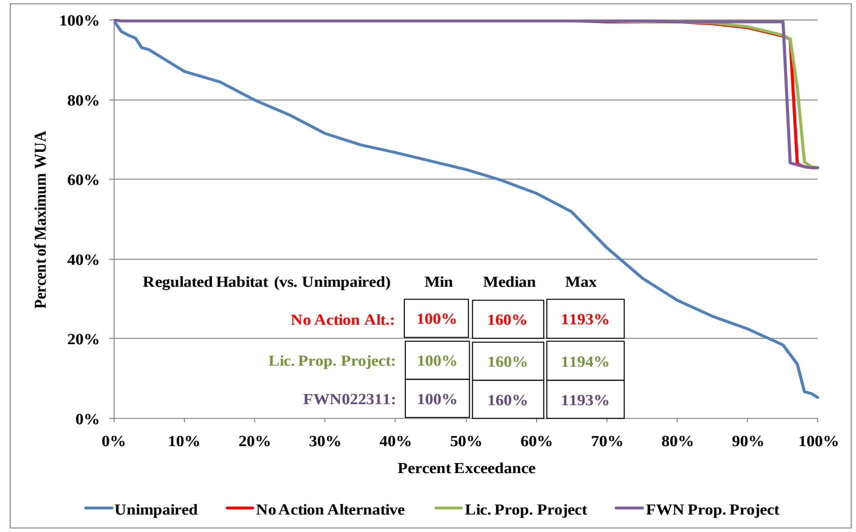


August – Node 2 – Dog Bar Sub-Reach

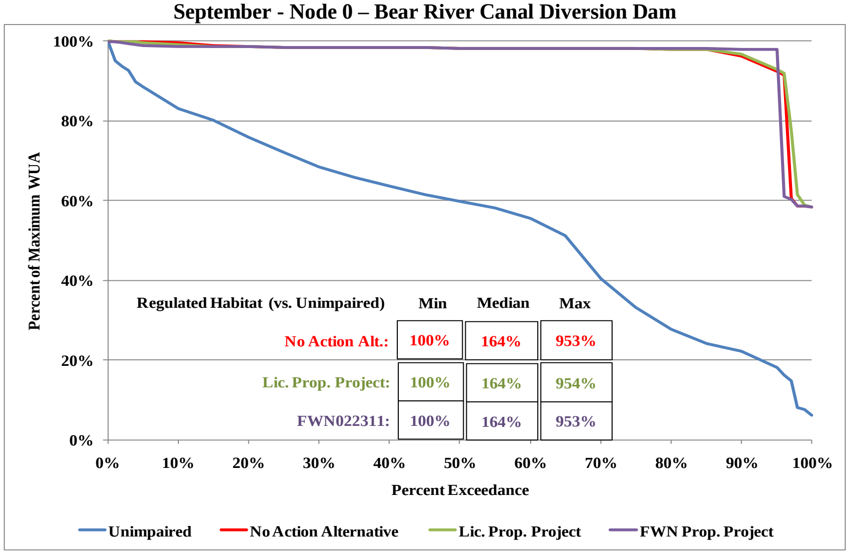
Figure 6.3.1-41k. HEA for adult rainbow trout during the month of August in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



September - Node 0 – Bear River Canal Diversion Dam

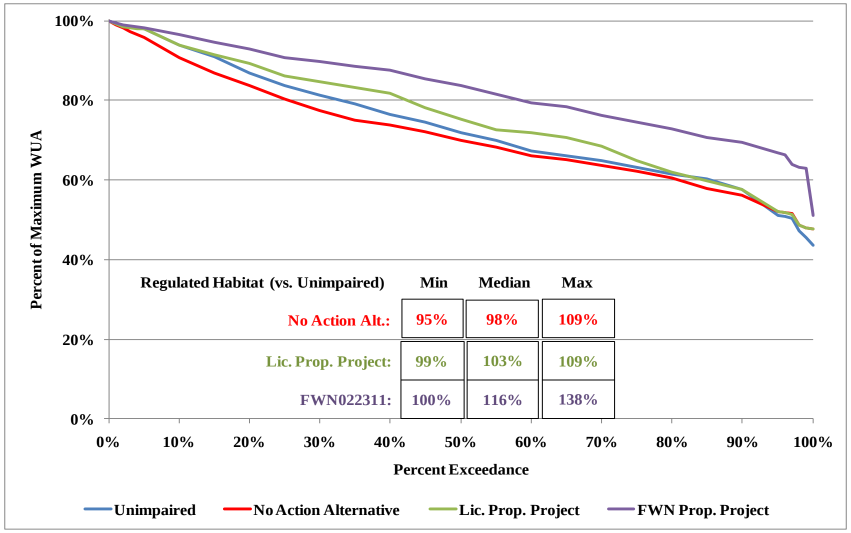


September - Node 1 – Taylor Crossing Sub-Reach

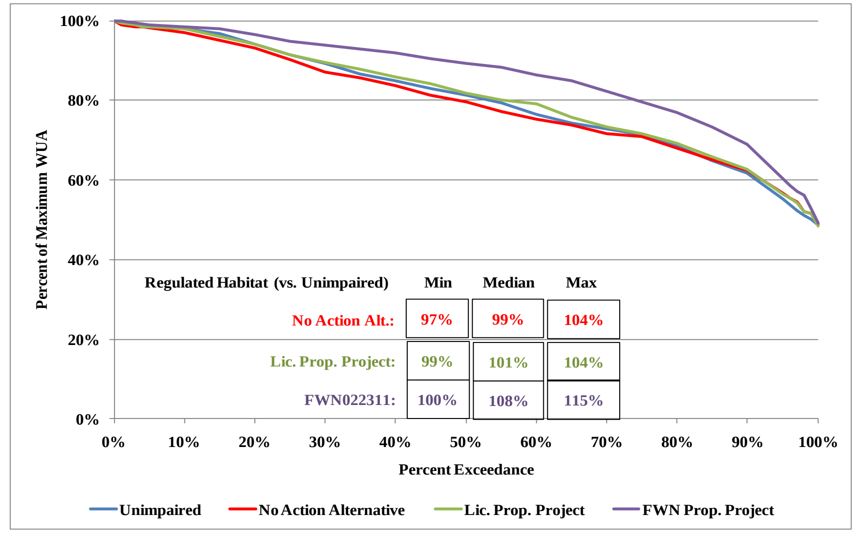


September – Node 2 – Dog Bar Sub-Reach

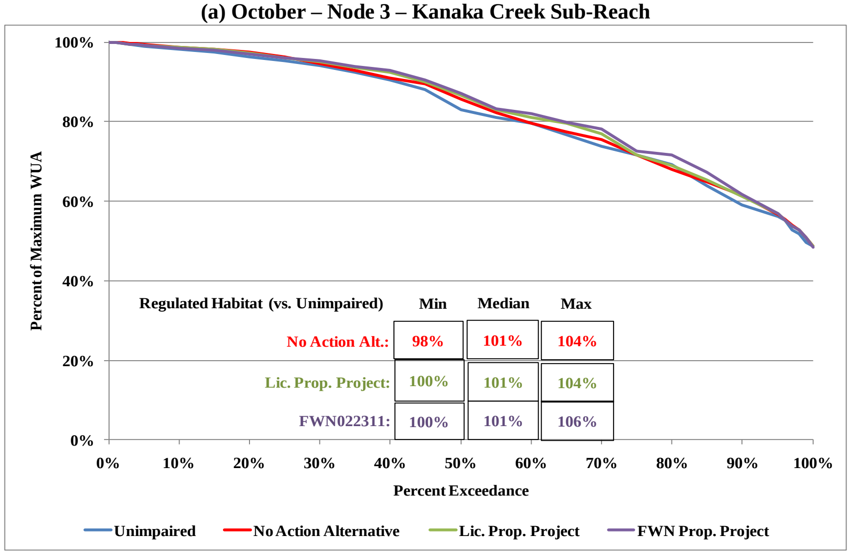
Figure 6.3.1-41l. HEA for adult rainbow trout during the month of September in the Bear River Canal Diversion Dam Reach, Taylor Crossing Sub-Reach and Dog Bar Sub-Reach, Bear River.



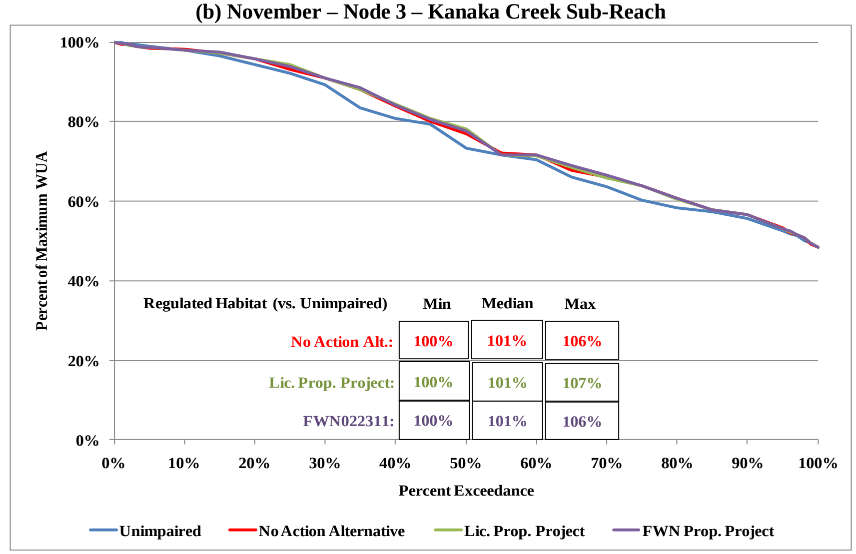
(a) October – Node 3 – Kanaka Creek Sub-Reach



(b) November – Node 3 – Kanaka Creek Sub-Reach

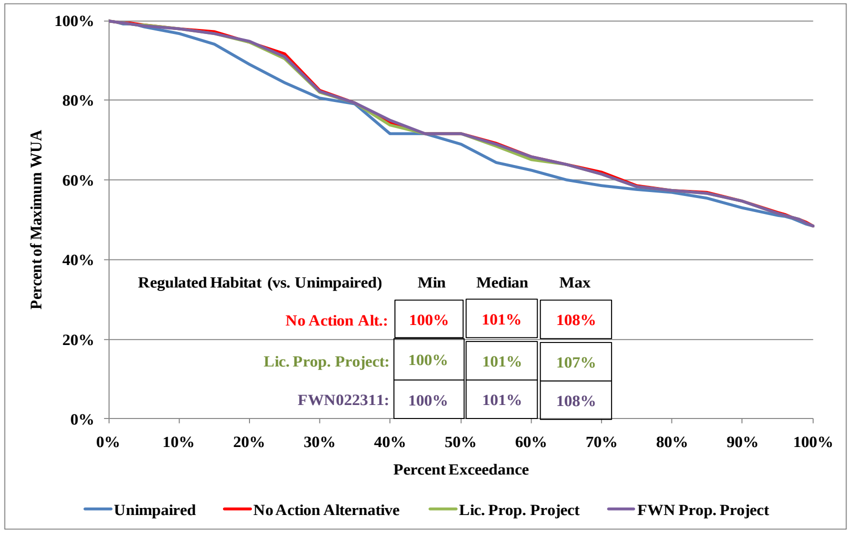


(c) December – Node 3 – Kanaka Creek Sub-Reach

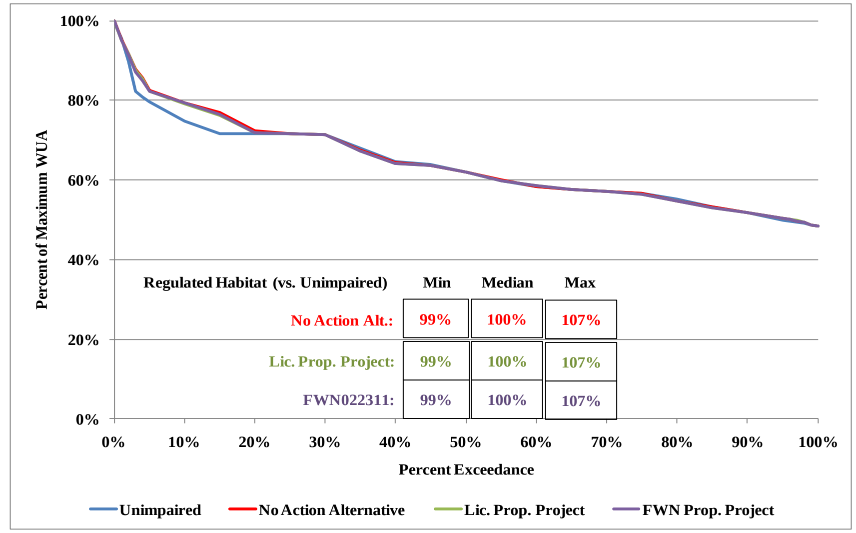


(d) January – Node 3 – Kanaka Creek Sub-Reach

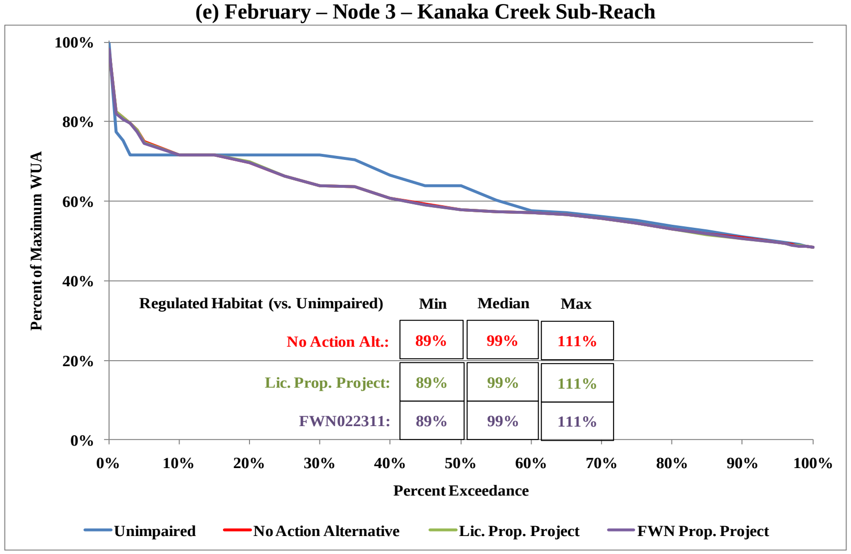
Figure 6.3.1-42a. HEA for adult hardhead during the month of October (a), November (b), December (c) and January (d) in the Kanaka Creek Sub-Reach, Middle Yuba River.



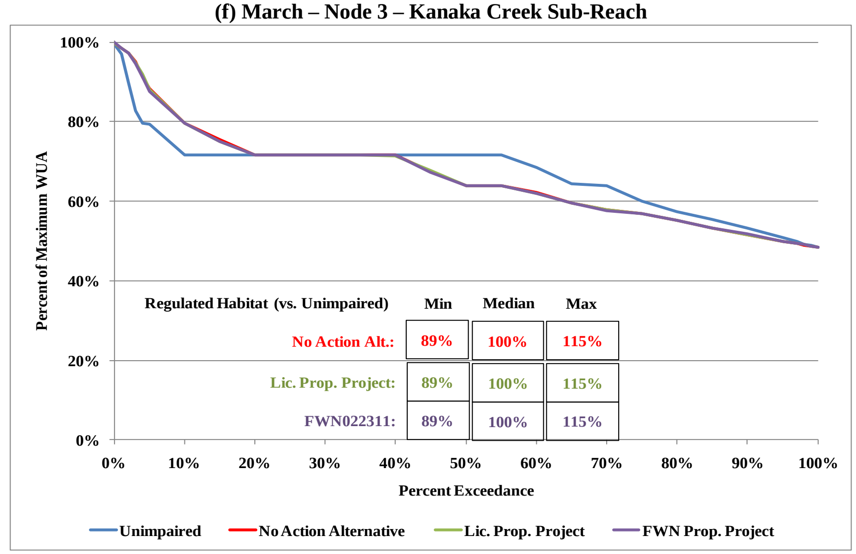
(e) February – Node 3 – Kanaka Creek Sub-Reach



(f) March – Node 3 – Kanaka Creek Sub-Reach

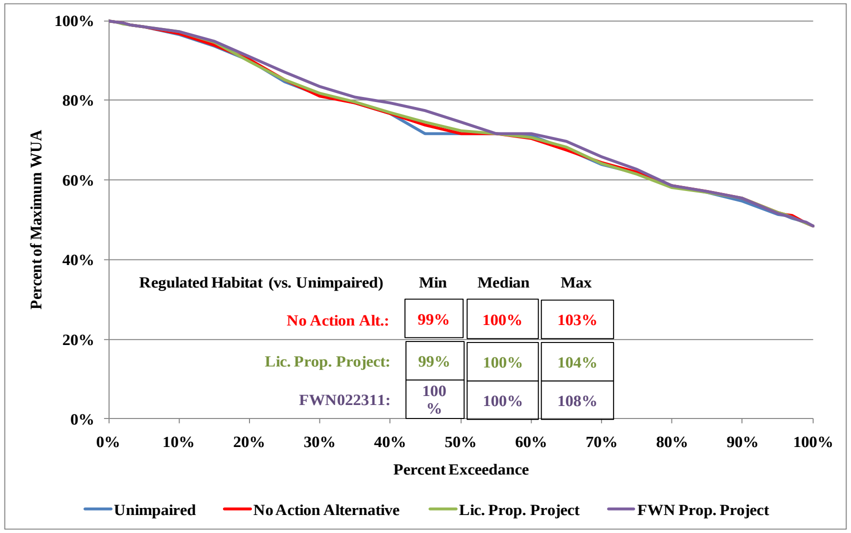


(g) April – Node 3 – Kanaka Creek Sub-Reach

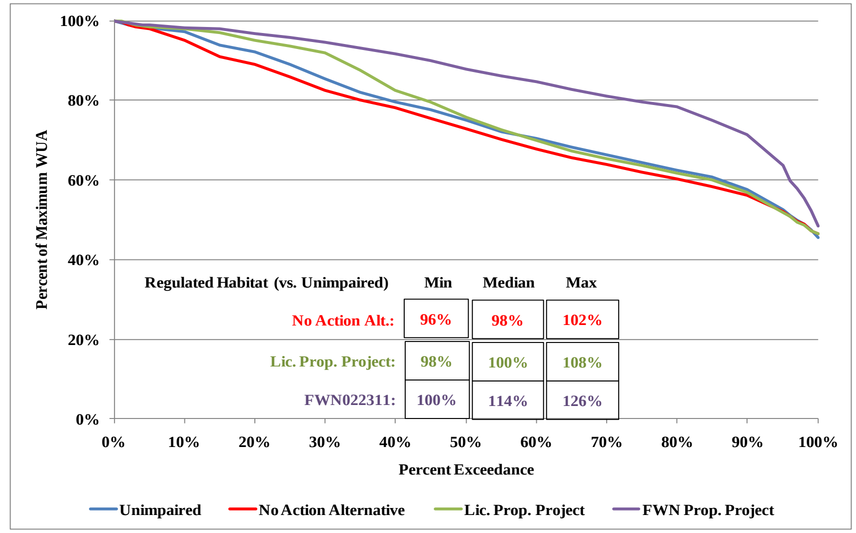


(h) May – Node 3 – Kanaka Creek Sub-Reach

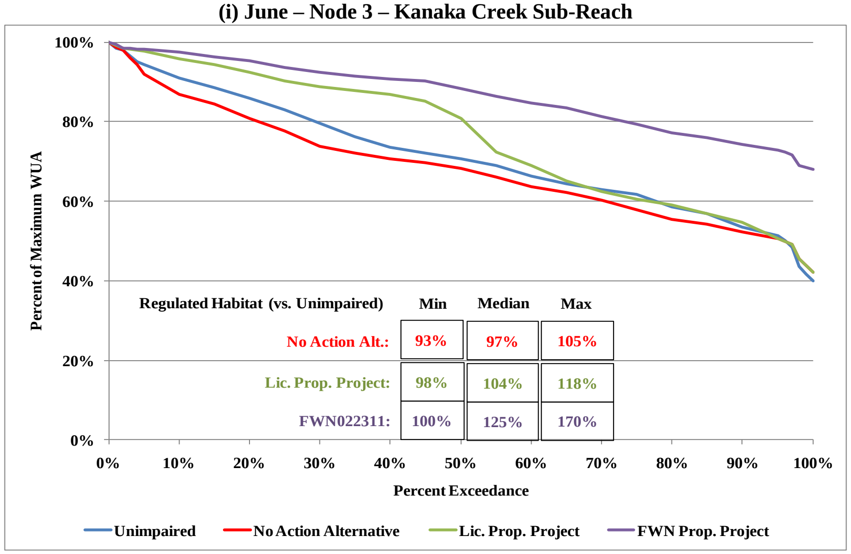
Figure 6.3.1-42b. HEA for adult hardhead during the month of February (e), March (f), April (g) and May (h) in the Kanaka Creek Sub-Reach, Middle Yuba River.



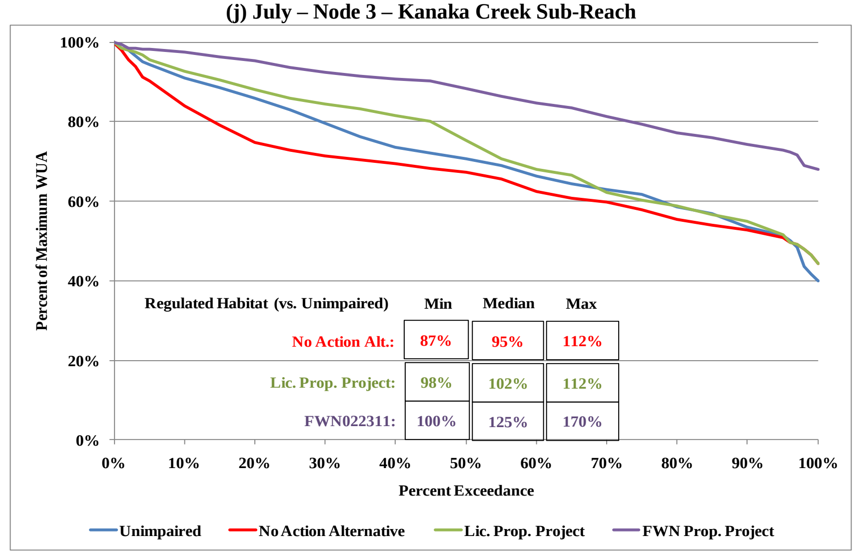
(i) June – Node 3 – Kanaka Creek Sub-Reach



(j) July – Node 3 – Kanaka Creek Sub-Reach



(k) August – Node 3 – Kanaka Creek Sub-Reach



(l) September – Node 3 – Kanaka Creek Sub-Reach

Figure 6.3.1-42c. HEA for adult hardhead during the month of June (i), July (j), August (k) and September (l) in the Kanaka Creek Sub-Reach, Middle Yuba River.

Table 6.3.1-13 provides by node a tabular summary of the No-Action Alternatives (i.e., existing conditions) curves provided in Figures 6.3.1-33 through 6.3.1-42, which show the Yuba-Bear Hydroelectric Project sub-reaches. In the table, the sub-reach (i.e., nodes) with the greatest amount of habitat, as compared to unimpaired flow conditions, is at the top of the table and the sub-reach with the least amount of habitat as compared to unimpaired flow conditions is at the bottom of the table. The table shows that, under existing conditions, the amount of rainbow trout habitat in project-affected reaches varies greatly with no discernable pattern. However, existing habitat conditions in many sub-reaches are not too different than habitat conditions that would occur under unimpaired flow conditions.

Table 6.3.1-13. Rainbow trout habitat by sub-reach under the No-Action Alternative (i.e., existing conditions - Yuba-Bear Hydroelectric Project.

Stream	Reach Name	Sub-Reach Name and Node Designation	Minimum Amount of Habitat in Any Month Under the No-Action Alternative		
			Minimum	Median	Maximum
Canyon Creek (tributary to South Yuba River)	French Lake Dam	French Lake Dam (Node 1)	74% (Jan/Feb)	86% (Feb)	118% (Apr)
Canyon Creek (tributary to South Yuba River)	Faucherie Lake Dam	Faucherie Lake Dam (Node 1)	72% (Jun)	97% (Jun)	110% (Mar)
Middle Yuba River	Milton Diversion Dam	Kanaka Creek (Node 3)	70% (Jun)	87% (Sep)	104% (Jun/Dec)
Middle Yuba River	Milton Diversion Dam	Milton Diversion (Node 1)	68% (Jun)	81% (Sep)	101% (Jun)
Middle Yuba River	Milton Diversion Dam	Wolf Creek (Node 2)	67% (Jun)	80% (Sep)	301% (Sep)
Canyon Creek (tributary to South Yuba River)	Bowman-Spaulding Diversion Dam	Bowman Spaulding Diversion Dam (Node 1)	63% (Mar)	82% (Dec)	103% (Jan)
Bear River	Bear River Canal Diversion Dam	Dog Bar (Node 2)	62% (Mar)	84% (Dec)	100% (Multiple Months)
Bear River	Bear River Canal Diversion Dam	Taylor Crossing (Node 1)	55% (Mar)	82% (Dec)	100% (Apr/May)
Canyon Creek (tributary to South Yuba River)	Sawmill Lake Dam	Sawmill Lake Dam (Node 1)	38% (Mar/Apr)	93% (Dec)	100% (Mar)
Middle Yuba River	Jackson Meadows Dam	Jackson Meadows Dam (Node 1)	18% (Apr)	24% (Apr)	100% (Apr)
Fall Creek	Fall Creek Diversion Dam	Fall Creek Diversion Dam (Node 1)	13% (Aug)	21% (Sep/Oct)	91% (Aug)
Bear River	Dutch Flat Afterbay Dam	Dutch Flat Afterbay Dam (Node 1)	11% (Nov)	74% (Apr)	100% (Multiple Months)

6.3.1.1.8.5 Channel Flow Response, Demonstration Flow Analysis and Rule Curve Analysis

Instream flows in 32 of the 52 project-affected stream reaches are supplied from relatively small headwater reservoirs with simple physical release structures. The small storage, limited operational flexibility, or small drainage area of these reservoirs restricts the instream flow that can be released to a relatively small volume and to a narrow range. The upper release limits are constrained primarily by two factors: 1) the risk of storage depletion and subsequent dewatering of the stream reach in late summer, and, 2) recreation demands for as close to a "full pool" as possible in the reservoir until after Labor Day. Licensees used one or more of the following three methods to examine the flow-habitat relationship in these 32 stream reaches:

- Development of channel inundation versus flow relationships for 29 stream reaches. Channel Flow Response (CFR) relationships were developed to measure changes in stream channel characteristics (e.g. wetted perimeter and average depth) as a function of incremental changes in discharge.
- Performance of demonstration flow analyses (DFA) at four stream reaches where CFR studies were conducted. The DFA, which involved observation of habitat characteristics and quality at three different flow levels with interested Relicensing Participants, provided additional information upon which to evaluate instream flows at these reaches.
- Development of reservoir rule curve analysis (RCA) relationships versus stream flow release for small project reservoirs in the headwaters of 22 project-affected reaches to provide information on the physical limits of instream flow releases from small reservoirs using a standard reservoir-storage equation and the Yuba-Bear Water Balance/Operations Model.

Table 6.3.1-14 list the stream reaches in which the CFR, RCA and DFA methods were applied, including the fish species known or possibly present.

Table 6.3.1-14. Project-affected streams and fish species known or possibly present in CFR, DFA, and RCA reaches.

Sub-basin	Stream Reach	Fish Species Known or Possibly Present	Method		
			CFR	DFA	RCA
Middle Yuba River	Wilson Creek Diversion Dam Reach	Rainbow Trout	X	--	--
Deer Creek	Deer Creek Powerhouse Reach	Rainbow Trout, Sacramento Sucker, and Sacramento Pikeminnow	X	--	--
Canyon Creek	Jackson Lake Dam Reach	Rainbow Trout	X	--	X
	Lower Rock Lake Dam Reach #1	Rainbow Trout	X	--	X
	Lower Rock Lake Dam Reach #2	Rainbow Trout	X	--	X
	Texas Creek Diversion Dam Reach	Rainbow Trout	X	X	--
	Culbertson Lake Dam Reach	Rainbow Trout	X	--	X
	Upper Lindsey Lake Dam Reach	Rainbow Trout	--	--	X
	Middle Lindsey Lake Dam Reach	Rainbow Trout	X	--	X
	Lower Lindsey Lake Dam Reach	Rainbow Trout	X	--	X
Fall Creek	Feeley Lake Dam Reach[1]	Rainbow Trout	--	--	X
	Carr Lake Dam Reach #1	Rainbow Trout	X	--	X
	Carr Lake Dam Reach #2	Rainbow Trout	X	--	X
	Trap Creek Diversion Reach[2]	Rainbow Trout	X	X	--
Rucker Creek	Blue Lake Dam Reach[1]	Rainbow Trout	X	--	X
	Rucker Lake Dam Reach	Rainbow Trout	X	--	X
	Rucker Creek Diversion Reach	Rainbow Trout	X	X	--
South Yuba River	Fuller Lake Dam Reach	Rainbow Trout	X	--	--
	Jordan Creek Diversion Dam Reach	Rainbow Trout	X	--	--
	Meadow Lake Dam Reach[2]	Rainbow Trout	X	X	X
	White Rock Lake Dam Reach #1 & #2	Rainbow Trout	X	--	X
	Lake Sterling Dam Reach	Rainbow Trout	--	--	X

Table 6.3.1-14. (continued)

Sub-basin	Stream Reach	Fish Species Known or Possibly Present	Method		
			CFR	DFA	RCA
	Kidd Lake Dam Reach[2]	Rainbow Trout	X	--	X
	Lower Peak Lake Dam Reach[2]	Rainbow Trout	X	--	X
	Upper South Yuba Reach #1 (Kidd Lake)	Rainbow Trout	X	--	X
	Upper South Yuba Reach #2 (Kidd and Peak Lake)	Rainbow Trout and Sacramento Sucker	X	--	X
	South Yuba below Spaulding #2 Powerhouse Reach	Rainbow Trout	X	--	--
Bear River	Alta Powerhouse Reach	Rainbow Trout	X	--	--
North Fork of North Fork American	Kelly Lake Dam Reach	Rainbow Trout	X	--	X
	Canyon Creek Above Towle Canal Diversion Dam	Rainbow Trout	X	--	--
Coon Creek	Rock Creek Dam Reach	Rainbow Trout and Hardhead	X	--	--
	Halsey Afterbay Dam Reach[2]	Rainbow Trout and Hardhead	X	--	--

1 No rainbow trout caught or observed during Licensees' sampling.
2 Reach was dry during Licensees' sampling season.

A general description of CFR, RCA, and DFA reaches is provided in Table 6.3.1-15. Refer to Licensees' Instream Flow Technical Memorandum (3-2) in Appendix E12 of this Exhibit E for a more detailed discussion.

Table 6.3.1-15. General description of project-affected streams where CFR, DFA, and RCA methods were applied.

Sub-Basin	Stream Reach	Reach Description
Middle Yuba River	Wilson Creek Diversion Dam Reach	The Wilson Creek Diversion Dam Reach (tributary to the Middle Yuba River) is approximately 0.3 mi long and extends from the confluence of Wilson Creek and the Middle Yuba River to the Milton-Bowman Diversion Conduit. The reach has an average elevation of 5,665 ft and a channel gradient of 3.6 percent. At the CFR study site wetted width is generally less than 10.0 ft and average depth is generally less than 0.8 ft.
Deer Creek	Deer Creek Powerhouse Reach	The Deer Creek Powerhouse Reach (on Deer Creek, tributary to the Yuba River below Englebright Reservoir) is approximately 0.1 mi long and extends from Cascade Canal Diversion Dam to Deer Creek Powerhouse. The reach has an average elevation of 3,360 ft and a channel gradient of 3.0 percent. At the CFR study site wetted width is generally less than 50.0 ft and average depth is generally less than 1.0 ft.
Canyon Creek (tributary to South Yuba River)	Jackson Lake Dam Reach	Jackson Lake Dam Reach (on Jackson Creek, tributary to Canyon Creek, South Yuba River) is approximately 3.0 mi long and extends from Bowman Lake to Jackson Lake Dam. The reach has an average elevation of 6,082 ft and a channel gradient of 6.9 percent. At the CFR study site wetted width is generally less than 10.0 ft and average depth is generally less than 1.0 ft.
	Lower Rock Lake Dam Reach #1	Lower Rock Lake Dam Reach #1 (on Texas Creek, tributary to Canyon Creek, South Yuba River) is approximately 3.6 mi long and extends from Texas Creek's confluence with Lindsey Creek upstream to Lower Rock Lake Dam. The reach has an average elevation of 6,011 ft and a channel gradient of 10.6 percent. At the CFR study site wetted width is generally less than 12.0 ft and average depth is generally less than 0.75 ft.
	Lower Rock Lake Dam Reach #2	Lower Rock Lake Dam Reach #2 (on Texas Creek, tributary to Canyon Creek, South Yuba River) is approximately 0.5 mi long and extends from Lindsey Creek Confluence to Bowman-Spaulding Conduit. The reach has an average elevation of 5,560 ft and a channel gradient of 10.6 percent. At the CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 1.0 ft.

Table 6.3.1-15. (continued)

Sub-Basin	Stream Reach	Reach Description
Canyon Creek (tributary to South Yuba River) (continued)	Texas Creek Diversion Dam Reach	The Texas Creek Diversion Dam Reach is approximately 0.6 mi long and extends from Texas Creek's confluence with Canyon Creek (tributary to the South Yuba River) to the Bowman-Spaulding Conduit. The reach has an average elevation of 5,020 ft and a channel gradient of 24.2 percent. At the DFA/CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 1.5 ft.
	Culbertson Lake Dam Reach	Culbertson Lake Dam Reach (on Texas Creek, tributary to Canyon Creek, South Yuba River) is approximately 0.2 mi long and extends from the tributary's confluence with Texas Creek to Culbertson Lake Dam. The reach has an average elevation of 6,420 ft and a channel gradient of 5.3 percent. At the CFR study site wetted width is generally less than 8.0 ft and average depth is generally less than 0.75 ft.
	Upper Lindsey Lake Dam Reach	Upper Lindsey Lake Dam Reach (on Lindsey Creek, tributary to Texas Creek) is approximately 0.1 mi long and extends from Middle Lindsey Lake to the base of Upper Lindsey Lake Dam. The reach has an average elevation of 6,468 ft and a channel gradient of 11.0 percent. CFR was not conducted on this reach therefore stream measurements are not available.
	Middle Lindsey Lake Dam Reach	Middle Lindsey Lake Dam Reach (on Lindsey Creek, tributary to Texas Creek) is approximately 0.3 mi long and extends from Lower Lindsey Lake to the base of Middle Lindsey Lake Dam. The reach has an average elevation of 6,336 ft and a channel gradient of 12.9 percent. At the CFR study site wetted width is generally less than 7.0 ft and average depth is generally less than 0.60 ft.
	Lower Lindsey Lake Dam Reach	Lower Lindsey Lake Dam Reach (on Lindsey Creek, tributary to Texas Creek) is approximately 1.4 mi long and extends from the confluence of Lindsey Creek with Texas Creek to Lower Lindsey Lake Dam. The reach has an average elevation of 5,940 ft and a channel gradient of 7.1 percent. At the CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 0.75 ft.
Fall Creek	Feeley Lake Dam Reach	Feeley Lake Dam Reach (on Lake Creek, tributary to Fall Creek) is approximately 0.1 mi long and extends from Carr Lake to the base of Feeley Lake Dam. The reach has an average elevation of 6,694 ft and a channel gradient of 4.7 percent. CFR was not conducted on this reach therefore stream measurements are not available.
	Carr Lake Dam Reach #1	Carr Lake Dam Reach #1 is located on Lake Creek and extends for 2.2 mi from the Carr Lake Dam downstream to the Lake Creek and Fall Creek confluence. The reach has an average elevation of 6,112 ft and a channel gradient of 10.0 percent. At the CFR study site wetted width is generally less than 8.0 ft and average depth is generally less than 0.80 ft.
	Carr Lake Dam Reach #2	Carr Lake Dam Reach #2 is located on Lake Creek and is approximately 1.3 mi long and extends from Lake Creek Confluence to Bowman-Spaulding Conduit. The reach has an average elevation of 5,420 ft and a channel gradient of 3.2 percent. At the CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 0.75 ft.
	Trap Creek Diversion Reach	The Trap Creek Diversion Reach is approximately 1.2 mi long and extends from Trap Creek's confluence with Fall Creek to the Bowman-Spaulding Conduit. The reach has an average elevation of 4,480 ft and a channel gradient of 27.6 percent. At the DFA/CFR study site wetted width is generally less than 9.0 ft and average depth is generally less than 0.70 ft.
Rucker Creek	Blue Lake Dam Reach	Blue Lake Dam Reach (on Rucker Creek, tributary the South Yuba River) is approximately 0.7 mi long and extends from Rucker Lake to Blue Lake Dam. The reach has an average elevation of 5,691 ft and a channel gradient of 9.5 percent. At the CFR study site wetted width is generally less than 10.0 ft and average depth is generally less than 0.75 ft.
	Rucker Lake Dam Reach	Rucker Lake Dam Reach (on Rucker Creek, tributary the South Yuba River) is approximately 0.4 mi long and extends from the Bowman-Spaulding Conduit to Rucker Lake Dam. The reach has an average elevation of 5,371 ft and a channel gradient of 2.8 percent. At the CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 0.90 ft.
	Rucker Creek Diversion Reach	The Rucker Creek Diversion Reach is approximately 1.2 mi long and extends from Rucker Creek's confluence with the South Yuba River to the Bowman-Spaulding Conduit. The reach has an average elevation of 4,480 ft and a channel gradient of 26.1 percent. At the DFA/CFR study site wetted width is generally less than 14.0 ft and average depth is generally less than 1.0 ft.
South Yuba River	Fuller Lake Dam Reach	The Fuller Lake Dam Reach, located on Fuller Creek, tributary to Jordan Creek, tributary to the South Yuba River, is 1.0 mi long and extends from the Fuller Lake Dam downstream to the confluence of Fuller Creek and Jordan Creek. The reach has an average elevation of 4,960 ft and an average gradient of 14.5 percent. At the CFR study site wetted width is generally less than 9.0 ft and average depth is generally less than 1.0 ft.

Table 6.3.1-15. (continued)

Sub-Basin	Stream Reach	Reach Description
South Yuba River (continued)	Jordan Creek Diversion Dam Reach	Jordan Creek Diversion Dam Reach is a tributary to the South Yuba River, is approximately 1.7 mi long, and extends from Jordan Creek Diversion Dam to South Yuba River Confluence. The reach has an average elevation of 4,840 ft and a channel gradient of 8.5 percent. At the CFR study site wetted width is generally less than 7.5 ft and average depth is generally less than 1.0 ft.
	Meadow Lake Dam Reach	Meadow Lake Dam Reach is a tributary to the South Yuba River above Lake Spaulding, is approximately 1.4 mi long, and extends from Fordyce Lake to the base of Meadow Lake Dam. The reach has an average elevation of 6,845 ft and a channel gradient of 11.9 percent. At the DFA/CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 1.1 ft.
	White Rock Lake Dam Reaches #1 & #2	White Rock Lake Dam Reach #1 is a tributary to North Creek above Fordyce Lake, is approximately 2.7 mi long, and extends from White Rock Creek's confluence with North Creek to White Rock Lake Dam. The reach has an average elevation of 7,360 ft and a channel gradient of 6.5 percent. At the CFR study site wetted width is generally less than 10.0 ft and average depth is generally less than 1.0 ft.
	Lake Sterling Dam Reach	Sterling Lake Dam Reach (on Bloody Creek) is a tributary to the South Yuba River above Lake Spaulding is approximately 0.3 mi long and extends from Fordyce Lake to the base of Lake Sterling Dam The reach has an average elevation of 6,695 ft and a channel gradient of 31.3 percent. CFR was not conducted on this reach therefore stream measurements are not available.
	Kidd Lake Dam Reach	Kidd Lake Dam Reach is a tributary to the South Yuba River above Lake Spaulding, is approximately 0.7 mi long, and extends from Kidd Lake Dam to the South Yuba River Confluence. The reach has an average elevation of 6,340 ft and a channel gradient of 16.6 percent. At the CFR study site wetted width is generally less than 7.0 ft and average depth is generally less than 0.50 ft.
	Lower Peak Lake Dam Reach	The Lower Peak Lake Dam Reach on Cascade Creek is a tributary to South Yuba River above Lake Spaulding, is approximately 1.1 mi long, and extends from Cascade Creek's confluence with the South Yuba River to Lower Peak Lake Dam. The reach has an average elevation of 6,300 ft and a channel gradient of 9.6 percent. At the CFR study site wetted width is generally less than 15.0 ft and average depth is generally less than 1.0 ft.
	Upper South Yuba Reach #1 (Kidd Lake)	The Upper South Yuba Reach #1 is approximately 0.6 mi long and extends from the South Yuba River's confluence with Cascade Creek to the South Yuba River's confluence with Kidd Lake Dam Reach. The reach has an average elevation of 6,056 ft and a channel gradient of less than 1.0 percent. At the CFR study site wetted width is generally less than 40.0 ft and average depth is generally less than 1.50 ft.
	Upper South Yuba Reach #2 (Kidd and Peak Lake)	The Upper South Yuba Reach #2 is approximately 12.2 mi long and extends from Lake Spaulding to the South Yuba River's confluence with Cascade Creek. The reach has an average elevation of 5,540 ft and a channel gradient of 1.6 percent. At the CFR study site wetted width is generally less than 33.0 ft and average depth is generally less than 1.0 ft.
	South Yuba below Spaulding #2 Powerhouse Reach	South Yuba below Spaulding #2 Powerhouse Reach is approximately 3.6 mi long and extends from the Spaulding No. 2 Powerhouse to Jordan Creek Confluence. The reach has an average elevation of 4,580 ft and a channel gradient of 5.9 percent. At the CFR study site wetted width is generally less than 16.0 ft and average depth is generally less than 1.50 ft.
Bear River	Alta Powerhouse Reach	The Alta Powerhouse Reach is on Little Bear Creek, tributary to the Bear River. The reach is approximately 2.0 mi long and extends from Dutch Flat Afterbay to the Alta Powerhouse. The reach has an average elevation of 3,140 ft and a channel gradient of 8.3 percent. At the CFR study site wetted width is generally less than 8.0 feet and average depth is generally less than 0.60 feet.
North Fork of North Fork American	Kelly Lake Dam Reach	Kelly Lake Dam Reach is on Kelly Creek, tributary to the North Fork North Fork American River, is approximately 0.3 mi long, and extends from Snow Flower Reservoir to Kelly Lake Dam. The reach has an average elevation of 5,820 ft and a channel gradient of 4.4 percent. At the CFR study site wetted width is generally less than 12.0 feet and average depth is generally less than 0.90 feet.
	Canyon Creek Above Towle Canal Diversion Dam	Canyon Creek above Towle Canal Diversion Dam Reach on Canyon Creek (tributary to the North Fork North Fork American River) is approximately 0.8 mi long and extends from the Towle Canal Diversion Dam to the confluence of the Towle Diversion (from Drum Forebay) and Canyon Creek. The reach has an average elevation of 4,250 ft and a channel gradient of 3.9 percent. At the CFR study site wetted width is generally less than 15.0 feet and average depth is generally less than 1.25 feet.

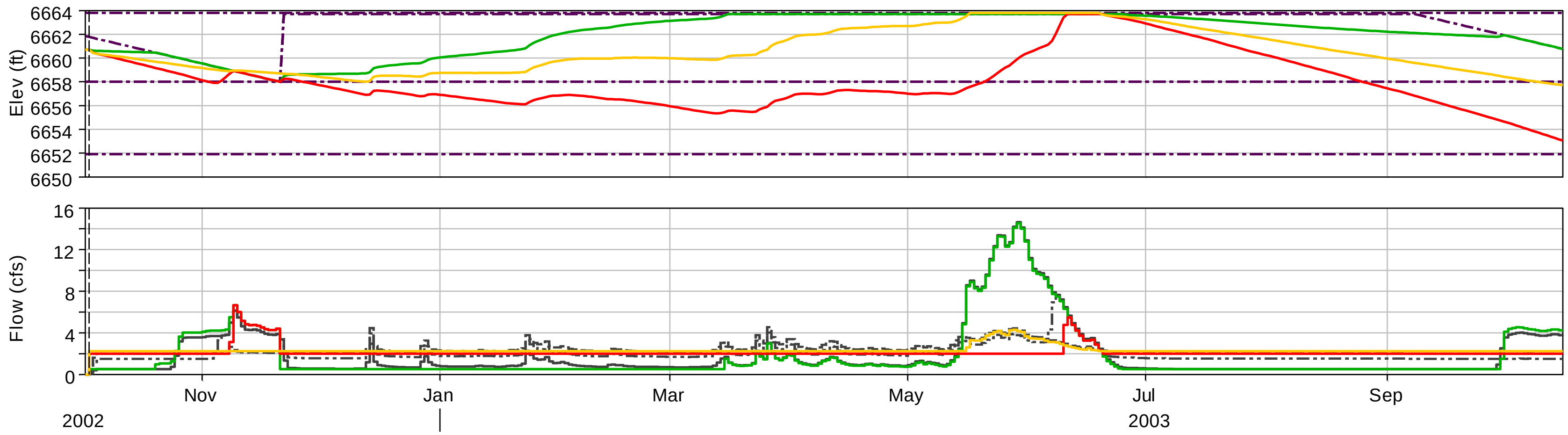
Table 6.3.1-15. (continued)

Sub-Basin	Stream Reach	Reach Description
Coon Creek	Rock Creek Dam Reach	Rock Creek Dam Reach is approximately 2.1 mi long and extends from Rock Creek Dam downstream to the confluence with Dry Creek. The reach has an average elevation of 1,310 ft and a channel gradient of 2.4 percent. At the CFR study site wetted width is generally less than 10.0 feet and average depth is generally less than 1.0 feet.
	Halsey Afterbay Dam Reach	Halsey Afterbay Dam Reach on Dry Creek is approximately 2.2 mi long, beginning at the high-water pool of Redhawk Ranch Reservoir, and ending at the Halsey Afterbay Dam. The reach has an average elevation of 1,450 ft and a channel gradient of 1.6 percent. At the CFR study site wetted width is generally less than 10.0 feet and average depth is generally less than 0 .80 feet.

Rule Curve Analysis

The product of the RCA is graphical and numerical and provides the release flow and pool-elevation of each reservoir under a suite of variable operational scenarios and hydrologic regimes. The primary operational variable of interest in the RCA is the effect of alternative instream flow releases on reservoir storage and pool elevation. Pool elevation is also of interest for other benefits, such as recreation. The RCA was initially conducted to determine the range or “bookends” of calibration flows for the CFR study, as well as to identify the maximum potential release feasible for the reservoirs analyzed. This analysis was completed and used for the CFR study.

Because of the large number of figures generated by the RCA, only one example of the analysis is presented in this Exhibit E. The remaining results are presented in Licensees’ Instream Flow Technical Memorandum (3-2). Figure 6.3.1-43 shows the typical results for the RCA output in graphical form for Carr Lake. The figure provides two graphs for the representative year model run: one for reservoir pool elevation (elevation in feet, top section of figure) and one for release from the reservoir (flow in cfs, bottom section of figure). For each reservoir analyzed, the graphical results include: 1) the base-case model results for the existing minimum flow and rule curve (green line); 2) the model results under the highest-possible year-round minimum flow using the existing storage target rule curve (red line); and, 3) the model results under the highest-possible year-round minimum flow using no rule curve (yellow line). In cases where no rule curve is used for current reservoir operations, the releases for the “with-rule-curve” and “without-rule-curve” scenarios are identical and the two resulting storage and flow lines in the graphical output are coincident.



Pool Elevation Legend (top figure)

Pool elevation with existing minimum flow release and existing reservoir rule curve

Pool elevation with highest possible year-round flow release and existing reservoir rule curve

Pool elevation with highest possible year-round flow release without reservoir rule curve

Pool elevation with highest possible year-round flow release without reservoir rule curve

ResSim Model Reservoir Zones (dash-dot-dash line – as generally shown from top to bottom)

Flood Control

Conservation / Rule Curve

Minimum Pool

Inactive Storage

Flow Release Legend (bottom figure)

Existing minimum flow release with existing reservoir rule curve

Highest possible year-round flow release with existing reservoir rule curve

Highest possible year-round flow release without reservoir rule curve

Unimpaired inflow to reservoir

Figure 6.3.1-43. Example of Rule Curve Analysis (RCA) for Carr Lake.

Channel Flow Response

The product of the CFR analysis is presented in three formats: 1) a table for each transect showing the response of channel/flow parameters to discharge; 2) a cross-sectional profile of each transect showing the water surface elevation and channel coverage at the measured calibration flows; 3) a graphic of percent change in wetted perimeter as a function of discharge, averaged across the CFR transects; and 4) an interactive spreadsheet format in Excel® that visually illustrates the channel response of water surface elevation, wetted perimeter and depth to changes in discharge. Current required minimum flow or, if no minimum flow requirement is in the existing license, Licensees used 0.4 times the lowest calibration flow, as the base flow to calculate percentage change of hydraulic parameters in tables.

Because the result are presented in an interactive spreadsheet that is functional only in Microsoft Excel®, only one example of the analysis is presented in this Exhibit E. The example, Lower Rock Lake Dam Reach #1 is on Texas Creek, a tributary to Canyon Creek. The reach is approximately 3.6 mi long and extends from Texas Creek's confluence with Lindsey Creek upstream to Lower Rock Lake Dam. The reach has an average elevation of 6,011 ft and a channel gradient of 10.6 percent. CFR data were collected at three cross sections below Lower Rock Lake Dam. Discharges of 1.08 cfs, were measured on August 4, 2008, 1.75 cfs on September 24, 2008, and 3.02 cfs on September 24, 2008. Cross sectional profiles and CFR metrics showing the cumulative percent change in the habitat parameters at selected discharges are provided in Tables 6.3.1-16 through 6.3.1-18 and Figures 6.3.1-44 through 6.3.1-47.

Table 6.3.1-16. Results for key hydraulic parameters for Lower Rock Lake Dam Reach #1 – Transect 1 Channel Flow Response Cross Section 1 - Run.

Calibration Flow (cfs)	Calculated WSL (ft)	WP (ft)	% Change WP	WA (ft2)	% Change WA	WW (ft)	% Change WW	HR	% Change HR	AD (ft)	% Change AD
0.43	97.64	7.39	0.0%	3.07	0.0%	6.60	0.0%	0.42	0.0%	0.47	0.0%
1.08*	97.81	7.73	4.6%	4.15	35.2%	6.70	1.5%	0.54	28.6%	0.62	31.9%
1.75*	97.91	7.96	7.7%	4.83	57.3%	6.80	3.0%	0.61	45.2%	0.71	51.1%
3.02*	98.04	8.50	15.0%	5.73	86.6%	7.17	8.6%	0.67	59.5%	0.80	70.2%
7.55	98.30	11.90	61.0%	8.09	163.5%	9.91	50.2%	0.68	61.9%	0.82	74.5%

* Indicates field calibration flow. Lowest flow and highest flow represent 40% of the low calibration flow and 250% of the high calibration flow, respectively.

WSL = water surface elevation; WP = wetted perimeter; WA = wetted area; WW = wetted width; HR = hydraulic radius; AD = average depth

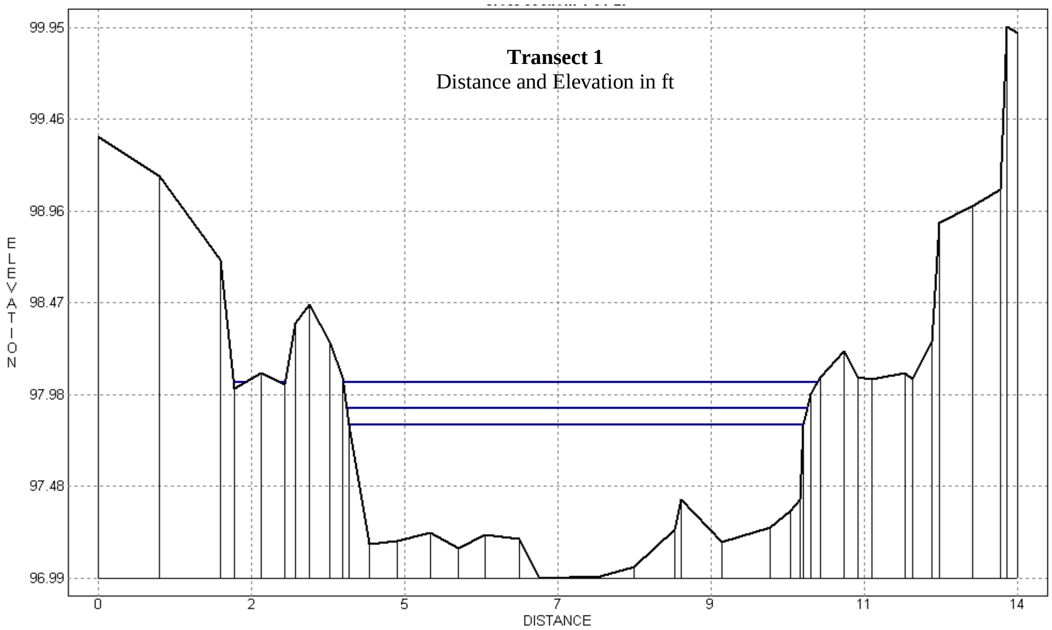


Figure 6.3.1-44. Cross sectional profiles and water surface elevations at 1.08 cfs (lowest line), 1.75 cfs (mid-line), and 3.02 cfs (upper line) at Lower Rock Lake Dam Reach #1 Channel Flow Response Cross-Section 1 – Run.

Table 6.3.1-17. Results for key hydraulic parameters for Lower Rock Lake Dam Reach #1 Channel Flow Response Cross Section 2 – Pool.

Calibration Flow (cfs)	Calculated WSL (ft)	WP (ft)	% Change WP	WA (ft2)	% Change WA	WW (ft)	% Change WW	HR	% Change HR	AD (ft)	% Change AD
0.43	97.62	10.33	0.0%	5.01	0.0%	9.50	0.0%	0.49	0.0%	0.53	0.0%
1.08*	97.81	11.51	11.4%	6.96	38.9%	10.55	11.1%	0.61	24.5%	0.66	24.5%
1.75*	97.92	11.97	15.9%	8.19	63.5%	10.93	15.1%	0.68	38.8%	0.75	41.5%
3.02*	98.06	13.66	32.2%	9.80	95.6%	12.50	31.6%	0.72	46.9%	0.78	47.2%
7.55	98.33	16.94	64.0%	13.75	174.5%	15.65	64.7%	0.81	65.3%	0.88	66.0%

* Indicates field calibration flow. Lowest flow and highest flow represent 40% of the low calibration flow and 250% of the high calibration flow, respectively.

WSL = water surface elevation; WP = wetted perimeter; WA = wetted area; WW = wetted width; HR = hydraulic radius; AD = average depth

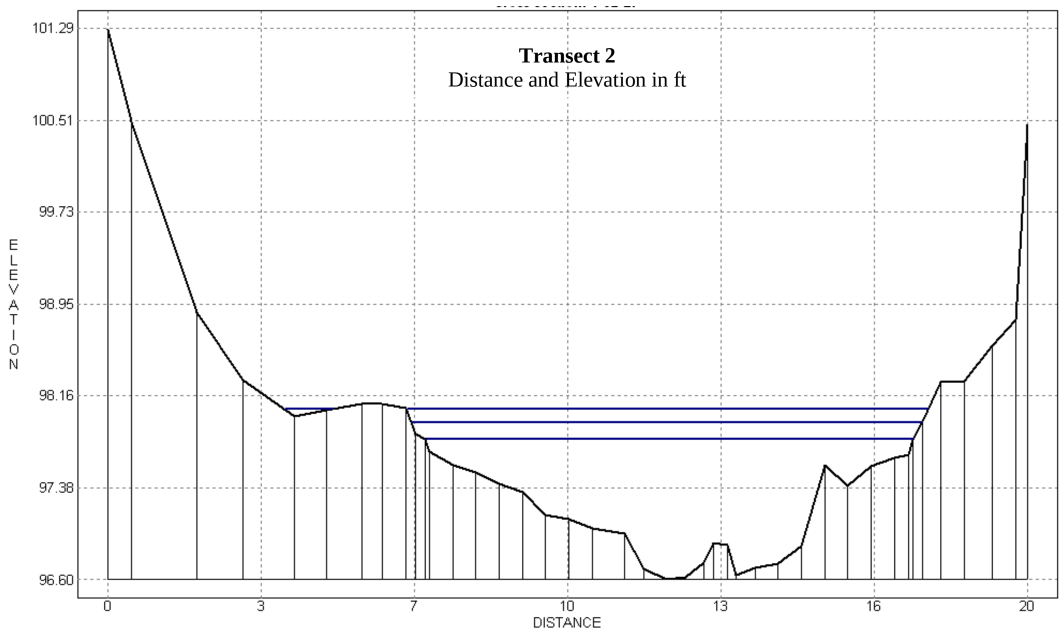


Figure 6.3.1-45. Cross sectional profiles and water surface elevations at 1.08 cfs (lowest line), 1.75 cfs (mid-line), and 3.02 cfs (upper line) at Lower Rock Lake Dam Reach #1 Channel Flow Response Cross-Section 2 – Pool.

Table 6.3.1-18. Results for key hydraulic parameters for Lower Rock Lake Dam Reach #1 Channel Flow Response Cross Section 3 – Riffle.

Calibration Flow (cfs)	Calculated WSL (ft)	WP (ft)	% Change WP	WA (ft2)	% Change WA	WW (ft)	% Change WW	HR	% Change HR	AD (ft)	% Change AD
0.43	98.03	6.25	0.0%	1.05	0.0%	5.71	0.0%	0.17	0.0%	0.18	0.0%
1.08*	98.15	7.97	27.5%	1.77	68.6%	7.28	27.5%	0.22	29.4%	0.24	33.3%
1.75*	98.22	8.77	40.3%	2.34	122.9%	7.98	39.8%	0.27	58.8%	0.29	61.1%
3.02*	98.32	9.26	48.2%	3.15	200.0%	8.36	46.4%	0.34	100.0%	0.38	111.1%
7.55	98.53	12.52	100.3%	5.32	406.7%	11.44	100.4%	0.43	152.9%	0.47	161.1%

* Indicates field calibration flow. Lowest flow and highest flow represent 40% of the low calibration flow and 250% of the high calibration flow, respectively.

WSL = water surface elevation; WP = wetted perimeter; WA = wetted area; WW = wetted width; HR = hydraulic radius; AD = average depth

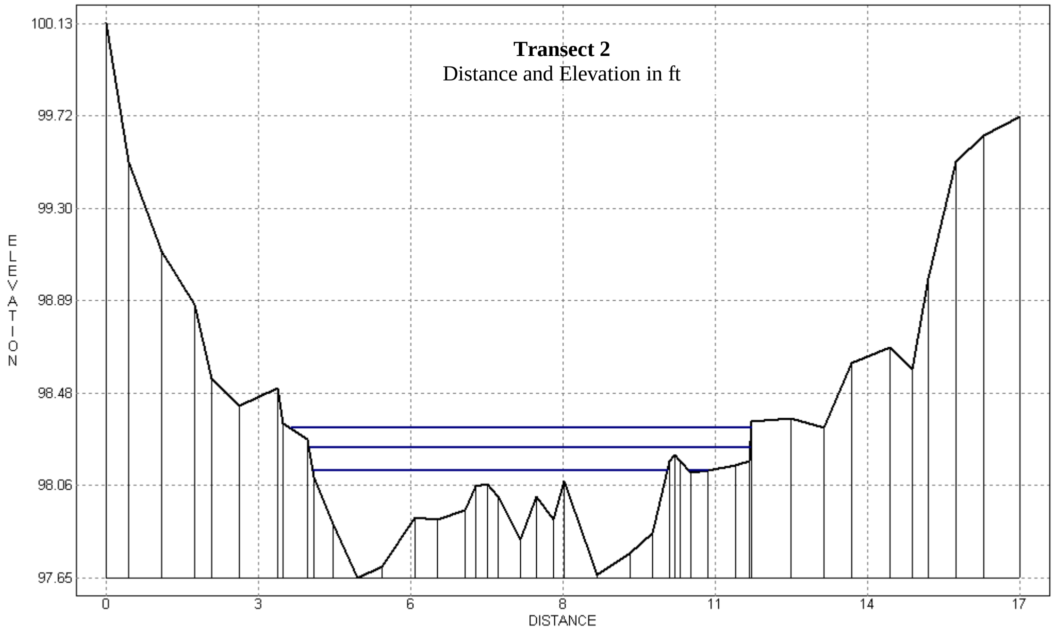


Figure 6.3.1-46. Cross sectional profiles and water surface elevations at 1.08 cfs (lowest line), 1.75 cfs (mid-line), and 3.02 cfs (upper line) at Lower Rock Lake Dam Reach #1 Channel Flow Response Cross Section 3 – Riffle.

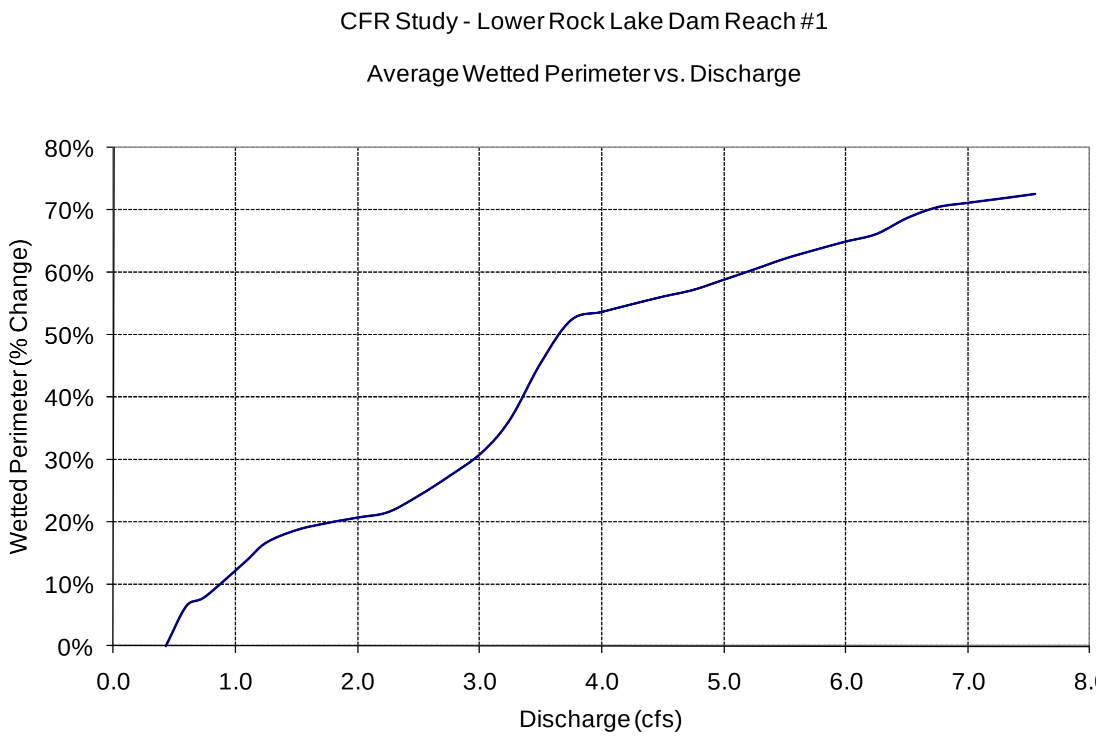


Figure 6.3.1-47. Percent change in wetted perimeter as a function of discharge in Lower Rock Lake Dam Reach #1, averaged across three Channel Flow Response transects.

Demonstration Flow Analysis

With the exception of video footage and spot velocity summaries, the products for the DFA are the same as described for the CFR. Results of the DFA are presented in Licensees' Instream Flow Technical Memorandum (3-2).

6.3.1.2 Amphibians

6.3.1.2.1 Special-Status Amphibian Species[11]

Two special-status amphibian species occur in the vicinity of the projects: foothill yellow-legged frog (*Rana boylii*) and Sierra Nevada yellow-legged frog (*R. sierrae*). Both species are listed by the Forest Service as Sensitive Species and by CDFG as California Species of Special Concern. foothill yellow-legged frog (FYLF) is also listed by BLM as a Sensitive Species.

Foothill yellow-legged frog (FYLF) is a stream-adapted species, usually associated with shallow, flowing streams with backwater habitats and coarse cobble-sized substrates (Jennings and Hayes 1994) between about 600 to 5,000 ft elevation (Moyle 1973; Seltenrich and Pool 2002; ECORP 2005). FYLF populations may require both mainstem and tributary habitats for long-term persistence. Tributaries that are too small to provide breeding habitat may still be important as seasonal habitats (e.g., in winter and during the hottest part of the summer) (VanWagner 1996; Seltenrich and Pool 2002), and there is evidence that habitat use by YOY, sub-adult, and adult frogs differs by age-class and changes seasonally (Randall 1997). Breeding tends to occur in spring or early summer when eggs are laid in areas of shallow, slow moving waters near the shore. Egg masses are rarely found if water temperatures drop below about 11°C to 12ºC (Seltenrich and Pool 2002, Drennan et al. 2006, A. Lind pers. comm., 2008). FYLF are infrequent in habitats where introduced fish and American bullfrogs (*Lithobates catesbeianus*) are present (Jennings and Hayes 1994). Developing tadpoles typically utilize warm, edge-water habitat.

Sierra Nevada yellow-legged frog (SNYLF) was previously known as the "northern population segment" of the mountain yellow-legged frog (*R. muscosa*). The southern population segment, which is listed as a federally endangered species (CDFG 2006, USFWS 2002a), retains the name *R. muscosa* (Vredenburg et al. 2007). Historically, SNYLF occurred in lakes, ponds, and streams primarily at elevations above 5,900 ft. Recent surveys by researchers suggest that this species has disappeared from more than 80 percent of historically known sites in the Sierra Nevada, and many of the remaining populations are comprised of few individuals (USFWS 2003). SNYLF populations are believed to be extant in the vicinity of the projects in a few areas: south of Faucherie Lake and west of French Lake in the Five Lakes Basin and south of French Lake near Canyon Creek; south of Fordyce Lake; near White Rock Lake; and east of the projects in the Truckee River watershed (USFWS 2003, Kundargi and Hanson 2005, CDFG 2010a). The decline of the SNYLF appears to be related in large part to the introduction of trout into high elevation lakes and streams where predatory fish did not previously occur (Bradford et

[11] One amphibian species listed as threatened under the ESA may also occur in the area of the projects: California red-legged frog (*R. draytonii*). This species is discussed in Exhibit E, Section 6.5 (Threatened and Endangered Species).

al. 1993, Drost and Fellers 1996, Knapp and Matthews 2000), although recent declines are increasingly attributed to the disease, chytridiomycosis (Rachowicz et al. 2006, Vredenburg et al. 2010). Extant populations are generally associated with lake, pond, and stream complexes in montane or sub-alpine forests and meadows (Knapp and Matthews 2000, Pope and Matthews 2001, USFWS 2003). SNYLF are highly aquatic in all life stages although overland dispersal has been documented (Matthews and Pope 1999). Because of the short growing season at high elevation sites, individuals require two or more years to complete the larval phase.

6.3.1.2.2 Amphibian Distribution, Abundance, and Habitat Modeling

Nine species of amphibians are known to occur in the vicinity of the projects and most of these species could potentially occur across a wide range of elevations. With the exception of two completely terrestrial species without a free-living larval stage (ensatina [*Ensatina eschscholtzii*] and California slender salamander [*Batrachoseps attenuatus*]), all of these amphibians require still or slow-flowing water in which to breed. Species most likely to occur in aquatic habitats at lower elevations in the vicinity of the projects are Sierra newt (*Taricha sierrae*), Sierran treefrog (*Pseudacris sierra),* FYLF, and American bullfrog. Sierra newt (formerly considered a sub-species of California newt, *T. torosa*) is largely associated with foothill streams and was observed incidentally by Licensees during relicensing studies on the Middle Yuba River. Sierran treefrog was observed during relicensing studies on the Middle Yuba River, South Yuba River, Bear River, and a tributary to Auburn Ravine. American bullfrog was observed at sites on the South Yuba River, Rollins Reservoir and Bear River downstream of Rollins Reservoir, Dry Creek (Halsey Afterbay Dam Reach), a tributary to Auburn Ravine, and the North Fork of the North Fork American River downstream of Lake Valley Reservoir.

At elevations above 5,000 ft, Sierran treefrog may be the most widespread and numerous amphibian species, occurring in the majority of seasonal and permanent ponds and lakes examined during relicensing studies. Long-toed salamander (*Ambystoma macrodactylum*) was detected in fewer, but widespread sites, whereas western toad (*Anaxyrus boreas*) and SNYLF were infrequently observed.

Licensees performed specific surveys for FYLF and SNYLF, which are described below. In addition, Licensees developed flow-habitat relationships using the River2D Habitat Simulation models at seven sites in stream reaches with documented FYLF breeding, and using the 1D PHABSIM models in four stream reaches or sub-reaches with no known FYLF breeding. For a detailed discussion on Licensees' studies, refer to the Special-Status Amphibians – FYLF Surveys Technical Memorandum (3-6) and the Special-Status Amphibians – FYLF Habitat Modeling Technical Memorandum (3-7) in Appendix E12 of this Exhibit E.

6.3.1.2.2.1 Foothill Yellow-Legged Frog Surveys

In 2008, Licensees conducted Visual Encounter Surveys (VES) for FYLF at 37 sites in 16 stream reaches potentially affected by the projects. Historical information on FYLF occurrence in these stream reaches is limited, but includes observations in the Middle Yuba River, South Yuba River, and Bear River. Most of Licensees' survey sites were 1,000 meters in length, and 25 of the sites included a tributary. In 2009, Licensees repeated the surveys at 10 sites in nine stream reaches. In 2010, an additional entire reach (Chicago Park Powerhouse Reach on the Bear River) was surveyed.

Of the sites and reaches surveyed in 2008, 2009 and 2010, Licensees found FYLF at 23 sites in 11 stream reaches. . FYLF egg masses were found in six stream reaches, and tadpoles were found in three other reaches. One reach, the Dutch Flat Afterbay Dam Reach, was not surveyed because Relicensing Participants agreed that there was ample existing information, including previously documented FYLF breeding (Jones & Stokes 2006). Table 6.3.1.19 is a summary of 2008 and 2009 FYLF surveys, and documents the known occurrence of FYLF at the Dutch Flat Afterbay Dam Reach. The details of the FYLF VES study are detailed in the Special Status Amphibians-FYLF Surveys technical memorandum (3-6), filed with this Exhibit E in Appendix E12.

Table 6.3.1-19. Summary of FYLF VES results from 2008 and 2009 surveys.

Reach/ Site[1]	Survey Dates (2008)[2, 3]	Survey Dates (2009)[3]	FYLF Detected	FYLF Breeding Sites Documented (Egg Masses)[3]	FYLF Breeding Sites Not Documented, But Tadpoles Found[3]
MILTON DIVERSION DAM REACH (MIDDLE YUBA RIVER)					
MY-2	6/9; 6/24; 8/27	N/A	Yes	Yes	N/A
MY-4	6/24; 7/14-7/22; 9/3	N/A	Yes	Yes	N/A
MY-5	6/19; 7/8; 9/5	N/A	Yes	Yes	N/A
MY-6	7/7, 7/16; 9/4	N/A	Yes	No	Yes
BOWMAN-SPAULDING DIVERSION DAM REACH (CANYON CREEK, TRIBUTARY OF SOUTH YUBA RIVER)					
CC-1	6/11; 8/12; 9/18	6/10; 6/19	Yes	Yes	N/A
CC-2	7/9	N/A	No	N/A	N/A
CC-3A	7/9	N/A	No	N/A	N/A
SOUTH YUBA REACH #1 (SOUTH YUBA RIVER)					
SY-10	7/3; 7/15; 9/10	6/18; 6/22	No	N/A	N/A
SOUTH YUBA REACH #3 (SOUTH YUBA RIVER)					
SY-7	6/5	6/9; 6/15	Yes	Yes	N/A
SY-11A	7/7	N/A	Yes	No	Yes
SY-8	6/16	N/A	Yes	Yes	N/A
SOUTH YUBA REACH #4 (SOUTH YUBA RIVER)					
SY-5	6/12; 8/26	N/A	Yes	Yes	N/A
SY-6	6/14; 8/26	N/A	Yes	Yes	N/A
SOUTH YUBA REACH #5 (SOUTH YUBA RIVER)					
SY-4	6/11; 7/11; 8/27	6/8	Yes	Yes	N/A
SOUTH YUBA REACH #6 (SOUTH YUBA RIVER)					
SY-2	5/20; 6/10; 9/12	N/A	Yes	Yes	N/A
SY-9A	6/20; 7/8; 9/8	N/A	Yes	No	Yes
SY-3	6/4; 6/23; 9/16	6/3; 6/12; 6/17	Yes	Yes	N/A
BEAR RIVER REACH #2 (BEAR RIVER)					
BR-1	6/17; 7/2; 8/5	N/A	No	N/A	N/A
BR-2	6/19; 7/2; 8/5	N/A	No	N/A	N/A
BR-3	6/16; 6/24; 8/5	N/A	No	N/A	N/A
DRUM AFTERBAY DAM REACH (BEAR RIVER)					
DA-1	5/22; 6/25; 9/11-9/15	6/2; 6/11; 6/16; 8/13	Yes	No	No
DA-2	6/13; 6/25; 9/11	N/A	No	N/A	N/A
DA-3	6/25; 7/2; 9/11	N/A	No	N/A	N/A

Table 6.3.1-19. (continued)

Reach/ Site[1]	Survey Dates (2008)[2, 3]	Survey Dates (2009)[3]	FYLF Detected	FYLF Breeding Sites Documented (Egg Masses)[3]	FYLF Breeding Sites Not Documented, But Tadpoles Found[3]
DUTCH FLAT AFTERBAY DAM REACH (BEAR RIVER)					
N/A	No surveys performed because of ample existing information, including known FYLF breeding occurrences				
CHICAGO PARK POWERHOUSE REACH (BEAR RIVER)					
CP-1	6/25; 8/30, 9/2	N/A	Yes	No	Yes[4]
BEAR RIVER CANAL DIVERSION DAM REACH (BEAR RIVER)					
BRC-1	6/2; 6/15; 8/29	N/A	Yes	No	No
BRC-1A	N/A	6/11; 6/18; 7/24	No	N/A	N/A
BRC-2A	6/9; 6/24; 8/28	N/A	Yes	No	No
BRC-2B	N/A	6/11; 6/18; 6/23; 7/24	Yes	No	Yes[5]
BRC-3	6/15; 6/26; 8/28	N/A	Yes	No	No
LAKE VALLEY CANAL DIVERSION DAM REACH (N. FORK OF N. FORK AMERICAN RIVER)					
NF-1A	6/17	N/A	Yes	No	Yes
NF-2	6/18; 7/24; 9/19	6/1; 6/9; 8/11	Yes	No	No
NF-3	6/19; 7/23; 9/15	N/A	No	N/A	N/A
NF-4	6/25; 7/23; 9/15	N/A	No	N/A	N/A
TOWLE CANAL DIVERSION DAM REACH (CANYON CREEK, TRIBUTARY OF N. FORK AMERICAN RIVER)					
TC-1	6/17; 6/26; 8/25	6/11; 6/16; 6/24; 7/1; 8/15	Yes	No	No
TC-2A	6/10; 6/24; 8/9	N/A	No	N/A	N/A
TC-3	6/2; 6/26; 8/8	N/A	No	N/A	N/A
ROCK CREEK DAM REACH (ROCK CREEK)					
RC-1	5/22; 6/19; 8/18	N/A	No	N/A	N/A
HALSEY AFTERBAY DAM REACH (DRY CREEK)					
HA-1	5/27; 6/17; 8/19	N/A	No	N/A	N/A
WISE POWERHOUSE OVERFLOW REACH (UPPER AUBURN RAVINE)					
AR-1	Surveys only in tributary 5/28; 6/19; 8/26	N/A	No	N/A	N/A

1 Sites are listed in the order that they occur downstream to upstream in each reach.
2 For surveys that required a second day to complete, dates are hyphenated (e.g., 07/14-07/22).
3 N/A = not applicable
4 Incidental observations in 2009 and in a 2010 survey of a section of Chicago Park Powerhouse Reach during a brief low flow period that allowed safe access
5 Incidental observations in 2008 (not during survey)

Milton Diversion Dam Reach. Numerous FYLF observations occurred in the Middle Yuba River below Milton Diversion Dam, where suitable habitat was widespread. Detections were recorded for all four survey sites, which were distributed from about 15 to more than 31 miles downstream of Milton Diversion Dam. Upstream of the survey sites the reach includes sections of V-notch canyon bounded by near-vertical canyon walls and much of the reach (5.7 miles) is above the 5,000-ft elevation range for FYLF. Introduced crayfish (*Pacifastacus* spp.) and American bullfrog, which are potential FYLF predators and competitors, were not documented in the Middle Yuba River. Recreation is limited, but some dredge mining occurs.

South Yuba Reaches #1-6. In the South Yuba River, Licensees did not find FYLF upstream of Fall Creek. Below Fall Creek, FYLF were normally found in areas that generally corresponded to the occurrence of alluvial deposits that occur discontinuously, separated by stretches of less suitable habitat (e.g., boulder/bedrock confined with a paucity of smaller substrates) and usually in the vicinity of perennial tributaries. The survey sites in the lower half of the South Yuba

River were notable for the presence of crayfish, which was found at all the survey sites, and American bullfrog, which was found at two of the four sites surveyed. Also, moderate to high levels of recreation - including wading, swimming, and placer mining - were observed at three of the sites where FYLF breeding or tadpoles were observed.

Bowman-Spaulding Diversion Dam Reach. In Canyon Creek, a tributary to the South Yuba River, FYLF were found at one survey site in the lower 1.25 miles of the stream. No FYLF were observed at the two other sites upstream which are separated from the lower area by sections of steep, nearly vertical in places, bedrock canyon walls that may prevent FYLF dispersal.

Drum Afterbay Dam Reach, Dutch Flat Afterbay Dam Reach and Bear River Canal Diversion Dam Reach. In Bear River, FYLF were not found upstream of Drum Afterbay. There were few FYLF found in the Drum Afterbay Dam Reach and the Bear River Canal Diversion Dam Reach below Rollins Reservoir. Potentially suitable FYLF breeding and rearing habitats are generally scarce in these reaches and were also largely absent at some of the survey sites. FYLF are known to be numerous in the section of Bear River below Dutch Flat Afterbay Dam (Jones & Stokes 2006). The Dutch Flat Afterbay Dam Reach, was not surveyed because Relicensing Participants agreed that existing information regarding previously documented FYLF breeding was ample (Jones & Stokes 2006) and was therefore not required in the study plan.

Chicago Park Powerhouse Reach. The short section of the Bear River from Chicago Park Powerhouse to Rollins Reservoir (~1 mi) generally lacks potential breeding and rearing habitat because of high and variable flows, as well as an actively changing channel configuration. However, based on observations of FYLF tadpoles, breeding evidently occurred in 2009 and 2010 in a relict channel where high flow conditions do not occur. Tadpoles were also observed in a small side channel in 2009, which was not suitable in 2010. The Chicago Powerhouse Reach is proximate to areas with exceptionally good habitat at Steephollow Creek, a tributary to the reach where FYLF are unusually abundant, and the Dutch Flat Afterbay Dam Reach, where the FYLF population is also robust (Jones & Stokes 2006). Steephollow Creek, which is unaffected by the projects, contains good FYLF habitat - crayfish and American bullfrogs were not found and only small fish were observed.

Towle Canal Diversion Dam Reach. There were few FYLF detections in Towle Canal Diversion Dam Reach on Canyon Creek, a tributary of the North Fork American River, and in Lake Valley Diversion Dam Reach on the North Fork of the North Fork American River. Canyon Creek is a relatively small stream, with moderate to high shading by the riparian canopy. Potential FYLF breeding and rearing habitat is limited and associated with shallow pools and edgewater. In the North Fork of the North Fork American River FYLF occurrence may be related to discontinuous distribution of suitable habitats separated by sections of steep, bedrock-confined channels with waterfalls and cascades.

Halsey Afterbay Dam Reach, Rock Creek Dam Reach and Wise Powerhouse Overflow Reach. No FYLF were found in Dry Creek, Rock Creek and Upper Auburn Ravine in western Placer County. The reaches are situated within small watersheds in areas urbanized to varying degrees, and they contain little or no potential habitat for FYLF.

Drum-Spaulding Project Canals. As part of their 2008 and 2009 FYLF study, Licensees also performed field reconnaissance of sites on seven Drum-Spaulding Project canals below 5,000 ft in elevation. Licensees found that potential habitat for FYLF rarely occurs along canals and that streams where FYLF might occur are typically spanned by the canals in an elevated flume. Where stream channels are spanned by an elevated flume, it is unlikely that FYLF would come into contact with the canal. Several seasonal/ephemeral streams documented in the field reconnaissance were intersected by canals; specifically, one stream passed over a canal in a culvert; one stream was spanned by an elevated flume; one stream flowed under the canal (no culvert); and five streams were intercepted by (i.e., flowed into) canals. Because intercepted ephemeral streams are not connected to larger drainages downstream, FYLF is unlikely to ever occur. Adult or juvenile FYLF could potentially occur in some of the other seasonal streams that intersect canals, and could, if present, come into contact with the proximate canal after overland movement from the stream. Where stream channels and canals intersect more directly (e.g., small streams passing under canal in a culvert), there is little potential that FYLF may occur in the streams.

6.3.1.2.2.2 Foothill Yellow-Legged Frog-Habitat Modeling

Licensees conducted 2D and 1D habitat modeling studies on ten stream reaches affected by the two projects. In each reach, a site was selected that met the following criteria: 1) the site contained FYLF habitat that was representative of FYLF habitat in the reach; 2) the site contained known FYLF breeding habitat if such locations had been documented in the reach; and, 3) if more than one location in the reach met the previous two criteria, the most upstream site (nearest to Project facility) was selected. Details of these studies are provided in the Special Status Amphibians-FYLF Habitat Modeling technical memorandum (3-7), filed with this Exhibit E in Appendix E12.

Licensees performed River 2D habitat modeling to simulate the relationship of stream flows to FYLF habitat suitability – defined by water depth and velocity, and substrate – for a site on each of the following seven stream reaches where FYLF breeding is known to occur:

- Milton Diversion Dam Reach on the Middle Yuba River
- Bowman-Spaulding Diversion Dam Reach on Canyon Creek (tributary to South Yuba River)
- Jordan Creek Reach (South Yuba River Reaches #2 through #6)
- Dutch Flat Afterbay Dam Reach on the Bear River
- Chicago Park Powerhouse Dam Reach on the Bear River[12]
- Bear River Canal Diversion Dam Reach on the Bear River
- Lake Valley Canal Diversion Dam Reach on the North Fork North Fork American River

[12] River2D habitat modeling in Chicago Park Powerhouse Reach was not specified in FERC's Study Determination, but was performed following incidental observation of FYLF tadpoles at two locations in this stream reach in 2009.

Habitat versus flow relationships were also developed using 1D PHABSIM for the following stream reaches where no FYLF breeding was detected during surveys:

- Bear River Reach #2 (Meadow Sub-reach and Boardman Sub-reach)
- Drum Afterbay Dam Reach on the Bear River
- Towle Canal Diversion Dam Reach on Canyon Creek, tributary to the North Fork American River

Figure 6.3.1-48 shows the location of FYLF River2D and 1D PHABSIM sites.

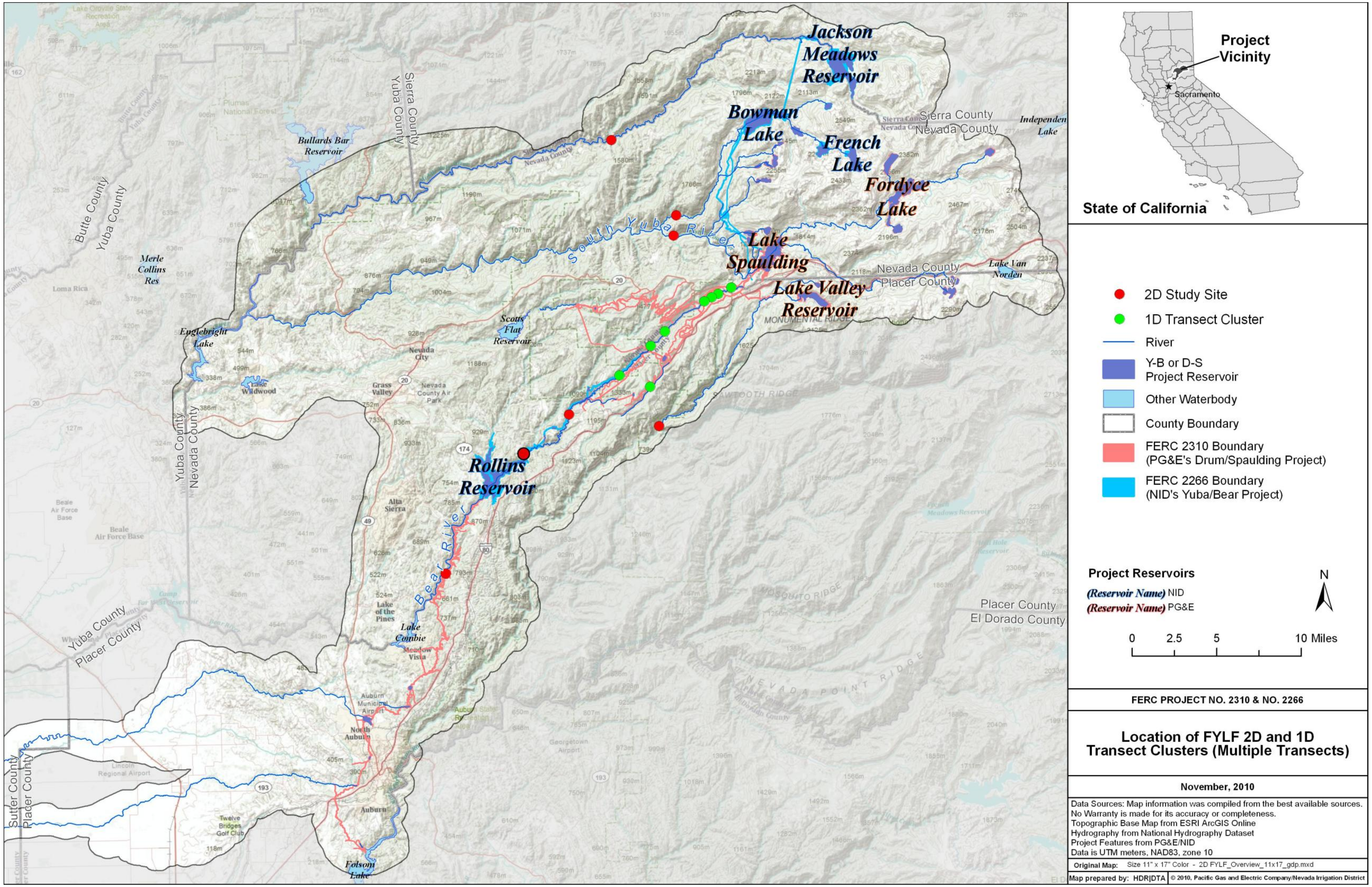


Figure 6.3.1-48. Location of FYLF 2D Sites and 1D transect clusters (multiple transects) for the Yuba Bear Hydroelectric Project and Drum-Spaulding Project study sites.

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HSC for FYLF were collaboratively developed with other Relicensing Participants for both the 2D and 1D models using site-specific habitat data from three studies representing a variety of Sierra Nevada rivers, including the Yuba and Bear basins, the American River basin (PCWA 2008), and the Feather River, Pit River, and Butte Creek basins (Lind et al. 2008). HSC for FYLF egg masses and tadpoles were created by constructing Non-Parametric Tolerance Limits (NPTL) around the depth and mean column velocity data pooled among the three sources listed above (Bovee 1986). HSC for substrate were developed using frequency analysis. Details of HSC development can be found in Licensees' Special-Status Amphibians – FYLF Modeling Technical Memorandum (3-7) filed with this Exhibit E in Appendix E12. Table 6.3.1-20 summarizes HSC criteria for FYLF.

Table 6.3.1-20. Habitat suitability criteria for FYLF egg and tadpole lifestages.

Criteria	Suitability Range for Egg Mass	Suitability Range for Tadpole
Water Depth (cm)	1.0 = 12.0 to 66.0 0.3 = 66.01 to 120.0 0.1 = 2.0 to 11.99 and 120.01 to 161.0 0.0 = < 2.0 and > 161.0	1.0 = 6.0 to 44.0 0.1 = 2.0 to 5.99 and 44.01 to 155.0 0.0 = < 2.0 and > 155.0
Water Velocity (cm/sec)	1.0 = 0 to 9.0 0.1 = 9.01 to 30.0 0.0 = > 30.0	1.0 = 0.0 to 5.0 0.1 = 5.01 to 28 0.0 > 28.0
Substrate	1.0 = cobble and boulder 0.10 =sand, gravel, bedrock 0.0 = fines and other substrates	1.0 = cobble and boulder 0.10 =sand, gravel, bedrock 0.0 = fines and other substrates

Flow versus habitat was simulated using the models at a series of discharges covering a range appropriate for the specific study reach. Tables and graphs of WUA and effective habitat were produced for FYLF egg mass and tadpole lifestages at numerous discharges. Comprehensive habitat modeling results can be found in Section 3.1 for 2D site results and Section 3.2 for 1D results, as well as Attachment 3-7D of Licensees Technical Memorandum 3-7 in Appendix E12 of this Exhibit E. Representative examples are presented below.

The assessment of the four following basic study parameters for egg mass and tadpole life stages were of particular interest to other Relicensing Participants: 1) WUA, 2) effective WUA, 3) effective velocity suitability, and 4) effective depth suitability. The trends for each of these parameters are described below using the Milton Diversion Dam Reach River 2D as an example. A description of the other FYLF modeling sites follows the discussion of the Milton Diversion Dam Reach Site.

Milton Diversion Dam Reach

On the Middle Yuba River, the upstream distribution of FYLF is evidently limited by elevation and stream geomorphology, with narrow canyons and high gradient sections unsuitable for FYLF and likely a barrier to dispersal. The Middle Yuba River site at which FYLF, including breeding, was observed is 17.7 mi downstream of the Milton Diversion Dam, immediately upstream of Wolf Creek. Flows at this location during the FYLF breeding season are typically dominated by accretion, not Yuba-Bear Hydroelectric Project's releases. The model results are consistent with other indications, most importantly the relatively high number of FYLF detections recorded during surveys, that existing conditions for FYLF at this site are favorable. High quality and continuity of FYLF habitats were noted during surveys at this and other locations in the Middle Yuba River. In addition to the flow regime, favorable habitat attributes in the reach include abundant alluvial deposits and associated suitable breeding and rearing areas, numerous perennial tributaries that provide off-river habitat important to post-metamorphic life stages, favorable water temperatures for tadpole growth, limited recreational use, and the apparent absence of American bullfrog and crayfish.

Available Suitable Habitat – WUA

For the Milton Diversion Dam Reach on the Middle Yuba River, and all other reaches except for the Chicago Park Powerhouse Reach site, the area of available FYLF suitable habitat (WUA) is greatest at the lowest modeled flow and least at the highest modeled flow. This is largely due to the high energy character of the streams in combination with the general lack of recruitable habitat beyond the low to medium flow water's edge. Within the low to medium flow zone, the maximum velocities that are highly suitable (HSC = 1.0) for egg mass (9.0 cm/sec) and tadpole lifestage (5.0 cm/sec) are quickly exceeded with increases in discharge. Depth suitability is also lost with increases in discharge, but generally this occurs at a lower rate than for velocity. In contrast, at the Chicago Park Powerhouse Reach site, WUA increases with discharge because higher flows inundate additional habitat in the side channel where suitable habitat is concentrated. Table 6.3.1-21 for the Milton Diversion Dam Reach site illustrates the typical WUA pattern.

Table 6.3.1-21. WUA results for FYLF egg mass and tadpole life stages at the Milton Diversion Dam Reach River2D Site.

Flow (cfs)[1]	Egg Mass WUA (m^2)	Tadpole WUA (m^2)
11	1,313	1,151
29	1,295	1,062
45	1,209	977
67	1,065	821
110	823	612
150	651	471
187	524	367
275	311	213
375	192	132
475	138	98

1 Bold indicates calibration flow.

Effective WUA

The persistence of spatially specific habitat as flows change is critical to FYLF life stages that are immobile (i.e., egg mass) or have limited mobility (i.e., small tadpoles). By definition, effective WUA only diminishes or remains the same from one flow to the next, it never increases. This is illustrated at the egg and tadpole FYLF for the Milton Diversion Dam modeling sites shown in Tables 6.3.1-22 and Figure 6.3.1-49 for FYLF egg masses and Table 6.3.1-23 and Figure 6.3.1-50 for FYLF tadpoles. The tables and graphs are designed to assess the maintenance of suitable habitat from a high starting flow to a lower ending flow and should be read by row across columns. For example, as shown in Table 6.3.1-22, a change in discharge from 187 cfs to 11 cfs will retain 47.4 percent of the FYLF breeding habitat for the egg mass life stage at the Milton Diversion Dam Reach site (525 m^2 WUA to 249 m^2 WUA). If the change in discharge were to be reduced from 187 cfs to 67 cfs, then 78.3 percent of the habitat for FYLF egg masses would be maintained (525 m^2 WUA to 411 m^2 WUA). These wedge tables (i.e., data is presented in a wedge shape) can also be read in columns to evaluate how effective habitat changes when flows are increased from a low base flow to higher discharges. The general trend of effective WUA was consistent among all of the sites, although the rates and magnitudes of change relative to discharge were different for each site. Effective habitat is greatest when the starting flow (higher flow) is in the lower flow range and the difference between the starting flow and ending flow is the least.

Table 6.3.1-22. Tabular Effective Habitat for FYLF egg mass life stage at the Milton Diversion Dam Reach River2D Site.

Starting Discharge (cfs)	Ending Discharge (cfs) and Corresponding Effective WUA										Percent Effective WUA From Starting to Ending Flow
	475	375	275	187	150	110	67	45	29	11	
475	138	117	100	89	82	73	62	52	43	29	21.2%
375		192	165	148	139	125	107	93	78	52	27.3%
275			311	281	265	243	214	189	161	113	36.3%
187				525	494	459	411	373	326	249	47.4%
150					651	599	534	482	425	331	50.9%
110						823	727	659	583	462	56.2%
67							1065	958	847	676	63.5%
45								1,209	1,057	843	69.7%
29									1,295	1,029	79.4%
11										1,313	100.0%

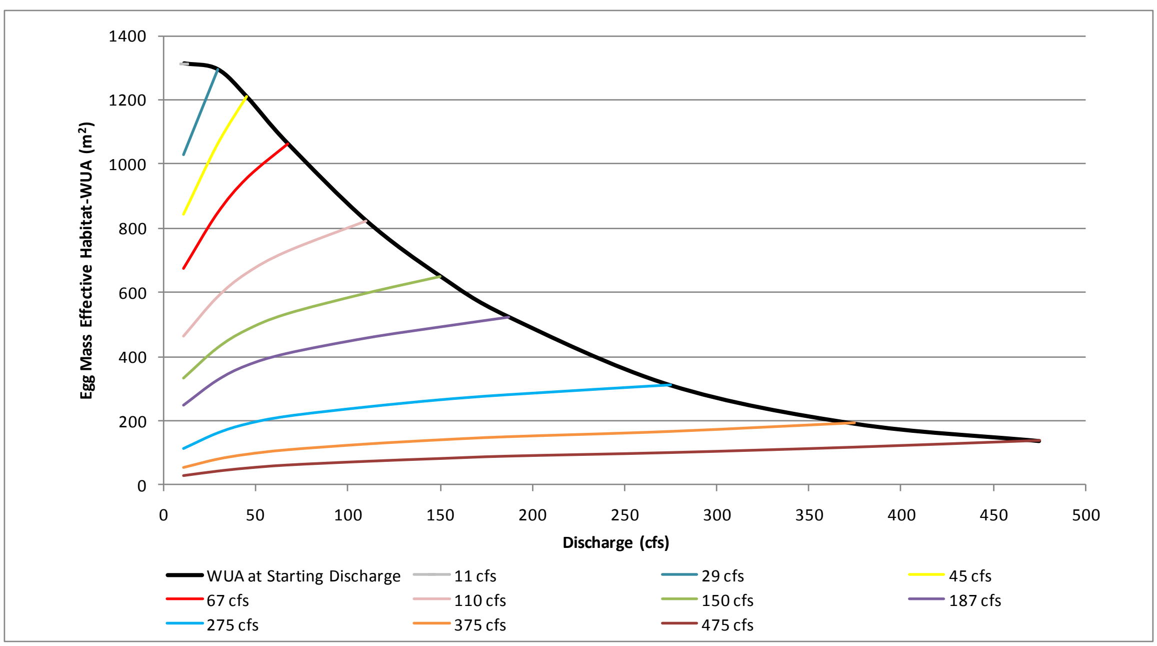

Figure 6.3.1-49. Graphical Effective Habitat for FYLF egg mass lifestage at the Milton Diversion Dam Reach River2D Site.

Table 6.3.1-23. Tabular Effective Habitat for FYLF tadpole life stage at the Milton Diversion Dam Reach River2D Site.

Starting Discharge (cfs)	Ending Discharge (cfs) and Corresponding Effective WUA										Percent Effective WUA From Starting to Ending Flow
	475	375	275	187	150	110	67	45	29	11	
475	98	80	65	56	49	42	32	26	21	15	15.3%
375		132	109	95	86	76	58	47	37	26	19.7%
275			213	189	174	155	129	109	84	52	24.2%
187				367	340	309	268	235	193	128	34.8%
150					471	427	369	326	274	191	40.6%
110						612	527	467	394	289	47.2%
67							821	730	625	476	58.0%
45								977	834	641	65.6%
29									1,062	821	77.3%
11										1,151	100.0%

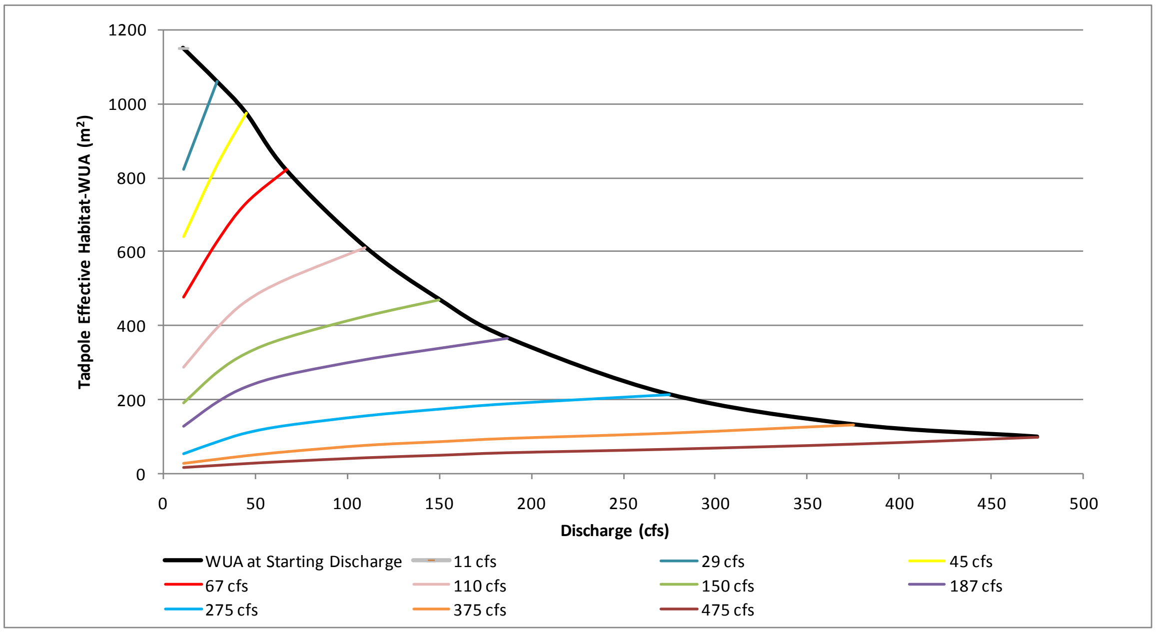

Figure 6.3.1-50. Graphical Effective Habitat for FYLF tadpole lifestage at the Milton Diversion Dam Reach River2D Site.

Effective Velocity Suitability

The purpose of the effective velocity suitability analysis was to determine the loss of suitable velocity habitat due to increases in velocity with increased discharge. An increase in discharge and water velocities during the egg mass period has the potential, depending on the magnitude of the increase, to dislodge egg masses from the attachment substrate, causing mortality. For tadpoles, individuals can be swept out of their nursery refugia, which could potentially cause mortality. In general, Licensees' study shows that the loss of suitable velocity habitat occurs rapidly with initial increases in discharge from the base flow, and then the loss rate diminishes as flows continue higher. For most reaches, there is an inflection point that denotes this transition in loss rate, although the rates and magnitudes of change in suitable velocities are different between sites. This general pattern is illustrated for the Milton Diversion Dam Reach site in Figure 6.3.1-51 for FYLF egg masses and Figure 6.3.1-52 for FYLF tadpoles. The exception is the Lake Valley Diversion Dam Reach site where the loss rate is relatively consistent throughout and there is no clear inflection point (Refer to Figure 6.3.1-58 below).

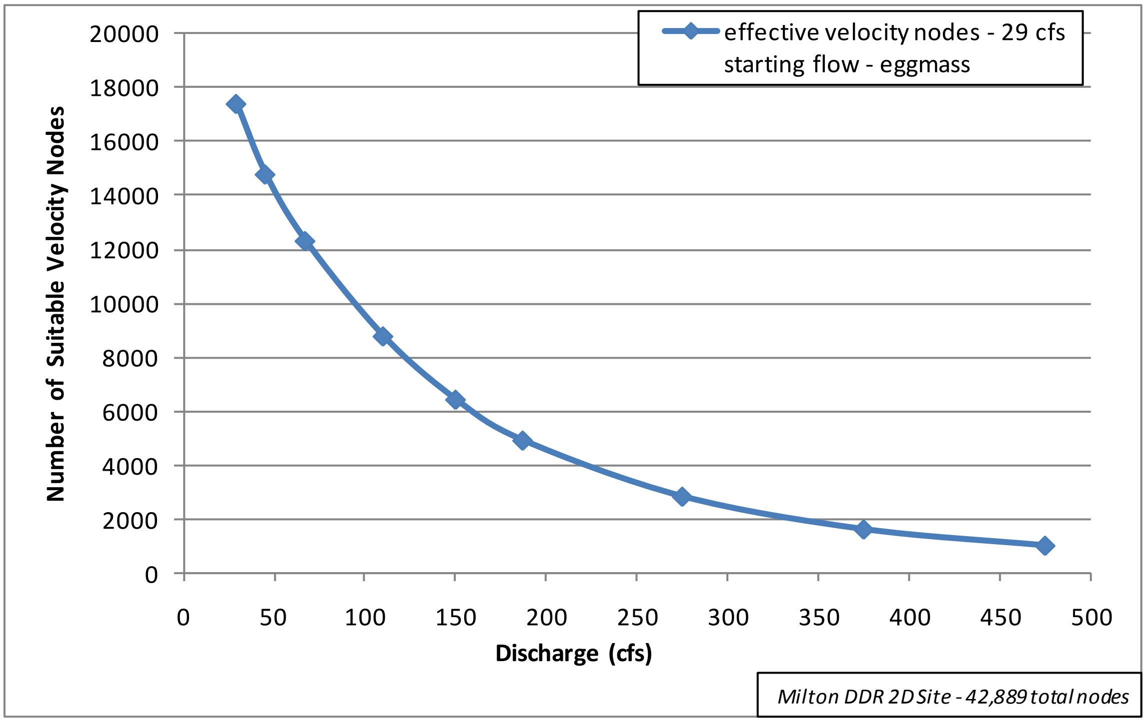

Figure 6.3.1-51. Effective Velocity Suitability for FYLF egg mass life stage at the Milton Diversion Dam Reach River2D Site.

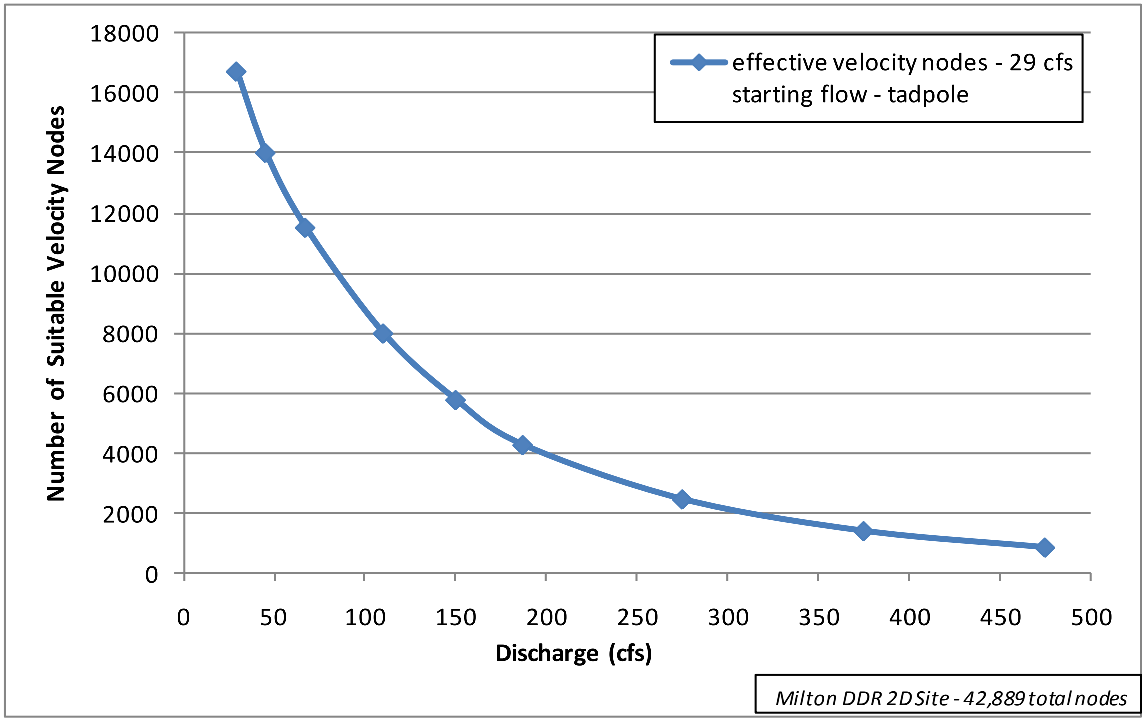

Figure 6.3.1-52. Effective Velocity Suitability for FYLF tadpole life stage at the Milton Diversion Dam Reach River2D Site.

Effective Depth Suitability

The purpose of the effective depth suitability analysis was to determine the loss of suitable depth habitat due to changes in depth with increased discharge. A decrease in flow during the egg mass period has the potential to dewater egg masses laid when flows were high, causing mortality. For tadpoles, individuals can be stranded in isolated pools or pockets, potentially causing mortality. In general, Licensees' study shows that, as expected, the number of suitable depth nodes was substantially lower when the starting flows were highest, but the rate of loss was lower than the rate when starting at a mid-range flow. For example, at the Milton Diversion Dam Reach site the number of suitable egg mass depth nodes changes from 2,635 nodes at 475 cfs to 915 nodes at 11 cfs, compared to 8,613 nodes at 187 cfs and 3,832 nodes at 11 cfs. This is illustrated for the Milton Diversion Dam Reach site in Figure 6.3.1-53 for FYLF egg mass life stage and Figure 6.3.1-54 for FYLF tadpole life stage. The Chicago Park Powerhouse Reach site is different from other sites in that the amount of suitable depth habitat is basically the same at the high flow of 1,200 cfs (8,461 nodes) and the mid-range starting flow of 799 cfs (8,373 nodes) (Refer to Figures 6.3.1-66 and 6.3.1-67 below).

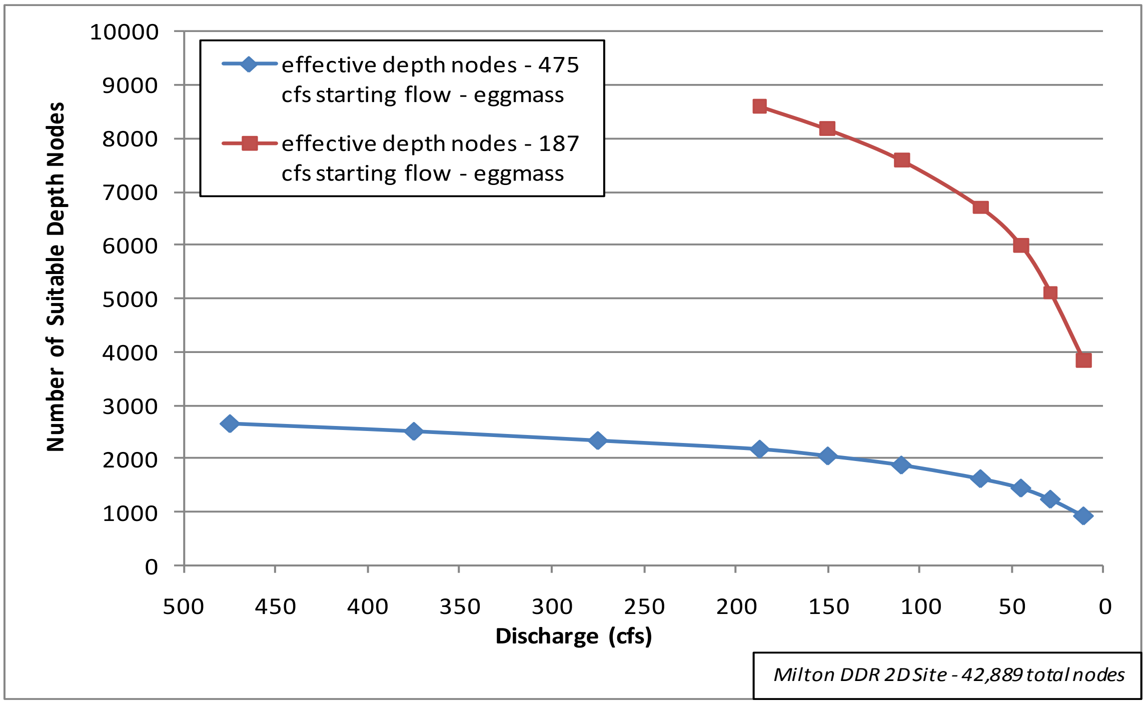

Figure 6.3.1-53. Effective Depth Suitability for FYLF egg mass life stage at the Milton Diversion Dam Reach River2D Site on the Bear River.

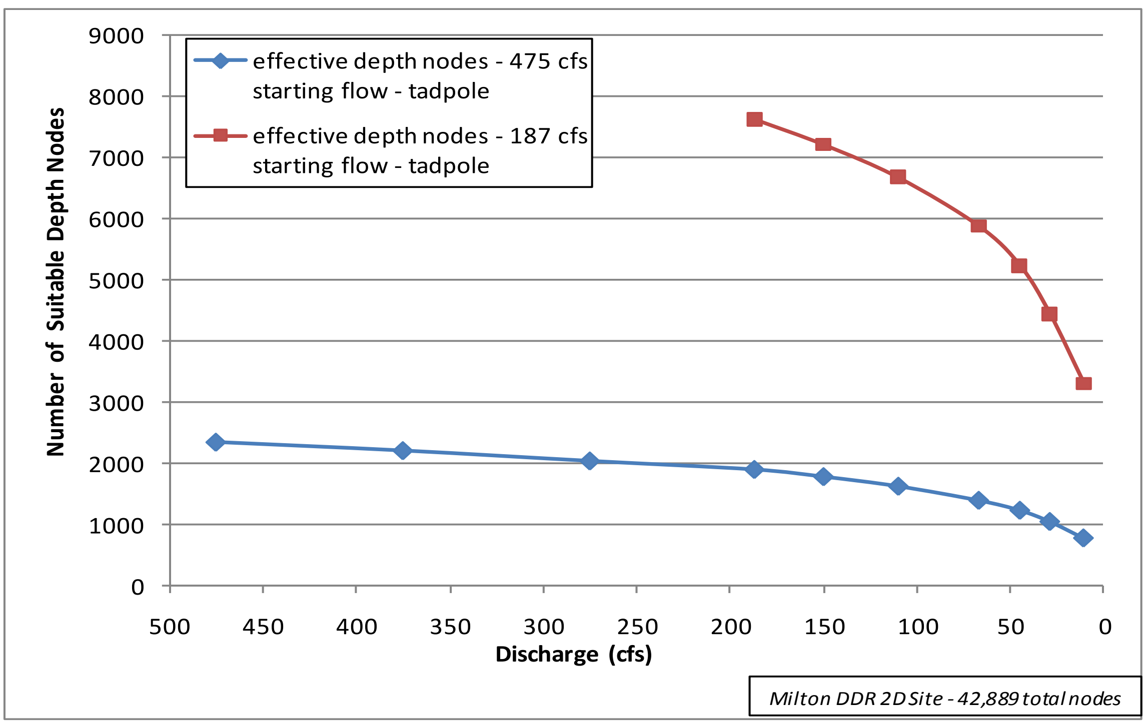

Figure 6.3.1-54. Effective Depth Suitability for FYLF tadpole life stage at the Milton Diversion Dam Reach River2D Site on the Bear River.

Existing FYLF Habitat Conditions

The existing habitat conditions for FYLF may be described by integrating the results of the habitat modeling with other information, including hydrology and other environmental characteristics of the modeling sites and the associated stream reach. Based on the habitat suitability maps generated with the River2D model, substantial areas of suitable habitat (i.e., areas of suitable depth, velocity, and substrate) for FYLF egg mass and tadpole life stages occur under existing flow conditions at the sites located on the Milton Diversion Dam Reach (Middle Yuba River) (Figure 6.3.1-55), Lake Valley Canal Diversion Dam Reach (North Fork of North Fork American River) (Figure 6.3.1-60), and the Dutch Flat Afterbay Dam Reach (Bear River) (Figure 6.3.1-63). Suitable habitat was much more limited at the modeling sites located on the Bear River in the Chicago Park Powerhouse Reach, where habitat is concentrated in a relict side channel with backwater conditions (Figure 6.3.1-68); and Bear River Canal Diversion Dam Reach, where substrates have low suitability in most of the site (Figure 6.3.1-71). Existing FYLF habitat conditions at modeling sites in the Jordan Creek Reach of the South Yuba River (Figure 6.3.1-77) and the Bowman-Spaulding Diversion Dam Reach (Figure 6.3.1-74) indicate there is ample, contiguous suitable habitat under existing flow conditions, although variations in flow may have a negative influence on effective habitat in some years.

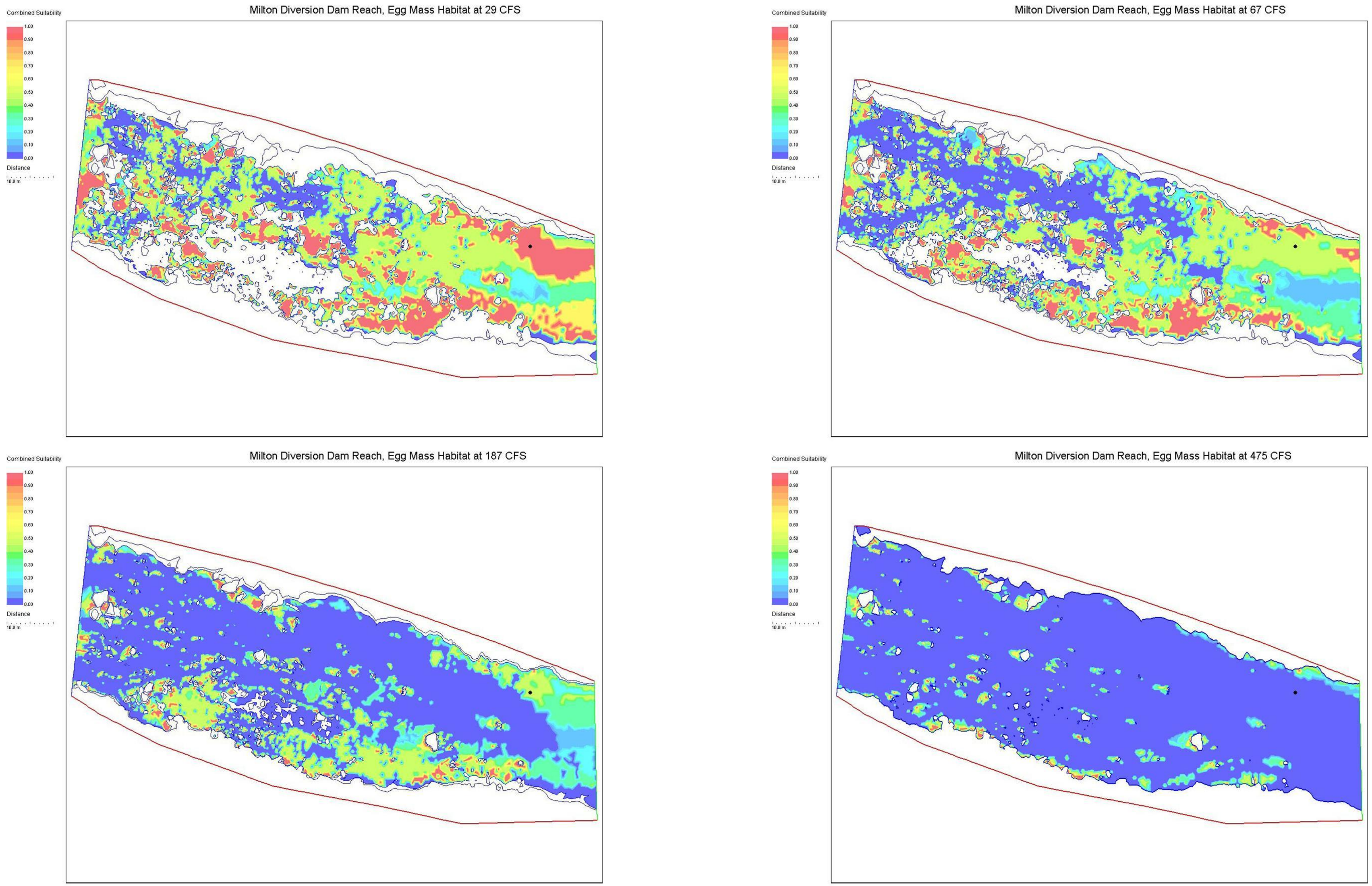

Figure 6.3.1-55. FYLF egg mass habitat distribution at four flow scenarios in the Milton Diversion Dam Reach River 2D Site in the Middle Yuba River. Black dot represents egg mass observation.

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Lake Valley Canal Diversion Dam Reach (North Fork of the North Fork American River)

The Lake Valley Canal Diversion Dam Reach modeling site is located 13.0 miles downstream of the diversion dam. Similar to the Middle Yuba River, narrow canyons and high gradient sections unsuitable for FYLF occur upstream of areas where FYLF was found. Flows at the modeling site are dominated by accretion during the FYLF breeding season. The modeling site contains suitable substrate for breeding and rearing life stages, and most of the suitable habitat is maintained even at higher flows. Nonetheless, indications are that modest levels of FYLF breeding occur at the site (small numbers of tadpoles observed in 2008 and 2009), which may be attributable to the relatively limited extent and discontinuity of suitable habitat areas throughout the stream reach. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Lake Valley Canal Diversion Dam Reach Site.

Table 6.3.1-24. Tabular Effective Habitat for FYLF egg mass lifestage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA							Percent Effective WUA From Starting to Ending Flow
	120	90	56	40	26	12	5	
120	276	235	191	168	146	116	96	34.6%
90		316	257	228	199	159	132	41.8%
56			376	335	291	235	197	52.3%
40				419	364	297	251	59.8%
26					453	373	316	69.8%
12						490	413	84.3%
5							487	100.0%

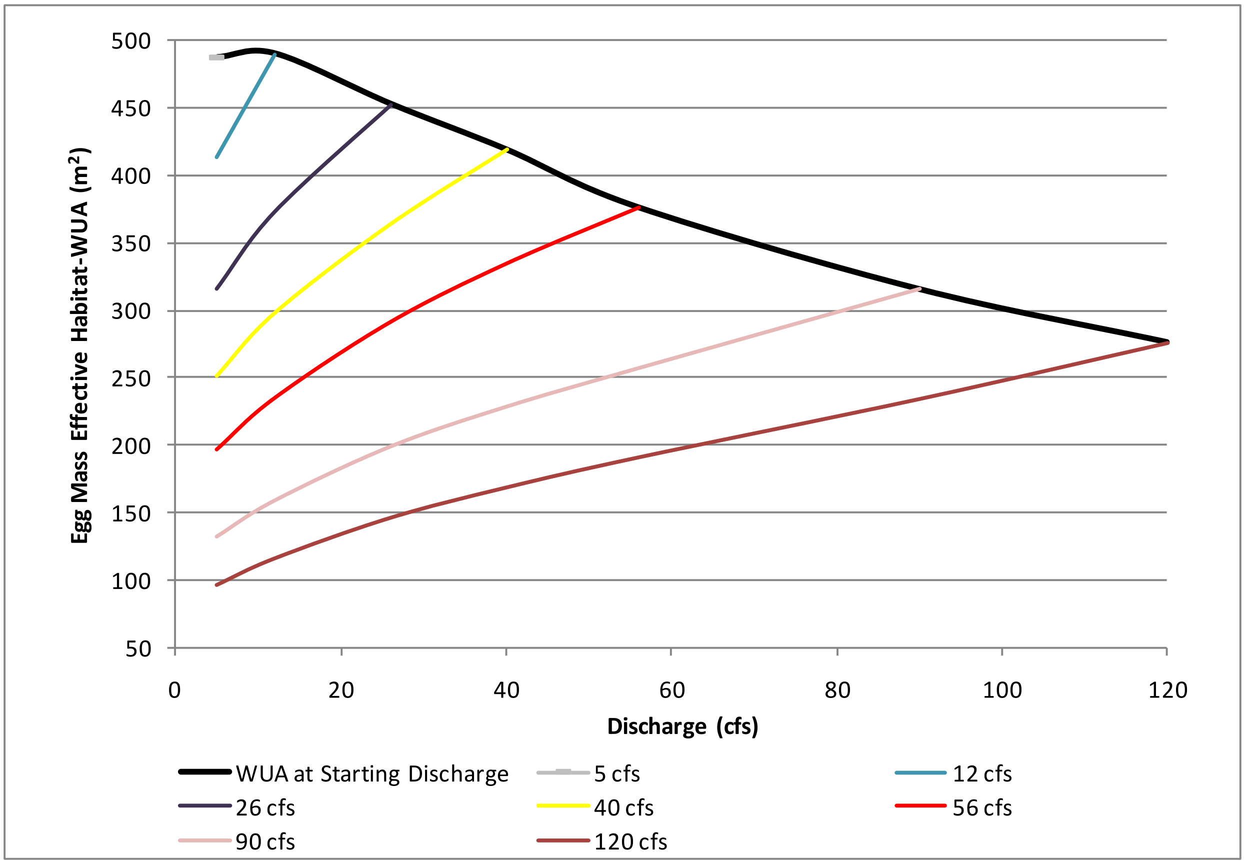

Figure 6.3.1-56. Graphical Effective Habitat for FYLF egg mass lifestage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

Table 6.3.1-25. Tabular Effective Habitat for FYLF tadpole lifestage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA							Percent Effective WUA From Starting to Ending Flow
	120	90	56	40	26	12	5	
120	214	176	131	110	90	64	53	24.6%
90		246	183	156	129	93	72	29.2%
56			288	247	208	154	119	41.3%
40				322	269	203	160	49.7%
26					353	271	218	61.6%
12						386	314	81.3%
5							409	100.0%

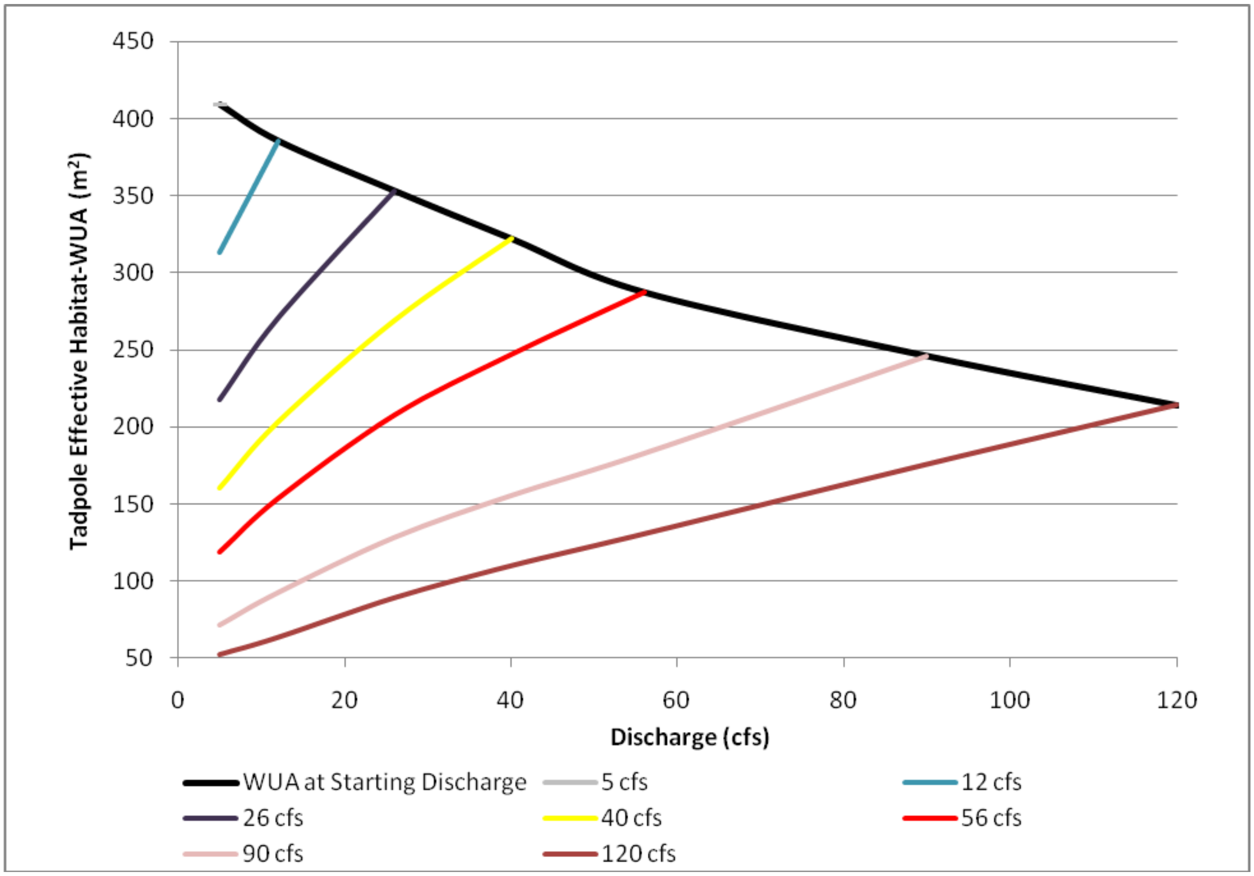

Figure 6.3.1-57. Graphical Effective Habitat for FYLF tadpole lifestage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

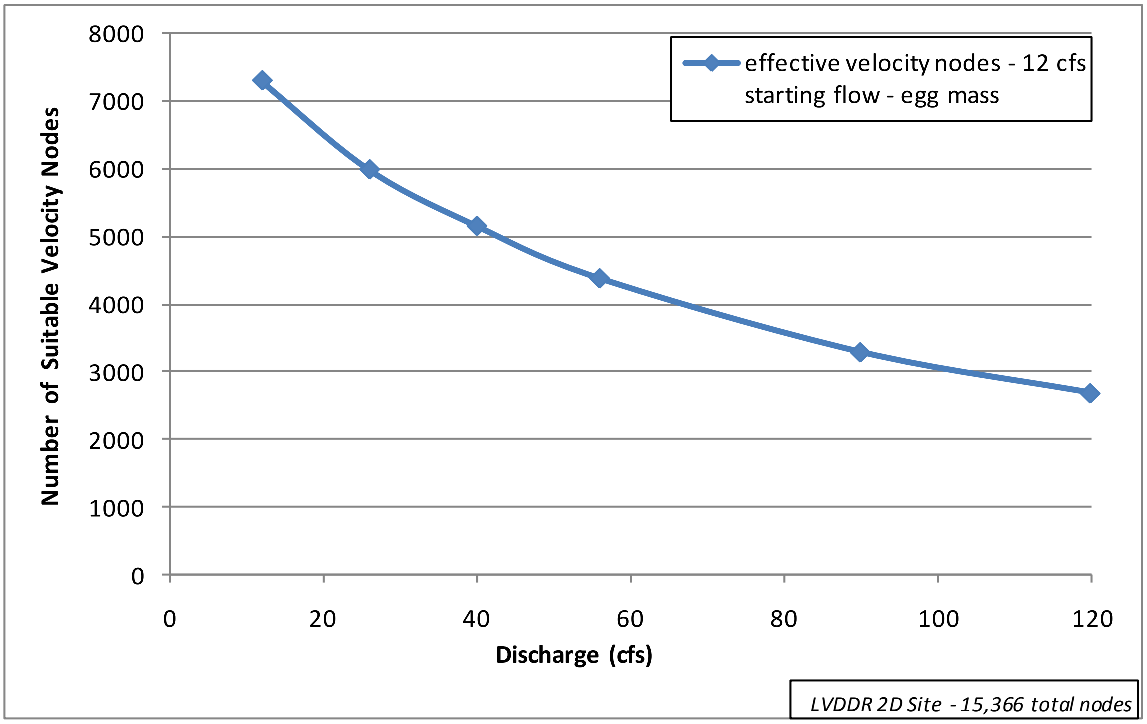

Figure 6.3.1-58. Effective Velocity Suitability for FYLF egg mass life stage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

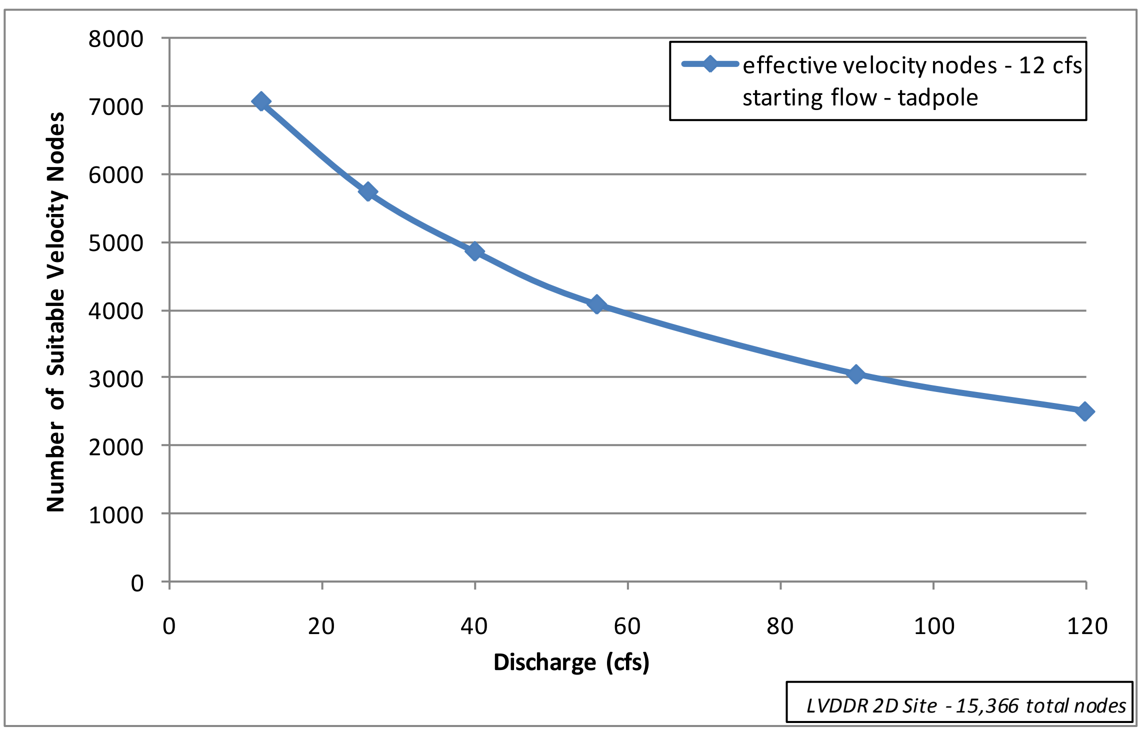

Figure 6.3.1-59. Effective Velocity Suitability for FYLF tadpole life stage at the Lake Valley Canal Diversion Dam Reach River2D Site on the North Fork of the North Fork American River.

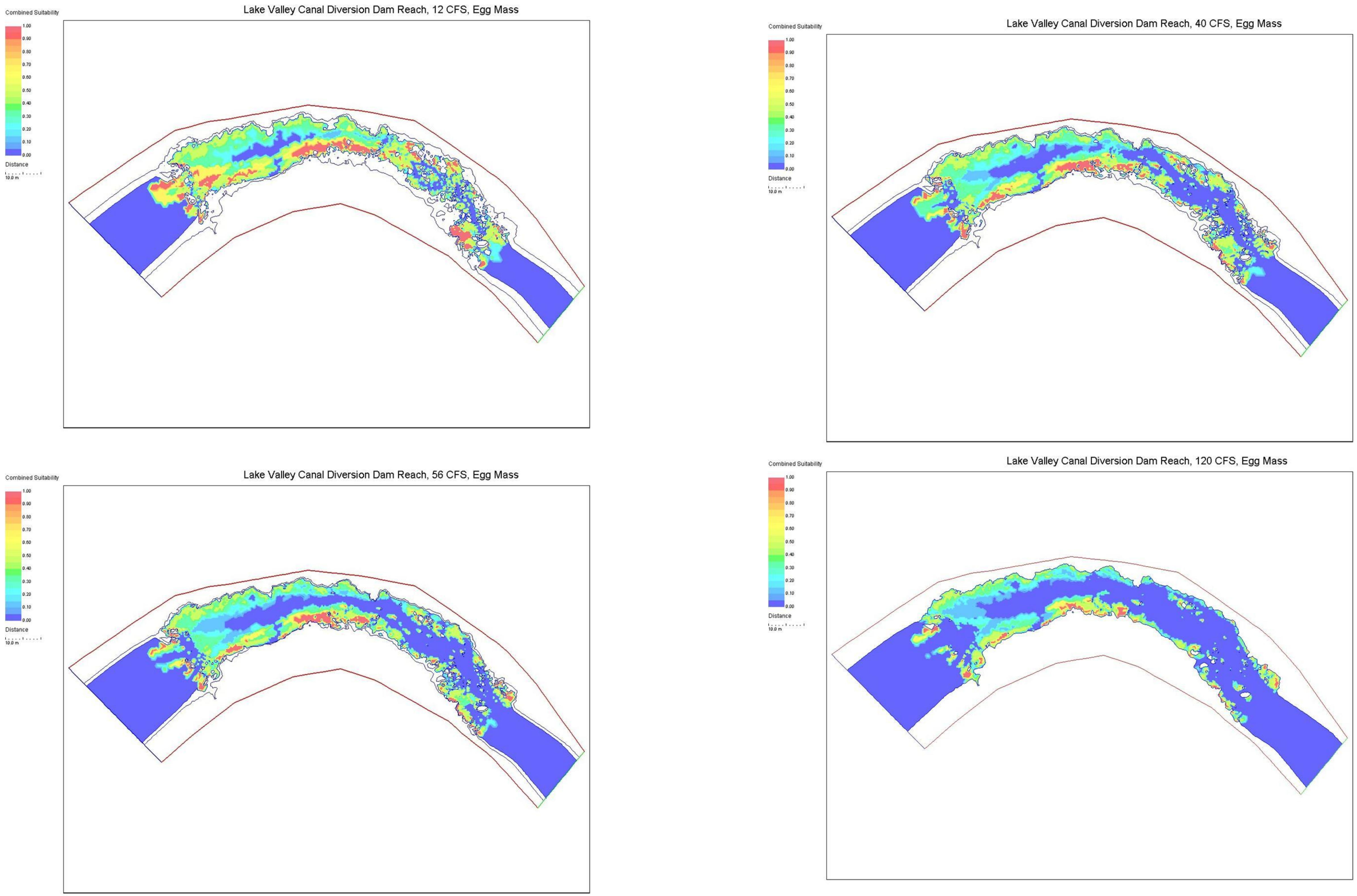

Figure 6.3.1-60. FYLF egg mass habitat distribution at four flow scenarios in the Lake Valley Canal Diversion Dam River Reach River2D Site in the North Fork of the North Fork American River.

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Dutch Flat Afterbay Dam Reach (Bear River)

In the Dutch Flat Afterbay Dam Reach, suitable habitats are well distributed along most of the reach. Jones & Stokes (2006) described this reach as a "healthy system" for FYLF with no serious decline in population size or breeding effort over a 3-year monitoring period following a large spill event. The habitat modeling site contains ideal substrates, predominately cobbles. The model indicates that substantial suitable habitat occurs at flow levels typically found in the reach from May to September; these flows are stable and largely originate from Project releases. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Dutch Flat Afterbay Dam Reach Site.

Table 6.3.1-26. Tabular effective habitat for FYLF egg mass lifestage at the Dutch Flat Afterbay Dam Reach River2D Site on the Bear River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA								Percent Effective WUA From Starting to Ending Flow
	130	**90**	**50**	**37**	**24**	**17**	**11**	**4**	
130	64	48	39	34	29	26	22	17	26.3%
90		108	83	71	60	52	44	31	28.8%
50			251	213	182	161	139	102	40.7%
37				349	296	264	228	174	49.8%
24					486	428	372	290	59.6%
17						542	460	353	65.0%
11							570	418	73.2%
4								584	100.0%

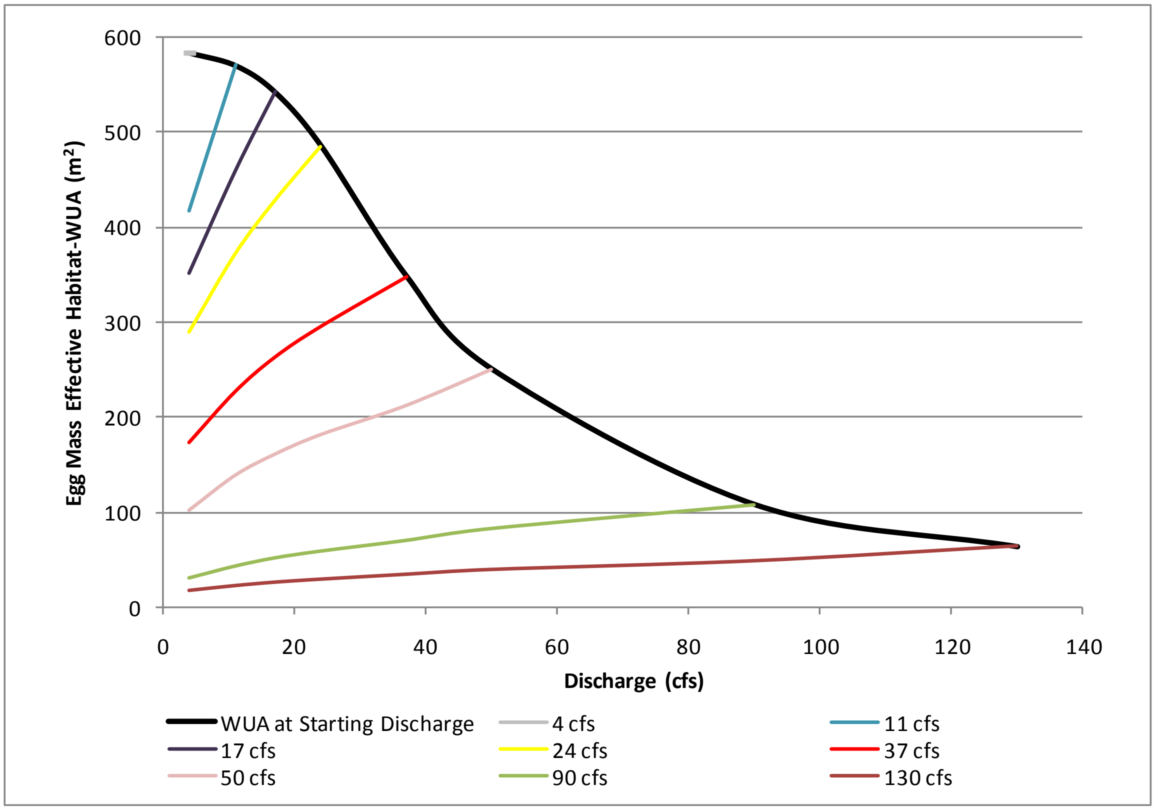

Figure 6.3.1-61. Graphical Effective Habitat for FYLF egg mass lifestage at the Dutch Flat Afterbay Dam Reach River2D Site on the Bear River.

Table 6.3.1-27. Tabular Effective Habitat for FYLF tadpole lifestage at the Dutch Flat Afterbay Dam Reach River2D Site on the Bear River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA								Percent Effective WUA From Starting to Ending Flow
	130	90	50	37	24	17	11	4	
130	51	35	26	21	16	14	12	8	16.3%
90		85	61	50	40	33	26	17	19.5%
50			209	178	148	129	107	69	33.2%
37				291	248	220	189	131	44.9%
24					441	398	348	257	58.2%
17						522	454	342	65.5%
11							565	420	74.4%
4								566	100.0%

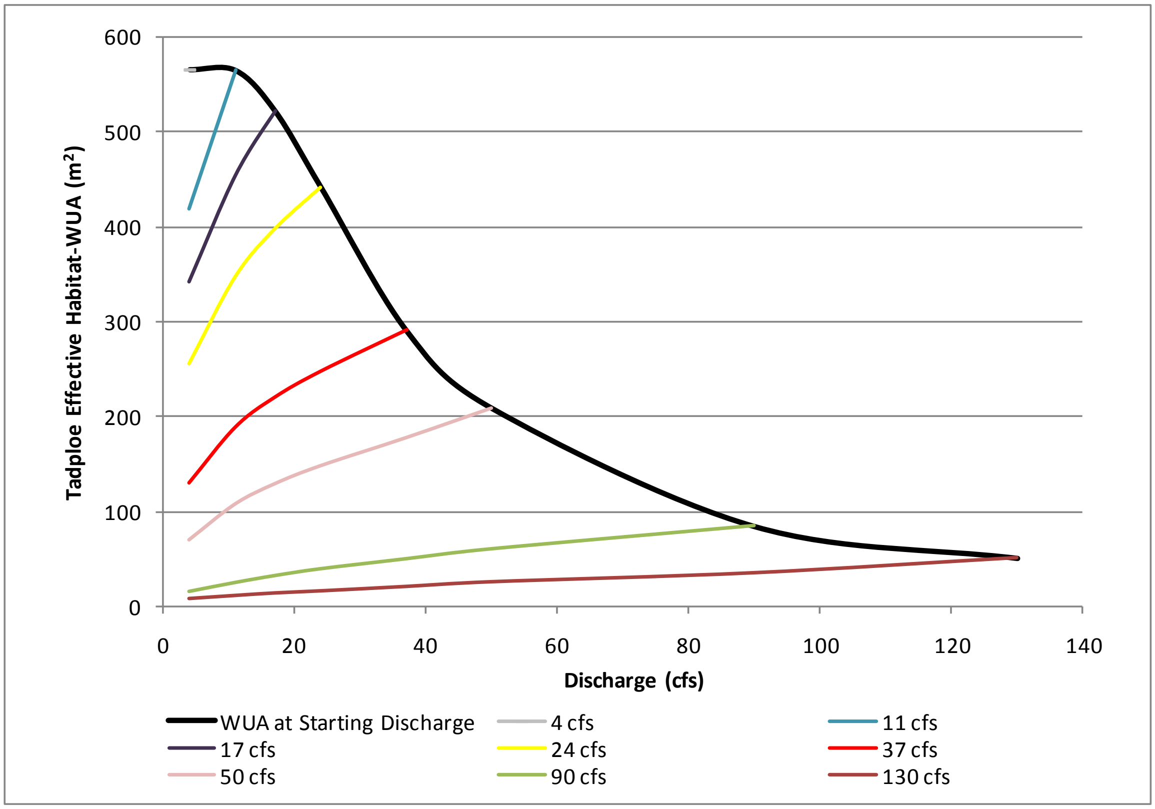

Figure 6.3.1-62. Graphical Effective Habitat for FYLF tadpole lifestage at the Dutch Flat Afterbay Dam Reach River2D Site on the Bear River.

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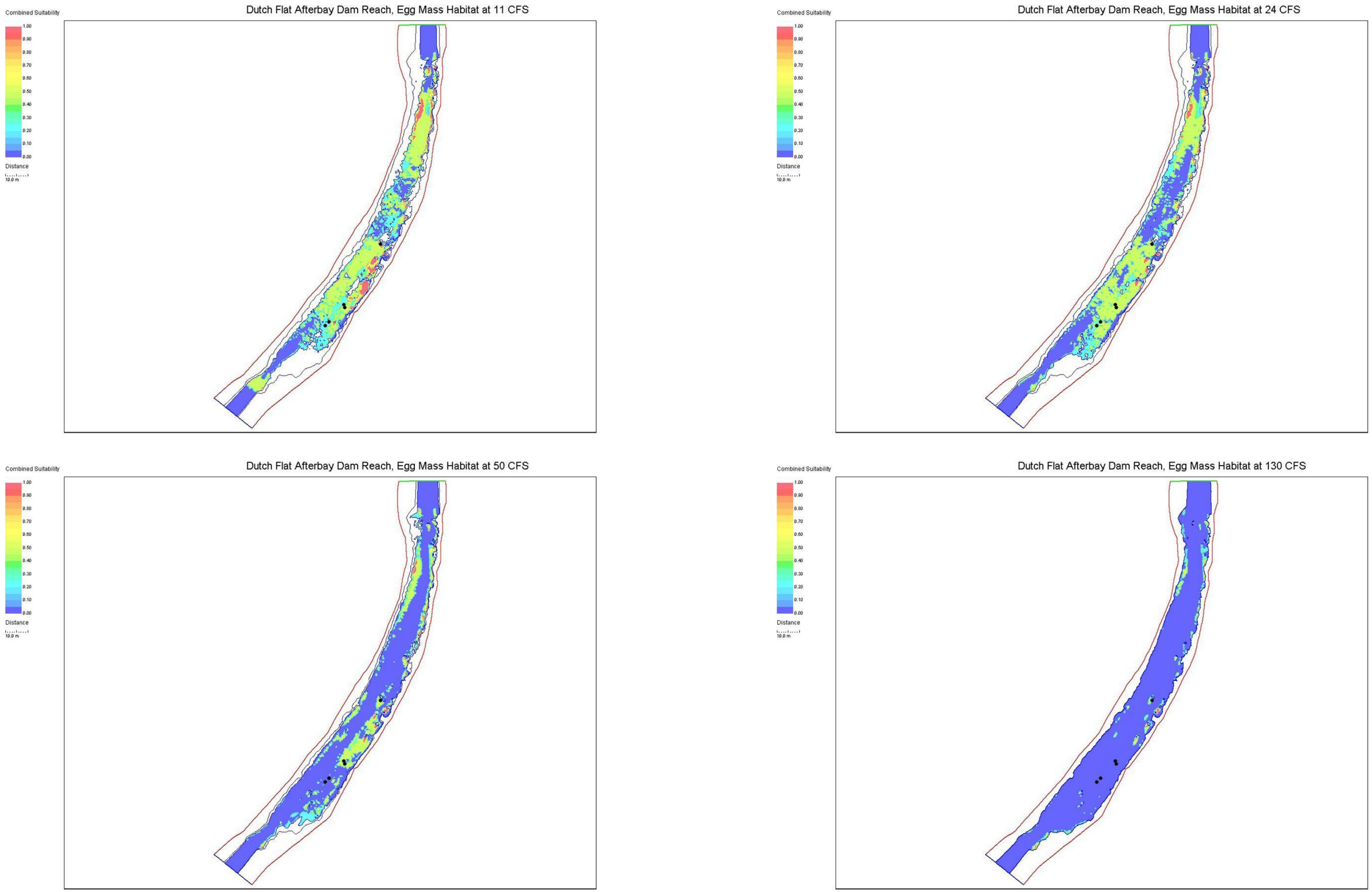

Figure 6.3.1-63. FYLF egg mass habitat distribution at four flow scenarios in Dutch Flat Afterbay Dam Reach River 2D Site in the Bear River. Black dot represents egg mass observation.

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Chicago Park Powerhouse Reach (Bear River)

The modeling site results indicate that suitable habitat in the Chicago Park Powerhouse Reach is almost entirely restricted to a network of connected, relict side channels where low velocity, backwater conditions exist at all of the modeled flows. FYLF tadpoles were observed in this area, although fine grained substrates which have a low suitability score for the FYLF egg mass life stage were prevalent, and vegetation patterns were consistent with an absence of high flow velocities. Elsewhere in the reach, substrates are predominately cobbles and gravel, but the typical daily flow range of 300 to 800 cfs produces high velocity conditions unsuitable for FYLF. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Chicago Park Powerhouse Reach (Bear River).

Table 6.3.1-28. Tabular Effective Habitat for FYLF egg mass lifestage for the Chicago Park Powerhouse Reach.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA														Percent Effective WUA From Starting to Ending Flow
	1,200	1,100	1,000	900	799	700	600	500	356	300	200	100	50	12	
1,200	5,248	3,741	2,386	1,876	1,479	1,241	941	754	469	375	286	221	189	134	2.6%
1,100		4,637	2,868	2,223	1,728	1,443	1,100	881	541	430	327	250	207	143	3.1%
1,000			3,719	2,799	2,144	1,762	1,328	1,056	660	521	394	306	254	180	4.8%
900				3,446	2,582	2,073	1,523	1,198	745	586	436	332	275	193	5.6%
799					3,379	2,597	1,798	1,382	839	658	484	362	298	207	6.1%
700						3,445	2,198	1,616	954	747	539	391	315	217	6.3%
600							2,995	2,096	1,175	916	642	441	350	238	8.0%
500								2,808	1,515	1,165	783	513	390	262	9.3%
356									2,490	1,857	1,167	654	478	316	12.7%
300										2,406	1,430	730	511	335	13.9%
200											2,407	1,017	643	385	16.0%
100												2,036	1,173	602	29.6%
50													2,289	1,105	48.3%
12														3,259	100.0%

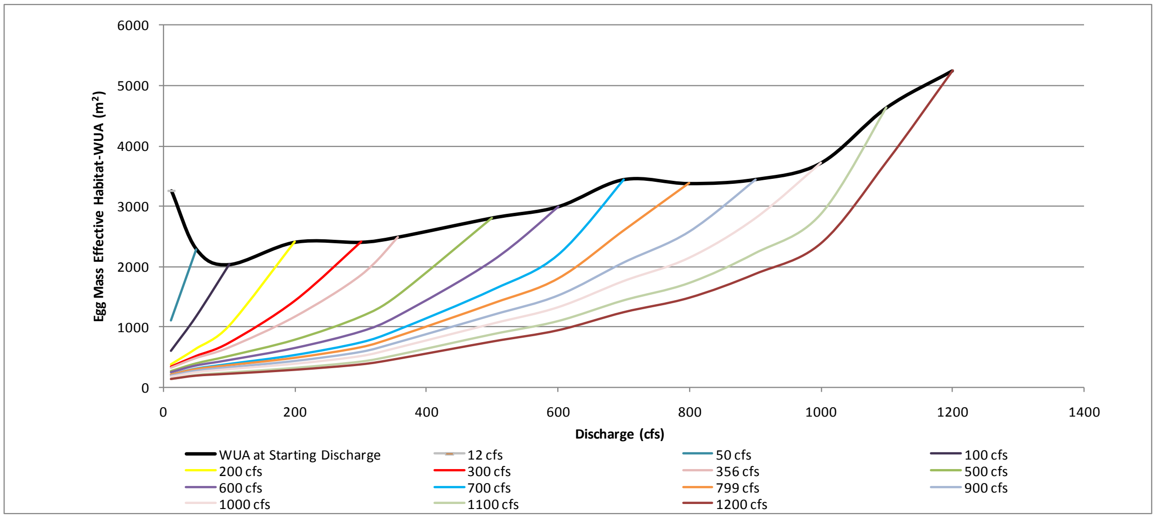

Figure 6.3.1-64. Graphical Effective Habitat for FYLF egg mass lifestage at the Chicago Park Powerhouse Reach River2D Site on the Bear River.

Table 6.3.1-29. Tabular Effective Habitat for FYLF tadpole lifestage at the Chicago Park Powerhouse Reach River2D Site on the Bear River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA														Percent Effective WUA From Starting to Ending Flow
	1,200	**1,100**	**1,000**	**900**	**799**	**700**	**600**	**500**	**356**	**300**	**200**	**100**	**50**	**12**	
1,200	5,560	3,934	2,380	1,826	1,400	1,156	842	654	353	273	193	149	129	84	1.5%
1,100		4,974	2,933	2,206	1,662	1,361	989	764	420	324	230	176	151	99	2.0%
1,000			3,847	2,838	2,112	1,692	1,222	944	535	408	293	226	193	136	3.5%
900				3,531	2,600	2,031	1,432	1,087	606	459	322	243	205	145	4.1%
799					3,396	2,582	1,738	1,304	718	546	373	268	224	156	4.6%
700						3,774	2,220	1,602	858	650	440	304	244	167	4.4%
600							3,084	2,137	1,100	829	544	361	283	188	6.1%
500								2,940	1,465	1,090	695	436	329	212	7.2%
356									2,547	1,886	1,087	575	416	264	10.4%
300										2,499	1,375	656	455	287	11.5%
200											2,540	954	596	338	13.3%
100												2,064	1,122	513	24.9%
50													2,264	918	40.5%
12														3,195	100.0%

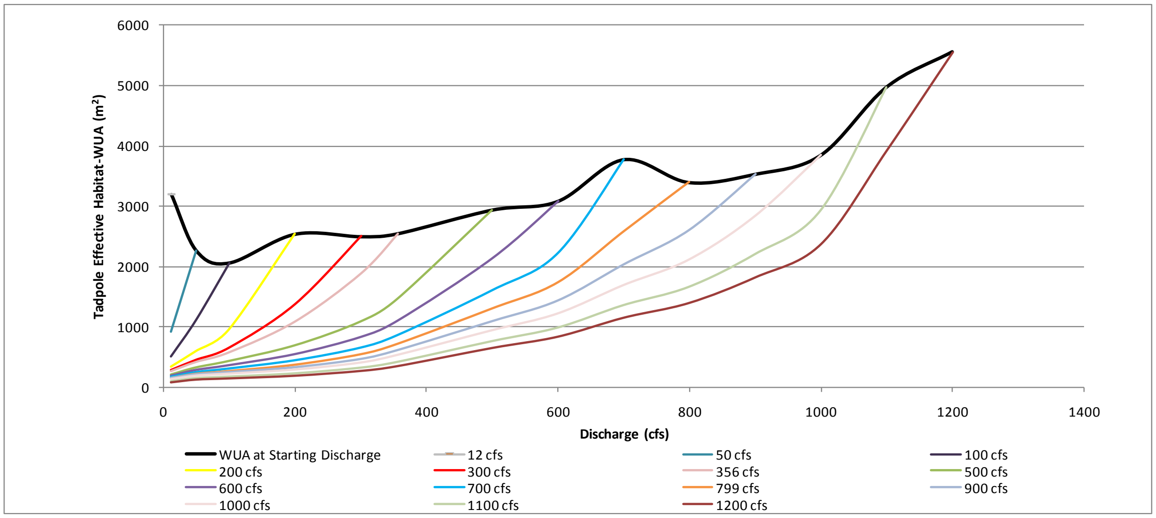

Figure 6.3.1-65. Graphical effective habitat for FYLF tadpole lifestage at the Chicago Park Powerhouse Reach River2D Site on the Bear River.

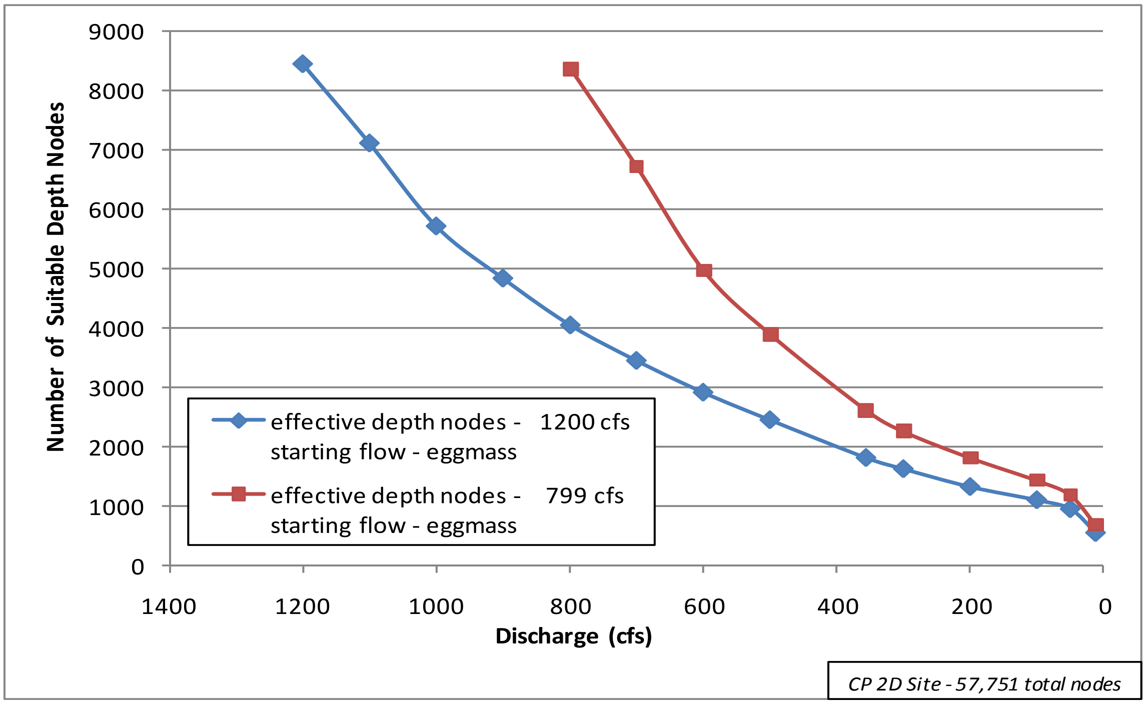

Figure 6.3.1-66. Effective Depth Suitability for FYLF egg mass life stage at the Chicago Park Powerhouse Reach River2D Site on the Bear River.

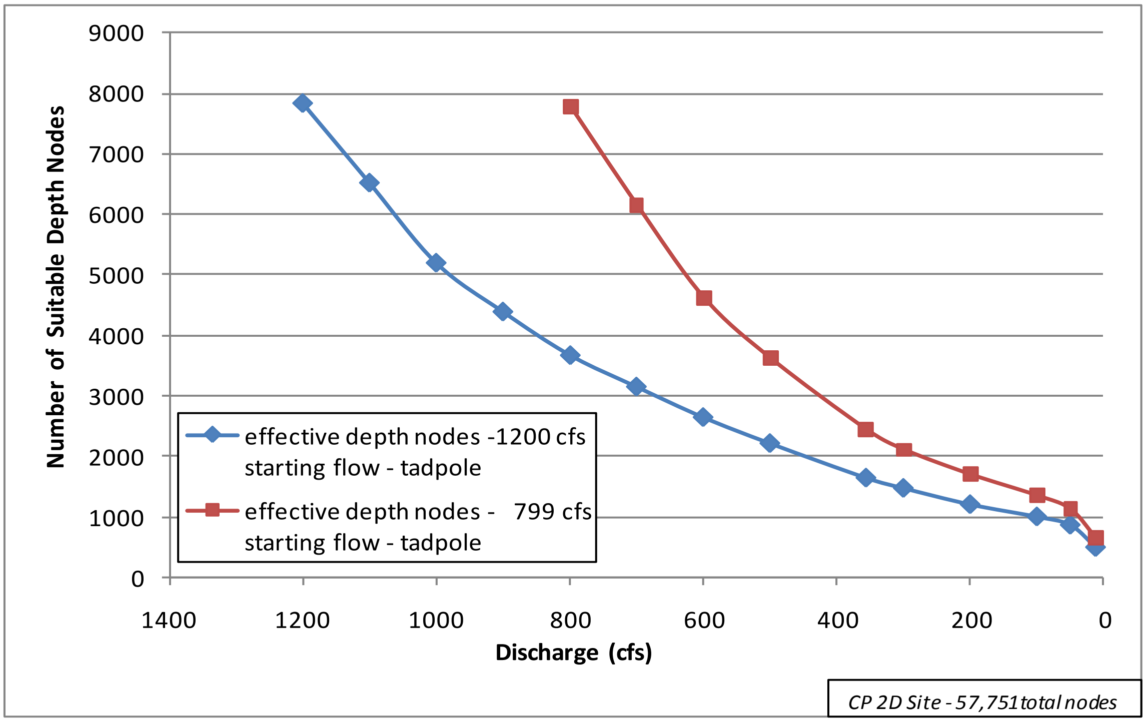

Figure 6.3.1-67. Effective Depth Suitability for FYLF tadpole life stage at the Chicago Park Powerhouse Reach River2D Site on the Bear River.

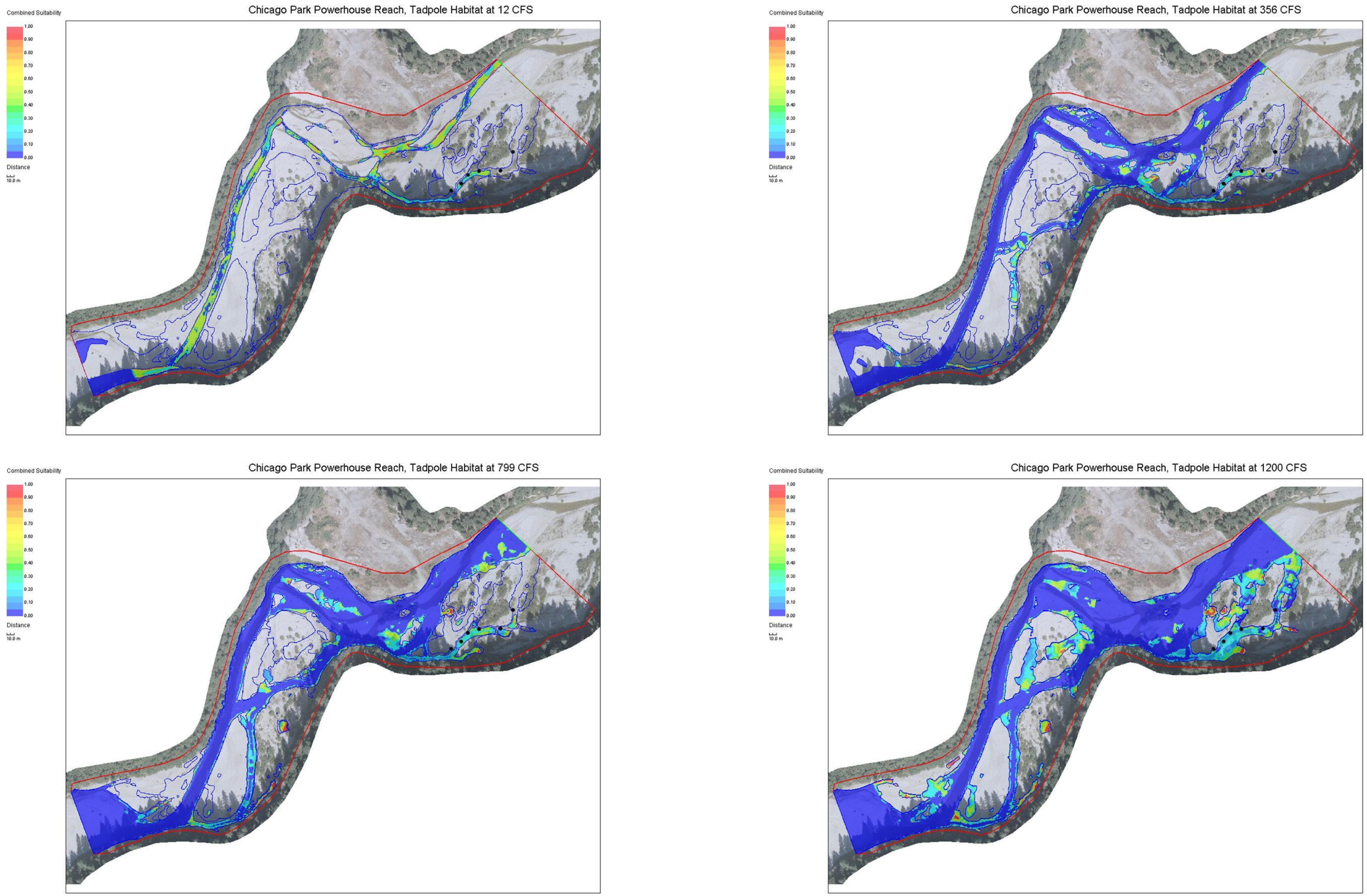

Figure 6.3.1-68. FYLF tadpole habitat distribution at four flow scenarios in the Chicago Park Powerhouse Reach River 2D Site in the Bear River. Black dot represents tadpole observation.

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Bear River Canal Diversion Dam Reach (Bear River)

The modeling site on the Bear River Canal Diversion Dam Reach appears to mainly have substrate limitations for successful breeding. The substrate composition of the modeling site is dominated by gravels, with only small pockets of the highly suitable boulder and cobble substrate classes. FYLF survey results suggest that FYLF breeding on the Bear River Canal Diversion Dam Reach is infrequent and suitable low velocity edgewater habitat was limited in extent at survey sites. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Bear River Canal Diversion Dam Reach.

Table 6.3.1-30. Tabular Effective Habitat for FYLF egg mass lifestage at the Bear River Canal Diversion Dam Reach River2D Site on the Bear River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA											Percent Effective WUA From Starting to Ending Flow
	938	750	550	354	275	200	127	100	70	40	16	
938	94	79	58	24	21	19	14	12	9	1	0	0.3%
750		182	129	43	32	27	20	17	13	1	1	0.3%
550			276	131	95	72	49	42	33	5	4	1.3%
354				344	274	222	168	142	112	21	15	4.5%
275					412	323	246	207	164	29	21	5.1%
200						513	379	321	255	47	33	6.4%
127							609	513	413	78	56	9.2%
100								671	538	101	73	10.8%
70									698	139	99	14.2%
40										738	532	72.1%
16											787	100.0%

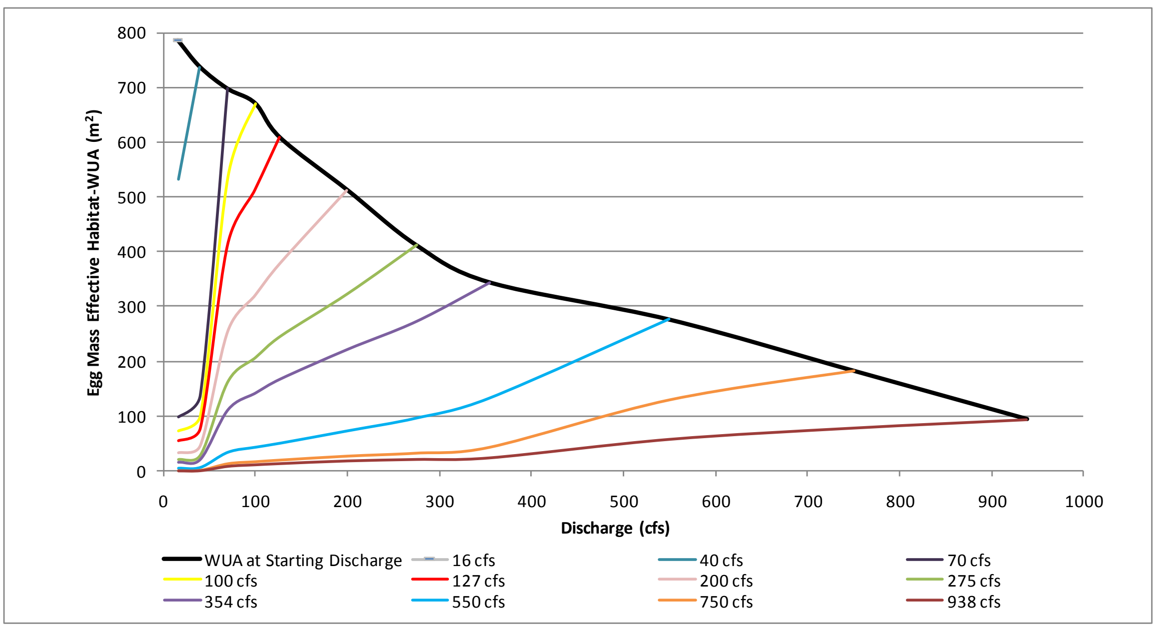

Figure 6.3.1-69. Graphical Effective Habitat for FYLF egg mass lifestage at the Bear River Canal Diversion Dam Reach River2D Site on the Bear River

Table 6.3.1-31. Tabular Effective Habitat for FYLF tadpole lifestage at the Bear River Canal Diversion Dam Reach River2D Site on the Bear River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA											Percent Effective WUA From Starting to Ending Flow
	938	750	550	354	275	200	127	100	70	40	16	
938	70	56	34	12	11	10	7	7	5	1	0	0.4%
750		157	113	28	20	16	10	9	7	1	0	0.3%
550			250	96	63	42	25	20	15	3	2	0.8%
354				289	222	165	112	88	61	13	9	3.1%
275					347	268	183	148	107	21	14	4.1%
200						437	303	247	185	36	24	5.4%
127							549	457	355	68	46	8.5%
100								584	459	89	61	10.4%
70									642	122	83	12.8%
40										647	436	67.5%
16											643	100.0%

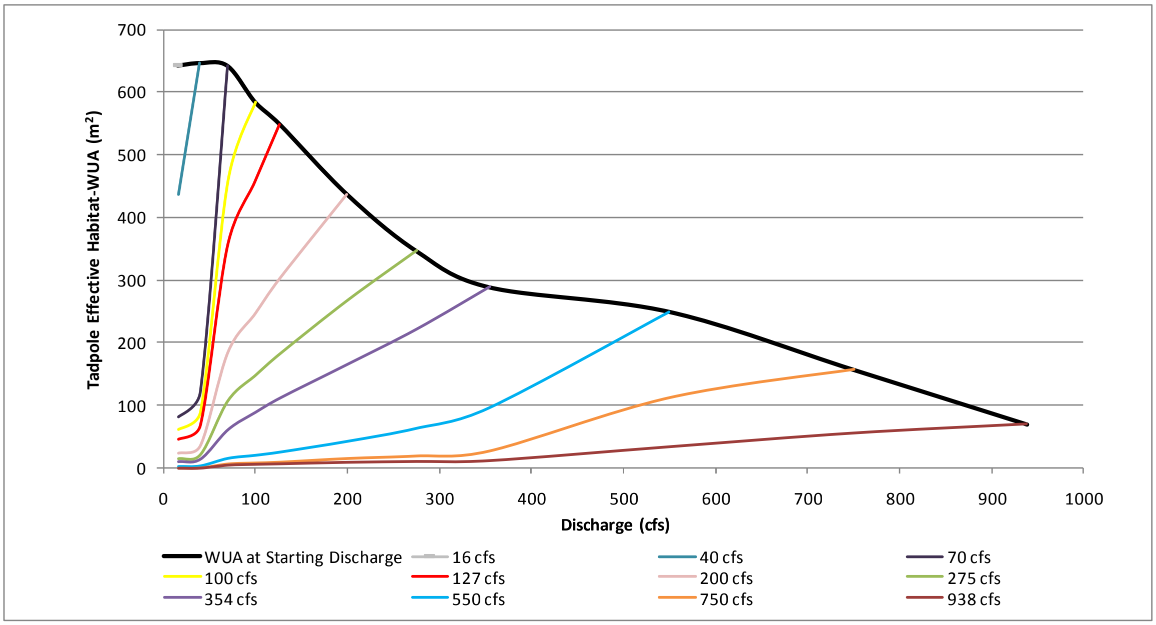

Figure 6.3.1-70. Graphical Effective Habitat for FYLF tadpole lifestage at the Bear River Canal Diversion Dam Reach River2D Site on the Bear River.

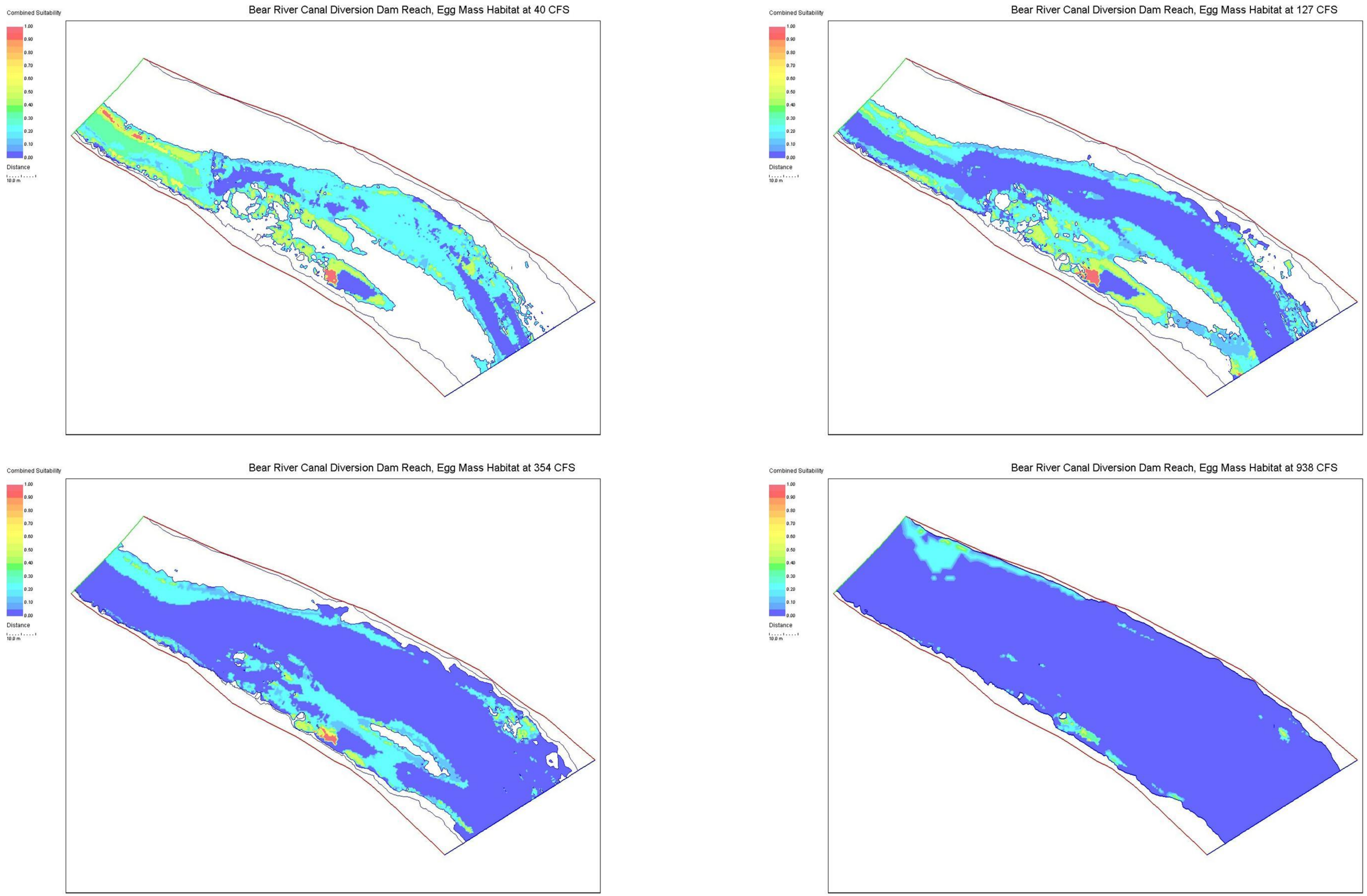

Figure 6.3.1-71. FYLF egg mass habitat distribution at four flow scenarios in the Bear River Canal Diversion Dam Reach River 2D Site in the Bear River.

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Bowman-Spaulding Diversion Dam Reach (Canyon Creek)

In the Bowman-Spaulding Diversion Dam Reach of Canyon Creek, the modeling site shows substantial areas of suitable FYLF breeding and rearing habitat at the lower modeled flows, which becomes less suitable and increasingly restricted to narrow bands of habitat along the stream margins as flows increase. Substrate at the modeling site is suitable, predominately cobbles and boulders. FYLF was only documented by surveys in the lower part of the Bowman-Spaulding Diversion Dam Reach. Suitable habitats for FYLF are limited by stream geomorphology and are discontinuously distributed, separated by steep canyons with falls, cascades, and deep plunge pools. The hydrology of the reach is not greatly influenced by accretion, which is limited. Large releases occur in some years during the FYLF breeding and early rearing period, due to imperfect weather forecasting and snowpack runoff predictions, and physical limitations of Project facilities. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Bowman-Spaulding Diversion Dam Reach (Canyon Creek).

Table 6.3.1-32. Tabular Effective Habitat for FYLF egg mass lifestage at the Bowman-Spaulding Diversion Dam Reach River2D Site in Canyon Creek.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA								Percent Effective WUA From Starting to Ending Flow
	373	260	150	110	70	27	17	10	
373	174	115	65	54	43	29	25	21	12.3%
260		162	99	83	65	44	37	31	18.9%
150			178	150	125	93	79	66	37.3%
110				203	170	130	114	99	48.7%
70					263	206	184	163	62.2%
27						333	297	262	78.5%
17							371	330	88.9%
10								381	100.0%

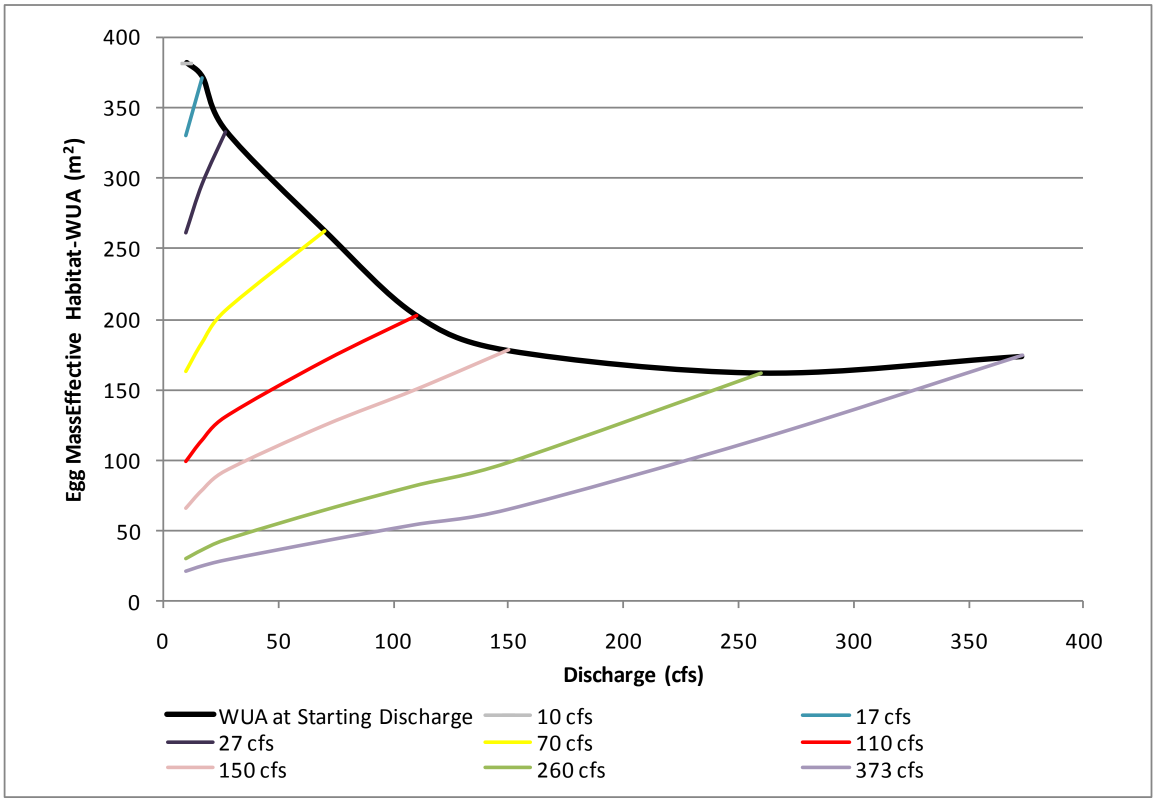

Figure 6.3.1-72. Graphical Effective Habitat for FYLF egg mass lifestage at the Bowman-Spaulding Diversion Dam Reach River2D Site in Canyon Creek.

Table 6.3.1-33. Tabular Effective Habitat for FYLF tadpole lifestage at the Bowman-Spaulding Diversion Dam Reach River2D Site in Canyon Creek.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA								Percent Effective WUA From Starting to Ending Flow
	373	260	150	110	70	27	17	10	
373	151	93	41	31	25	18	15	13	8.7%
260		136	69	54	38	24	21	18	13.3%
150			131	105	80	53	42	35	26.4%
110				148	117	81	68	55	37.1%
70					188	139	119	101	53.4%
27						249	215	184	73.8%
17							263	226	85.8%
10								285	100.0%

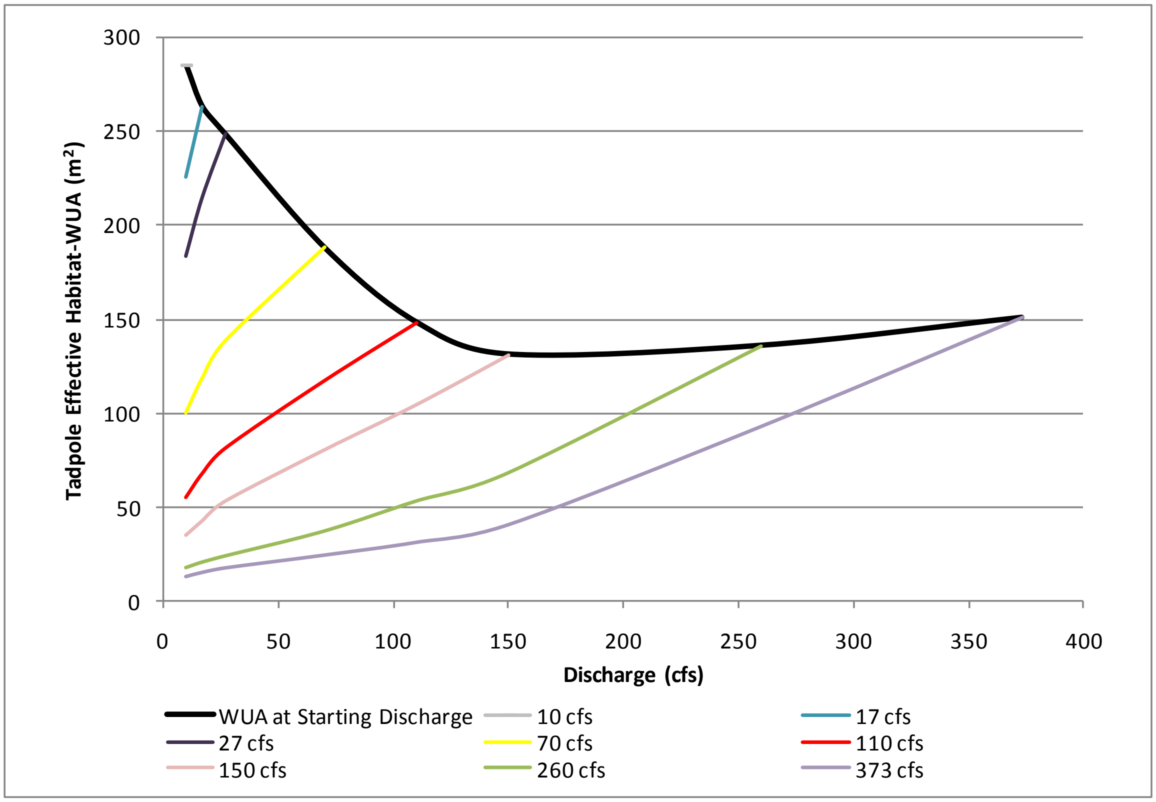

Figure 6.3.1-73. Graphical Effective Habitat for FYLF tadpole lifestage at the Bowman-Spaulding Diversion Dam Reach River2D Site in Canyon Creek.

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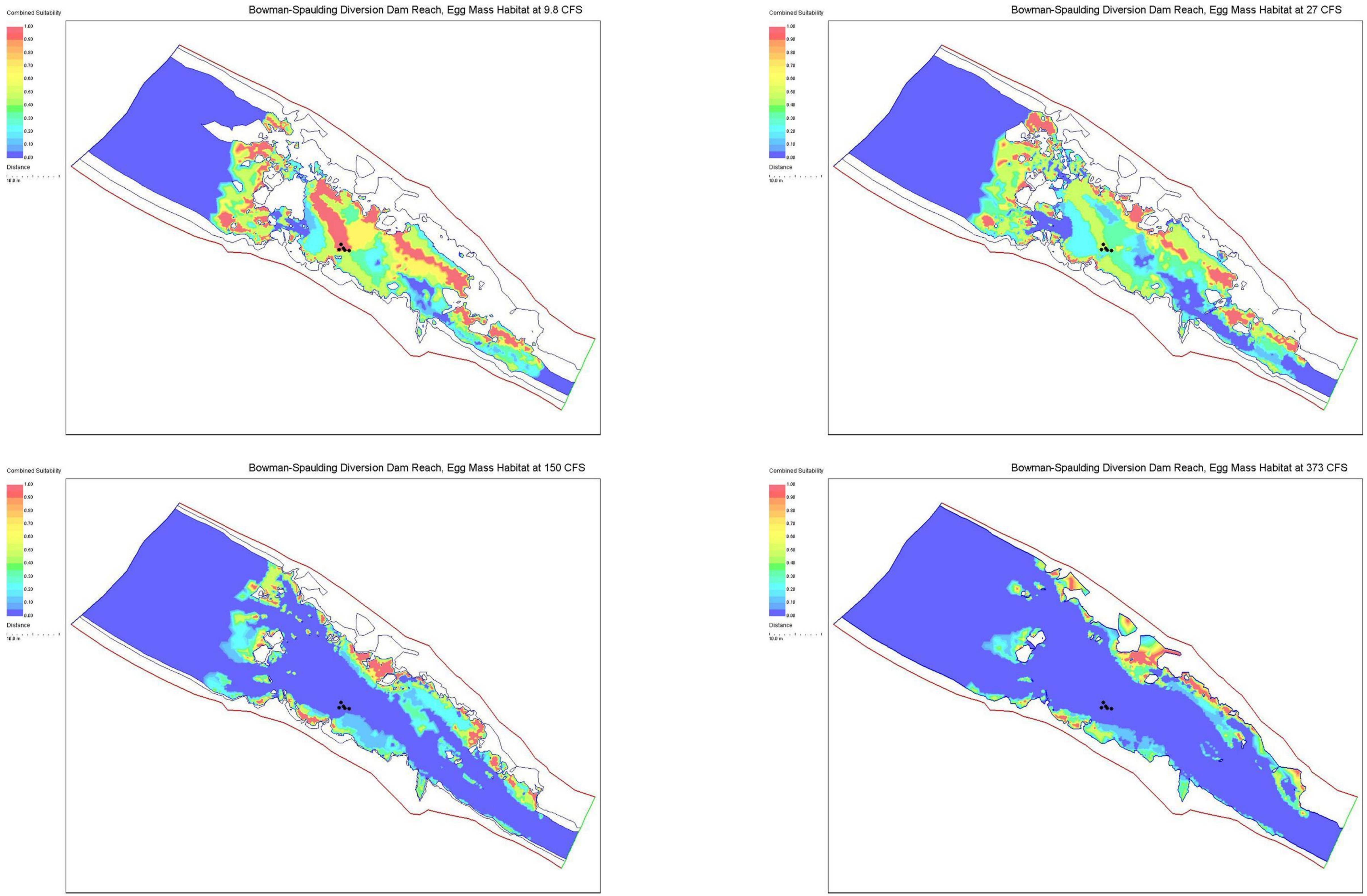

Figure 6.3.1-74. FYLF egg mass habitat distribution at four flow scenarios in the Bowman-Spaulding Diversion Dam Reach River 2D Site in Canyon Creek. Black dot represents egg mass observation.

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Jordan Creek Reach (South Yuba River)

The modeling site in Jordan Creek Reach of the South Yuba River was 74 m long and located at RM 33.4, which is 7.7 miles downstream of Lake Spaulding Dam and upstream of the confluence with Canyon Creek. The site is characterized by large areas of suitable FYLF breeding and rearing habitat at the lower modeled flows. As flows increase, habitat suitability is lost except for narrow bands of habitat along the stream margins. Substrate is suitable, predominately boulders and cobbles. FYLF breeding is known to occur at numerous locations over a long distance of at least 25 miles beginning at about 3,260 ft elevation and continuing downstream. As such, the influence of accretion on flows varies greatly. The hydrology of the reach includes large releases in some years during the FYLF breeding and early rearing period, due to imperfect weather forecasting and snowpack runoff predictions, and physical limitations of Project facilities. Potential FYLF habitat in the South Yuba River is generally patchy in distribution and predominantly associated with alluvial deposits, separated by stretches of less suitable habitats (e.g., boulder/bedrock confined stretches with a paucity of smaller substrates). However, at some locations, FYLF bred almost entirely in relatively deep, boulder-dominated pools. As indicated, other factors influencing habitat conditions on the South Yuba River include high levels of recreation in some areas and the presence of bullfrogs and crayfish. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Jordan Creek Reach. Although the headings imbedded in Figure 6.2.1-77 state that the figures apply to South Yuba Reaches #1-6, the results that are specifically reflected in the figures show the egg mass habitat distribution at four flow scenarios at the Jordan Creek Reach River2D FYLF modeling site.

Table 6.3.1-34. Tabular Effective Habitat for FYLF egg mass lifestage at the Jordan Creek Reach River2D Site on the South Yuba River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA												Percent Effective WUA From Starting to Ending Flow
	1,512	**1,200**	**900**	**605**	**450**	**350**	**250**	**121**	**80**	**50**	**15**	**6**	
1,512	119	90	68	43	30	24	18	10	7	4	2	1	0.9%
1,200		149	109	69	48	38	28	17	12	8	3	2	1.5%
900			185	118	84	66	51	30	22	17	8	6	3.0%
605				205	154	126	104	63	48	38	23	17	8.2%
450					235	195	161	100	78	61	37	28	11.8%
350						259	216	137	110	88	51	38	14.7%
250							289	184	151	122	71	53	18.2%
121								364	308	260	170	130	35.8%
80									426	361	248	197	46.2%
50										482	346	281	58.3%
15											548	456	83.3%
6												541	100.0%

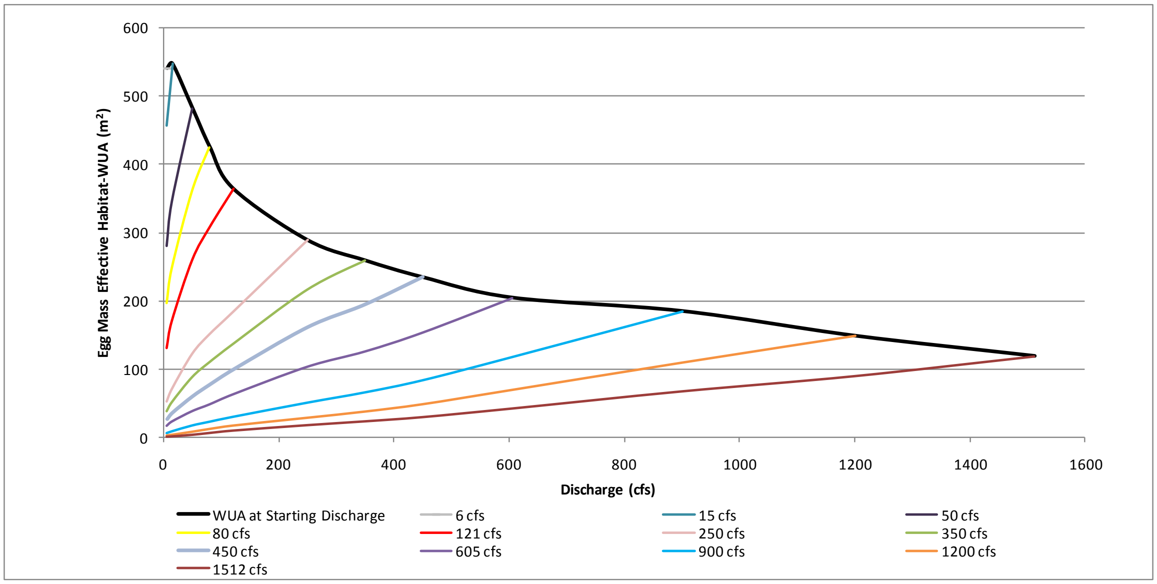

Figure 6.3.1-75. Graphical Effective Habitat for FYLF egg mass lifestage at the Jordan Creek Reach River2D Site on the South Yuba River.

Table 6.3.1-35. Tabular Effective Habitat for FYLF tadpole lifestage at the Jordan Creek Reach River2D Site on the South Yuba River.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA												Percent Effective WUA From Starting to Ending Flow
	1,512	1,200	900	605	450	350	250	121	80	50	15	6	
1,512	86	61	40	23	18	15	11	7	5	3	1	1	0.6%
1,200		117	79	43	27	22	18	11	8	6	3	2	1.6%
900			147	84	51	37	29	18	13	10	5	4	2.4%
605				163	110	86	64	37	30	24	15	11	7.0%
450					175	138	107	54	44	36	23	18	10.4%
350						194	152	80	58	47	30	24	12.3%
250							211	117	88	65	42	32	15.3%
121								280	225	182	101	72	25.7%
80									337	278	169	120	35.7%
50										384	250	188	49.1%
15											441	350	79.4%
6												465	100.0%

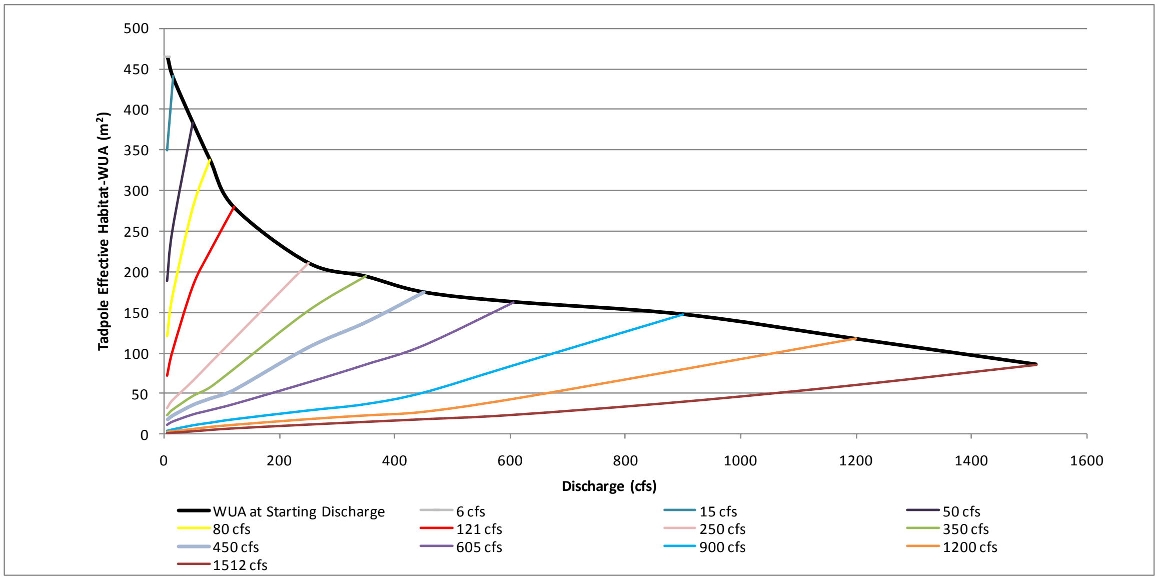

Figure 6.3.1-76. Graphical effective habitat for FYLF tadpole lifestage at the Jordan Creek Reach River2D Site on the South Yuba River.

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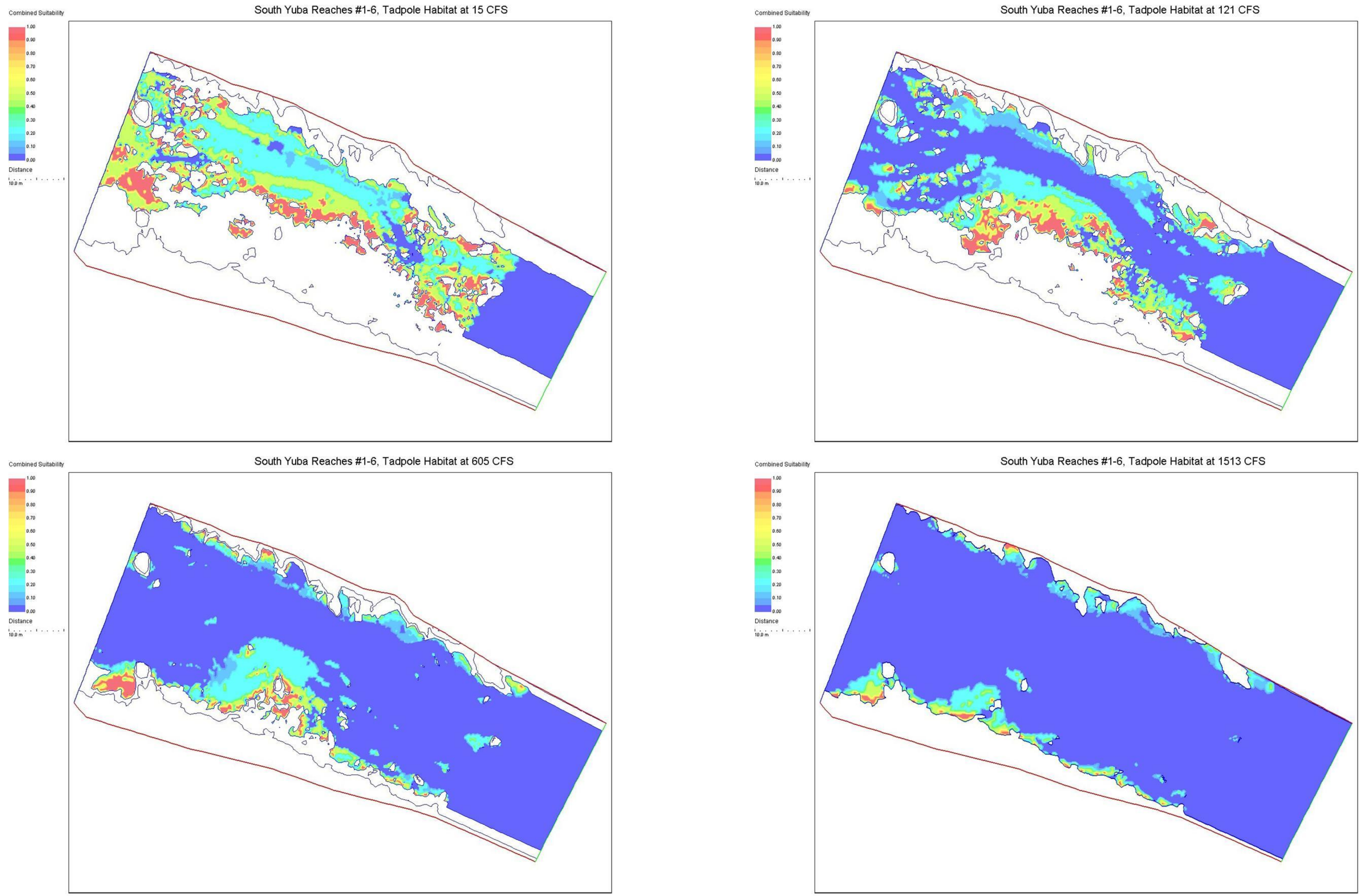

Figure 6.3.1-77. FYLF egg mass habitat distribution at four flow scenarios in the Jordan Creek Reach (River 2D Site in the South Yuba River. (Although the headings imbedded in this figure state that the figures apply to South Yuba Reaches #1-6, the results that are specifically reflected in the figures show the egg mass habitat distribution at four flow scenarios at the River2D FYLF modeling site in Jordan Creek Reach.)

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Bear River Reach #2 (Bear River), Drum Afterbay Dam Reach (Bear River) and Towle Canal Diversion Dam Reach (Canyon Creek)

The three remaining stream reaches addressed by the FYLF modeling study, Bear River Reach #2, Drum Afterbay Dam Reach (Bear River), and Towle Canal Diversion Dam Reach (Canyon Creek), were modeled using existing 1D PHABSIM transects, as specified in the approved study plan, to portray the relationship of habitat suitability to flows. The results indicate that areas that meet the habitat suitability criteria occur in each of these reaches under the existing flow regimes. Flows are higher in summer in each reach than would occur under unimpaired conditions, but are usually stable. The scarcity of FYLF in Drum Afterbay Dam Reach and Towle Canal Diversion Dam Reach, with no evidence of breeding, and absence of FYLF in Bear River Reach #2 may be explained by other factors. Suitable habitats were limited in extent (i.e., few edgewater/low-velocity areas) and persistently low water temperatures were noted in Bear River Reach #2 and Drum Afterbay Dam Reach, conditions not conducive to embryonic and tadpole growth and development. Habitats were also limited to small pools and edgewater in the Towle Canal Diversion Dam Reach, a relatively small stream. Provided below are study results regarding Effective Habitat, Effective Velocity Suitability and Habitat Distributions for the Bear River Reach #2, Drum Afterbay Dam Reach and Towle Canal Diversion Dam Reach.

Table 6.3.1-36. Tabular Effective Habitat for FYLF egg mass lifestage for the Bear River Reach #2 – Meadow Sub-reach 1D PHABSIM.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	137	64	30	13	5	
137	2,204	1,858	1,364	1,114	781	35.4%
64		3,201	2,401	1,854	1,402	43.8%
30			5,206	4,352	3,636	69.8%
13				7,174	5,917	82.5%
5					9,243	100.0%

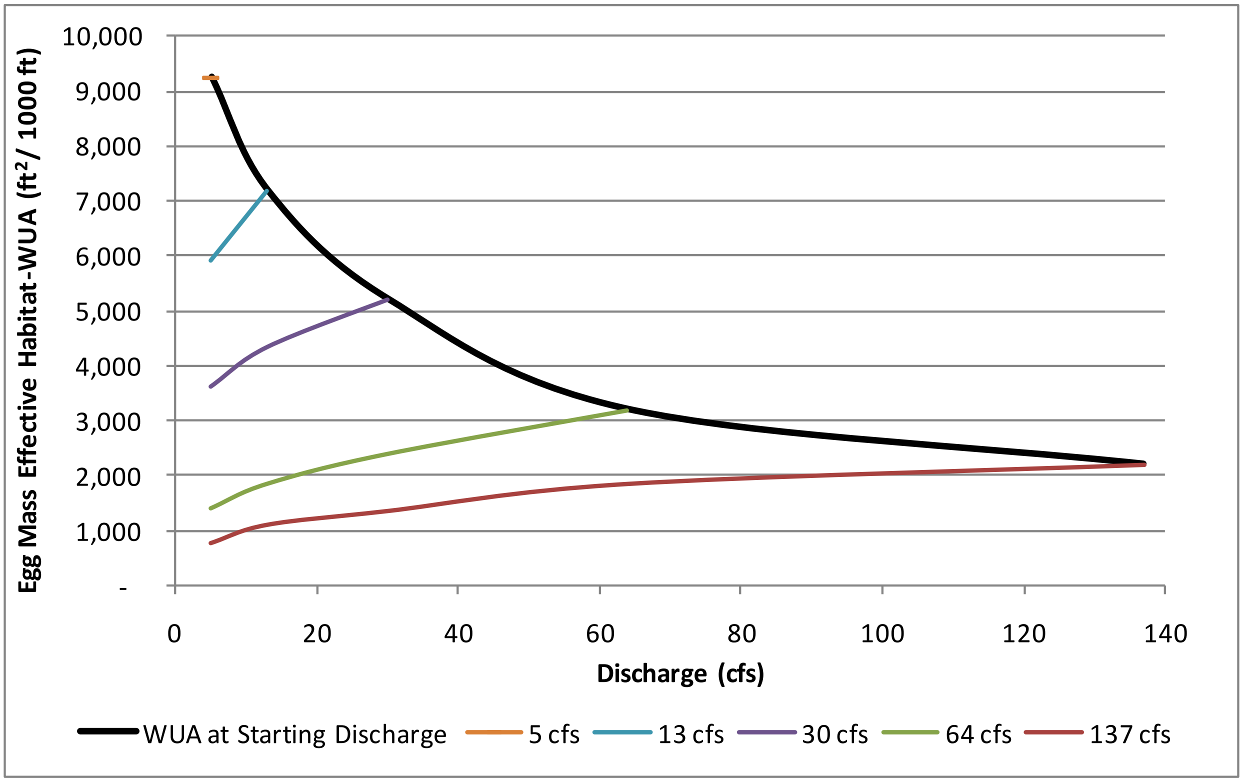

Figure 6.3.1-78. Graphical Effective Habitat for FYLF egg mass lifestage for the Bear River Reach #2 – Meadow Sub-reach 1D PHABSIM.

Table 6.3.1-37. Tabular Effective Habitat for FYLF tadpole lifestage for the Bear River Reach #2 – Meadow Sub-reach 1D PHABSIM.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	137	64	30	13	5	
137	1,700	1,295	912	699	459	27.0%
64		2,448	1,823	1,424	962	39.3%
30			4,049	3,238	2,484	61.3%
13				5,746	4,527	78.8%
5					7,387	100.0%

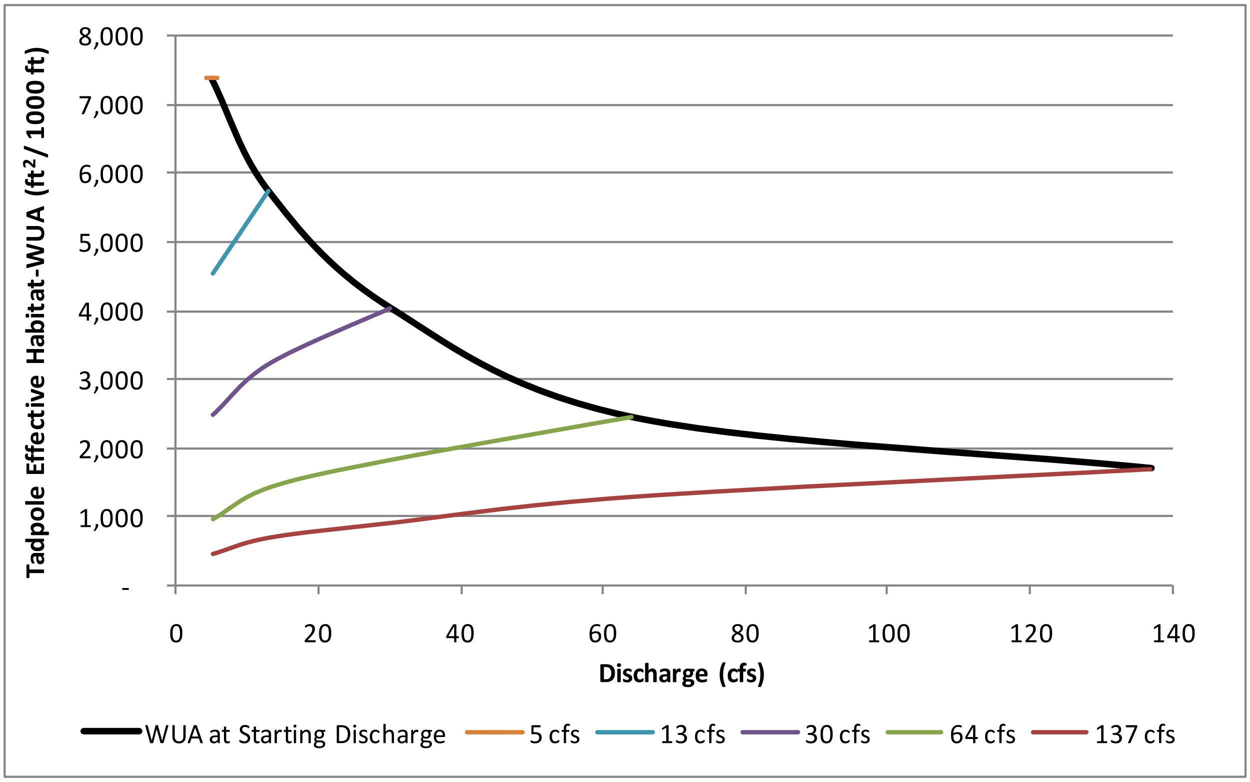

Figure 6.3.1-79. Graphical Effective Habitat for FYLF tadpole lifestage for Bear River Reach #2 – Meadow Sub-reach 1D PHABSIM.

Table 6.3.1-38. Tabular Effective Habitat for FYLF egg mass lifestage for the Bear River Reach #2 – Boardman Sub-reach 1D PHABSIM.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	137	64	30	13	5	
137	4,106	2,903	2,319	1,939	1,506	36.7%
64		5,002	3,857	3,185	2,395	47.9%
30			7,313	5,936	4,379	59.9%
13				9,517	6,847	71.9%
5					11,313	100.0%

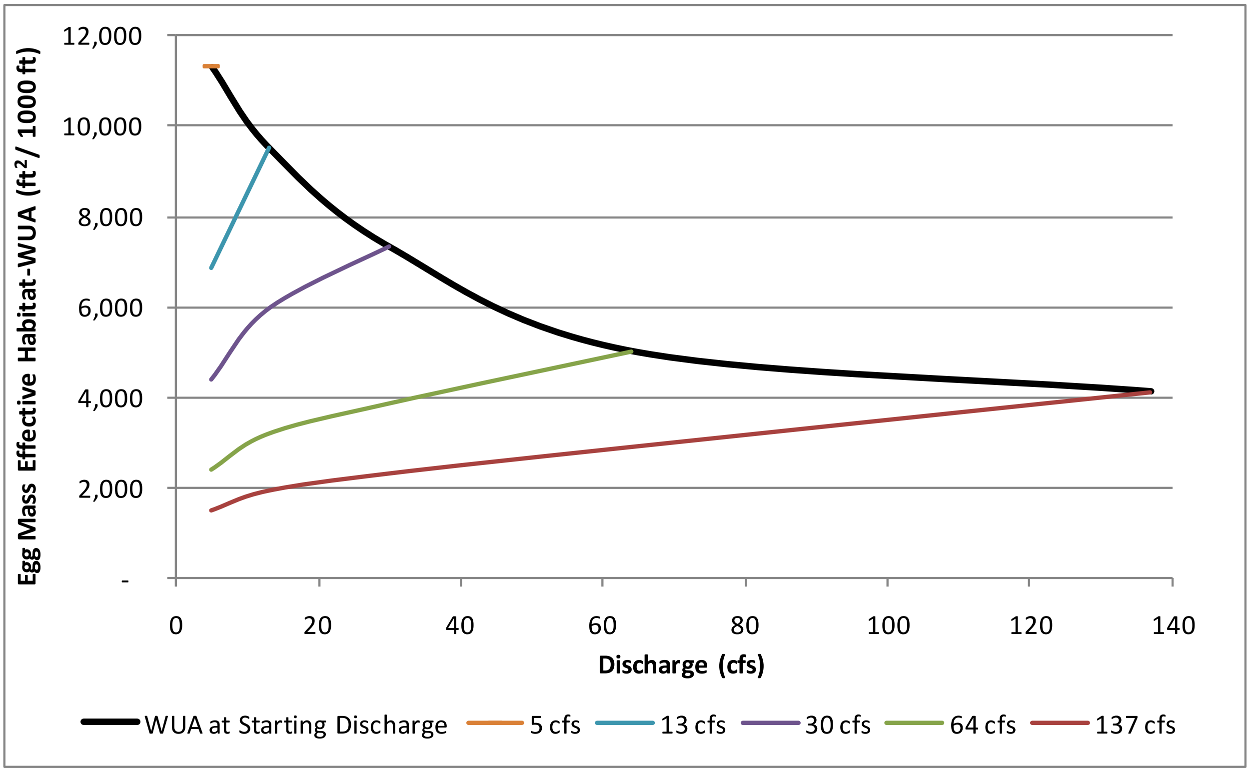

Figure 6.3.1-80. Graphical Effective Habitat for FYLF egg mass lifestage for the Bear River Reach #2 – Boardman Sub-reach 1D PHABSIM.

Table 6.3.1-39. Tabular Effective Habitat for FYLF tadpole lifestage for the Bear River Reach #2 – Boardman Sub-reach 1D PHABSIM.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	137	64	30	13	5	
137	3,359	2,213	1,683	1,350	1,022	30.4%
64		4,237	3,089	2,475	1,894	44.7%
30			5,943	4,665	3,419	57.5%
13				8,378	5,940	70.9%
5					9,681	100.0%

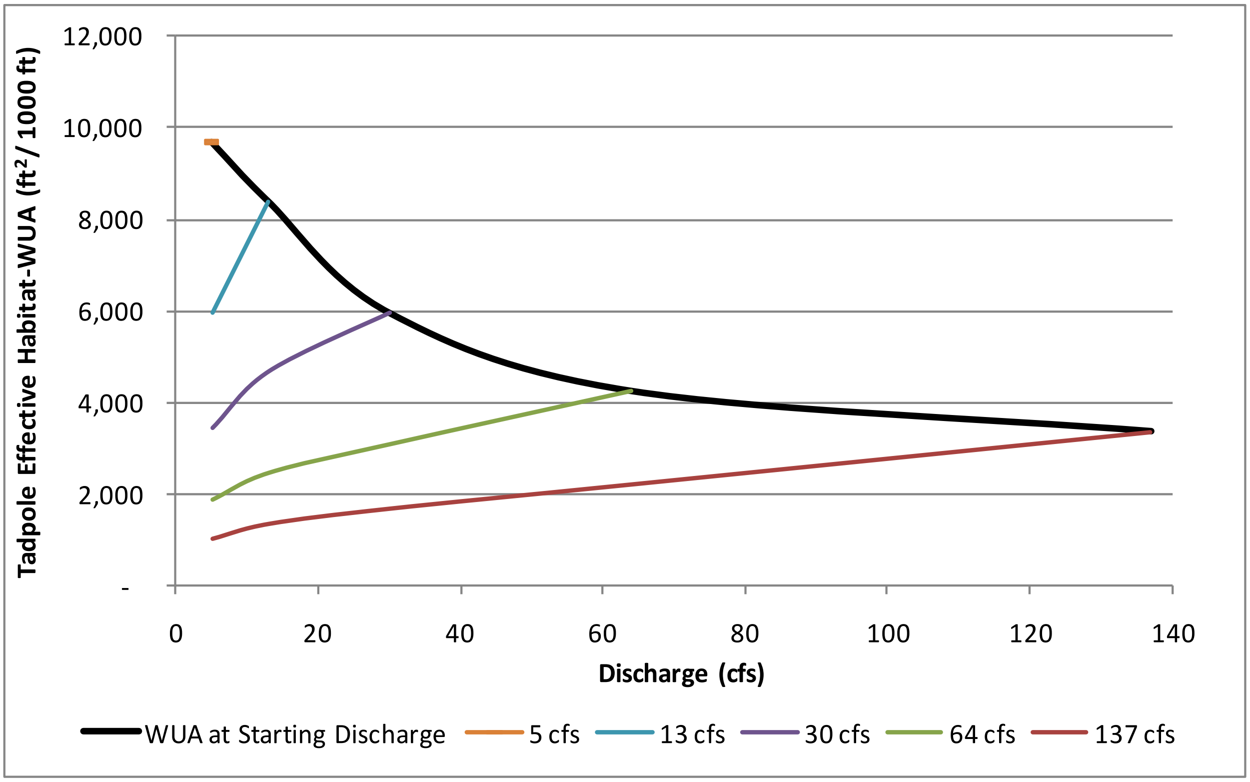

Figure 6.3.1-81. Graphical Effective Habitat for FYLF tadpole lifestage for Bear River Reach #2 – Boardman Sub-reach 1D PHABSIM.

Table 6.3.1-40. Tabular Effective Habitat for FYLF egg mass lifestage for Drum Afterbay Dam Reach 1D PHABSIM.

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	97	40	25	13	5	
97	3,011	2,198	1,881	1,579	1,335	44.3%
40		4,771	3,933	3,427	2,828	59.3%
25			6,577	5,751	5,059	76.9%
13				7,990	6,992	87.5%
5					10,446	100.0%

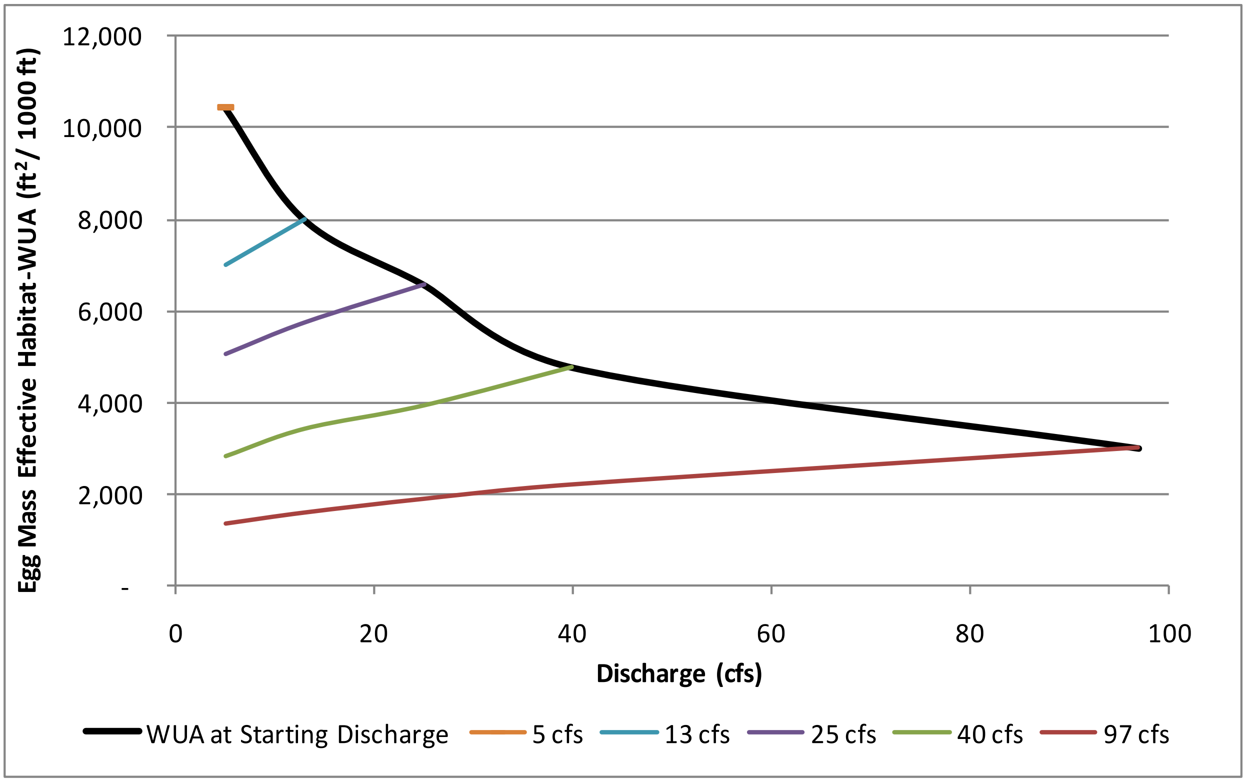

Figure 6.3.1-82. Graphical Effective Habitat for FYLF egg mass lifestage for Drum Afterbay Dam Reach 1D PHABSIM (Bear River).

Table 6.3.1-41. Tabular Effective Habitat for FYLF tadpole lifestage for Drum Afterbay Dam Reach 1D PHABSIM (Bear River).

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	97	40	25	13	5	
97	2,505	1,651	1,349	1,107	886	44.3%
40		3,551	2,904	2,261	1,763	59.3%
25			4,970	4,094	3,361	76.9%
13				6,908	5,792	87.5%
5					8,774	100.0%

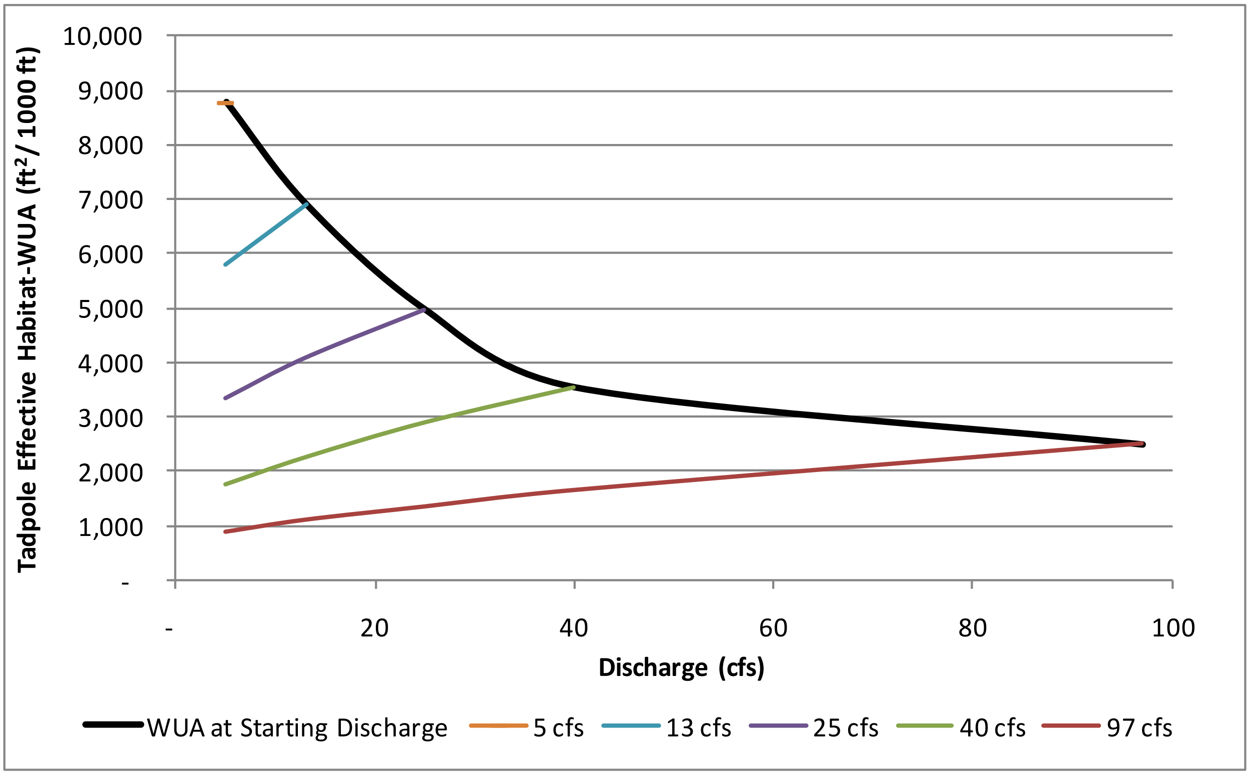

Figure 6.3.1-83. Graphical Effective Habitat for FYLF tadpole lifestage for Drum Afterbay Dam Reach 1D PHABSIM (Bear River).

Table 6.3.1-42. Tabular Effective Habitat for FYLF egg mass lifestage for Towle Canal Diversion Dam Reach 1D PHABSIM (Bear River).

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	25	16	9	2	1	
25	1,833	1,434	1,252	930	823	44.9%
16		2,005	1,671	1,228	1,100	54.9%
9			2,743	1,978	1,757	64.0%
2				3,688	3,117	84.5%
1					3,539	100.0%

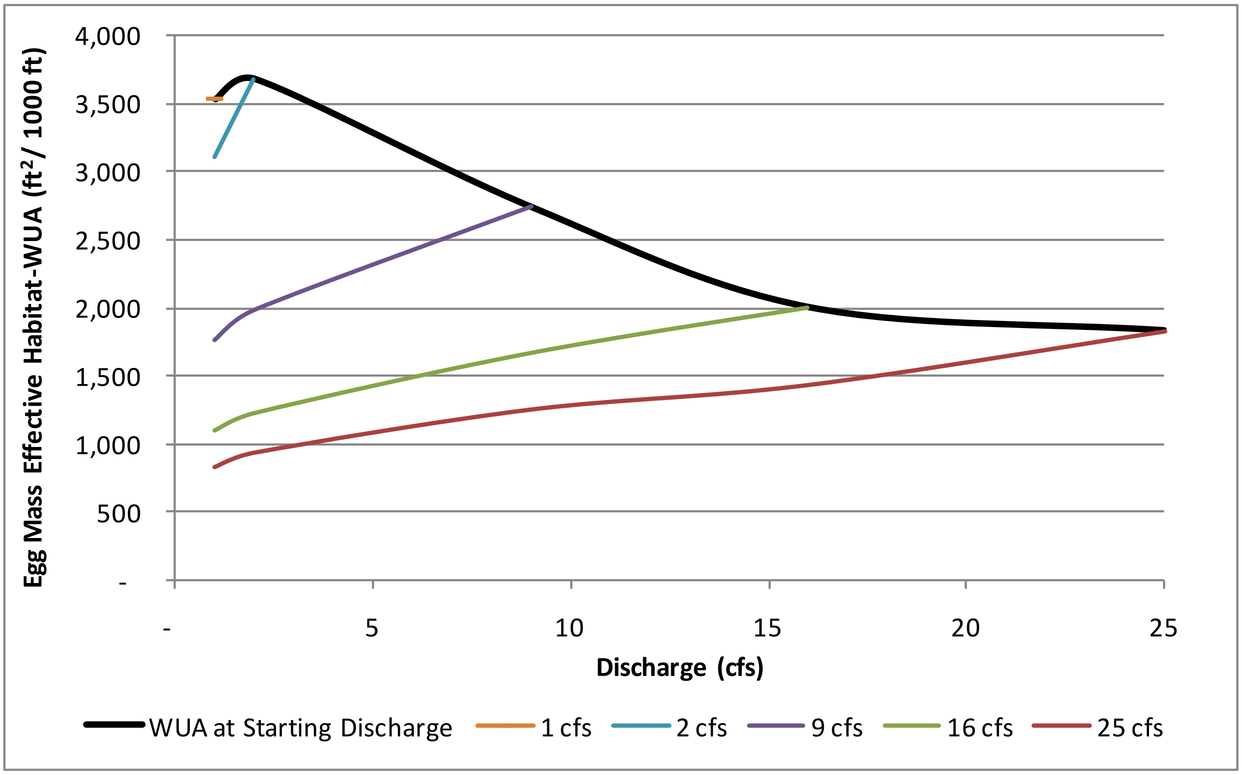

Figure 6.3.1-84. Graphical Effective Habitat for FYLF egg mass lifestage for Towle Canal Diversion Dam Reach 1D PHABSIM (Canyon Creek, tributary to NFNFAR).

Table 6.3.1-43. Tabular Effective Habitat for FYLF tadpole lifestage for Towle Canal Diversion Dam Reach 1D PHABSIM (Canyon Creek, tributary to NFNFAR).

Starting Discharge (cfs)	Ending discharge (cfs) and Corresponding Effective WUA					Percent Effective WUA From Starting to Ending Flow
	25	16	9	2	1	
25	1,545	1,240	1,004	804	657	42.6%
16		1,816	1,510	1,095	886	48.8%
9			2,483	1,736	1,423	57.3%
2				3,383	2,792	82.6%
1					3,629	100.0%

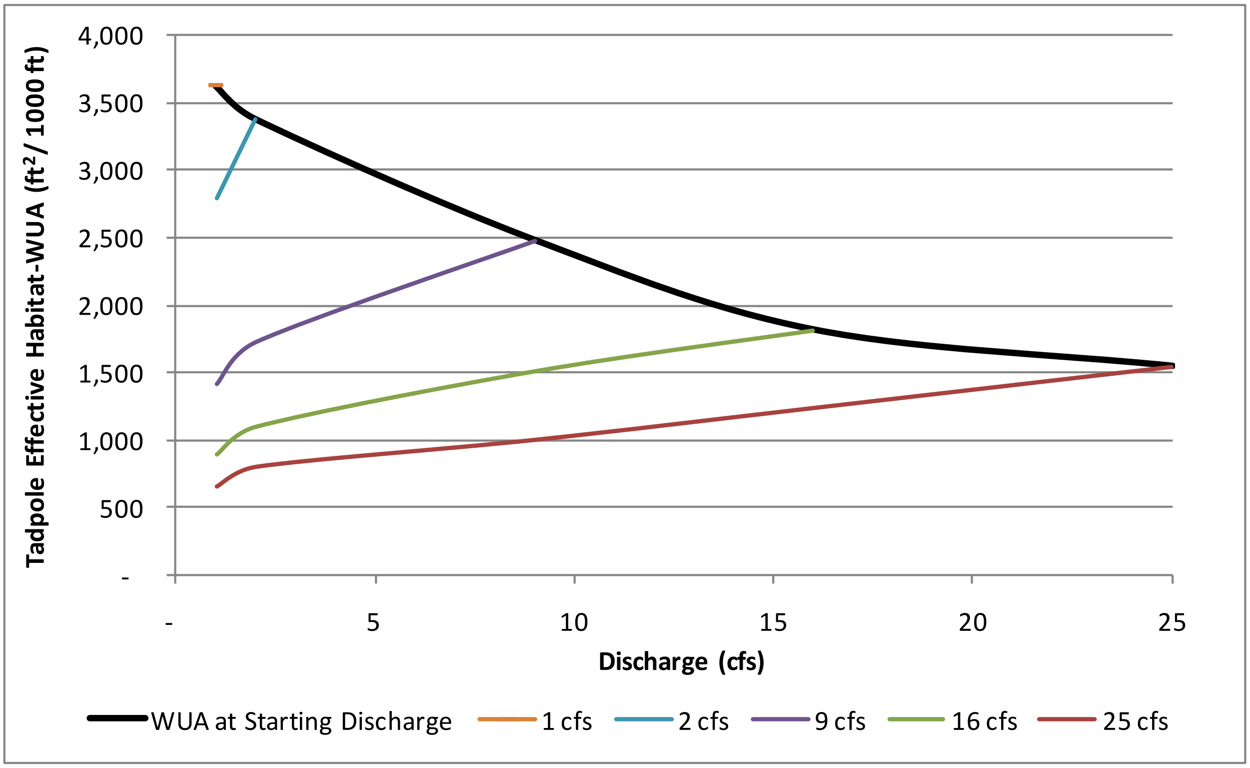

Figure 6.3.1-85. Graphical Effective Habitat for FYLF tadpole lifestage for Towle Canal Diversion Dam Reach 1D PHABSIM.

6.3.1.2.2.3 Sierra Nevada Yellow Legged Frog

SNYLF has been documented near six project reservoirs: French Lake, Faucherie Lake, Fordyce Lake, Lake Sterling, Meadow Lake and White Rock Lake.

In 2009, Licensees conducted habitat assessments for SNYLF at 55 locations within the vicinity of 15 project reservoirs and at 57 stream locations. The area surveyed included ponds of various size and seasonality, and emergent edges of four reservoirs. In 2010, Licensees assessed six additional stream locations and one project reservoir location not assessed in 2009, and repeated surveys at one project reservoir location assessed in 2009. For a detailed discussion of Licensees' study, refer to Licensees' Special-Status Amphibians - SNYLF technical memorandum (3-8) in Appendix E12 of this Exhibit E.

SNYLP was not found except at three sub-sties south of the Yuba-Bear Hydroelectric Project's French Lake. The detections consisted of two adults in a permanent pond with deep pools, a recently metamorphosed juvenile in a large permanent pond, and two sub-adults in a pool of an intermittent stream below the ponds. The ponds are deep with shallow edges, appear to hold water permanently, and are evidently fish-free. The stream was observed to be dry 0.1 mile before reaching the reservoir on August 19, 2009, but flowed continuously to French Lake on July 14, 2010. Licensees found a waterfall that apparently constitutes an upstream barrier to fish movement from French Lake. SNYLF had been found previously by CDFG at two of the ponds; however, previous observations were limited to adults.

Other ponds with habitat characteristics favorable for SNYLF occur about 0.1 mi from Jackson Meadows Reservoir, 0.06 mi northwest of Faucherie Lake and 0.4 mi west of Meadow Lake.

Of the stream reaches that were surveyed, only a few have shallow, vegetated habitat suitable for SNYLF egg mass placement and use by tadpoles, as well as deeper, over-wintering habitats. Stream reaches with these characteristics include Sawmill Lake Dam Reach and Upper South Yuba Reach #2; however, all of the stream reaches that were surveyed contained one or more species of predatory fish, which likely diminishes potential habitat quality for SNYLF.

6.3.1.3 Aquatic Turtles

6.3.1.3.1 Special-Status Aquatic Turtle Species

One special-status turtle (Class Chelonia)[13] occurs in the vicinity of the two projects, western pond turtle (WPT), (*Emys* [*Actinemys*] [formerly *Clemmys*] *marmorata*). The WPT occurs in a wide variety of aquatic habitats up to 6,000 ft in elevation, particularly permanent ponds, lakes, side channels, backwaters, and pools of streams, but is uncommon in high-gradient streams (Jennings and Hayes 1994). WPT has declined due to loss of habitat, introduced species, and historical over-collection (Jennings and Hayes 1994), and is considered a Sensitive Species by the Forest Service and designated by CDFG as a Species of Special Concern.

Isolated occurrences of WPT in lakes and reservoirs sometimes occur from deliberate releases of pets. Although highly aquatic, WPT often overwinters in forested habitats and lay eggs in shallow nests in sandy or loamy soil in summer at upland sites as much as 1,200 ft from aquatic habitats (Jennings and Hayes 1994). Hatchlings do not typically emerge from the covered nests until the following spring. Reese and Welsh (1997) documented WPT away from aquatic habitats for as much as 7 months a year and suggested that terrestrial habitat use was at least in part a response to seasonal high flows. Basking sites are an important habitat element (Jennings and Hayes 1994) used to elevate body temperature for digestion. Basking substrates include rocks, logs, banks, emergent vegetation, root masses, and tree limbs (Reese undated). Terrestrial activities include basking, overwintering, nesting, and moving between ephemeral sources of water (Holland 1991). Breeding activity may occur year-round in California, but egg laying tends to peak in June and July in colder climates, when females begin to search for suitable nesting sites upslope from water. Adult WPT have been documented traveling long distances from perennial watercourses for both aestivation and nesting, with long-range movements to aestivation sites averaging about 820 feet, and nesting movements averaging about 295 feet (Rathbun et al. 2002). During the terrestrial period, Reese and Welsh (1997) found that radio-tracked WPT were burrowed in leaf litter. Introduced species of turtles (e.g., red-eared sliders

[13] Following the phylogeny adopted by The Center for North American Herpetology (www.cnah.org), turtles are assigned to the Class Chelonia, whereas the Class Reptilia is comprised of snakes, lizards, amphisbaenids, and rhynchocephalians. No special-status aquatic reptiles occur in the vicinity of the projects.

[*Trachemys scripta elegans*) may out-compete WPT for basking sites, and bullfrogs are known to consume hatchling WPT.

6.3.1.3.2 Turtle Distribution and Abundance

As part of the WPT Study in 2009 (NID and PG&E 2010j), Licensees mapped potentially suitable aquatic and nesting habitat for WPT, assembled WPT incidental observations reported during various relicensing studies, and evaluated Project canals in areas below 6,000 ft in elevation associated with reservoirs, afterbays, forebays, canals, and stream reaches. Refer to Licensees' Special-Status Aquatic Reptiles – WPT Technical Memorandum (3-9) and WPT Basking Technical Memorandum (3-14) in Appendix E12 of this Exhibit E for a detailed discussion of the studies.

Incidental sightings of WPT totaled 31 in 2008 and 2009. The majority of these sightings occurred at the following locations: Upper South Yuba Reach #2 (9 observations) and two ponds within 0.25 mi of Kelly Lake (10) in association with Licensees' Special-Status Amphibians – SNYLF Study (NID and PG&E 2010i).

Licensees' sightings and historical records from the Tahoe National Forest and other sources (CAS 2007, MVZ 2007, CDFG 2008b) are generally associated with ponds, small lakes, and low-gradient streams, which generally comports with the expected association of WPT to habitats exhibiting slow currents, warm water temperatures, ample basking substrates, and food sources. Conversely, WPT is unlikely to occur and was not generally documented in areas of low water temperature, fast currents, oligotrophic habitats, and areas with limited food resources. With the exception of Rock Creek Reservoir, Halsey Afterbay, and Wise Forebay, all small re-regulating reservoirs, suitable habitats to support WPT populations were not found within project impoundments. These necessary habitat elements include adequate basking substrates and the vegetated, and shallow water areas required by juvenile WPT.

Licensees' 2010 WPT Basking Study (NID and PG&E 2010n) entailed basking surveys for WPT in three streams where no incidental observations of WPT were recorded: 1) Middle Yuba River (Milton Diversion Dam Reach); 2) South Yuba River below Spaulding Dam (South Yuba Reach #1, #4, and #6); and 3) Canyon Creek (Bowman-Spaulding Diversion Dam Reach). WPT was found at three of the 18 survey sites, with a total of six detections (Table 6.3.1-44). Recreational activity at several sites was substantial, including two of the sites where WPT were detected.

Table 6.3.1-44. Western pond turtle sightings recording during Licensees' WPT Basking Survey Study.

Date	Location	Detections	Comments
7/21/10	Middle Yuba River (28.4 mi downstream of Milton Diversion Dam	1 adult WPT	Adult female basking on exposed boulder in large, deep (~1.8 m) pool.
7/20/10	South Yuba River (41.6 mi downstream of Spaulding Dam	1 adult WPT (unknown sex)	Adult WPT basking on exposed boulder in deep (~1.5 m) pool near bank.
7/20/10	South Yuba River (41.7 mi downstream of Spaulding Dam)	2 adult WPT 2 juvenile WPT	Adult WPT (male and female) and juvenile WPT basking on boulders along bank adjacent to large deep (1-1.5 m) pool.

Along most project-affected stream reaches, potentially suitable deep pools and/or backwaters occur to varying degrees, although the steep, v-shaped valleys associated with some of these reaches may be unfavorable to WPT occurrence. Potential nesting habitat around project impoundments, and project-affected stream reaches is widely distributed. An analysis of project canals below 6,000 ft indicated that canals do not provide suitable habitat nor do they appear to be a significant barrier to overland movement in most cases, given the scarcity of appropriate habitat and accessible terrain in the areas adjacent to the canals.

6.3.1.4 Mollusks

6.3.1.4.1 Special-Status Mollusk Species

The Forest Service advised Licensees that five mollusk species listed by the Forest Service as Sensitive Species have a potential to occur in project-affected reaches on National Forest System (NFS) land. These are California floater mussel (*Anodonta californiensis*), Great Basin rams-horn (*Hellisoma newberryi newberryi*), topaz juga (*Juga acutifilosa*), scalloped juga (*J. occata*), montane peaclam (*Pisidium ultramontanum*), Owen's Valley springsnail (*Pyrgulopsis owensensis*), and Wong's springsnail (*P. wongi*). The associated habitat requirements and known distributions of the target species are described in Table 6.3.1-45.

Table 6.3.1-45. Forest Service Sensitive mollusk species with the potential to occur in the area of the projects based on consultation with the Forest Service.

Common Name Scientific Name	Habitat Requirements	Current Distribution by State
California floater *Anodonta californiensis*	Shallow muddy or sandy habitats in large rivers, reservoirs, and lakes	AZ, CA, ID, V, OR, UT, WA, WY
Great Basin rams-horn *Hellisoma newberryi newberryi*	Large lakes, slow rivers, and spring-fed creeks; burrows in soft mud	CA, NV, OR, WY
Topaz juga *Juga acutifilosa*	Sand and gravel substrates in spring-influenced streams and lakes and occasionally in large spring pools	CA, OR
Scalloped juga *J. occata*	Cold, moving waters of large rivers, often spring-influenced, with stable boulder and cobble substrates	CA
Montane peaclam *Pisidium ultramontanum*	Sand and gravel substrates in spring-influenced streams and lakes and occasionally in large spring pools	CA, OR
Owen's Valley springsnail *Pyrgulopsis owensensis*	Small springs and spring runs, typically in watercress	CA, NV
Wong's springsnail *P. wongi*	Perennial seeps and small- to moderate-sized springs and spring runs, only in flowing waters	CA, NV

Sources: Duncan (2008), Frest and Johannes (1999), Furnish (2005).

CDFG has not listed any of the mollusk species that may occur in the vicinity of the projects as Species of Special Concern, and BLM advised Licensees that there were no BLM Sensitive mollusks with a potential to occur on BLM administered land in streams affected by the projects.

6.3.1.4.2 Distribution and Abundance of Mollusks

CDFG's CNDDB includes reports of two mollusks in the vicinity of the projects (tight coin, *Ammonitella yatesii* and Button's Sierra sideband, *Monadenia mormonum buttoni*), neither of which is a special-status species.

In 2008 and 2009, Licensees conducted special-status mollusk surveys on NFS land on the Middle Yuba River, South Yuba River, Canyon Creek, Fordyce Creek, and North Fork of the North Fork American River. Twenty-five specimens of one gastropod species (*Juga oreobasis)* were found in the Middle Yuba River about 15 miles downstream of Milton Diversion Dam. One snail shell of the genus *Juga* and one partial bivalve shell of the family Sphaeriidae were observed in the South Yuba River about 13.3 miles downstream from Lake Spaulding Dam. No special-status mollusk species or ESA or CESA listed mollusks have been reported to occur or were found by Licensees. Refer to Licensees' Special-Status Mollusk Technical Memorandum (3-11) in Appendix E12 of this Exhibit E for a more detailed discussion of the study.

6.3.1.4.3 Invasive Mollusks

Licensees did not find any invasive mollusks species (e.g., zebra mussel) during their relicensing studies, nor are Licensees aware or any reports of invasive mussel species in the projects' reservoirs or project-affected streams. CDFG advised Licensees that invasive mussels, such as zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena rostriformis bugensis*) are not known to occur in the vicinity of the projects. New Zealand mud snails (*Potamopyrgus antipodarum*) are a concern to CDFG, but according to USGS website, which is updated daily for occurrences of New Zealand mud snail <http://nas.er.usgs.gov/taxgroup/mollusks/newzealandmudsnail_distribution.aspx>, the closest known occurrence of New Zealand mud snail with respect to the projects is on the American River downstream of Lake Natoma (L. Corvington, pers. comm., 2010).

In 2008, NID began a survey/inspection process to protect Rollins Reservoir from infestation of Quagga and zebra mussel. The procedure begins as a recreationists brings a vessel through the entrance of the boat launch facility. The recreationist is given a verbal survey by the gate attendant, and if the survey questions are not answered correctly the gate attendant performs a visual inspection of the vessel before the recreationists may launch the vessel. All boats that will be on buoys or slips for the recreation season undergo a visual inspection before they are allowed on the reservoir for the season. If evidence of mussel infestation is found during the survey or inspections, the vessel is not allowed on the reservoir. NID intends to continue to cooperate with State of California agencies in the implementation of state-approved procedures to limit the infestation into state waters by invasive mollusks.

PG&E found none of the Drum-Spaulding Project reservoirs to be high risk for infestation (PG&E 2009).

6.3.1.5 Benthic Macroinvertebrates

6.3.1.5.1 Special-Status Benthic Macroinvertebrate Species

The Forest Service considers benthic macroinvertebrates, as an assemblage, to be a Management Indicator Species.

6.3.1.5.2 Distribution of Benthic Macroinvertebrates

Prior to relicensing, limited benthic macroinvertebrate surveys were conducted at a few sites in the Middle and South Yuba rivers and in Canyon Creek from 2004 to 2008 (unpublished data, South Yuba River Citizen's League [SYRCL]), as well as in Fordyce Creek in 1999 and 2001 (Garcia and Associates 2001). While the studies provided useful general information, they used somewhat out-of-date methods and did not provide a systematic assessment of project effects on benthic macroinvertebrates.

Therefore, in 2009 Licensees conducted an aquatic macroinvertebrates study at 24 sites. Sampling and analysis conformed to the targeted riffle composite protocol for documenting and describing benthic macroinvertebrate (BMI) assemblages and physical habitat adopted by the SWRCB's Surface Water Ambient Monitoring Program (SWAMP). Refer to Licensees' Aquatic Macroinvertebrates Technical Memorandum (3-10) in Appendix E12 of this Exhibit E for a detailed discussion of the study.

A total of 12,111 organisms were identified, representing eight taxonomic orders. Midges (Chironomidae), blackflies (Simuliidae), and baetid mayflies (*Baetis tricaudatus*) were among the most common taxa observed.

Eighteen common macroinvertebrate metrics and two multi-metric indexes were calculated for each site. The multi-metric indexes included the index of biotic integrity (IBI) and the multi-metric index (MMI). Both of these multi-metric indexes are designed to evaluate the impacts of hydropower operations on stream condition; the MMI is specific to the west slope of the Sierra Nevada. Table 6.3.1-46 provides a summary of ecozone, elevation, IBI, and MMI scores for sampled aquatic macroinvertebrate sites, 2010. Project-wide, IBI and MMI scores were lowest at South Yuba River Reach #1 site and highest at the Middle Milton Diversion Dam Reach site (higher scores represent better conditions relative to lower scores). In general, IBI and MMI scores were slightly higher at middle elevation sites (i.e., 2,501 ft to 6,500 ft elevation) and at sites classified as montane rather than foothill (i.e., 900 ft to 2,500 ft elevation). Overall, IBI and MMI values did not follow any trends related to distance downstream of a project dam or reservoir, but appeared to be related to physical habitat characteristics such as streambed substrate composition, surrounding riparian vegetation, and vegetation canopy.

Table 6.3.1-46. Summary of ecozone, elevation, IBI, and MMI scores for sampled aquatic macroinvertebrate sites, 2009.

Study Site Name (River Mile)	Ecozone	Elevation (ft)	IBI Score	MMI Score
South Yuba below Spaulding No. 2 Powerhouse Reach (RM 40.3)	montane	4,498	76	68
South Yuba Reach #1 (RM 39.5)	montane	4,330	17	22
South Yuba Reach #5 (RM 27.8)	montane	2,516	44	58
South Yuba Reach #6 (RM 14.9)	foothill	1,935	40	56
Fordyce Lake Dam Reach (RM 6.2)	montane	5,679	50	44
Bear River Reach #1 (RM 35.0)	montane	4,711	74	84
Bear River Reach #2 (RM 32.9)	montane	4,498	60	80
Drum Afterbay Dam Reach (RM 25.4)	montane	3,149	67	70
Bear River Canal Diversion Dam Reach – Upper (RM 8.0)	foothill	1,827	36	26

Table 6.3.1-46. (continued)

Study Site Name (River Mile)	Ecozone	Elevation (ft)	IBI Score	MMI Score
Bear River Canal Diversion Dam Reach – Lower (RM 3.4)	foothill	1,680	51	50
Lake Valley Reservoir Dam Reach (RM 14.3)	montane	5,568	50	58
Lake Valley Canal Diversion Dam Reach (RM 10.3)	montane	4,777	54	62
Wise Powerhouse Overflow Reach (RM 27.2)	foothill	912	33	32
Rock Creek Dam Reach (RM 2.5)	foothill	1,420	34	36
Halsey Afterbay Dam Reach (RM 4.1)	foothill	1,450	21	24

6.3.1.6 Algae

Although Licensees did not conduct a formal algae study as part of relicensing, Licensees field staff recorded incidental observations, particularly in late summer, of *Didymosphenia geminata*, which is an aggressive and newly invasive species. Originally found in the low nutrient cold waters of the far northern hemisphere and common to Scotland, Sweden, Finland, and China's Kanchou region, *D. geminata* has now expanded its geographic range to include North America, Europe, and even New Zealand (Spaulding and Elwell 2007). As *D. geminata* expanded its geographic range, its ecological range and tolerance also expanded. Historically limited to low nutrient, cold waters, *D. geminata* is now observed in higher nutrient and warmer waters as well (Spaulding and Elwell 2007). Like many invasive species, it is likely that *D. geminata* expanded its range via contaminated fishing equipment, clothing, and boats used within multiple watersheds (Hoddle 2010). The first documented presence of *D. geminata* in California is from the mid-1990's on the South Fork American River, which is located just south of the Yuba and Bear rivers (Spaulding and Elwell 2007; Hoddle 2010).

D. geminata forms extensive mats on stream beds and attaches to the streambed by a stalk. To the observer, these mats appear as fiberglass insulation, tissue paper, brown shag carpet, or sheep skins covering the streambed (Spaulding and Elwell 2007). A survey of the literature performed by Kilroy (2004) documented that stable flow and a stable substrate are probably required for the initial attachment to the substrate, and that most *D. geminata* blooms reported in the literature occurred in lake-fed rivers or in regulated rivers. Further, once a colony is established, fast currents are likely to enhance growth by promoting transfer of nutrients to the cells at the mat surface. Kilroy (2004) also described a study from British Columbia, in which *D. geminata* was found in depths from 0.1 to 2 meters, with the heaviest biomass occurring in high-light areas.

Biological effects of *D. geminata* blooms on fish have been documented in several studies that are cited by Spaulding and Elwell (2007) and Kilroy (2004). Spaulding and Elwell (2007) report that the presence of the *D. geminata* mats can last months, thereby modifying the habitat for benthic organisms in a manner that both reduces their numbers and changes their species composition. This, in turn, affects the fish that feed upon them, affecting both the size and composition of the recreational and non-recreational fisheries.

Table 6.3.1-47 summarizes Licensees' incidental observations of *D. geminata*. In general, it was observed in most of the large stream reaches above 5,000 ft in elevation and some of the lower stream reaches that receive cold water. Licensees' operations staff also report seasonal blooms of *D. geminata* (Morrow, pers. comm., 2009; Ward, pers. comm., 2009)

Table 6.3.1-47. Incidental observations of the invasive algae *Didymosphenia geminata.*

River Reach	Incidental Observations
MIDDLE YUBA RIVER SUB-BASIN	
Jackson Meadows Dam Reach	In 2008 and 2009, the freshwater diatom, *D. geminata* was observed at River Mile 46.4.
Milton Diversion Dam Reach	In 2008 and 2009, the freshwater diatom, *D. geminata* was observed at River Mile 43.6. In 2009, diatomaceous algae was thick at this location, and at times challenging, to walk on, electrofish, and keep a block net up. Filamentous green algae also observed at Milton Diversion Dam Reach - SR1 (lower).
CANYON CREEK SUB-BASIN	
Bowman-Spaulding Diversion Dam Reach – SR4 (upper)	In 2008 and 2009, the freshwater diatom, *D. geminata*, was observed at River Mile 7.9. In 2009, diatomaceous algae was thick at this location and at times challenging to walk on, electrofish, and keep a block net up. White to light brown algae was not long and filamentous, but grew in mats.
Bowman-Spaulding Diversion Dam Reach - SR1 (lower)	In 2010, the freshwater diatom, *D. geminata* was thick in the Bowman-Spaulding Diversion Dam Reach above Texas Creek
SOUTH YUBA RIVER SUB-BASIN	
Fordyce Lake Dam Reach - SR3 (upper)	In 2008 and 2009, the freshwater diatom, *D. geminata*, was observed at River Mile 10.1. In 2009, diatomaceous algae was thick at this location and at times challenging to walk on, electrofish, and keep a block net up. Right below the dam, *D. geminata* was so thick that cobbles stuck to field boots; the geomorphologist could not estimate size of the substrate because it was so obscured by the thick algae.
South Yuba Reach #1 (Jordan Creek Confluence Reach)	Amphibian surveys forms note that "Algae [was] observed and covered most of the boulder/bedrock substrate." The notes do not specify if this was *D. geminata*, although covering the boulder/bedrock substrate is typical of it.
South Yuba Reach #5 (Poorman Creek Confluence Reach)	In 2010, the freshwater diatom, *D. geminata*, was observed at this site.
BEAR RIVER	
Bear River Canal Diversion Dam Reach	Between the 2008 and 2009 field seasons, *D. geminata* seemed to increase within the FYLF survey sites located in Bear River Canal Diversion Dam Reach. Sites 1B and 2B had the larger quantities of *D. geminata*, while Sites BRC 1, 2A, and 3 hosted algae in lesser amounts. At Site BRC 1B, *D. geminata* covered most of the aquatic substrate, excepting riffles and open cobble/gravel areas that receive recreation.
Bear River Reach #2	Amphibian survey forms for site BR-2 note that "Algae [was] observed and covered most of the boulder/bedrock substrate." The notes do not specify if this was *D. geminata*, although covering the boulder/bedrock substrate is typical of it.
NORTH FORK OF THE NORTH FORK AMERICAN RIVER SUB-BASIN	
Lake Valley Canal Diversion Dam Reach (lower)	In 2008 and 2009, the freshwater diatom, *D. geminata*, was observed at River Mile 10.3

6.3.2 Environmental Effects

6.3.2.1 Yuba-Bear Hydroelectric Project

This Section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3) on aquatic resources. The Section is divided into the following areas: 1) effects on special-status/CESA-listed aquatic species; 2) effects on the Project on streamflows; 3) effects of Project ramping rates; 4) effects of minimum reservoir pools; 5) effects of pulse flows; 6) effects of fish entrainment; and 7) effects on fish passage.

6.3.2.1.1 Effects on Special-Status/CESA-Listed Aquatic Species

Currently, four aquatic species are known or suspected to occur in the Project Area. These species are hardhead, FYLF, SNYLF, and WPT. In addition, the Forest Service considers benthic macroinvertebrates, as an assemblage, to be a Management Indicator Species. No species listed as threatened or endangered under the California ESA are known to occur in the Project Area.

Licensees did not find hardhead during stream and reservoir fish sampling, but habitat for hardhead may occur in the lower elevation sections of the Middle Yuba River and South Yuba River. Licensees found FYLF in the following stream reaches below Yuba-Bear Hydroelectric Project facilities: 1) in the Middle Yuba River below Milton Diversion Dam; 2) in Canyon Creek below Bowman-Spaulding Diversion Dam; 3) in the Bear River below Dutch Flat Afterbay Dam; 4) in the Bear River below Chicago Park Powerhouse; and 5) in the Bear River below Rollins Dam. NID found SNYLF in ponds near French Lake. Licensees found WPT in the Chicago Park Conduit near Little York Basin, in Rollins Reservoir near the confluence of Greenhorn Creek, and in the following stream reaches below Yuba-Bear Hydroelectric Project facilities: 1) in the Middle Yuba River below Milton Diversion Dam; 2) in the Bear River below Dutch Flat Afterbay Dam; and 3) in the Bear River below Rollins Dam. In addition, sightings of individual WPT were reported from the Chicago Park Conduit near Little York Basin and Rollins Reservoir near the confluence of Greenhorn Creek. Benthic macroinvertebrates were found in streams below all Project facilities.

Hardhead, FYLF, SNYLF and benthic macroinvertebrates have a potential to be affected by changes in streamflow. However, SNYLF was not found by Licensees' studies in any stream reach affected by Project flows (SNYLF at ponds and a stream near French Lake occur upstream of the Project) or otherwise known to occur in any of these stream reaches. Potential effects on special-status aquatic species are addressed by Project activity (e.g. streamflows) in subsequent sections. This Section discussed six measures included in NID's proposed Project that generally address special-status aquatic species.

The first measure, Annual Consultation, would: 1) assure that NID's planned activities are efficiently coordinated to the extent possible with the Forest Service and BLM activities; 2) make the Forest Service and BLM aware of NID's planned O&M activities on NFS land and on public land administered by BLM; and 3) make NID aware of all pertinent Forest Service and BLM orders, rules and policies that might affect the planned activities. NID would meet with the Forest Service, BLM and other agencies in the first quarter of each year to discuss NID's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate since NID normally develops an annual maintenance plan early in each calendar year. NID would file documentation of the meeting with FERC, including recommendations by the Forest Service and BLM, if requested by FERC. The measure does not imply that NID may not proceed with planned Project O&M activities until NID has reviewed the planned O&M activity with the Forest Service and BLM, or relieve NID from obtaining all necessary approvals and permits for the planned maintenance work.

In the second measure, Employee Training, NID would prepare and maintain a map of "sensitive areas" within the FERC Project Boundary. The map would show known areas of special-status species populations and other environmentally sensitive areas. NID would provide environmental sensitivity training to Project O&M staff when they are assigned to the Project and provide group training to all Project O&M staff annually. Providing training to staff when they are hired will assure new staff are quickly trained, and periodic training will serve as a refresher for staff to note any changes since the last training. Training would include the general identification of the special-status species that are known to occur in the Project Area and their location within the FERC Project Boundary, methods to avoid "sensitive areas" and minimize disturbance of special-status species during critical life stages, and a review of any pertinent Forest Service or BLM orders, rules or policies (e.g., LOPs) that pertain to these special-status species that may occur in the Project Area. Training would also include procedures for reporting to NID's management if staff observes any Project activity directly affecting these special-status species. To assure training is comprehensive and is accurate, NID would invite the Forest Service and BLM to assist in the annual training session.

In the third measure, Annual Review of Special-Status Species Lists and Assessment of New Species, NID would meet with the Forest Service and BLM annually to review pertinent special-status species lists. NID anticipates this would occur during the annual consultation meeting described above. An annual review is appropriate because changes to special-status species lists are usually very minor from year to year. If a species has been added to the list and has a reasonable likelihood of being directly affected by the Project and adequate information is not available to assess likely Project effects, NID would develop a study plan to assess potential Project effects, provide the plan to the Forest Service or BLM, as appropriate, and other appropriate resource agencies for review, and file the plan with FERC. NID would perform the study as approved by FERC, and develop a report, including recommended measures. NID would provide the report to the Forest Service and BLM, as appropriate, for review, file the report with FERC, and implement those measures as directed by FERC.

The next measure pertains to new ground disturbing activities. If during the term of the new license, NID proposes ground disturbing activities not addressed by the relicensing NEPA process; such activities have the potential to adversely affect special-status species and other resources on NFS lands and public lands administered by BLM. This measure would assure that reasonable PM&E measures are developed to address the potential effects of the new ground disturbing activities. Specifically, prior to performing the new ground disturbing activity, NID would consult with the Forest Service or BLM, as appropriate, to: 1) discuss potential effects; 2) determine if additional information is needed to assess effects; 3) gather additional information, if needed; and 4) upon Forest Service's receipt or BLM's request, as appropriate, enter into an agreement to fund a reasonable portion of Forest Service's staff or BLM's staff, as appropriate, to perform staff activities related to the proposed ground disturbing activity. This measure provides for the timely review of new ground disturbing activities.

The fifth measure, Consultation Regarding New Facilities, also pertains to activities not addressed in FERC's NEPA review. If, during the term of the new license, NID proposes new Project facilities that were not addressed in FERC's NEPA process, prior to construction NID would develop and submit a Biological Evaluation (BE) to the Forest Service or BLM, as appropriate. The BE would assess potential effects to special-status species, and would include procedures to minimize adverse effects to special-status species.

The last measure, Coordinated Operations between the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project, requires that NID develop a plan in consultation with PG&E, to provide for coordination between the Drum-Spaulding Project and Yuba-Bear Hydroelectric Project to assure implementation of flow–related measures in the two Project licenses once they are issued.

6.3.2.1.2 Effects on Streamflows[14]

NID's proposed Project has a potential to adversely, or beneficially affect, aquatic resources due to changes in minimum streamflows. To evaluate the adequacy of existing minimum streamflows and develop the proposed minimum flow releases,[15] NID divided the 17 Yuba-Bear Hydroelectric Project facilities from which releases might be made into five general categories. Table 6.3.2-1 lists each facility by category and provides for each facility, the length of affected reach, if the existing license includes a minimum flow release, and the type of instream flow analysis performed by NID downstream of the facility as part of the Instream Flow Study (NID and PG&E 2010h). The process used by NID to develop its proposed minimum streamflows for the categories is described below.

Table 6.3.2-1. Yuba-Bear Hydroelectric Project facilities from which NID may release flow into a stream.

Basin	Sub-Basin	Stream	Release Facility	Length of Stream Affected (mile)	Minimum Flow Release Requirement in Existing License?	Type of Instream Flow Analysis Performed
MAJOR STORAGE/REGULATION DAMS						
Middle Yuba River	Middle Yuba River	Middle Yuba River	Jackson Meadows Dam	1.6	Yes	PHABSIM
			Milton Diversion Dam	32.0	Yes	PHABSIM
		Canyon Creek	French Dam	11.4	Yes	PHABSIM
			Faucherie Dam	11.8	Yes	PHABSIM
			Sawmill Dam	0.8	Yes	PHABSIM
			Bowman Dam	None	Yes[1]	PHABSIM
			Bowman-Spaulding Conduit Diversion Dam	10.5	Yes	PHABSIM
Bear River	Bear River	Bear River	Dutch Flat Afterbay Dam	5.4	Yes	PHABSIM
			Rollins Dam	None	Yes[2]	PHABSIM

[14] Many of NID's proposed minimum streamflow releases are triggered by specific water year types (i.e., Critically Dry, Dry, Below Normal, Above Normal and Wet), which are part of NID's proposed Project. Refer to Exhibit B for a description and rational for NID's proposed water year types, and to NID's Proposed Measure YB-AQR1, Part 2, in Appendix E3 for the full text of NID's proposed measure regarding water year types.

[15] For the purpose of NID's analysis, "minimum flow release" is considered the flow measured at the designated compliance point and can be the result of any combination of releases through a Project dam (e.g., low-level release and seepage), controlled or uncontrolled spill over a Project dam (e.g., over a spillway), and accretion. This is also sometimes referred to as "minimum streamflow" or "minimum streamflow release."

Table 6.3.2-1. (continued)

Basin	Sub-Basin	Stream	Release Facility	Length of Stream Affected (mile)	Minimum Flow Release Requirement in Existing License?	Type of Instream Flow Analysis Performed
DIRECT DIVERSIONS OR DIVERSION DAMS ON EPHEMERAL CREEKS						
Middle Yuba River	Middle Yuba River	Wilson Creek	Wilson Creek Diversion Dam	0.3	No	CFR
South Yuba River	Fall Creek	Clear Creek	Bowman-Spaulding Conduit	0.9	No	PHABSIM
		Trap Creek	Bowman-Spaulding Conduit	1.2	No	CFR & DFA
DIRECT DIVERSIONS ON PERENNIAL CREEKS						
South Yuba River	South Yuba River	Rucker Creek	Bowman-Spaulding Conduit	1.2	No	CFR & DFA
STORAGE/DIVERSION DAMS ON PERENNIAL CREEKS						
South Yuba River	Canyon Creek	Jackson Creek	Jackson Dam	3.0	Yes	CFR & DFA
		Texas Creek	Texas Creek Diversion Dam	0.6	No	CFR & DFA
	South Yuba River	Fall Creek	Fall Creek Diversion Dam	2.0	No	PHABSIM
POWERHOUSES RELEASING DIRECTLY INTO A STREAM REACH						
Bear River	Bear River	Bear River	Chicago Park Powerhouse	11.5	No	River2D

[1] The minimum flow release requirement is from Bowman Dam but is measured in the stream downstream of the Bowman-Spaulding Diversion Dam, which is immediately below Bowman Dam.
[2] The minimum flow release requirement is from Rollins Dam but is measured in the stream downstream of the Drum-Spaulding Project's Bear River Canal Diversion Dam, which is immediately below Rollins Dam.

Major Storage/Regulating Dams

In general, and with some modifications, NID followed a six-step process for developing minimum flow releases from major storage and regulating dams. The process relied heavily on existing information and Licensees' studies. The first two steps in the process focused on habitat for the rainbow trout adult life stage or the rainbow trout spawning life stage because, in most Project-affected reaches, rainbow trout is the most important game fish and is the dominant fish species in both abundance and biomass. While juvenile rainbow trout also occur in these reaches, based on a comparison of adult, spawning, and juvenile rainbow trout WUA curves, NID concluded that providing habitat for rainbow trout adult or spawning life stages would provide adequate habitat for juvenile life stage (e.g., the flow needed to achieve the adult or spawning WUA peak was almost always higher than the flow needed to meet the juvenile WUA peak). As described in more detail below, NID relied on the Instream Flow Study HEA to assess the amount of habitat that could occur for adult or spawning rainbow trout life stages under various minimum flow release schedules. NID also examined the appropriate static WUA curves for rainbow trout adult and spawning life stages to better understand flow-habitat relationships. Each metric – the HEA and the static WUA - has its strengths and its weaknesses, but together they facilitate an understanding of existing conditions and potential enhancements to existing conditions.

In the third step, NID performed a similar HEA and WUA analysis for the adult hardhead life stage as was performed for the rainbow trout adult life stage in Step 1, but only in the lowest elevation sections of the Middle Yuba River. As described above, hardhead is the only special-status fish species with the potential to occur, but Licensees did not find hardhead in their Stream Fish Populations or Reservoir Fish Populations studies. However, hardhead habitat may occur in the lowest section of the Middle Yuba River. Therefore, NID carefully assessed the effects of its proposed minimum flow releases on hardhead in this section of river. Only the adult life stage was examined because, based on a comparison of WUA curves, NID concluded that providing habitat for the hardhead adult life stage would provide adequate habitat for juvenile life stage.[16]

Steps 4 and 5 included an adjustment to the minimum flow releases in consideration of WUA (i.e., increasing flow if they were close to flows that were almost always released by NID under existing conditions), adjusting flows for known water supply delivery constraints, and smoothing curves to facilitate operations.

In the last step, NID reviewed existing information and information developed by relicensing studies to determine if any of the monthly minimum flow releases in the schedule should be adjusted to address suspected resource issues.

Four aspects of NID's analysis for trout and hardhead habitat are worth highlighting. First, NID compared the various alternative minimum flow releases to two benchmarks: 1) the amount of habitat that would occur under unimpaired flow conditions; and 2) the amount of habitat that occurs under existing conditions. NID believed that the amount of habitat that would occur under unimpaired flow conditions is one reasonable benchmark: that is, if the reach without the Project would support a certain amount of habitat, comparing the Project to that amount of habitat – as compared to a theoretical maximum that may never have occurred, which the WUA curve may reflect[17] - is a useful comparison in determining adequate protection for the resource. The amount of habitat that occurs under existing conditions is also a useful benchmark to help understand existing conditions, including fish habitat and populations that are sustained by existing flows.

Second, NID's analysis assumed that under the base case and NID's proposed minimum flow releases, the Project would operate and it would continue to rain and snow. That is, if under normal operations, a dam spills in the spring, water is transported through the reach for water supply or other reasons, or runoff from snow and rain enters the reach, these would also occur with the proposed Project and minimum flow release – the dam would still spill (unless the minimum flow releases were high enough that spills stopped), the dam would continue to release water to meet downstream consumptive needs and for other purposes, and runoff would still enter the reach. NID believed that to not acknowledge these conditions in future operations (i.e., to base its minimum flow releases on Node Zero) is overly conservative and unrealistic.

Fourth, NID did not attempt to "shape" its minimum flow releases seasonally. NID found that since most Project facilities spill in many years and accretion is high in the reaches, the proposed Project would result in streamflows that "mimic the natural hydrograph;" that is with high flows

[16] Note that as part of the Instream Flow Study, Licensees developed WUA curves and HEA for Sacramento sucker and Sacramento pikeminnow, neither of which are popular game fish or special-status. NID did not target these fishes in the development of its proposed minimum streamflow releases. Refer to Licensees' Instream Flow Technical Memorandum (3-2) in Appendix E12 of this Exhibit E for a full discussion of these species.

[17] WUA does not take into consideration time (i.e., WUA is a static snapshot) or actual hydrology (i.e., either changes in flow or the natural hydrograph).

in spring, lower flows in summer, and gradual changes between the two periods. A review of the resulting hydrographs for the proposed Project confirms this assumption. Note that NID also examined existing conditions for indications that resources, which would be supported by a natural hydrograph, were not supported under existing conditions.

The individual steps in NID's process that were applied to each major storage and regulating dam are described below.

- Step 1 - Set Minimum Flow Release Schedule for Adult Rainbow Trout. Step 1 had two stages. In the first stage, NID used the HEA to identify the minimum flow releases necessary to provide that adult rainbow trout habitat in each month from April through November would be:

  - at least 80 percent of the amount of habitat that would have occurred under unimpaired flow conditions for each instream flow sub-reach in the reach; and
  - in no case less than the amount of habitat that occurs under existing minimum flow requirements.

  In the second stage, NID used the HEA to identify the minimum flow releases to provide that adult rainbow trout habitat in each month from December through March would be:

  - at least 70 percent of the amount of habitat that would have occurred under unimpaired flow conditions; and
  - in no case less than the amount of habitat that occurs under existing minimum flow requirements.

  Collectively, these two sets of target criteria are referred to as the "rainbow trout adult targets." Note that these targets are guidelines and not hard criteria – the targets may not be met in every month.

  In winter months (i.e., December through March), NID reduced the rainbow trout adult target habitat from 80 percent to 70 percent because trout are much less active and do not feed as extensively during winter. Once winter temperatures drop below certain thresholds, trout behavior shifts from active feeding to seeking refuge from predators and harsh environmental conditions. The literature contains many references to the cessation of water column feeding activity by salmonid species in winter when water temperatures are low. For instance, Campbell and Neuner (1985) performed a study in several western Washington cascade mountain streams and concluded:

  > Rainbow trout distribution in cool Cascade Mountain streams appears to be related to feeding during summer days, refuge during winter days, and resting at night. The seasonal shift is gradual and closely follows stream temperatures. A hiding response appears to begin at 8℃ and few, if any, trout can be found in the water column below 3˚C.

Similar findings were documented in a California stream by Vondracek and Longanecker (1993):

> Rainbow trout apparently sought shelter in interstitial spaces in the substrate of runs and riffles during the day in early winter.

These field studies, and others, have clearly demonstrated the shift in habitat use by salmonid species, including rainbow and brown trout when winter water temperatures drop below roughly 5ºC to 8°C. This threshold is not regularly exceeded in Project stream reaches in December through March (see Section 6.2.1.2.3 of Water Resources).

- Step 2 – Adjust Step 1 Minimum Flow Release Schedule for Spawning Rainbow Trout. Step 2 was only performed if a review of the rainbow trout adult and spawning curves indicated that the flow needed to achieve the spawning rainbow trout WUA peak was higher than the flow needed to achieve the adult rainbow trout WUA peak, using the first peak if the WUA curve was bimodal. In that case, NID used the HEA to identify the minimum flow releases necessary to assure that adult rainbow trout habitat in the months in which spawning would occur in the reach (i.e., varied by reach but generally a three-month period between April and July). The rainbow trout spawning periods for each reach were collaboratively developed with Relicensing Participants. The target criteria were:

  - at least 80 percent of the amount of habitat that would have occurred under unimpaired flow conditions; and
  - in no case less than the amount of habitat that occurs under existing minimum flow requirements.

  Collectively, these target criteria are referred to as the "rainbow trout spawning targets." As above, these targets are guidelines and not hard criteria – the targets may not be met in every month.

  In these cases and for the spawning period months, the minimum flow releases necessary to meet the rainbow trout spawning targets replaced those flows necessary to meet the rainbow trout adult targets. It was assumed that meeting the spawning targets would provide adequate habitat to meet the adult targets.

- Step 3 – Adjust Step 1 (or Step 2, if appropriate) Minimum Flow Release Schedule for Hardhead. In the Kanaka Creek sub-reach on the Middle Yuba River, NID used the HEA to determine the amount of flow necessary to provide for the hardhead adult life stage:

  - at least 80 percent of the amount of habitat that would have occurred under unimpaired flow conditions; and
  - in no case less than the amount of habitat that occurs under existing minimum flow requirements.

Collectively, these target criteria are referred to as the "hardhead adult targets." Again, these targets are guidelines and not hard criteria – the targets may not be met in every month. And this analysis only applied to the Kanaka Creek sub-reach.

If the minimum flow releases needed for 80 percent of hardhead adult habitat were greater than flows needed for 80 percent of rainbow trout adult or spawning habitat, the minimum flow releases was adjusted for hardhead adults. If not, no adjustment was made.

- Step 4 – Adjust Minimum Flow Releases as Appropriate for WUA and Normal Releases. In this step, NID reviewed the minimum flows releases developed in Steps 1 through 3, applicable WUA curves and typical operations. If NID found that the flows in the minimum flows releases were close to the flows that result in 80 to 100 percent of static WUA, NID increased the flows in the schedule. In addition, NID increased the flows in the schedule if: 1) NID found that it almost always released higher flows than in the schedule; 2) releasing the higher flows all the time would not require facility modification; and 3) the higher flows were found to result in more habitat.

- Step 5 – Adjust Minimum Flow Releases for Operational Feasibility and Known Water Supply Constraints. In this step, NID adjusted the minimum flows releases if there were known water supply delivery constraints that could be affected by increasing minimum flows. NID also made minor refinements to the minimum flow releases to address the following issues: 1) limited access to Project facilities in winter, which necessitates few adjustment during that period; 2) limiting minor or frequent monthly changes in minimum flows when they are unlikely to be biologically significant, and would unnecessarily increase the operational cost and complication of minimum flow compliance; and 3) generally smoothing the minimum flow releases in adjacent months to eliminate small flow variations.

- Step 6 – Adjust Minimum Flow Releases to Address Aquatic Resources and Reservoir Recreation. In this step, NID reviewed existing information and information developed by relicensing studies, as described in Sections 6.2.1 and 6.3.1, to determine if any of the monthly minimum flow releases should be adjusted to address fish, FYLF, water quality, water temperature, aquatic macroinvertebrate, or other aquatic resource problems areas identified during Licensees' studies, or would result in serious changes to reservoir elevations that would affect reservoir recreation, especially at Jackson Meadows Reservoir, Faucherie Lake, Bowman Lake and Rollins Reservoir where a significant portion of the Project-related recreation occurs. Issues related to ramping and supplemental flow releases (i.e., "pulse flows") were addressed separately, and not as part of NID's minimum flow releases development process.

The application of this six-step process to each of the major storage/regulating facilities is described below by facility.

Jackson Meadows Dam

NID's process focused on rainbow trout adult from July through March and rainbow trout spawning from April through June.

After completing Steps 1 and 2, NID found that a minimum flow release of 10 cfs met the rainbow trout adult and spawning criteria, with the exceptions of April, January, and May. In order to reach the habitat criteria in April, NID increased the minimum flow release to 50 cfs in April.

NID also increased minimum flow releases from Jackson Meadows Dam to provide flow for releases from the downstream Milton Diversion Dam. These releases, which would be released from Jackson Meadows Dam through Milton Diversion Dam were: 12 cfs from June through October in Below Normal Water Years; 12 cfs in June and October of Above Normal and Wet water years; 25 cfs in July and August of Above Normal and Wet water years; and 20 cfs in September of Above Normal and Wet water years. The benefits of these releases to the Middle Yuba River below Milton Diversion Dam are discussed below.

Figure 6.3.1-33 shows the amount of habitat that would occur under NID's proposed minimum flow releases from Jackson Meadows Dam. Excluding May, NID's proposed minimum flow release would provide at least 82 percent of the habitat that would occur under unimpaired flow conditions in every month, and often times much more habitat (Table 6.3.2-2). In May, due to periodic high flows, rainbow trout adult habitat can be low under both the No-Action Alternative and NID's proposed flow release (41% and 33%, respectively). However, in these cases, an increase in the minimum flow release does increase habitat since the problem is flows are too high, not too low. Since access to the area is poor in May, NID did not adjust the flow release in May.

Table 6.3.2.-2. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in the Middle Yuba River below Jackson Meadows Diversion Dam (Node 1). SOURCE: Figure 6.3.1-33 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
ALL MONTHS, EXCLUDING MAY						
No-Action Alternative	18% (Apr)	24% (Apr)	100% (Apr)	94% (Jul)	142% (Oct)	1,928% (Aug)
Licensees' Proposed Project	82% (Feb)	90% (Feb)	118% (Mar)	100% (Jun)	142% (Oct)	2,503% (Aug)
MAY[1]						
No-Action Alternative	41%		103%		157%	
Licensees' Proposed Project	33%		101%		157%	

[1] As described above, habitat in May does not meet NID's rainbow trout adult habitat target due to periodic high flows in the month. The high flows occur under both NID's proposed flow releases and the No-Action Alternative

NID did not modify the minimum flow releases described above based on a review of existing aquatic resource information. Fishes that occur in the reach include rainbow trout, brown trout and Lahontan redside, with overall trout abundance ranging from 2,640 fish/mi to 1,713 fish/mi in 2009, and trout biomass ranging from 22.6 lbs/ac to 14.2 lbs/ac. Age-classes for rainbow trout were variable between years and, overall, fish condition was good relative to wild-produced trout in Sierra Nevada streams. Water quality appears to meet Basin Plan Water Quality objectives, and no special-status mollusks occur. The reach is above the known elevation range for FYLF, and there are no historical records for WPT in the reach or the vicinity of the reach, and no incidental observations were reported.

NID's proposed minimum flow releases would effect the elevation of Jackson Meadows Reservoir, which supports almost 15 percent of the Project's total annual recreational use (second only to Rollins Reservoir, which accounts for about 70 percent of the use), for most of the summer in Critically Dry and Dry water years. However, under existing conditions the reservoir is already low in these water year types and the incremental effect would be minor. Reservoir elevation in Below Normal, Above Normal and Wet water year types would not be effected (Table 6.3.2-3).

Table 6.3.2-3. Reductions in average summertime reservoir elevations in Jackson Meadows Reservoir under NID's proposed Project as compared to the No-Action Alternative. Normal maximum water surface elevation is 6,036 feet.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNTAIVE (Elevation)							
Critically Dry	5,999.5	5,995.8	5,990.3	5,987.3	5,983.5	5,980.3	5,978.6
Dry	6,021.5	6,019.1	6,015.0	6,010.1	6,004.0	5,998.7	5,992.7
Below Normal	6,032.7	6,030.2	6,026.4	6,021.8	6,016.0	6,011.1	6,005.7
Above Normal	6,035.1	6,033.1	6,029.4	6,025.0	6,019.4	6,014.7	6,009.5
Wet	6,035.0	6,035.0	6,031.9	6,027.7	6,022.1	6,017.5	6,012.4
NID'S PROPOSED PROJECT (Change in Elevation)							
Critically Dry	-5.3	-5.3	-2.7	-3.0	-3.5	-2.3	-1.3
Dry	-4.5	-4.5	-4.7	-4.8	-5.1	-5.3	-5.8
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Yellow highlighted cells indicate periods when the reservoir elevation would be below one or more of the useable elevations (i.e., as defined as 3 vertical feet above the actual end of the paved ramp) of the two existing boat ramps in Jackson Meadows Reservoir. The usable elevation for each is 6,016.0 and 5,996.5 feet.

Milton Diversion Dam

NID's process for Milton Diversion Dam focused on rainbow trout adult in all months in all three Milton Diversion Dam sub-reaches (i.e., Milton Diversion Dam to Wolf Creek, Wolf Creek to Kanaka Creek, and Kanaka Creek to Our House Diversion dam).

After completing Step 1 through 3, NID found that minimum flow releases in the 3 to 21 cfs range met the rainbow trout adult targets, with the higher minimum flow releases in the Critically Dry and Dry water years generally from June through October when accretion flows are lowest in the reach.

However, as described in the Water Resources Section (6.2) of this Exhibit E, under existing conditions NID's water supply demand is not met in Critically Dry water years and some Dry water years. Any increase in minimum flows below Milton Diversion Dam in these water year types would exacerbate this condition since water released from the dam is lost for NID's water supply purposes. Therefore, NID proposes to maintain the existing minimum flow releases of 3 cfs in Critically Dry water years, and increase the existing flow releases slightly in Dry water years from 3 cfs to 5 cfs, which together would not add to the consumptive water shortages that already occurs in these water year types.

To meet the trout habitat targets in Below Normal, Above Normal and Wet water years, NID increased the existing minimum flow from 3 cfs to 8 cfs from November through May and from the existing minimum flow of 3 cfs to 12 cfs from June through October. Under those minimum flow releases, the trout habitat targets are met or exceeded in all months in all water types at each of the three PHABSIM reaches below Milton Diversion Dam, except in July in Below Normal and Above Normal water years in the Wolf Creek Reach, when the habitat value would be 73 and 75 percent, respectively. These two exceptions were so minor that they did not warrant for their own sake increasing the minimum flow release to 21 cfs, which would be needed to meet the target in July of Below Normal and Above Normal water years in the Wolf Creek Reach.

In addition, NID modified the existing minimum flow releases based on its water temperature modeling efforts. NID found that increasing minimum flows to 25 cfs in July and August and 20 cfs in September extended cold water (i.e., mean daily water temperatures of 20°C or less) downstream by about 6 miles - from about RM 31 to RM 25. Therefore, NID increased the minimum flows to these levels in Above Normal and Wet water years, but not in other water year types due to impacts on water deliveries. Figure 6.3.2-1 provides a depiction of predicted water temperature conditions in the Jackson Meadows Reservoir Dam and Milton Diversion Dam reaches under instream flow releases ranging from 3 to 150 cfs, based on a combination of 2008 hydrology and 2009 meteorology.

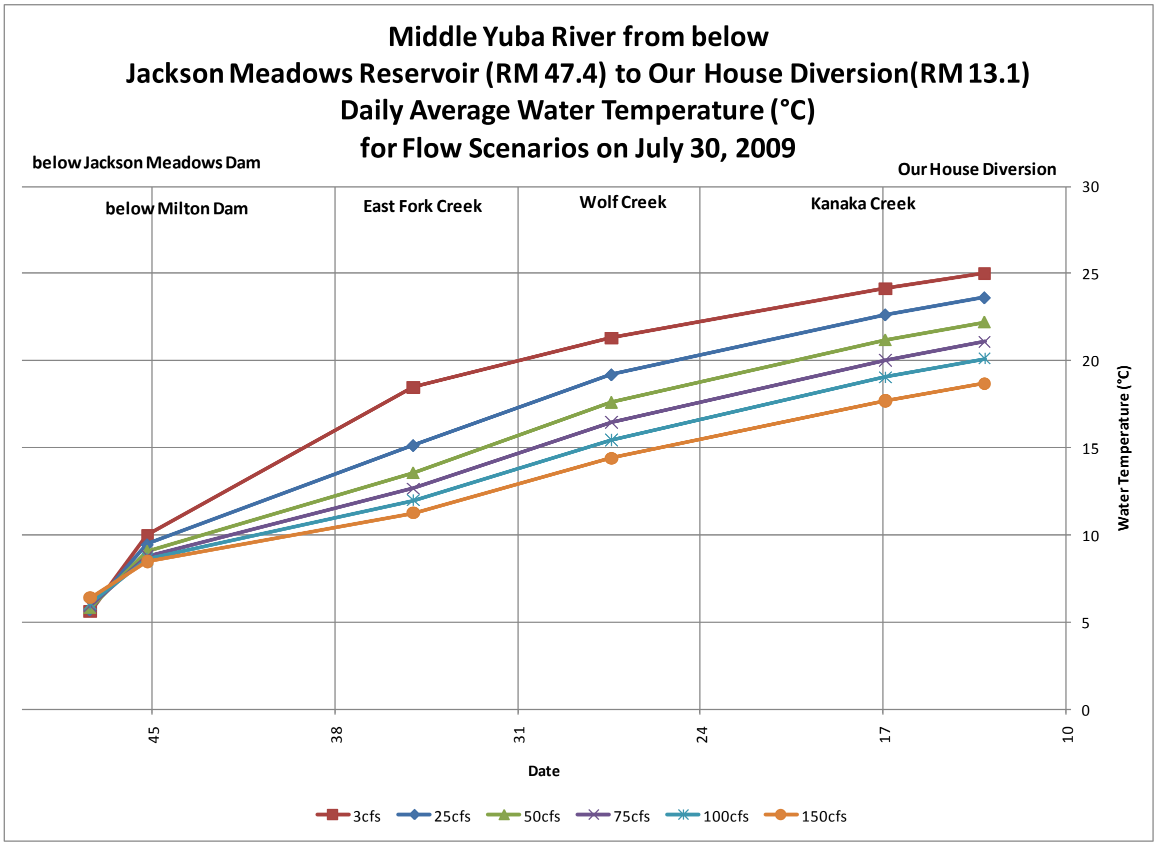

Figure 6.3.2-1. Modeled water temperatures in the entire Milton Diversion Dam Reach based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

Figures 6.3.1-34 shows the amount of habitat that would occur under NID's proposed minimum flow releases from Milton Diversion Dam. In general, NID's proposed minimum flow releases meet the rainbow trout adult target habitat in all months except in May in the Wolf Creek Sub-reach (Node 2) and June in the entire reach (Nodes 1, 2 and 3). An examination of the Figures 6.3.1-2 (h) and (i) shows that NID's proposed flows result in habitat similar to what would occur under unimpaired flow conditions for most of the exceedance plot, but both the No-Action Alternative and NID's proposed minimum flow release curve drops precipitously near the tail of the curve.

Table 6.3.2.-4. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in the Middle Yuba River below Milton Diversion Dam (Nodes 1, 2 and 3). SOURCE: Figure 6.3.1-34 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
MILTON SUB-REACH, EXCLUDING MAY AND JUNE						
No-Action Alternative	69% (Jul/Sept)	80% (Sept)	102% (Multiple Months)	100% (Multiple Months)	108% (Apr)	301% (Sept)
Licensees' Proposed Project	77% (Feb)	97% (Dec)	102% (Multiple Months)	100% (Multiple Months)	114% (Oct/Aug)	301% (Sept)

Table 6.3.2.-4. (continued)

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
MAY						
No-Action Alternative	68% (Node 2)	101% (Nodes 1 & 2)	108% (Node 1)	100 % (Node 3)	103% (Node 3)	120% (Node 3)
Licensees' Proposed Project	71% (Node 2)	101% (Nodes 1 & 2)	108% (Node 1)	100% (Node 3)	103% (Node 3)	121% (Node 3)
JUNE						
No-Action Alternative	67% (Node 2)	100% (All Nodes)	101% (Node 1)	70% (Node 3)	100% (All Nodes)	104% (Node 3)
Licensees' Proposed Project	67% (Node 2)	100% (All Nodes)	102% (Node 1)	75% (Node 1)	100% (All Nodes)	106% (Node 3)

Figure 6.3.1-18 provides similar information for hardhead adult life stage in the Kanaka Creek Sub-reach as provided for rainbow trout, and shows that under NID's proposed minimum flow releases hardhead adult targets are exceeded in all months.

Table 6.3.2.-5. Comparison of adult hardhead habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in the Middle Yuba River below Kanaka Creek (Nodes 3). SOURCE: Figure 6.3.1-42 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
No-Action Alternative	87% (Sep)	95% (Sep)	102% (Jul)	100% (Jan & Feb)	101% (Multiple Months)	115% (May)
Licensees' Proposed Project	89% (Apr & May)	99% (Apr)	104% (Multiple Months)	100% (Multiple Months)	104% (Aug)	118% (Aug)

NID did not modify the minimum flow release schedule described above based on a review of existing aquatic resource information. Besides rainbow trout, fishes in the reach include brown trout, Sacramento sucker, Sacramento pikeminnow and Lahontan redside. Rainbow trout abundance and biomass ranged from 3,919 to 273 fish/mi and 45.2 to 17.8 lbs/ac, respectively. Hardhead were not collected or observed in any sub-reach. Fish density was greatest in the middle sub-reach, moderate in the upper sub-reach, and declined in the lower sub-reach. In all sub-reaches, all age-classes of rainbow trout were present, though age-0 fish were present in low to moderate numbers.

Macroinvertebrate surveys using the SWAMP protocol were conducted at a site in each of the three Middle Yuba River sub-reaches. The middle sub-reach site had the highest IBI score relative to the other sites and also scored relatively high compared to Rehn's (2009) listed scores for reference reaches. The upper sub-reach site had a poor IBI score and the lower site had a good IBI score that was very close to being within the 95th percentile of IBI scores from Rehn's (2009) listed reference reaches. The upper site was in a high gradient (4.2 percent) channel, dominated by bedrock and large boulder substrates, which possibly affected the BMI community composition at the site.

FYLF surveys were performed at four locations in the reach, distributed from 15.3 mi to 30.9 mi below Milton Diversion Dam. Potential habitat further upstream is constrained by a deep, narrow valley form, with bedrock canyons. FYLF occurred at each survey site, with relatively high numbers of detections, including numerous egg masses and subsequent YOY at three of the sites. These sites were characterized by ample suitable habitats associated with alluvial deposits, favorable water temperatures for egg and tadpole development, absence of introduced crayfish and American bullfrog, and limited recreational disturbance. The site with the fewest FYLF detections was located 15.3 mi below Milton Diversion Dam, and was characterized by limited habitat (e.g., sporadic pools and limited low-velocity edgewater areas), fewer depositional areas, higher bank configuration, and a higher potential for scouring flows because of channel confinement.

The FYLF River2D Habitat modeling site was located 17.7 mi downstream of Milton Diversion Dam in an area where a relatively large number of FYLF of all life stages, including 23 egg masses and 358 tadpoles, were documented during surveys in 2008. Ten flows were modeled, ranging from 11 cfs to 475 cfs. The River2D model indicated that the WUA for the FYLF egg mass life stage and the WUA for tadpoles was highest at the lowest modeled flow of 11 cfs. At the study site, the proposed minimum instream flows will be much greater than the release flows due to natural accretion. The flow levels and WUA that can be expected within the site under the proposed flow release schedule are summarized in Table 6.3.2-6 to illustrate the effect of accretion on flows. This can also be illustrated by measured flows at the site. For example, on June 18, 2009, flows measured at the site were 67 cfs compared to the 3 cfs minimum flow release from Milton Diversion Dam. In addition to the WUA summary, the spatial distribution of suitable habitat generated by the River2D model indicates that there is contiguous, highly suitable habitat at lower flow ranges, which becomes less suitable and increasingly fragmented at higher flows. Based on these results, the proposed minimum flow schedule will provide substantial suitable habitat and will not adversely affect FYLF.

Table 6.3.2-6. Percent of maximum FYLF weighted usable area (WUA) by month and Water Year type that would be available with NID's proposed minimum flow releases from Milton Diversion Dam - Middle Yuba River from Milton Diversion Dam to Wolf Creek.

Month	FYLF Lifestage	WATER YEAR TYPE																			
		Critically Dry				Dry				Below Normal				Above Normal				Wet			
		Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*
January	--	3	--	85.9	--	5	--	176.7	--	8	--	300.7	--	8	--	235.8	--	8	--	157.7	--
February	--	3	--	69.7	--	5	--	92.9	--	8	--	342.2	--	8	--	245.9	--	8	--	313.1	--
March	--	3	--	124.9	--	5	--	264.9	--	8	--	282.1	--	8	--	406.9	--	8	--	398.8	--
April	--	3	--	182.0	--	5	--	374.5	--	8	--	456.7	--	8	--	522.6	--	8	--	474.9	--
May	Egg Mass	3	100.0%	157.7	47.6%	5	100.0%	311.4	20.4%	8	100.0%	639.3	10.5%	8	100.0%	835.2	10.5%	8	100.0%	830.0	10.5%
June	Egg Mass	3	100.0%	30.4	98.1%	5	100.0%	64.3	82.5%	12	99.9%	191.8	39.1%	12	99.9%	287.1	22.6%	12	99.9%	621.8	10.5%
June	Tadpole	3	100.0%	30.4	91.7%	5	100.0%	64.3	73.0%	12	99.6%	191.8	31.2%	12	99.6%	287.1	17.7%	12	99.6%	621.8	8.6%
July	Tadpole	3	100.0%	7.0	100.0%	5	100.0%	12.6	99.3%	12	99.6%	26.4	93.4%	25	94.0%	66.2	71.8%	25	94.0%	154.6	39.8%
August	Tadpole	3	100.0%	9.5	100.0%	5	100.0%	9.5	100.0%	12	99.6%	18.6	96.8%	25	94.0%	35.4	89.3%	25	94.0%	45.5	84.6%
September	Tadpole	3	100.0%	9.4	100.0%	5	100.0%	9.9	100.0%	12	99.6%	18.3	96.9%	20	96.2%	30.5	91.6%	20	96.2%	34.6	89.7%
October	--	3	--	7.3	--	5	--	13.0	--	12	--	25.8	--	12	--	32.9	--	12	--	56.2	--
November	--	3	--	29.4	--	5	--	25.6	--	8	--	158.3	--	8	--	67.5	--	8	--	130.1	--
December	--	3	--	66.0	--	5	--	53.0	--	8	--	350.2	--	8	--	135.7	--	8	--	164.9	--

* Note: Flow values under the minimum modeled flow use the minimum modeled flow WUA value; flow values over the maximum modeled flow use the maximum modeled flow WUA value.

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Surveys for basking WPT were conducted at six sites distributed 18.3 to 32.2 mi below Milton Diversion Dam. A single WPT was found at one site that was 28.9 mi downstream of Milton Diversion Dam and about 3.5 mi upstream of YCWA's Our House Diversion Dam. This sighting could indicate a small population in this part of the reach or stray individuals. Conditions experienced by WPT 28.9 mi downstream of Milton Diversion Dam reflect considerable natural flow accretion relative to the minimum flow releases at the dam. Therefore, the proposed minimum flow schedule will not markedly change and will not adversely affect WPT habitats (i.e., primarily pools and backwater areas) where the species occurs. In addition, the proposed Project will not measurably affect water temperatures where WPT occurs.

French Dam

In Steps 1 and 2, NID focused on rainbow trout adult in all months. Hardhead habitat does not occur in the reach. NID found that with an increase in the existing minimum flow release from 2.5 cfs to 5 cfs, the rainbow trout adult target for the reach was always met and often greatly exceeded. This is due primarily to the fact that the reach is at a high elevation, in a very small watershed, and mostly granitic – so small changes in flow have large habitat consequences.

Figure 6.3.1-35 and Table 6.3.2-7 show the amount of habitat that would occur at NID's proposed minimum flow release of 5 cfs (i.e., no less than 87 percent of the habitat that would occur under unimpaired flow conditions, and usually much more).

Table 6.3.2.-7. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in Canyon Creek below French Lake Dam. SOURCE: Figure 6.3.1-35 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
No-Action Alternative	74% (Jan & Feb)	86% (Feb)	118% (Apr)	100% (Multiple Months)	900% (Aug)	4,486% (Sept)
Licensees' Proposed Project	87% (Feb)	99% (Feb)	136% (May)	100% (Multiple Months)	977% (Aug)	5,151% (Sept)

NID did not modify the minimum flow release schedule described above based on a review of existing resource information. NID collected only rainbow trout in this high gradient reach, and population abundance and biomass were not estimated. The reach is primarily composed of plunge pools where the rainbow trout congregate. Age-1 fish were the most frequently caught, with few numbers of age-0 fish. Mean daily water temperatures in 2008 and 2009 ranged from 9.0°C to 18.3°C. The reach is above the known elevation range for FYLF and WPT.

Faucherie Dam

NID's process focused on rainbow trout adult from July through March and rainbow trout spawning from April through June. NID found that with an increase in the existing minimum flow release from 2.5 cfs to 5 cfs, which would be consistent with the releases from French Dam, rainbow trout adult and spawning targets were always met and often greatly exceeded. Like the section of Canyon Creek below French Dam, the section of creek below Faucherie Dam is at a high elevation, in a very small watershed, and mostly granitic.

Figure 6.3.1-36 and Table 6.3.2-8 show the amount of habitat that would occur at NID's proposed minimum flow release of 5 cfs minimum flow release.

Table 6.3.2.-8. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in Canyon Creek below Faucherie Lake Dam. SOURCE: Figure 6.3.1-36 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
No-Action Alternative	72% (Jun)	97% (Jun)	110% (Mar)	100% (Multiple Months)	447% (Aug)	2,146% (Sept)
Licensees' Proposed Project	95% (Oct)	100% (Jun)	111% (Mar)	100% (Multiple Months)	430% (Aug)	2,099% (Sept)

NID did not modify the minimum flow releases described above based on a review of existing aquatic resource information. NID collected rainbow and brown trout in the reach: population abundance and biomass were not estimated. Mean daily water temperatures in 2008 and 2009 ranged from 11.1°C to 19.51°C. The reach is above the elevation range for FYLF, and there are no historical records for WPT in the reach or the vicinity of the reach, and no incidental observations were reported.

In addition, NID's proposed minimum flow releases would have a little effect on the elevation of Faucherie Lake, which supports about 5 percent of the Project's total annual recreational use (fourth to Rollins Reservoir, Jackson Meadows Reservoir and Bowman Lake, which together represent 93 percent of the use), during the summer recreation season (Table 6.3.2-9).

Table 6.3.2-9. Reductions in average summertime reservoir elevations in Faucherie Lake under NID's proposed Project as compared to the No-Action Alternative. Normal maximum water surface elevation is 6,123 feet.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNTAIVE (Elevation)							
Critically Dry	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,122.8	6,122.4
Dry	6,123.0	6,123.0	6,123.0	6,123.0	6,122.9	6,122.7	6,122.3
Below Normal	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0
Above Normal	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0
Wet	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0	6,123.0
NID'S PROPOSED PROJECT (Change in Elevation)							
Critically Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Faucherie Lake does not have any designated boat ramps.

<u>Sawmill Dam</u>

In Steps 1 and 2, NID focused on rainbow trout adult from August through April and rainbow trout spawning from Apr through Jun. Like French and Faucherie dams, NID found that with an increase in the existing minimum flow release from 2.5 cfs to 5 cfs, rainbow trout adult and spawning targets were met and often greatly exceeded. However, with a 5 cfs minimum flow release, the rainbow trout adult criteria are not met in February, March, April, and November. Therefore in Step 4 NID increased the minimum flows further in most of these periods to meet the criteria. NID increased minimum flows in Critically Dry years in February to 6 cfs, March to 6 cfs, and in April to 10 cfs. In February of Dry water years NID increased the minimum flow to 6 cfs. NID found that increasing flows much more in February and March had little benefit because, at times, the low habitat values are a result of high flows.

Figure 6.3.1-37 and Table 6.3.2-10 show the amount of habitat that would occur at NID's proposed minimum flow release. The rainbow trout adult target habitat is not met in February and March.

Table 6.3.2.-10. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in Canyon Creek below Sawmill Lake Dam. SOURCE: Figure 6.3.1-37 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
ALL MONTHS, EXCLUDING FEBRUARY AND MARCH						
No-Action Alternative	38% (Apr)	93% (Dec)	100% (Oct)	100% (Multiple Months)	616% (Oct)	1,808 (Oct)
Licensees' Proposed Project	75% (Jan)	98% (Jan)	108% (Apr)	100% (Multiple Months)	616% (Oct)	2,684 (Sept)

FEBRUARY[1]			
Flow Condition	Minimum	Median	Maximum
No-Action Alternative	39%	96%	273%
Licensees' Proposed Project	67%	99%	490%
MARCH[1]			
Flow Condition	Minimum	Median	Maximum
No-Action Alternative	38%	99%	100%
Licensees' Proposed Project	65%	100%	109%

1 As described above, habitat in May does not meet NID's rainbow trout adult habitat target due to periodic high flows in the month. The high flows occur under both NID's proposed flow releases and the No-Action Alternative

Rainbow and brown trout occur in the reach; no population estimates were made. All of the captured rainbow trout were age-0 fish indicating that successful reproduction had occurred, and all fish were of a healthy size. The stream reach is above the known elevation range for FYLF, and there are no historical records for WPT in the reach or the vicinity of the reach, and no incidental observations were reported. No adjustments were made to the above minimum streamflow release schedule.

Bowman Dam and Bowman-Spaulding Diversion Dam

Bowman Dam releases directly into the Bowman-Spaulding Diversion Dam impoundment. Therefore, as in the existing license, NID proposes a single minimum flow compliance location for both facilities, and that the compliance site be located downstream of Bowman-Spaulding Diversion Dam.

In Steps 1 through 3, NID focused on rainbow trout adult.

NID found that minimum flow releases in the 2 to 10 cfs range met the rainbow trout adult targets, with the higher minimum streamflow releases primarily in the summer period in Critically Dry water years.

Similar to minimum flow releases from Milton Diversion Dam into the Middle Yuba River, increased releases from the Bowman-Spaulding Diversion Dam in Critically Dry and Dry water years would exacerbate existing water supply deficits. Therefore, NID proposes a minimum flow requirement of 3 cfs in Critically Dry water years. NID increased the minimum flow release in Dry water years from 2-3 cfs to 4 cfs. Further, to be consistent with the proposed increase minimum flow release in Canyon Creek upstream of Bowman Lake, NID proposes a 5 cfs minimum flow release from Bowman Spaulding Diversion Dam in Below Normal, Above Normal and Wet water years.

Further, NID reviewed the results of the water temperature models to assess whether increased minimum flow releases would have a beneficial effect on the cold water extent in Canyon Creek. NID found that for the vast majority of the creek, water temperature was cold (i.e., a mean daily water temperature of 20° C or less), and was colder than the water in the South Yuba River where Canyon Creek enters the river (Table 6.2.1-6 in Section 6.2, Water Resources). NID increased the minimum flows to 5 cfs year-round in Wet water years, and also increased minimum flows in Below Normal and Above Normal Years to 4 and 5 cfs year-round, respectively, but not in drier water year types due to potential impacts on water deliveries. Figure 6.3.2-3 provides a depiction of predicted water temperature conditions in the Bowman-Spaulding Diversion Dam Reach under instream flow rates ranging from 3 to 150 cfs, based on a combination of 2008 hydrology and 2009 meteorology.

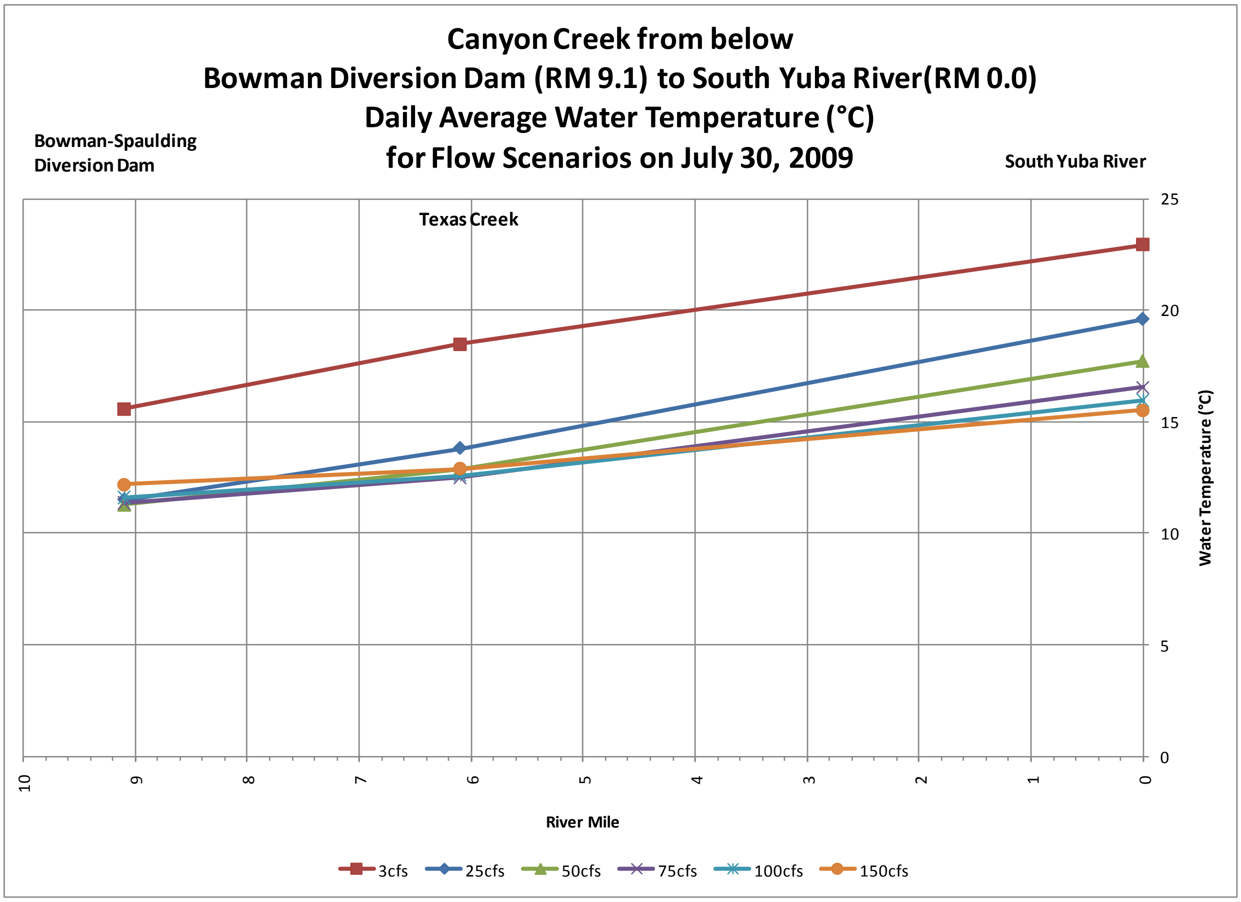

Figure 6.3.1-2. Modeled water temperatures in the entire Bowman-Spaulding Conduit Diversion Dam Reach based on 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

Figure 6.3.1-38 and Table 6.3.2-11 show the amount of habitat that would occur at NID's proposed minimum flow release.

Table 6.3.2.-11. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in Canyon Creek below Bowman-Spaulding Diversion Dam. SOURCE: Figure 6.3.1-38 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
ALL MONTHS, EXCLUDING, MAY, JUNE, AUGUST AND SEPTEMBER						
No-Action Alternative	63% (Mar)	82% (Dec)	103% (Jan)	81% (Apr)	111% (Oct)	429% (Oct)
Licensees' Proposed Project	78% (Feb)	96% (Dec)	109% (Mar)	84% (Apr)	129% (Oct)	528% (Oct)
MAY						
Flow Condition	Minimum		Median		Maximum	
No-Action Alternative	66%		101%		122%	
Licensees' Proposed Project	77%		101%		123%	

Table 6.3.2.-11. (continued)

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
JUNE						
Flow Condition	**Minimum**		**Median**		**Maximum**	
No-Action Alternative	70%		97%		131%	
Licensees' Proposed Project	76%		98%		136%	
AUGUST						
Flow Condition	**Minimum**		**Median**		**Maximum**	
No-Action Alternative	65%		120%		627%	
Licensees' Proposed Project	74%		158%		778%	
SEPTEMBER						
Flow Condition	**Minimum**		**Median**		**Maximum**	
No-Action Alternative	70%		117%		315%	
Licensees' Proposed Project	76%		152%		388%	

A review of existing information did not result in a modification to the above minimum flow releases. Only rainbow and brown trout were found in the reach in 2008 and 2009. Rainbow trout abundance and biomass ranged from 2,243 to 843 fish/mi and 33.6 to 12.2 lbs/ac, respectively. All rainbow trout age-classes were represented.

FYLF was found at a site situated 9.3 miles below the dam. The numbers of detections of each life stage were relatively low to moderate. Suitable FYLF breeding and rearing habitats occurred in only a few scattered sections of the reach and these are separated by sections of steep, nearly vertical in places, bedrock canyon walls.

The FYLF River2D Habitat modeling site was located 8.7 mi downtream of Bowman-Spaulding Diversion Dam, and slightly upstream of the area where FYLF were found during surveys in 2008 and where 5 egg masses were documented during surveys in 2009. Eight flows were modeled, ranging from 9.8 cfs to 372 cfs. The River2D model indicated that the WUA for both the FYLF egg mass and tadpole life stages was highest at the lowest modeled flow of 9.8 cfs. At the 2D study site, the proposed minimum instream flows will be higher than the release flows due to natural accretion. The flow levels and WUA that can be expected within the 2D site under the proposed flow release schedule are also summarized in Table 6.3.2-12 to illustrate the effect of accretion on flows. This can also be illustrated by measured flows at the 2D site. For example, on July 29, 2009 flows measured at the site were 9.8 cfs compared to the 3 cfs instream flow release. In addition to the WUA summary, the spatial distribution of suitable habitat generated by the River2D model also indicates that there is contiguous highly suitable habit at lower flow ranges which becomes less suitable and increasingly restricted to narrow bands of habitat along the stream margins. Based on these results, the proposed minimum flow schedule will provide substantial suitable habitat and will not adversely affect FYLF.

Table 6.3.2-12. Percent of maximum FYLF weighted usable area (WUA) by month and Water Year type that would be available with NID's proposed minimum flow releases from Bowman-Spaulding Diversion Dam - Canyon Creek from Bowman-Spaulding Diversion Dam to the confluence with the South Yuba River.

Month	FYLF Lifestage	WATER YEAR TYPE																			
		Critically Dry				Dry				Below Normal				Above Normal				Wet			
		Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*
January	--	3	--	27.7	--	4	--	51.5	--	5	--	132.1	--	5	--	85.8	--	5	--	56.6	--
February	--	3	--	22.1	--	4	--	28.7	--	5	--	110.8	--	5	--	96.2	--	5	--	166.5	--
March	--	3	--	36.5	--	4	--	69.5	--	5	--	78.9	--	5	--	164.4	--	5	--	236.2	--
April	--	3	--	43.5	--	4	--	86.9	--	5	--	154.1	--	5	--	229.9	--	5	--	289.2	--
May	Egg Mass	3	100.0%	37.6	82.8%	4	100.0%	71.7	68.2%	5	100.0%	277.9	43.0%	5	100.0%	509.4	45.6%	5	100.0%	582.9	45.6%
June	Egg Mass	3	100.0%	11.0	99.6%	4	100.0%	101.8	56.4%	5	100.0%	244.8	43.1%	5	100.0%	340.8	44.7%	5	100.0%	681.6	45.6%
June	Tadpole	3	100.0%	11.0	98.8%	4	100.0%	101.8	54.9%	5	100.0%	244.8	47.5%	5	100.0%	340.8	51.4%	5	100.0%	681.6	52.9%
July	Tadpole	3	100.0%	5.6	100.0%	4	100.0%	8.1	100.0%	5	100.0%	20.8	90.3%	5	100.0%	27.2	87.1%	5	100.0%	156.7	46.2%
August	Tadpole	3	100.0%	6.1	100.0%	4	100.0%	6.8	100.0%	5	100.0%	8.5	100.0%	5	100.0%	9.6	100.0%	5	100.0%	12.5	97.1%
September	Tadpole	3	100.0%	6.1	100.0%	4	100.0%	6.9	100.0%	5	100.0%	8.4	100.0%	5	100.0%	9.6	100.0%	5	100.0%	11.0	98.7%
October	--	3	--	5.7	--	4	--	7.8	--	5	--	10.5	--	5	--	13.5	--	5	--	22.7	--
November	--	3	--	11.5	--	4	--	11.2	--	5	--	50.7	--	5	--	22.2	--	5	--	66.7	--
December	--	3	--	21.1	--	4	--	18.6	--	5	--	143.0	--	5	--	43.1	--	5	--	57.0	--

* Note: Flow values under the minimum modeled flow use the minimum modeled flow WUA value; flow values over the maximum modeled flow use the maximum modeled flow WUA value.

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There are no known historical records of WPT in Canyon Creek downstream of Bowman-Spaulding Conduit Diversion Dam or from other locations in the vicinity. NID performed surveys in 2010 for basking WPT at two sites in Canyon Creek, but WPT was not observed.

NID's proposed minimum flow releases in the Middle Yuba River and Canyon Creek would affect the elevation of Bowman Lake, which supports about 6 percent of the Project's total annual recreational use (third to Rollins Reservoir and Jackson Meadows Reservoir, which together represent 85 percent of the use), for most of the summer in Critically Dry and Dry water years. The reason the effect is less later in the summer in Critically Dry water years is due to the recharging of the reservoir from upstream reservoirs and the Bowman-Spaulding Conduit. Reservoir elevations are affected to a small degree (~3 ft) late in the summer in Above Normal and Wet water years. (Table 6.3.2-13). This is due primarily to a reduction in diversions from the Milton-Bowman Tunnel, due to increased minimum instream flows in the Milton Diversion Dam Reach.

Table 6.3.2-13. Reductions in average summertime reservoir elevations in Bowman Lake under NID's proposed Project as compared to the No-Action Alternative. Normal maximum water surface elevation is 5,562 feet.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Elevation)							
Critically Dry	5,537.8	5,530.2	5,520.6	5,510.8	5,497.8	5,486.0	5,470.9
Dry	5,557.2	5,549.9	5,540.9	5,535.3	5,528.3	5,524.5	5,521.1
Below Normal	5,560.0	5,552.6	5,544.0	5,538.6	5,532.4	5,530.1	5,526.7
Above Normal	5,563.5	5,558.2	5,550.3	5,545.0	5,539.0	5,536.1	5,533.6
Wet	5,563.6	5,559.8	5,552.6	5,547.6	5,541.7	5,539.3	5,537.0
NID'S PROPOSED PROJECT (Change in Elevation)							
Critically Dry	4.7	4.7	2.6	3.1	3.8	3.4	1.0
Dry	-0.1	0.0	0.0	0.1	0.3	2.6	-0.3
Below Normal	0.0	-0.2	-0.5	-0.9	-1.5	-1.4	-0.9
Above Normal	-0.1	-0.7	-1.6	-2.1	-3.2	-3.3	-3.3
Wet	0.0	-0.6	-1.6	-2.4	-3.3	-3.3	-3.6

[1] Bowman Lake does not have any designated boat ramps.

Dutch Flat Afterbay Dam

In Steps 1 and 2, NID's process focused on rainbow trout adult from July through March and rainbow trout spawning from April through June. NID found that existing minimum flow requirements met, and often exceeded, the rainbow trout adult criteria. However, existing minimum flows do not meet the criteria for most spawning months during most water year types. Therefore, in Step 4, with one exception, NID increased the minimum flows in those months and water year types. The exception was in April where habitat under existing minimum instream flows are very close to the 80 percent criteria at 76 percent.

With respect to observed water temperatures, in July and August in 2008 and 2009, mean daily water temperatures in the Bear River immediately upstream of the Chicago Park Powerhouse exceeded 20.0°C. Elevated water temperatures are largely an artifact of hydraulic mining debris in this reach, as the debris has artificially widened the channel and exposed the streamflow to greater air-water convective heating and solar radiation. As a result, NID does not propose to increase the existing minimum flow in July or August.

Figure 6.3.1-40 and Table 6.3.2-14 show the amount of habitat that would occur at NID's proposed minimum flow release.

Table 6.3.2.-14. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in the Bear River below the Dutch Flat Afterbay Dam. SOURCE: Figure 6.3.1-40 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
ALL MONTHS, EXCLUDING APRIL						
No-Action Alternative	68% (Jun)	83% (May)	100% (Jan & Feb)	96% (Multiple Months)	108% (Sep)	1962% (Aug)
Licensees' Proposed Project	78% (Jan, Feb & Mar)	87% (Nov & Dec)	100% (Jan & Feb)	96% (Multiple Months)	108% (Sep)	1962% (Aug)
APRIL						
Flow Condition	Minimum		Median		Maximum	
No-Action Alternative	48%		74%		100%	
Licensees' Proposed Project	76%		90%		100%	

No adjustments were made to the above minimum flow releases. Fishes found in the reach below the afterbay in 2008 and 2009 included rainbow trout, brown trout and speckled dace. Rainbow trout abundance and biomass ranged from 2,203 to 106 fish/mi and 19.6 to 1.4 lbs/ac, respectively. Age-0 rainbow trout were not present in 2008, but in 2009, there were relatively high numbers of the age-class. Age-1+ rainbow trout were represented well in both years.

Aquatic macroinvertebrate SWAMP assessment was performed at one site in the reach. The MMI score for the site was relatively low, despite having moderate riparian vegetation development and a diverse streambed substrate composition. The IBI results were less than scores identified within Rehn's (2009) reference reaches.

Surveys for FYLF were conducted at three sites in this stream reach from 2003 through 2005 (Jones and Stokes 2006). All FYLF life stages were found in moderate to high numbers. Incidental observations reported during stream habitat mapping and channel characterization fieldwork in September 2007 also indicated large numbers of young-of-year.

The FYLF River2D Habitat modeling site was located 1.2 mi below Dutch Flat Afterbay Diversion Dam. During topographic data collection at least 5 FYLF egg masses were noted at the site in late May 2009. Eight flows were modeled, ranging from 4.4 cfs to 130 cfs. The River2D model indicated that the WUA for the FYLF egg mass and tadpole life stages was highest at the lowest modeled flow of 4.4 cfs. At the 2D study site, the proposed minimum instream flows will be slightly higher than the release flows due to natural accretion from the Dutch Flat Canyon tributary. The flow levels and WUA that can be expected within the 2D site under the proposed flow release schedule are summarized in Table 6.3.2-15 to illustrate the effect of accretion on flows. In addition to the WUA summary, the spatial distribution of suitable habitat generated by the River2D model also indicates that there is contiguous highly suitable habit at lower flow ranges which becomes less suitable and restricted to narrow bands of habitat along the stream margins and virtually absent at the two highest flows. Based on these results, the proposed minimum flow schedule will provide substantial suitable habitat and will not adversely affect FYLF.

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Table 6.3.2-15. Percent of maximum FYLF weighted usable area (WUA) by month and Water Year type that would be available with NID's proposed minimum flow releases from Dutch Flat Afterbay Dam - Bear River from Dutch Flat Afterbay Dam to Chicago Park Powerhouse.

Month	FYLF Lifestage	WATER YEAR TYPE																			
		Critically Dry				Dry				Below Normal				Above Normal				Wet			
		Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*
January	--	5	--	8.2	--	5	--	20.4	--	5	--	59.8	--	5	--	48.7	--	5	--	10.1	--
February	--	5	--	6.2	--	5	--	6.9	--	5	--	98.0	--	5	--	40.1	--	5	--	38.3	--
March	--	5	--	7.8	--	5	--	8.7	--	5	--	10.2	--	5	--	20.2	--	5	--	45.3	--
April	--	17	--	17.9	--	17	--	19.6	--	5	--	10.9	--	5	--	11.4	--	5	--	26.0	--
May	Egg Mass	17	92.9%	17.8	91.8%	17	92.9%	18.7	90.6%	17	92.9%	25.3	80.8%	17	92.9%	20.7	87.8%	17	92.9%	34.7	63.9%
June	Egg Mass	10	98.0%	10.5	97.9%	17	92.9%	17.9	91.7%	17	92.9%	18.4	91.0%	17	92.9%	18.9	90.3%	17	92.9%	20.0	88.8%
June	Tadpole	10	99.9%	10.5	99.8%	17	92.3%	17.9	90.4%	17	92.3%	18.4	89.4%	17	92.3%	18.9	88.3%	17	92.3%	20.0	86.2%
July	Tadpole	10	99.9%	10.2	99.9%	10	99.9%	10.5	99.8%	10	99.9%	10.8	99.8%	10	99.9%	11.1	99.7%	10	99.9%	11.5	99.2%
August	Tadpole	10	99.9%	10.2	99.9%	10	99.9%	10.3	99.9%	10	99.9%	10.5	99.8%	10	99.9%	10.7	99.8%	10	99.9%	10.9	99.8%
September	Tadpole	10	99.9%	10.2	99.9%	10	99.9%	10.3	99.9%	10	99.9%	10.4	99.8%	10	99.9%	10.7	99.8%	10	99.9%	10.8	99.8%
October	--	10	--	10.2	--	10	--	10.5	--	10	--	10.6	--	10	--	14.9	--	10	--	11.5	--
November	--	5	--	5.6	--	5	--	5.7	--	5	--	15.8	--	5	--	6.3	--	5	--	15.2	--
December	--	5	--	6.3	--	5	--	6.5	--	5	--	41.3	--	5	--	30.3	--	5	--	25.1	--

* Note: Flow values under the minimum modeled flow use the minimum modeled flow WUA value; flow values over the maximum modeled flow use the maximum modeled flow WUA value.

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Two adult WPT were observed incidentally in a pool in the lower section of the reach. Suitably deep pools and potential basking sites are well distributed in the reach. The proposed increases in minimum flows will not substantially change the distribution or condition of these habitats and will have a negligible effect on water temperature.

Rollins Dam

Rollins Dam releases directly into the Bear River Canal Diversion Dam impoundment. As in the existing license, NID proposes that the Rollins Dam minimum flow release compliance location be at a site downstream of the Bear River Canal Diversion Dam.

In Steps 1 through 3, NID focused on rainbow trout adult from July through March and rainbow trout spawning from April through June. NID found that existing minimum flow requirements met, and often greatly exceeded, the rainbow trout adult and spawning targets, with a few exceptions. During Critically Dry Water years in April, spawning habitat does not meet the criteria 100 percent of the time. This is due to a flood event on one day of the record that caused WUA to drop to very low levels. However, the proposed April minimum flow does meet the spawning habitat criteria 99 percent of the time. This same circumstance also occurred one day in December of the Below Normal and one day in Above Normal Water years. In these cases proposed December minimum flows meet the habitat criteria 98 percent of the time in below Normal Water years and 99 percent of the time in Above Normal Water years. During the remaining months and water years where the criteria are not met, Project existing median monthly flows in April, May, and June are higher than the peak of the WUA curve and much higher than the proposed minimums. Therefore, increasing minimum flows does not increase habitat during these months. Therefore, the existing minimum flow requirements were not adjusted in Steps 1 through 3.

Further, NID reviewed the results of empirical water temperature monitoring and water temperature models to assess whether increased minimum flow releases would have a beneficial effect on the cold water extent in the reach. NID found that, under existing conditions, water temperature in the reach generally remained below a mean daily temperature of 20°C. Therefore, since NID does not propose to change the existing minimum flow releases, NID did not adjust minimum flow releases for water temperature.

Figure 41 and Tables 6.3.2-16 show the amount of habitat that would occur at NID's proposed minimum flow release.

Table 6.3.2.-16. Comparison of rainbow trout habitat under NID's proposed minimum flow releases and No-Action Alternative flow conditions in the Bear River below the Bear River Canal Diversion Dam. SOURCE: Figure 6.3.1-41 (a) through (l).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
ALL MONTHS, EXCLUDING, MARCH, APRIL AND MAY						
No-Action Alternative	70% (Jan, Node 1)	82% (Dec, Node 1)	111% (Jan, Node 2)	100% (Multiple Months, All Nodes)	166% (Aug, Node 2)	1457% (Aug, Node 1)
Licensees' Proposed Project	70% (Jan, Node 1)	85% (Dec , All Nodes)	111% (Jan, Node 2)	100% (Multiple Months, All Nodes)	166% (Aug, Node 2)	1457% (Aug, Node 1)

Table 6.3.2.-16. (continued)

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
MARCH						
No-Action Alternative	55% (Node 1)	95% (All Nodes)	100% (Node 2)	62% (Node 2)	95% (All Nodes)	111% (Node 1)
Licensees' Proposed Project	55% (Node 1)	95% (All Nodes)	100% (Node 2)	62% (Node 2)	95% (All Nodes)	111% (Node 1)
APRIL						
No-Action Alternative	76% (Node 2)	89% (Node 2)	100% (All Nodes)	82% (Node 1)	90% (Node 1)	100% (All Nodes)
Licensees' Proposed Project	75% (Node 2)	89% (Node 2)	100% (All Nodes)	82% (Node 1)	90% (Node 1)	100% (All Nodes)
MAY						
No-Action Alternative	64% (Node 2)	89% (Node 2)	100% (All Nodes)	75% (Node 1)	95% (Node 2)	100% (All Nodes)
Licensees' Proposed Project	64% (Node 2)	89% (Node 2)	100% (All Nodes)	75% (Node 1)	95% (Node 2)	100% (All Nodes)

No adjustments were made to the minimum flow requirement. Rainbow trout, brown trout, Sacramento sucker, Sacramento pikeminnow, green sunfish, and speckled dace were collected between two fish sample sites at RM 3.4 and 8.0. In 2008, rainbow trout abundance ranged from 26 to 92 fish/mi. In 2009, rainbow trout abundance ranged from 176 to 1,161 fish/mi. Rainbow trout population density was greater at the upstream site. Biomass for rainbow trout was only determined in the upper site, since the lower site was snorkeled and ranged from and 0.2 to 0.5 lbs/ac, from 2008 to 2009 respectively. Length-frequency data show that age-0 rainbow trout production was good in the upper reach in 2008. The upper reach in 2009 and the lower reach in 2008 and 2009 all had relatively low rainbow trout production, which was similar to lower overall rainbow trout population density observed

NID conducted macroinvertebrate surveys at two sites in the reach at RM 3.4 and 8.0, where stream fish population sampling also occurred. The upper site had a poor IBI score and the lower site had a fair IBI score. While the upper site had a poor IBI score, quality aquatic habitat was noted by good levels of beneficial sediment and riparian cover.

Licensees performed surveys for FYLF at three sites in 2008 and two sites in 2009, distributed from 3.1 to 8.9 miles downstream of Bear River Canal Diversion Dam. The number of FYLF detections, limited to juvenile and adult FYLF, was consistently low. No egg masses or tadpoles were found at any of the sites. However, a few FYLF tadpoles were observed incidentally at two locations in 2008 and a few young-of-year were observed incidentally during stream habitat characterization work in 2007. Potential breeding and rearing habitat is associated with occasional gravel/cobble bars. Conditions for FYLF in this reach may also be adversely affected by high levels of recreational activities at several sites, as well as the presence of American bullfrog and crayfish.

The FYLF River2D Habitat modeling site was located 5.8 mi downstream of Bear River Canal Diversion Dam at one of the locations where tadpoles were incidentally documented in 2008. Eight flows were modeled, ranging from 16 cfs to 938 cfs. The River2D model indicated that WUA for FYLF egg masses was highest at the 16 cfs modeled flow, and highest for tadpoles at

40 cfs. At the 2D study site, the proposed minimum instream flows will be slightly higher than the release flows due to natural accretion. The flow levels and WUA that can be expected within the 2D site are summarized in Table 6.3.2-17. In addition to the WUA summary, the spatial distribution of suitable habitat generated by the River2D model also indicates that there is contiguous highly suitable habit at lower flow ranges which becomes less suitable and increasingly fragmented at higher flows. Based on these results, the proposed minimum flow schedule will provide substantial suitable habitat and will not adversely affect FYLF.

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Table 6.3.2-17. Percent of maximum FYLF weighted usable area (WUA) by month and Water Year type that would be available with NID's proposed minimum flow releases from Bear River Canal Diversion Dam - Bear River from Bear River Canal Diversion Dam to Dog Bar Road (Taylor Crossing Sub-reach).

Month	FYLF Lifestage	WATER YEAR TYPE																			
		Critically Dry				Dry				Below Normal				Above Normal				Wet			
		Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*
January	--	15	--	132.5	--	15	--	331.8	--	15	--	748.9	--	20	--	476.0	--	20	--	386.1	--
February	--	15	--	58.0	--	15	--	100.7	--	15	--	844.4	--	20	--	728.2	--	20	--	994.6	--
March	--	15	--	124.4	--	15	--	217.3	--	15	--	364.3	--	20	--	982.2	--	20	--	1,083.5	--
April	--	15	--	80.9	--	15	--	147.3	--	15	--	527.3	--	20	--	729.7	--	20	--	1,037.9	--
May	Egg Mass	40	93.8%	143.6	74.6%	40	93.8%	382.5	42.5%	40	93.8%	730.5	24.3%	75	88.2%	691.7	26.6%	75	88.2%	942.4	11.9%
June	Egg Mass	40	93.8%	126.7	77.5%	40	93.8%	177.6	68.9%	40	93.8%	350.0	44.2%	75	88.2%	486.7	37.9%	75	88.2%	639.5	29.7%
June	Tadpole	40	100.0%	126.7	84.9%	40	100.0%	177.6	72.8%	40	100.0%	350.0	45.2%	75	97.8%	486.7	40.6%	75	97.8%	639.5	32.2%
July	Tadpole	40	100.0%	136.1	82.7%	40	100.0%	140.6	81.6%	40	100.0%	174.2	73.7%	75	97.8%	271.4	54.3%	75	97.8%	368.3	44.3%
August	Tadpole	40	100.0%	130.4	84.0%	40	100.0%	137.9	82.3%	40	100.0%	145.1	80.5%	75	97.8%	203.2	67.0%	75	97.8%	218.2	64.2%
September	Tadpole	40	100.0%	104.3	89.5%	40	100.0%	130.8	83.9%	40	100.0%	134.2	83.1%	75	97.8%	153.9	78.5%	75	97.8%	151.7	79.0%
October	--	40	--	75.7	--	40	--	95.8	--	40	--	136.4	--	75	--	179.2	--	75	--	194.3	--
November	--	15	--	40.4	--	15	--	47.7	--	15	--	183.8	--	20	--	297.9	--	20	--	435.9	--
December	--	15	--	44.4	--	15	--	60.0	--	15	--	424.0	--	20	--	244.2	--	20	--	439.0	--

* Note: Flow values under the minimum modeled flow use the minimum modeled flow WUA value; flow values over the maximum modeled flow use the maximum modeled flow WUA value.

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Incidental observations of WPT were reported from two locations on this stream reach, as well as on a small tributary, and an unidentified turtle was also reported. Observations occurred in pools and backwaters, where basking habitats include overhanging vegetation and logs. One WPT was also observed in Rollins Reservoir at the confluence of Greenhorn Creek. The proposed minimum flows will not change the distribution or condition of WPT habitats.

In addition, NID's proposed minimum flow releases would have a minimal effect on the elevation of Rollins Reservoir, which supports approximately 70 percent of the Project's total annual recreational use, during the recreation season (Table 6.3.2-18). Reservoir elevations are slightly affected under all water year types due to a combination of increased minimum flow releases at upstream Yuba-Bear Hydroelectric Project and Drum-Spaulding Project reservoirs under their combined proposed projects as compared to the No-Action Alternative, along with carry-over storage totals which allow the previous year's water year type-based minimum instream flow conditions to affect the following year's water conditions. Note that in Critically Dry years, Licensees' proposed project minimum flow requirements upstream result in a slightly increased reservoir elevation during the latter portion of the recreation season.

Table 6.3.2-18. Reductions in average summertime reservoir elevations in Rollins Reservoir under NID's proposed Project as compared to the No-Action Alternative. Normal maximum water surface elevation is 2,171 feet.[1]

Water Year Type	Median Reservoir Water Surface Elevation (ft)						
	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Elevation)							
Critically Dry	2,160.3	2,148.6	2,129.9	2,120.4	2,111.2	2,105.3	2,072.8
Dry	2,170.9	2,169.0	2,166.2	2,164.5	2,161.6	2,161.4	2,141.4
Below Normal	2,170.9	2,169.9	2,168.0	2,166.3	2,164.3	2,161.7	2,141.4
Above Normal	2,170.9	2,170.0	2,168.7	2,166.9	2,164.9	2,161.7	2,141.7
Wet	2,171.1	2,170.0	2,168.9	2,167.1	2,164.9	2,161.7	2,142.0
NID'S PROPOSED PROJECT (Change in Elevation)							
Critically Dry	0.7	0.9	0.4	-0.3	-1.1	-1.8	-2.4
Dry	0.0	-0.1	-0.2	-0.3	-0.2	0.1	0.0
Below Normal	0.0	-0.2	-0.5	-0.7	-1.1	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Yellow highlighted cells indicate periods when the reservoir elevation would be below one or more of the useable elevations (i.e., as defined as 3 vertical feet above the actual end of the paved ramp) of the three ramps in Rollins Reservoir. The useable elevations of which are 2,146.0, 2,137.0 and 2,133.0 ft.

Direct Diversions on Perennial Creeks

Rucker Creek Diversion

Rucker Creek above Rucker Creek Diversion receives releases from PG&E's Drum-Spaulding Project's Blue and Rucker dams. Because the drainage between PG&E's Rucker Lake and NID's Rucker Creek Diversion is ephemeral in nature, and in order to provide flow continuity in Rucker Creek to its confluence with the South Yuba River, NID's proposed Project includes a year-round target flow of 0.75 cfs and a year-round minimum flow of 0.3 cfs from each of these two dams – the same upstream target and minimum flows releases. The target flows result in a mean depth and wetted perimeter of 0.57 and 7.92 feet, respectively, below the Bowman-

Spaulding Conduit based on results of Licensee's DFA survey in the riffle transect taken within this reach, as part of Licensee's Instream Flow Study.

Diversion Dams on Perennial Creeks

Texas Creek Diversion Dam

Texas Creek above Texas Creek Diversion Dam receives releases from PG&E's Upper Rock, Lower Rock, Culbertson, Upper Lindsey, Middle Lindsey and Lower Lindsey dams. Under the Drum-Spaulding Proposed Project, PG&E proposes a cumulative year-round target flow of 1.5 cfs and a cumulative year-round minimum flow of 0.6 cfs in the reach above the Texas Creek Diversion Dam (all upstream minimum flows measured separately). Because the drainage between PG&E's upstream facilities and NID's Texas Creek Diversion Dam is ephemeral in nature, and in order to provide flow continuity in Texas Creek to its confluence with Canyon Creek, NID's Project includes the cumulative upstream target and minimum flows in the Texas Creek Diversion Dam Reach. The target flows result in a mean depth and wetted perimeter of 0.95 and 12.91 feet, respectively, based on results of the Demonstration Flow Analysis survey in the run/pool transect taken within this reach, as part of Licensee's Instream Flow Study.

Fall Creek Diversion Dam

Fall Creek above Fall Creek Diversion Dam receives releases from PG&E's Carr and Feeley dams. Under PG&E's Drum-Spaulding Proposed Project, PG&E proposes a year-round target flow of 0.5 cfs and a year-round minimum flow of 0.2 cfs in the reach above the Fall Creek Diversion Dam (all upstream minimum flows measured separately). Because the drainage between PG&E's upstream facilities and NID's Fall Creek Diversion Dam is ephemeral in nature, and in order to provide flow continuity in Fall Creek to its confluence with the South Yuba River, NID's proposed Project includes the cumulative upstream target and minimum flows in the Fall Creek Diversion Dam Reach. The target flows result in a mean depth and wetted perimeter of 0.21 and 19.6 feet, respectively, based on the PHABSIM survey in a low-gradient riffle transect taken within this reach as part of Licensee's Instream Flow Study.

Facilities Where No Minimum Streamflow is Proposed by NID

Wilson Creek below Wilson Creek Diversion Dam

Wilson Creek Diversion Dam is a 3-foot high rubble dam located on Wilson Creek about 0.3 miles upstream of the confluence with the Middle Yuba River. The dam diverts water from Wilson Creek into the Milton-Bowman Conduit. Wilson Creek is an ephemeral creek with no associated storage facilities – the creek runs dry upstream and downstream of the diversion dam each year.

The existing license does not include a minimum flow release requirement for this facility, nor does NID propose one since the Project does not have the ability to provide flow in the creek.

Clear and Trap Creeks below the Bowman-Spaulding Conduit

Clear and Trap creeks feed into the Bowman-Spaulding Conduit. Both creeks are ephemeral creek with no associated storage facilities – the creek runs dry upstream and downstream of the conduit each year.

The existing license does not include a minimum streamflows in Clear and Trap creeks, nor does NID propose one.

Bear River below Chicago Park Powerhouse

Chicago Park Powerhouse is the only Project peaking facility and releases directly into the Bear River about 1.5 miles upstream of the normal maximum water surface elevation of Rollins Reservoir. Releases from and spills over Dutch Flat Afterbay Dam as well as accretion in a 5.4-mile-long section of the Bear River flow upstream of the powerhouse flow unimpeded past the powerhouse.

The existing license does not include a minimum flow release for this facility, nor does NID propose one for a number of reasons. First, this is the Project's only peaking facility, and therefore the power generated by the facility is particularly valuable.

Second, the section of stream affected by the peaking operations is very short (i.e., less than 1.5 miles), and has been severely disturbed by past hydraulic mining. The reach is a low gradient, braided channel due to high sediment supply from hydraulic mining. The original valley is filled with cobbles and gravels with materials excavated during hydraulic mining. Subsurface flow is common and deep pools are infrequent. Deposition is further enhanced in the lower 0.5 mile due to backwater effect from Rollins Reservoir, where sinuosity and anastomosing is increased, and sands and silts are deposited.

Not unexpectedly, aquatic resources in the reach are limited. NID did not find rainbow trout in the reach – only Sacramento sucker, brown trout, smallmouth bass, Sacramento pikeminnow, and speckled dace. However, rainbow trout are historically planted in Rollins Reservoir and naturally occur in Steephollow Creek, a tributary to the Bear River, within the Chicago Park Powerhouse Reach. This reach is within the expected distribution of FYLF and is adjacent to areas with robust populations of FYLF - the Bear River immediately upstream of the powerhouse and in Steephollow Creek. NID identified a survey site for FYLF in the reach below Chicago Park Powerhouse, which included the lower part of Steephollow Creek, but surveys in the reach in 2008 were largely precluded by high daily peaking flows. There were incidental observations of a few FYLF tadpoles in two locations of the Chicago Park Powerhouse Reach in September 2009 which might indicate limited breeding at those locations. NID performed FYLF surveys in 2010 in two sections of the reach covering 0.35 mile, areas that could be safely accessed, but no FYLF egg masses or tadpoles were detected. On September 8, 2010, additional sections were surveyed during a brief low flow period that allowed safe access. Suitable habitats for FYLF rearing were not present on the main channel. However, a relict channel south of the main active channel contained suitable habitat and tadpoles were observed to be numerous. The area was characterized by backwater conditions and there was no evidence that the area regularly experienced high flows. The FYLF River2D Habitat modeling site, which encompassed an area beginning about 0.5 mi downstream of the Chicago Park Powerhouse. The spatial distribution of suitable habitat generated by the River2D model demonstrates that suitable habitat is situated almost entirely within the relict channel where tadpoles were observed in 2009.

There are no historical records for WPT in the reach and no incidental observations.

Of note, minimum flow releases from Dutch Flat Afterbay plus accretion in the 5.4-mile–long section of the Bear River between the afterbay dam and the powerhouse continue past the powerhouse. In effect, this provides a minimum flow in the Chicago Park Powerhouse Reach of the Bear River.

6.3.2.1.3 Effects of Ramping on Aquatic Resources

The proposed Project has the potential to affect aquatic resources due to rates of changes in flow. Typically in hydroelectric projects, these effects are materialized in fish stranding, dewatering trout redds, scoured or exposed frog egg masses, or other effects related to changes in flow. NID believes that inclusion of its ramping rate measures into the proposed Project will assure that the effects of changes in flow on aquatic resources are minimized.

NID’s proposed Project includes ramping rate restrictions at two facilities: Jackson Meadows Dam and Rollins Dam – where ramping rate restrictions are included in the existing license. The Jackson Meadows Dam ramping rate is 40 cfs/hour when flows begin below 50 cfs, and 200 cfs/hour when flows begin above 50 cfs (all flows measured at the low level outlet). The Rollins Dam ramping rate is 0.5 ft/hr.

NID performed a study on the ramping rates of the South Yuba River at Cisco Grove and the Bear River below Rollins Dam, as measured at streamflow gages YB-316 and YB-196, respectively. The South Yuba River at Cisco Grove was selected as a surrogate site for the Middle Yuba River below Jackson Meadows due to their similar elevations and channel types. The analysis was conducted by reviewing 15-minute stage and flow data for the period of 1997 through 2008, and identifying periods of streamflow variability due to natural runoff conditions (i.e. uncontrolled flows).

During this period, a storm event which occurred on December 1-2, 2005 resulted in a stage hydrograph at YB-316 with typical natural accession and recession characteristics; see Figure 6.3.2-3 for a graphical summary. This event produced a downward rate of stage change of 0.62 feet per hour, as measured by the stream gage. Several natural runoff events during the 1997-2008 period produced downward rates of stage change between 0.5 and 0.6 feet per hour.

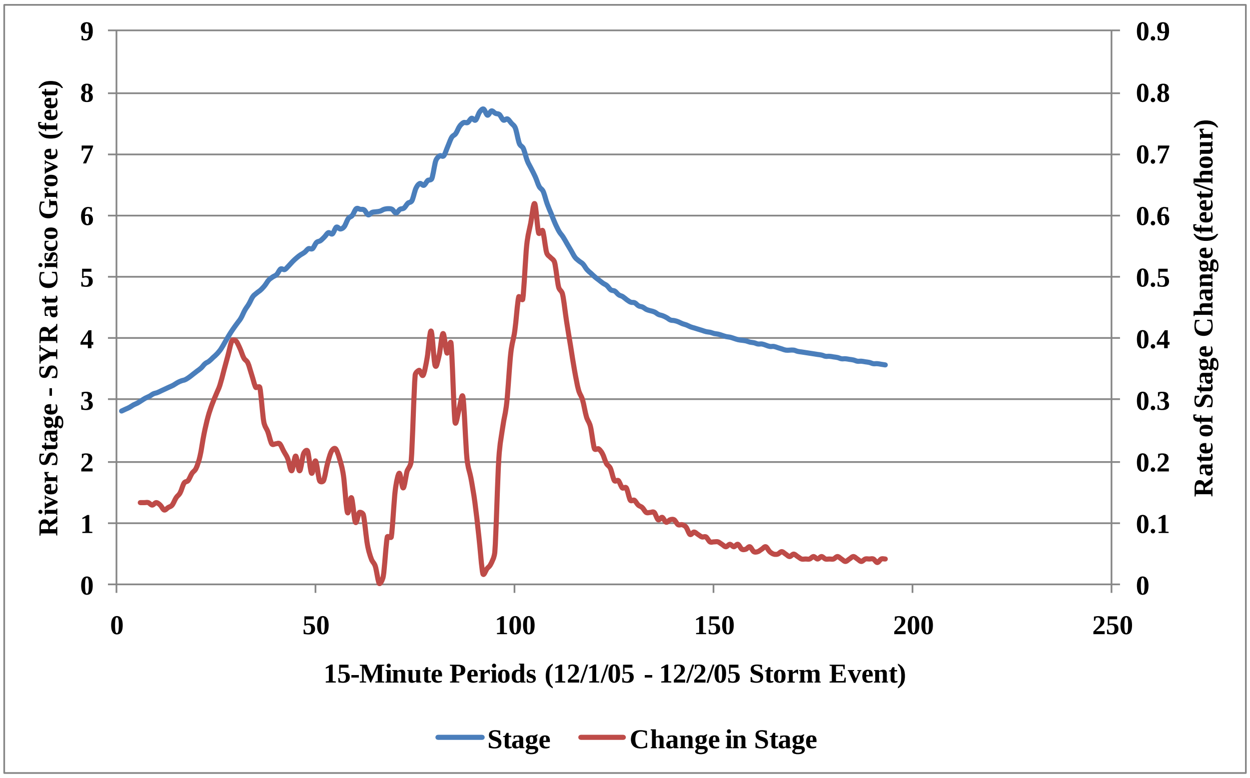


Figure 6.3.2-3. River stage (expressed in feet) and change in stage (expressed in feet/hour) during a natural runoff event in the South Yuba River at gage YB-316 on December 1-2, 2005. A maximum change in stage of 0.62 feet/hour was observed.

Based on the results of this analysis, NID believes that a 0.6 foot per hour maximum rate of stage change will provide conditions which mimic the natural extent of stage variability in the Middle Yuba River below Jackson Meadows Dam. Licensees converted this change in stage to an equivalent change in flow at the Jackson Meadows Dam low-level outlet, through the use of stage-discharge relationships that were developed as part of Licensees' PHABSIM study in the Jackson Meadows Dam Reach. An average stage-discharge relationship from the three transects taken in the reach was used to develop the flow equivalencies.

In the Bear River below Rollins Dam, a storm event which occurred on February 8-9, 1999 resulted in a stage hydrograph at YB-196 with typical natural accession and recession characteristics; see Figure 6.3.2-4 for a graphical summary. This event produced a downward rate of stage change of 0.64 feet per hour, as measured by the stream gage. Several natural runoff events during the 1997-2008 period produced downward rates of stage change between 0.4 and 0.6 feet per hour.

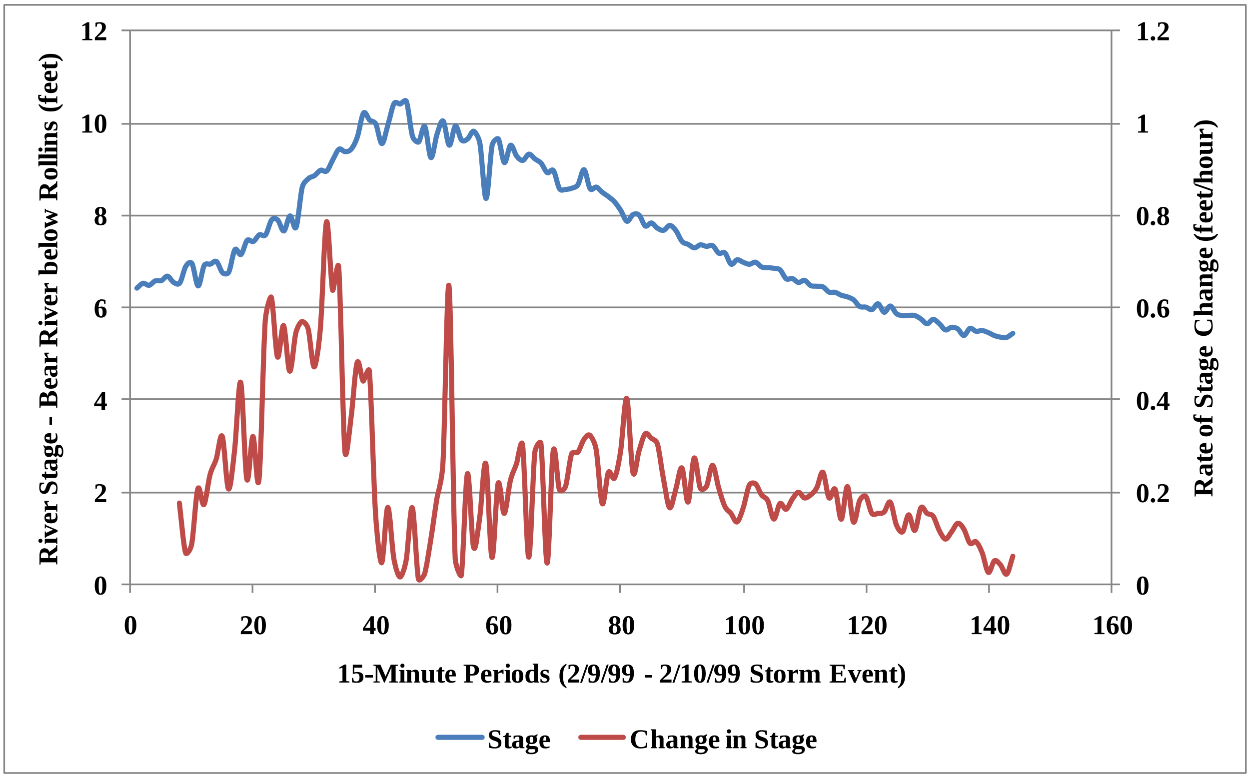


Figure 6.3.2-4. River stage (expressed in feet) and change in stage (expressed in feet/hour) during a natural runoff event in the Bear River below Rollins Dam (YB-196) on February 9-10, 1999. A maximum change in stage during flow recession of 0.64 feet/hour was observed.

Based on the results of this analysis, NID believes that a 0.5 foot per hour maximum rate of stage change will provide conditions which mimic the natural extent of stage variability in the Bear River below Rollins Dam. The maximum stage change was reduced from the maximum observed stage change as a conservative approach, in order to account for the inherent noisiness in stage data at this gage location during high flow event.

Other than reports by CDFG of fish stranding at Jackson Meadows Dam and Rollins Dam spillways, NID is unaware of any reports of chronic stranding of fish under existing Project operations, which includes ramping rates at Jackson Meadows Diversion Dam and Rollins Dam. NID examined fish stranding at both spillways as requested by CDFG, and found only one fish in Jackson Meadows Dam spillway.

Similarly, NID is unaware of reports of chronic dewatering of trout redds due to rapid changes in releases from Project facilities. As described in Section 6.3.2.1.1, NID's proposed minimum streamflow releases are specifically designed to provide adequate habitat for trout spawning.

The effects of changes in flows on FYLF egg masses have been documented on other hydroelectric projects (e.g., Kupferberg et al. 2007), which suggests that these phenomena could also occur under NID's proposed Project. FYLF egg masses are typically attached to the substrate, are not motile, and require 10-28 days for development before hatching. Tadpoles are motile, but could also be stranded or trapped in isolated pools created by down-ramping, whereas tadpole response to increased flows is to seek refuge in the stream bed. Ramping effects on FYLF could occur on each of the stream reaches where this species breeds: the Middle Yuba downstream of Milton Diversion Dam; Canyon Creek downstream of Bowman Dam; and the Bear River downstream of Dutch Flat Afterbay Dam, Chicago Park Powerhouse, and Rollins Dam. On the Middle Yuba below Milton Diversion Dam, spills are closely associated with precipitation events and snow melt, and spills generally do not occur on the Bear River below Dutch Flat Afterbay Dam. In the Chicago Park Powerhouse Reach of the Bear River, FYLF breeding is largely limited to a backwater area unaffected by high flows. Flow levels typically found in the Bear River Canal Diversion Dam Reach of the Bear River during the FYLF breeding and rearing period are higher than would be found in the unimpaired condition, which limits suitable, low-velocity edgewater habitat. However, down-ramping is similar under both unimpaired and regulated flows and is not an issue.

NID's proposed Project potential effects of ramping on WPT may be largely associated with spills that increase flows; however, WPT are motile and presumably move to areas of quieter water as they would in response to natural increases in flow and to deeper water in response to stage decline. Because WPT often over-winter in upland sites, some of these spills may have no effect on WPT. This species has been documented about 29 mi downstream of Milton Diversion Dam in the Middle Yuba River and at locations on and in the vicinity of the Bear River, including downstream of Dutch Flat Afterbay and downstream of Rollins Reservoir. The proposed ramping rates for the Middle Yuba River downstream of Milton Diversion Dam and on the Bear River downstream of Rollins Reservoir are comparable to or smaller than natural stage variability. In the Dutch Flat Afterbay Reach of the Bear River rapid stage changes may occur during canal outages and spills, although natural changes in flow are likely to be more substantial. Spilling may temporarily displace WPT from some habitats during high flows. However, because WPT often over-winter in upland sites, some of these spills may have no effect on WPT.

NID's proposed Project does not include a ramping rate for Chicago Park Powerhouse, the only Project peaking facility that discharges directly into a stream reach. As described above, the powerhouse affects a short portion of stream that has been severely degraded by mining. Ramping rate restrictions at this facility would significantly affect the benefits of the powerhouse for generation peaking, and likely have little environmental benefit.

6.3.2.1.4 Effects of Reservoir Pool on Aquatic Resources

The proposed Project might affect aquatic resources in Project reservoirs if the reservoir pools were drawn down significantly below historic levels or reservoir operations was otherwise altered. NID's propose Project includes five measures that would reduce the effects of pool drawdown to less than significant.

The first measure is NID's proposed minimum flows, which would not result in pools appreciably lower than they have been historically. The four other measures are continuations of minimum pool restrictions in the existing license. These are the Jackson Meadows Reservoir, Milton Diversion Impoundment, Faucherie Lake and Rollins Reservoir. Under these conditions, existing information and Licensee's studies found healthy populations of fishes in Project reservoirs, especially in Jackson Meadows Reservoir, Bowman Lake, and Rollins Reservoir in which sampling occurred in 2009 (Table 6.3.1-4).

6.3.2.1.5 Effects of Pulse Flows on Aquatic Resources

NID's proposed Project does not include supplemental, or pulse, flows related to aquatic resources. The existing license does not include any such measure, and existing information and Licensees' studies did not develop any evidence to suggest that the addition of pulse flows to the proposed Project would benefit aquatic resources.

Note that NID's proposed Project includes a supplemental flow in September in Canyon Creek below French Dam for whitewater boating. NID collected only rainbow trout in this high gradient reach, and population abundance and biomass were not estimated. The reach is primarily composed of plunge pools where rainbow trout congregate. The reach is above the elevation range for FYLF, and SNYLF does not occur. WPT was not observed.

6.3.2.1.6 Effects of Entrainment on Fish Populations

The Yuba-Bear Hydroelectric Project includes 27 intakes including low-level intakes, power intakes and diversions, all of which would continue to operate as part of NID's proposed Project, at which fish may be entrained. Over the course of the relicensing, general agreement was reached that existing information was adequate to determine most of these intakes have a low potential to significantly affect fish populations. Therefore, specific entrainment data gathering was requested on only nine of the intakes: the five feeder tributaries to the Bowman-Spaulding Conduit, and the Milton-Bowman, Bowman-Spaulding, Dutch Flat No. 2 and Chicago Park conduit intakes.

NID's studies documented that two of the Bowman-Spaulding Conduit feeder tributaries - Clear and Trap creeks - are dry for extended portions of each year. The tributaries can not support viable populations of fish and therefore, and fish entrainment into the conduit would have a less than significant effect on the fish populations, if any, that may occur for brief periods of time in the ephemeral streams.

Similarly, NID's studies, though confused by misleading hydroacoustic information, indicate with reliability that effects of entrainment into the Dutch Flat No. 2 Flume and Chicago Park Conduit on fish populations in Drum Forebay and Dutch Flat Afterbay, respectively are less than significant. NID's netting study in 2010 suggested that less than 7-8 fish were entrained into the Dutch Flat No. 2 Flume over a 60 day period. Extrapolating the Dutch Flat No. 2 Conduit results to the Chicago Park Conduit yields 13.88 fish entrained into the Chicago Park Conduit over a 60 day period. These levels of entrainment are well below levels that would have significant effects on fish populations, and do not warrant fish screens at the intakes or other protective measures.

Data sampling in Dutch Flat No. 2 Flume will be conducted in 2011 and results of the study will be used to conduct a final assessment of current conclusions.

Entrainment data were also collected by hydroacoustic devices at the Bowman-Spaulding Conduit intake. NID's hydroacoustic devices recorded an average of 9.2 counts per day, which equaled 1,104 counts over the 120-day period from May through August 2009. While NID believes this is an overestimate because the acoustic devices were not able to accurately distinguish between fish and debris, even if the estimate is accurate, the numbers are not likely to have a significant effect on fish populations in Bowman Lake, which is heavily stocked. The heavily stocked fishery is driven based on stocking events and not natural reproduction or existing wild populations. As a result, the identified level and timing of entrainment would not impact important reproduction events or existing natural populations that might otherwise be a critical detriment to the fishery. Instead, the stocking events provide a sustainable and re-occurring source of fish for the reservoir that offsets any potential effects of entrainment and supports recreational activity. In addition, CDFG stated that if NID assumed the stocking responsibility for Bowman Lake, CDFG would consider this mitigation for any effects. Therefore, NID has included a measure in the proposed Project that would require NID stock fish in Bowman Lake.

The potential for fish entrainment into the Bowman-Spaulding Conduit to have a significant effect on fish populations in Texas, Fall, and Rucker creeks is less than significant. All three high-elevation streams are in very small drainages and would be dry without upstream releases from Drum-Spaulding Project reservoirs; all three are relatively short; all three streams have very low summertime flows ranging from about less than 0.5 cfs to 2 cfs with water temperatures reaching abut 20° C; and all three streams support rainbow and brown trout populations. An example of the habitat is presented in Figure 6.3.2-5.

Figure 6.3.2-5. Example of the high gradient pools in Texas Creek.

Even though NID considered the potential effects due to entrainment to be less than significant, NID considered exclusionary devices for each of three feeder tributaries, but determined the potential benefit would not warrant the cost. The facilities are located in remote, high elevation areas where access, even in summer, is difficult. Access in winter is even more difficult, and the nearest power source for a fish screen is the Bowman-Spaulding 60kV transmission line, as much as one half mile away, and would require a costly voltage step-down facility. In addition the tributaries often contain large amounts of debris during spring runoff. Given that the potential affects are less than significant, the cost for constructing and maintaining exclusion devices at these intakes is not warranted.

As described in Section 6.3.1.1.4, NID believes the hydroacoustic information regarding detections at the Milton-Bowman Conduit intake is unreliable for a number of reasons. However, if the detections actually represent fish entrained into the canal from this CDFG-designated Trophy Trout Waters – a number that is seven to eight times the population of fish in the stream – this would constitute a significant effect. At this time, NID has taken a dual approach to this issue. First, as agreed with CDFG, NID developed conceptual drawings and costs for potential fish screen designs at the Milton-Bowman Conduit intake, and has discussed with CDFG, the Forest Service and SWRCB the need and feasibility of installing a fish screen at the intake. However, NID remains concerned that a screen at this intake is needed, or that it would function properly because of the high debris load in the river in spring, even if the screen was continuously monitored.

At this time, NID does not propose a fish screen or other protective devices regarding entrainment into the Milton-Bowman Conduit.

6.3.2.1.7 Effects on Fish Passage

NID's proposed Project would have a less than significant effect of fish populations due to fish passage barriers for the following reasons:

- NID's proposed Project will not affect the upstream migration of anadromous or adfluvial fish for spawning - anadromous or adfluvial fish do not occur in any of the stream reaches affected by Project. There are no species that specifically require passage for reproduction and populations are capable of moving within the stream so that genetic isolation is not occurring.
- Resident fish populations occur both upstream and downstream of Project dams indicating that they have access suitable habitat for spawning, food and other needs.
- No fish passage barriers were found within the normal maximum water surface elevations of Project reservoirs. Since NID's proposed Project will not substantially alter reservoir elevations, fish in the reservoirs will continue to be able to move into tributaries.
- NID's proposed Project would not affect the ability of fish to move into tributaries from the mainstem of Project-affected streams. Potential barriers that occur as a result of Project operations were not found at the confluence of the tributaries and mainstems, through barriers to upstream movement were found upstream of the confluence.
- NID's proposed Project would not affect the ability of resident rainbow trout to move upstream in the Middle Yuba River. Data presented in Gast et al. (2005) and NID's studies demonstrate that, under existing conditions, rainbow trout of all sizes are found in the Middle Yuba River both upstream and downstream of potential upstream barriers identified by Vogel (2006). This distribution demonstrates that trout have access to suitable summertime and spawning habitat both upstream and downstream of the potential barriers. NID's proposed Project would not significantly alter flows in the Middle Yuba River, so access to suitable habitat will not be affected.

6.3.2.2 Drum-Spaulding Project

This Section summarizes effects of the existing Drum-Spaulding Project on aquatic resources. In some instances, it is concluded that the existing Project does not adversely affect aquatic resources, and therefore no PM&E measure is proposed. In general, if it is concluded that the existing Project does or may adversely affect a specific aquatic resource, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect.

PG&E has proposed five PM&E measures that are relevant to this resource area, which are listed in Section 6.3.4.2 below. The complete text of the measure and the accompanying rationale is presented in Appendix E7 of this FLA.

6.3.2.2.1 Effects of Streamflows on Fish and FYLF[18]

PG&E conducted various studies, including fish, amphibian, and turtle surveys in stream reaches potentially affected by the existing Project.

Fish

As described in Section 6.3.1.1.8 above, Licensees performed instream flow studies that included 1D PHABSIM, CFR, RCA and DFA methods. For reaches in which a PHABSIM model was developed, PG&E developed WUA verses flow curves for target species and life stages. These WUA curves are shown in Figures 6.3.1-20 to 6.3.1-32 above. In addition, PG&E performed habitat exceedence analysis (HEA) on Drum-Spaulding Project affected reaches (except one in which a PHABSIM was performed) similar to the HEA performed by NID. . The exception was the Wise Powerhouse Overflow Reach. An HEA was not performed in this reach because the Drum-Spaulding Project does not divert or store water.

Figure 6.3.2-6 through Figure 6.3.2-13 below provide monthly HEA exceedance curves for rainbow trout adult life stages for four hydrologic scenarios for the following Drum-Spaulding Project-affected sub-reaches where PHABSIM studies were conducted: Fordyce Lake Dam Reach (Fordyce Creek); Jordan Creek Reach (South Yuba River); Bear River Reach #1 (Bear River); Bear River Reach #2 (Bear River); Drum Afterbay Dam Reach (Bear River); Lake Valley Reservoir Dam Reach (North Fork of the North Fork American River); Lake Valley Canal Diversion Dam Reach (North Fork of the North Fork American River); and Towle Canal Diversion Dam Reach (Canyon Creek, tributary to North Fork American River). Figures are provided for each month of the year. Each figure includes four curves, one each for the following modeled hydrology scenarios:

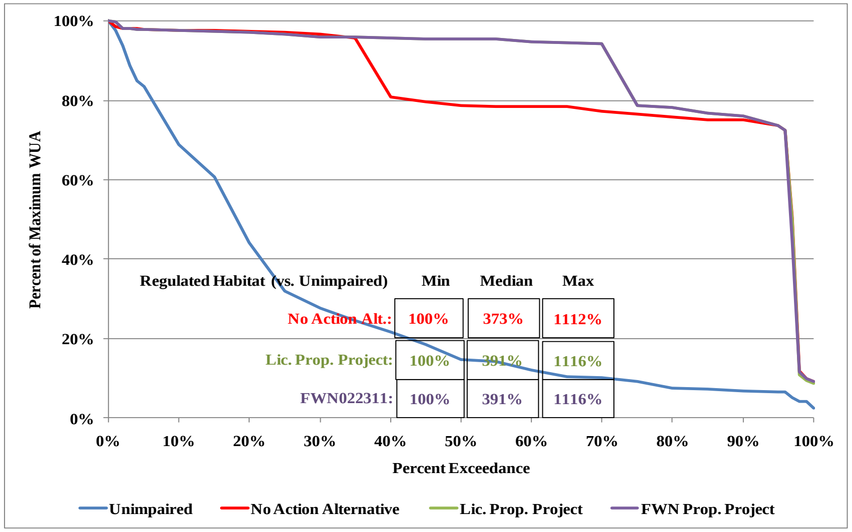
- The unimpaired flow condition (synthesized modeled flows by Licensees)
- The No-Action Alternative (i.e., existing conditions, or Base Case)
- Licensees' Proposed Projects (system-wide runs for both projects)
- FWN's Proposed Projects

Licensees modeled the No-Action Alternative using the HEC-ResSim Operations Model. Comparison of the modeled No-Action Alternative to historical operations of a project frequently yields similar results, but in this case the results differ slightly. The difference is primarily due to: 1) the official retirement of Alta Powerhouse, Unit 2; 2) the re-operation between PG&E's

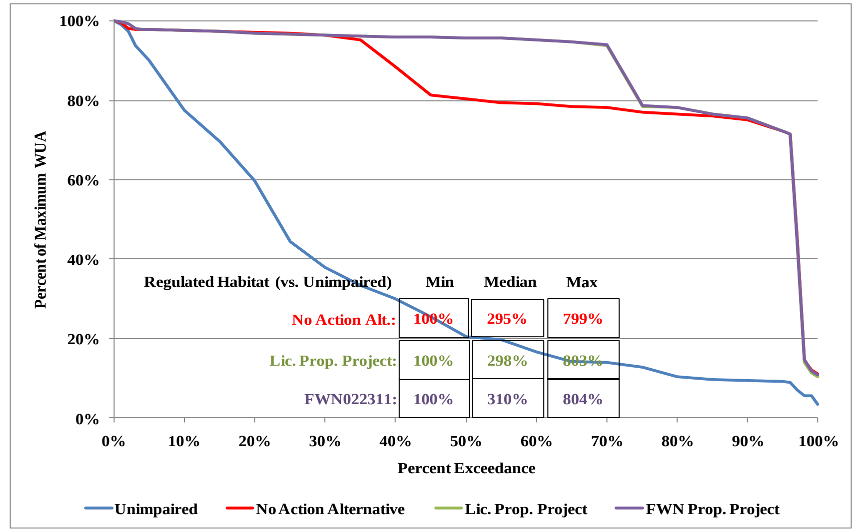
[18] Many of PG&E's proposed minimum streamflow releases are triggered by specific water year types (i.e., Critically Dry, Dry, Below Normal, Above Normal and Wet), which are part of PG&E's Proposed Project. Refer to PG&E's Proposed Measure DS-AQR1, Part 2, in Appendix E7 for the full text of the measure.

Dutch Flat No. 1 and NID's Dutch Flat No. 2 powerhouses; 3) PG&E and NID's modified winter/spring operations since 1997; 4) the inclusion of usable storage capacity estimates generated by Licensees' 2007-2009 bathymetric studies, where applicable; and 5) the use of the WY2001-2009 annual average water demands. These five items have been captured by the HEC-ResSim Operations Model. The modeled No-Action Alternative does not incorporate PG&E's proposed PM&E measures.

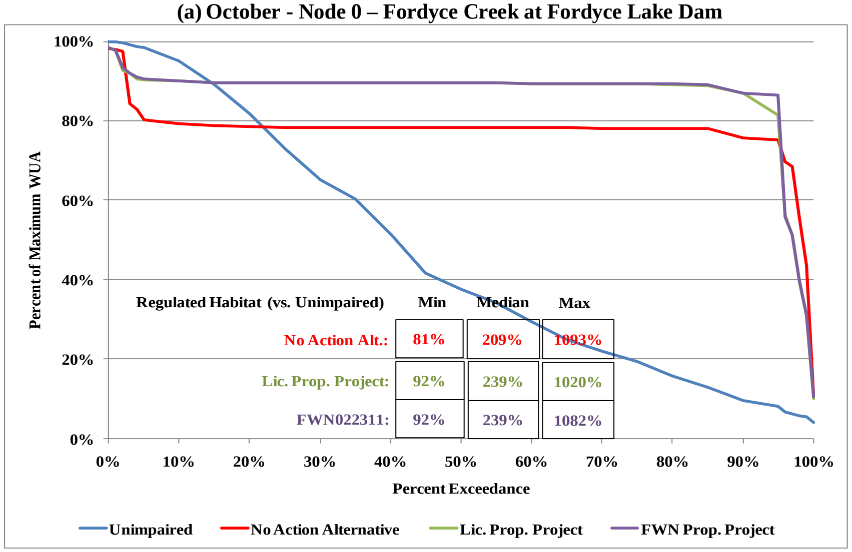
PG&E has presented its Proposed Project Streamflows in Appendix E7 of this Exhibit E. FWN's Proposed Project Streamflows are set forth in Appendix E12. It should be noted that although FWN's February 24, 2011 proposal provided Licensees with additional detail, it did not provide all of the information that was needed to make a complete model run. As a result, the Operations Model scenario run that is included in the Operations Model DVD in Appendix E12 of this Exhibit E uses FWN's recommended flow for all reaches where FWN provided such flows; in other reaches, where no flows were specified by FWN, flows from Licensees' Proposed Projects were utilized so that an entire system run could be conducted. Section 3 (Cumulative Effects) of this Exhibit E describes the results (on generation and reservoir level impacts) of PG&E Proposed Project Streamflows and those proposed by FWN. PG&E included the HEA results for the FWN's Proposed Project flows in Figures 6.3.2-6 through 6.3.2-13 below to facilitate comparisons between the various Operation Model runs. It should be noted that, in some reaches, there are no differences in flow proposals between the No-Action Alternative, Licensees' Proposed Projects and FWN's Proposed Project. In such cases, the HEA curves may overlap one another on the figures below, and appear as a single curve. The table of statistics on the bottom of each figure can be utilized to determine if the flow proposals in a given reach during a given month are identical (i.e., identical statistics for "minimum", "median", and "maximum" between the various flow proposals).



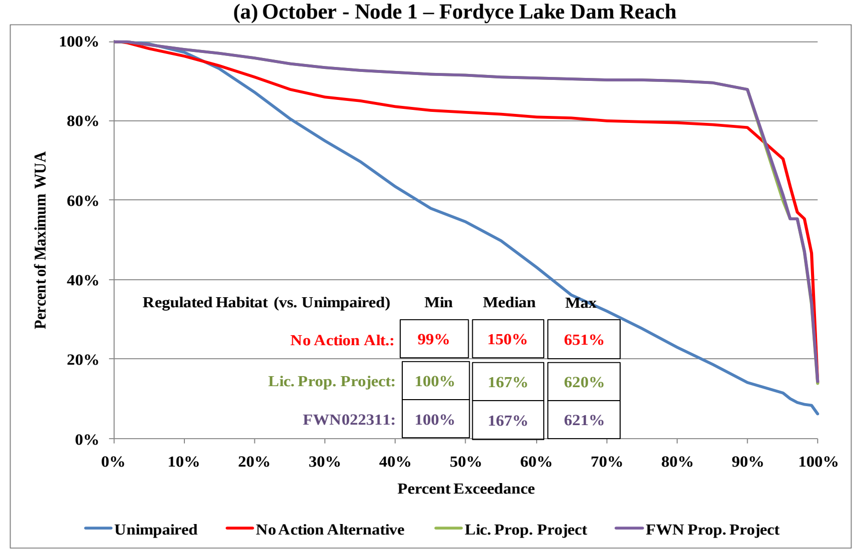
(a) October - Node 0 – Fordyce Creek at Fordyce Lake Dam



(a) October - Node 1 – Fordyce Lake Dam Reach

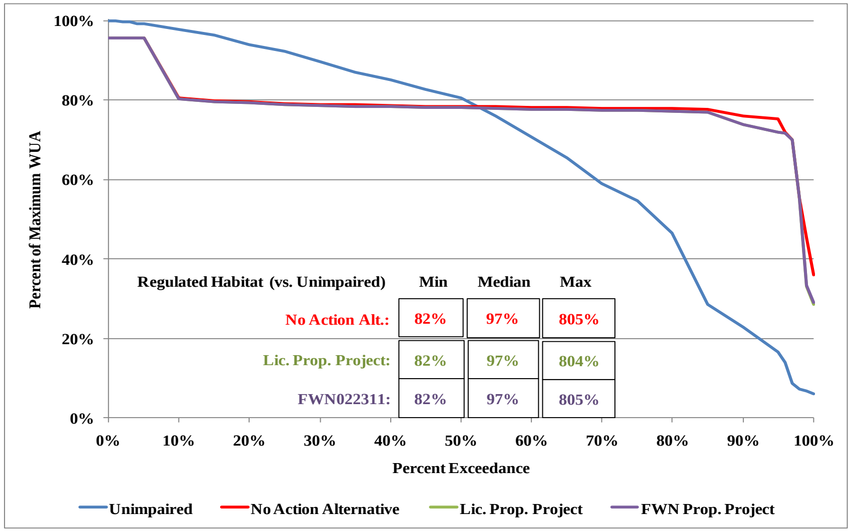


(b) November - Node 0 – Fordyce Creek at Fordyce Lake Dam

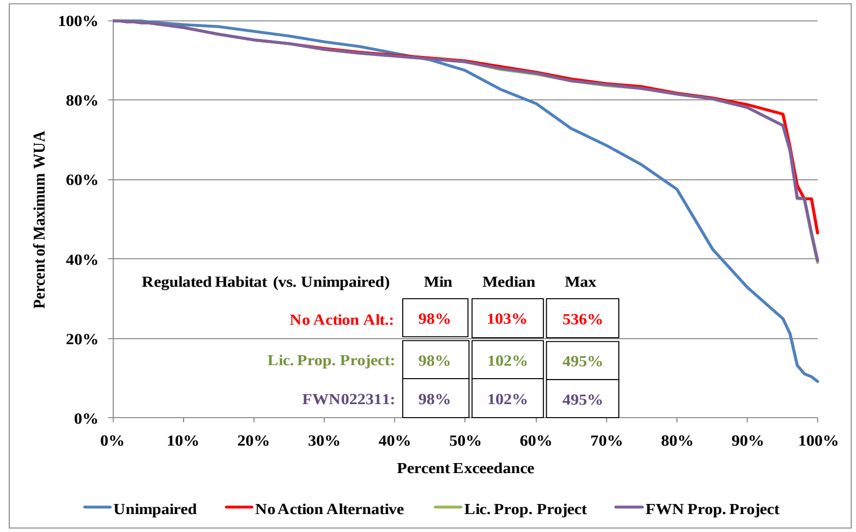


(b) November - Node 1 – Fordyce Lake Dam Reach

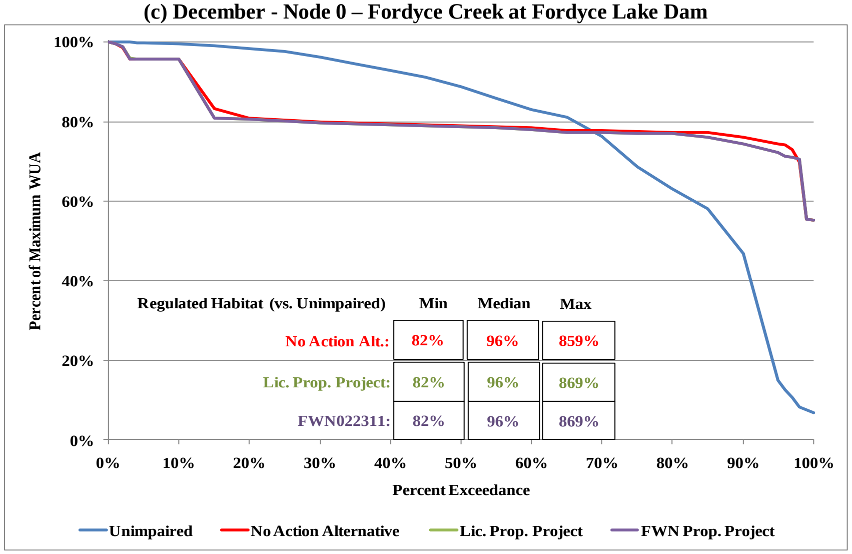
Figures 6.3.2-6a and 6.3.2-6b. HEA for adult rainbow trout during the months of October (a) and November (b) in Fordyce Dam Reach, Fordyce Creek.



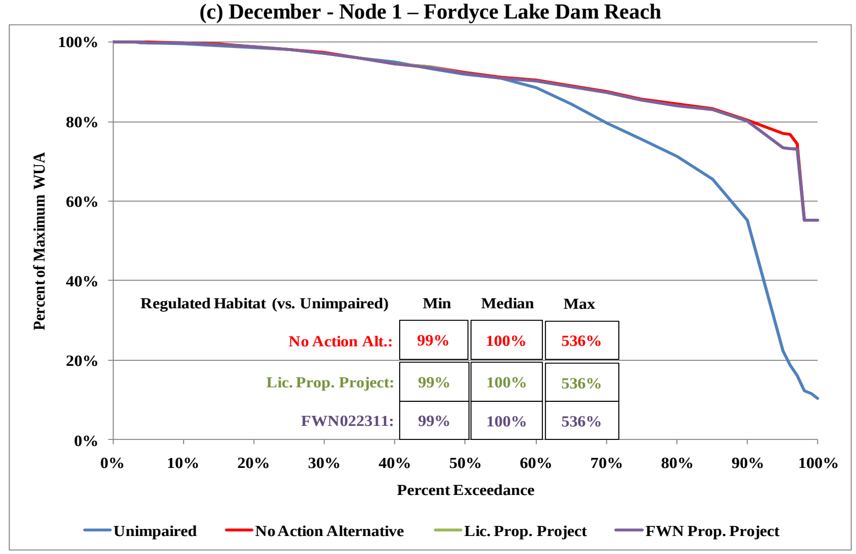
(c) December - Node 0 – Fordyce Creek at Fordyce Lake Dam



(c) December - Node 1 – Fordyce Lake Dam Reach

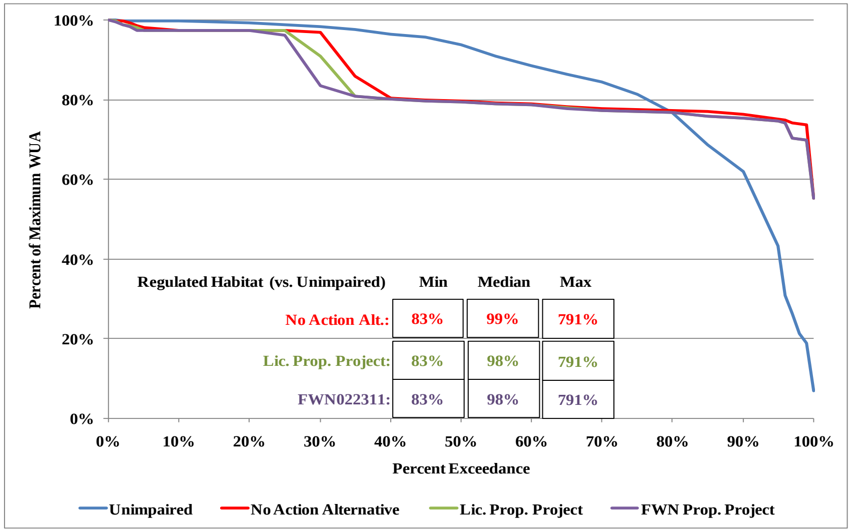


(d) January - Node 0 – Fordyce Creek at Fordyce Lake Dam

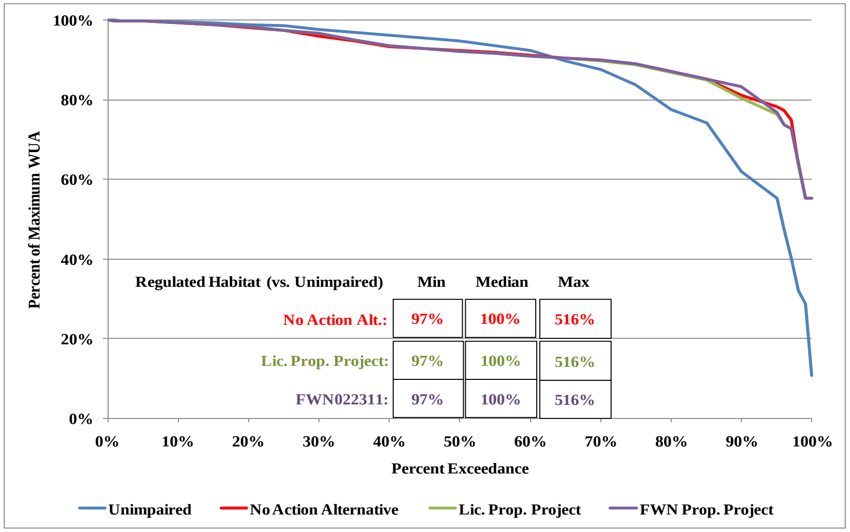


(d) January - Node 1 – Fordyce Lake Dam Reach

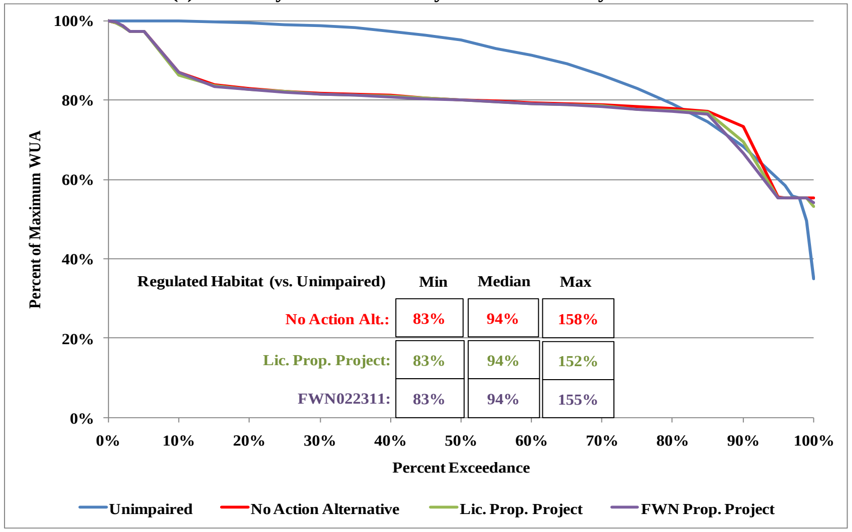
Figures 6.3.2-6c and 6.3.2-6d. HEA for adult rainbow trout during the months of December (c) and January (d) Fordyce Dam Reach, Fordyce Creek.



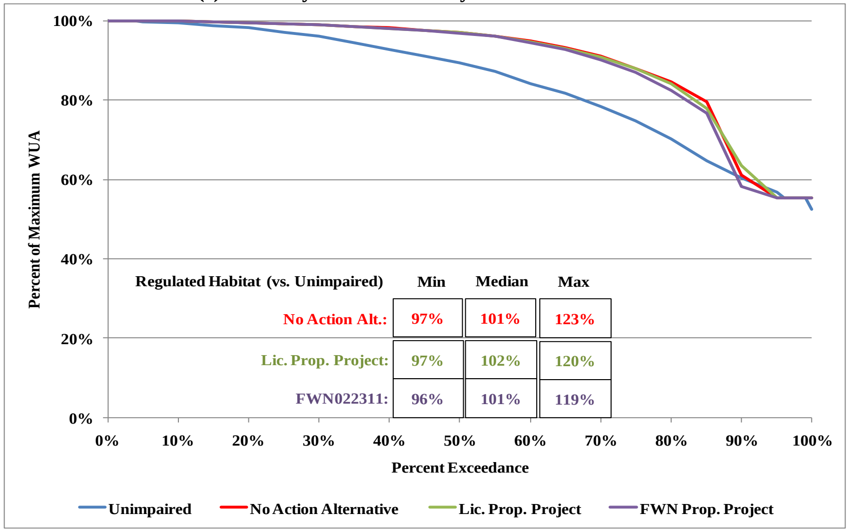
(e) February - Node 0 – Fordyce Creek at Fordyce Lake Dam



(e) February - Node 1 – Fordyce Lake Dam Reach

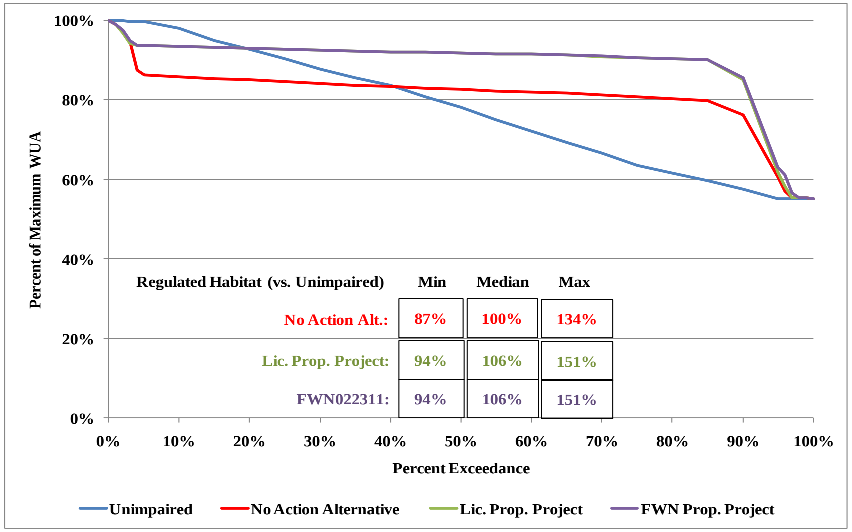


(f) March - Node 0 – Fordyce Creek at Fordyce Lake Dam

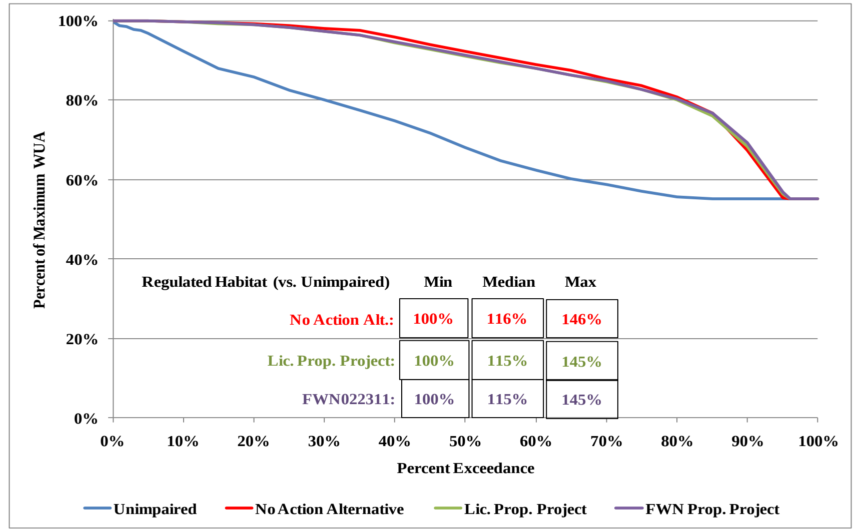


(f) March - Node 1 – Fordyce Lake Dam Reach

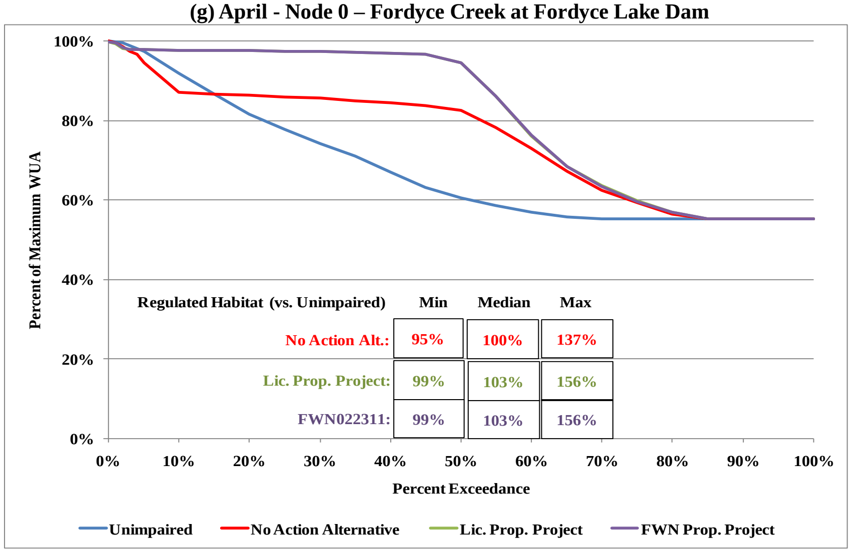
Figures 6.3.2-6e and 6.3.2-6f. HEA for adult rainbow trout during the months of February (e) and March (f) in Fordyce Dam Reach, Fordyce Creek.



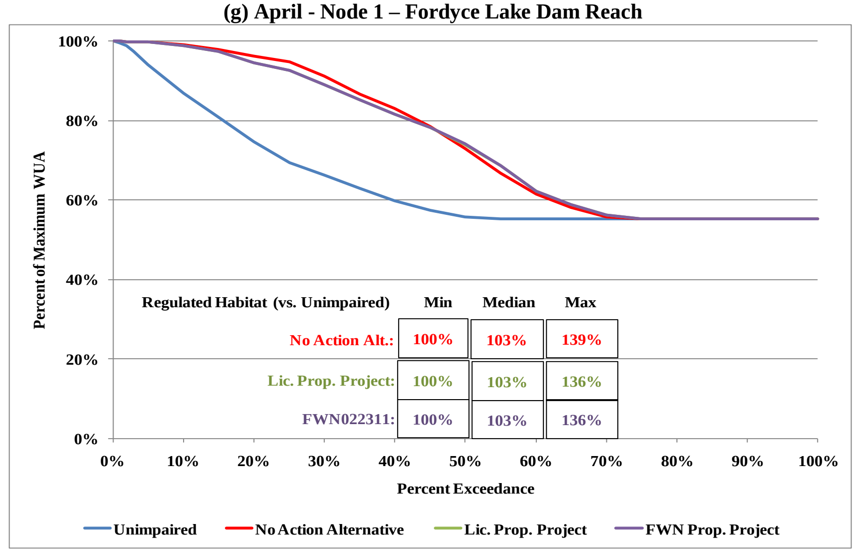
(g) April - Node 0 – Fordyce Creek at Fordyce Lake Dam



(g) April - Node 1 – Fordyce Lake Dam Reach

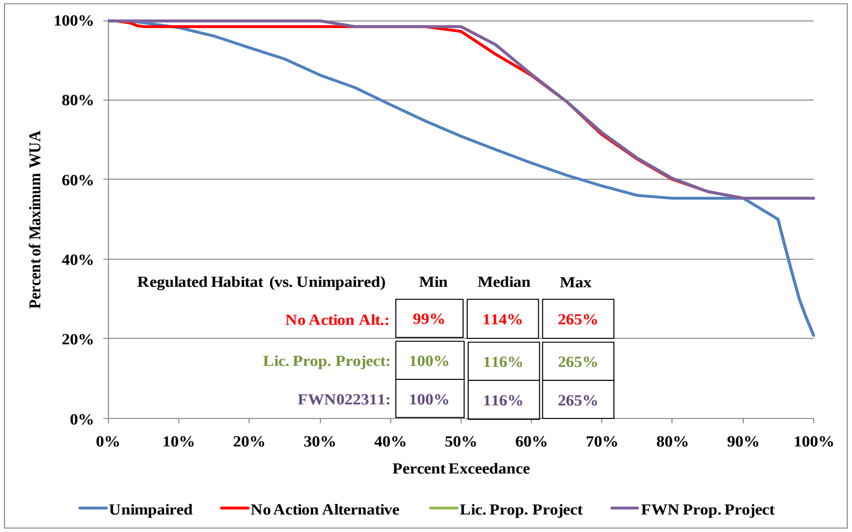


(h) May - Node 0 – Fordyce Creek at Fordyce Lake Dam

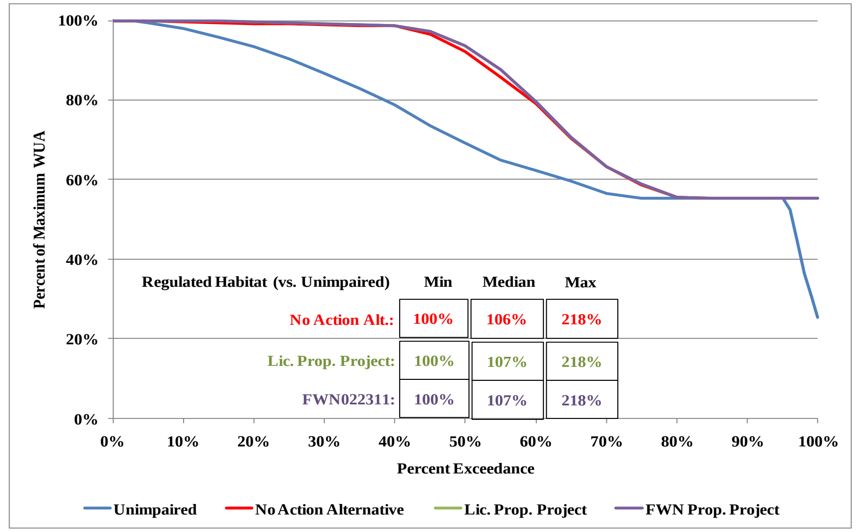


(h) May - Node 1 – Fordyce Lake Dam Reach

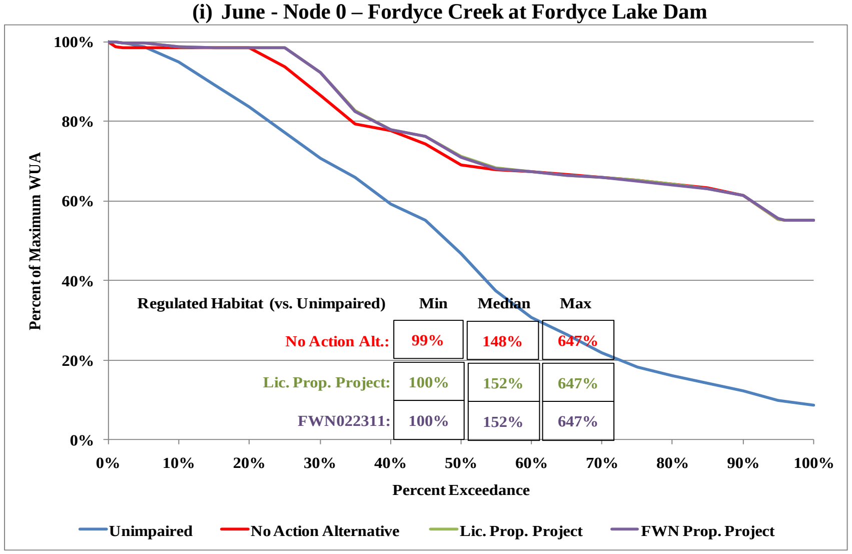
Figures 6.3.2-6g and 6.3.2-6h. HEA for adult rainbow trout during the months of April (g) and May (h) in Fordyce Lake Reach, Fordyce Creek.



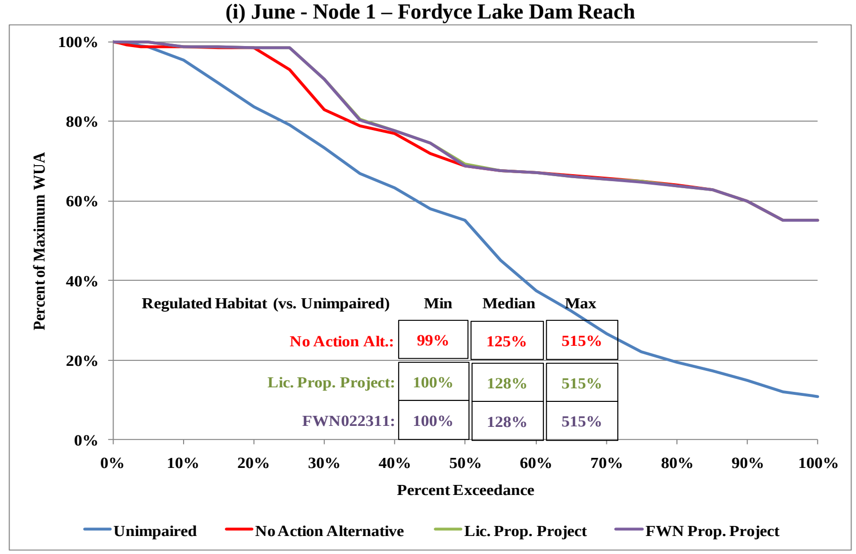
(i) June - Node 0 – Fordyce Creek at Fordyce Lake Dam



(i) June - Node 1 – Fordyce Lake Dam Reach

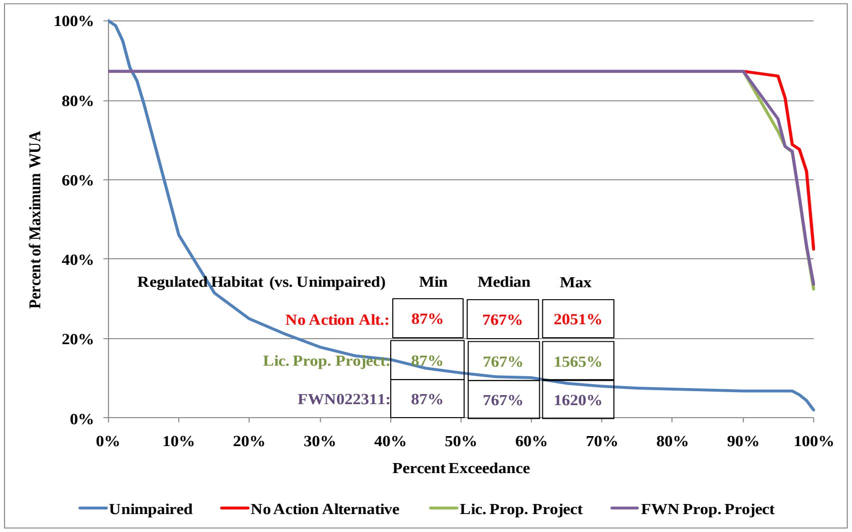


(j) July - Node 0 – Fordyce Creek at Fordyce Lake Dam

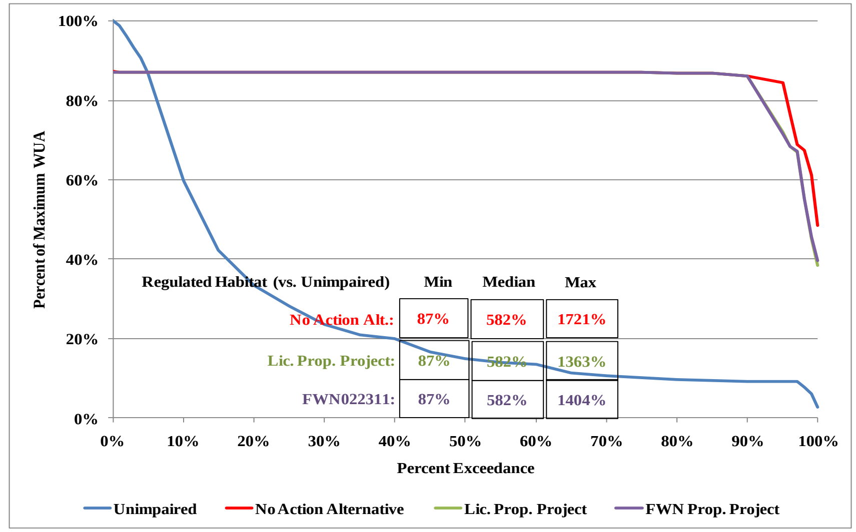


(j) July - Node 1 – Fordyce Lake Dam Reach

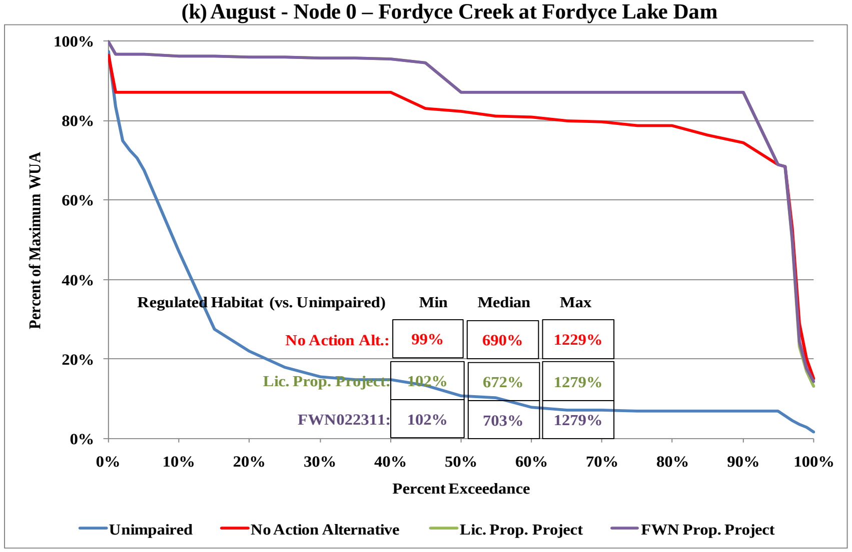
Figures 6.3.2-6i and 6.3.2-6j. HEA for adult rainbow trout during the months of June (i) and July (j) in Fordyce Dam Reach, Fordyce Creek.



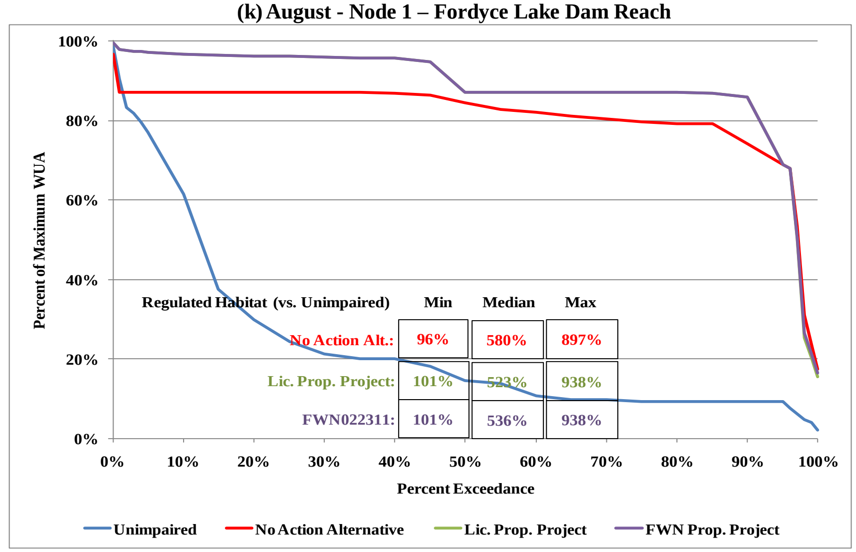
(k) August - Node 0 – Fordyce Creek at Fordyce Lake Dam



(k) August - Node 1 – Fordyce Lake Dam Reach

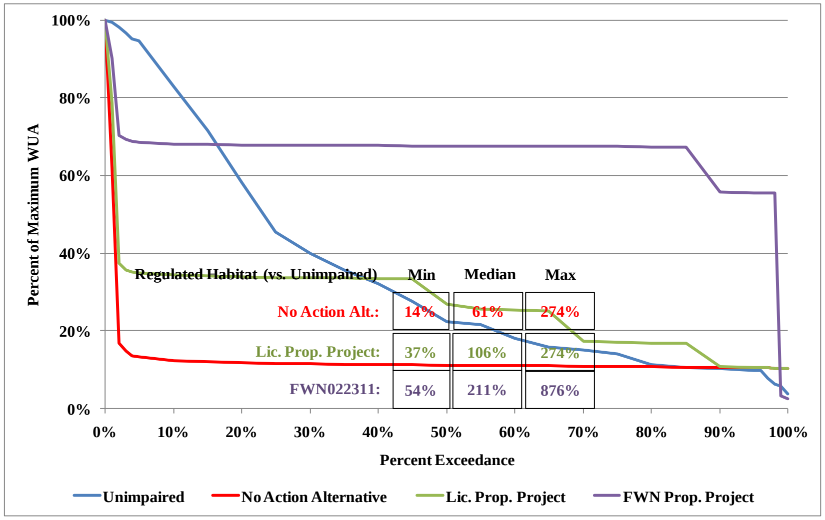


(l) September - Node 0 – Fordyce Creek at Fordyce Lake Dam

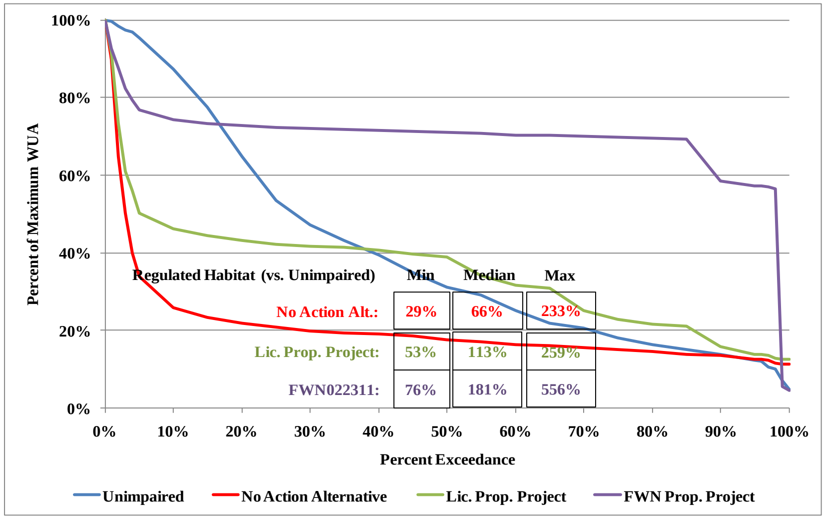


(l) September - Node 1 – Fordyce Lake Dam Reach

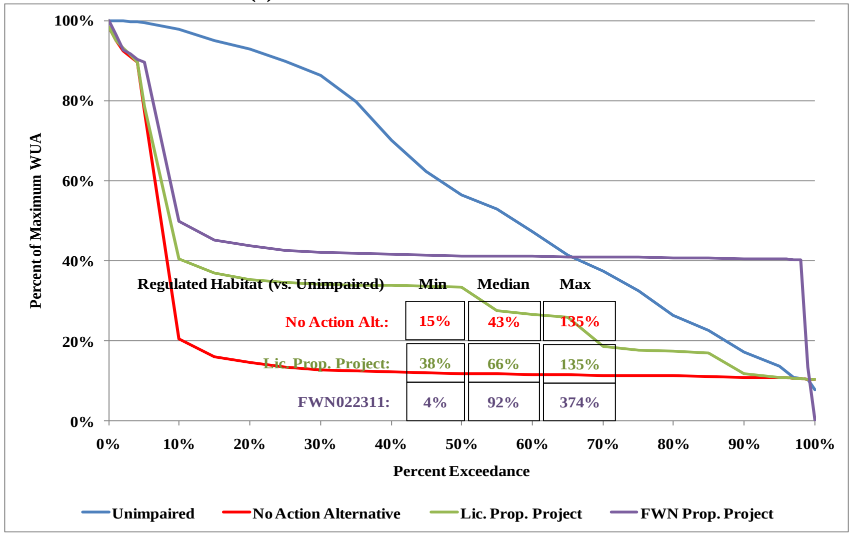
Figures 6.3.2-6k and 6.3.2-6l. HEA for adult rainbow trout during the months of August (k) and September (l) in Fordyce Dam Reach, Fordyce Creek.



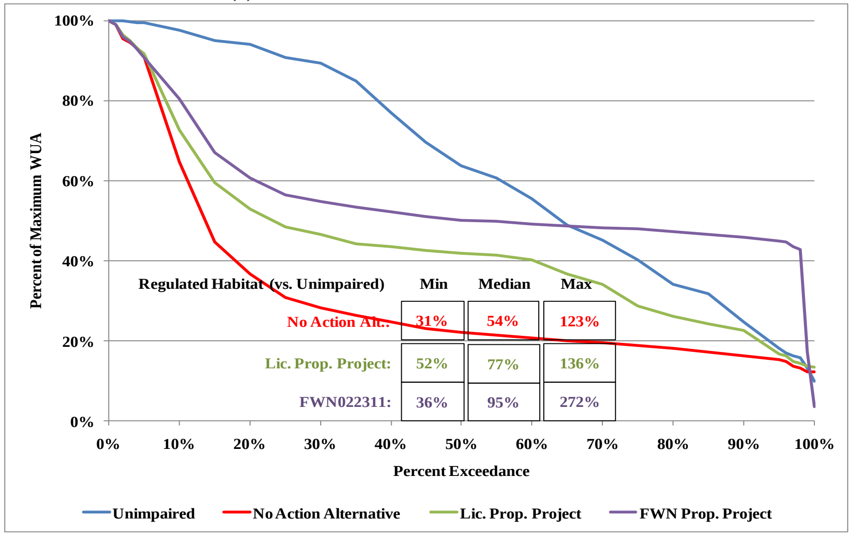
(a) October - Node 0 – SYR at Jordan Creek



(a) October - Node 1 – SYR Jordan Creek Reach

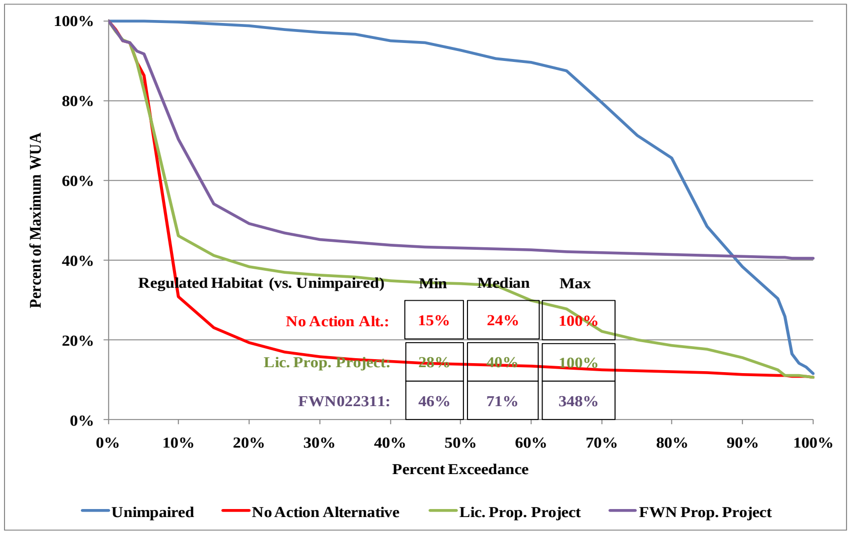


(b) November- Node 0 – SYR at Jordan Creek

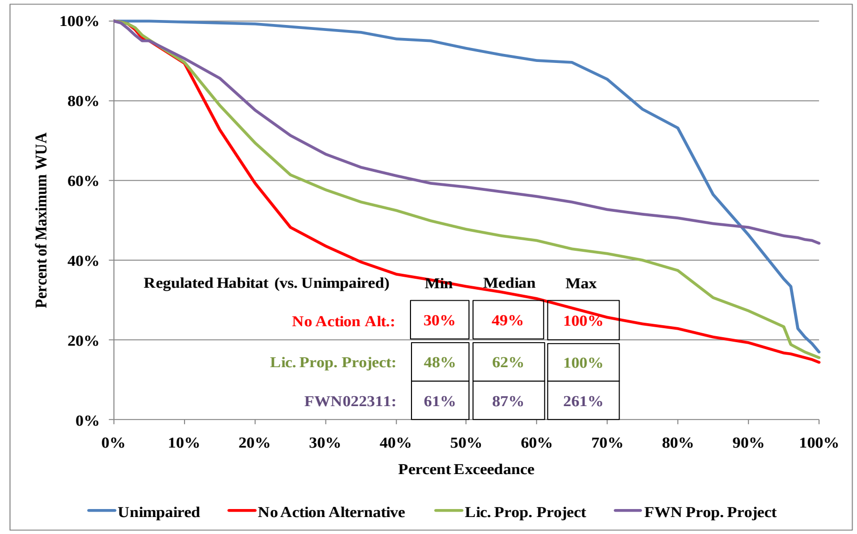


(b) November- Node 1 – SYR Jordan Creek Reach

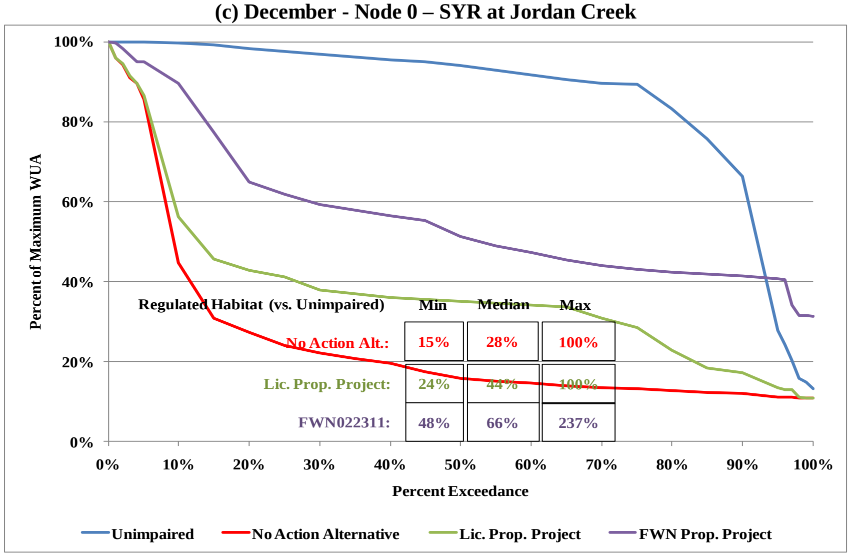
Figure 6.3.2-7a and 6.3.2-7b. HEA for adult rainbow trout during the months of October (a) and November (b) in Jordon Creek Reach, South Yuba River.



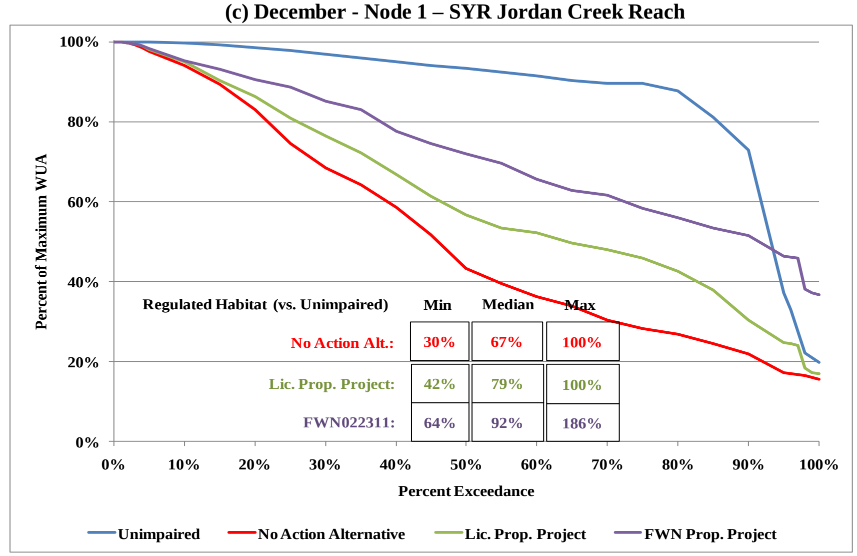
(c) December - Node 0 – SYR at Jordan Creek



(c) December - Node 1 – SYR Jordan Creek Reach

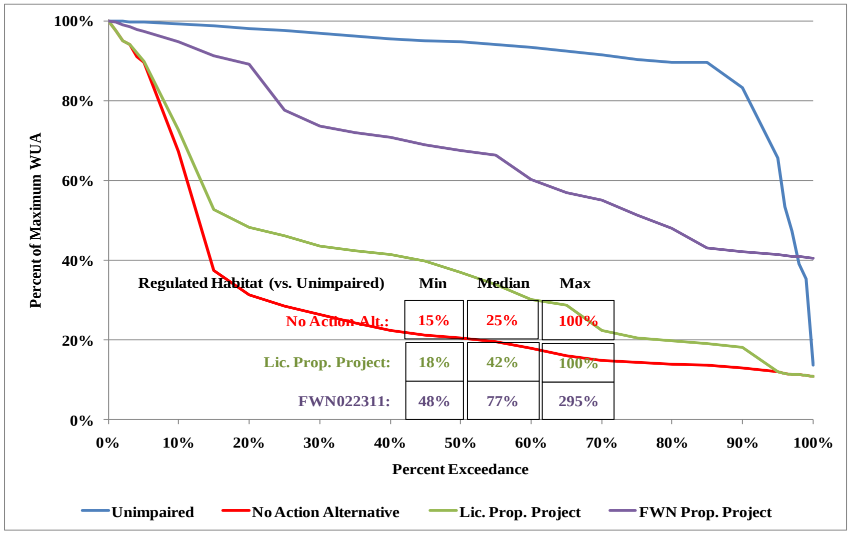


(d) January - Node 0 – SYR at Jordan Creek

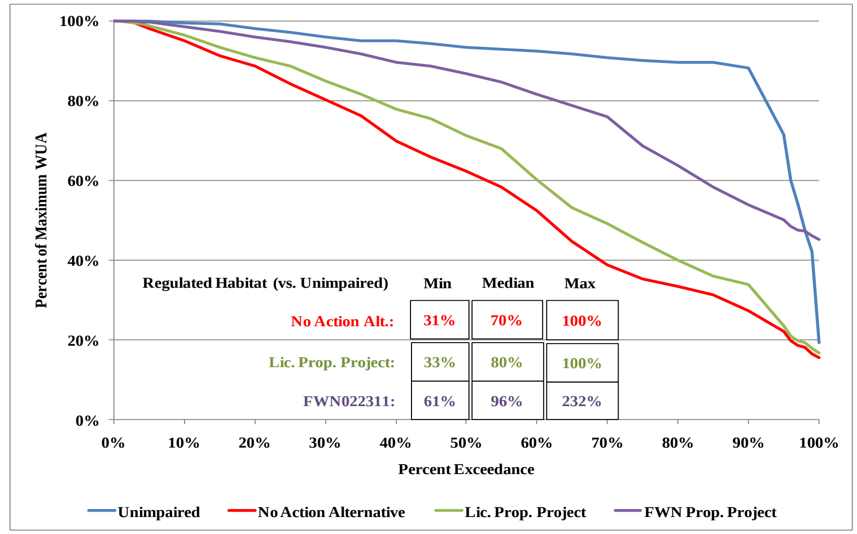


(d) January - Node 1 – SYR Jordan Creek Reach

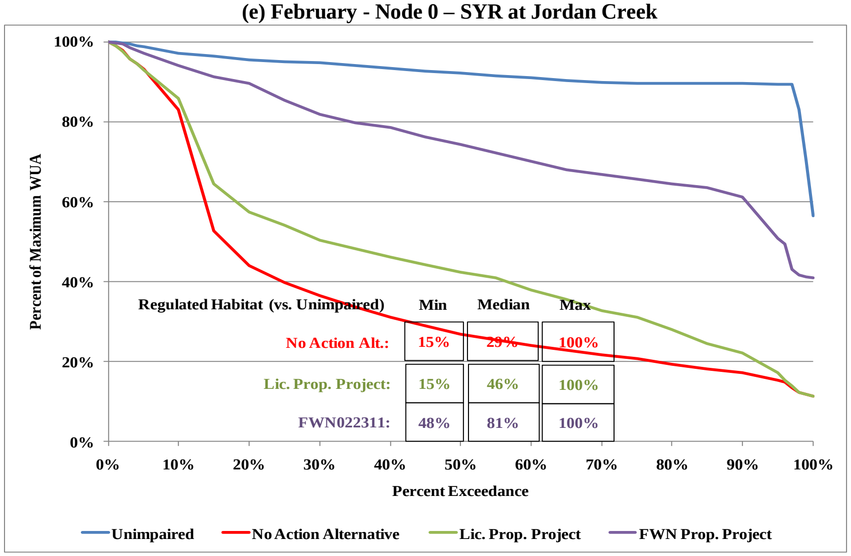
Figure 6.3.2-7c and 6.3.2-7d. HEA for adult rainbow trout during the months of December (c) and January (d) in Jordon Creek Reach, South Yuba River.



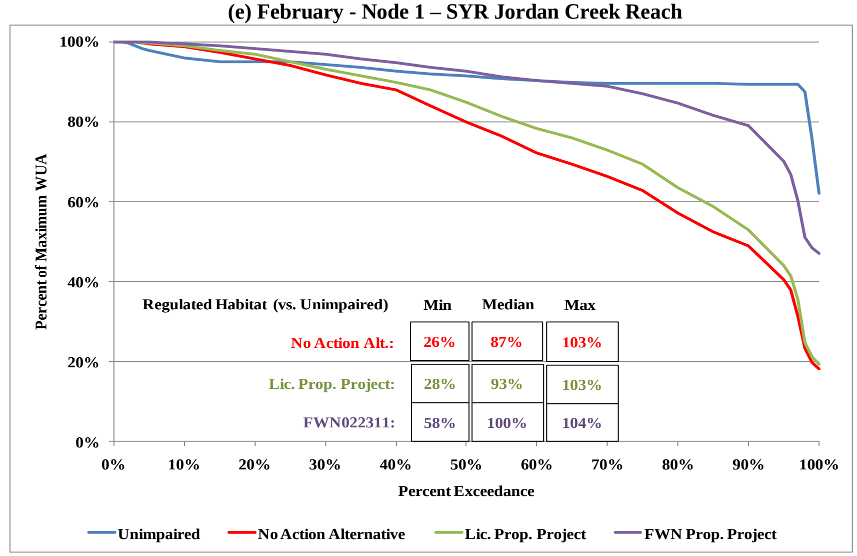
(e) February - Node 0 – SYR at Jordan Creek



(e) February - Node 1 – SYR Jordan Creek Reach

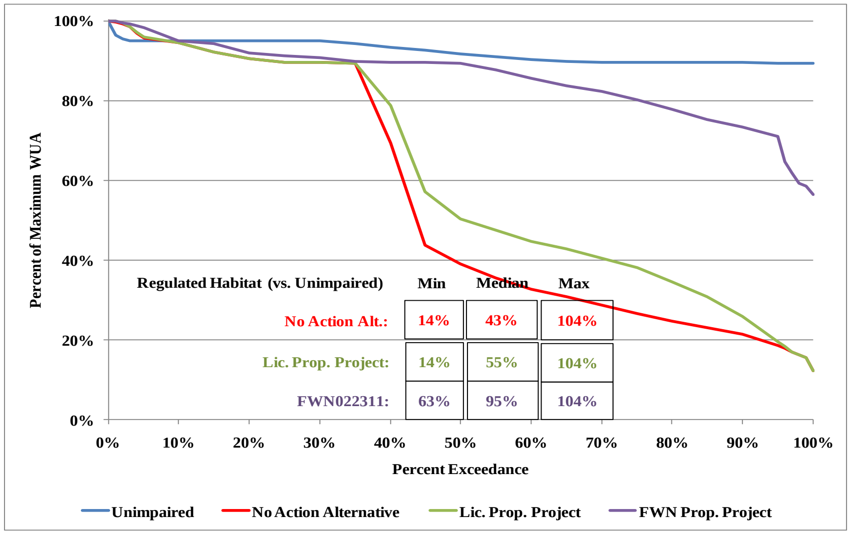


(f) March - Node 0 – SYR at Jordan Creek

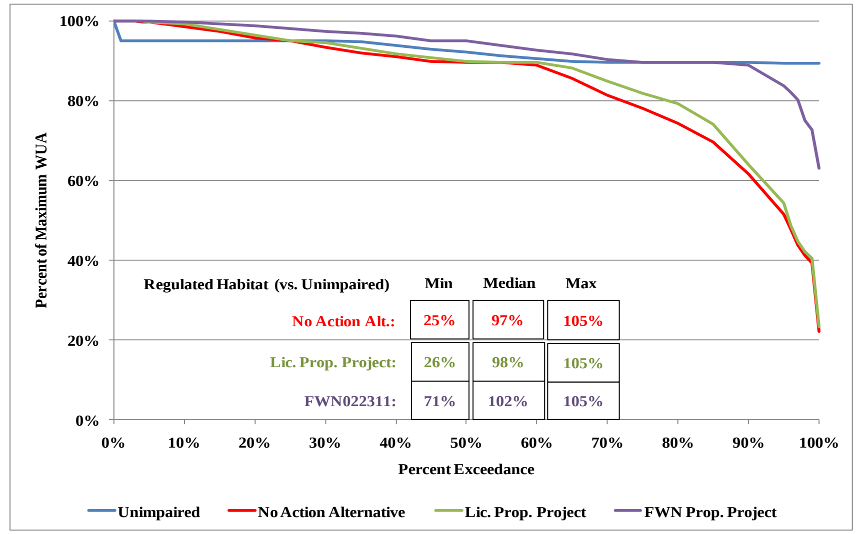


(f) March Node 1 – SYR Jordan Creek Reach

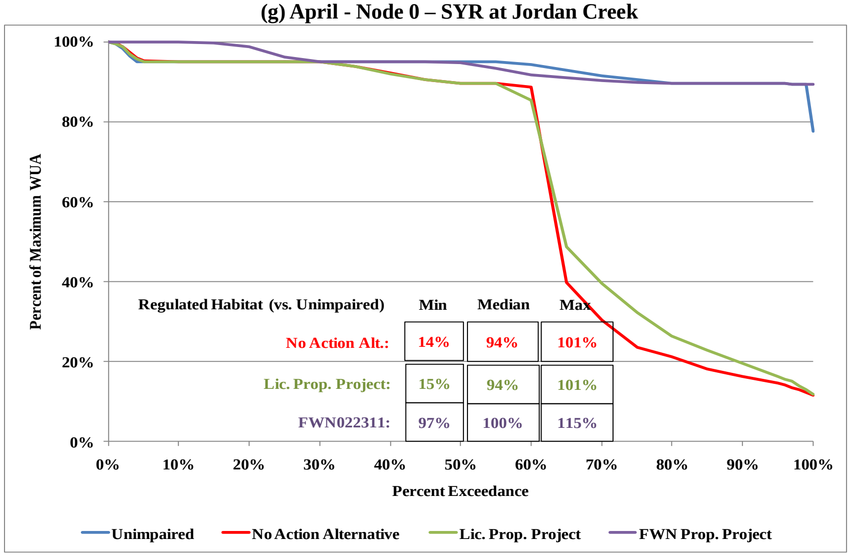
Figure 6.3.2-7e and 6.3.2-7f. HEA for adult rainbow trout during the months of February (e) and March (f) in Jordon Creek Reach, South Yuba River.



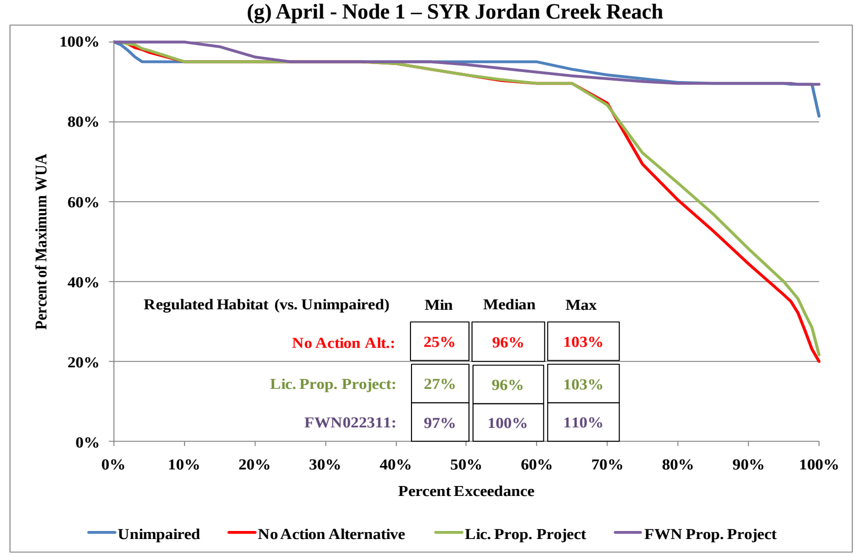
(g) April - Node 0 – SYR at Jordan Creek



(g) April - Node 1 – SYR Jordan Creek Reach

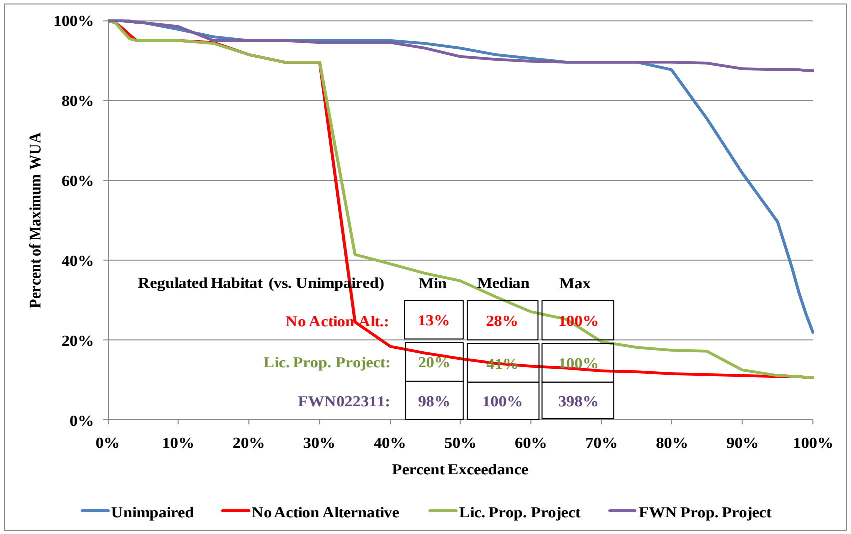


(h) May - Node 0 – SYR at Jordan Creek

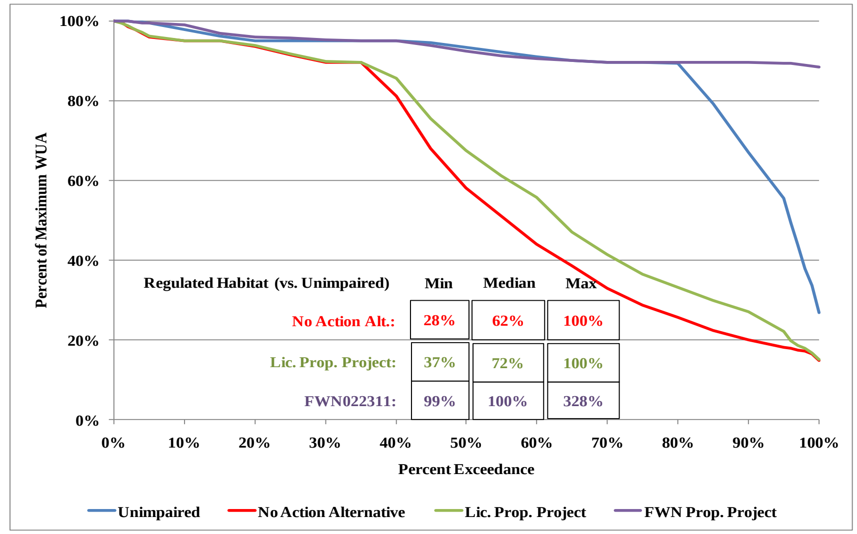


(h) May - Node 1 – SYR Jordan Creek Reach

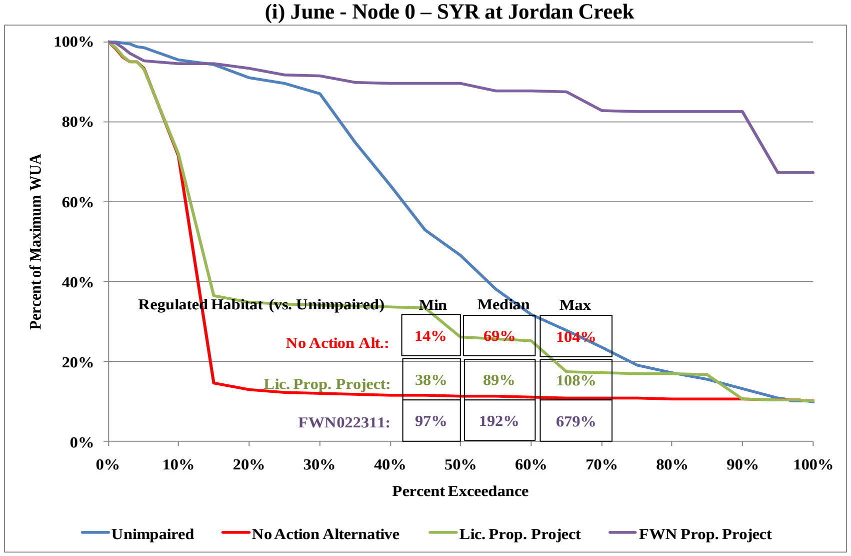
Figure 6.3.2-7g and 6.3.2-7h. HEA for adult rainbow trout during the months of April (g) and May (h) in Jordon Creek Reach, South Yuba River.



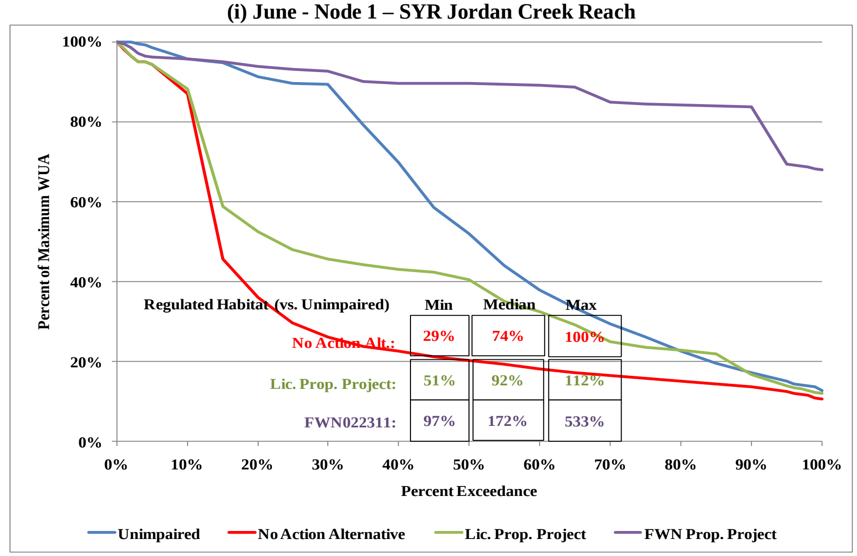
(i) June - Node 0 – SYR at Jordan Creek



(i) June - Node 1 – SYR Jordan Creek Reach

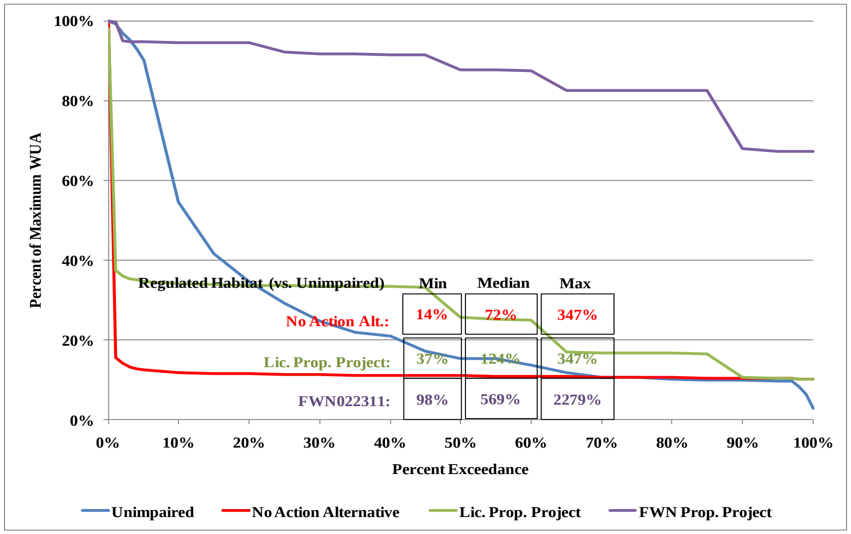


(j) July - Node 0 – SYR at Jordan Creek

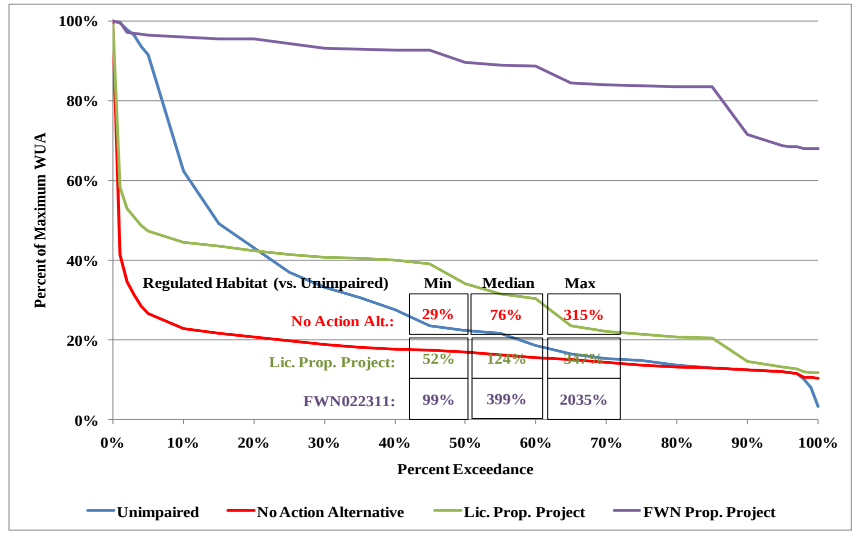


(j) July - Node 1 – SYR Jordan Creek Reach

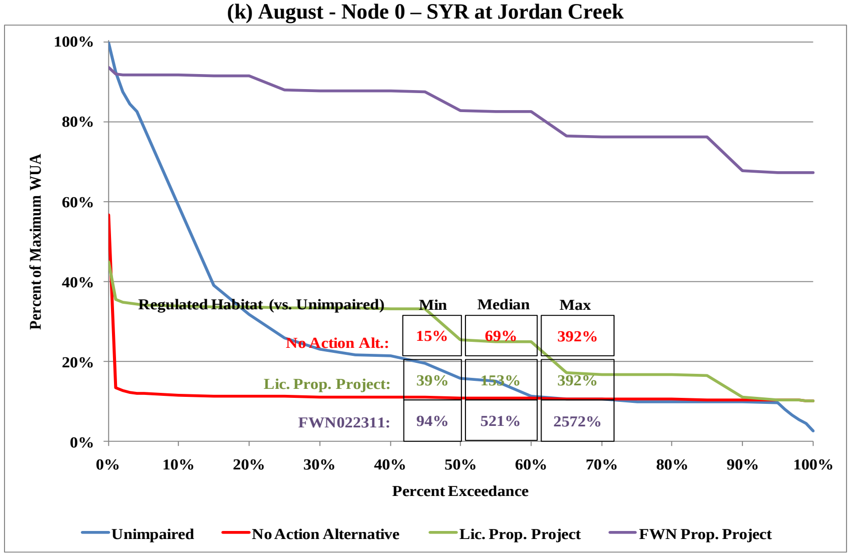
Figure 6.3.2-7i and 6.3.2-7j. HEA for adult rainbow trout during the months of June (i) and July (j) in Jordon Creek Reach, South Yuba River.



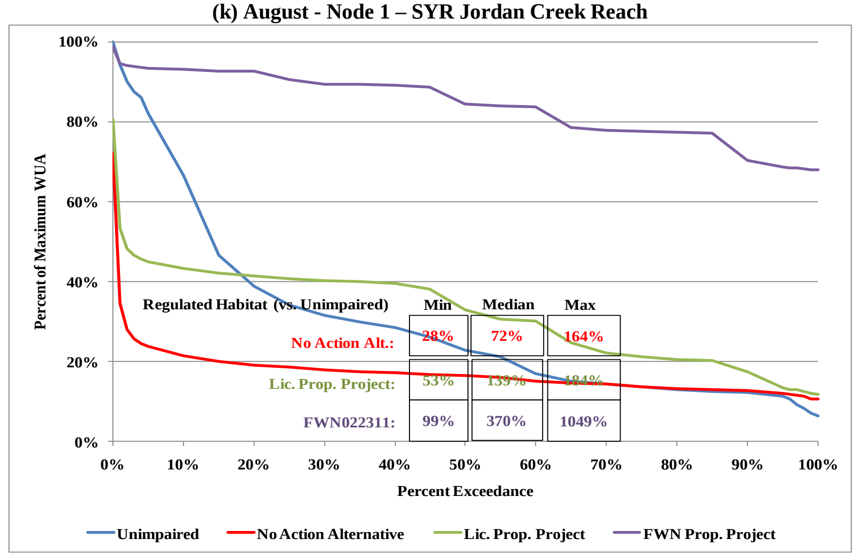
(k) August - Node 0 – SYR at Jordan Creek



(k) August - Node 1 – SYR Jordan Creek Reach

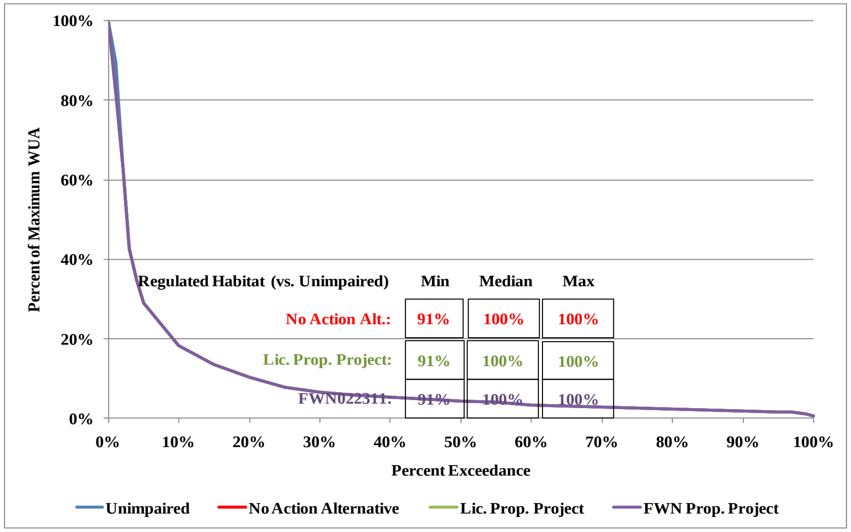


(l) September - Node 0 – SYR at Jordan Creek

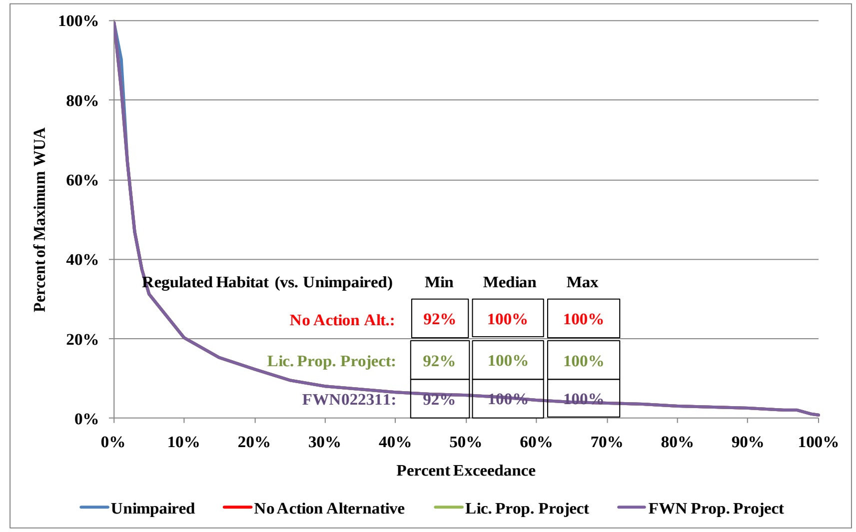


(l) September - Node 1 – SYR Jordan Creek Reach

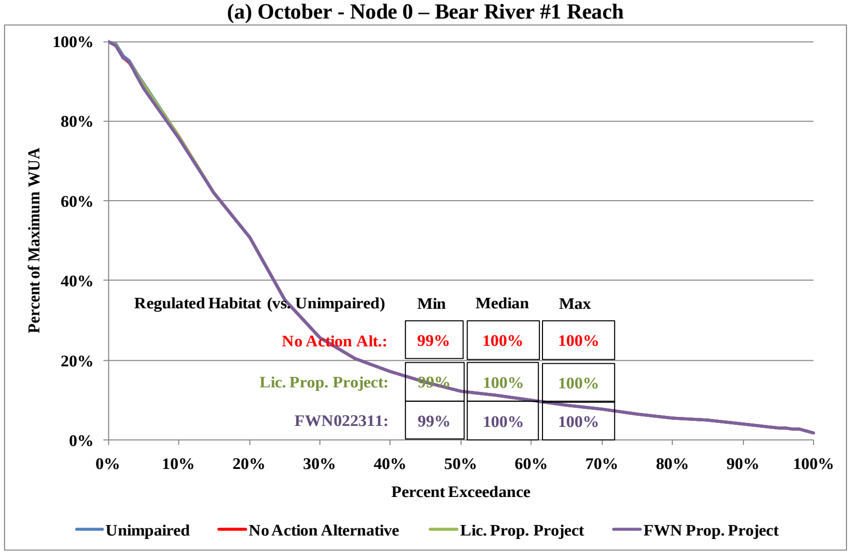
Figure 6.3.2-7k and 6.3.2-7l. HEA for adult rainbow trout during the months of August (c) and September (l) in Jordon Creek Reach, South Yuba River.



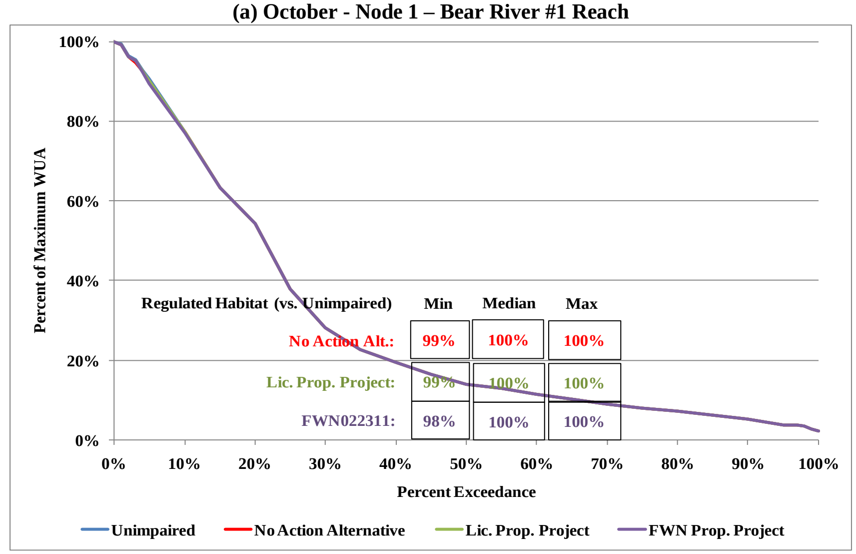
(a) October - Node 0 – Bear River #1 Reach



(a) October - Node 1 – Bear River #1 Reach

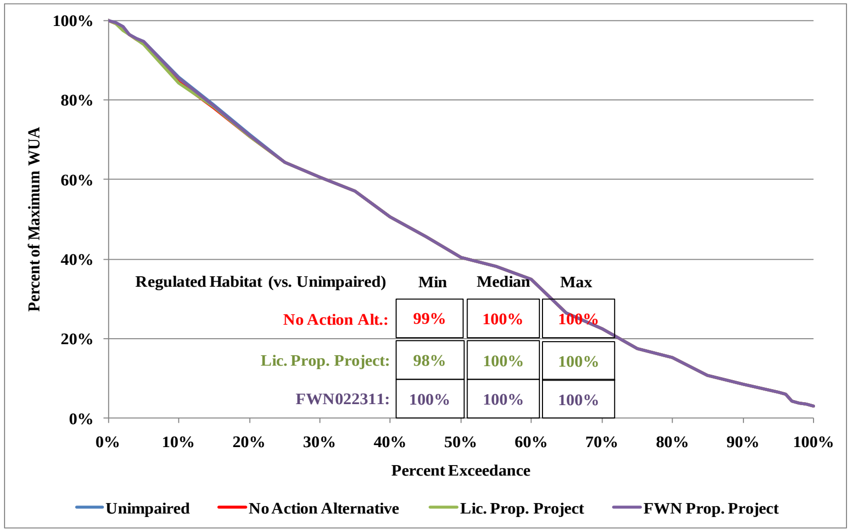


(b) November - Node 0 – Bear River #1 Reach

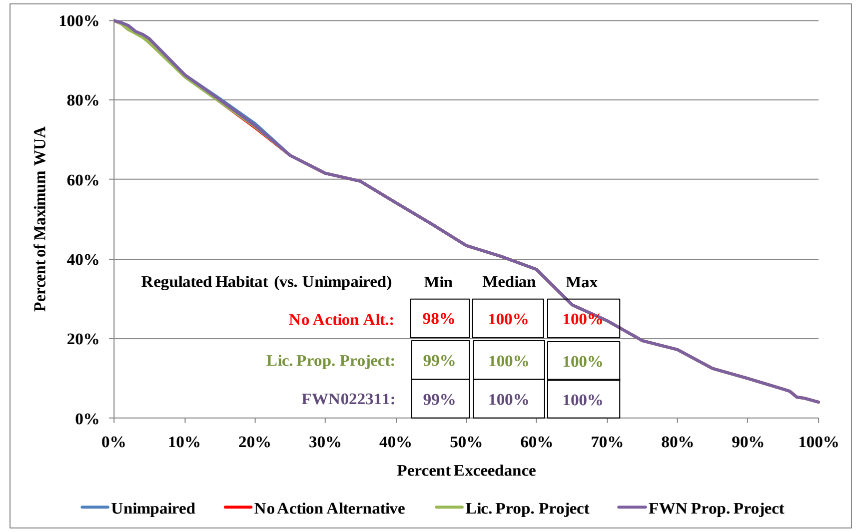


(b) November - Node 1 – Bear River #1 Reach

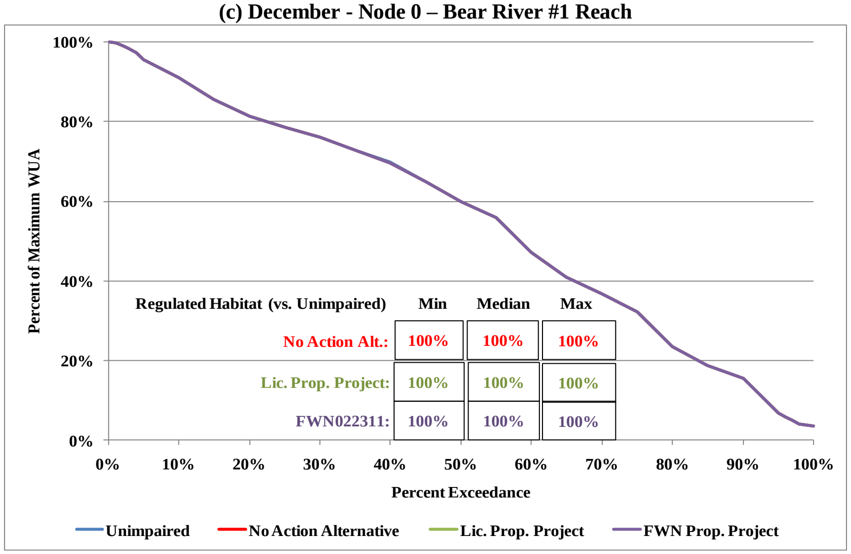
Figures 6.3.2-8a and 6.3.2-8b. HEA for adult rainbow trout during the months of October (a) and November (b) in Bear River #1 Reach, Bear River.



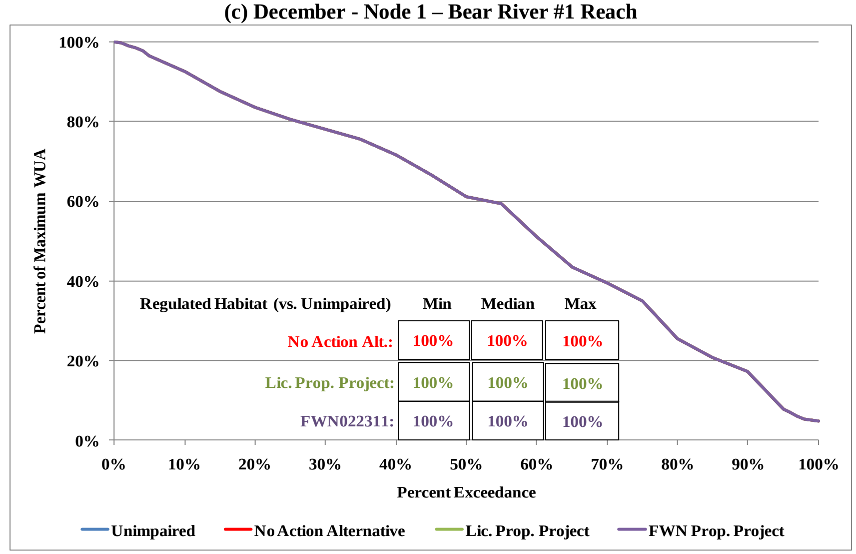
(c) December - Node 0 – Bear River #1 Reach



(c) December - Node 1 – Bear River #1 Reach

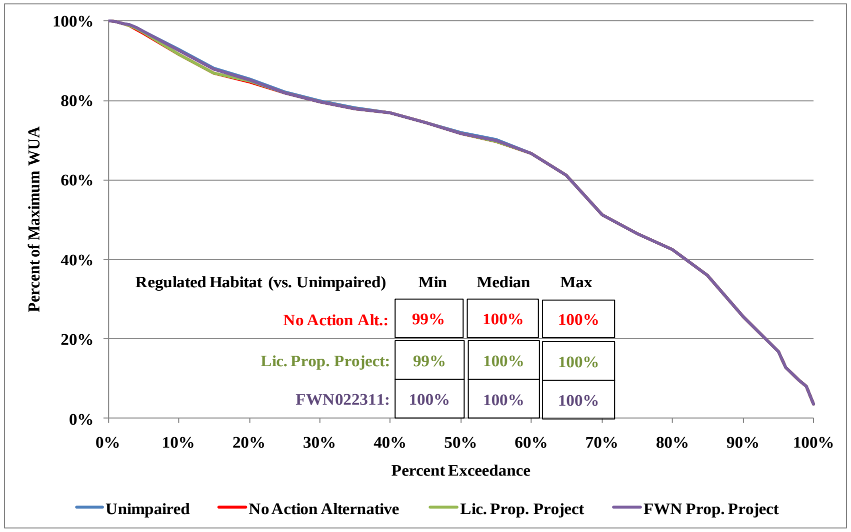


(d) January - Node 0 – Bear River #1 Reach

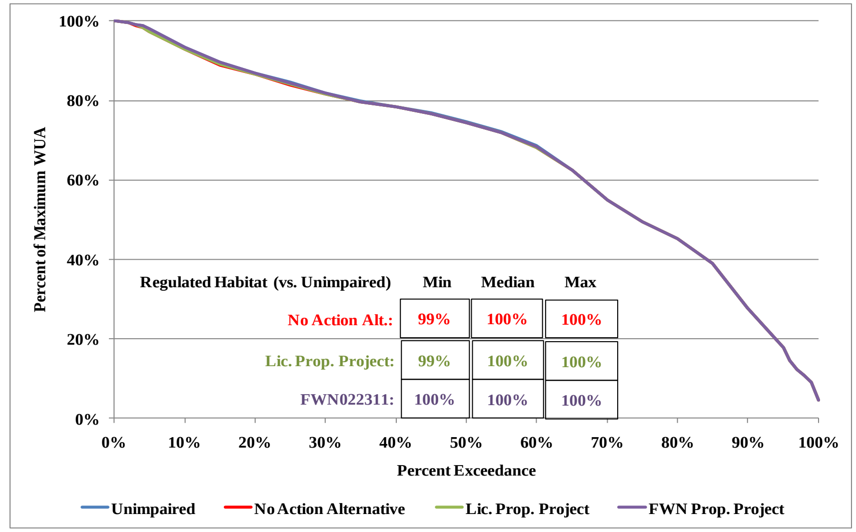


(d) January - Node 1 – Bear River #1 Reach

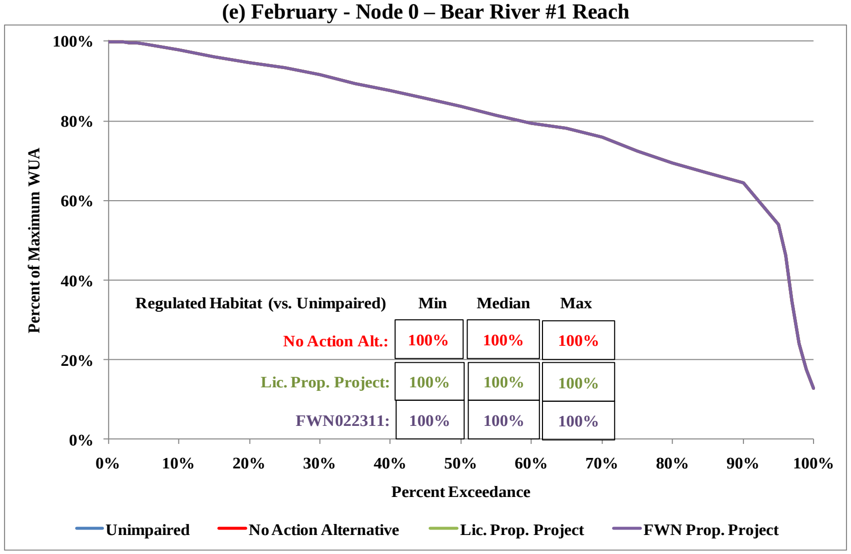
Figures 6.3.2-8c and 6.3.2-8d. HEA for adult rainbow trout during the months of December (c) and January (d) in Bear River Reach #1, Bear River.



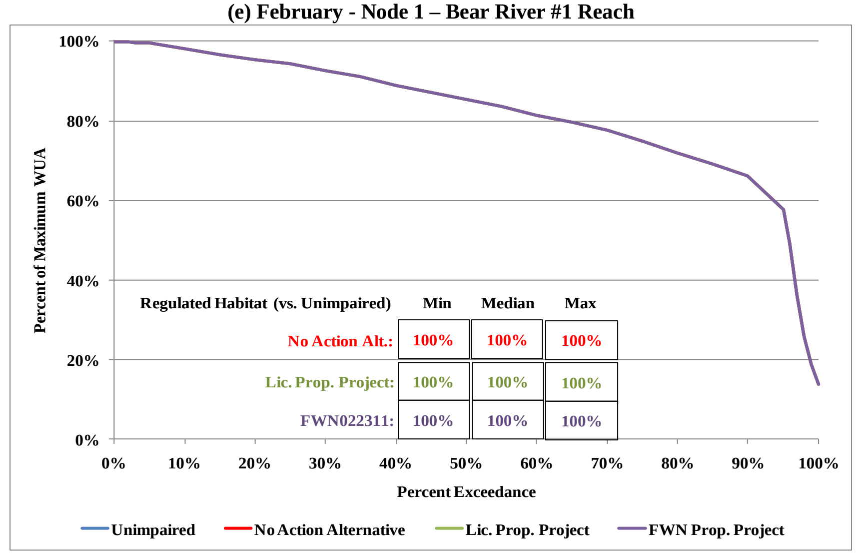
(e) February - Node 0 – Bear River #1 Reach



(e) February - Node 1 – Bear River #1 Reach

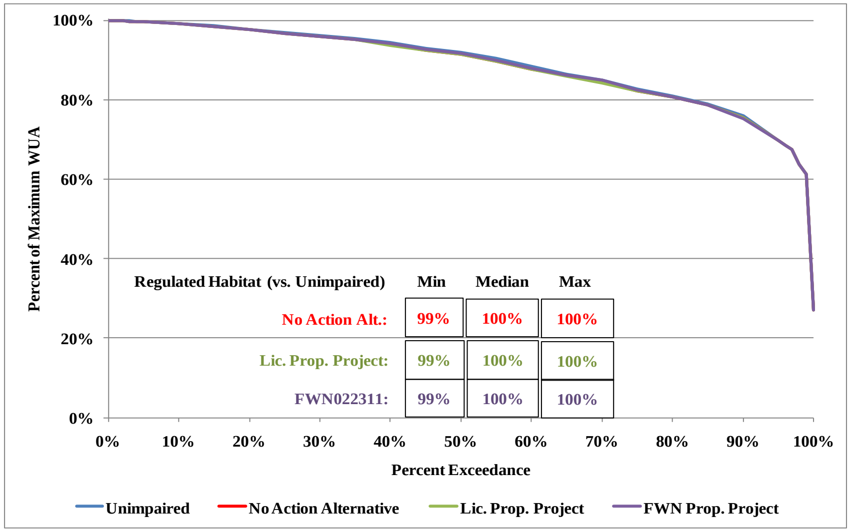


(f) March - Node 0 – Bear River #1 Reach

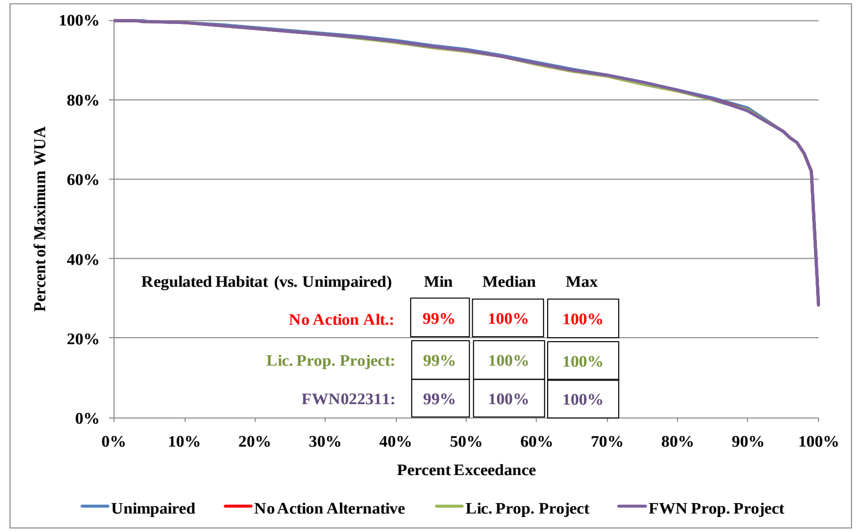


(f) March - Node 1 – Bear River #1 Reach

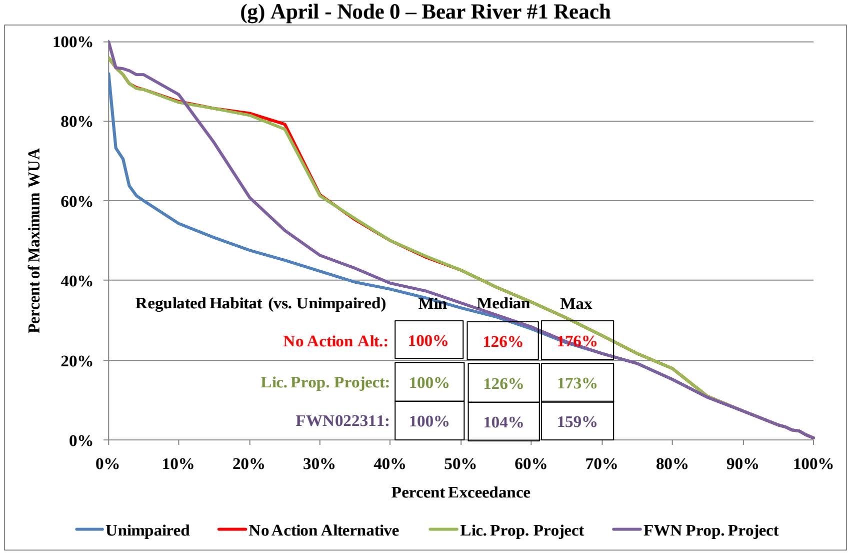
Figures 6.3.2-8e and 6.3.2-8f. HEA for adult rainbow trout during the months of February (e) and March (f) in Bear River Reach #1, Bear River.



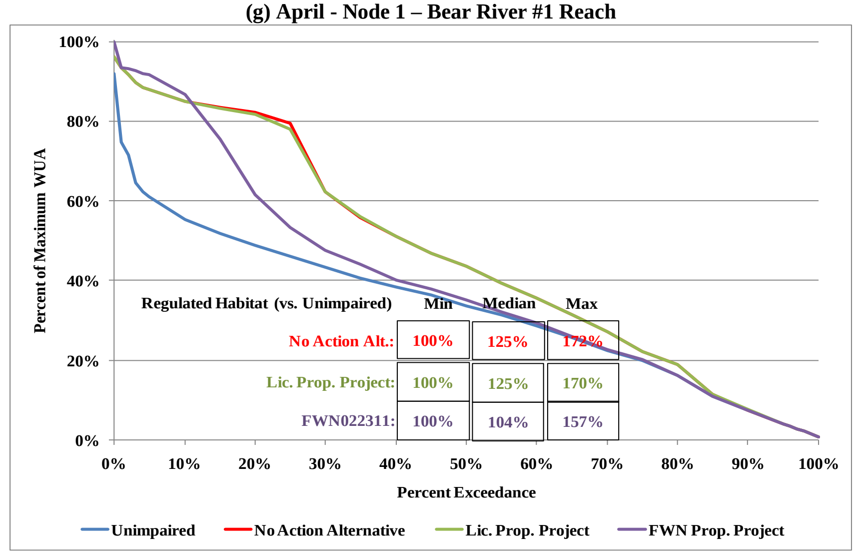
(g) April - Node 0 – Bear River #1 Reach



(g) April - Node 1 – Bear River #1 Reach

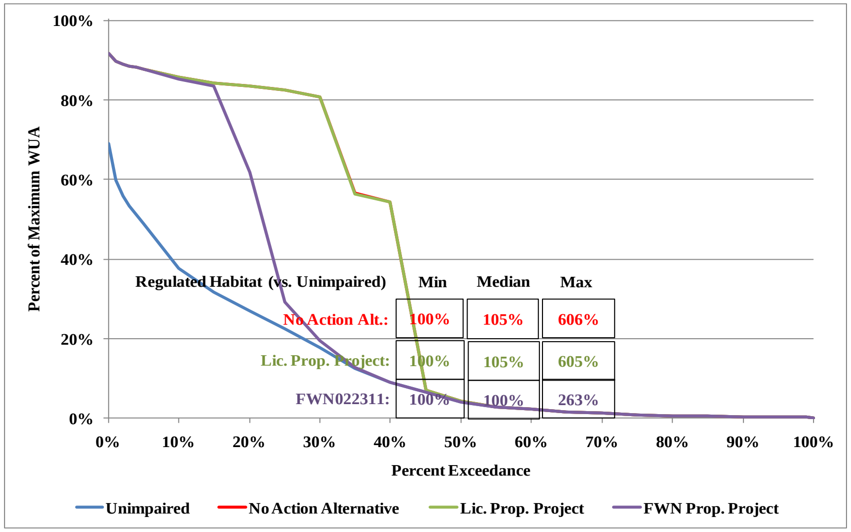


(h) May - Node 0 – Bear River #1 Reach

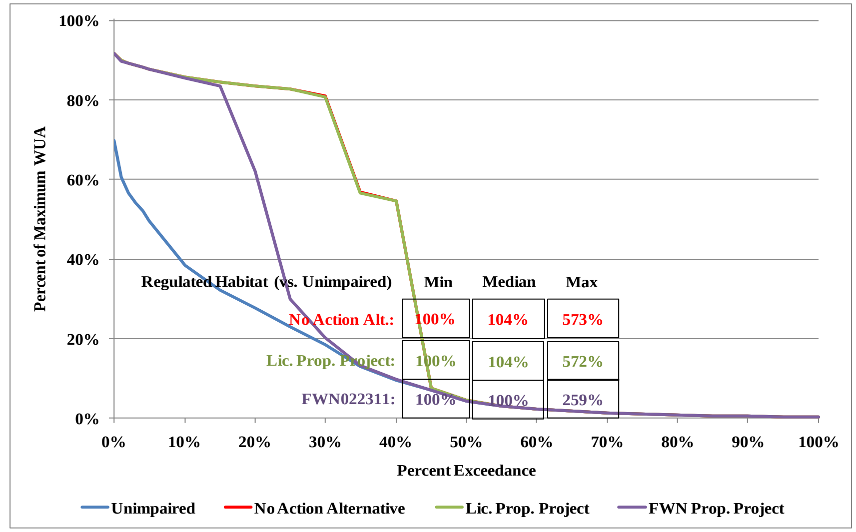


(h) May - Node 1 – Bear River #1 Reach

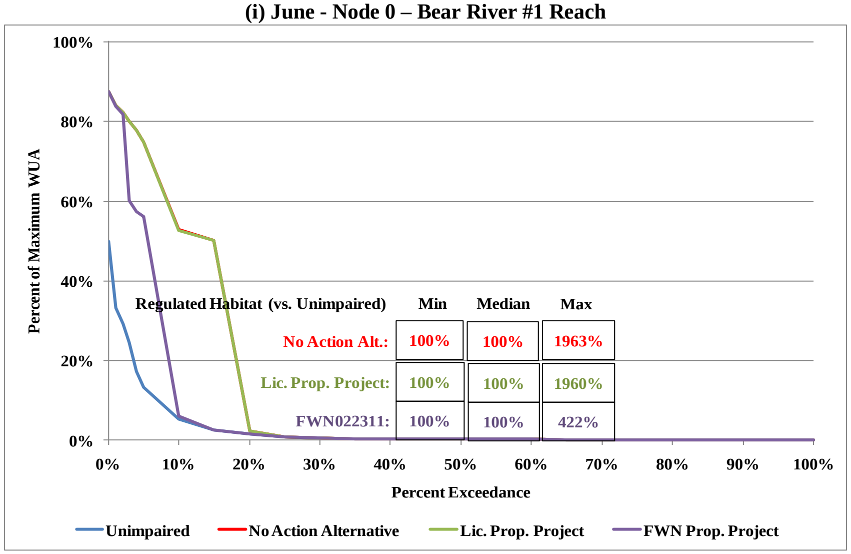
Figures 6.3.2-8g and 6.3.2-8h. HEA for adult rainbow trout during the months of April (g) and May (h) in Bear River Reach #1, Bear River.



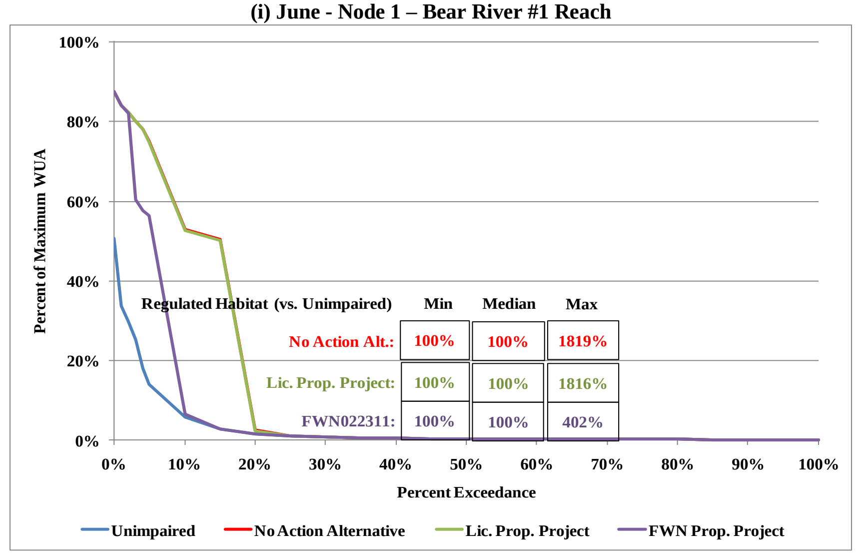
(i) June - Node 0 – Bear River #1 Reach



(i) June - Node 1 – Bear River #1 Reach

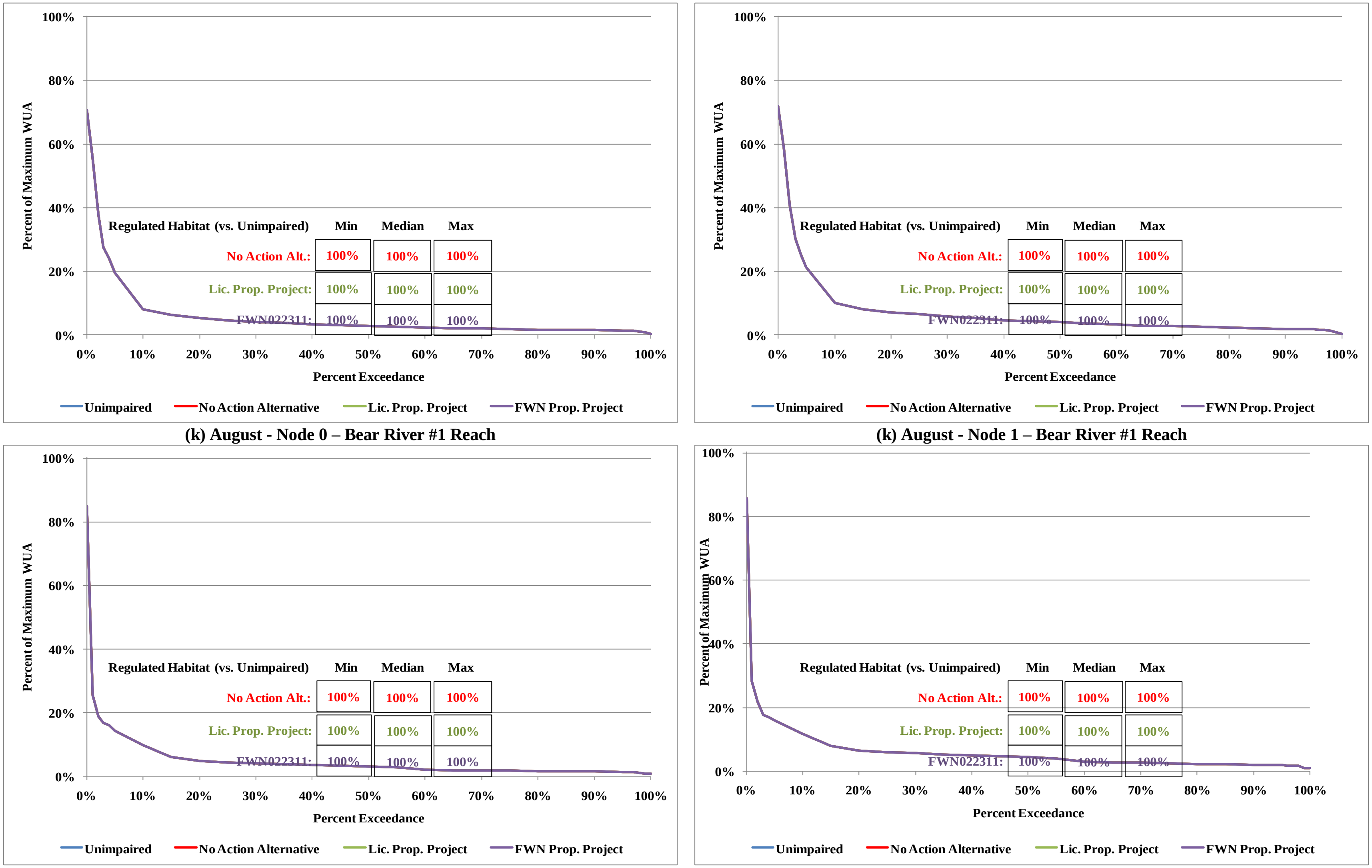


(j) July - Node 0 – Bear River #1 Reach



(j) July - Node 1 – Bear River #1 Reach

Figures 6.3.2-8i and 6.3.2-8j. HEA for adult rainbow trout during the months of June (i) and July (j) in Bear River Reach #1, Bear River.



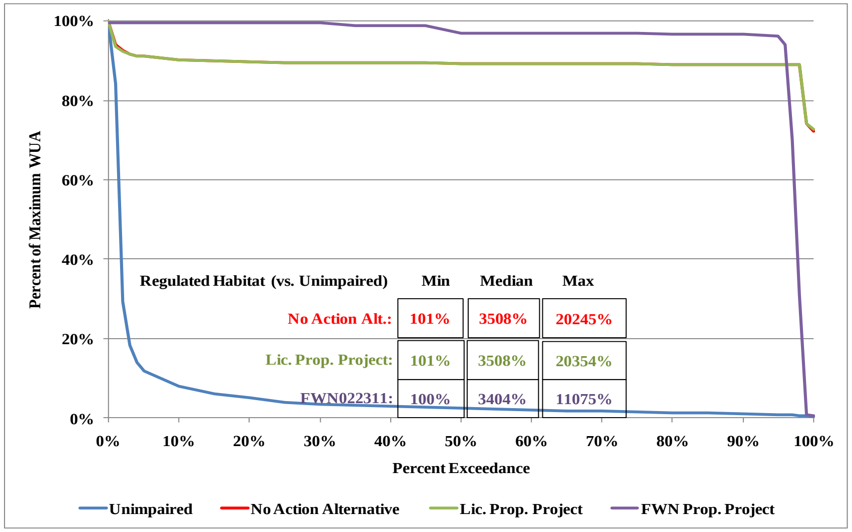
(k) August - Node 0 – Bear River #1 Reach

(k) August - Node 1 – Bear River #1 Reach

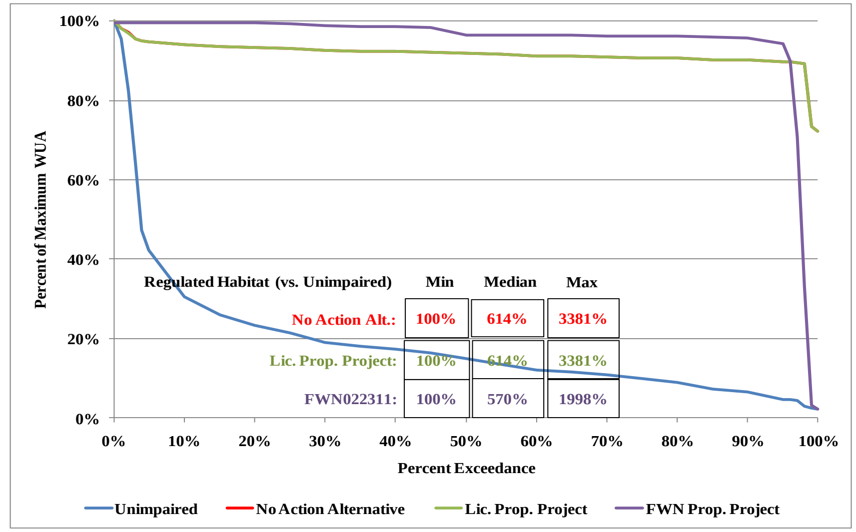
(l) September - Node 0 – Bear River #1 Reach

(l) September - Node 1 – Bear River #1 Reach

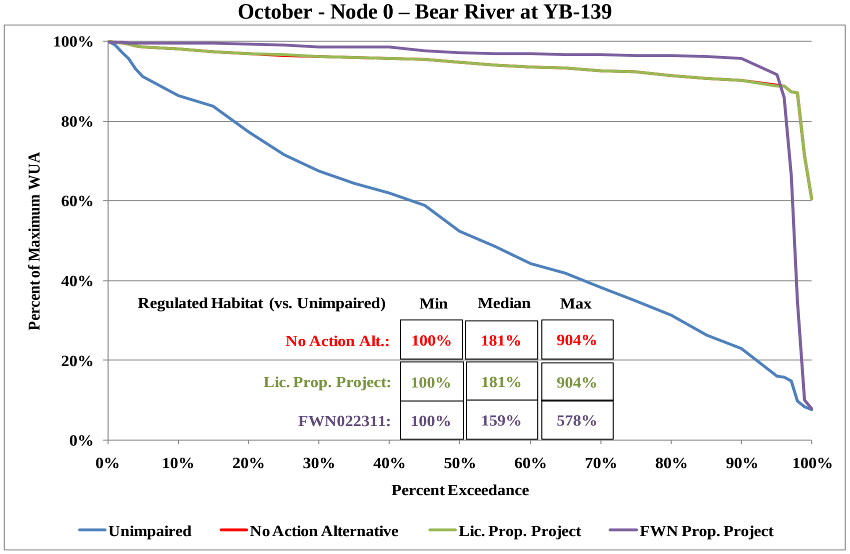
Figures 6.3.2-8k and 6.3.2-8l. HEA for adult rainbow trout during the months of August (k) and September (l) in Bear River Reach #1. Bear River.



October - Node 0 – Bear River at YB-139

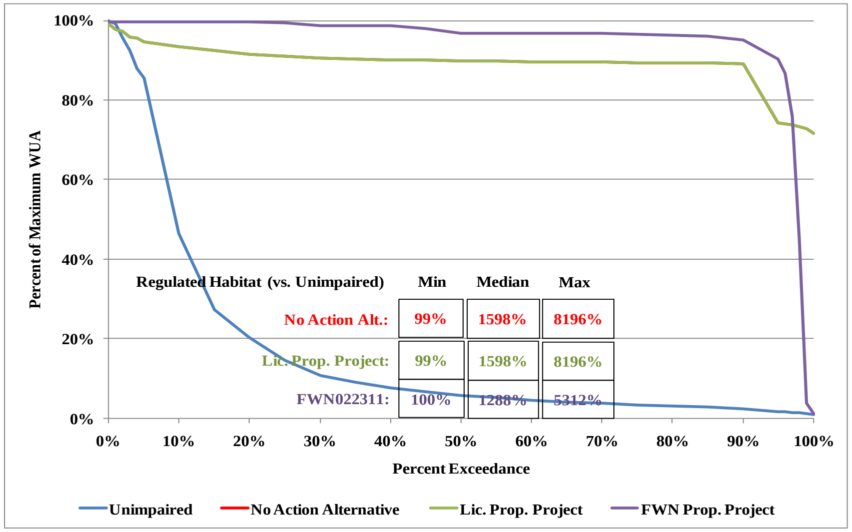


October - Node 1 – Bear River Reach #2 - Meadow SubReach

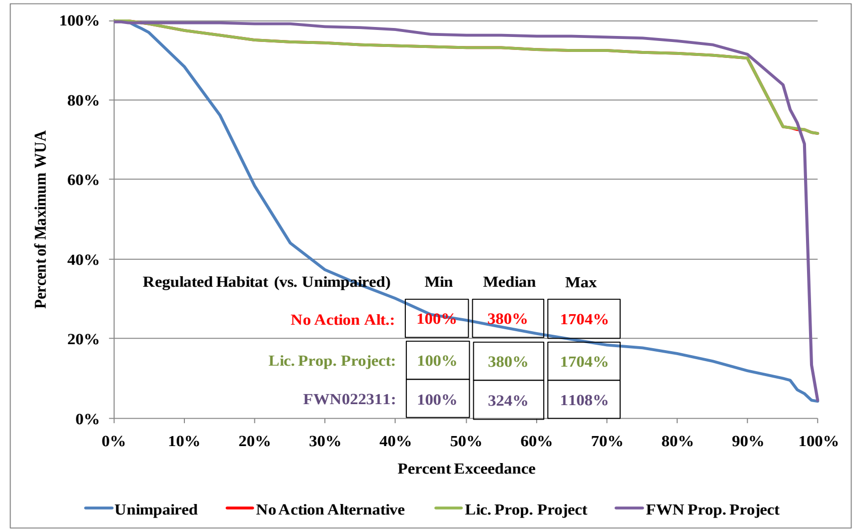


October – Node 2 – Bear River Reach #2 - Boardman SubReach

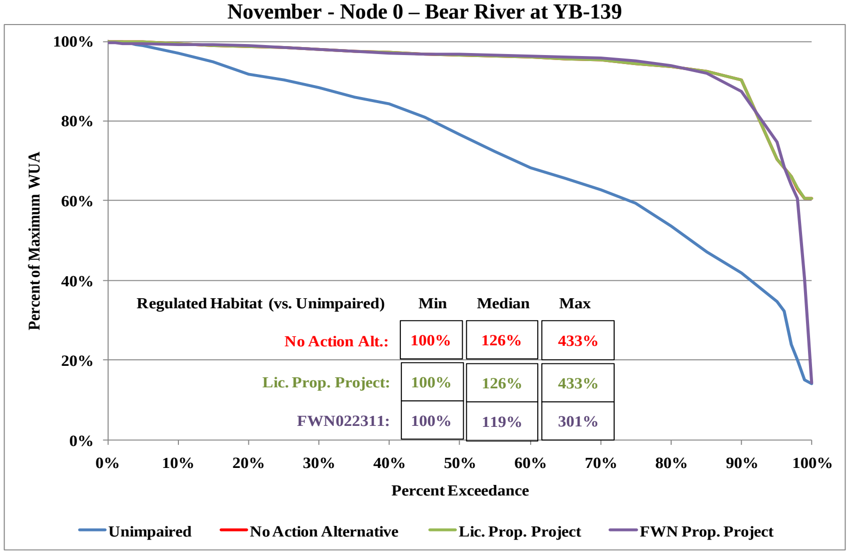
Figure 6.3.2-9a. HEA for adult rainbow trout during the month of October in Bear River Reach #2, Bear River.



November - Node 0 – Bear River at YB-139

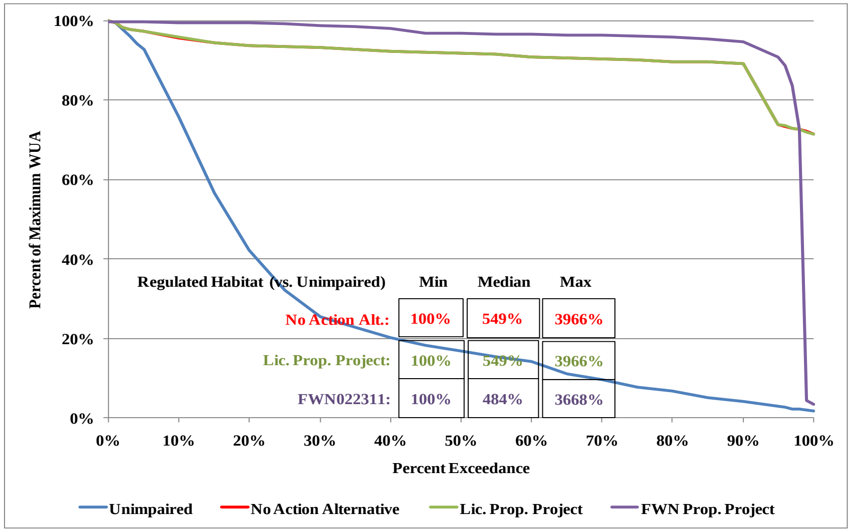


November - Node 1 – Bear River Reach #2 - Meadow SubReach

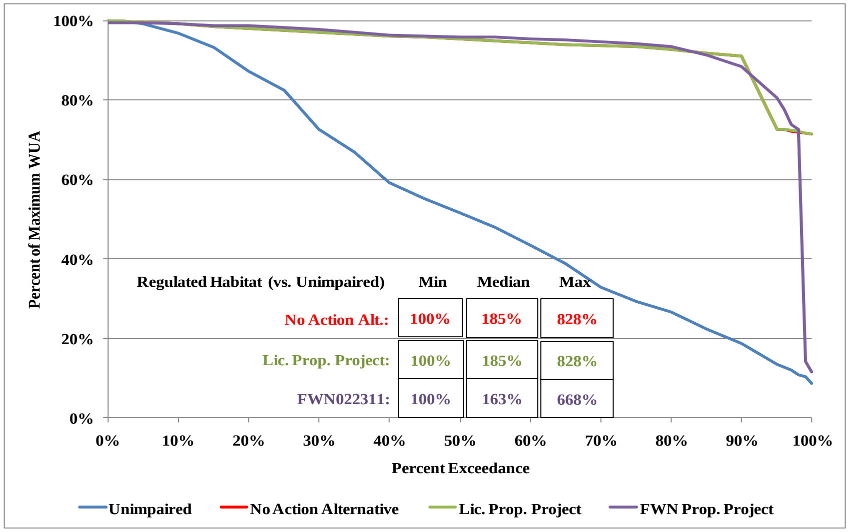


November – Node 2 – Bear River Reach #2 - Boardman SubReach

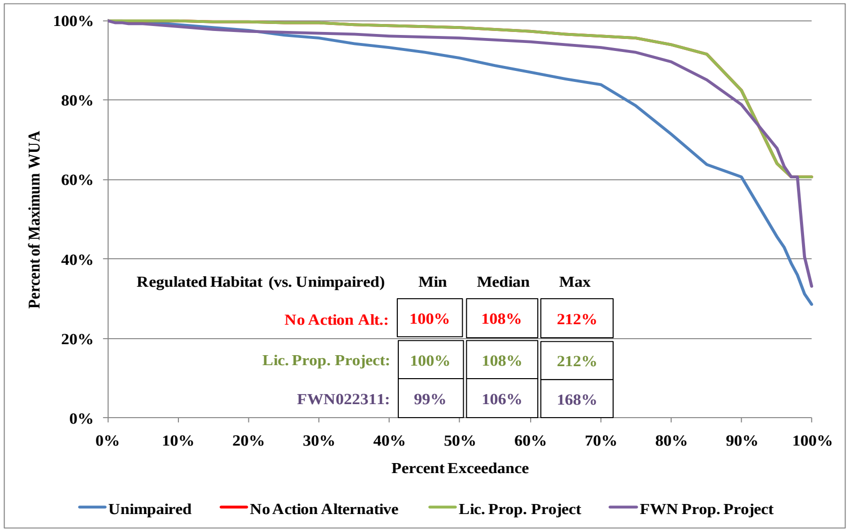
Figure 6.3.2-9b. HEA for adult rainbow trout during the month of November in Bear River Reach #2, Bear River.



December - Node 0 – Bear River at YB-139

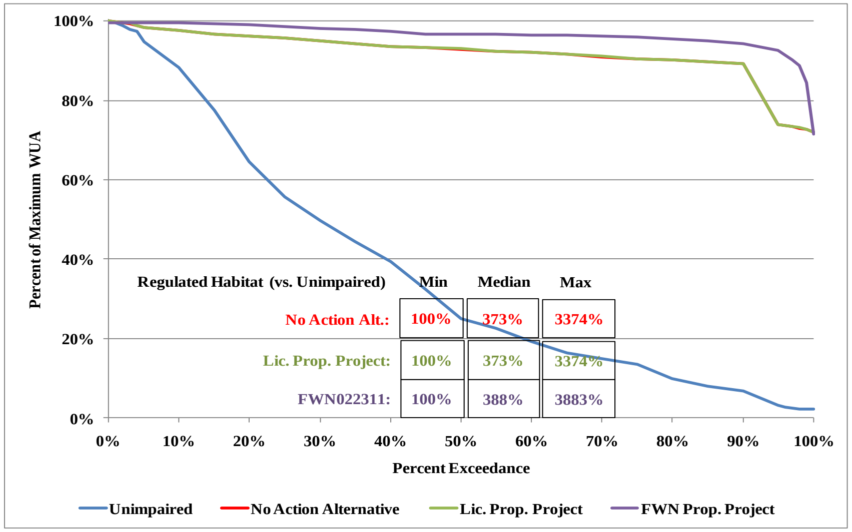


December - Node 1 – Bear River Reach #2 - Meadow SubReach

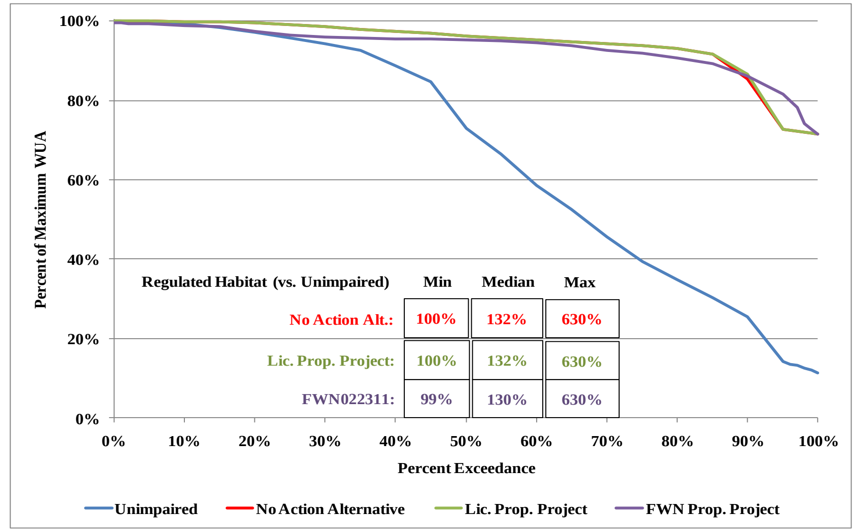


December – Node 2 – Bear River Reach #2 - Boardman SubReach

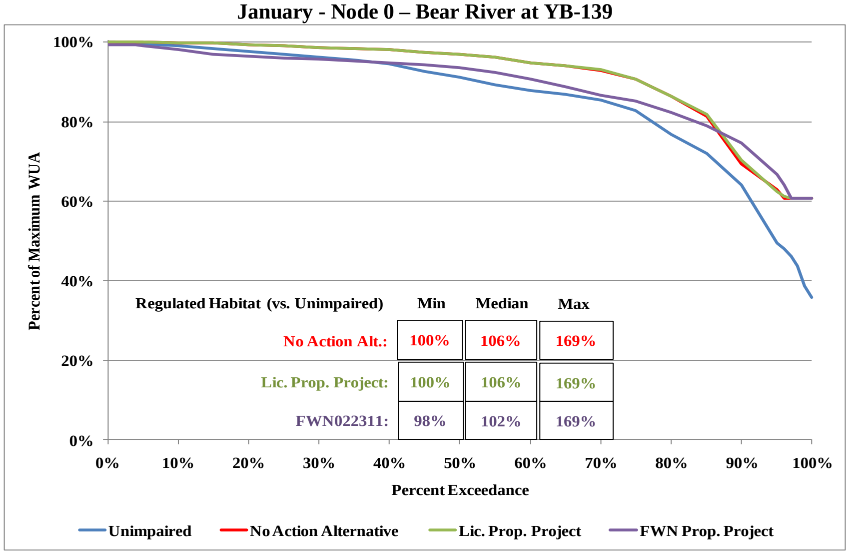
Figure 6.3.2-9c. HEA for adult rainbow trout during the month of December in Bear River Reach #2, Bear River.



January - Node 0 – Bear River at YB-139

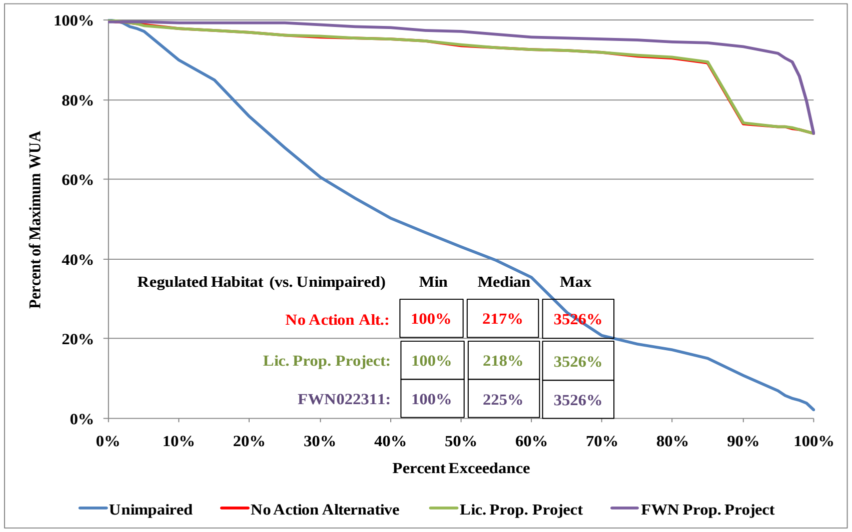


January - Node 1 – Bear River Reach #2 - Meadow SubReach

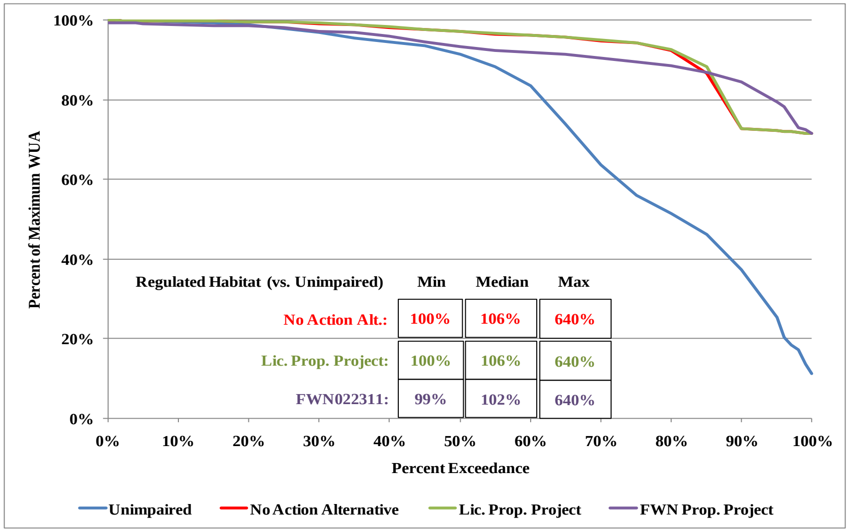


January – Node 2 – Bear River Reach #2 - Boardman SubReach

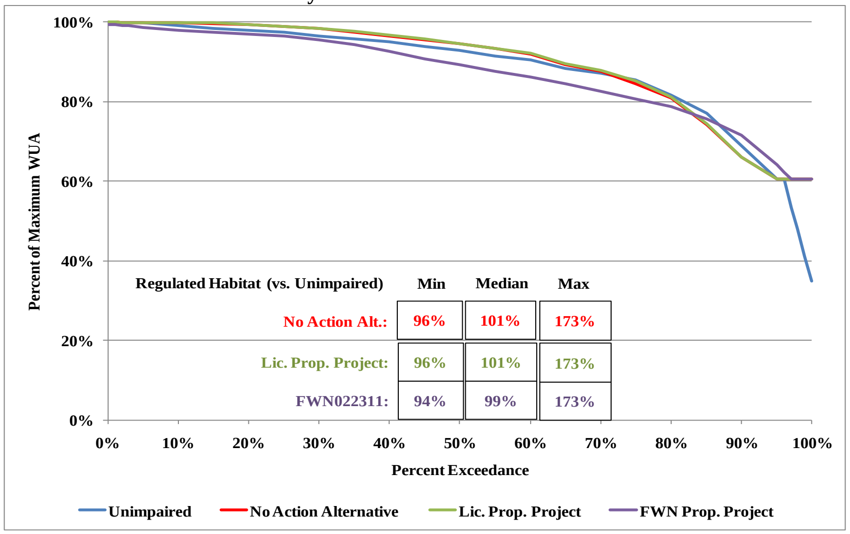
Figure 6.3.2-9d. HEA for adult rainbow trout during the month of January in Bear River Reach #2, Bear River.



February - Node 0 – Bear River at YB-139

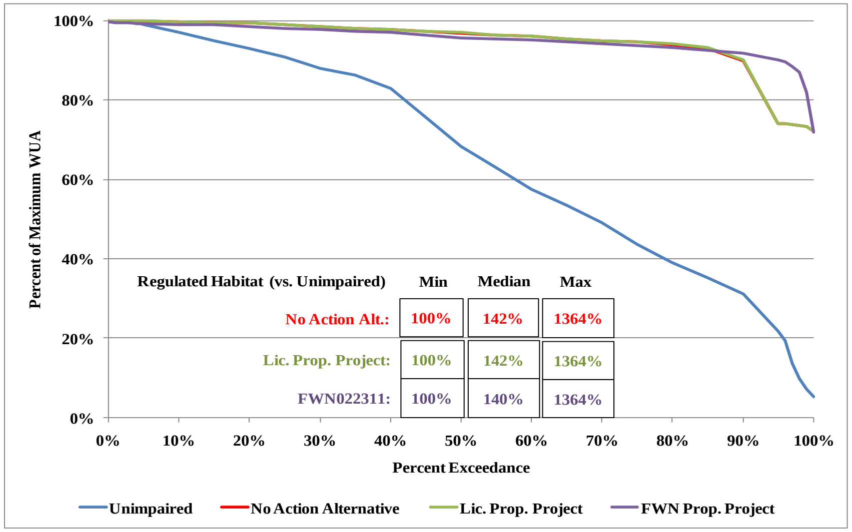


February - Node 1 – Bear River Reach #2 - Meadow SubReach

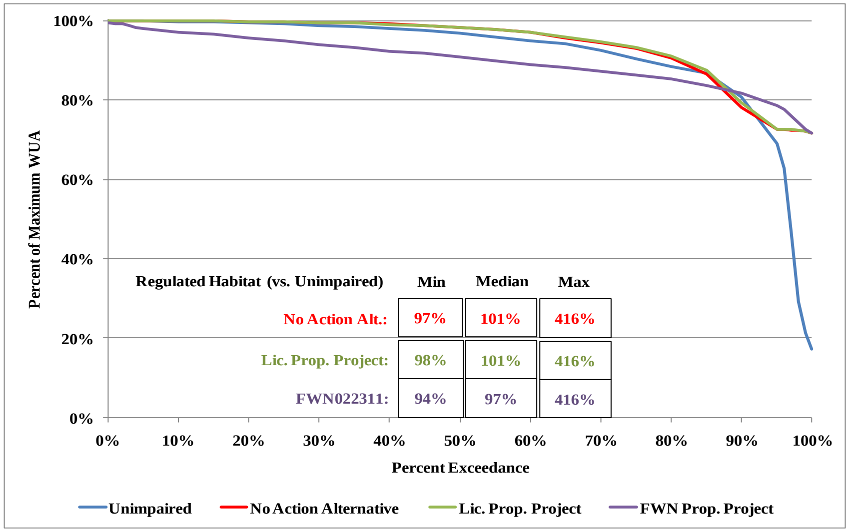


February – Node 2 – Bear River Reach #2 - Boardman SubReach

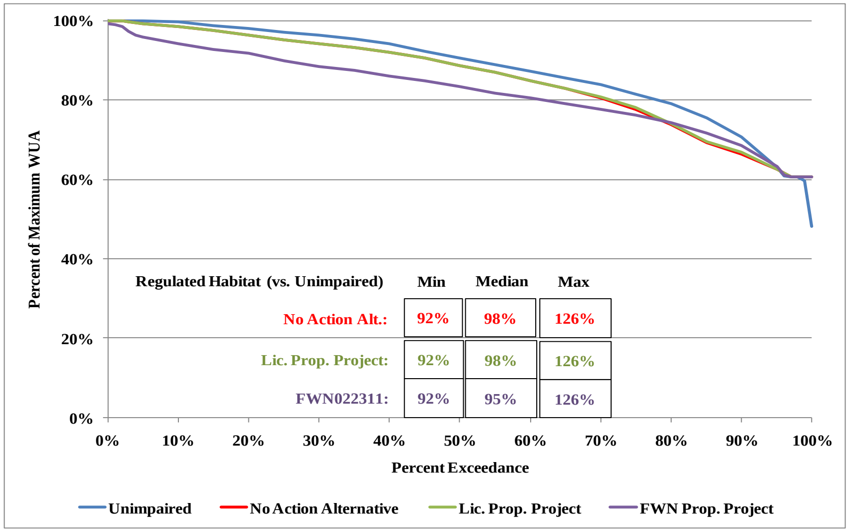
Figure 6.3.2-9e. HEA for adult rainbow trout during the month of February in Bear River Reach #2, Bear River.



March - Node 0 – Bear River at YB-139

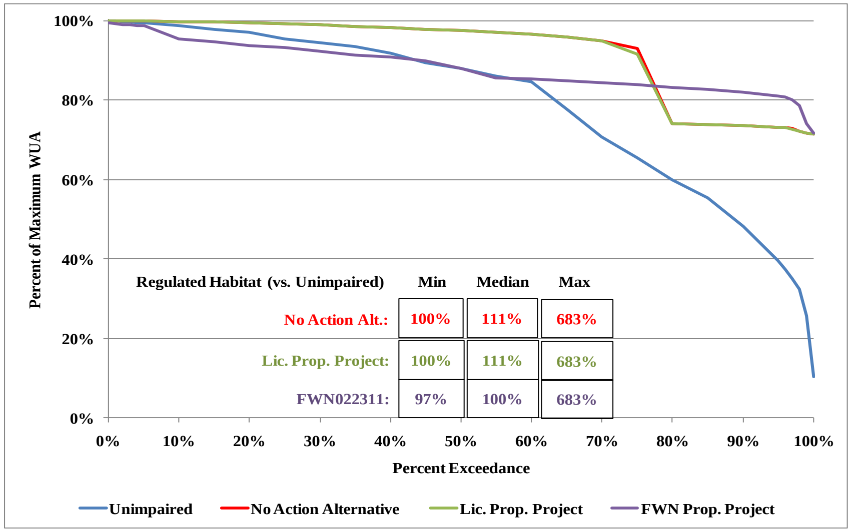


March - Node 1 – Bear River Reach #2 - Meadow SubReach

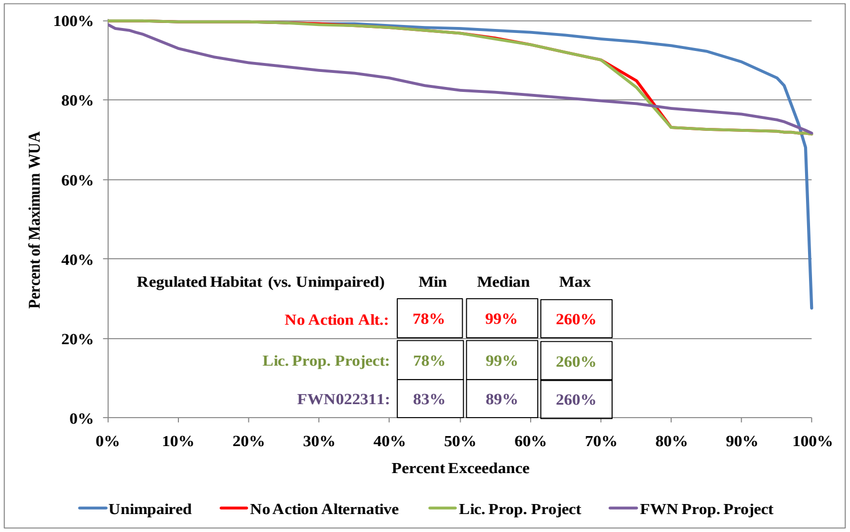


March – Node 2 – Bear River Reach #2 - Boardman SubReach

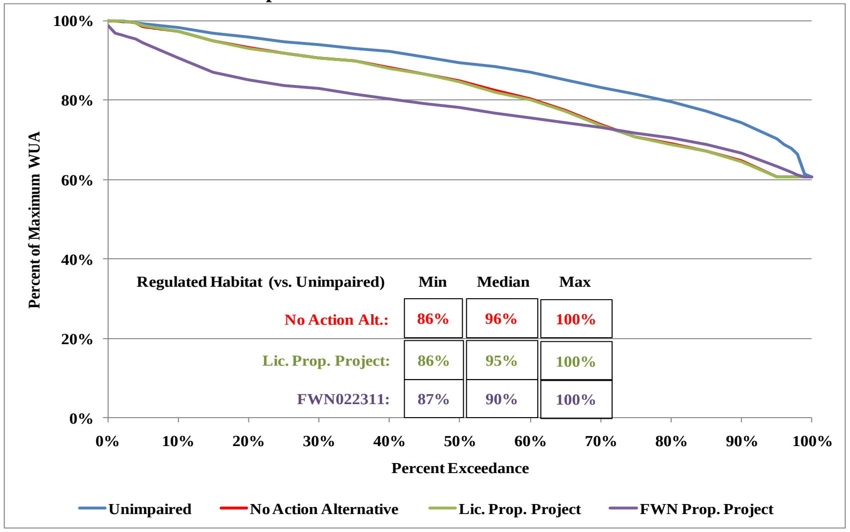
Figure 6.3.2-9f. HEA for adult rainbow trout during the month of March in Bear River Reach #2, Bear River.



April - Node 0 – Bear River at YB-139

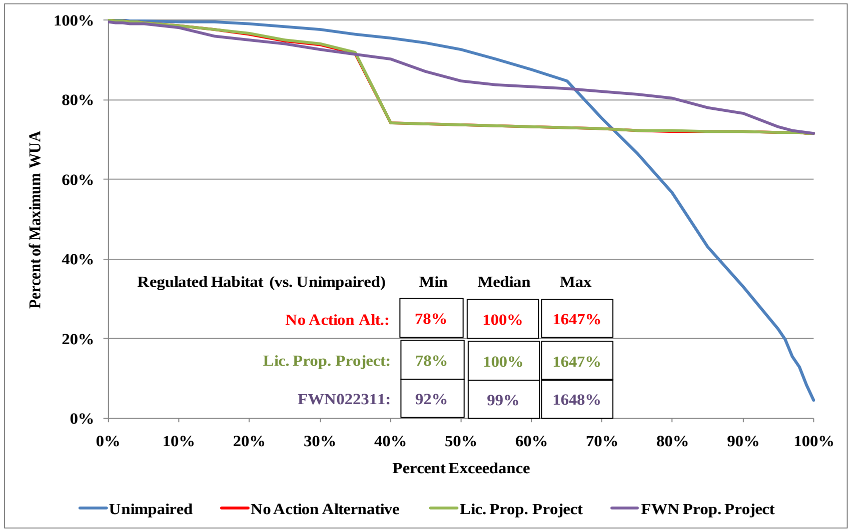


April - Node 1 – Bear River Reach #2 - Meadow SubReach

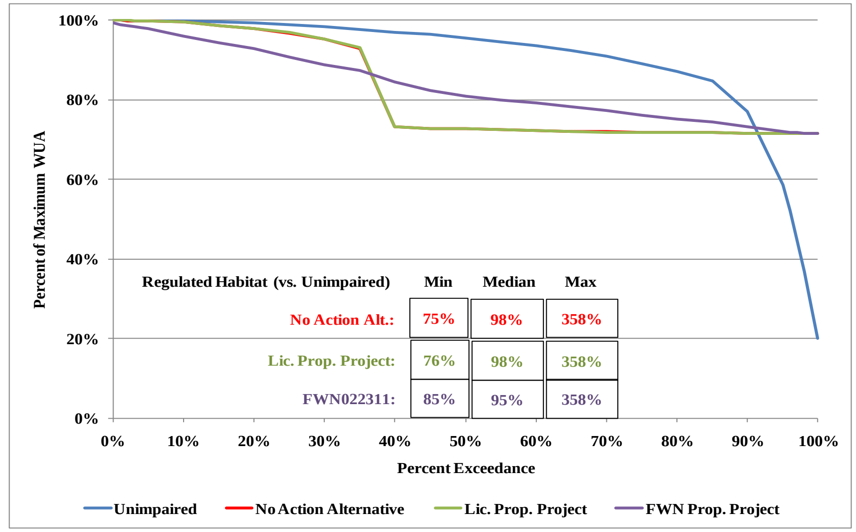


April – Node 2 – Bear River Reach #2 - Boardman SubReach

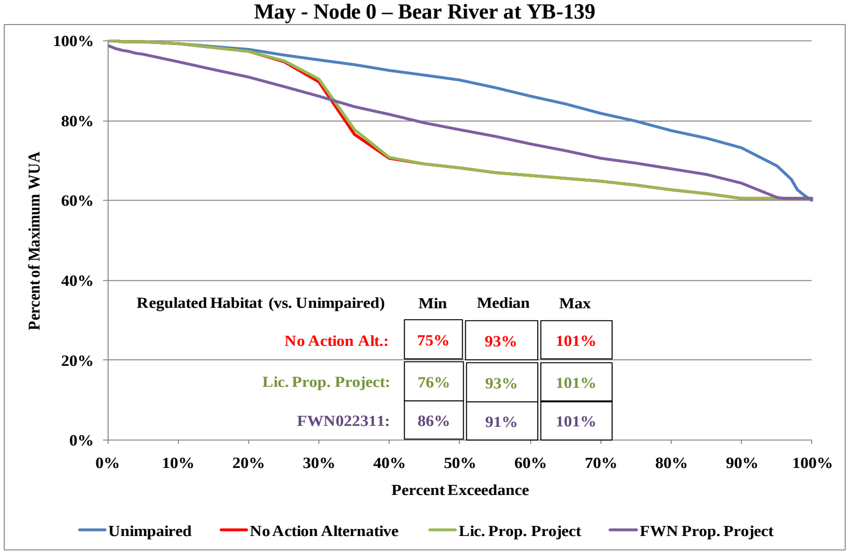
Figure 6.3.2-9g. HEA for adult rainbow trout during the month of April in Bear River Reach #2, Bear River.



May - Node 0 – Bear River at YB-139

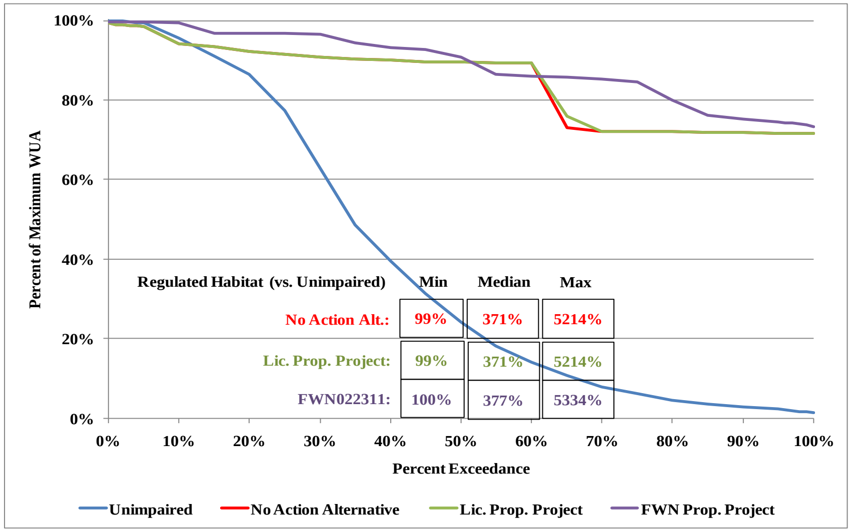


May - Node 1 – Bear River Reach #2 - Meadow SubReach

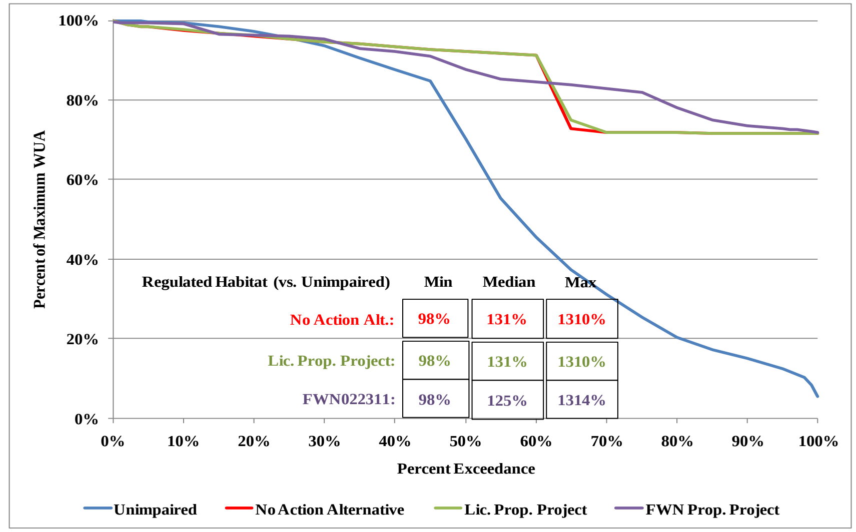


May – Node 2 – Bear River Reach #2 - Boardman SubReach

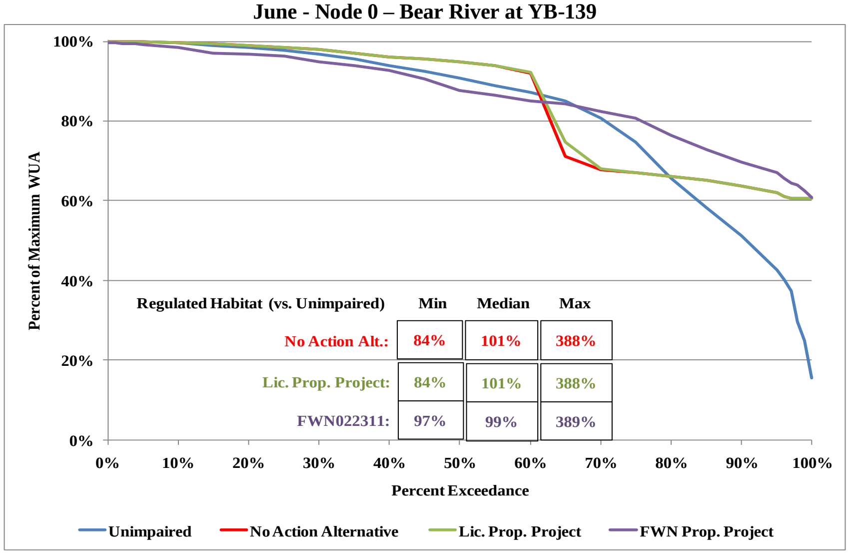
Figure 6.3.2-9h. HEA for adult rainbow trout during the month of May in Bear River Reach #2, Bear River.



June - Node 0 – Bear River at YB-139

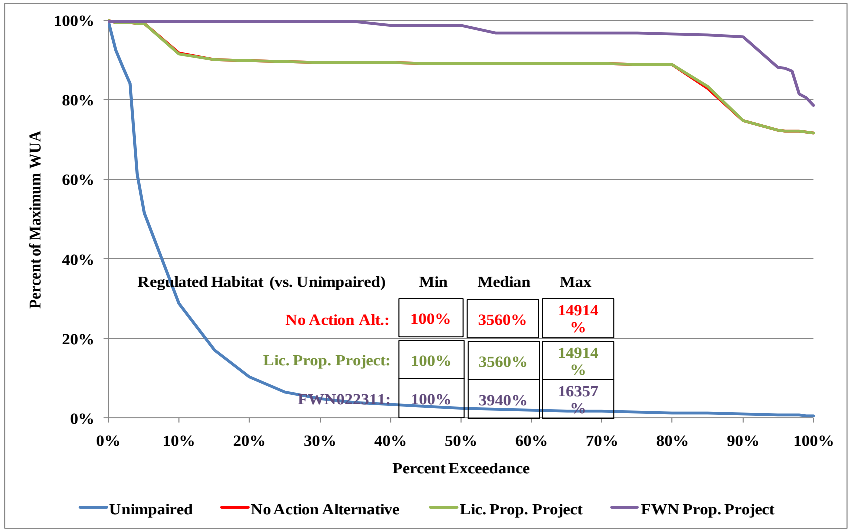


June - Node 1 – Bear River Reach #2 - Meadow SubReach

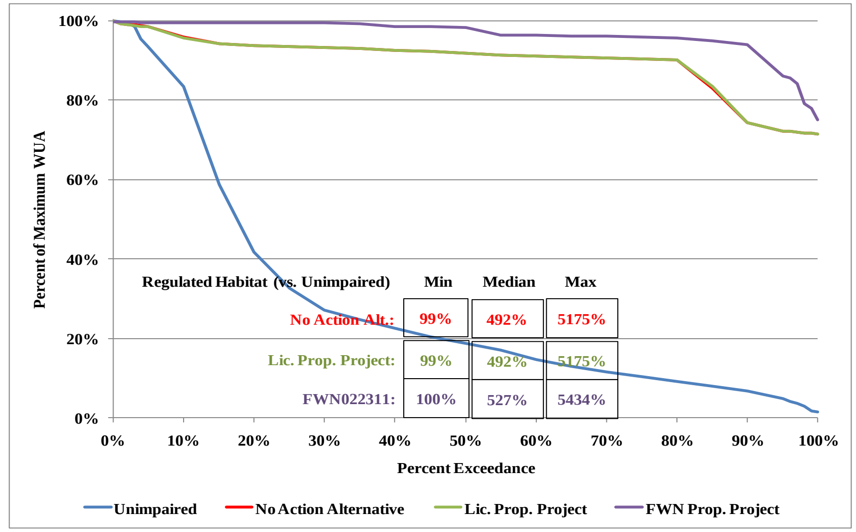


June – Node 2 – Bear River Reach #2 - Boardman SubReach

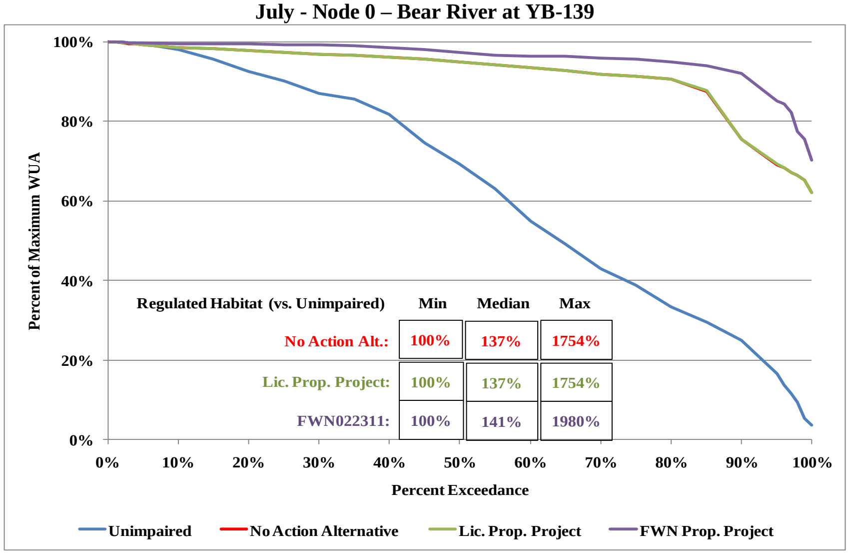
Figure 6.3.2-9i. HEA for adult rainbow trout during the month of June in Bear River Reach #2, Bear River.



July - Node 0 – Bear River at YB-139

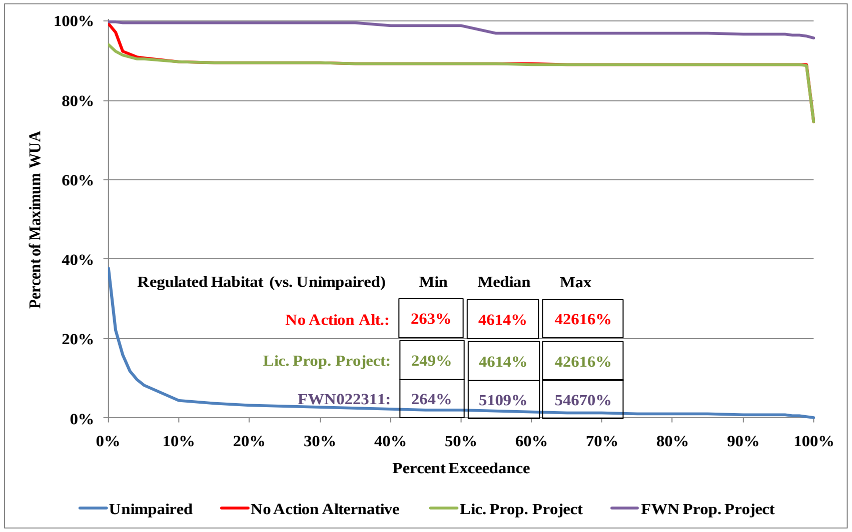


July - Node 1 – Bear River Reach #2 - Meadow SubReach

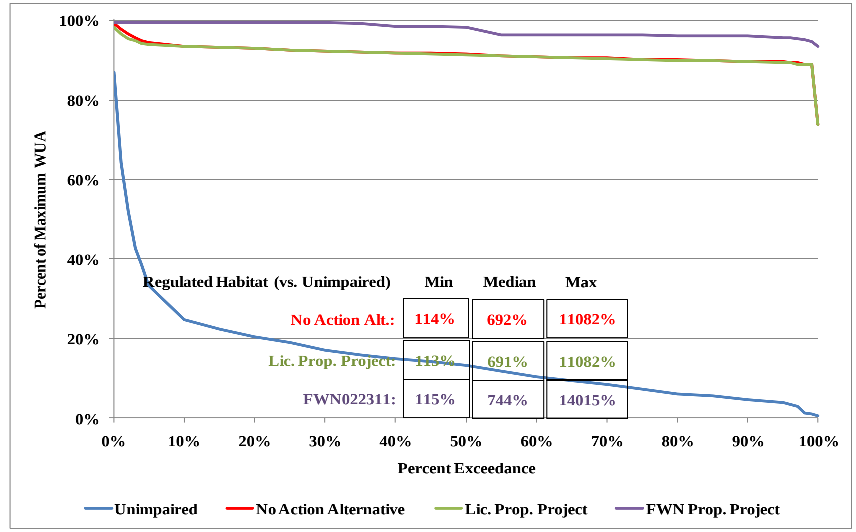


July – Node 2 – Bear River Reach #2 - Boardman SubReach

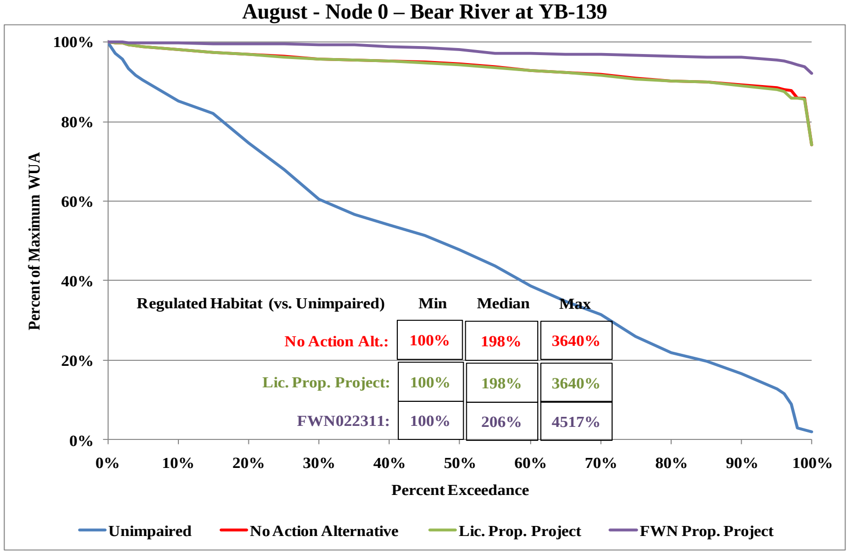
Figure 6.3.2-9j. HEA for adult rainbow trout during the month of July in Bear River Reach #2, Bear River.



August - Node 0 – Bear River at YB-139

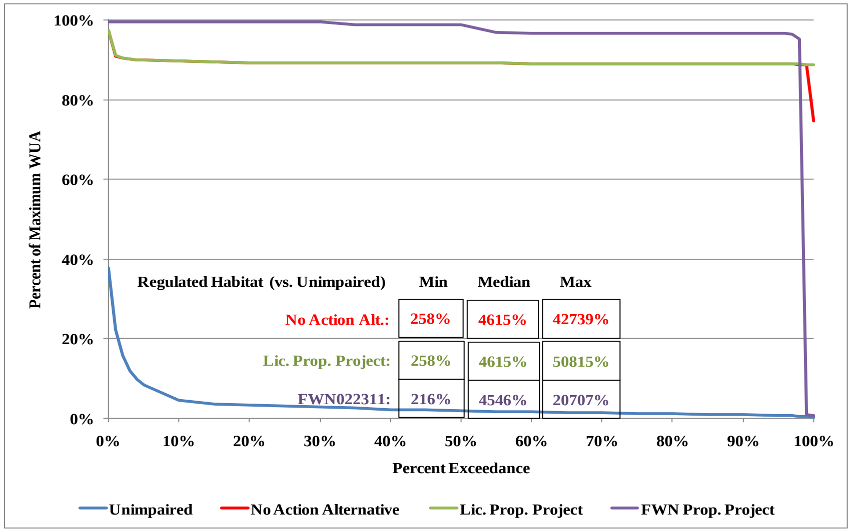


August - Node 1 – Bear River Reach #2 - Meadow SubReach

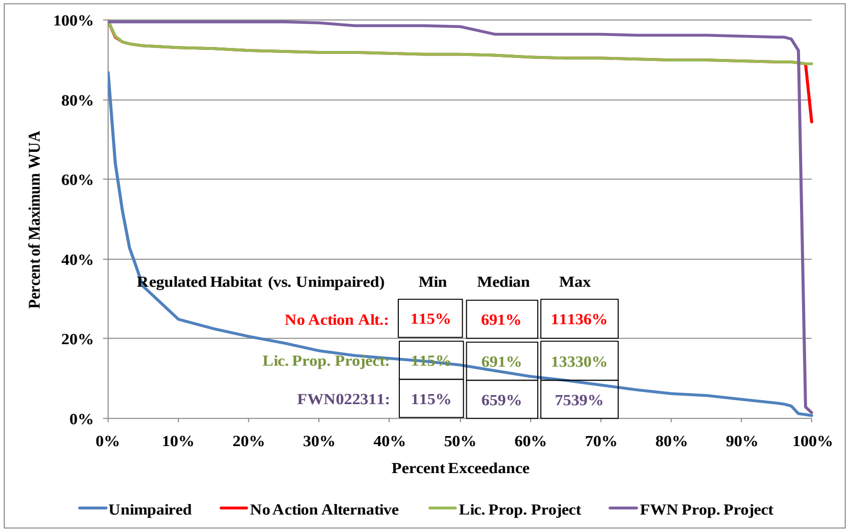


August – Node 2 – Bear River Reach #2 - Boardman SubReach

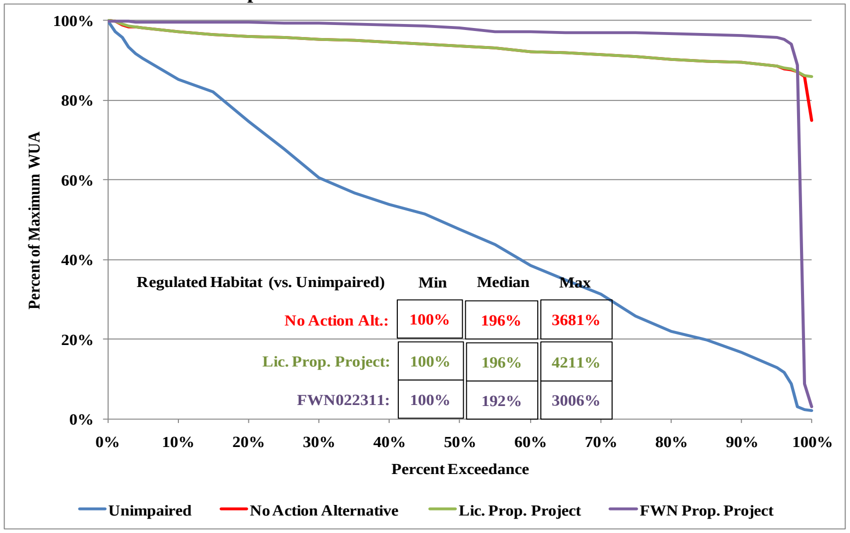
Figure 6.3.2-9k. HEA for adult rainbow trout during the month of August in Bear River Reach #2, Bear River.



September - Node 0 – Bear River at YB-139

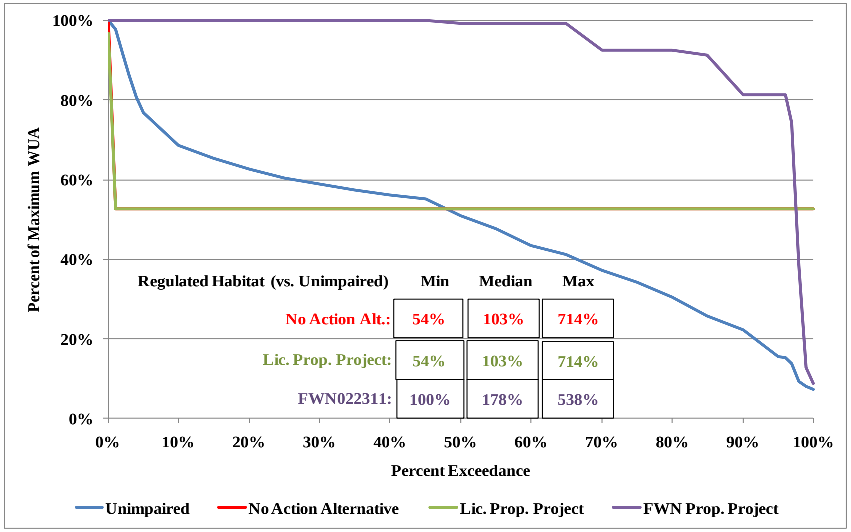


September - Node 1 – Bear River Reach #2 - Meadow SubReach

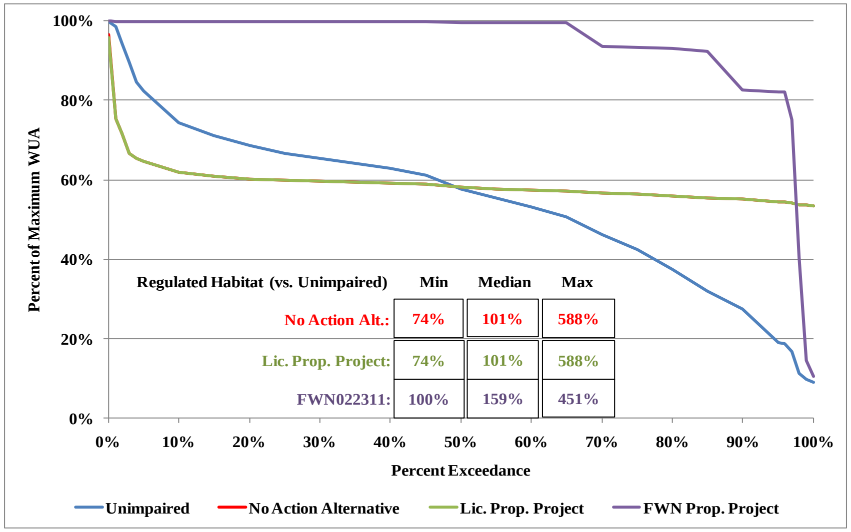


September – Node 2 – Bear River Reach #2 - Boardman SubReach

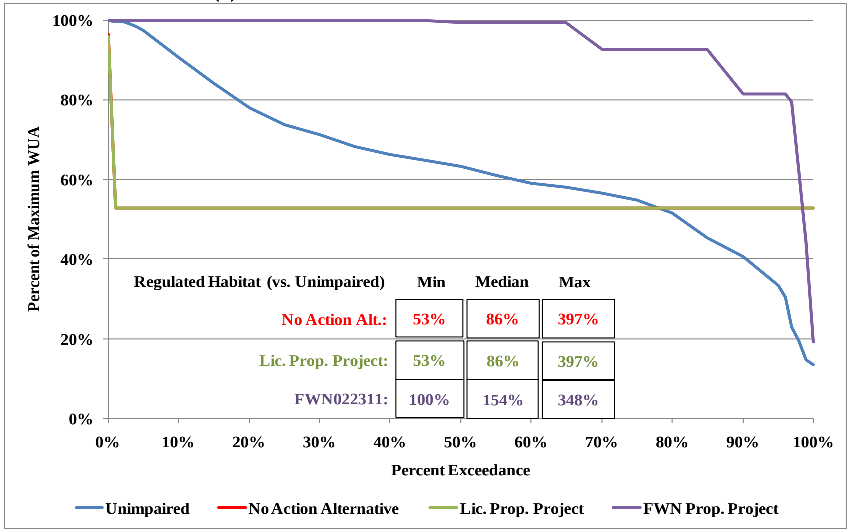
Figure 6.3.2-9l. HEA for adult rainbow trout during the month of September in Bear River Reach #2, Bear River.



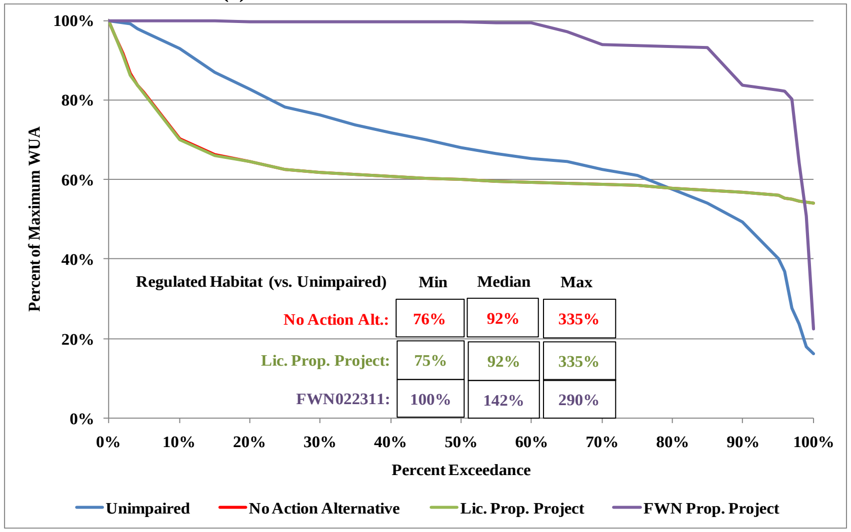
(a) October - Node 0 – Bear River at Drum AB



(a) October - Node 1 – Drum AB Dam Reach

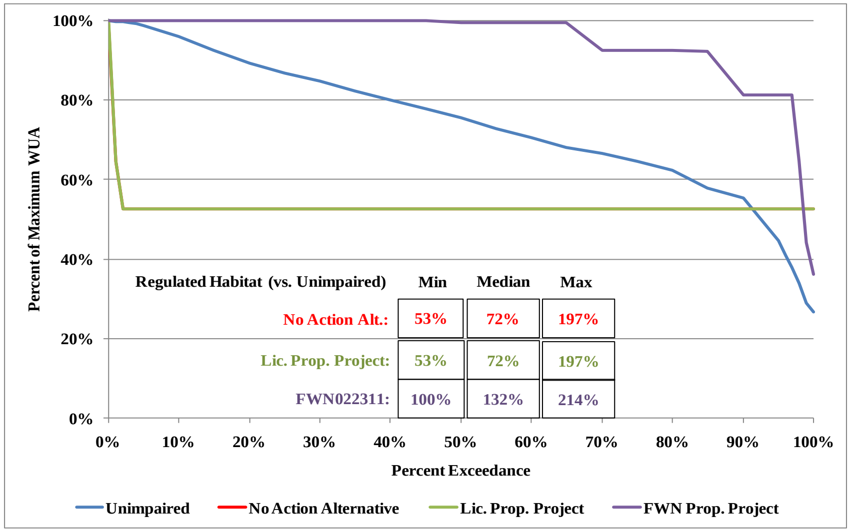


(b) November - Node 0 – Bear River at Drum AB

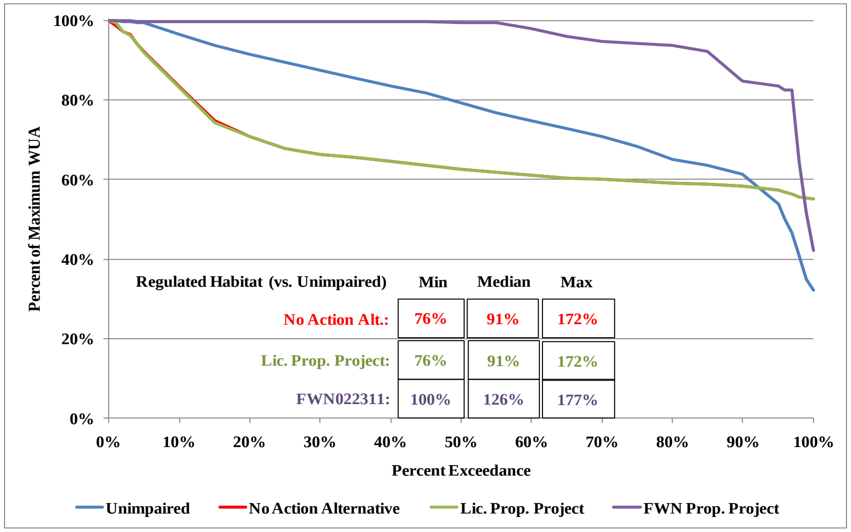


(b) November - Node 1 – Drum AB Dam Reach

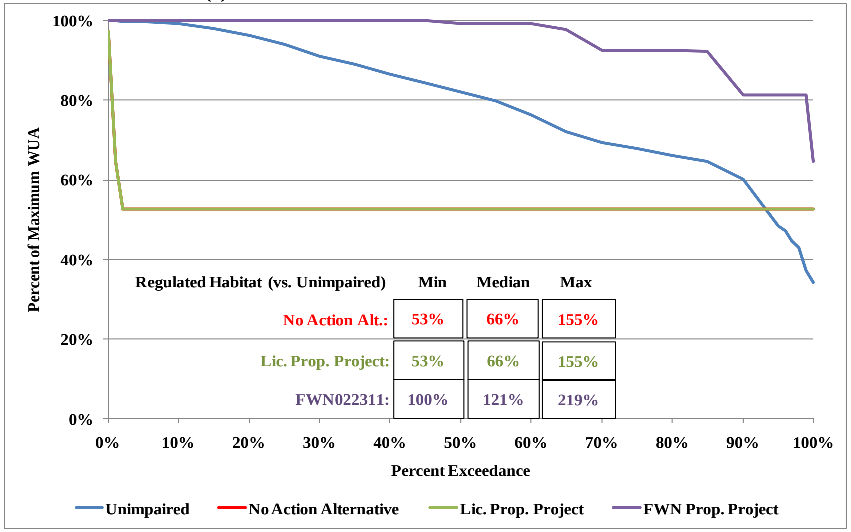
Figures 6.3.2-10a and 6.3.2-10b. HEA for adult rainbow trout during the months of October (a) and November (b) in the Drum Afterbay Dam Reach, Bear River.



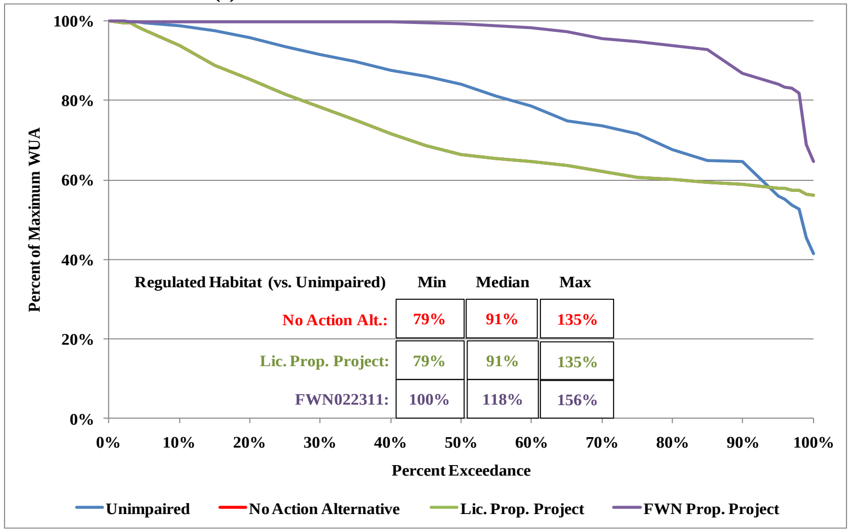
(c) December - Node 0 – Bear River at Drum AB



(c) December - Node 1 – Drum AB Dam Reach

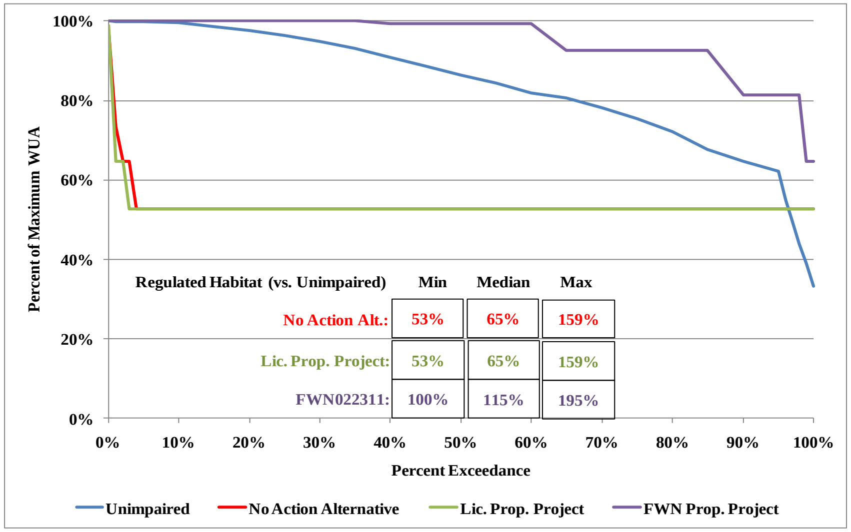


(d) January - Node 0 – Bear River at Drum AB

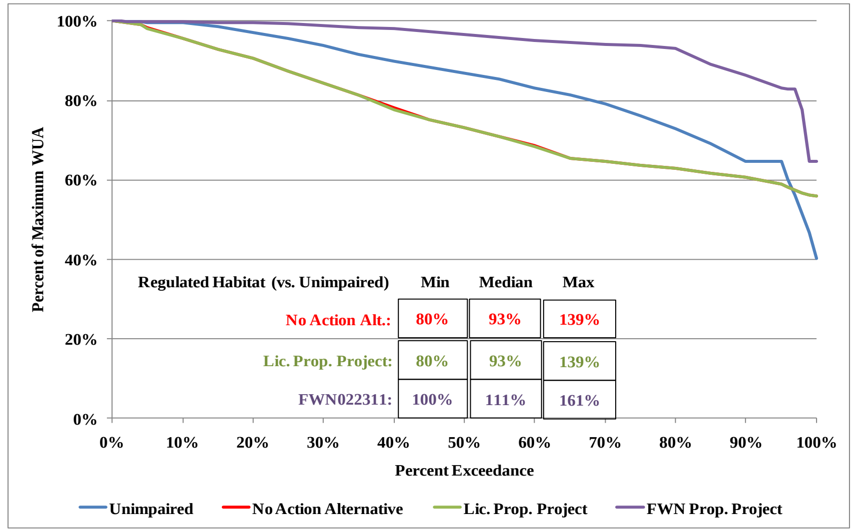


(d) January - Node 1 – Drum AB Dam Reach

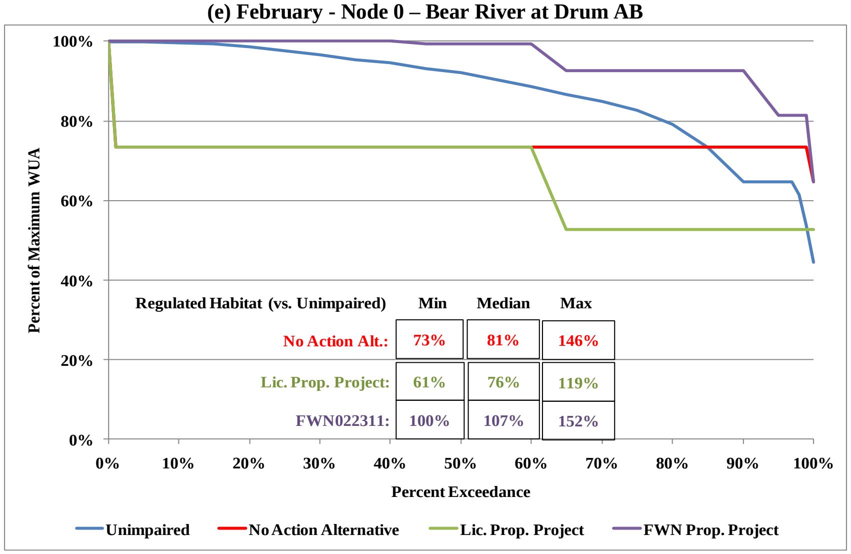
Figures 6.3.2-10c and 6.3.2-10d. HEA for adult rainbow trout during the months of December (c) and January (d) in the Drum Afterbay Dam Reach, Bear River.



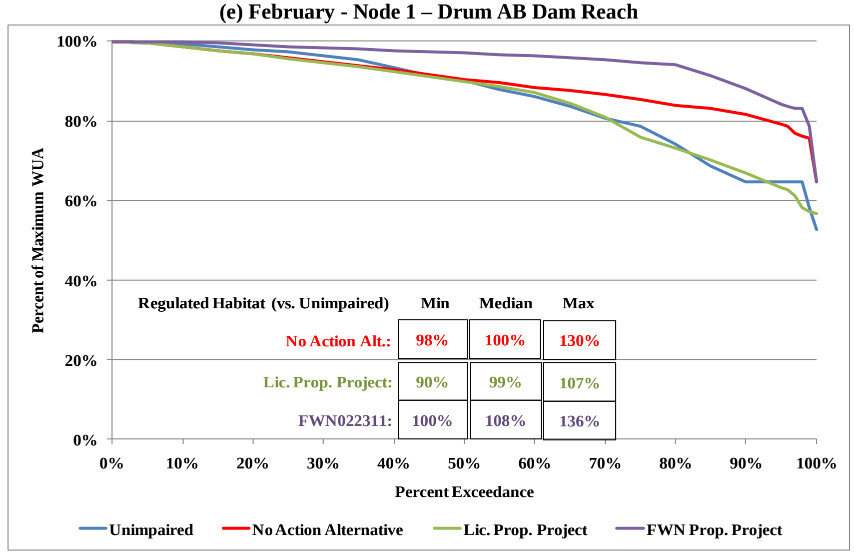
(e) February - Node 0 – Bear River at Drum AB



(e) February - Node 1 – Drum AB Dam Reach

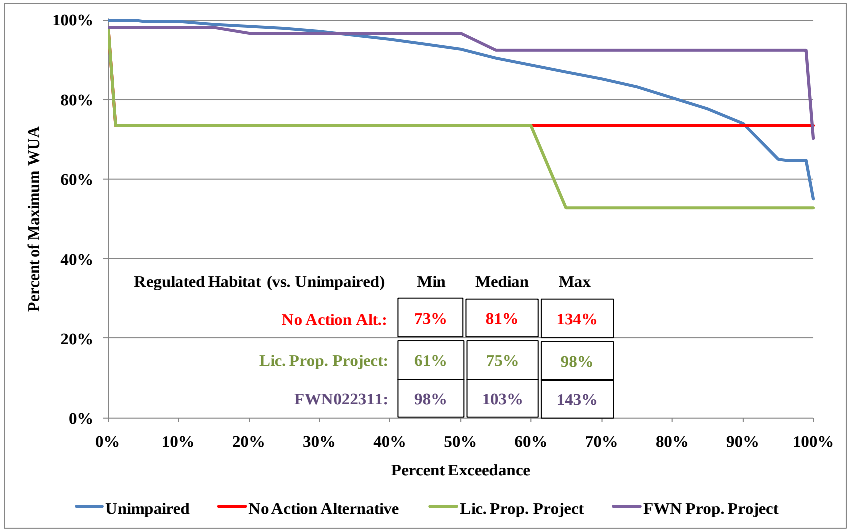


(f) March - Node 0 – Bear River at Drum AB

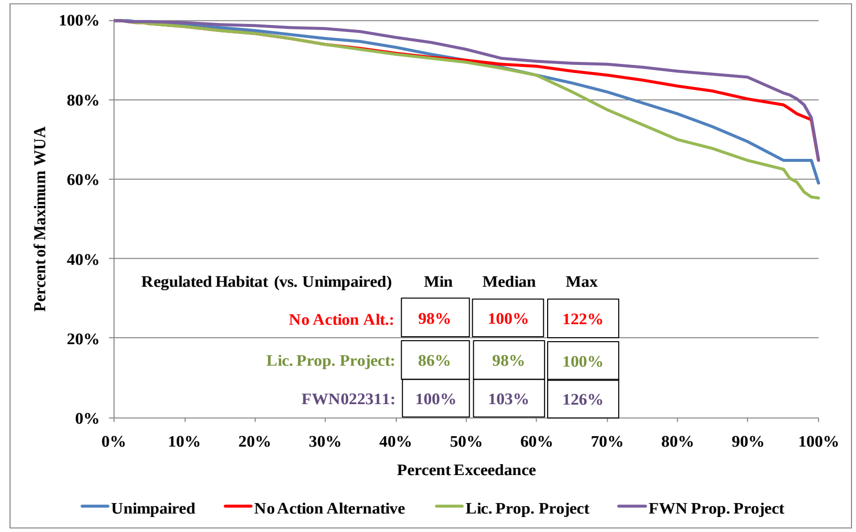


(f) March - Node 1 – Drum AB Dam Reach

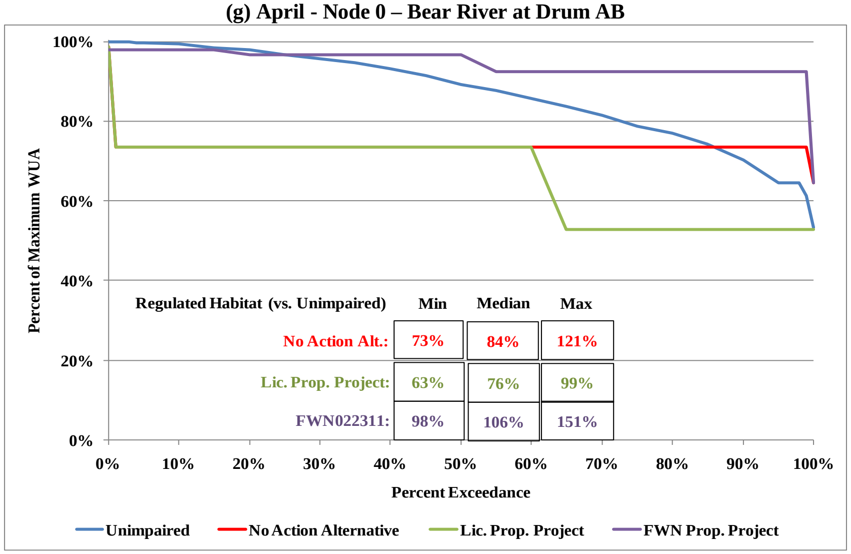
Figures 6.3.2-10e and 6.3.2-10f. HEA for adult rainbow trout during the months of February (e) and March (f) in the Drum Afterbay Dam Reach, Bear River.



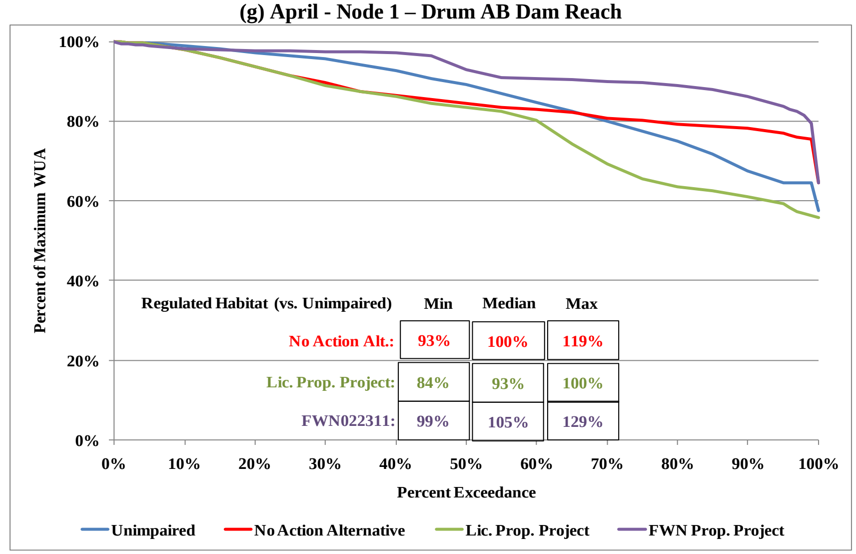
(g) April - Node 0 – Bear River at Drum AB



(g) April - Node 1 – Drum AB Dam Reach

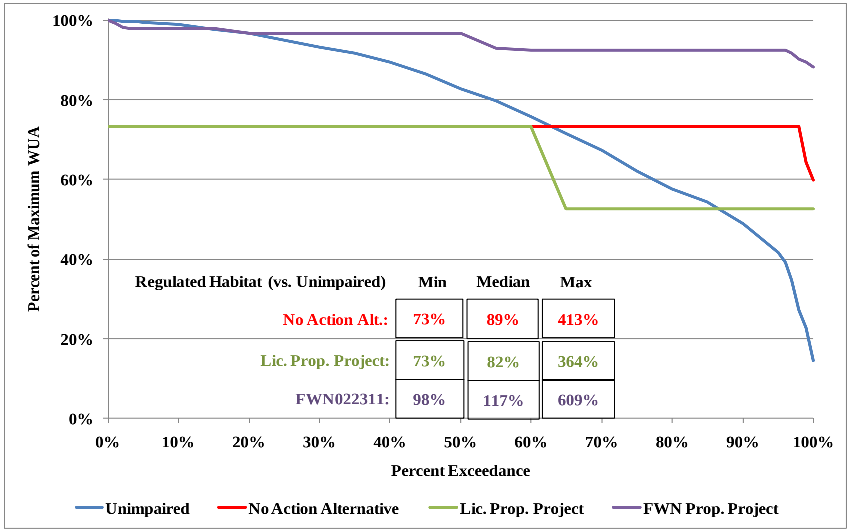


(h) May - Node 0 – Bear River at Drum AB

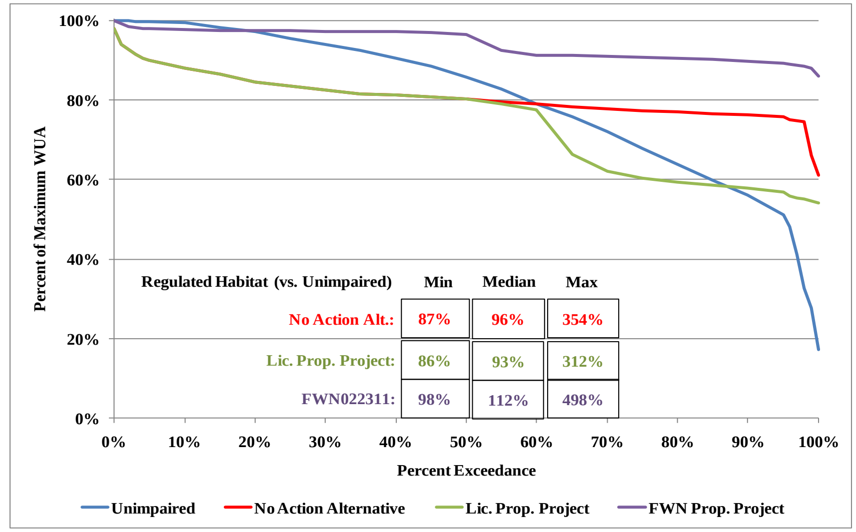


(h) May - Node 1 – Drum AB Dam Reach

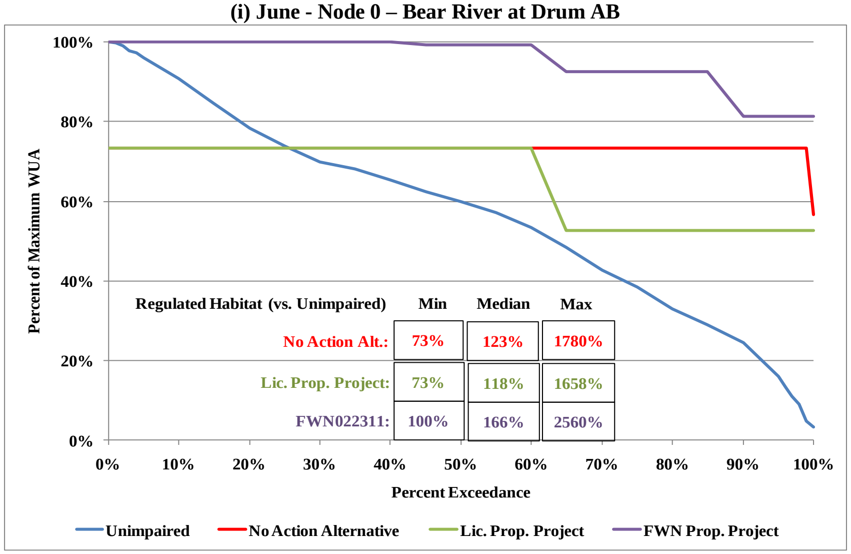
Figures 6.3.2-10g and 6.3.2-10h. HEA for adult rainbow trout during the months of April (g) and May (h) in the Drum Afterbay Dam Reach, Bear River.



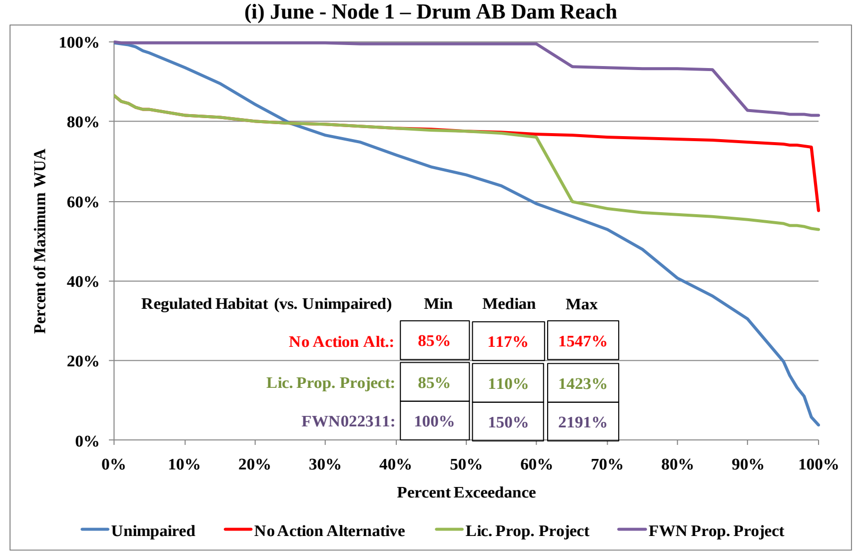
(i) June - Node 0 – Bear River at Drum AB



(i) June - Node 1 – Drum AB Dam Reach

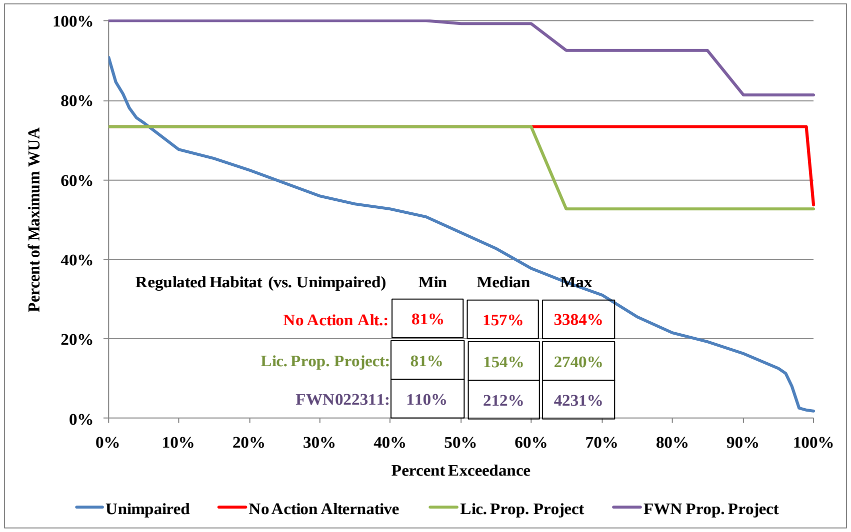


(j) July - Node 0 – Bear River at Drum AB

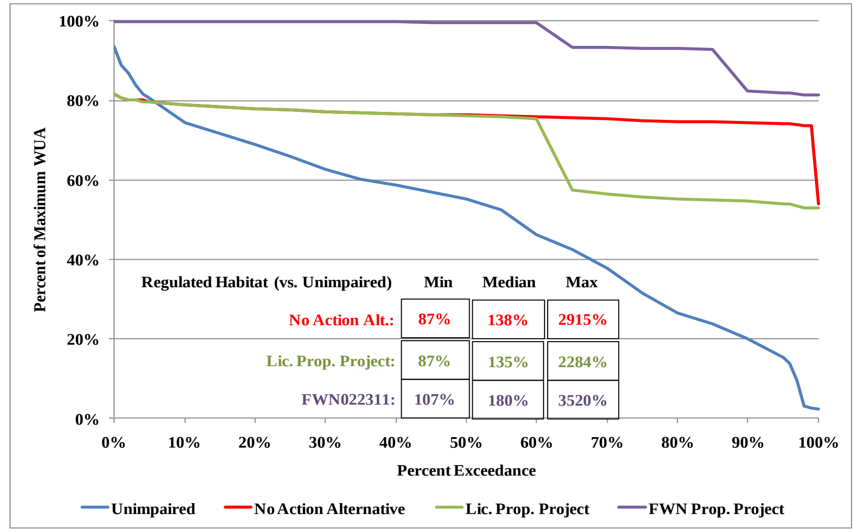


(j) July - Node 1 – Drum AB Dam Reach

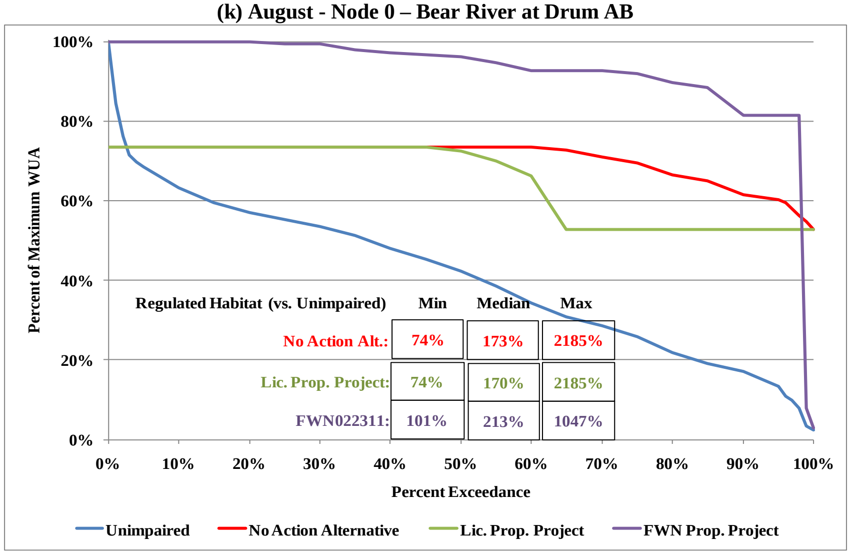
Figures 6.3.2-10i and 6.3.2-10j. HEA for adult rainbow trout during the months of June (i) and July (j) in the Drum Afterbay Dam Reach, Bear River.



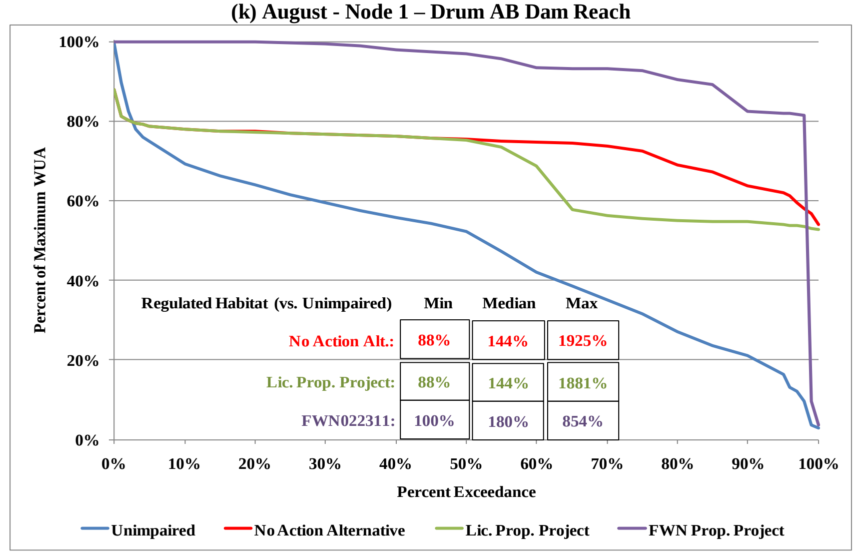
(k) August - Node 0 – Bear River at Drum AB



(k) August - Node 1 – Drum AB Dam Reach

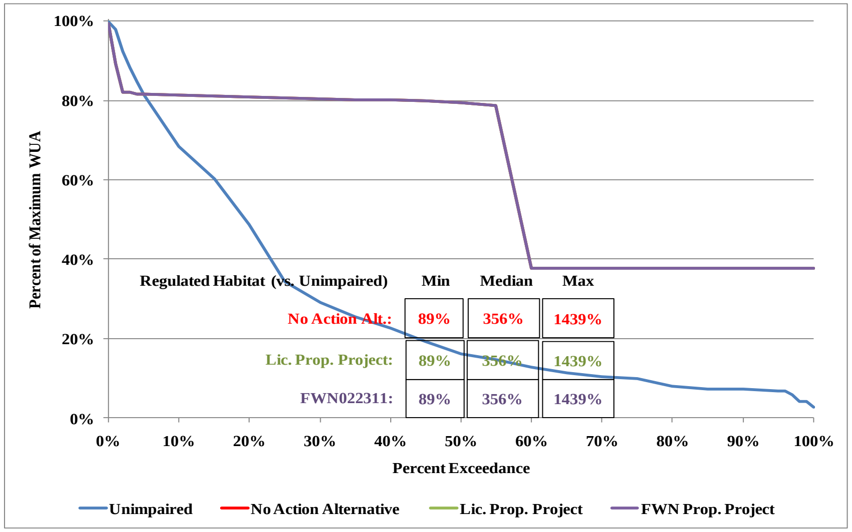


(l) September - Node 0 – Bear River at Drum AB

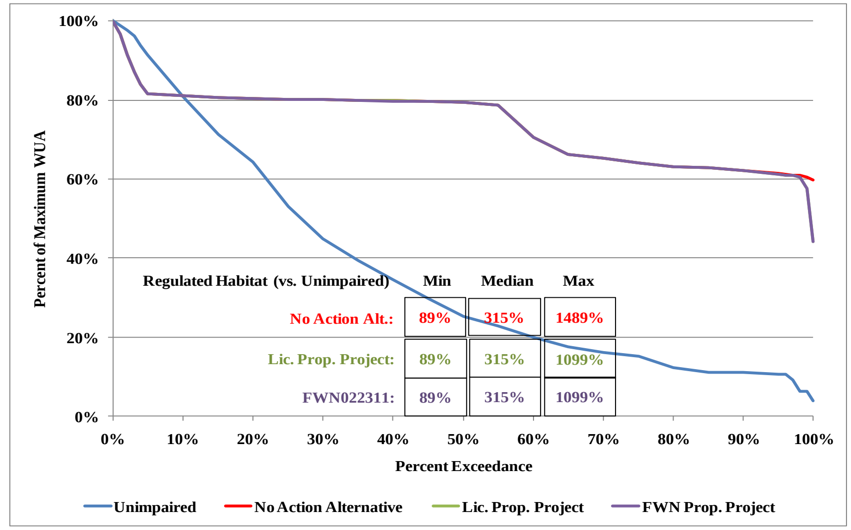


(l) September - Node 1 – Drum AB Dam Reach

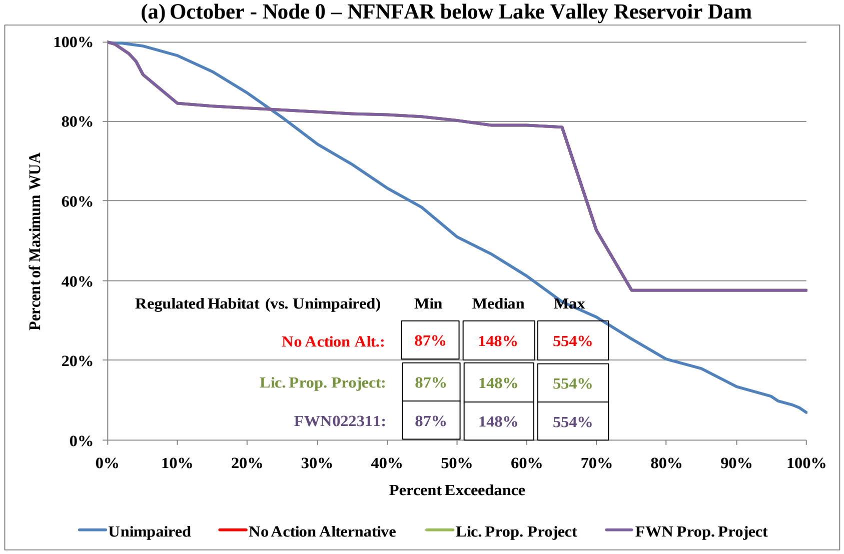
Figures 6.3.2-10k and 6.3.2-10l. HEA for adult rainbow trout during the months of August (k) and September (l) in the Drum Afterbay Dam Reach, Bear River.



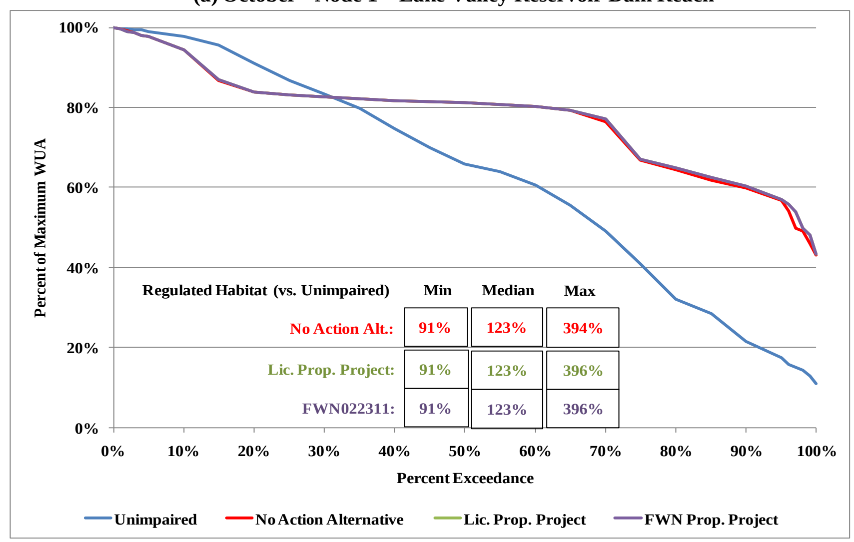
(a) October - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(a) October - Node 1 – Lake Valley Reservoir Dam Reach

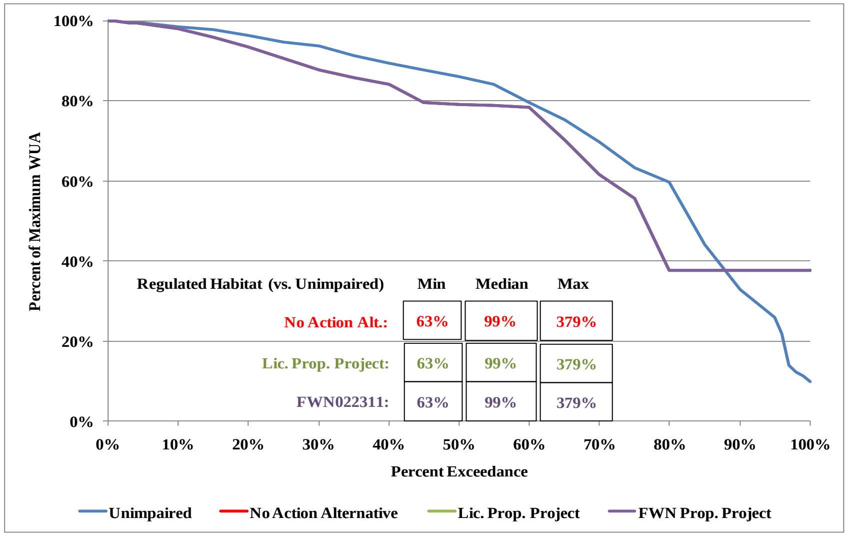


(b) November - Node 0 – NFNFAR below Lake Valley Reservoir Dam

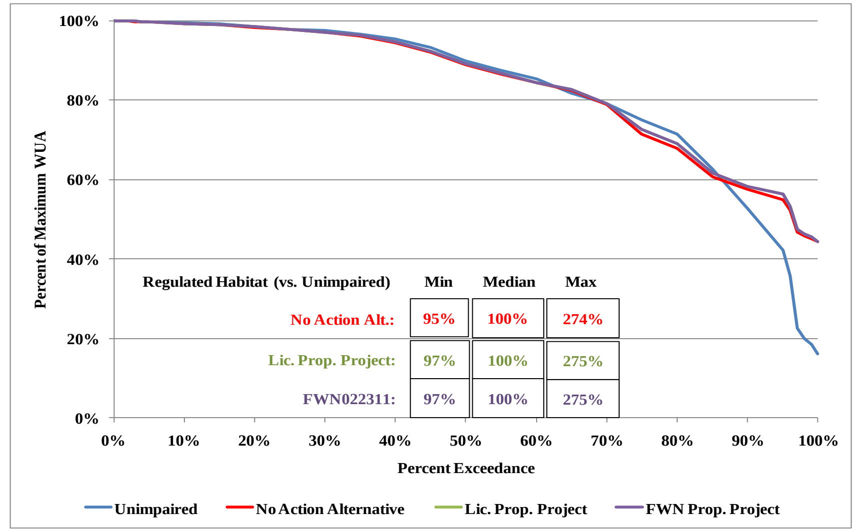


(b) November - Node 1 – Lake Valley Reservoir Dam Reach

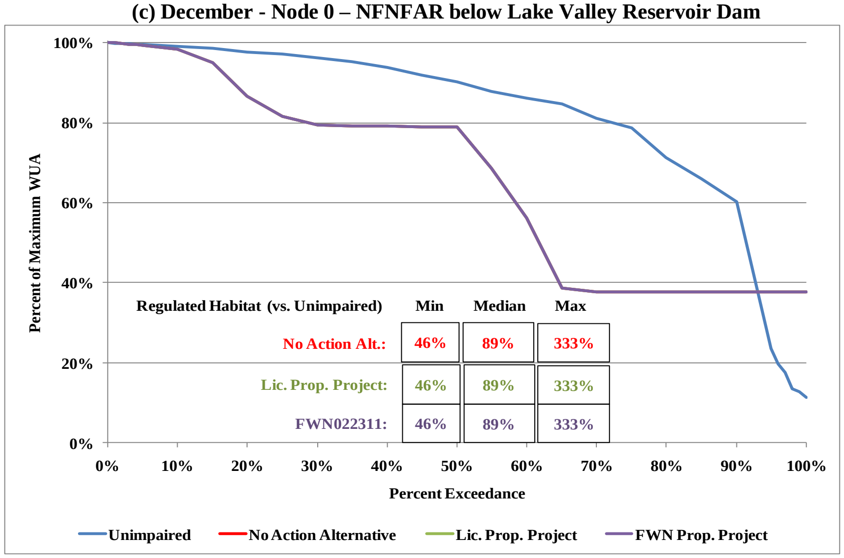
Figures 6.3.2-11a and 6.3.2-11b. HEA for adult rainbow trout during the months of October (a) and November (b) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



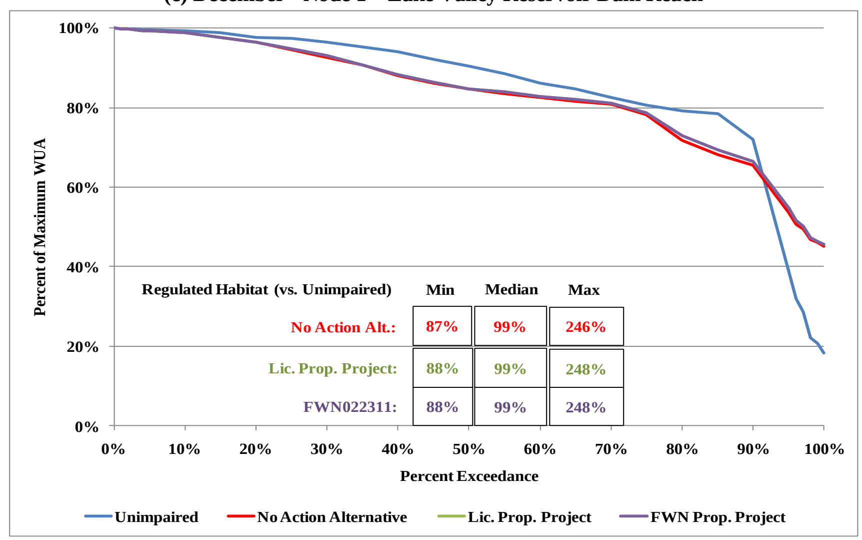
(c) December - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(c) December - Node 1 – Lake Valley Reservoir Dam Reach

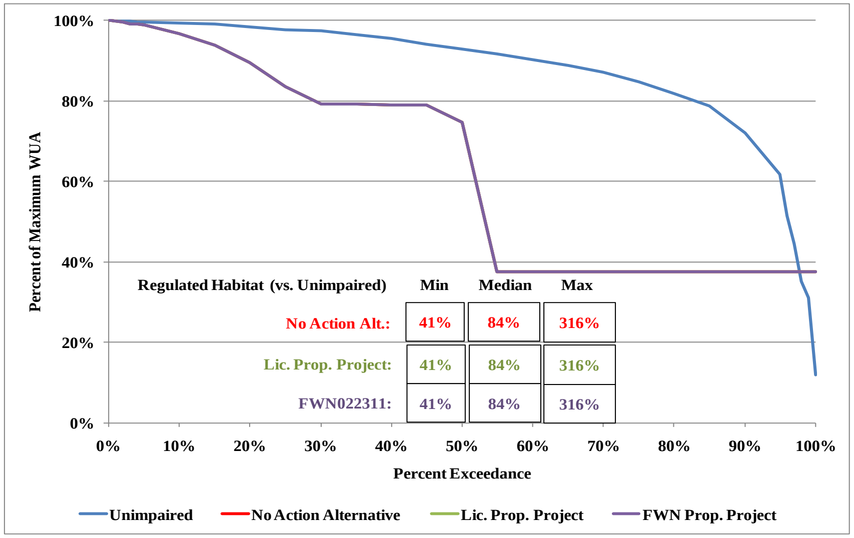


(d) January - Node 0 – NFNFAR below Lake Valley Reservoir Dam

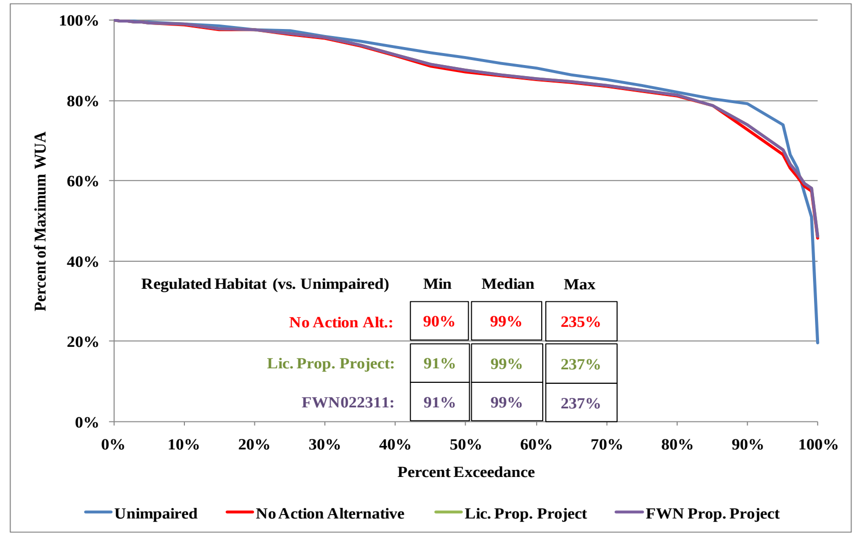


(d) January - Node 1 – Lake Valley Reservoir Dam Reach

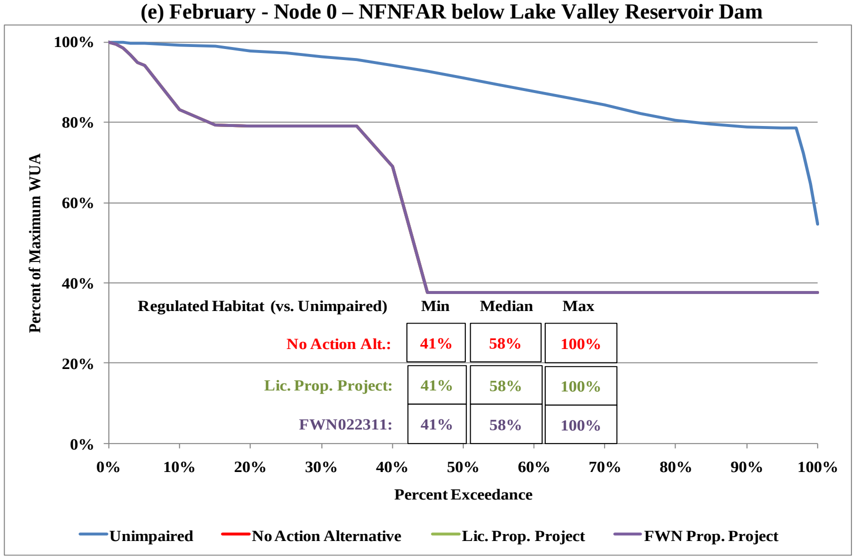
Figures 6.3.2-11c and 6.3.2-11d. HEA for adult rainbow trout during the months of December (c) and January (d) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



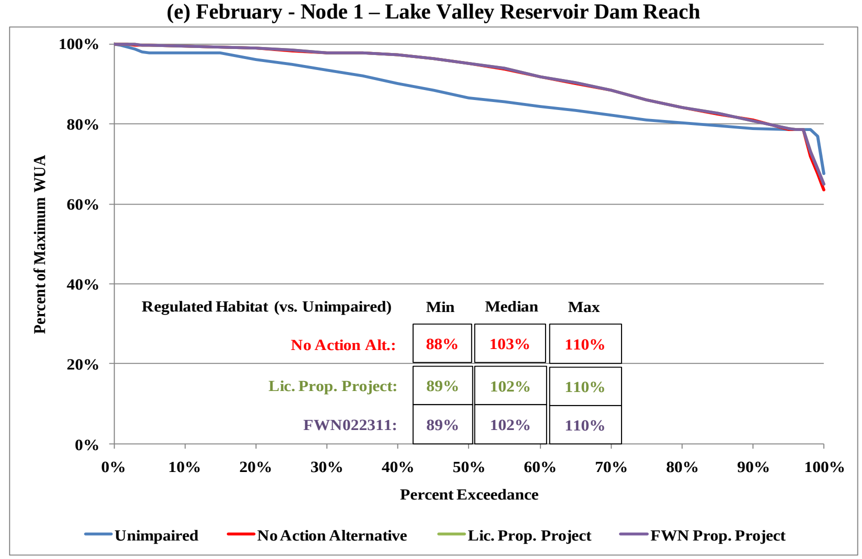
(e) February - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(e) February - Node 1 – Lake Valley Reservoir Dam Reach

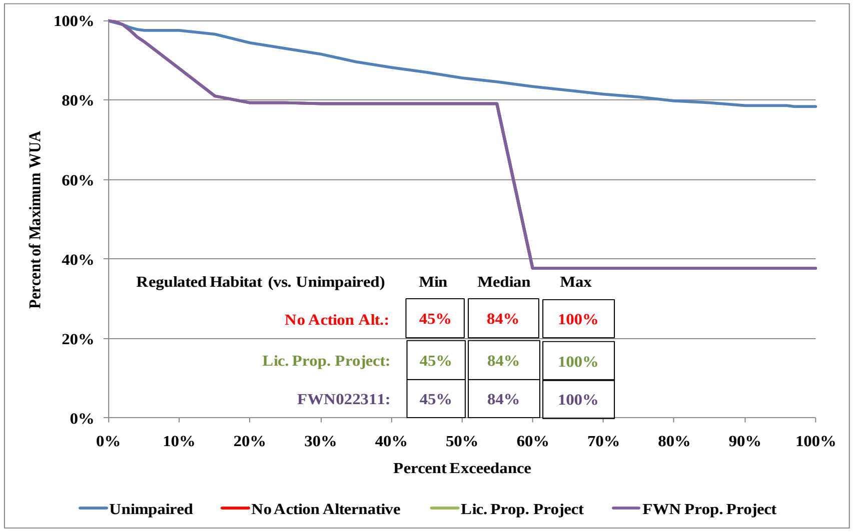


(f) March - Node 0 – NFNFAR below Lake Valley Reservoir Dam

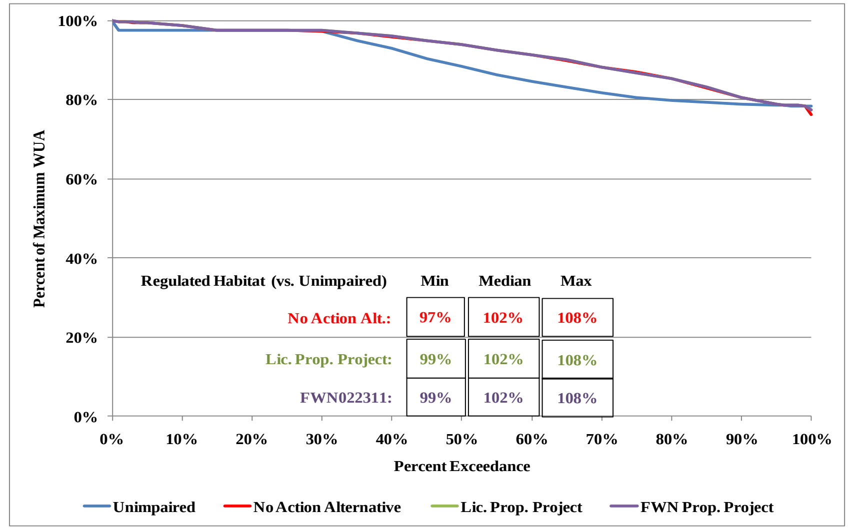


(f) March - Node 1 – Lake Valley Reservoir Dam Reach

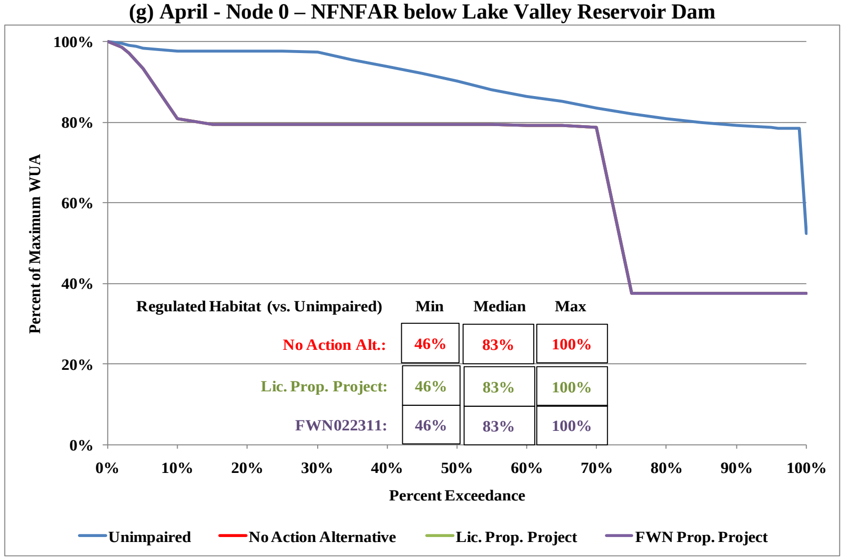
Figures 6.3.2-11e and 6.3.2-11f. HEA for adult rainbow trout during the months of February (e) and March (f) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



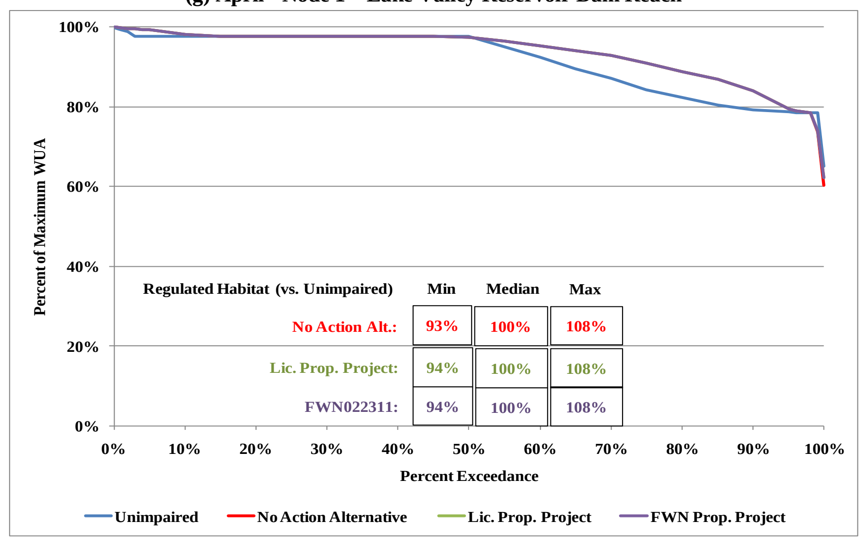
(g) April - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(g) April - Node 1 – Lake Valley Reservoir Dam Reach

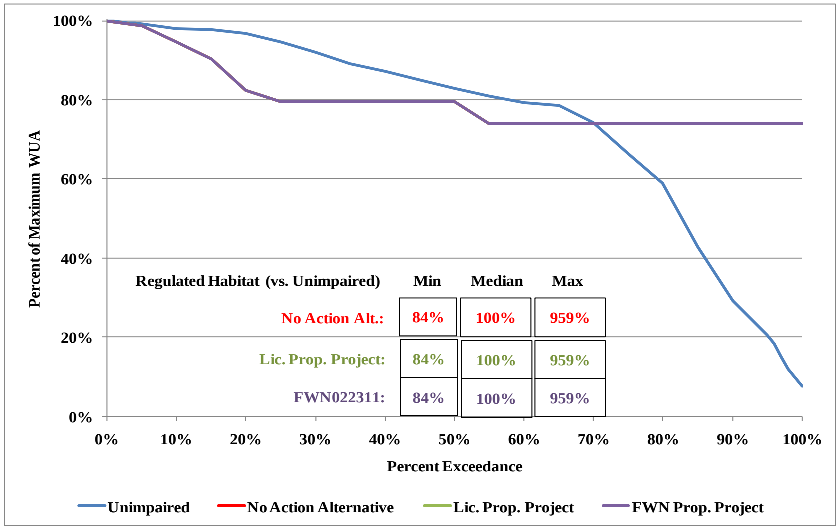


(h) May - Node 0 – NFNFAR below Lake Valley Reservoir Dam

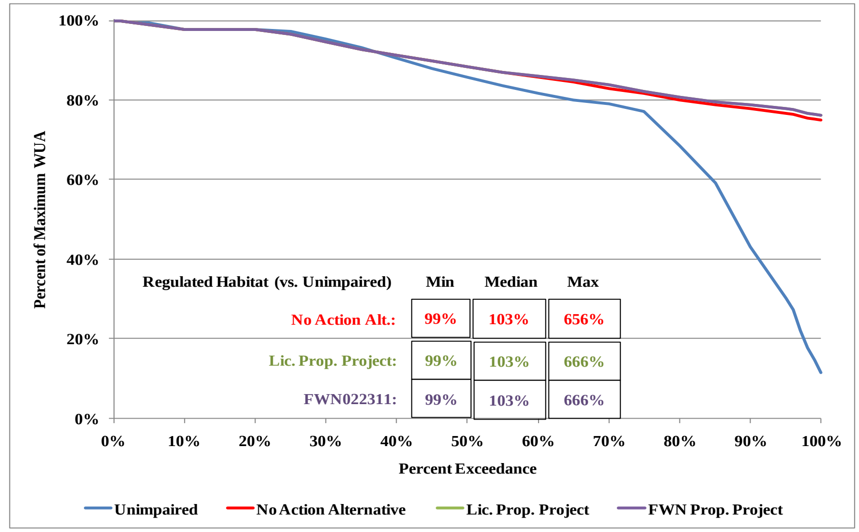


(h) May - Node 1 – Lake Valley Reservoir Dam Reach

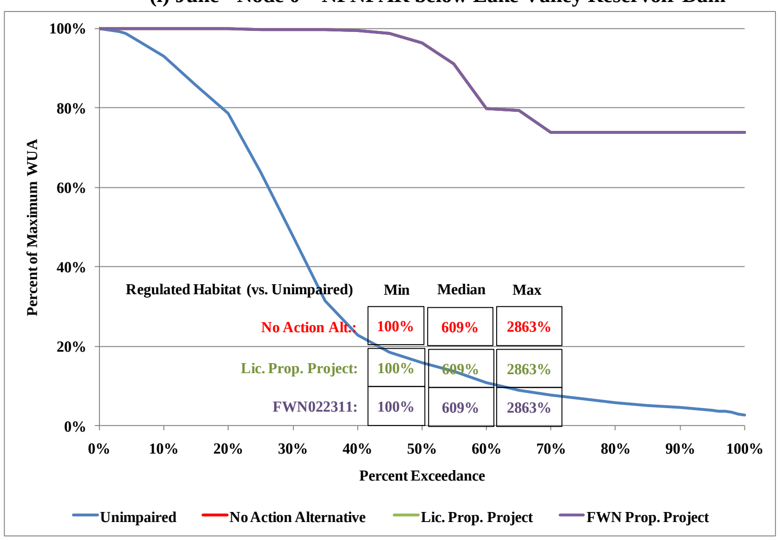
Figures 6.3.2-11g and 6.3.2-11h. HEA for adult rainbow trout during the months of April (g) and May (h) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



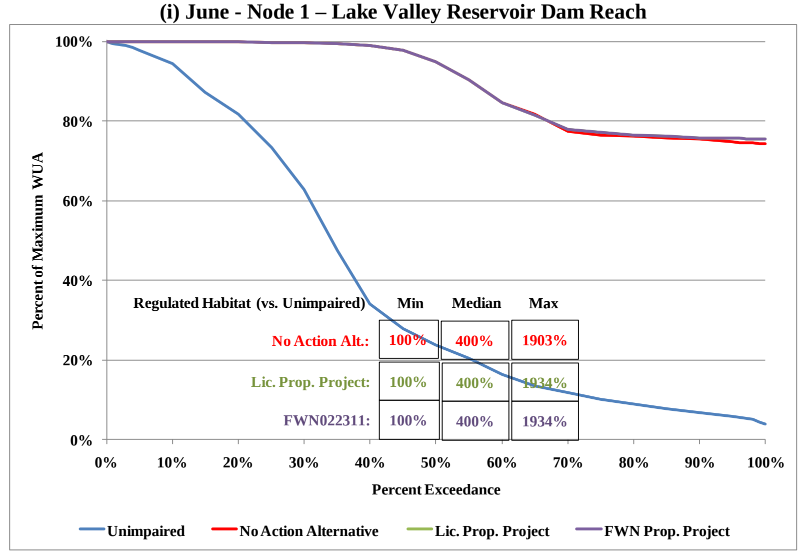
(i) June - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(i) June - Node 1 – Lake Valley Reservoir Dam Reach

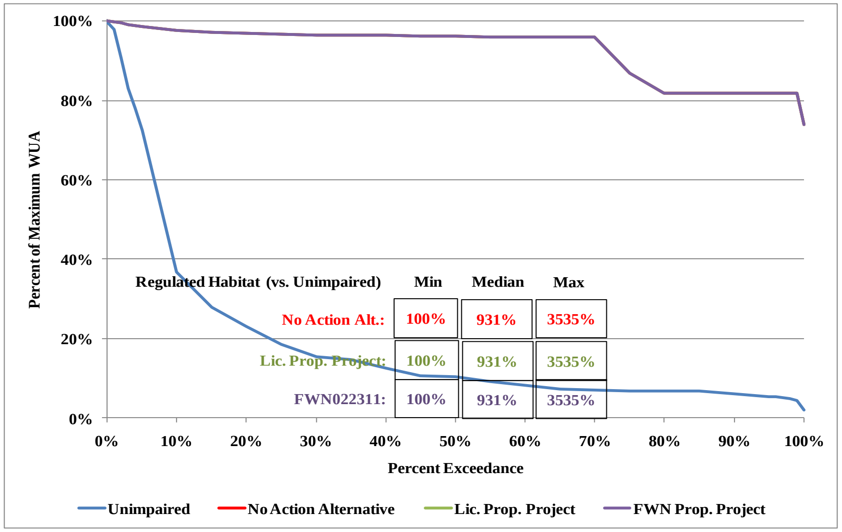


(j) July - Node 0 – NFNFAR below Lake Valley Reservoir Dam

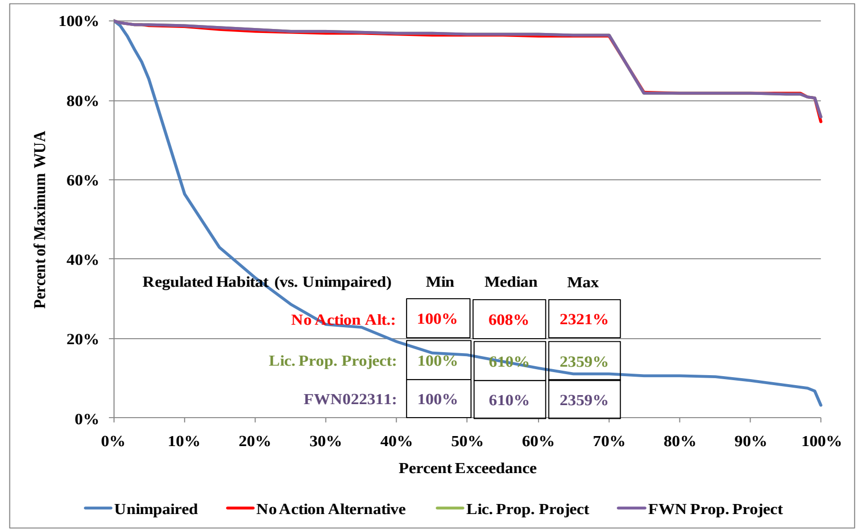


(j) July - Node 1 – Lake Valley Reservoir Dam Reach

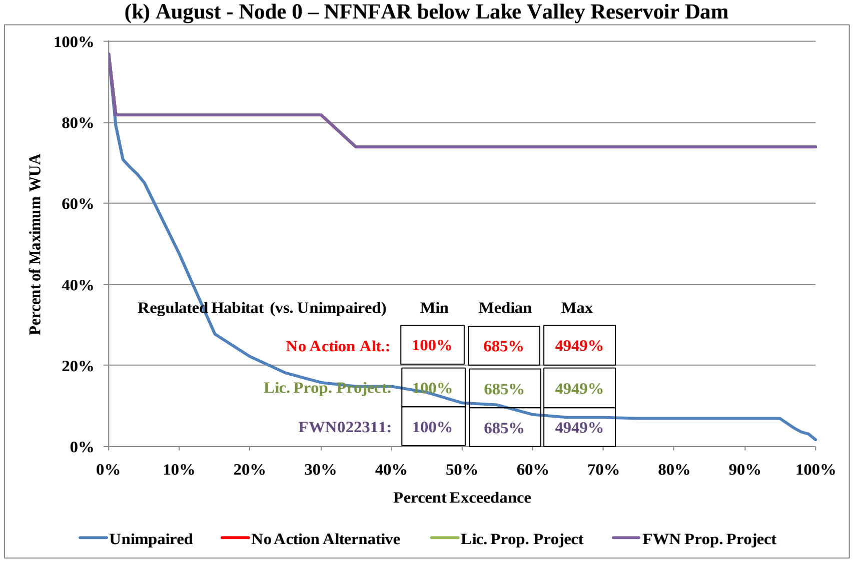
Figures 6.3.2-11i and 6.3.2-11j. HEA for adult rainbow trout during the months of June (i) and July (j) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



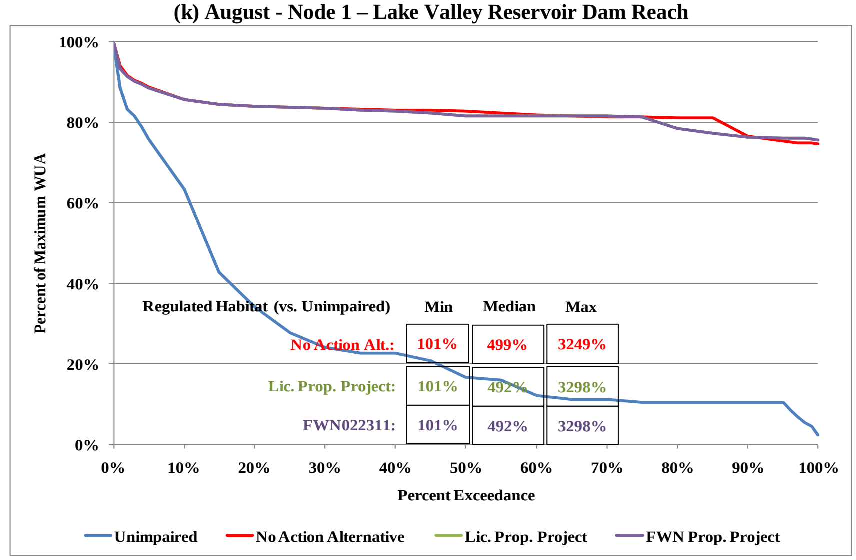
(k) August - Node 0 – NFNFAR below Lake Valley Reservoir Dam



(k) August - Node 1 – Lake Valley Reservoir Dam Reach

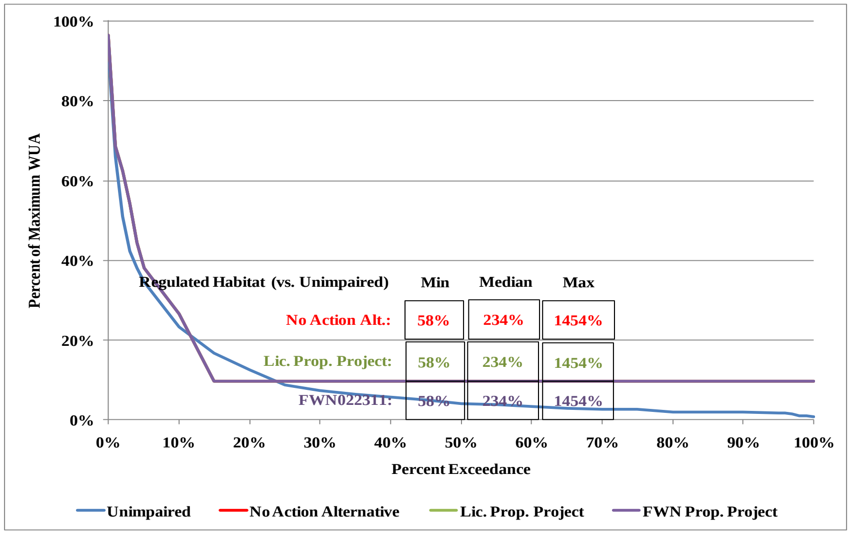


(l) September - Node 0 – NFNFAR below Lake Valley Reservoir Dam

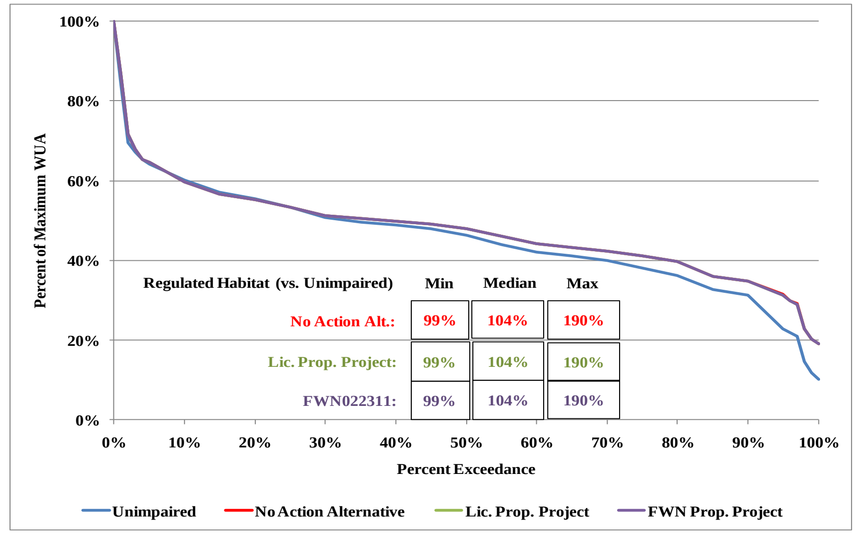


(l) September - Node 1 – Lake Valley Reservoir Dam Reach

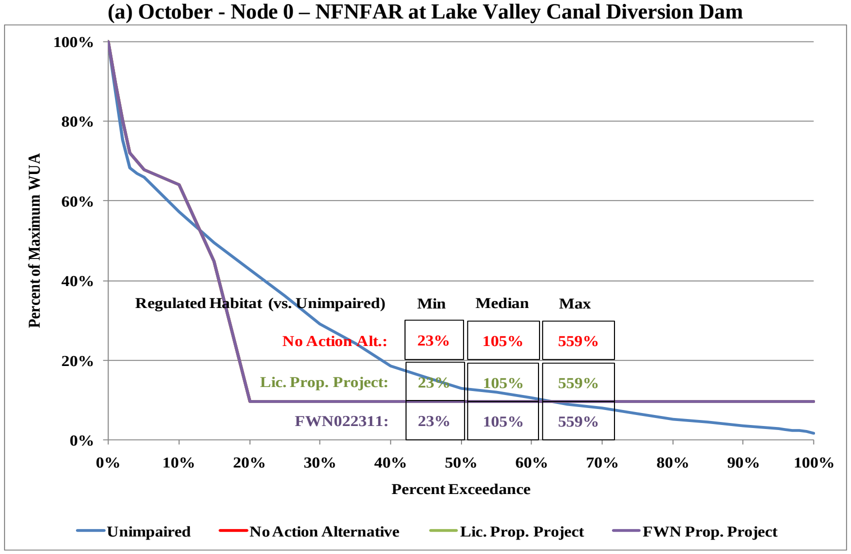
Figures 6.3.2-11k and 6.3.2-11l. HEA for adult rainbow trout during the months of August (k) and September (l) in North Fork of North Fork American River below Lake Valley Reservoir Dam.



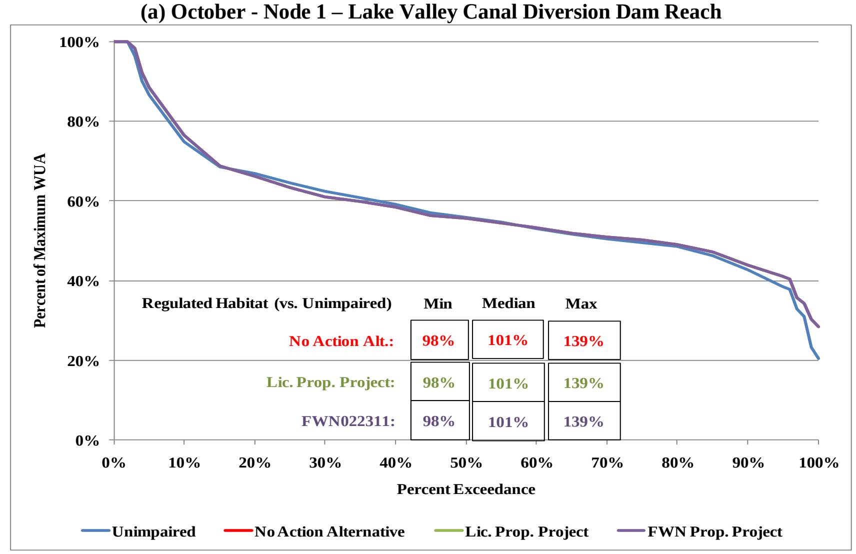
(a) October - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(a) October - Node 1 – Lake Valley Canal Diversion Dam Reach

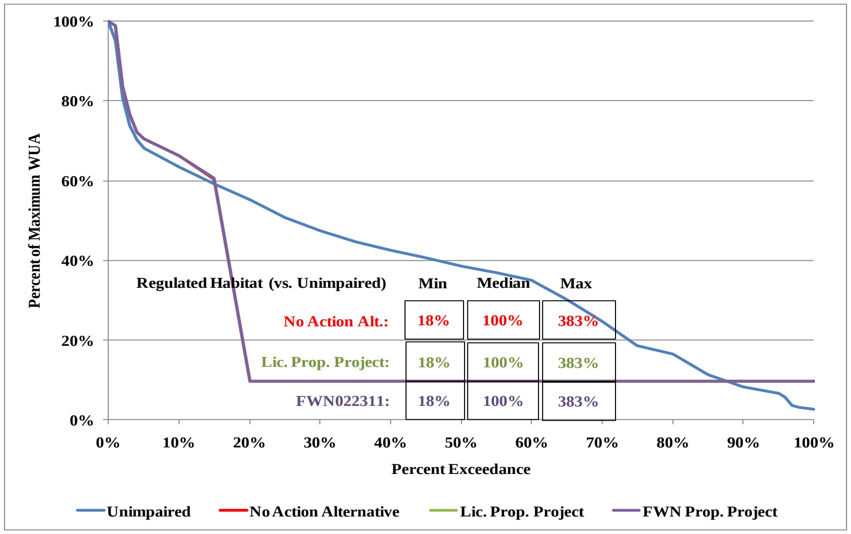


(b) November - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

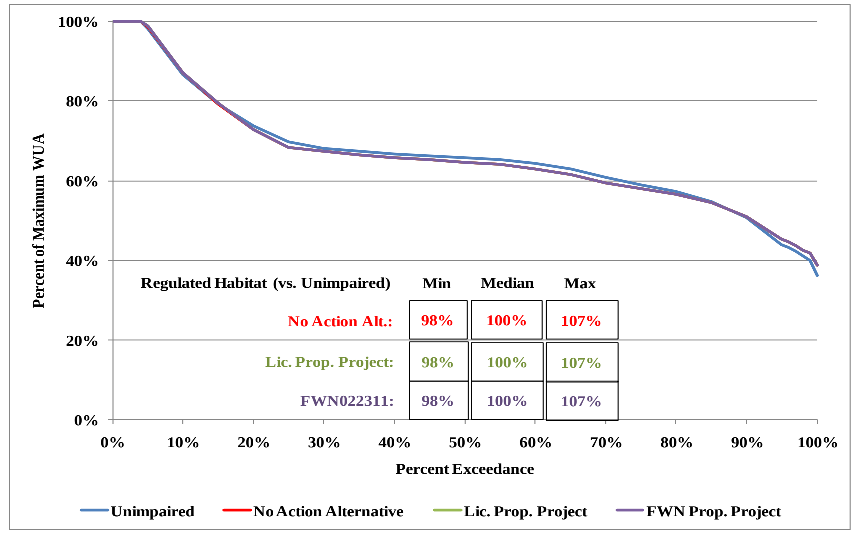


(b) November - Node 1 – Lake Valley Canal Diversion Dam Reach

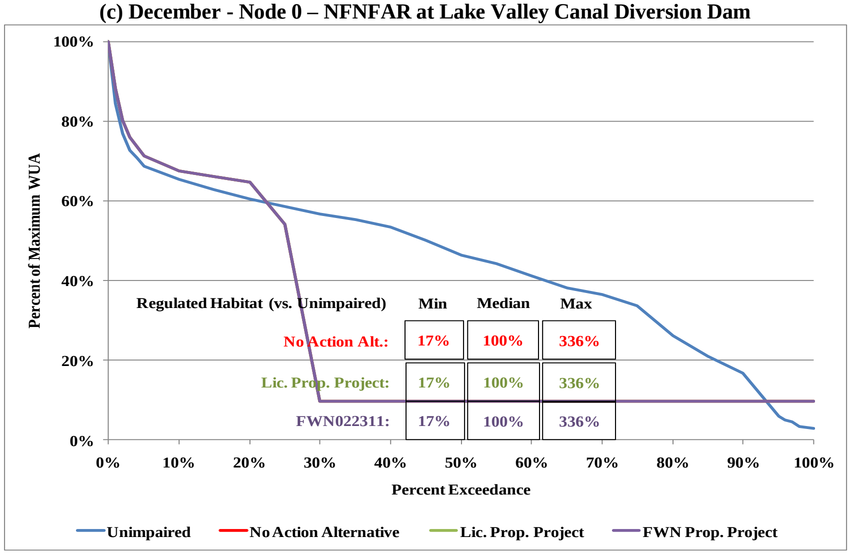
Figures 6.3.2-12a and 6.3.2-12b. HEA for adult rainbow trout during the months of October (a) and November (b) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



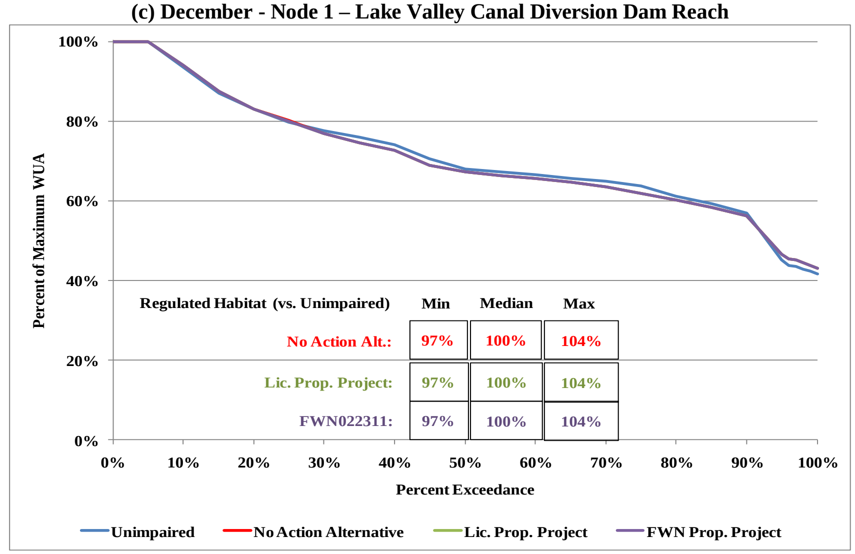
(c) December - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(c) December - Node 1 – Lake Valley Canal Diversion Dam Reach

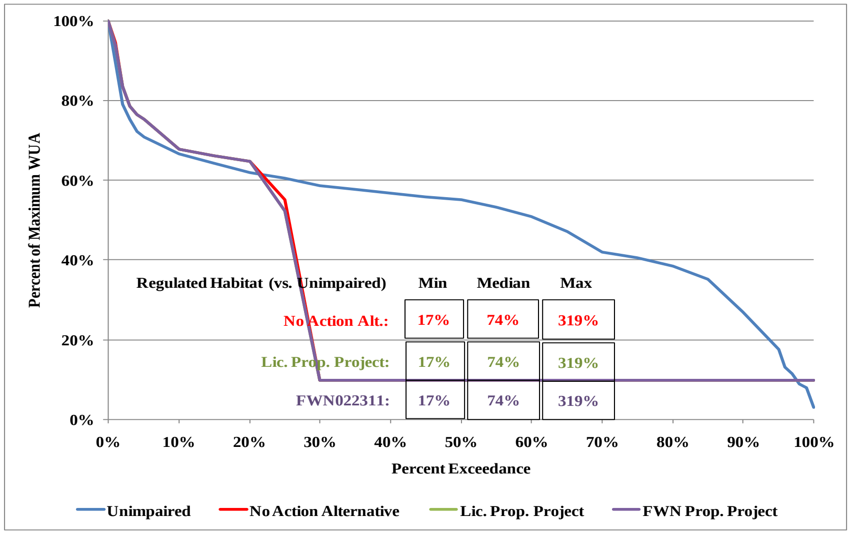


(d) January - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

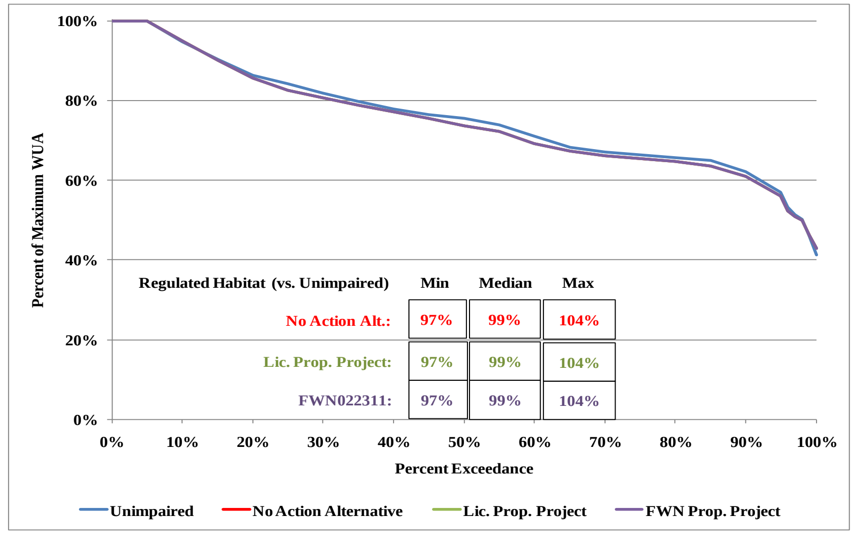


(d) January - Node 1 – Lake Valley Canal Diversion Dam Reach

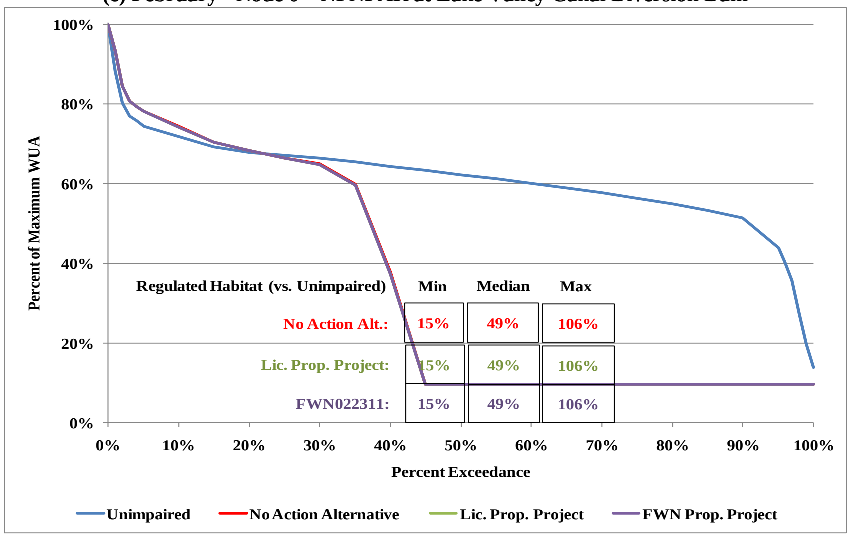
Figures 6.3.2-12c and 6.3.2-12d. HEA for adult rainbow trout during the months of December (c) and January (d) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



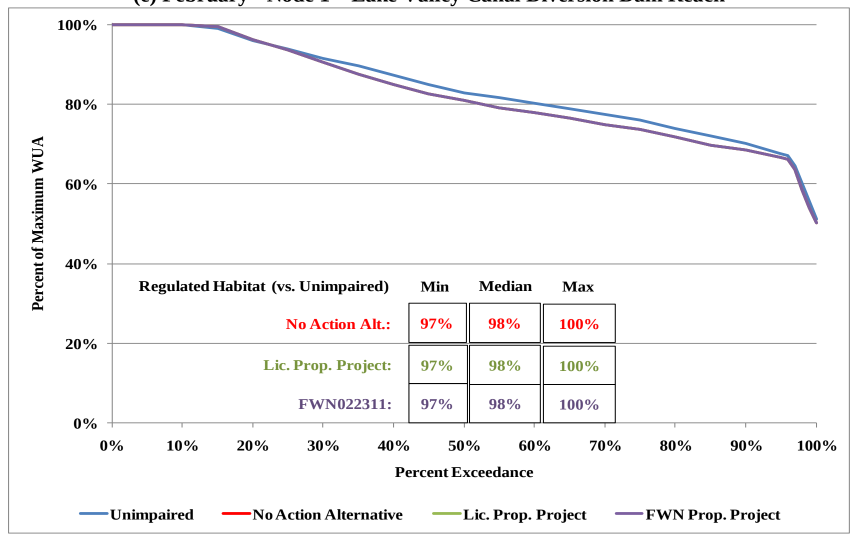
(e) February - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(e) February - Node 1 – Lake Valley Canal Diversion Dam Reach

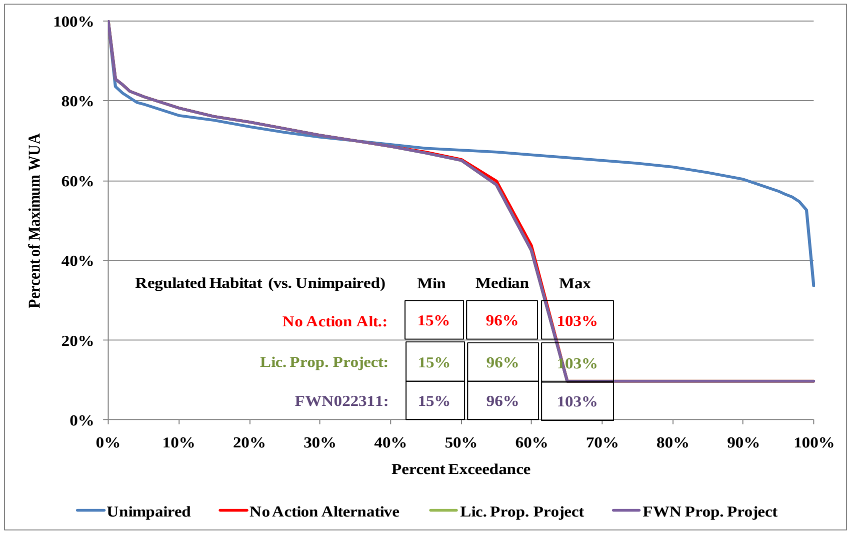


(f) March - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

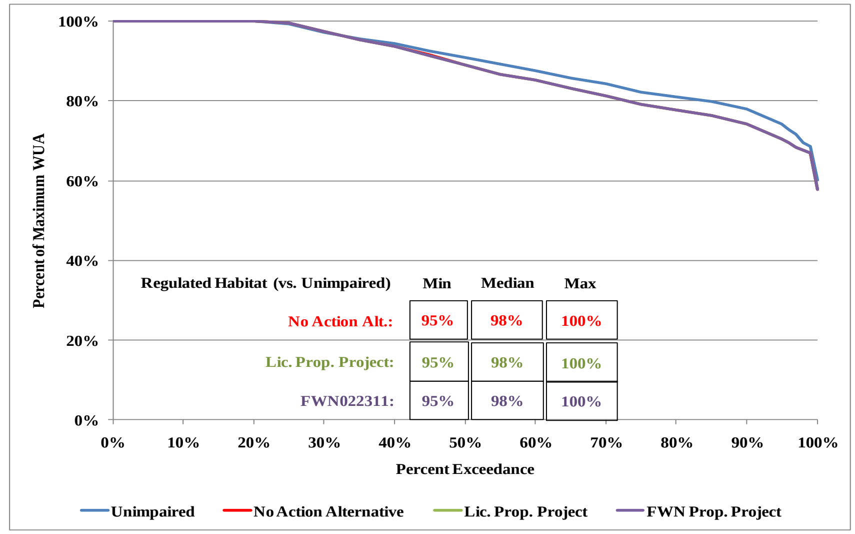


(f) March - Node 1 – Lake Valley Canal Diversion Dam Reach

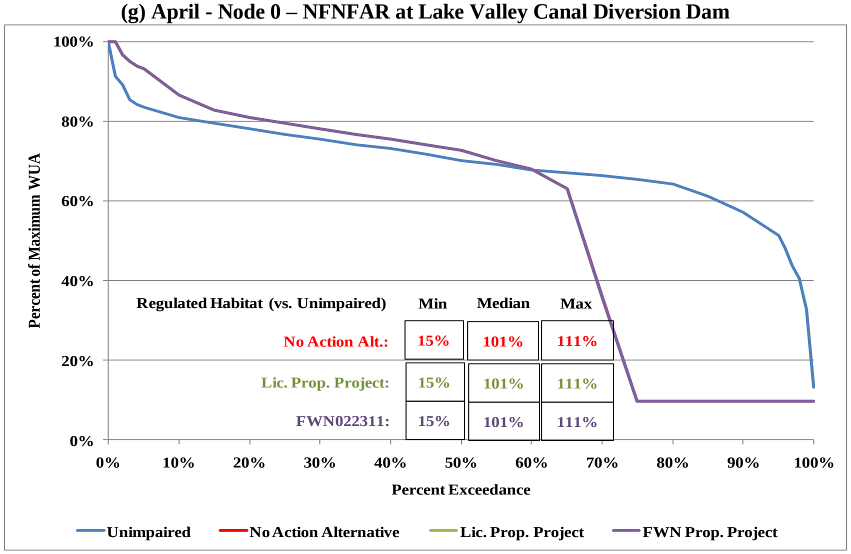
Figures 6.3.2-12e and 6.3.2-12f. HEA for adult rainbow trout during the months of February (e) and March (f) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



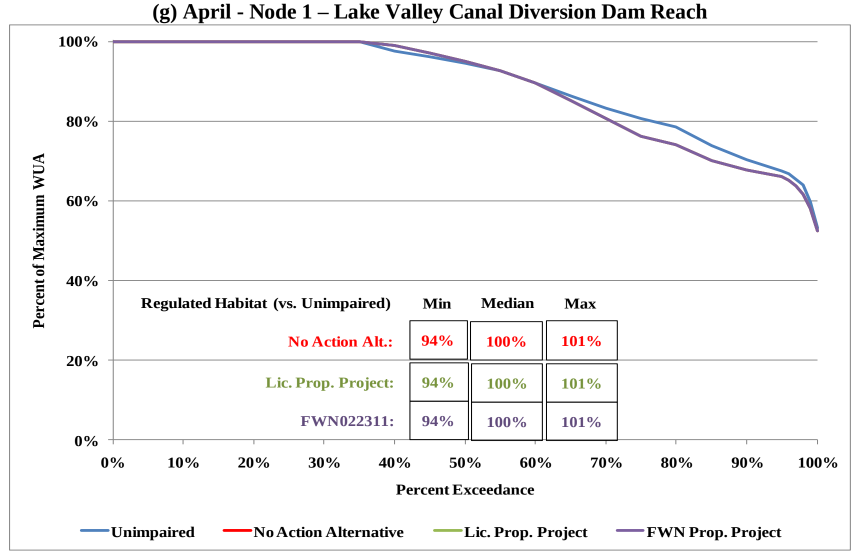
(g) April - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(g) April - Node 1 – Lake Valley Canal Diversion Dam Reach

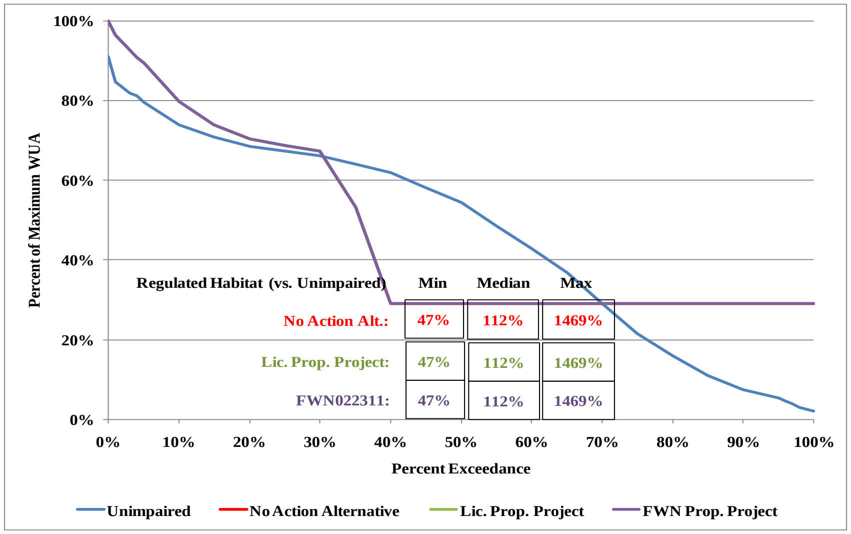


(h) May - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

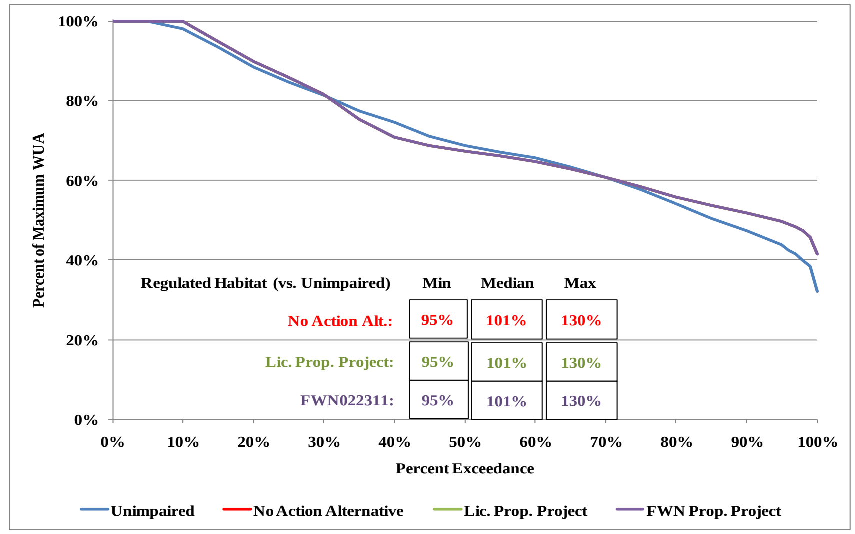


(h) May - Node 1 – Lake Valley Canal Diversion Dam Reach

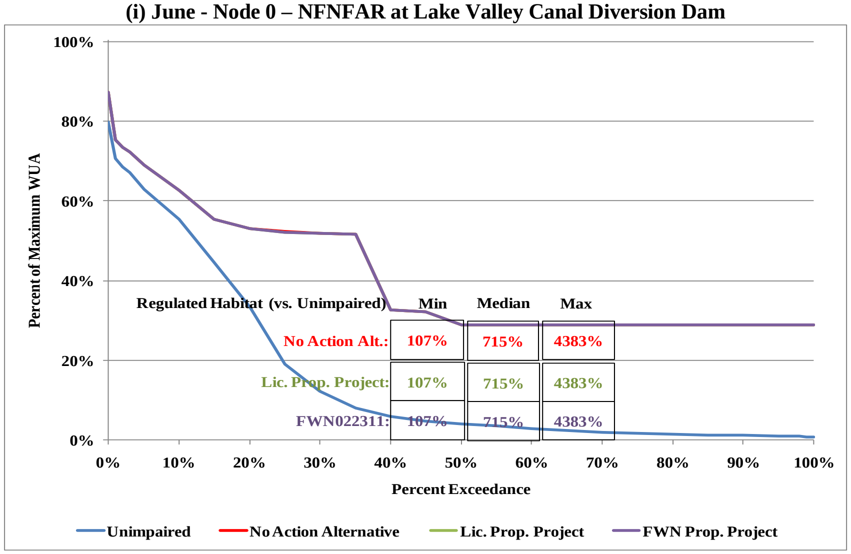
Figures 6.3.2-12g and 6.3.2-12h. HEA for adult rainbow trout during the months of April (g) and May (h) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



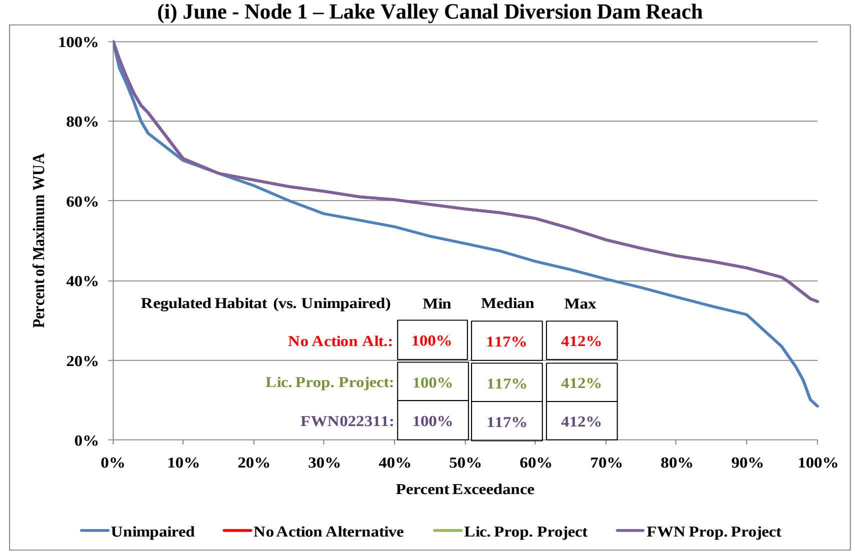
(i) June - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(i) June - Node 1 – Lake Valley Canal Diversion Dam Reach

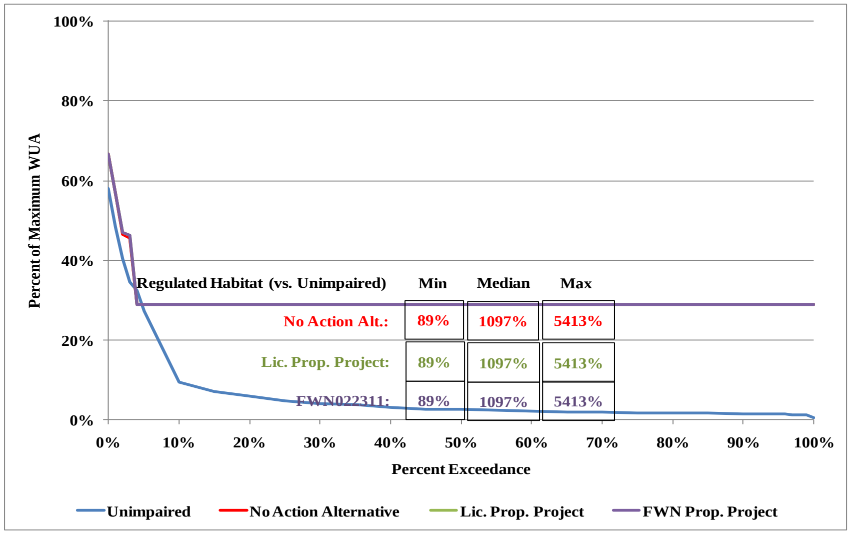


(j) July - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

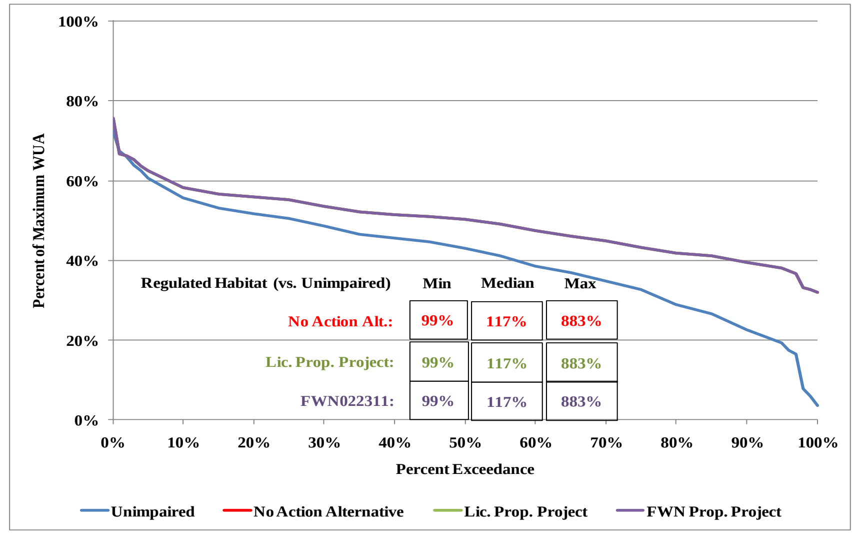


(j) July - Node 1 – Lake Valley Canal Diversion Dam Reach

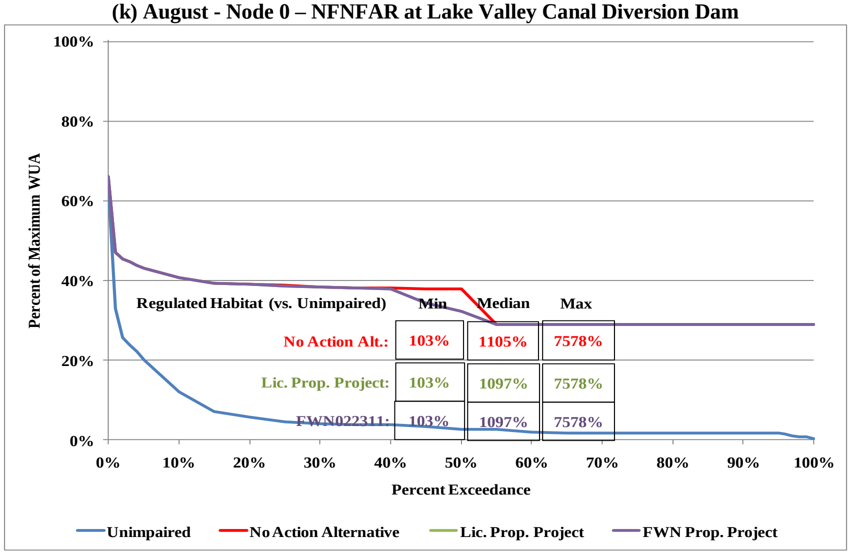
Figures 6.3.2-12i and 6.3.2-12j. HEA for adult rainbow trout during the months of June (i) and July (j) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



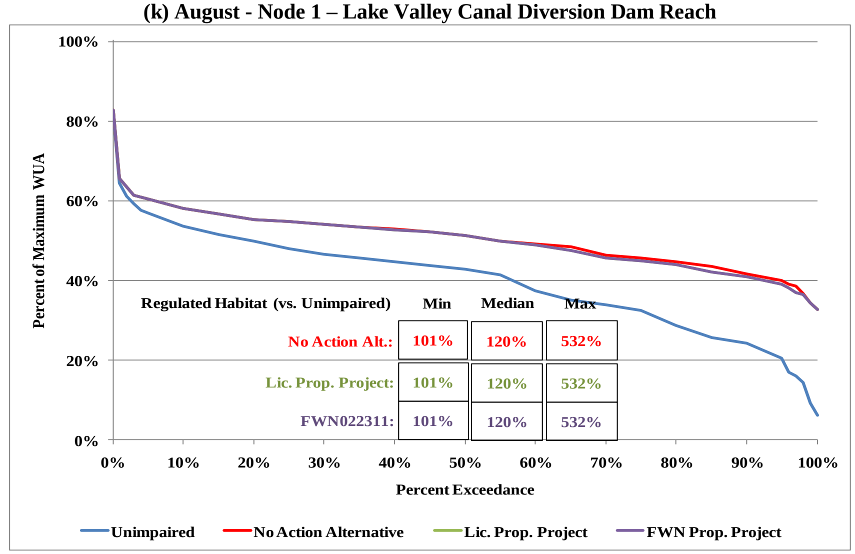
(k) August - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam



(k) August - Node 1 – Lake Valley Canal Diversion Dam Reach

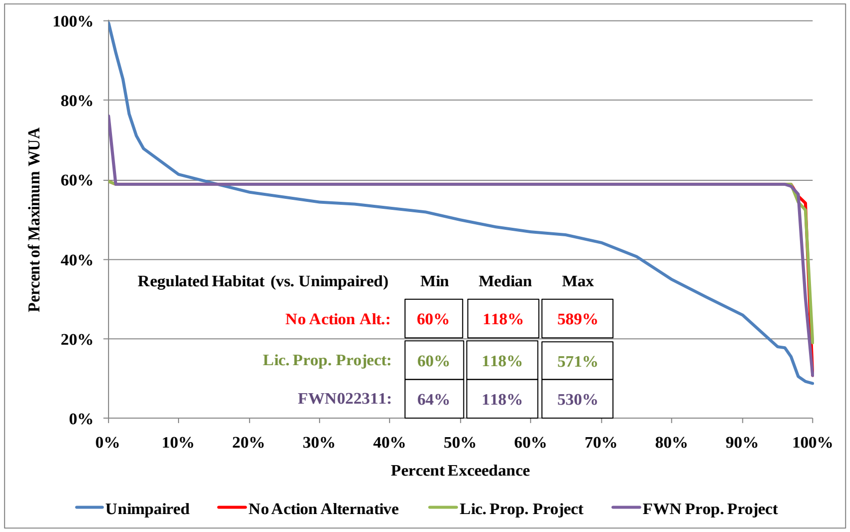


(l) September - Node 0 – NFNFAR at Lake Valley Canal Diversion Dam

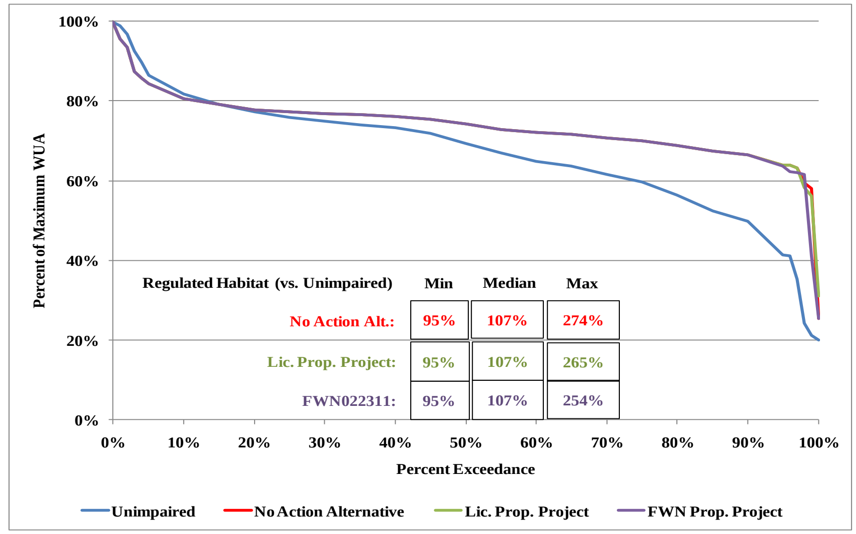


(l) September - Node 1 – Lake Valley Canal Diversion Dam Reach

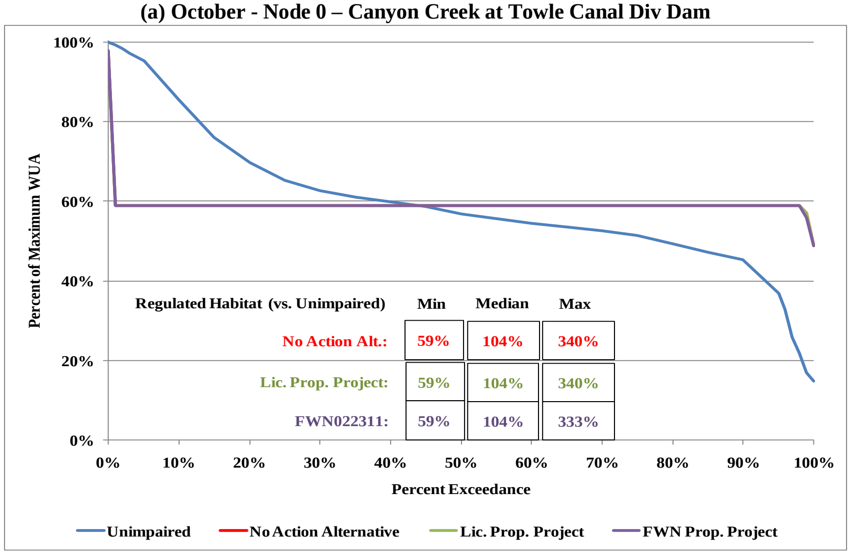
Figures 6.3.2-12k and 6.3.2-12l. HEA for adult rainbow trout during the months of August (k) and September (l) in Lake Valley Canal Diversion Dam Reach, North Fork of the North Fork American River.



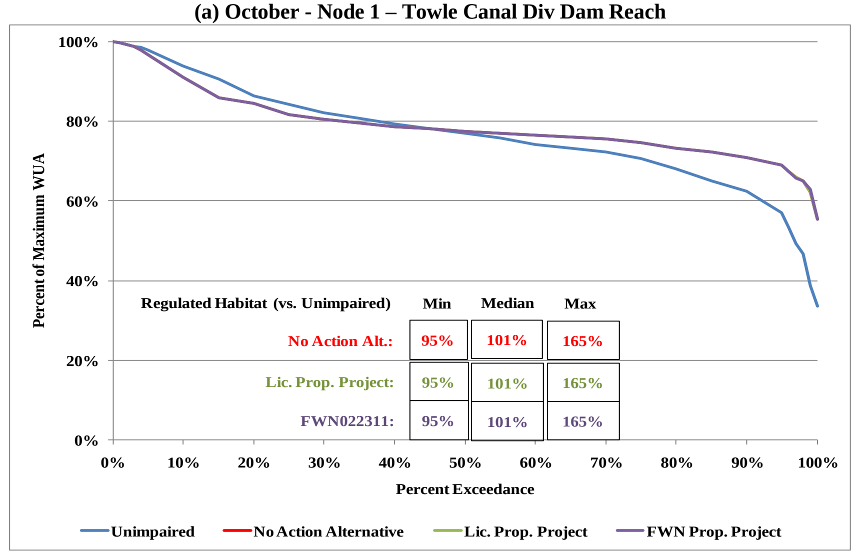
(a) October - Node 0 – Canyon Creek at Towle Canal Div Dam



(a) October - Node 1 – Towle Canal Div Dam Reach

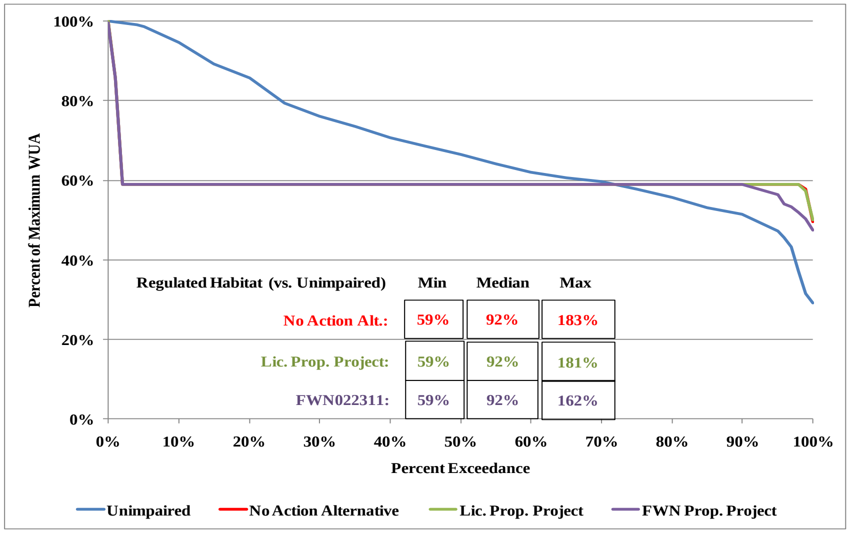


(b) November - Node 0 – Canyon Creek at Towle Canal Div Dam

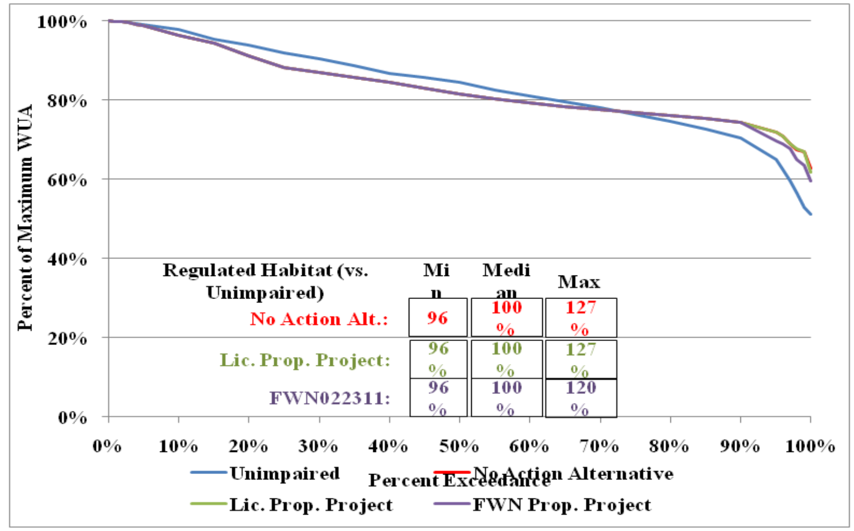


(b) November - Node 1 – Towle Canal Div Dam Reach

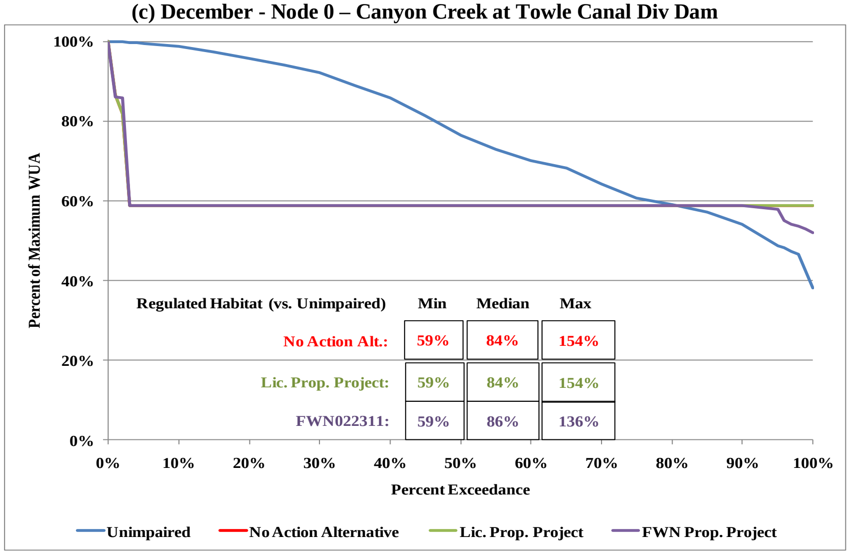
Figures 6.3.2-13a and 6.3.2-13b. HEA for adult rainbow trout during the months of October (a) and November (b) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).



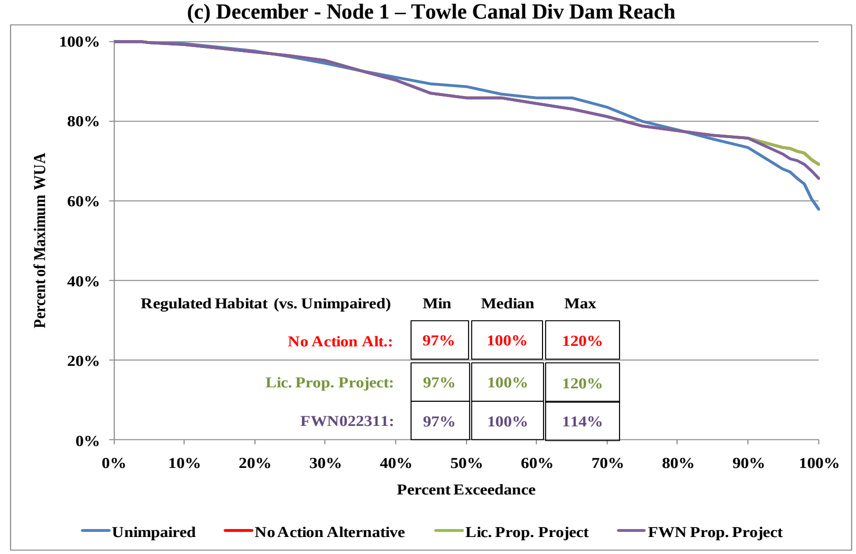
(c) December - Node 0 – Canyon Creek at Towle Canal Div Dam



(c) December - Node 1 – Towle Canal Div Dam Reach

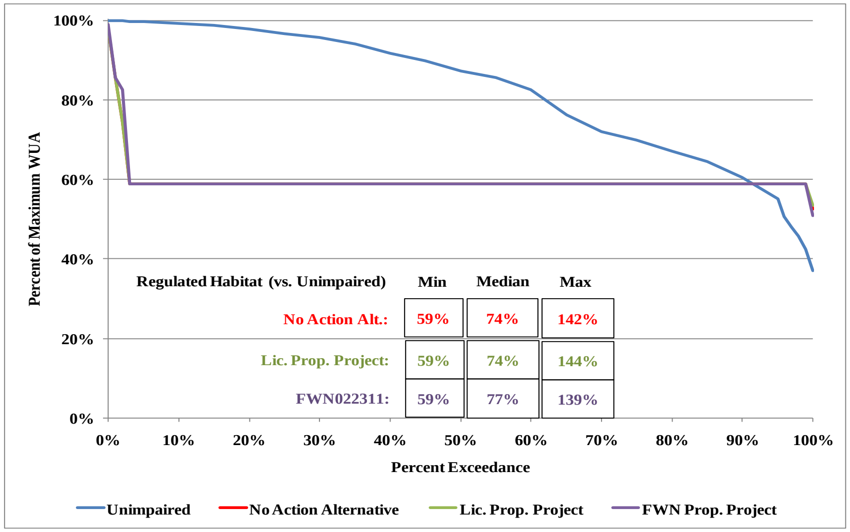


(d) January - Node 0 – Canyon Creek at Towle Canal Div Dam

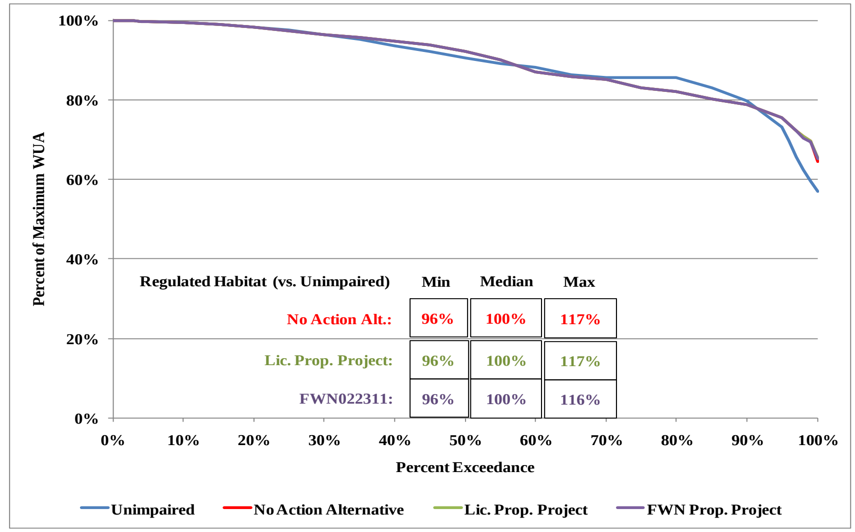


(d) January - Node 1 – Towle Canal Div Dam Reach

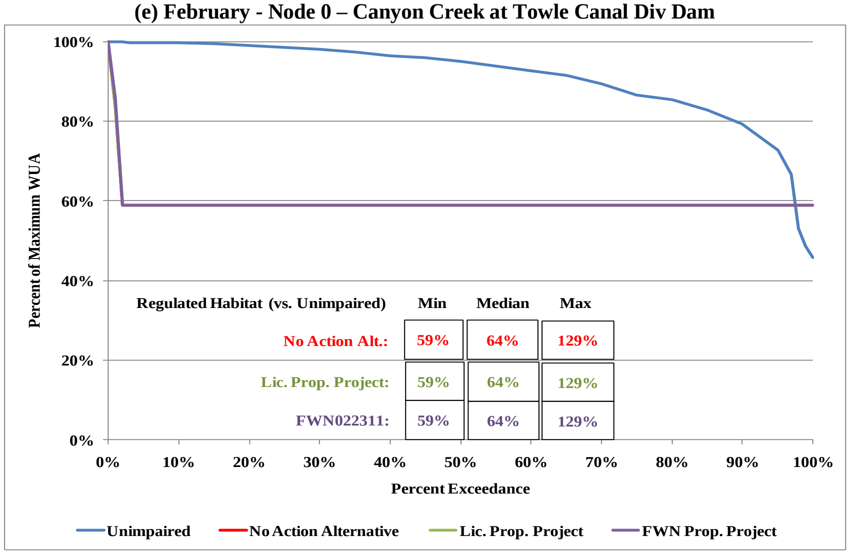
Figures 6.3.2-13c and 6.3.2-13d. HEA for adult rainbow trout during the months of December (c) and January (d) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).



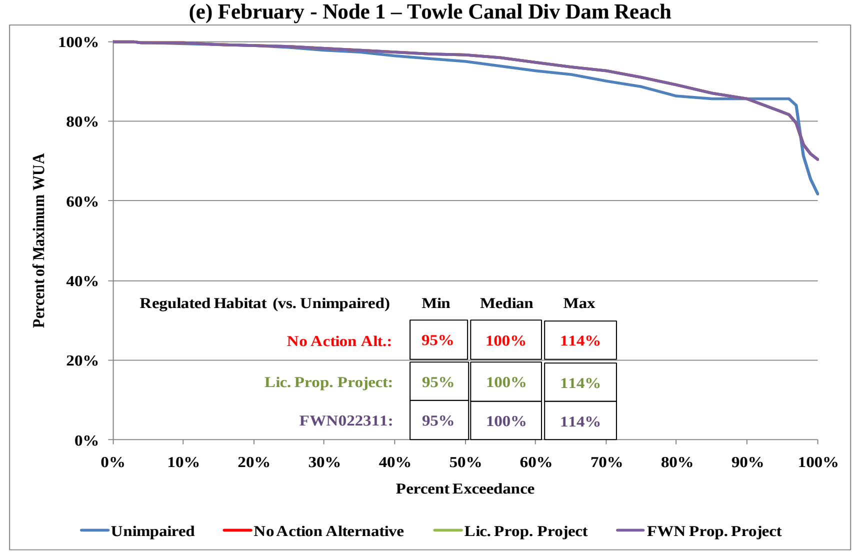
(e) February - Node 0 – Canyon Creek at Towle Canal Div Dam



(e) February - Node 1 – Towle Canal Div Dam Reach

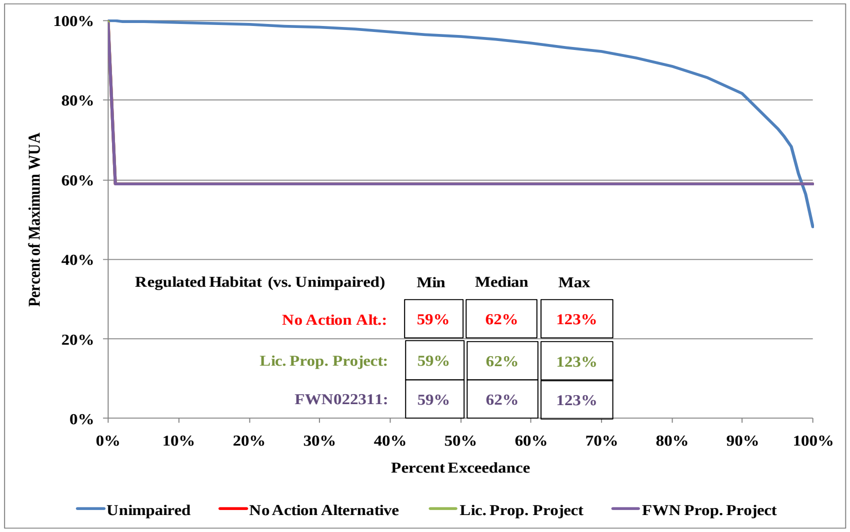


(f) March - Node 0 – Canyon Creek at Towle Canal Div Dam

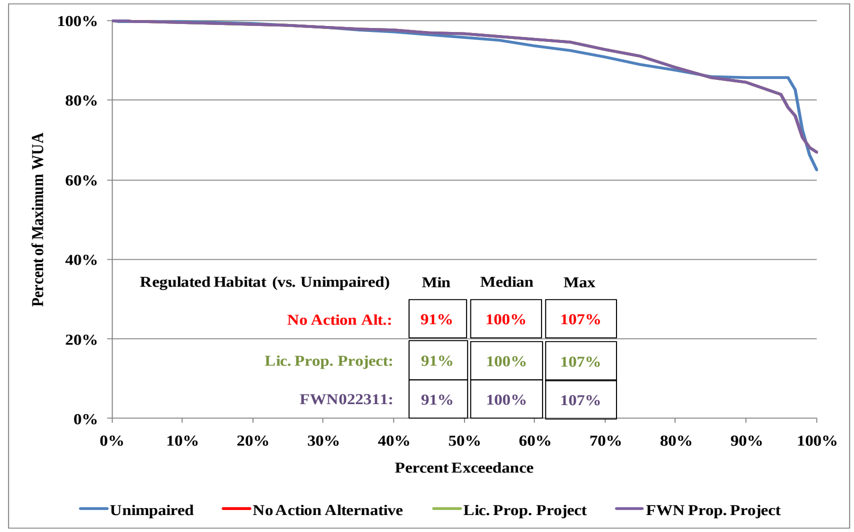


(f) March - Node 1 – Towle Canal Div Dam Reach

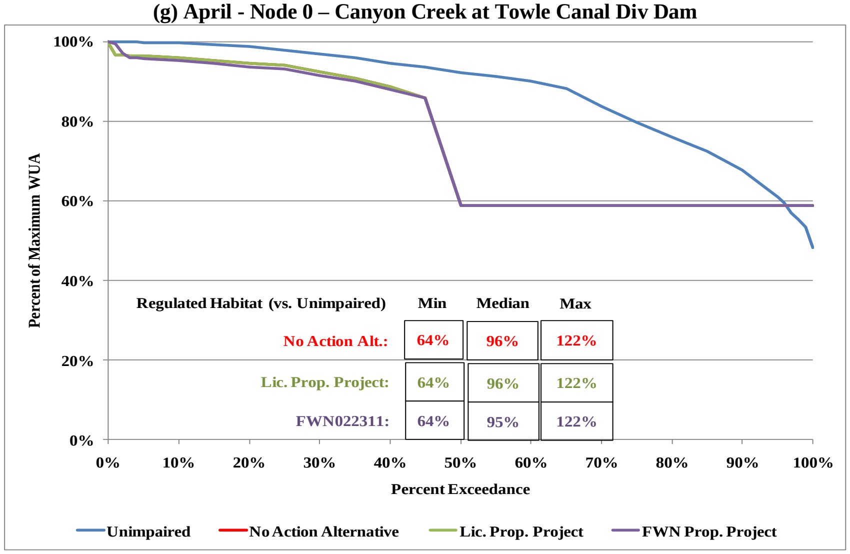
Figures 6.3.2-13e and 6.3.2-13f. HEA for adult rainbow trout during the months of February (e) and March (f) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).



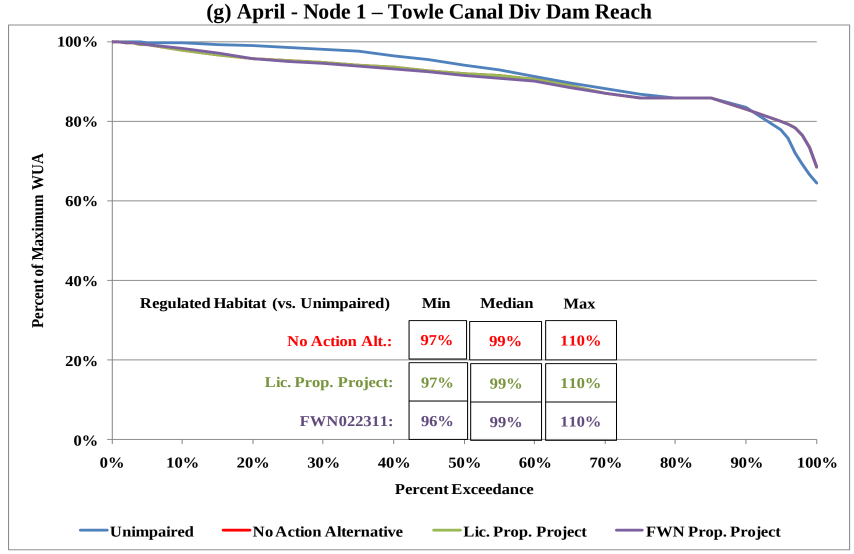
(g) April - Node 0 – Canyon Creek at Towle Canal Div Dam



(g) April - Node 1 – Towle Canal Div Dam Reach

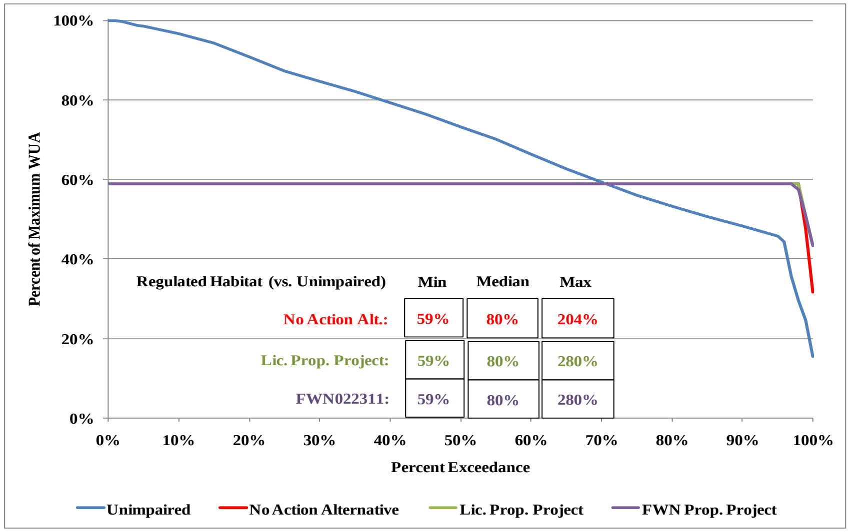


(h) May - Node 0 – Canyon Creek at Towle Canal Div Dam

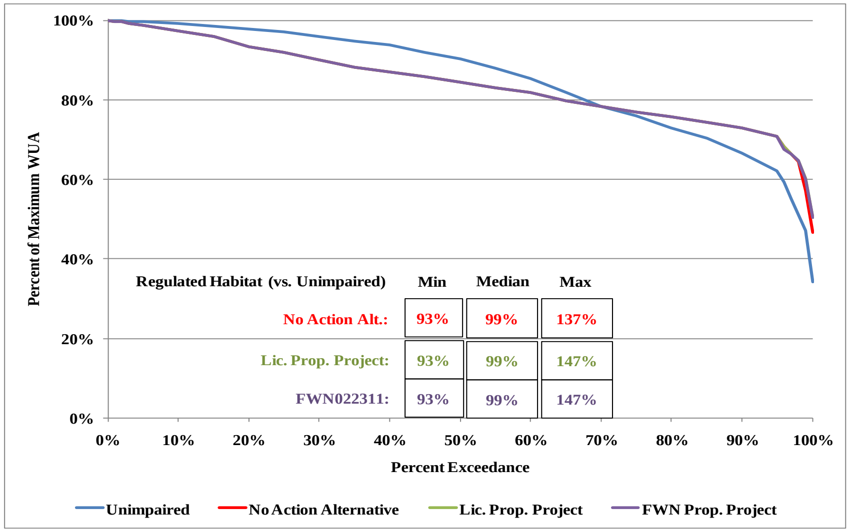


(h) May - Node 1 – Towle Canal Div Dam Reach

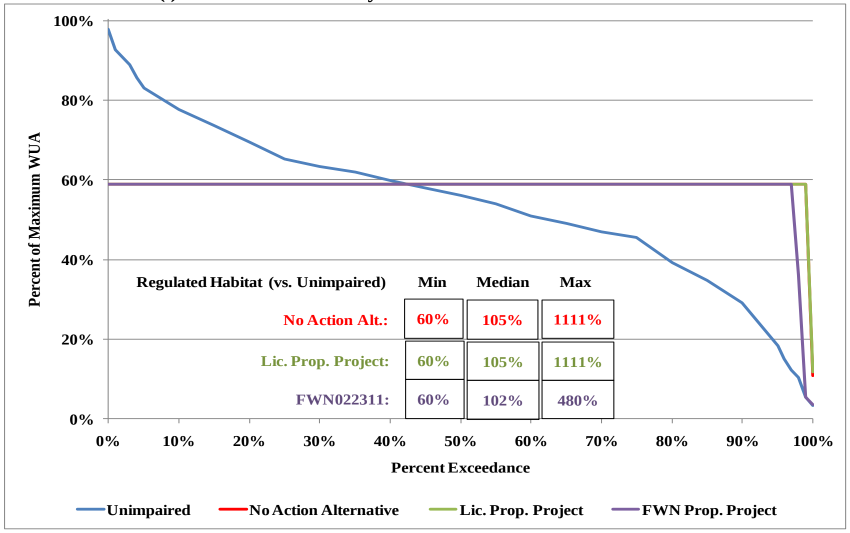
Figures 6.3.2-13g and 6.3.2-13h. HEA for adult rainbow trout during the months of April (g) and May (h) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).



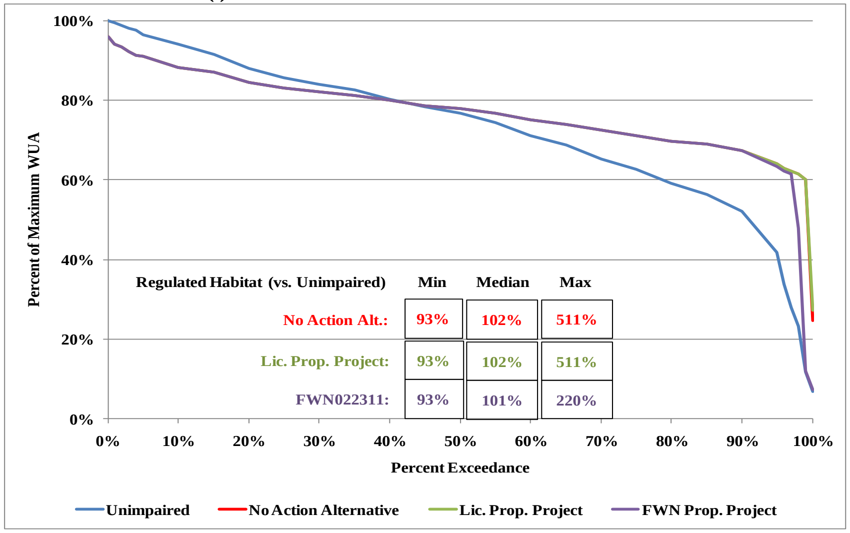
(i) June - Node 0 – Canyon Creek at Towle Canal Div Dam



(i) June - Node 1 – Towle Canal Div Dam Reach

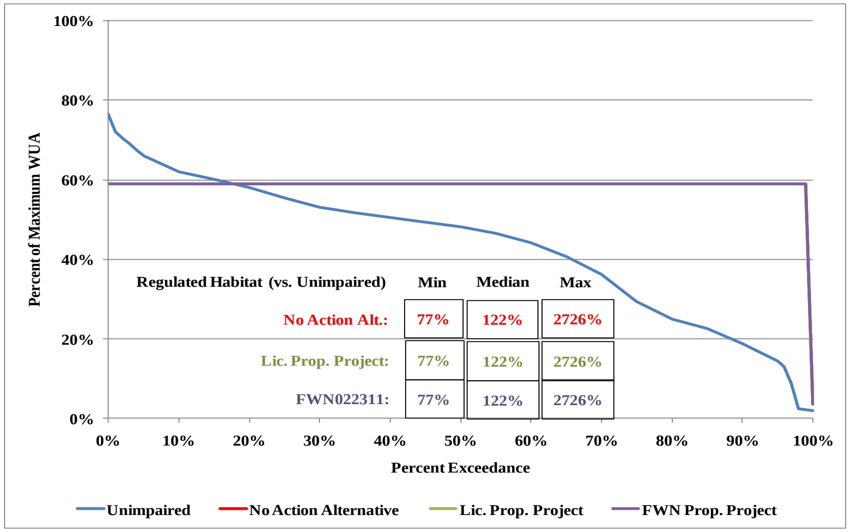


(j) July - Node 0 – Canyon Creek at Towle Canal Div Dam

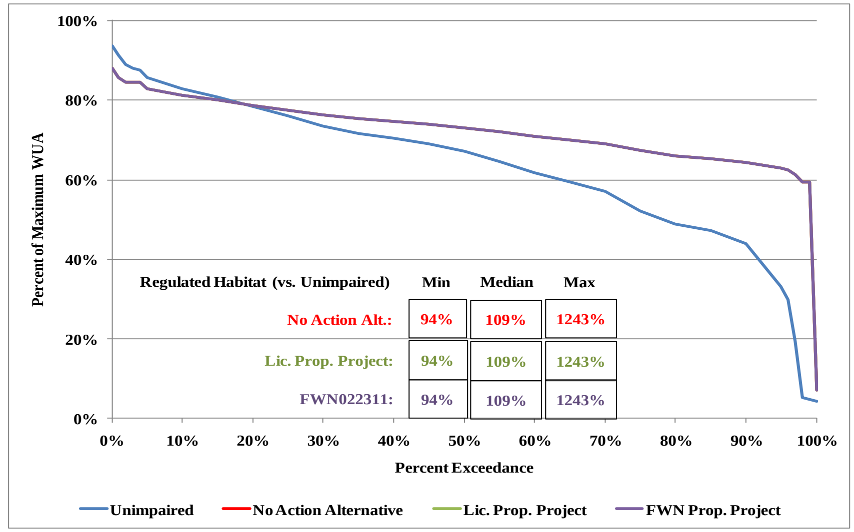


(j) July - Node 1 – Towle Canal Div Dam Reach

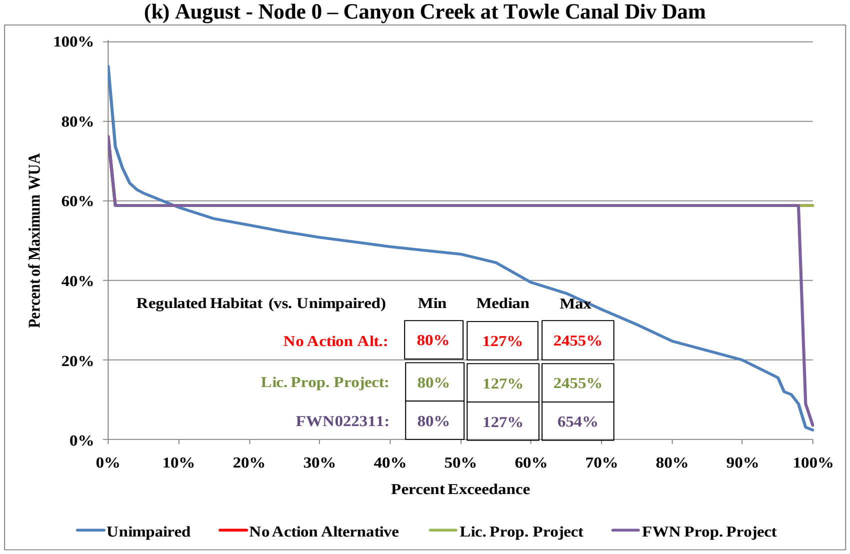
Figures 6.3.2-13i and 6.3.2-13j. HEA for adult rainbow trout during the months of June (i) and July (j) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).



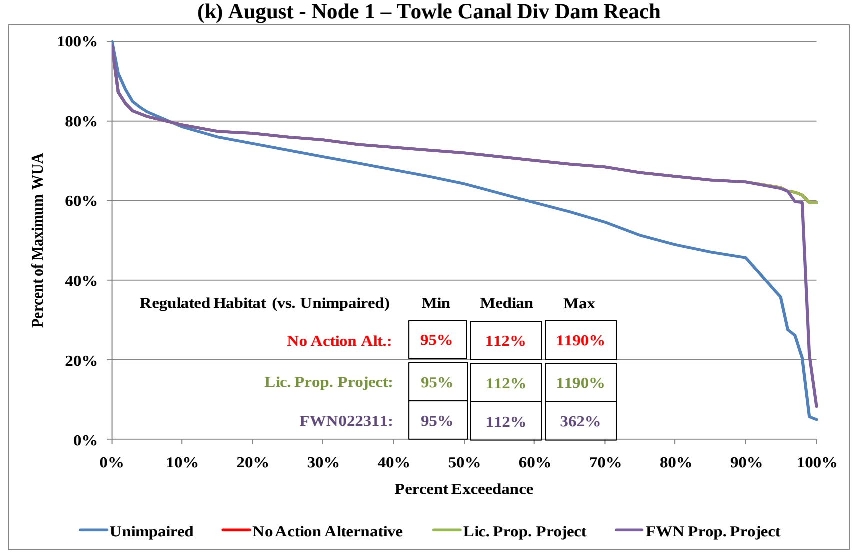
(k) August - Node 0 – Canyon Creek at Towle Canal Div Dam



(k) August - Node 1 – Towle Canal Div Dam Reach



(l) September - Node 0 – Canyon Creek at Towle Canal Div Dam



(l) September - Node 1 – Towle Canal Div Dam Reach

Figures 6.3.2-13k and 6.3.2-13l. HEA for adult rainbow trout during the months of August (k) and September (l) in Towle Canal Dam Reach, Canyon Creek (tributary to North Fork American River).

As depicted in the HEA figures above, in all instances, PG&E's Proposed Project provides the same or better habitat than would otherwise be provided in the No-Action Alternative. For additional information regarding PG&E's proposed streamflow measures and the associated rationale, see Appendix E7 of this Exhibit E.

In regard to the stream reaches where an RCA, CFR or DFA was conducted, PG&E concluded that increasing existing minimum streamflows would result in draining the reservoirs or affecting reservoir recreation. Therefore, PG&E is either proposing no change, or very little change, to the existing minimum streamflows below these facilities. For PG&E's proposed streamflow measures and the associated rationale, see Appendix E7 of this Exhibit E.

PG&E's Proposed Project would not adversely affect fish due to increases in stream water temperature. As described in Section 6.3.1.1.7 above, with the exception of the lower South Yuba River, water temperature in the higher elevation Project-affected stream reaches is generally cold (i.e., mean daily water temperature of less than 20°C). Maintaining or slightly increasing minimum streamflows would provide adequate coldwater habitat for trout and other coldwater fishes in these reaches.

With respect to the South Yuba River between Lake Spaulding and Canyon Creek, under the No-Action Alternative mean daily water temperatures periodically exceed 20°C. Figure 6.3.2-14 below provides the results of Licensees' water temperature modeling in the South Yuba River between Lake Spaulding and the confluence with Canyon Creek. The figure demonstrates that a flow of nearly 50 cfs would be required to maintain mean daily water temperatures at 20°C or less. Refer to Section 6.3.3.1 below for a discussion of the cumulative effects of NID's proposed Yuba-Bear Hydroelectric Project and PG&E's proposed Drum-Spaulding Project on water temperature in the South Yuba River from Canyon Creek to Englebright Reservoir.

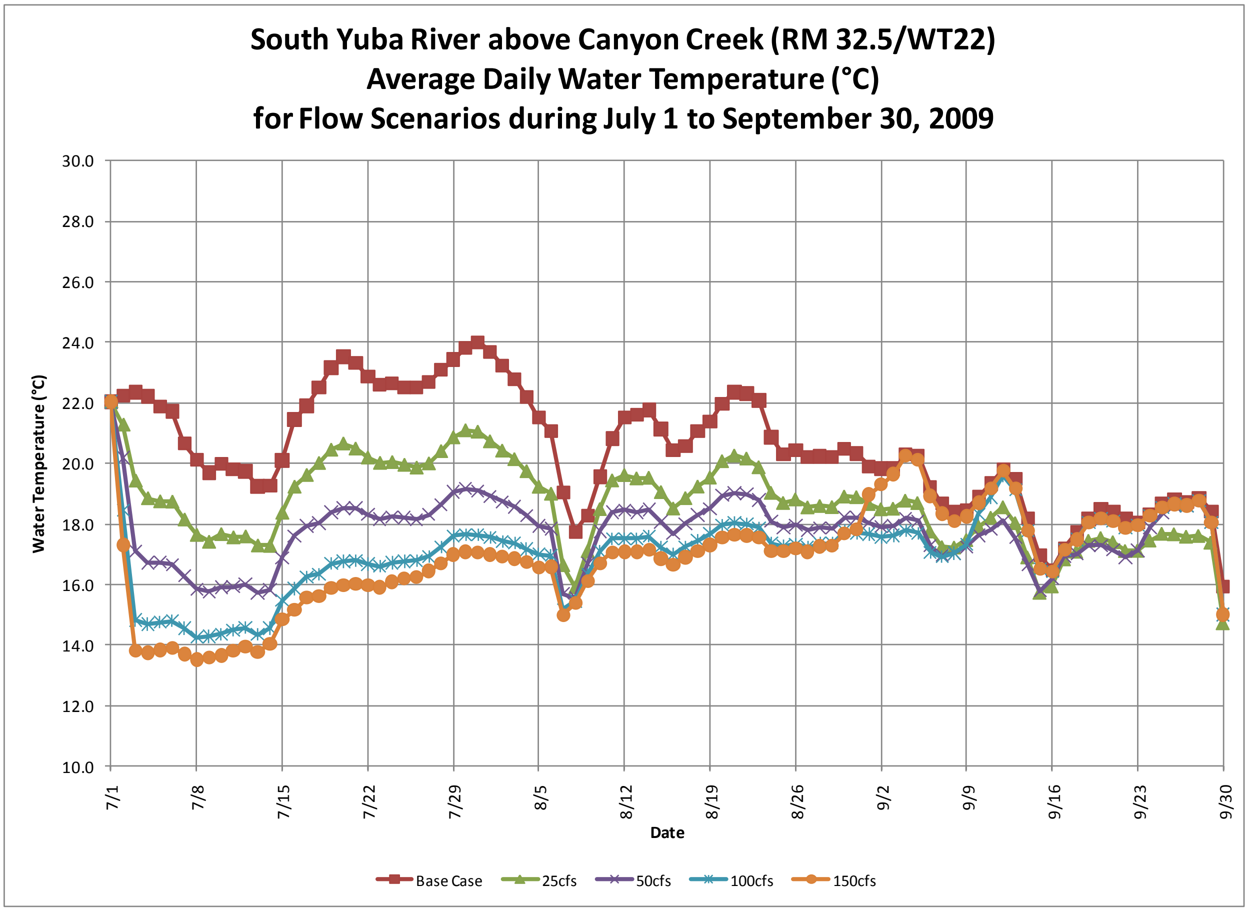


Figure 6.2.2-14. Modeled water temperatures in the South Yuba River above Canyon Creek based on 2008 hydrological and 2009 meteorological conditions.

FYLF

The River 2D model in the South Yuba River indicated that WUA for FYLF egg masses was highest at 15 cfs, and WUA for tadpoles was highest at 6 cfs, the two lowest modeled flows. Percent maximum WUA for FYLF egg masses and tadpoles for proposed minimum instream flow releases from Spaulding Dam for the South Yuba River from Jordan Creek to Canyon Creek is shown in Table 6.3.2-19. The spatial distribution of suitable habitat generated by the River 2D model (Technical Memorandum 3-7 – Special Status FYLF Habitat Modeling) also indicates that there is contiguous highly suitable habitat at the lower flow range, which becomes less suitable and increasingly fragmented at higher flows. Based on the information set forth in Table 6.4-19 below, PG&E's Proposed Project will not negatively affect FYLF in the South Yuba River compared to the No-Action Alternative. Similarly, 2D model results for a site in the Lake Valley Canal Diversion Dam Reach indicate a pattern of maximum WUA at the 2 lowest modeled flows of 12 cfs and 5 cfs for FYLF egg masses and tadpoles, respectively. Also, suitable habitat maps from the River 2D model (Technical Memorandum 3-7 – Special Status FYLF Habitat Modeling) show that large contiguous areas of moderate to highly suitable habitat is maintained along the stream margins at flows up to 120 cfs. In addition, PG&E conducted studies in: Bear River Reach #2 where no FYLF were detected; Towle Canal where only 1 adult FYLF was found, no breeding was documented, and where the PHABSIM model indicates maximal habitat (WUA) is consistent with proposed Project flow releases: and Drum Afterbay Dam reach where few FYLF were found, no breeding was documented, and where maximal habitat (WUA) is consistent with proposed Project flow releases. Therefore, PG&E's Proposed Project also will not negatively affect FYLF in those reaches compared to the No-Action Alternative. For additional information regarding PG&E's proposed streamflow measures and the associated rationale, see Appendix E7 of this Exhibit E.

Table 6.3.2-19. Percent of maximum FYLF weighted usable area (WUA) by month and Water Year type that would be available with PG&E's proposed minimum stream flows from Spaulding Dam - South Yuba River from Jordan Creek to Canyon Creek.

Month	FYLF Lifestage	WATER YEAR TYPE																			
		Critically Dry				Dry				Below Normal				Above Normal				Wet			
		Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*	Dam Release (cfs)	FYLF WUA (% of Max)*	Mean Flow at 2D Site (cfs)	FYLF WUA (% of Max)*
January	--	5	--	34.0	--	8	--	60.6	--	12	--	174.8	--	16	--	246.2	--	16	--	84.4	--
February	--	5	--	23.2	--	8	--	40.3	--	12	--	181.3	--	16	--	155.1	--	16	--	227.2	--
March	--	5	--	39.0	--	8	--	71.9	--	12	--	92.6	--	16	--	181.6	--	16	--	322.6	--
April	--	5	--	37.3	--	8	--	116.7	--	12	--	278.3	--	16	--	588.2	--	16	--	716.8	--
May	Egg Mass	5	98.8%	41.1	91.1%	8	99.0%	165.1	61.8%	12	99.6%	1,080.1	29.8%	16(*Target= 50)*	88.0%	1,798.6	21.7%	16(*Target= 50)*	88.0%	1,594.4	21.7%
June	Egg Mass	5	98.8%	42.5	90.6%	8	99.0%	36.2	92.7%	12	99.6%	320.1	48.9%	16(*Target= 50)*	88.0%	545.7	39.4%	16(*Target= 50)*	88.0%	1,243.4	26.4%
June	Tadpole	5	100.0%	42.5	85.2%	8	98.8%	36.2	87.4%	12	96.5%	320.1	42.9%	16(*Target= 50)*	82.5%	545.7	36.0%	16(*Target= 50)*	82.5%	1,243.4	24.3%
July	Tadpole	5	100.0%	14.3	95.2%	8	98.8%	11.4	96.9%	12	96.5%	20.0	93.0%	16	94.4%	54.8	80.9%	16	94.4%	326.7	42.6%
August	Tadpole	5	100.0%	6.9	99.5%	8	98.8%	10.2	97.6%	12	96.5%	15.4	94.6%	16	94.4%	21.3	92.6%	16	94.4%	32.1	88.8%
September	Tadpole	5	100.0%	7.0	99.4%	8	98.8%	10.3	97.5%	12	96.5%	15.0	94.8%	16	94.4%	20.7	92.8%	16	94.4%	21.8	92.4%
October	--	5	--	7.7	--	8	--	12.0	--	12	--	17.9	--	16	--	24.1	--	16	--	63.7	--
November	--	5	--	16.8	--	8	--	20.9	--	12	--	82.4	--	16	--	33.6	--	16	--	163.7	--
December	--	5	--	24.7	--	8	--	31.1	--	12	--	319.9	--	16	--	85.5	--	16	--	121.1	--

* Note: Flow values under the minimum modeled flow use the minimum modeled flow WUA value; flow values over the maximum modeled flow use the maximum modeled flow WUA value.

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6.3.2.2.2 Effects of Ramping on Aquatic Resources

Based on available information to date, PG&E has identified two locations where data indicate a ramping rate may benefit aquatic resources. The first is in the upper Bear River near Bear River Reach #2, which flows through Bear Valley.[19] The second is in Auburn Ravine, and would only apply for hydroelectric spills, which occur from about mid-November or when the annual Project outage concludes, whichever occurs first, through April 15, when water deliveries begin. The proposed ramping rates for these two locations mimic maximum natural hydrograph recession rates based on observed data at these locations. For the full text of PG&E's proposed ramping rate measure, including specific ramping rates and the rationale for the ramping rates, refer to Appendix E7 of this Exhibit E.

6.3.2.2.3 Effects of Reservoir Pools on Aquatic Resources

The Proposed Project could affect aquatic resources in Project reservoirs if, in the future, the reservoir pools are drawn down significantly below historic levels or reservoir operations are otherwise altered. PG&E does not propose to operate the Project in a substantially different manner than how it is currently operated, and has proposed a measure that would continue the existing minimum pool measure at Fordyce Lake. Refer to Appendix E7 for this measure (DS-AQR2) as well as the accompanying rationale statement. Tables 6.3.2-20, 6.3.2-21 and 6.3.2-22 below show the average summertime water surface elevation of the three largest Drum-Spaulding Project reservoirs under existing conditions (No-Action Alternative) and the reduction in elevations that would occur under Licensees' Proposed Projects.[20] As shown, reservoir elevations are slightly lowered at Fordyce Lake and Lake Spaulding under all water year types. Reservoir elevations in Lake Valley Reservoir are not affected. Since reservoir elevations would be only slightly affected, no impact to aquatic resources that use the reservoirs (e.g., fish, amphibians and turtles) is anticipated.

Table 6.3.2-20. Comparison of modeled average summertime reservoir elevations at Lake Fordyce under the No-Action Alternative and Licensees' Proposed Projects.

Water Year Type	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Median Reservoir Water Surface Elevation in feet)							
Normal Maximum Water Surface Elevation	6,405.1	6,405.1	6,405.1	6,405.1	6,405.1	6,405.1	6,405.1
Critically Dry	6,374.0	6,371.7	6,360.0	6,350.0	6,336.3	6,322.8	6,321.1

[19] With regard to Bear River Reaches #1 and #2, PG&E does not divert water from these reaches, and, aside from a stream gage, PG&E does not have any Project facilities in these reaches. PG&E believes that in the Proposed Projects, Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches with NID because water from both projects is anticipated to be periodically moved through the reaches as is currently the case. NID disagrees with PG&E for three reasons. First, NID's Yuba-Bear Hydroelectric Project has no facilities in this section of the Bear River. Second, under historic as well as current conditions, PG&E at its sole discretion and without request by NID, releases water from Drum Canal into the Bear River at RM 35.3. Third, at this time, NID has made no decision regarding whether releases from the Drum Canal into the Bear River at RM 35.3 might be beneficial to NID in the future, and has not requested that PG&E include such releases in PG&E's application for a new Drum-Spaulding Project license.

[20] Note that the HEC-ResSim Operations Model scenario referred to as "Licensees' Proposed Projects" includes NID's Yuba-Bear Hydroelectric Project's proposed flow and reservoir pool elevations in Appendix E3 of this Exhibit E and PG&E's Drum-Spaulding Project's proposed streamflow requirements in Appendix E7 of this Exhibit E. Licensees modeled the projects together for the purpose of this Exhibit E because of the hydraulic interconnection between the two projects.

Table 6.3.2-20. (continued)

Water Year Type	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Median Reservoir Water Surface Elevation in feet) (continued)							
Dry	6,397.2	6,390.0	6,370.0	6,361.1	6,349.2	6,338.9	6,338.1
Below Normal	6,404.6	6,395.0	6,375.0	6,366.4	6,355.1	6,345.7	6,346.0
Above Normal	6,405.1	6,400.0	6,380.0	6,371.8	6,361.1	6,353.3	6,353.7
Wet	6,405.1	6,405.0	6,387.0	6,379.4	6,369.4	6,362.5	6,354.1
PG&E'S PROPOSED PROJECT (Change in Elevation in feet)							
Critically Dry	-5.9	-5.8	-1.6	-1.4	-0.7	-0.1	-1.6
Dry	-1.4	0.0	0.0	0.1	0.5	0.6	-0.8
Below Normal	-0.3	0.0	0.0	0.2	0.4	0.5	-1.4
Above Normal	0.0	0.0	0.0	0.2	0.4	-0.1	-1.0
Wet	0.0	0.0	0.0	0.2	0.3	-0.4	0.0

Table 6.3.2-21. Comparison of modeled average summertime reservoir elevations at Lake Spaulding under the No-Action Alternative and Licensees' Proposed Projects.

Water Year Type	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Median Reservoir Water Surface Elevation in feet)							
Normal Maximum Water Surface Elevation	5,014.6	5,014.6	5,014.6	5,014.6	5,014.6	5,014.6	5,014.6
Critically Dry	4,902.2	4,895.3	4,900.1	4,899.7	4,899.9	4,901.7	4,915.1
Dry	4,973.4	4,965.4	4,966.9	4,958.0	4,946.7	4,938.9	4,950.7
Below Normal	4,989.9	4,987.3	4,989.6	4,981.8	4,971.9	4,964.9	4,975.7
Above Normal	5,006.6	5,008.0	5,006.2	4,995.8	4,983.1	4,974.8	4,987.2
Wet	5,014.0	5,009.9	5,005.8	4,995.5	4,984.2	4,978.7	4,999.2
PG&E'S PROPOSED PROJECT (Change in Elevation in feet)							
Critically Dry	1.1	0.9	-4.8	-4.0	-3.0	-2.2	-0.6
Dry	1.1	-0.5	-0.5	-0.6	-0.8	-0.9	0.0
Below Normal	0.1	-0.2	-0.3	-0.5	-0.7	-0.9	-0.6
Above Normal	0.0	0.0	-0.4	-1.2	-2.4	-3.0	-3.9
Wet	0.0	0.0	-0.4	-1.3	-0.5	-0.3	-2.7

Table 6.3.2-22. Comparison of modeled average summertime reservoir elevations at Lake Valley Reservoir under the No-Action Alternative and Licensees' Proposed Projects.

Water Year Type	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Sep 30
NO-ACTION ALTERNATIVE (Median Reservoir Water Surface Elevation in feet)							
Normal Maximum Water Surface Elevation	5,784.9	5,784.9	5,784.9	5,784.9	5,784.9	5,784.9	5,784.9
Critically Dry	5,779.0	5,778.4	5,777.3	5,773.8	5,769.5	5,765.8	5,765.2
Dry	5,782.6	5,781.9	5,780.7	5,778.6	5,775.9	5,772.8	5,772.2
Below Normal	5,783.8	5,782.7	5,781.1	5,780.1	5,779.0	5,776.7	5,776.1
Above Normal	5,783.8	5,782.7	5,781.1	5,780.1	5,779.0	5,776.9	5,776.4
Wet	5,783.9	5,782.7	5,781.1	5,780.1	5,779.0	5,776.9	5,776.3
PG&E'S PROPOSED PROJECT (Change in Elevation in feet)							
Critically Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0

6.3.2.2.5 Effects of Entrainment on Fish Populations

Licensees' relicensing studies to date indicate that fish screens or other protective devices are not needed to protect reservoir or stream fish populations at the following Drum-Spaulding Project facilities evaluated as part of the Fish Entrainment Study (Study 3.2.5): Fordyce Lake (low level intake/outlet), Drum Canal (intake in Lake Spaulding), Lake Valley Canal Diversion Dam on North Fork of North Fork American River, Towle Canal Diversion Dam on Canyon Creek (tributary to North Fork American River), and Bear River Canal on Bear River below Rollins Reservoir. The results of the studies did not provide evidence of entrainment levels that might result in adverse effects on fish populations. A summary of each location is discussed further below.

PG&E still has two remaining study activities to complete that are relevant to this resource: 1) perform hydroacoustic sampling near the low level outlet in Fordyce Lake; and 2) estimate the level of entrainment at the Drum-Spaulding Project's Dutch Flat No. 1 Conduit Intake based on the level of entrainment at the Dutch Flat No. 2 Conduit Intake. PG&E will submit the results of those remaining study activities to FERC by October 31, 2011.

Fordyce Dam

PG&E's initial hydroacoustic surveys near the upstream face of Fordyce Dam indicate that fish are not active in the deeper portion of the reservoir during the day. Activity increased at night, but not in the vicinity of the intakes. Therefore, the potential for fish entrainment into the intake appears to be less than significant. However, additional sampling (i.e., perform hydroacoustic sampling near the intake at night in early June 2011, during the day and night in late June 2011, and in early August 2011) is planned in summer 2011.

Lake Valley Canal

In the Drum-Spaulding Project's Lake Valley Canal, Licensee's sampling effort captured an average of 0.45 fish per day between May 5 and November 13, 2009, excluding the periods of June 13 to September 8 and September 19 to October 4, while the canal was taken of service during normal seasonal outages. A total of nine rainbow trout were estimated to be entrained over the 120-day period required by the study. This represents less than one percent (0.6%) of the estimated rainbow trout population in the Lake Valley Reservoir Dam Reach. This level of entrainment would be expected to have an insignificant effect on the rainbow trout population in the reach.

Towle Canal

In the Drum-Spaulding Project's Towle Canal, Licensee's sampling effort captured an average of 2.1 fish per day between May 5 through September 16, 2009, excluding the period of May 10 through May 18, while the canal was taken out of service during a normal seasonal outage. A total of 14 rainbow trout was estimated to be entrained over the 120-day period required by the study. The estimated number of rainbow trout entrained equates to about 0.1 rainbow trout per day. This low number of entrained rainbow trout would be expected to have an insignificant effect on the rainbow trout population of Canyon Creek.

Drum Canal

In the Drum Canal, PG&E's hydroacoustic sampling study recorded an average of 28.1 detections per day. This equaled 3,372 detections over the 120-day period required by the study. PG&E believes that the hydroacoustic study likely overestimated fish entrainment as has been demonstrated in the sampling at Yuba-Bear Hydroelectric Project Dutch Flat No. 2 Conduit. As described above the Yuba-Bear Hydroelectric Project Dutch Flat No. 2 Conduit hydroacoustic sampling in 2009 and fyke net sampling in 2010, hydroacoustics appear to be counting objects that are not fishes and/or may be repeatedly counting milling fish. Direct fyke net sampling in the canal (filtering 100 percent of the water column) in 2010 at Dutch Flat No. 2 Flume found that a total of 6 fish were entrained at that location over a 59 day monitoring period (0.1 fish per day). This level of observed entrainment was in contrast to the hydroacoustic average counts of 28.1 detections of fish per day. As described in the Dutch Flat No. 2 Conduit section above, the high hydroacoustic counts in 2009 could not be explained given the size of the fish populations in the Bear River above Drum Afterbay.

Stocking records indicate that Lake Spaulding is frequently stocked with Chinook salmon (Table 6.3.1-1) ranging from 18,150 to 32,300 fish per year. Reservoir fish sampling in Lake Spaulding was conducted in 2009 as part of Licensees Reservoir Fish study (see Reservoir Fish Population Technical Memorandum 3-5 in Appendix E12 of this Exhibit E). The sampling indicated that pikeminnow were very common, particularly near the dam where the intake tower to Drum Canal is located. Pikeminnow represented 56 percent (n=192) of the total catch throughout the reservoir and 68 percent (n=53) of the total catch at the two sites located closest to the dam, and intake to the powerhouse over three sample events. It can be concluded that the majority of fish potentially susceptible to entrainment were pikeminnow.

In addition, PG&E has proposed a measure to reimburse CDFG for fish stocking in Lake Spaulding (as further described in Appendix E7) to help support the ongoing recreational fishery in Lake Spaulding.

Bear River Canal

Results of PG&E's Bear River Canal sampling, in conjunction with the stream and reservoir fish population sampling above and below Bear River Canal, indicate that the population of wild rainbow trout in Bear River Canal is the result of reproduction in the canal and not due to entrainment into the Bear River Canal (see Licensee's Fish Entrainment Technical Memorandum (3-5) in Appendix E12 of this Exhibit E). An intensive effort to qualitatively sample the entire 23 mile canal using backpack electrofishing and to map the potential fish habitat in the canal was conducted in 2009. This effort resulted in collecting 2,049 fish, 97% which were wild rainbow trout, a relatively high number of fish unlikely to be accounted for by entrainment (Rollins Reservoir is stocked with hatchery rainbow trout). Habitat mapping documented 402 usable spawning gravel deposits throughout the canal. In addition, natural inside walls of the canal that were not gunited also provided flow refugia and shelter for smaller fish. The overhanging trees and plants appear to provide a substantial amount of coarse particulate organic matter, providing a rich food source for the dense mats of macroinvertebrates that were observed throughout the length of the canal. Also, no accessible tributaries to the canal were found.

The Bear River Canal Instream Flow Release Gate near the head of the canal was also assessed to determine if fish could move upstream from the Bear River into the Bear River Canal. A water velocity modeling assessment found that the flow through the release gate exceeded commonly accepted trout burst speeds found in scientific literature. As a result, the conclusion is that fish could not move upstream into the canal from the Bear River.

In addition, in 2010 Licensees sampled the Rollins Reservoir outfall pool between Rollins Powerhouse outfall and the Bear River Canal Diversion intake to determine species composition for comparison with the fish populations in Bear River Canal. A two day sample event using boat electrofishing and gillnets in the relatively small outfall pool on October 25-26, 2010 resulted in the capture of 13 rainbow trout which most likely came from the population in the canal and not from production in the outfall pool or from Rollins Reservoir.

The above assessments suggested that rainbow trout documented in the Bear River Canal were reproduced there. As a result, the potential impact on stream and reservoir fishes from entrainment is negligible. Therefore, a fish screen or other measure to mitigate effects of entrainment into the Bear River Canal on fish populations is not warranted.

Dutch Flat No. 1 Tunnel Intake

PG&E's entrainment study plan for the Dutch Flat No. 1 involved utilizing data from NID's entrainment study at the Dutch Flat No. 2 Intake, which is locate on the same afterbay (Drum Afterbay). The entrainment study at NID's Dutch Flat No. 2 canal was conducted in 2010 using relatively large fyke nets. One-hundred percent of the cross-sectional area and discharge of the conduit was sampled for 551 hours by netting from July 18, 2010 to September 18, 2010. Using the data collected in 2010 by NID, PG&E estimated that over the 59-day sample period, approximately 6 fish would be entrained into the Dutch Flat No. 1 Tunnel. This level of entrainment is below levels that would have significant effects on fish populations, and does not warrant fish screens at the intake or other protective measures. However, additional sampling at Dutch Flat No. 2 Flume by NID will occur in 2011. The additional surveys are planned from mid-April through mid-July, 2011 with the fyke netting method used in the 2010 effort. PG&E will use this information to reevaluate conclusions for Dutch Flat No. 1 Intake.

6.3.2.2.6 Effects of the Project on Fish Passage

Licensees conducted two specific studies related to fish passage: 1) a fish passage study (Study 2.3.1), which focused on passage of fish into selected major tributaries from the mainstem of project-affected streams, reservoirs, and dams; and 2) a fish barrier study (Study 2.3.12), which focused on the evaluation of three specific barriers on the lower South Yuba River below RM 9.7.

During the Fish Passage Study, one or more natural barriers were found on five project-affected streams and on two tributaries within the normal maximum water surface elevation of two of PG&E's Project reservoirs (one each). One man-made barrier was also identified on Canyon Creek (tributary to South Yuba River) - a small water supply diversion dam for the City of Washington. As described in Section 6.3.1.1.3 above, a self-sustaining trout fishery occurs above and below that diversion dam. The determination of a sustainable population is based on the surveyed reaches having moderate to high densities of trout (rainbow/brown) and that fish were represented by all life stages.

The Fish Barrier Study on the three potential barriers to fish passage on the South Yuba River below RM 9.7 is still in progress. Final study results will be provided to FERC by October 31, 2011.

6.3.3 Cumulative Effects

6.3.3.1 South Yuba River Below Canyon Creek

NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project each have a cumulative effect on aquatic resources in the South Yuba River downstream of the confluence with Canyon Creek.

Under existing conditions, a transitional fishery, driven primarily by stream temperature, exists in the lower section of the river. Rainbow trout are relatively abundant in the upper portions of the river below Canyon Creek, but transition to warm water species in the lower reaches as water warms. Hardhead, a special status species, was not found in Licensees' sampling within the South Yuba River.

Water temperatures in South Yuba River below Canyon Creek are representative of the relatively warmer water conditions historically occurring during the summer in the South Yuba River. Seasonally warm ambient heat in combination with low gradient, low summertime flows and large substrate warm the water during summer months to daily mean temperatures exceeding 20°C. The existing projects' operations and the flows proposed by PG&E and NID provide cooler water (due to the releases from the deeper portions of Lake Spaulding and Bowman Lake) and higher flow in the months of August and September (depending on water year type) in comparison to the unimpaired flows.

Figures 6.3.3-1 and 6.3.3-2 below presents results of water temperature model runs under a range of flow release conditions (from the No-Action Alternative modeled flows to 150 cfs releases) from Lake Spaulding and Bowman-Spaulding Conduit Diversion dams into the South Yuba River and Canyon Creek, respectively. Refer to Section 6.2 (Water Resources) in this Exhibit E for a more detailed description of how water temperatures in the South Yuba River downstream of Canyon Creek will be cumulatively affected by Licensees' Proposed Projects. With respect to fish, Licensees' Proposed Projects will result in slightly cooler water temperatures in the South Yuba River, but a transitional fishery is expected to persist.

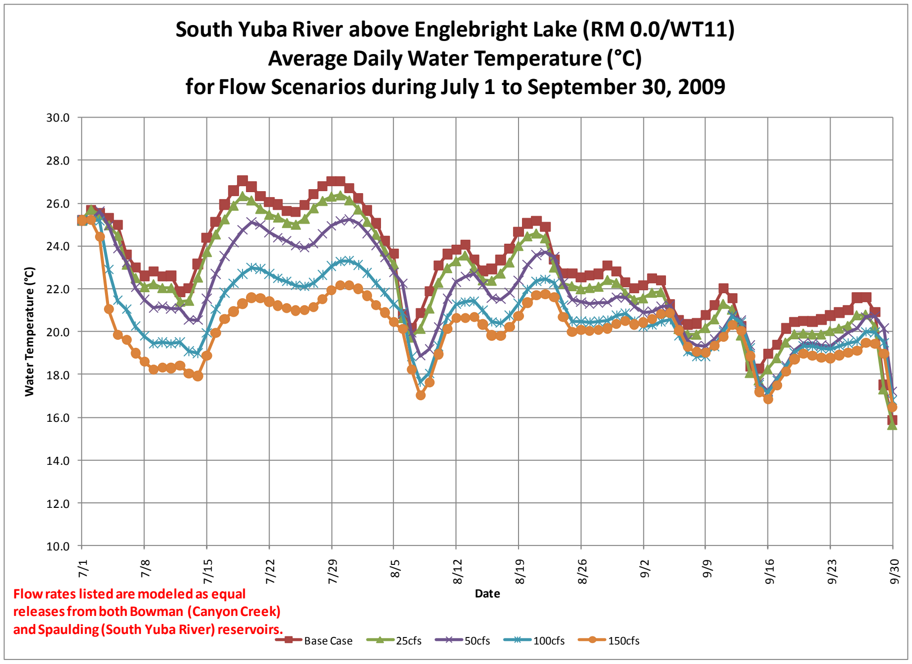


Figure 6.3.3-1. Modeled water temperatures in the South Yuba River above Englebright Reservoir based on releases from Lake Spaulding and the Bowman-Spaulding Conduit using 2008 hydrological and 2009 meteorological conditions.

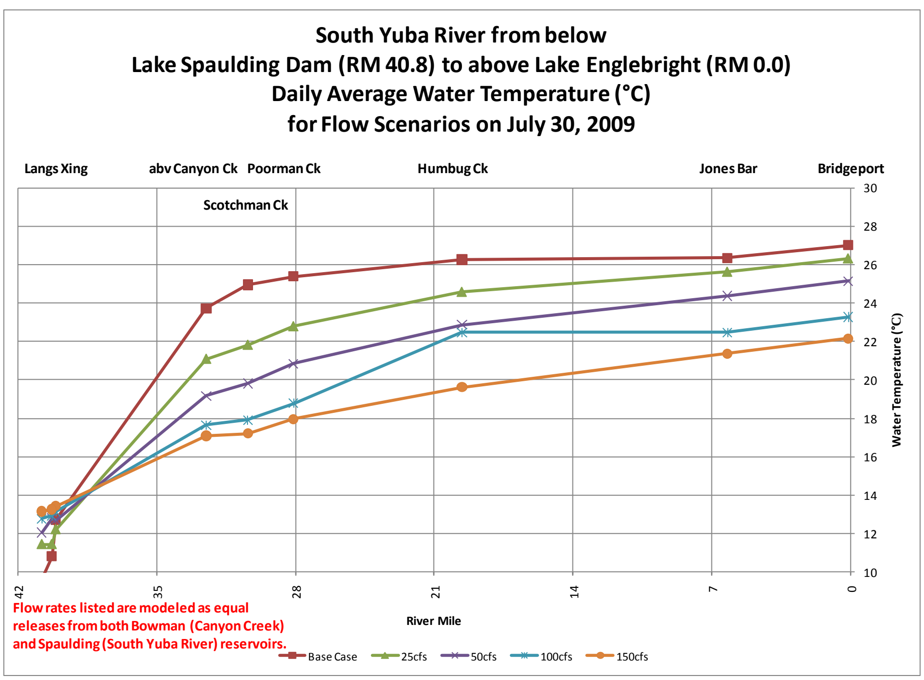


Figure 6.3.3-2. Modeled water temperatures in the South Yuba River between Lake Spaulding and Englebright Reservoir, based on releases from Lake Spaulding and the Bowman-Spaulding Conduit using 2008 hydrological and 2009 meteorological conditions, for the warmest day modeled in the period of analysis.

With regard to the instream flow studies conducted by Licensees, Figures 6.3.1-3 through 6.3.1-8 below provide WUA verses flow curves for target species and life stages for the three PHABSIM sub-reaches in the lower South Yuba River: 1) Canyon Creek to Poorman Creek (South Yuba River Reach #3); 2) Poorman Creek to Humbug Creek (South Yuba River Reach #4); and 3) Humbug Creek to USACE's Englebright Reservoir (South Yuba River Reach #5). Note that these figures present the relationship between WUA and flow – but WUA is only a function of water depth and velocity and substrate – not water temperature. As such, habitat may not be useable depending on water temperature and species of interest.

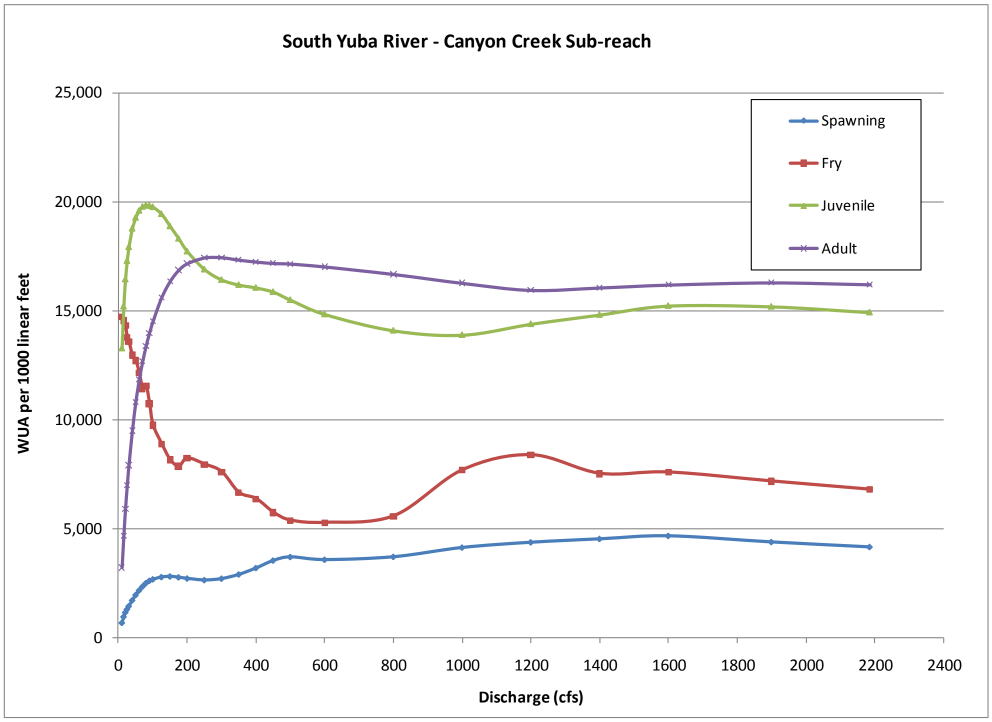


Figure 6.3.3-3. Modeled habitat suitability index (WUA) for rainbow trout, Canyon Creek to Poorman Creek (South Yuba River Reach #3).

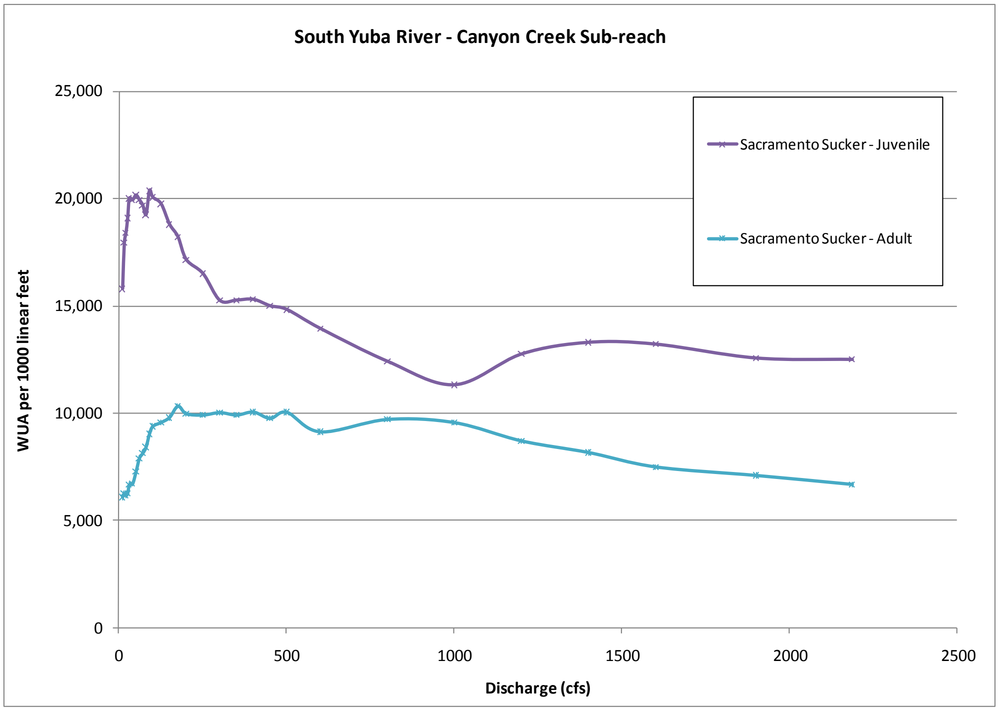


Figure 6.3.3-4. Modeled habitat suitability index (WUA) for Sacramento sucker, Canyon Creek to Poorman Creek (South Yuba River Reach #3).

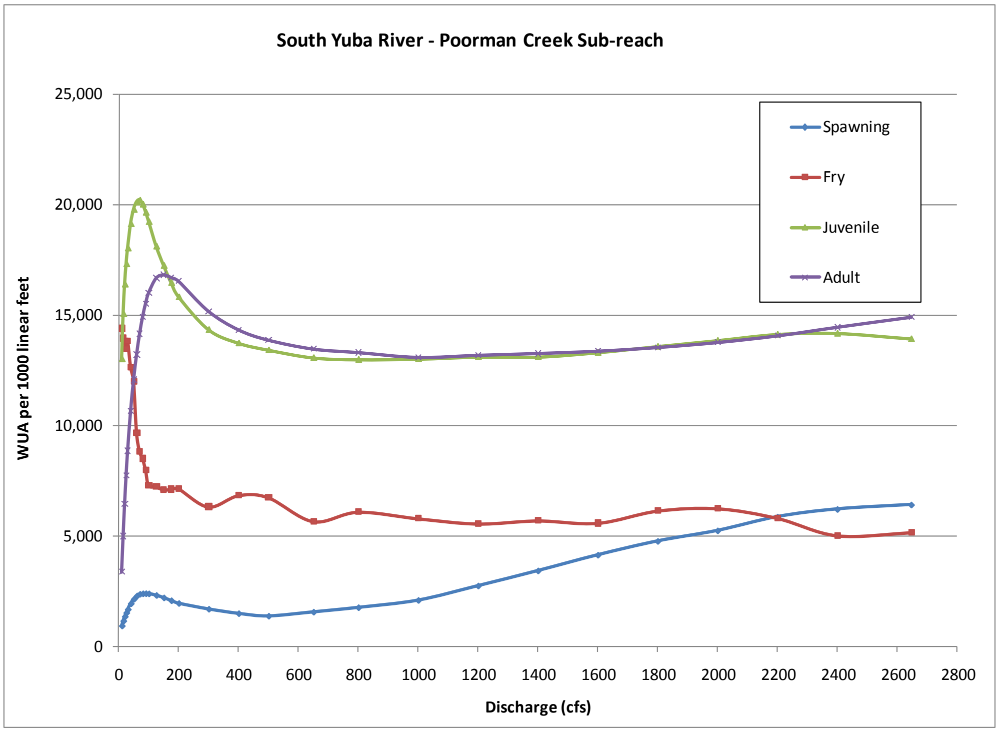


Figure 6.3.3-5. Modeled habitat suitability index (WUA) for rainbow trout, Poorman Creek to Humbug Creek (South Yuba River Reach #4).

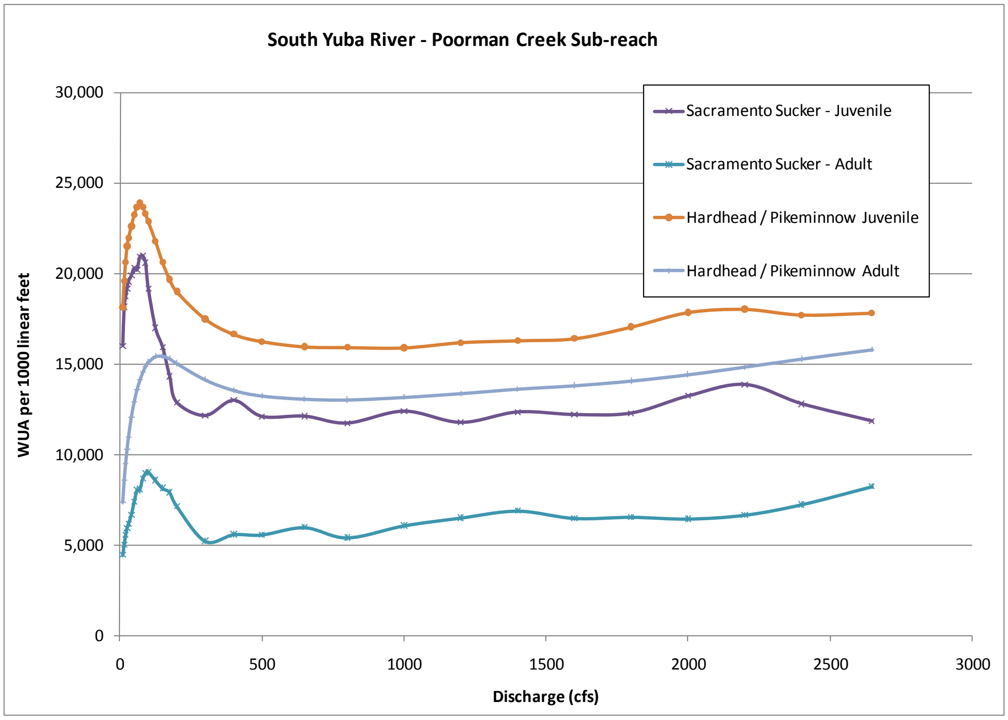


Figure 6.3.3-6. Modeled habitat suitability index (WUA) for Sacramento sucker and hardhead/pikeminnow, Poorman Creek to Humbug Creek (South Yuba River Reach #4).

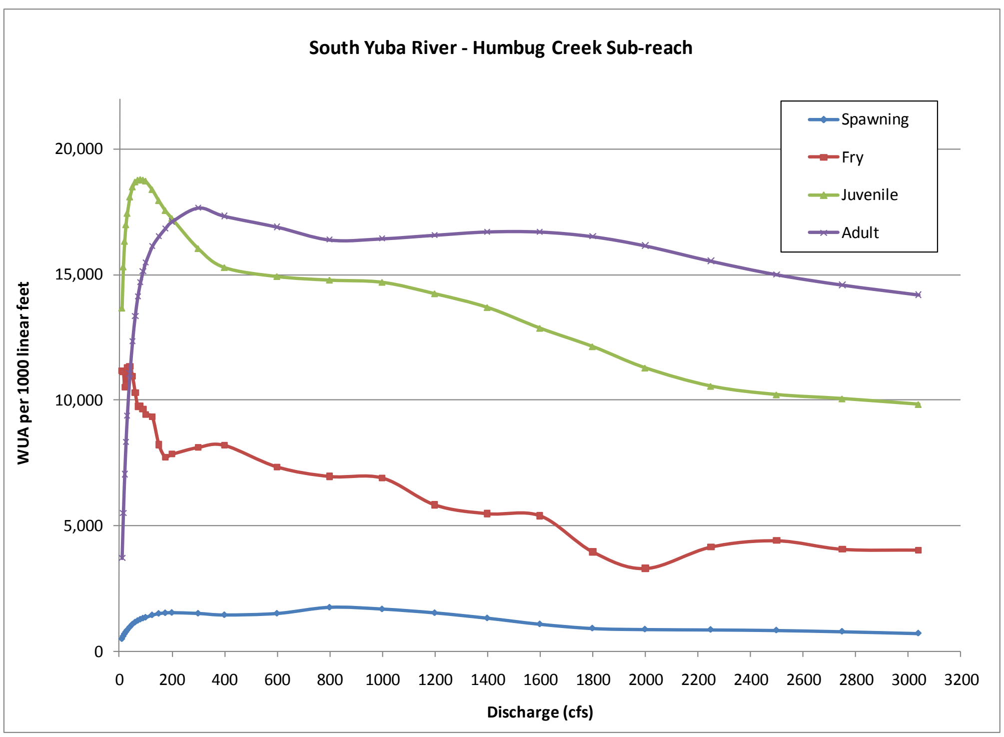


Figure 6.3.3-7. Modeled habitat suitability index (WUA) for rainbow trout, Humbug Creek to USACE's Englebright Reservoir (South Yuba River Reach #5).

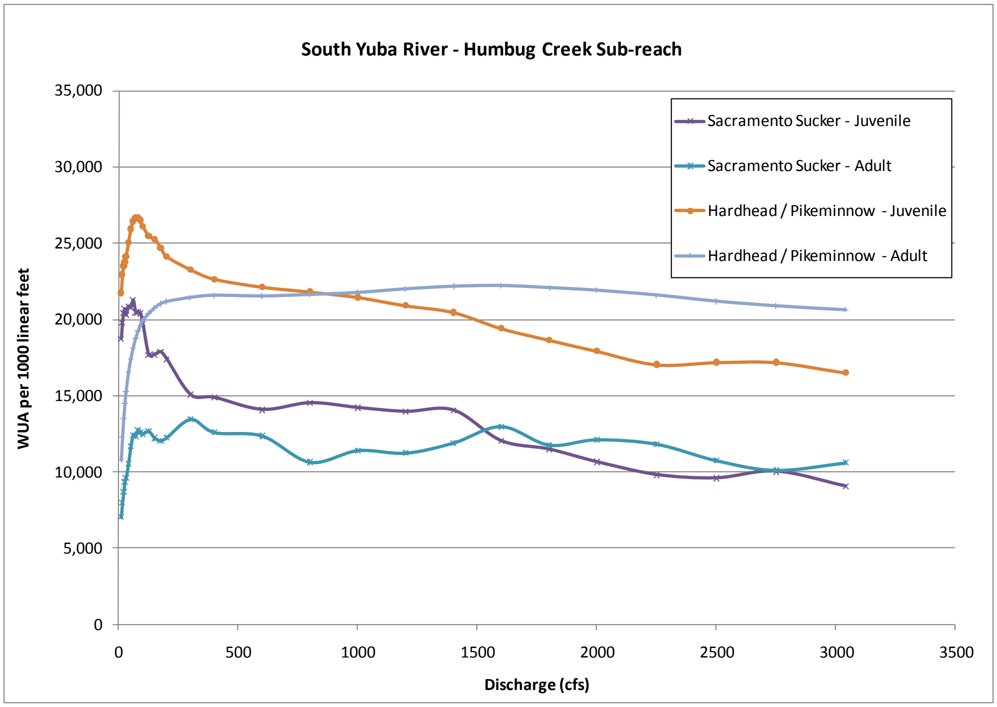
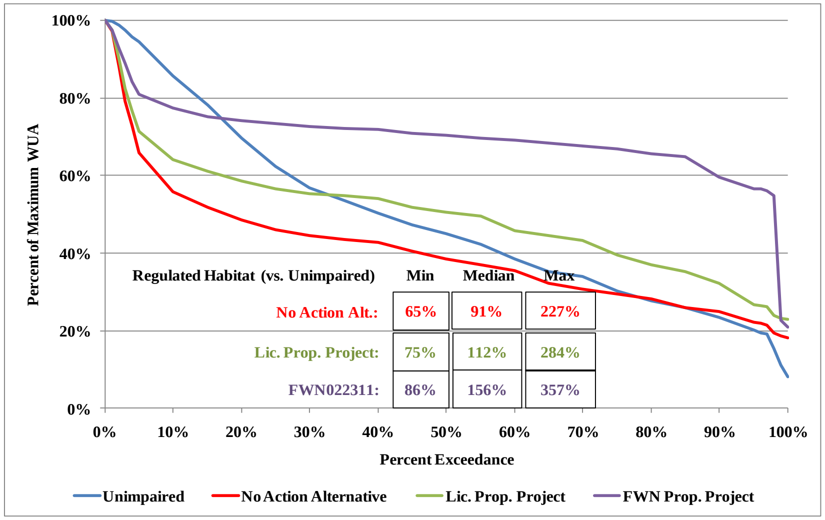
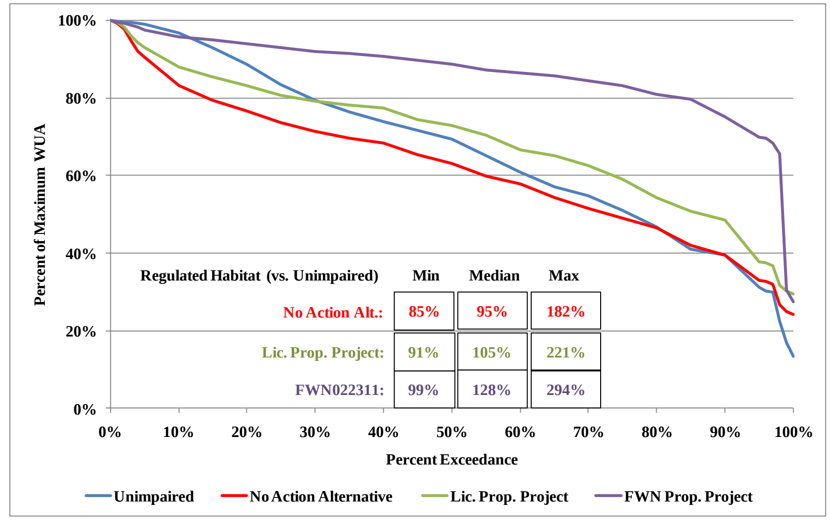


Figure 6.3.3-8. Modeled habitat suitability index (WUA) for Sacramento sucker and hardhead/pikeminnow, Humbug Creek to USACE's Englebright Reservoir (South Yuba River Reach #5).

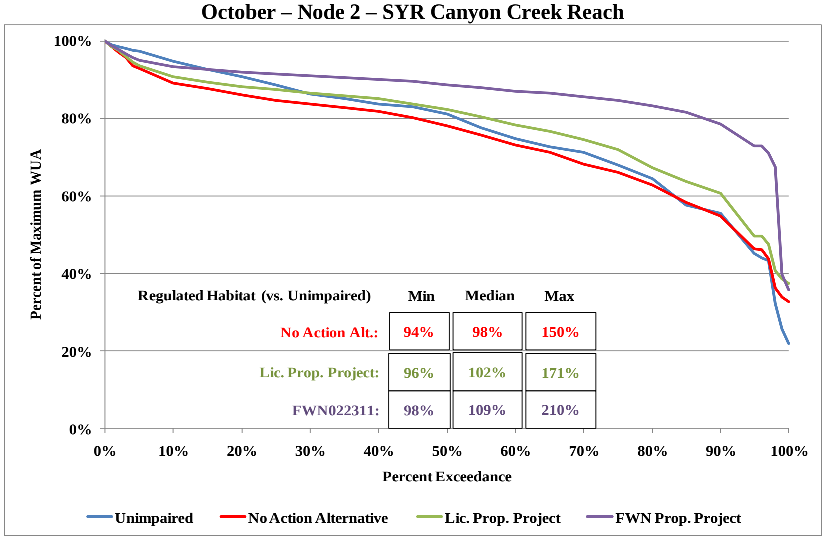
Figure 6.3.3-9 below provides a comparison of rainbow trout adult habitat in the South Yuba River between Canyon Creek and USACE's Englebright Reservoir under unimpaired flow conditions, the No-Action Alternative, Licensees' Proposed Projects and FWN's Proposed Projects.



October – Node 2 – SYR Canyon Creek Reach

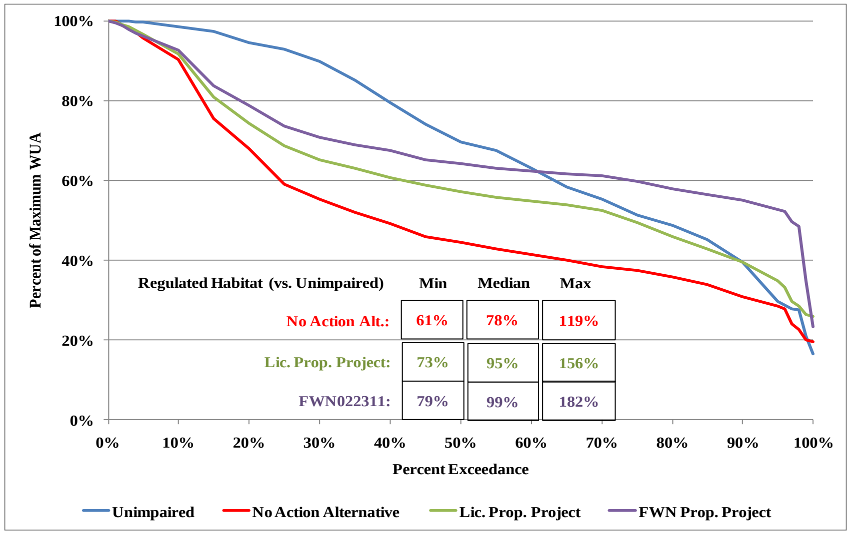


October – Node 3 – SYR Poorman Creek Reach

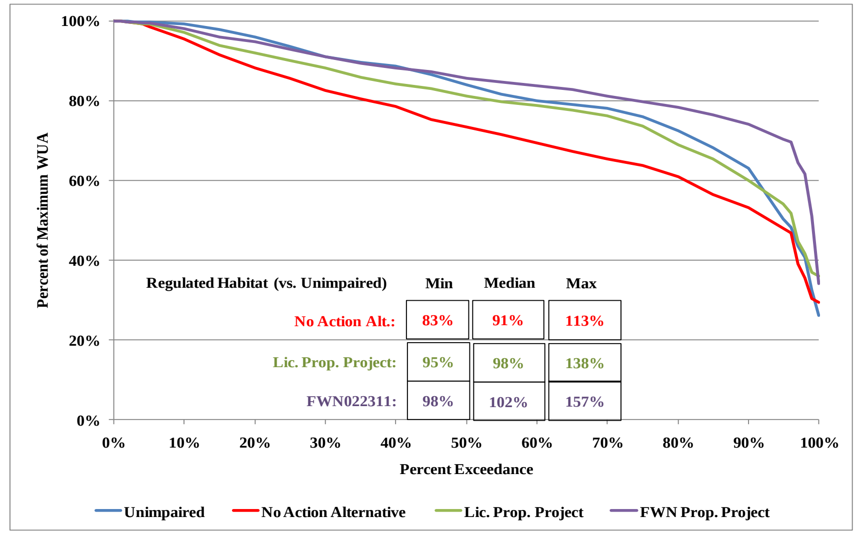


October – Node 4 – SYR Humbug Creek Reach

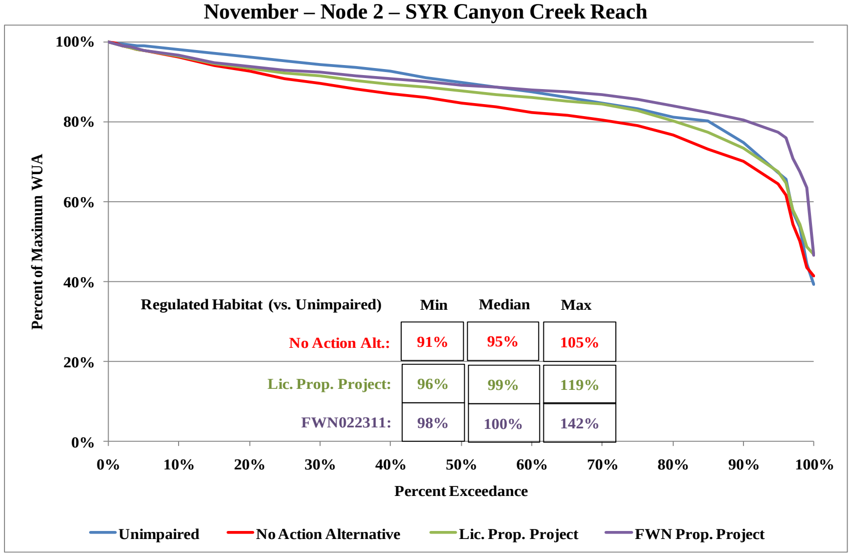
Figure 6.3.3-9a. HEA for adult rainbow trout during the month of October in the South Yuba River below Canyon Creek (Canyon Creek Sub-Reach) (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



November – Node 2 – SYR Canyon Creek Reach

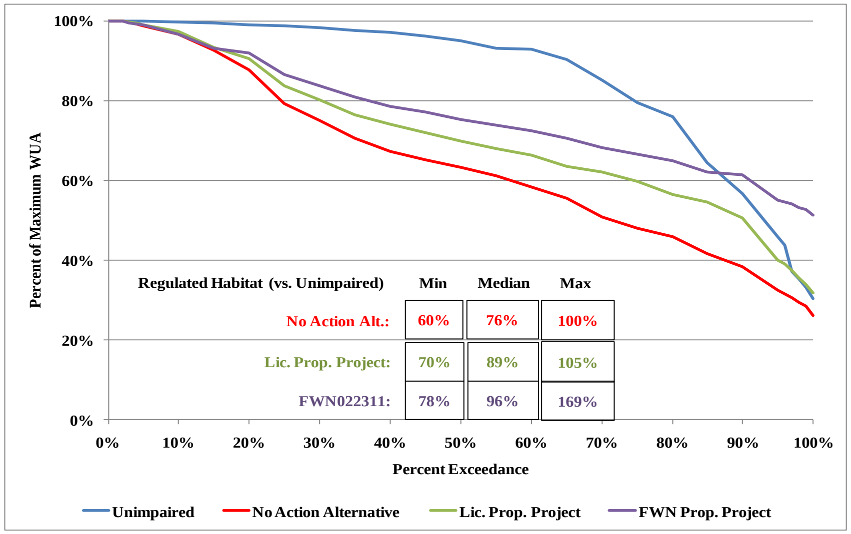


November – Node 3 – SYR Poorman Creek Reach

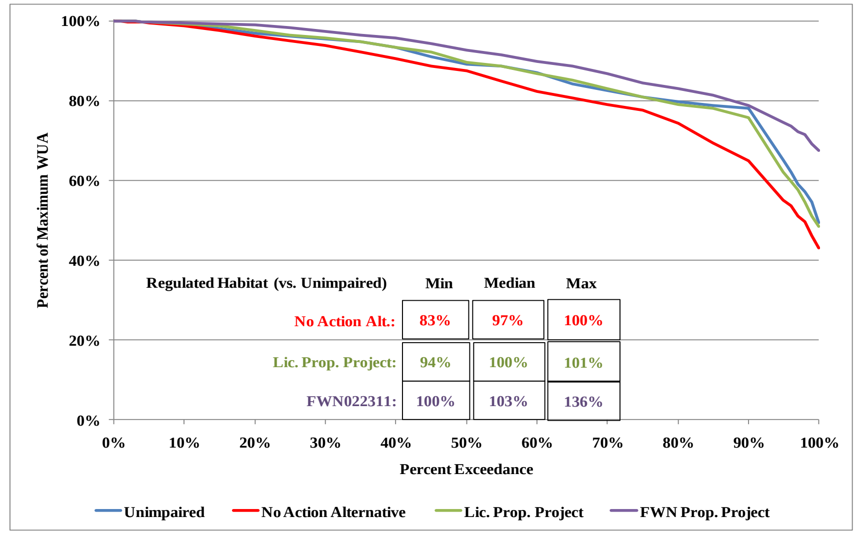


November – Node 4 – SYR Humbug Creek Reach

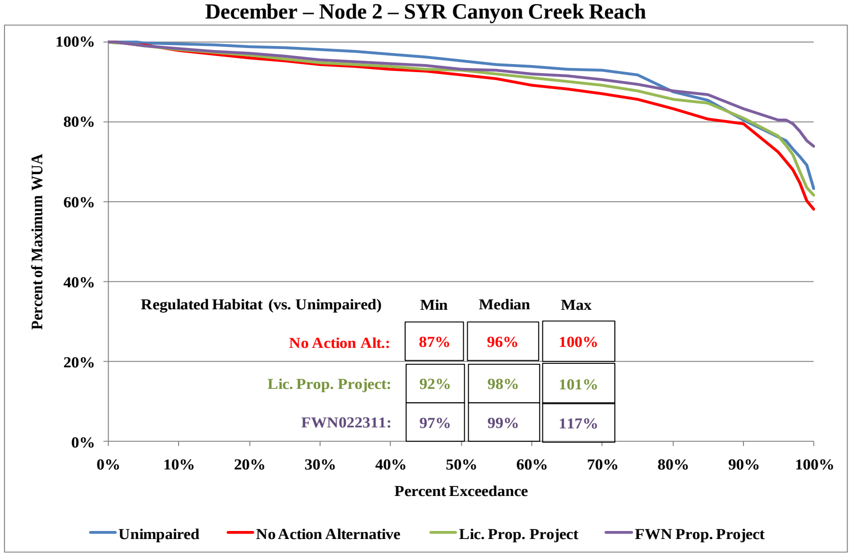
Figure 6.3.3-9b. HEA for adult rainbow trout during the month of November in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



December – Node 2 – SYR Canyon Creek Reach

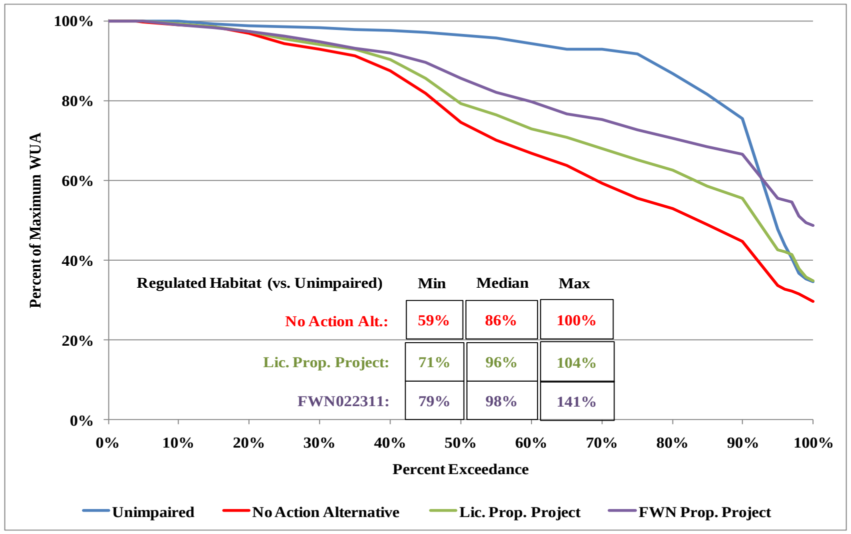


December – Node 3 – SYR Poorman Creek Reach

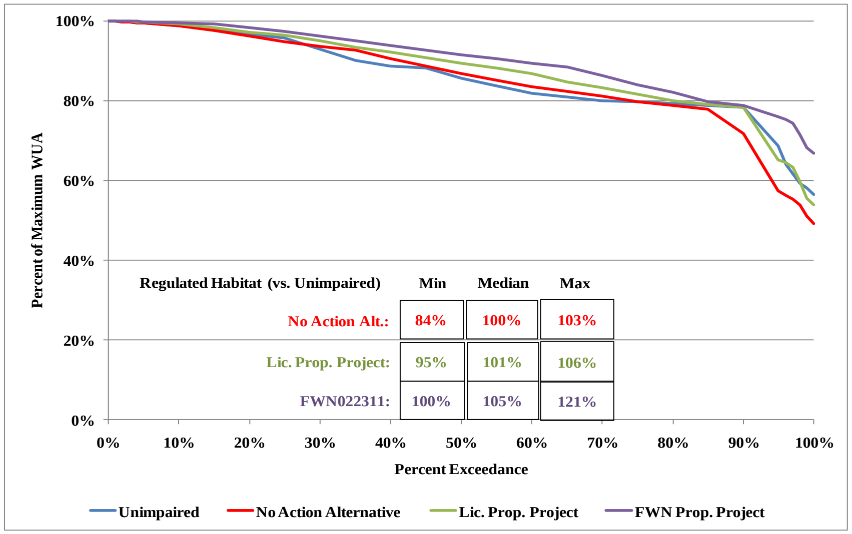


December – Node 4 – SYR Humbug Creek Reach

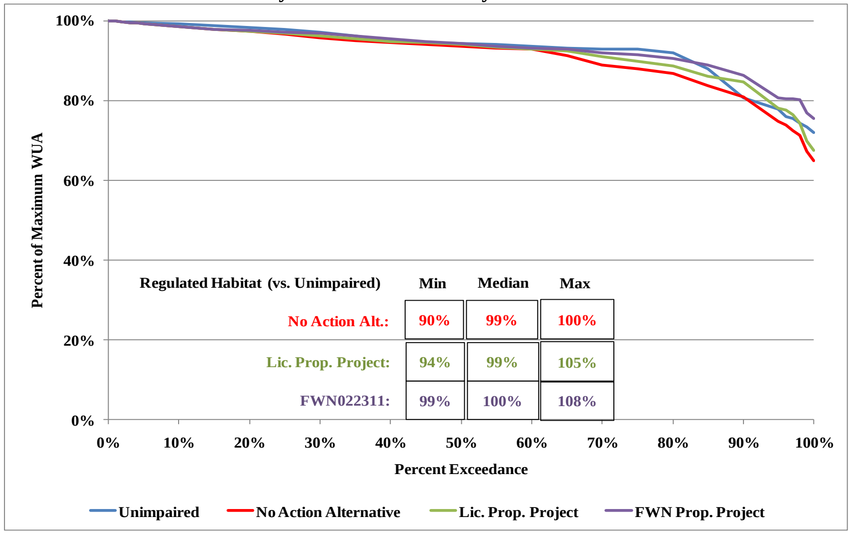
Figure 6.3.3-9c. HEA for adult rainbow trout during the month of December in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



January – Node 2 – SYR Canyon Creek Reach

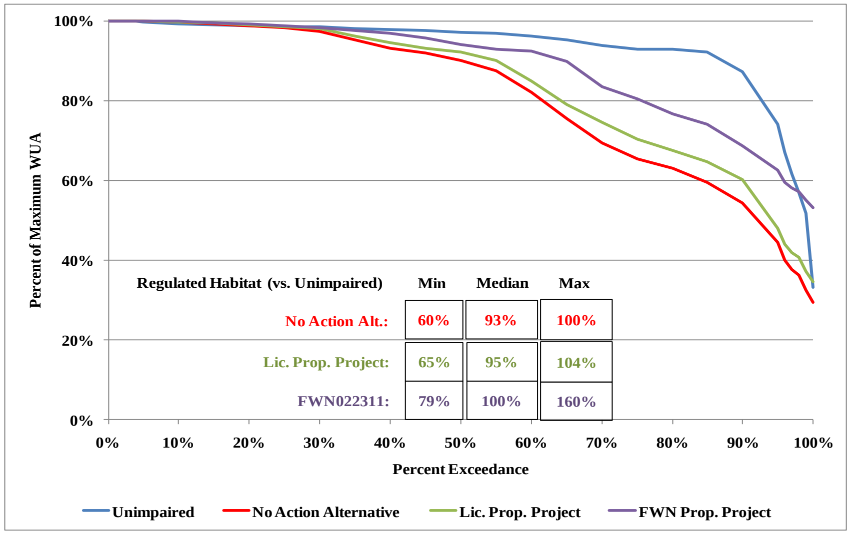


January – Node 3 – SYR Poorman Creek Reach

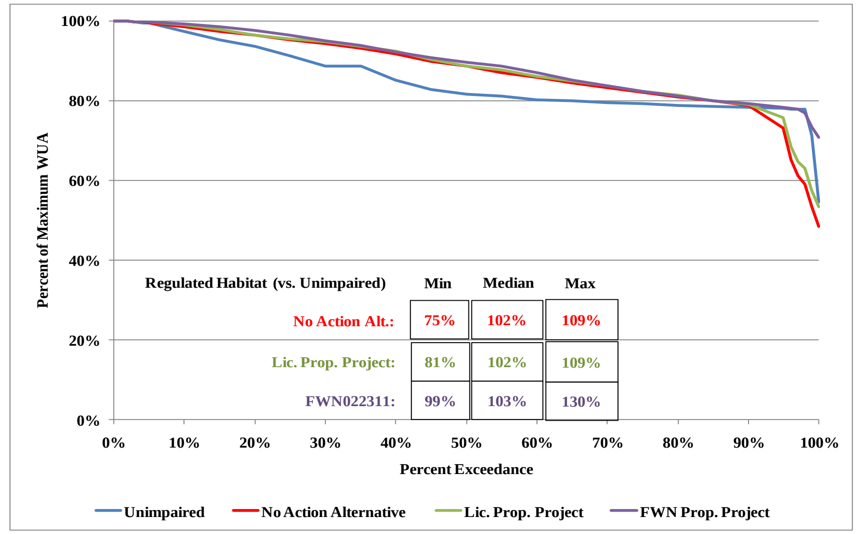


January – Node 4 – SYR Humbug Creek Reach

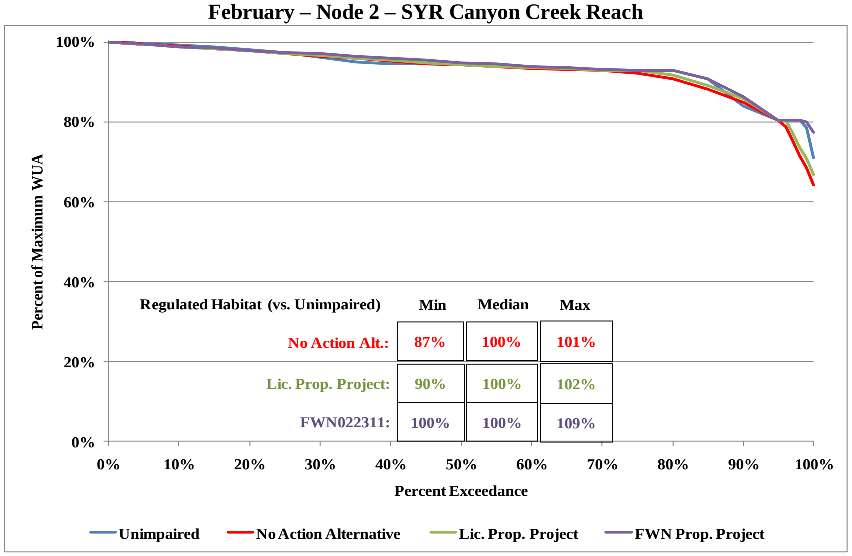
Figure 6.3.3-9d. HEA for adult rainbow trout during the month of January in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



February – Node 2 – SYR Canyon Creek Reach

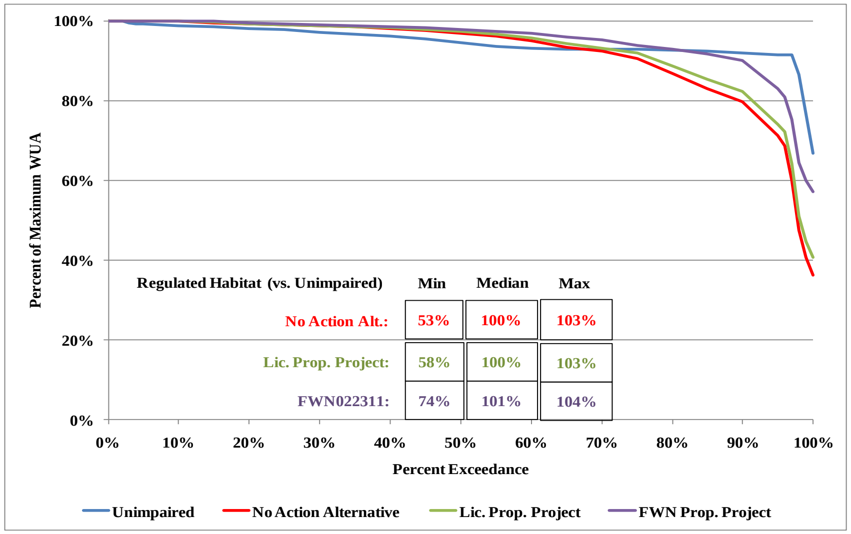


February – Node 3 – SYR Poorman Creek Reach

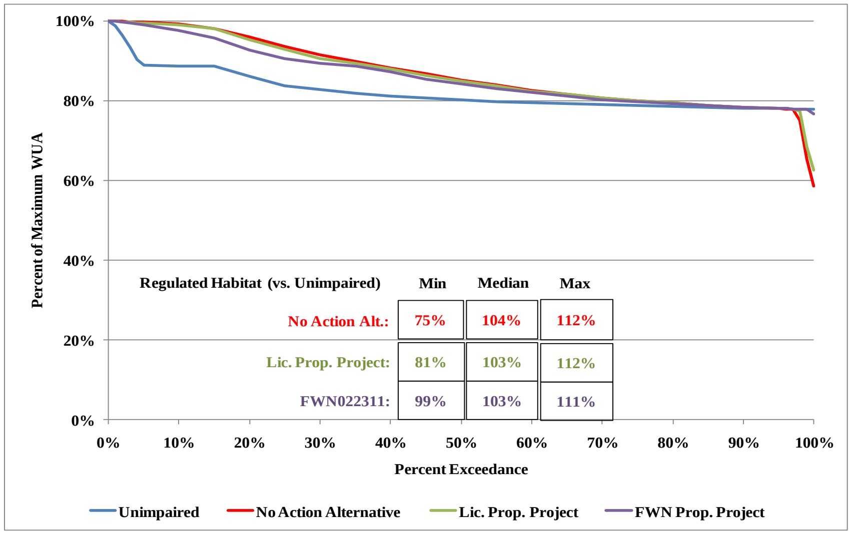


February – Node 4 – SYR Humbug Creek Reach

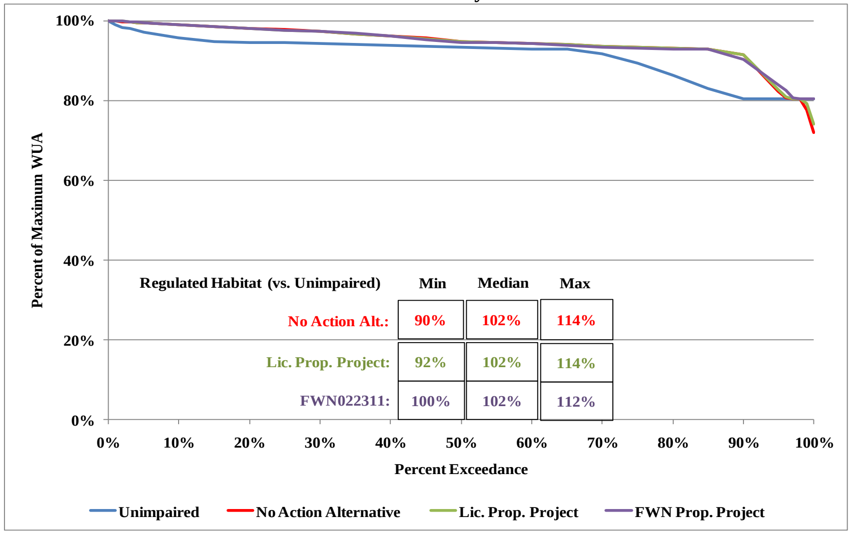
Figure 6.3.3-9e. HEA for adult rainbow trout during the month of February in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



March – Node 2 – SYR Canyon Creek Reach

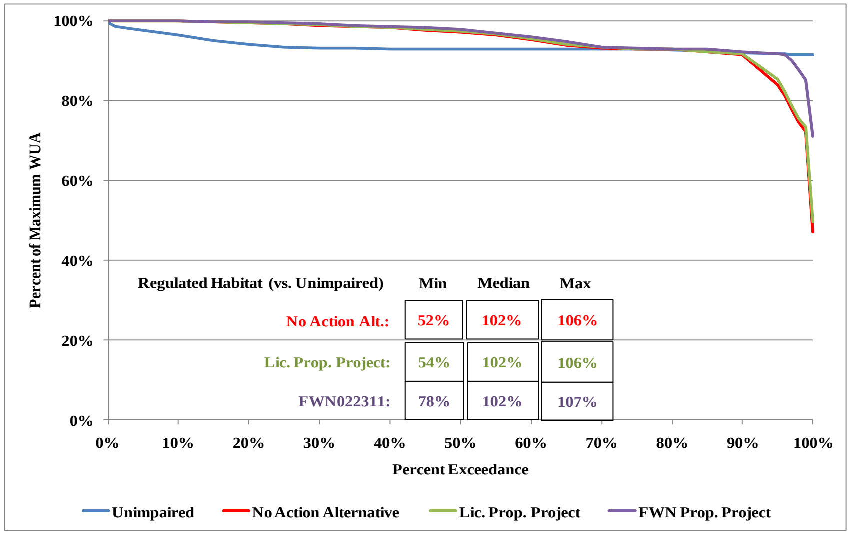


March - Node 3 – SYR Poorman Creek Reach

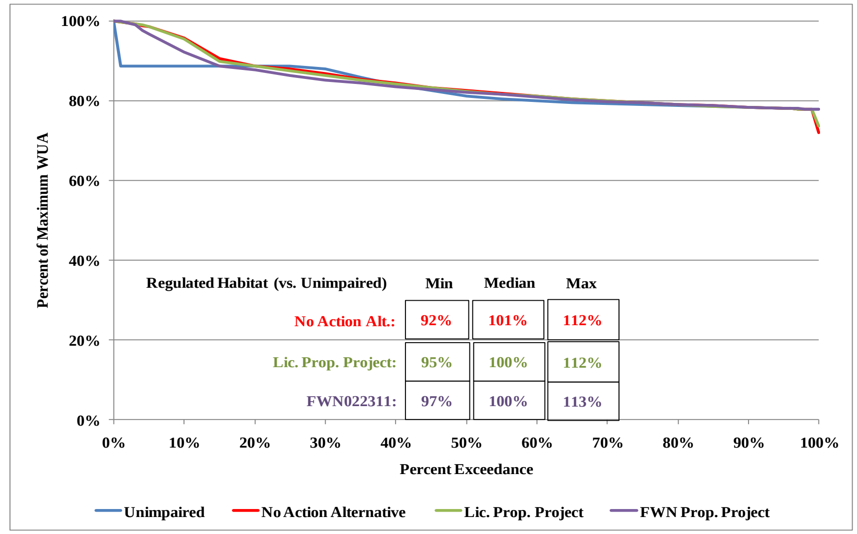


March – Node 4 – SYR Humbug Creek Reach

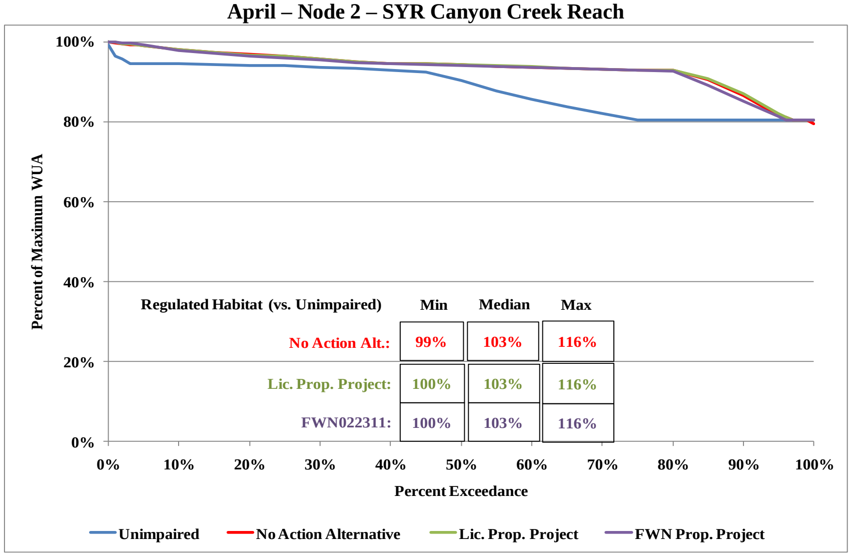
Figure 6.3.3-9f. HEA for adult rainbow trout during the month of March in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



April – Node 2 – SYR Canyon Creek Reach

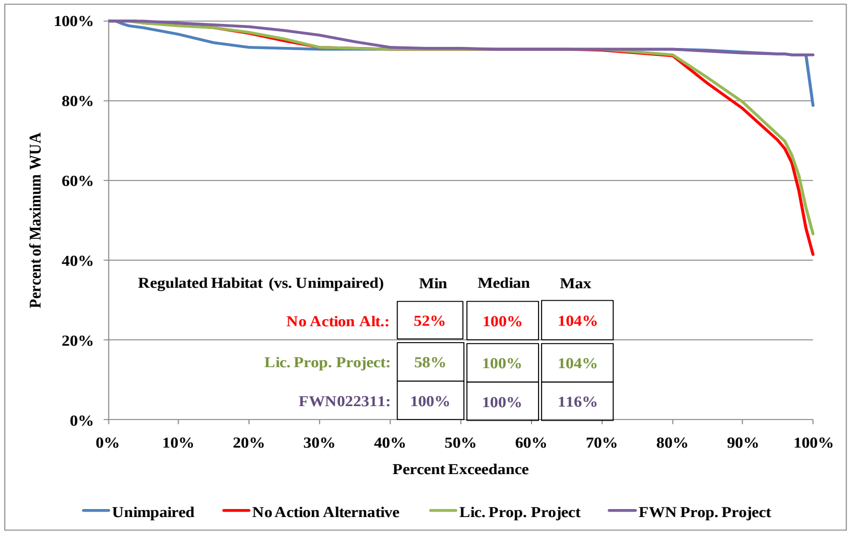


April – Node 3 – SYR Poorman Creek Reach

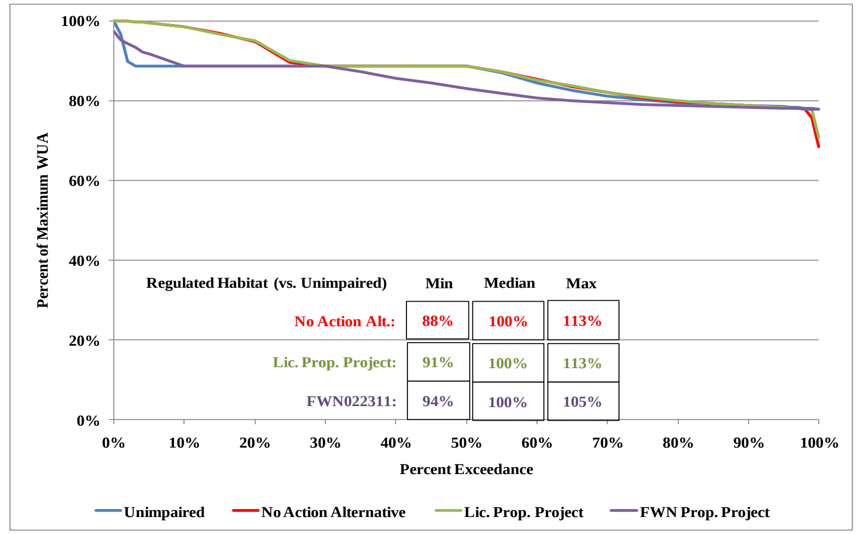


April – Node 4 – SYR Humbug Creek Reach

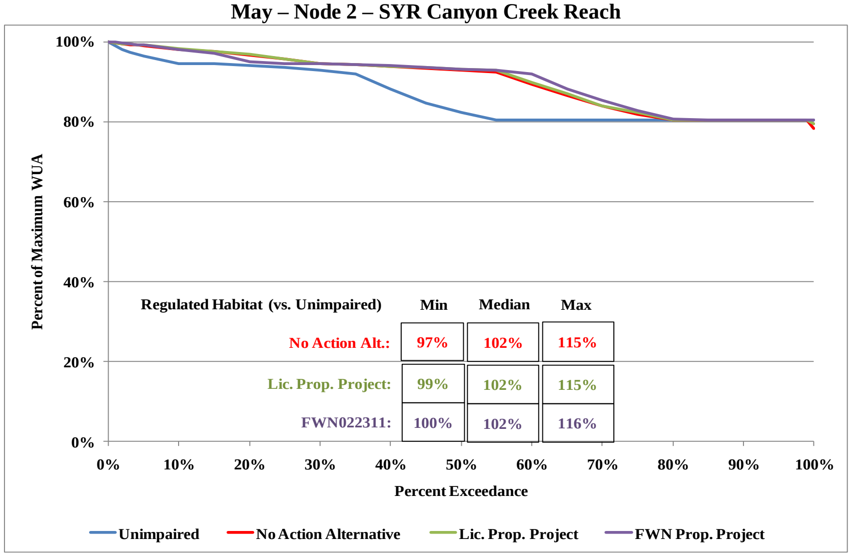
Figure 6.3.3-9g. HEA for adult rainbow trout during the month of April in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



May – Node 2 – SYR Canyon Creek Reach

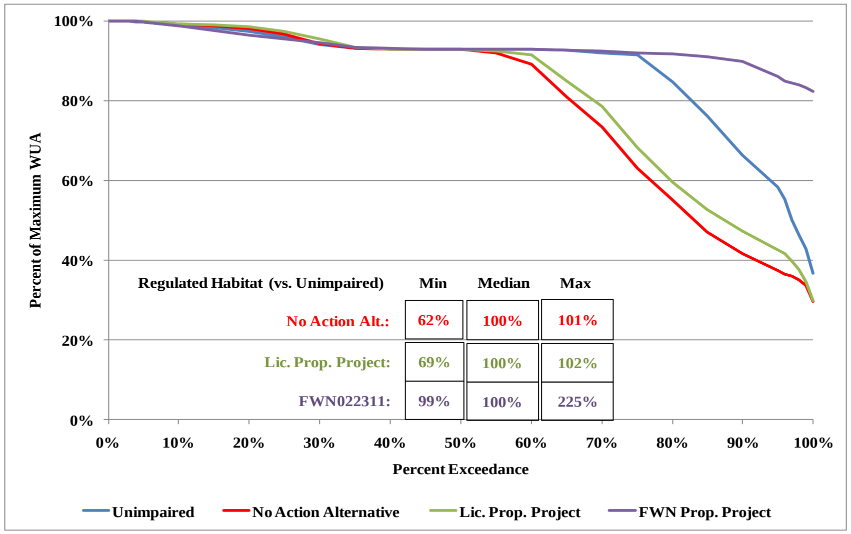


May – Node 3 – SYR Poorman Creek Reach

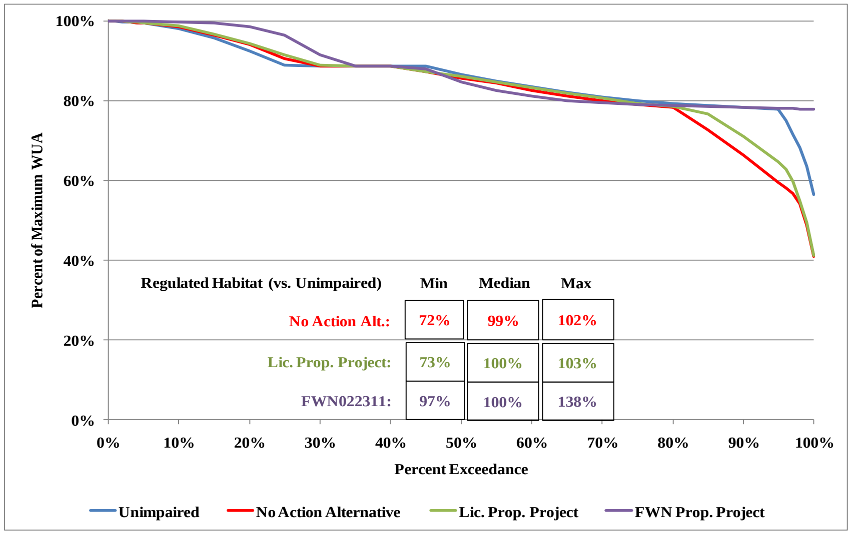


May – Node 4 – SYR Humbug Creek Reach

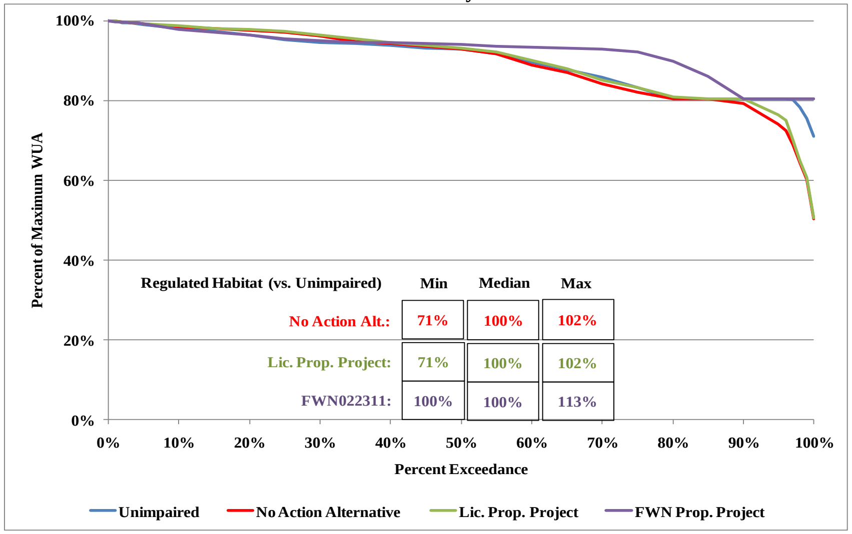
Figure 6.3.3-9h. HEA for adult rainbow trout during the month of May in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



June – Node 2 – SYR Canyon Creek Reach

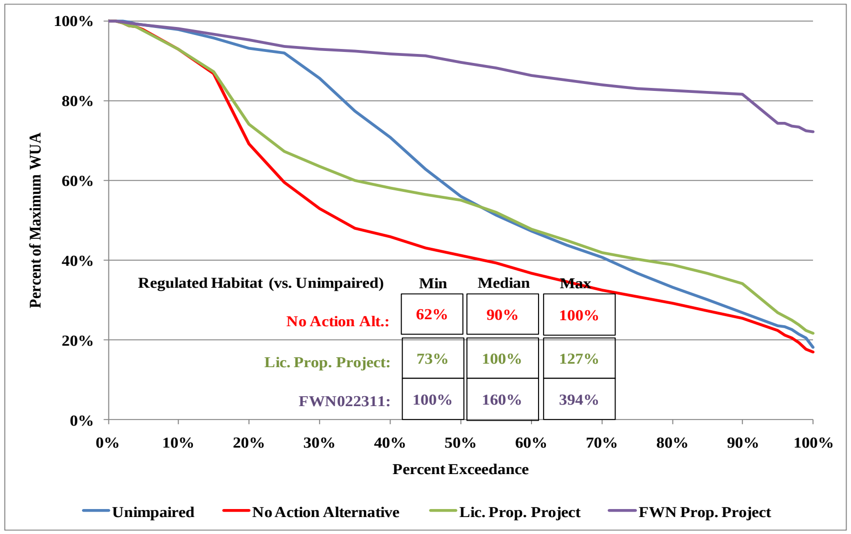


June – Node 3 – SYR Poorman Creek Reach

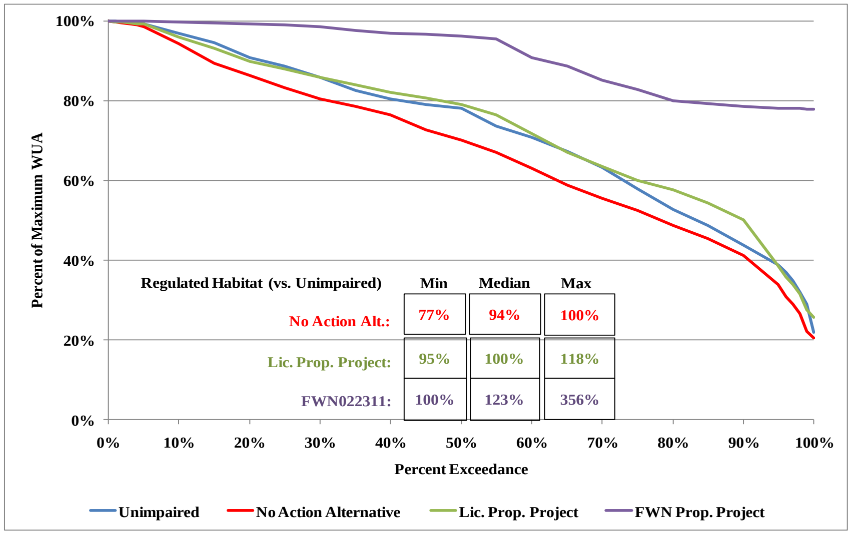


June – Node 4 – SYR Humbug Creek Reach

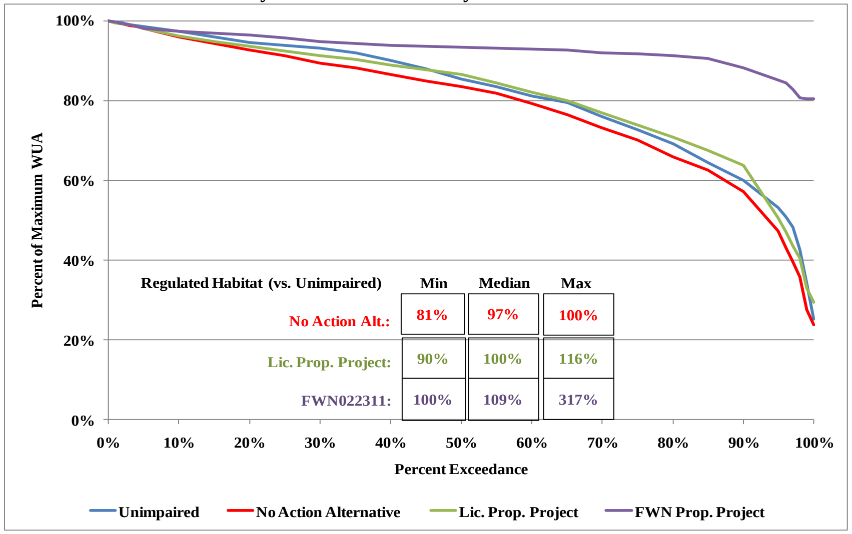
Figure 6.3.3-9i. HEA for adult rainbow trout during the month of June in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



July – Node 2 – SYR Canyon Creek Reach

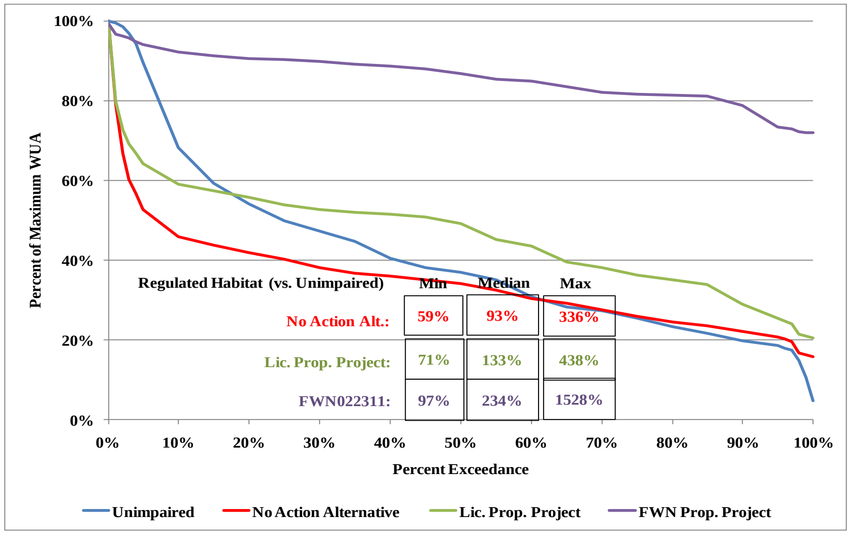


July – Node 3 – SYR Poorman Creek Reach

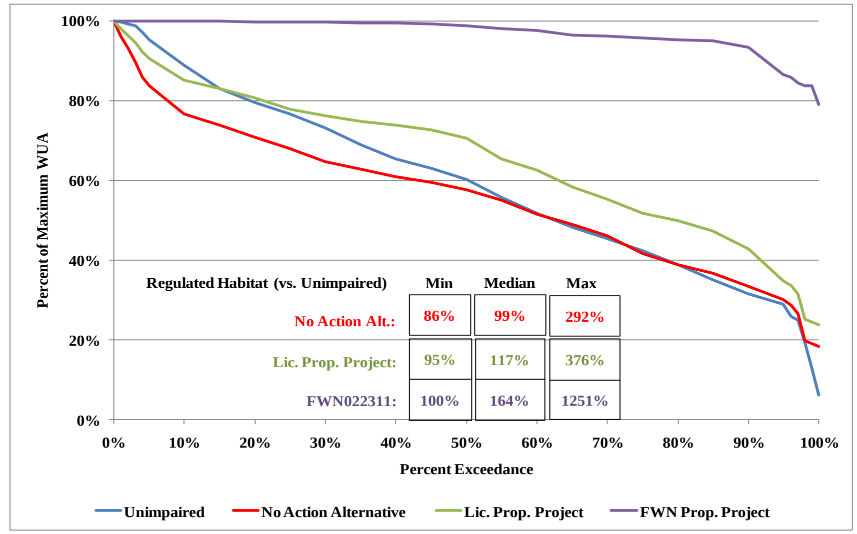


July – Node 4 – SYR Humbug Creek Reach

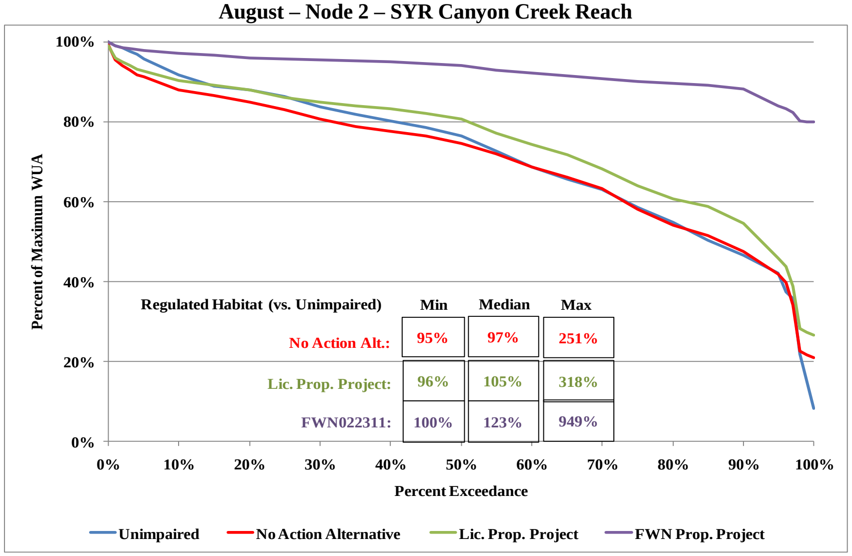
Figure 6.3.3-9j. HEA for adult rainbow trout during the month of July in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



August – Node 2 – SYR Canyon Creek Reach

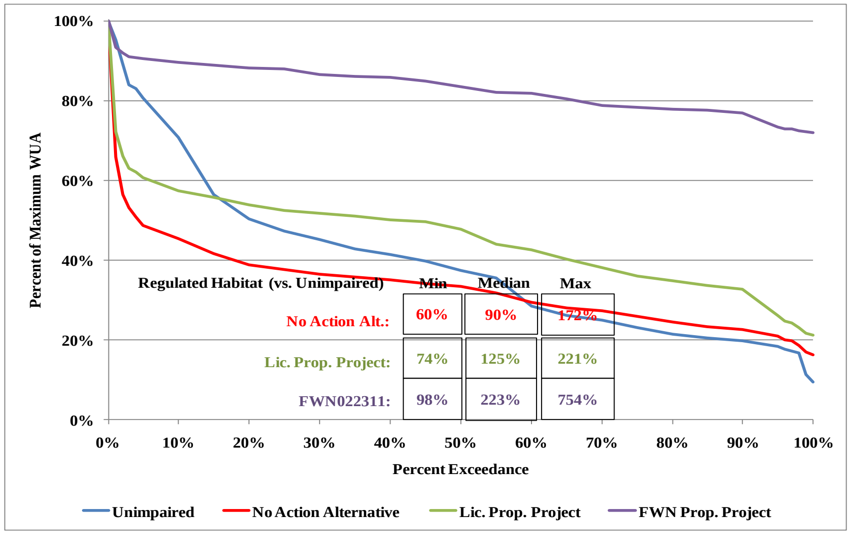


August – Node 3 – SYR Poorman Creek Reach

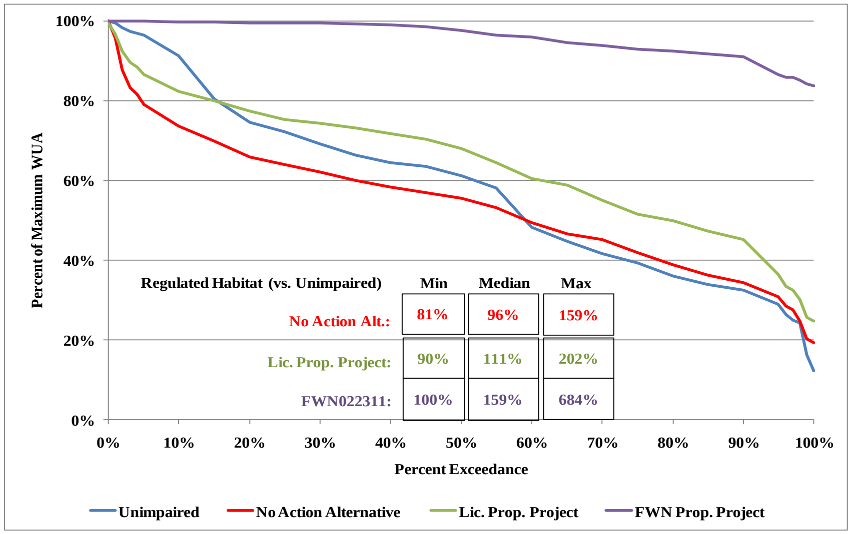


August – Node 4 – SYR Humbug Creek Reach

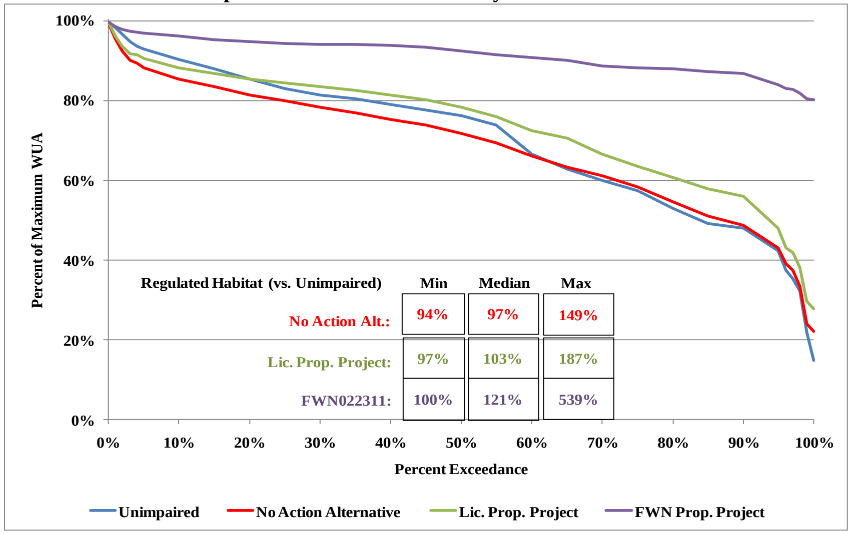
Figure 6.3.3-9k. HEA for adult rainbow trout during the month of August in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.



September – Node 2 – SYR Canyon Creek Reach



September – Node 3 – SYR Poorman Creek Reach



September – Node 4 – SYR Humbug Creek Reach

Figure 6.3.3-9l. HEA for adult rainbow trout during the month of September in Canyon Creek Sub-Reach (Node 2), Poorman Creek Sub-Reach (Node 3) and Humbug Creek Sub-Reach (Node 4), South Yuba River.

Figure 6.3.3-9 (above) is summarized in Table 6.3.3-1 below, which compares the amount of adult rainbow trout habitat that would occur under the No-Action Alternative and Licensees' Proposed Projects. The table shows that, in most cases and for the majority of the time, the amount of habitat in both cases that would occur is 70 to 80 percent of unimpaired flow conditions, and often greater than 100 percent.

Table 6.3.3-1. Comparison of rainbow trout habitat under NID's and PG&E's Proposed Projects and No-Action Alternative flow conditions in the South Yuba River between Canyon Creek and USACE's Englebright Reservoir.

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
CANYON CREEK SUB-REACH						
No-Action Alternative	52% (Apr & May)	76% (Dec)	100% (Multiple Months)	65% (Oct)	102% (Apr)	336% (Aug)
Licensees' Proposed Projects	54% (Apr)	89% (Dec)	102% (Jun)	75% (Oct)	133% (Aug)	438% (Aug)
POORMAN CREEK SUB-REACH						
No-Action Alternative	72% (Jun)	91% (Nov)	100% (Dec & Jul)	92% (Apr)	104% (Mar)	292% (Aug)
Licensees' Proposed Projects	73% (Jun)	98% (Nov)	101% (Dec)	95% (Multiple Months)	117% (Aug)	376% (Aug)
HUMBUG CREEK SUB-REACH						
No-Action Alternative	71% (Jun)	95% (Nov)	100% (Multiple Months)	99% (Apr)	103% (Apr)	251% (Aug)
Licensees' Proposed Projects	71% (Jun)	98% (Dec)	101% (Dec)	100% (Apr)	105% (Aug)	318% (Aug)

6.3.3.2 Increased Water Deliveries

To assess the cumulative effects of NID's and PG&E's Proposed Projects and projected water deliveries on aquatic resources, Licensees modeled the Proposed Projects with projected future (2062) water deliveries and compared the model results to the results of the Licensees' Proposed Projects, which assumed existing water deliveries. A summary of the model scenarios is provided in Section 3 (Cumulative Effects) of this Exhibit E.

Comparing the two model results, Licensees found that in 2062, the elevation of major Project reservoirs in summer would be lower than they are today, and the reduction is attributable to increased water supply delivery. Licensees' proposed minimum flow and reservoir pool requirements have a minor effect when compared to the effects of Projected Future (2062) Water Deliveries. See Section 6.2 (Water Resources) of this Exhibit E for a detailed summary of these anticipated reservoir impacts.

Licensees also compared the HEA habitat that would occur under Licensees' Proposed Projects with existing water deliveries and HEA habitat that would occur under Licensees' Proposed Projects with projected future (2062) water deliveries. Tables 6.3.3-2 through 6.3.3-4 provide a comparison of rainbow trout habitat under Licensees' Proposed Projects with existing water deliveries and projected future (2062) water deliveries in the Middle Yuba River below Milton Diversion Dam, South Yuba River below Lake Spaulding Dam and the Bear River below the Bear River Canal Diversion Dam. In general, rainbow trout habitat in the Middle and South Yuba rivers is unchanged because minimum streamflows are unchanged. In comparison, in the

Bear River, rainbow trout habitat increases slightly due to a reduction in high stream flows during some winter and spring months.

With regard to water temperature, conditions in the Middle and South Yuba rivers are not anticipated to be substantially affected by reservoir operation changes caused by increased consumptive water deliveries. The Bear River below Bear River Canal Diversion Dam will likely be warmed by several degrees in drier than normal water years under projected future (2062) water deliveries, due to reduced late summer reservoir levels in Rollins Reservoir which will result in epilimnetic waters being introduced into the low level/power intake into the Bear River Canal Diversion Impoundment.

Table 6.3.3-2. Comparison of rainbow trout habitat under NID's and PG&E's Proposed Projects with existing water deliveries and Projected (2062) water deliveries in the Middle Yuba River below Milton Diversion Dam (Nodes 1, 2 and 3).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Licensees' Proposed Projects with Existing Water Deliveries	67% (Jun, Node 2)	97% (Dec, Node 2)	102% (Multiple Months, Multiple Nodes)	100% (Multiple months, Node 3)	114% (Multiple Months, Multiple Nodes)	301% (Sep, Node 2)
Licensees' Proposed Projects with Projected Future (2062) Water Deliveries	67% (Jun, Node 2)	97% (Dec, Node 2)	102% (Multiple Months, Multiple Nodes)	100% (Multiple months, Node 3)	114% (Multiple Months, Multiple Nodes)	301% (Sep, Node 2)

Table 6.3.3-3. Comparison of rainbow trout habitat under NID's and PG&E's Proposed Projects with existing water deliveries and Projected (2062) water deliveries in the South Yuba River below Lake Spaulding Dam (Nodes 2, 3 and 4).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Licensees' Proposed Projects with Existing Water Deliveries	54% (Apr, Node 2)	89% (Dec, Node 2)	101% (Dec, Node 3&4)	100% (Apr, Node 4)	133% (Aug, Node 2)	438% (Aug, Node 2)
Licensees' Proposed Projects with Projected Future (2062) Water Deliveries	54% (Apr, Node 2)	89% (Dec, Node 2)	101% (Multiple Months, Multiple Nodes)	100% (Apr, Node 4)	133% (Aug, Node 2)	438% (Aug, Node 2)

Table 6.3.3-4. Comparison of rainbow trout habitat under NID's and PG&E's Proposed Projects with existing water deliveries and Projected (2062) water deliveries in the Bear River below Bear River Canal Diversion Dam (Nodes 1 and 2).

Flow Condition	Lowest Value and Month			Highest Value and Month		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Licensees' Proposed Projects with Existing Water Deliveries	55% (Mar, Node 1)	85% (Dec, All Nodes)	100% (Multiple Months, Node 1 & 2)	100% (Multiple Months, Node 1 & 2)	166% (Aug, Node 2)	1457% (Aug, Node 1)
Licensees' Proposed Projects with Projected Future (2062) Water Deliveries	66% (May, Node 2)	89% (May, Node 2)	101% (Apr & May, Node 1 & 2)	99% (Sep & Oct, Node 2)	166% (Sep, Node 2)	1206% (Aug, Node 1)

6.3.3.3 Auburn Ravine

The effect of the Drum-Spaulding Project on aquatic resources in Auburn Ravine, when taken in combination with past, present and reasonably foreseeable future actions is discussed in Section 6.5 of this Exhibit E.

6.3.4 Proposed Measures

6.3.4.1 Yuba-Bear Hydroelectric Project

6.3.4.1.1 <u>NID's Proposed Measures</u>

NID has included in its proposed Project the following 14 measures related to aquatic resources:

- Proposed Measure YB-GEN1: Annual Consultation with Forest Service and BLM
- Proposed Measure YB-GEN2: Employee Training
- Proposed Measure YB-GEN3: Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land
- Proposed Measure YB-GEN4: Consultation Regarding New Ground Disturbing Activities on Federal Land
- Proposed Measure YB-GEN5: Consultation Regarding New Facilities on Federal Land
- Proposed Measure YB-GEN6: Coordinated Operations between the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project,
- Proposed Measure YB-AR1: Streamflows (includes minimum flow and ramping rates)
- Proposed Measure YB-AR2: Fish Stocking in Bowman Lake
- Proposed Measure YB-AR3: Jackson Meadows Reservoir Minimum Pool
- Proposed Measure YB-AR4: Milton Diversion Impoundment Normal Pool
- Proposed Measure YB-AR5: Rollins Reservoir Minimum Pool
- Proposed Measure YB-AR6: Faucherie Lake Minimum Pool
- Proposed Measure YB-AR2: Fish Stocking in Rollins Reservoir
- Proposed Measure YB-TR2: Implement Invasive Species Management Plan

Refer to Appendix E3 for the full text of each measure. Management plans are included in Appendix E4.

6.3.4.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Provide Increased Streamflows

FWN recommended in its letter a general minimum instream flow schedule that included water temperature targets in the Middle Yuba River, South Yuba River and Canyon Creek and shaping the descending limb of the spring hydrograph.

In general, FWN recommended:

> The NID FLA should include higher minimum flows [in Canyon Creek below Bowman Dam and Bowman-Spaulding Diversion Dam] than those proposed in the DLA. (pp. 50-51)
>
> The NID FLA should include higher instream flows for the Middle Yuba River below Milton Diversion Dam than those proposed in the DLA. (p. 52)
>
> The NID FLA should increase minimum instream flows to increase wetted perimeter in Upper Milton Diversion reach in order to enhance Macroinvertebrates. (p. 53)
>
> Higher instream flows also inundate riparian vegetation and reduce riparian encroachment to enhance FYLF breeding sites on open cobble bars. (p. 53)
>
> The PG&E [*sic*] FLA should include higher minimum instream flows [in the Dutch Flat Afterbay Dam Reach] than those proposed in the DLA. (p. 58)
>
> NID's FLA should include higher minimum instream flows [in the Chicago Park Powerhouse Reach] than proposed in the DLA in order to enhance rainbow trout life stages. (p. 59)
>
> The NID FLA should include minimum instream flows for the Bear River below Rollins that are higher than those proposed in its DLA. (p. 59)

With respect to water temperature, FWN proposed:

Increased minimum streamflows should meet the following temperature thresholds in Canyon Creek:

Water Year Type	Months	Temperature	Compliance Point
All water year types	July – September	19 degrees C average daily temperature	Confluence with South Yuba

(p. 51)

The NID FLA should develop a minimum instream flow measure for the Middle Yuba River below Milton that meets the following temperature criteria:

Water Year Type	Months	Temperature	Compliance Point
Wet, AN, Below Normal, and Dry	July – September	19 degrees C average daily temperature	5 miles downstream of Wolf Creek confluence with the Middle Yuba River
Critically Dry and Extreme Critical Dry	July – September	19 degrees C average daily temperature	Wolf Creek confluence

(p. 52)

The NID FLA should include minimum instream flows for the Bear River below Rollins that are higher than those proposed in the DLA.

The minimum instream flows should meet the following temperature criteria to meet the SWRCB Basin designation of this reach as coldwater reach:

Water Year Type	Months	Temperature	Compliance Point
All Water Year Types	July – September	18 degrees C average daily temperature	To be determined

(p. 59)

For the descending limb of the spring hydrograph, FWN proposed:

The PG&E and NID FLA's should include flows and recession rates to more closely resemble the spring snowmelt hydrograph in specific stream reaches. PG&E and NID should expand the approach outlined below for the South Yuba River below Spaulding Reservoir into a "Snowmelt Recession Analysis and Design." The licensees should conduct similar analyses on the Middle Yuba River below Milton Diversion Dam, on Canyon Creek below Bowman Dam, and Bear River Reach #2. The analysis should be conducted collaboratively among Relicensing Participants. (p. 32)

> Recent analysis by scientists at University of California at Davis suggests that a 9% per day recession rate is the limit for flow changes that is protective of Foothill Yellow-Legged Frogs (FYLF). Therefore, we recommend that PG&E and NID FLA's include measures that allow the snowmelt recession limb to recede at 9%/day on appropriate reaches. (p. 40)
>
> The FLA should include measures for Canyon Creek that provide a spring snowmelt recession rate as generally described in section 5.5 to enhance existing FYLF populations observed in FYLF VES Study Results on Canyon Creek below Texas Creek at RM 1.2 Little Canyon Creek confluence (CC-1). (p. 51)

Subsequent to filing of its comment letter, FWN stated that it could provide a more detailed flow proposal that would incorporate the concepts in FWN's DLA comment letter and that would supersede FWN"s flow proposal request in its comment letter. Licensees agreed to consider the more detailed flow proposal, which was provided to Licensees on February 24, 2011, at analyze the flow proposal in their Exhibit E. Refer to Appendix E12 for FWN's detailed flow proposal and Licensees' Operations Model scenario run of the proposal.

NID has not adopted FWN's Flow Proposal in its Proposed Project for one main reason – the environmental benefits are not consistent with the impacts on water deliveries and power generation. Table 6.3.4-1 presents a comparison of the minimum habitat, by Project-affected reach and as compared to unimpaired conditions that would result from both NID's Proposed Project and FWN's Flow Proposal. While FWN's Flow Proposal provides measurable levels of "minimum habitat" improvement in the Milton Diversion Dam and Bowman-Spaulding Canal Diversion Dam reaches (6% and 13% improvements, respectively), their flow proposals in the Middle Yuba River, Canyon Creek and South Yuba River have the indirect effect of threatening the sustainability of habitat in the Bear River, as shown by the 44 percent reduction in "minimum habitat" projected to occur in the Bear River Canal Diversion Dam Reach.

Table 6.3.4-1. Amount of habitat by reach that would result from NID's proposed minimum streamflows as compared to habitat that would occur under FWN's flow proposal.

Reach	Minimum Amount of Habitat in Any Month Resulting from NID's and FWN's Proposed Minimum Streamflows as Compared to the Minimum Habitat in Any Month That Would Occur Under Unimpaired Flow Conditions	
	NID's Proposed Project	FWN's Flow Proposal
Milton Diversion Dam Reach	67% (Node 2, June)	73% (Node 2, May)
Bowman-Spaulding Canal Diversion Dam Reach	74% (Node 1, August)	87% (Node 1, December)
Bear River Canal Diversion Dam Reach	55% (Node 1, March)	11% (Node 1, November)

NID considers the water delivery and power generation costs for these mixed environmental impacts to be too great. As described in Section 3.6.2.3, under FWN's Flow Proposal, water deliveries are affected in almost every year in the period of record, reservoir elevations are considerably lower in many of the major project reservoirs, and the Project's power generation is reduced by 23.2 percent.

Mimic Spring Snowmelt Recession Rates

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that a ramping rate proposal matching typical snowmelt recession rates should be discussed:

> The resource agencies would like to discuss a ramping rate proposal that, when feasible, ramp down of flows during the spring snowmelt period be done with the goal of mimicking natural runoff conditions. In the resource agencies' opinion, these rates are best determined by reviewing unimpaired hydrology and developing seasonally appropriate measures. Unimpaired flows differ seasonally (fall, winter, spring) in flow pattern (shape and timing) and provide different geomorphologic and biological benefits (Yarnell et al. 2010). Based on analyses of unimpaired Sierran rivers conducted by agency and university biologists and hydrologists, typical spring (May-June) snowmelt recession rates are on the order of 1 foot over 3 weeks (Yarnell, Epke, Lind, pers. comm.). This rate would be protective of foothill yellow-legged frog egg masses laid during this time period. (p. 116)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measures, or for NID to estimate the cost associated with implementing it.

NID has not included in its proposed Project a general measure related to spring snowmelt recession rates for the following reasons. Although the agencies have not described procedures to achieve the desired results, the conceptual approach would entail substantially increased base flows (higher releases from Project reservoirs) with the expected result of reducing effects of spill events. NID has included in its proposed Project increased minimum instream flow releases in three stream reaches where FYLF occurs: the Middle Yuba River downstream of Milton Diversion Dam, Canyon Creek downstream of Bowman-Spaulding Diversion Dam and Bear River downstream of Dutch Flat Afterbay. NID has considered the potential effects on FYLF in the development of the proposed flows and has attempted to balance protection of FYLF with that of other resources and operational constraints.

NID's studies demonstrate that natural accretion during springtime is the dominant source of flows in areas where FYLF is known to occur on the Middle Yuba River, locations that are more than 13 mi downstream of the Milton Diversion Dam. As such, accretion is also an uncontrollable source of stage change. Additionally, the fact that this accretion is unimpaired provides the natural snowmelt recession shape to the flows on the lower Middle Yuba River where FYLF occurs. This reach also has significant operational restrictions which must be considered in implementing flows. The spillway at Milton Diversion Dam is not gated, and controllable only indirectly by inflow to the Milton Diversion Dam Impoundment (via releases from Jackson Meadows Reservoir) and outflow to the Middle Yuba River and Milton-Bowman tunnel. Spills are inherently difficult, if not impossible, to control using Project facilities. Other than the spillway, Project facilities for controlled release control flows at a different order of magnitude of flows than the spillway – spill flows may be in the hundreds or thousands of cfs, while typical controlled releases (and therefore low-level outlet controls) are in the range of tens of cfs. Consequently, upon cessation of spill flows, flows can only be released at a comparatively low level, not at the high amounts needed to create a sustained transition from higher flows to base flows.

On Canyon Creek FYLF were found only well downstream of the controlling structure where there is some natural accretion. However, accretion flows are not as substantial here as on the Middle Yuba River. NID has proposed increased flows for fish which also provide good habitat for FYLF, and the increased instream flows will have the effect (generally) of decreasing spill magnitude, duration, and total amount of water spilled to Canyon Creek. NID believes that the proposed flows effectively consider potential effects on FYLF and balance protection of FYLF with that of other resources. NID does not believe that additional measures to increase Project releases on this reach in spring are warranted or compatible with other resource requirements. Additionally, Project facilities for controlled release control flows are at a different order of magnitude of flows than the spillway at Bowman Lake – spill flows may be in the hundreds or thousands of cfs, while typical controlled releases (and therefore low-level outlet controls) are in the range of tens of cfs. Consequently, upon cessation of spill flows, flows can only be released at a comparatively low level, not at the high amounts needed to create a sustained transition from higher flows to base flows.

FYLF survey results suggest that FYLF breeding on the Bear River Canal Diversion Dam Reach is infrequent and suitable low velocity edgewater habitat was limited in extent at survey sites – no egg masses were found. In addition, Bear River Canal Diversion Dam Reach appears to have substrate limitations for successful breeding. The substrate composition of the 2-D modeling site is dominated by gravels, with only small pockets of the highly suitable boulder and cobble substrate classes. NID has proposed to maintain its existing minimum instream flow schedule, and feels that these flows also provide good habitat for FYLF. NID believes that the continuation of these flows effectively consider potential effects on FYLF and balance protection of FYLF with that of other resources. NID does not believe that additional measures, such as a ramping rate in spring, are warranted.

Monitor Fish and Aquatic Macroinvertebrates

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID monitor stream fish and macroinvertebrates:

> The proposed measures do not appear to include monitoring. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of proposed measures. The resource agencies would like to further discuss monitoring and provide the

> following list of potential items that may need to be monitored to assist in that discussion.
>
> - Stream Fish Populations
> - Aquatic Macroinvertebrates
>
> (pp. 51 & 52)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended monitoring plans, or for NID to estimate the cost associated with implementing them.

NID has not included in its proposed Project a general measure related to monitoring fish populations because fish populations within the Project were determined to be in relatively good condition under existing conditions, and NID's proposed measures will improve conditions. Agencies have not provided any specific evidence to support that monitoring, at any level, would be beneficial or provide additional protection to the resource potentially affected by the Project. Also, the agencies have provide no evidence to suggest that, even as a general concept, fish monitoring as part of any new license has ever resulted in additional protection for the resource.

NID has not included in its proposed Project a general measure related to monitoring aquatic macroinvertebrates. As a general comment, the agencies have provided no evidence and NID aware of no evidence that suggests aquatic macroinvertebrate monitoring in the hydro project has ever led to improved protection for the resource. In the case of the Project, Licensees' study showed that aquatic macroinvertebrate populations were in generally good condition under existing conditions, and NID's proposed Project will improve conditions. Therefore, NID does not see a need for monitoring.

Stock Fish in Bowman Lake and Rollins Reservoir

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID stock fish in Bowman Lake and Rollins Reservoir:

> The licensee will fund the stocking of fish in Bowman and Rollins Reservoirs on an annual basis during the term of the new license. The fish stocking program will be supported at a rate equivalent to 100 percent of CDFG's annual management target in the reservoirs or 100 percent of the historical average stocking into these reservoirs, whichever is less. Fish species and size class stocking targets shall be determined by CDFG. (p. 53)

NID included in its DLA a measure for fish stocking in Bowman Lake. The agencies have not described why NID's measure is inadequate for Bowman Lake, nor have they provided any evidence to suggest that the agencies' measure would provide, in combination with or instead of NID's measure, any additional protection to the resource. The main difference between the two measures is that NID's measure provides certainty – NID, upon evidence of stocking, would reimburse CDFG for stocking up to current levels. The agencies measure references undefined "historic levels," and does not include a mechanism for confirming that stocking has occurred.

Even through the agencies provide no justification of estimate of cost for its proposal regarding fish stocking in Rollins Reservoir, NID has generally adopted the agencies' recommendation and included it in NID's proposed Project (YB-AQR7). However, NID's measure is more specific than the agencies in that it sets known limits and a mechanism for evidence of stocking.

Use NAIP Protocol for New or Problem Culverts for Fish and Amphibian Passage

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID use NAIP criteria to address any new or problem culverts for fish or amphibian passage:

> The resource agencies also included a request in the transportation section that we would like to discuss including in the Transportation Management Plan post-license monitoring of aquatic species, using a protocol agreed upon by relicensing participants to evaluate problem culverts and determine how to repair them. For discussion purposes, the following protocol is available: National Inventory and Assessment – For Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings. U.S. Department of Agriculture Forest Service National Technology and Development Program, 444 E Bonita Avenue, San Dimas, CA 91773. (p. 25)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing it.

NID has included in its proposed Transportation Management Plan a measure for evaluating and repairing culverts associated with Project roads to enable fish passage, but NID has not included measures for passage by amphibians or other organisms through culverts for two reasons. First, there are no existing NIAP models to design culverts that allow amphibian passage. Second, the agencies have provided no evidence to suggest that amphibians that may occur in the Project area streams are not fully capable of overland movement following metamorphosis from the larval stage. These species do not require culverts for upstream movement.

Monitor and Manage for Sierra Nevada Yellow-Legged Frog

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that a monitoring plan and watershed plans be developed for SNYLF.

> The resource agencies propose that licensees work with CDFG to develop basin (watershed) plans for protecting and enhancing SNYLF. (p.117)

> A monitoring plan that focuses on the response of SNYLF populations to any changes in fish stocking, fish distribution and recreational use is needed. (p. 117)

The agencies have provided insufficient detail for NID to analyze the scope of the recommended measure, or for NID to estimate the cost associated with implementation.

NID has not included in its proposed Project measures for monitoring and managing SNYLF because the plans are not warranted and include aspects that are clearly the responsibility of resource agencies. The current status of SNYLF is largely attributable to the introduction of fish into areas where fish did not occur historically. NID did not and does not stock fish and decisions regarding future fish stocking will not be made by NID. SNYLF is known to occur in the proximity of only one Project facility, French Lake, where the species was found at ponds and a small stream south of the reservoir. The overall level of Project-related recreation use at French Lake is very low outside of some hike-in/backpack camping along the shoreline on NID land around the dam. NID's study documented less than 1 campsite per weekend and roughly 1 vehicle per weekend at the gate over the course of the 2009 season (July-Sept). Overall, this site experiences very low use (estimated 360 Recreation Days). There are no formal trails and no recreation facilities that would attract recreationists at the places where SNYLF occurs south of French Lake. CDFG has developed a draft watershed management plan (Kundargi and Hanson 2005) that recommends continued fish stocking at French Lake. NID believes that development of such plans, and the gathering of information to support the plan, is properly the responsibility of the agency with jurisdiction over the resource.

Monitor Western Pond Turtle

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID develop and implement a monitoring plan for WPT.

> Work with relicensing participants to develop a proposal to collect adequate data to assess project effects on Western Pond Turtle. (p. 2)
>
> More information is needed about the distribution, abundance, and age structure of WPT. Based on work in other portions of WPT's range (e.g., northern California) low water temperature negatively affect WPT growth and reproduction (Welsh, Ashton, Bettaso pers. comm). WPT also makes significant overland movements for nesting (summer) and overwintering (fall/winter). Thus project roads and canals that parallel rivers may impede these movements and/or result in entrainment of WPT. (p. 8)
>
> The DLA provides no measures which address the above issues for WPT – especially low water temperatures resulting from low outlet releases from reservoirs and canals that may disrupt seasonal movements of WPT. In addition, a monitoring plan for WPT is needed. This plan should first address the collection of additional information on WPT distribution,

> abundance, and age structure and then establish appropriate monitoring methods for this species to determine if changes in the new license are protecting and enhancing populations of this species. (p. 118)

The agencies have provided insufficient detail for NID to perform in depth analysis of the recommended monitoring plan, or for NID to estimate the cost associated with implementation.

NID has not included in its proposed Project measures for monitoring WPT for two reasons. First, NID does not agree that inclusion of such a plan for WPT, which would entail essentially a new study, is warranted because existing information is sufficient. NID has performed two studies for WPT which were developed in collaboration with agencies and other Relicensing Participants. The first study was largely based on gathering incidental observations of WPT, but also included an assessment of the potential for Project canals to affect WPT overland movement. In the second study, NID performed field surveys to document whether WPT occurs on one stream reach affected by the Yuba-Bear Hydroelectric Project - the Middle Yuba River downstream of Milton Diversion Dam (6 survey sites); and two stream reaches affected by the Project and by the Drum-Spaulding Project, Canyon Creek downstream of Bowman-Spaulding Diversion Dam (2 survey sites), and South Yuba River downstream of Spaulding Dam (10 survey sites). The agencies did not at any time request or recommend surveys at other specific locations. The two studies indicated that WPT occurs in four stream reaches affected by the Project. A single WPT was found in the lowermost Middle Yuba River about 29 mi downstream of Milton Diversion Dam; five WPT were found in the South Yuba River about 42 mi downstream of Spaulding Dam; two WPT were found downstream of Dutch Flat Afterbay; and five WPT (and one unidentified turtle) were found downstream of Rollins Reservoir (including sightings in tributaries). Although the studies do not indicate the size or demography of WPT populations, NID believes they are sufficient to show the general pattern of WPT occurrence in relation to the Project.

Second, and most importantly, NID believes that the need for monitoring should be commensurate to the potential of the Project to affect the resource. The agencies suggest WPT may be adversely affected by low water temperatures and that Project roads and canals that parallel streams may impede overland movement by WPT and/or result in entrainment of WPT. However, the influence of the Project on stream temperatures where WPT occurs is negligible or not detectable (e.g., in the lower Middle Yuba River). Furthermore, the agencies have indicated elsewhere that warm water temperatures are not compatible with temperature objectives for stream fish. Agencies have not provided any evidence to support that Project roads pose barriers to WPT overland movements. The three Project canals within the potential distribution of WPT (i.e., the elevation range of this species), Bowman-Spaulding Conduit, Dutch Flat No. 2 Conduit, and Chicago Park Conduit, have a potential to affect WPT movements, but NID believes that this potential is low. The Bowman-Spaulding Conduit is situated along a steep slope in an area where there are no known occurrences of WPT and little potential habitat. Dutch Flat No. 2 Conduit parallels the Bear River, but follows a steep, rocky slope where WPT overland movements are improbable. Chicago Park Conduit is situated in areas that are not as steep and Licensee documented an instance of entrainment (i.e., a WPT unable to climb the steep sides of the conduit and subsequently swept down the canal, presumably to Chicago Park Forebay, where it might have been able to escape). It is unclear what pertinent information relative to these potential Project effects would be generated by a WPT monitoring plan.

Evaluate and Manage Recreation Use for Protection of Sierra Nevada Yellow-Legged Frog

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID evaluate and manage recreational use that may affect SNYLF and provide public information to reduce the spread of amphibian chytrid fungus.

> Licensees should evaluate recreational use in the vicinity of SNYLF populations and work with FS to provide for the appropriate level of use at key sites occupied by SNYLF. (p. 117)
>
> At the recreational sites they manage, licensees should provide public education on reducing the spread of amphibian chytrid fungus and should engage in practice of cleaning project equipment that is used in or near multiple water bodies (boots, waders, nets, etc.). (p. 117)

The agencies have provided insufficient detail for NID to perform in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementation.

NID has not included in its proposed Project measures for evaluating and managing recreation in regards to SNYLF. NID has already performed a recreation study that evaluated levels of recreation use at French Lake, the only Project facility near a SNYLF population. It is unclear what additional steps the agencies may be suggesting. Currently, Project facilities and recreation improvements associated with French Lake do not attract recreationists to locations where SNYLF occurs and recreation use is kept very low by a locked gate on the access road, which requires that visitors walk to the reservoir. Regarding future recreation use, NID will respect and implement specific recommendations for access restrictions that resource agencies consider warranted for SNYLF protection.

SNYLF has not been documented directly at any Project facilities; however, NID will engage in appropriate decontamination procedures at Project facilities where SNYLF is documented during the term of the new license. These procedures would be implemented under Employee Training described in Section 6.3.2.1.1. NID will also post educational materials at the information boards of recreational sites near SNYLF occurrences (i.e. French Lake) related to reducing the spread of amphibian chytrid fungus as provided by CDFG and/or Forest Service.

Develop and Implement Program to Prevent Introduction of Non-Native Mussel Species

The Forest Service, BLM, NPS and CDFG wrote in their joint letter (YBDS-42):

> However, Fish and Game code requires that, where recreational, boating, or fishing activities are permitted, the owner of the reservoir must develop and implement a program designed to prevent the introduction of

> nonnative dreissenid mussel species (Cal. Fish & Game Code § 2302). (p.26)
>
> These plans should incorporate state-approved monitoring and inspection procedures and should be submitted to the resource agencies for comment prior to institution. (p. 26)

The agencies have provided insufficient detail for NID to perform in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementation.

NID has not included in its proposed Project a specific invasive aquatic species management plan because the Invasive Species Management Plan (Proposed Measure YB-TR2) provides guidelines for the management of aquatic invasive species, including dreissenid mussel species. The agencies recommendations for aquatic invasive species management have been incorporated into this plan. An additional plan is unnecessary.

6.3.4.2 Drum-Spaulding Project

6.3.4.2.1 PG&E's Proposed Measures

PG&E has included in its Proposed Project the following five measures related to aquatic resources:

- Proposed Measure DS-GEN1: Annual Consultation with Forest Service, BLM and BOR
- Proposed Measure DS-AQR1: Streamflows (Part 1: Minimum and Target Streamflows; Part 2: Water Year Type; Part 3: Consecutive Dry Water Years; Part 4: Ramping Rates; Part 5: Streamflow Measurements)
- Proposed Measure DS-AQR2: Fordyce Lake Minimum Pool
- Proposed Measure DS-AQR3: Fish Stocking in Lake Spaulding
- Proposed Measure DS-TR1: Develop and Implement Integrated Vegetation Management Plan

Refer to Appendix E7 for the full text of each measure and the associated rationale statement.

6.3.4.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the eight (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as required by the regulations. However, some commenters made requests or proposals that provided PG&E with enough information that PG&E could address at least components of the request (including whether the proposal was consistent with study results). Below PG&E has made its best effort to capture each of these proposals (and PG&E's response to each proposal) that relate to this resource area.

Provide Increased Streamflows[21]

FWN made numerous recommendations in its February 1, 2011 letter regarding minimum instream flows:

> The PG&E FLA should include higher minimum instream flows [in the South Yuba River below Spaulding Dam] than in the DLA. (p. 46).
>
> The PG&E FLA should include higher minimum instream flows than those proposed in the DLA. (p.58).
>
> The PG&E FLA flow magnitudes and temperatures should protect FYLF below Drum Afterbay. The average daily temperatures in July and August are as low as 13-15 degrees C, which provides excellent thermal conditions for trout. (p. 58).
>
> The PG&E FLA should include minimum streamflows that meet the following temperature criteria:

Water Year Type	Months	Temperature	Compliance Point
Wet, AN, Below Normal, and Dry	July – September	19 degrees C average daily temperature	Humbug Creek confluence with South Yuba
Critically Dry and Extreme Critical Dry	July – September	19 degrees C average daily temperature	Poorman Creek confluence with the South Yuba River

> The PG&E and NID FLA's should include flows and recession rates to more closely resemble the spring snowmelt hydrograph in specific stream reaches. PG&E and NID should expand the approach outlined below for the South Yuba River below Spaulding Reservoir into a "Snowmelt Recession Analysis and Design." The licensees should conduct similar analyses on the Middle Yuba River below Milton Diversion Dam, on Canyon Creek below Bowman Dam, and Bear River Reach #2. The analysis should be conducted collaboratively among Relicensing Participants. (p. 32).

[21] PG&E discusses FWN's streamflow proposal in several locations in Section 6 of Exhibit E. In this Aquatic Resources section, PG&E discusses FWN's proposal as it pertains to aquatic resources. PG&E discusses FWN's streamflow proposal as the proposal relates to water resources in Sections 6.2 (Water Resources) and 6.6 (Recreation Resources), respectively.

> Recent analysis by scientists at University of California at Davis suggests that a 9% per day recession rate is the limit for flow changes that is protective of Foothill Yellow-Legged Frogs (FYLF). Therefore, we recommend that PG&E and NID FLA's include measures that allow the snowmelt recession limb to recede at 9%/day on appropriate reaches. (p. 40) [footnote omitted].
>
> The FLA should include measures for Canyon Creek that provide a spring snowmelt recession rate as generally described in section 5.5 to enhance existing FYLF populations observed in FYLF VES Study Results on Canyon Creek below Texas Creek at RM 1.2 Little Canyon Creek confluence (CC-1). (p. 51) [footnote omitted].

Subsequent to filing of its comment letter, FWN stated that it could provide a more detailed flow proposal that would incorporate the concepts in FWN's DLA comment letter and that would supersede FW"s flow proposal request in its comment letter. Licensees agreed to consider the more detailed flow proposal, which was provided to Licensees on February 24, 2011, and analyze the flow proposal in Exhibit E. Refer to the Operations Model DVD in Appendix E12 for FWN's detailed flow proposal and Licensees' Operations Model scenario run of the proposal.

PG&E has not adopted FWN's Proposed Project. As discussed in various places throughout this Exhibit E, including in Section 3 (Cumulative Effects), Section 6.2 (Water Resources), and in this Section (Aquatic Resources) above, the environmental benefits, if any, are unclear (given the inconsistent positive and negative results as applied to particular species, reaches and reservoirs) and the consequences (to power generation, water supply and reservoir levels) are severe.

Monitoring Fish and Aquatic Macroinvertebrates

The Forest Service, BLM, NPS and CDFG recommended in their joint letter (dated January 28, 2011) monitoring plans for stream fish and macroinvertebrates:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion. [The list included Stream Fish Populations and Benthic Macroinvertebrates.] (p. 51-52).

The agencies made a similar request on page 119 of their letter. The agencies have provided insufficient detail for PG&E to perform an in depth analysis of the recommended monitoring plans, or for PG&E to estimate the cost associated with implementing such plans.

PG&E has not included in its proposed Project a general measure related to monitoring fish populations within the Project because fish populations within the Project were determined to be in relatively good condition. Agencies have not identified specific areas where there is concern (or where study results demonstrated such a need) but are rather requesting a blanketed measure to the entire Project.

PG&E has not included in its Proposed Project a general measure related to monitoring aquatic macroinvertebrates within the Project. PG&E has noted that aquatic macroinvertebrate monitoring rarely leads to adaptive management measures and such monitoring requires significant resources to complete. The aquatic macroinvertebrate populations were in generally good condition based on IBI and MMI metrics in the Project and PG&E does not see a need for the study. The general request for monitoring is also not specific enough to reasonably identify future measures that would be beneficial.

Stock Fish in Fuller Lake and Lake Spaulding

In their joint letter the resource agencies recommend that stocking occur in Spaulding Reservoir and Fuller Lake:

> The licensee will fund the stocking of fish in Spaulding Reservoir and Fuller on an annual basis during the term of the new license. The fish stocking program will be supported at a rate equivalent to 100 percent of CDFG's annual management target in the reservoirs or 100 percent of the historical average stocking into these reservoirs, whichever is less. Fish species and size class stocking targets shall be determined by CDFG. (p. 53).
>
> At the licensee's discretion, the licensee will either: (1) acquire the fish directly from private fish hatcheries approved by CDFG or (2) reimburse CDFG for the cost of the stocking program in . . .Spaulding Reservoir [and] Fuller Lake . . . based on the criteria established above. The licensee will consult with CDFG annually to obtain fish stocking targets, fish species, discuss fish acquisition, and verify the completion of the previous year's stocking commitment. (p. 53).
>
> Spaulding Reservoir was historically stocked with an average of approximately 5,000 lbs of catchable rainbow trout. The historical average stocking at Fuller Lake was approximately 6,000 lbs of catchable rainbow trout and approximately 2,000 lbs of catchable brown trout. (p. 118).

CDFG does not provide any details as to the cost or possible cooperative logistical details behind the stocking that is requested, and the agencies do not provide any evidence (including study results) to support the need for their request in either Fuller Lake (which is currently stocked by CDFG) Lake Spaulding. Nevertheless, with regard to Lake Spaulding, PG&E has generally adopted the agencies' recommendation and included it in PG&E's Proposed Project (DS-AQR3).

Monitor and Manage for Sierra Nevada Yellow-Legged Frog

The resource agencies recommended, in their joint letter, that a monitoring plan and watershed plan be developed for SNYLF, stating:

> The resource agencies propose that licensees work with CDFG to develop basin (watershed) plans for protecting and enhancing SNYLF. (p.117).
>
> A monitoring plan that focuses on the response of SNYLF populations to any changes in fish stocking, fish distribution and recreational use is needed. (p.117).

The agencies have provided insufficient detail for PG&E to analyze the scope of the recommended measure, or for PG&E to estimate the cost associated with implementation of such plans.

PG&E has not included in its Proposed Project measures for monitoring and managing SNYLF because the studies did not demonstrate that the plans are warranted and the request includes aspects that are clearly the responsibility of the resource agencies. The current status of SNYLF is largely attributable to the introduction of fish into areas where fish did not historically occur. SNYLF is known to occur in the proximity of only two Project facilities, White Rock Lake and Fordyce Lake, and there is no evidence that SNYLF breeds at either facility. Sightings of SNYLF at White Rock Lake evidently reflect proximity to a breeding pond that is not in the Project Boundary. The level of Project-related recreation use at White Rock Lake is low to moderate, with visitation measured as 3 vehicles/day and about 1.5 campsites/weekend. There is no vehicle use in the one shoreline area where SNYLF have been reported. Foot traffic does occur in the area where SNYLF has been reported; however, there are no formal trails and no recreation facilities that would attract recreationists to this location. At Fordyce Lake, SNYLF has been documented in a stream 0.1 mi north of the reservoir and also at several locations in ponds on plateaus south of the reservoir. Hiking and camping occurs on this plateau and multiple hiking trails exist in this area, along with OHV trails on USFS and BLM land. Project-related recreation is centered on the reservoir, particularly along the southwest arm of the lake (i.e. not in the area of SNYLF occurrences). Although some of the trails originate near the reservoirs, others do not; therefore, much of the recreation use is not Project-related. Regarding future recreation use, Licensee will respect and implement specific and reasonable recommendations for access restriction that resource agencies consider warranted for SNYLF protection.

Monitor Western Pond Turtle

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that PG&E develop and implement a monitoring plan for WPT.

> Work with relicensing participants to develop a proposal to collect adequate data to assess project effects on Western Pond Turtle. (p. 2).

> More information is needed about the distribution, abundance, and age structure of WPT. Based on work in other portions of WPT's range (e.g., northern California) low water temperature negatively affect WPT growth and reproduction (Welsh, Ashton, Bettaso pers. comm). WPT also makes significant overland movements for nesting (summer) and overwintering (fall/winter). Thus project roads and canals that parallel rivers may impede these movements and/or result in entrainment of WPT. (p. 8).
>
> The DLA provides no measures which address the above issues for WPT – especially low water temperatures resulting from low outlet releases from reservoirs and canals that may disrupt seasonal movements of WPT. In addition, a monitoring plan for WPT is needed. This plan should first address the collection of additional information on WPT distribution, abundance, and age structure and then establish appropriate monitoring methods for this species to determine if changes in the new license are protecting and enhancing populations of this species. (p. 118)

The agencies have provided insufficient detail and have not provided any cost estimates for this recommendation.

PG&E has not included, in its Proposed Project, measures for monitoring WPT. Licensee does not agree that inclusion of such a plan for WPT, which would essentially entail a new study, is warranted because sufficient information regarding WPT (relating to the Project) has been developed. Licensee has performed two studies for WPT, which were developed in collaboration with the agencies and other relicensing participants. The first study was largely based on gathering incidental observations of WPT, but also included an assessment of the potential for Project canals to affect WPT overland movement. In the second study Licensee performed field surveys to document WPT on two stream reaches affected by the Project and by the Yuba-Bear Hydroelectric Project, Canyon Creek downstream of Bowman-Spaulding Diversion Dam (2 survey sites), and South Yuba River downstream of Spaulding Dam (10 survey sites); and one reach affected by the Yuba-Bear Hydroelectric Project, Middle Yuba River downstream of Milton Diversion Dam (6 survey sites). The agencies did not request or recommend surveys at other specific locations. The studies indicated that WPT occurs in two stream reaches affected by the Project. Nine WPT were found in the Upper South Yuba River about 13 mi downstream of Lower Peak Lake Dam and Kidd Lake Dam; five WPT were found in the South Yuba River about 42 mi downstream of Spaulding Dam; and two unidentified turtles were found in Rock Creek about 1 mi downstream of Rock Creek Reservoir. Although the studies do not indicate the size or demography of WPT populations, Licensee believes the studies were sufficient to show the general pattern of WPT occurrence in relation to the Project.

In addition, Licensee believes that the need for monitoring should be commensurate to the potential of the Project to affect the resource. The agencies suggest WPT may be adversely affected by low water temperatures and that Project roads and canals that parallel streams may impede overland movement by WPT and/or result in entrainment of WPT. However, the influence of the Project on stream temperatures where WPT occurs is negligible or not detectable (e.g., in the lower South Yuba River and Upper South Yuba). Furthermore, the agencies have indicated elsewhere that warm water temperatures are not compatible with temperature objectives for stream fish. Project roads do not experience high levels of traffic and do not pose barriers to WPT overland movements. The six Project canals within the elevation range of WPT (South Yuba Canal, Lake Valley Canal, Drum Canal, Bear River Canal, Wise Canal, and South Canal) have a potential to affect WPT movements, but Licensee believes that this potential is low. It is unclear what pertinent information relative to these potential Project effects would be generated by a WPT monitoring plan. Most of the canals are situated in areas with no known WPT occurrences, suitable habitats for WPT are limited or absent in many areas, and long sections of Project canals are on steep slopes where WPT movement is improbable. The agencies have not indicated specific locations where WPT may be impeded or where additional escapement provisions might be needed in Project canals. It is unclear what pertinent information relative to these potential Project effects would be generated by a WPT monitoring plan.

Recreation Management for Sierra Nevada Yellow-Legged Frog

In their joint letter the resource agencies recommended that PG&E evaluate and manage recreational use that may affect SNYLF and provide public information to reduce the spread of amphibian chytrid fungus, stating:

> At the recreational sites they manage, licensees should provide public education on reducing the spread of amphibian chytrid fungus and should engage in practice of cleaning project equipment that is used in or near multiple water bodies (boots, waders, nets, etc.). Licensees should evaluate recreational use in the vicinity of SNYLF populations and work with FS to provide for the appropriate level of use at key sites occupied by SNYLF. (p. 117).

The agencies have provided insufficient detail (including cost estimates) for PG&E to perform in depth analysis of the recommendations.

PG&E has not included in its Proposed Project measures for evaluating and managing recreation in regard to SNYLF. Licensee has already performed a recreation study that evaluated levels of recreation use at White Rock and Fordyce Lakes, the only Project facilities near a SNYLF population. It is unclear what additional steps the agencies may be suggesting. As described above, the level of Project-related recreation use at White Rock Lake is low to moderate and includes foot traffic in the area where SNYLF has been reported; however, there are no formal trails and no recreation facilities that would attract recreationists at this location. At Fordyce Lake, SNYLF does not occur at Fordyce Lake itself, but has been found 0.1 mi north of the reservoir and on plateaus south of the reservoir near hiking trails that receive some visitation originating at Fordyce Lake. The level of Project-related recreation use at Fordyce Lake is moderate and is primarily located along the southwest arm of the lake (i.e. not in the area of SNYLF occurrences). Regarding future recreation use, Licensee will respect and implement specific, reasonable recommendations for access restriction that resource agencies consider warranted for SNYLF protection.

Aquatic Invasive Species

In their joint letter the resource agencies also stated:

> However, Fish and Game code requires that, where recreational, boating, or fishing activities are permitted, the owner of the reservoir must develop and implement a program designed to prevent the introduction of nonnative dreissenid mussel species (Cal. Fish & Game Code § 2302) . . . . These plans should incorporate state-approved monitoring and inspection procedures and should be submitted to the resource agencies for comment prior to institution. (p. 26).

PG&E has not included in its Proposed Project a specific invasive aquatic species management plan. As part of PG&E's company-wide Quagga/Zebra Mussel Infestation Prevention Program, PG&E evaluated the Drum-Spaulding Project reservoirs and found none of the reservoirs are a high risk for infestation (PG&E 2009). The agencies have provided no evidence or study results that demonstrate a contrary conclusion, and they have not provided a cost estimate for the proposal. Based on the foregoing, inclusion of an aquatic invasive species management plan in the new license is not warranted.

6.3.5 Unavoidable Adverse Impacts

6.3.5.1 Yuba-Bear Hydroelectric Project

Yuba-Bear Hydroelectric Project dams will continue to capture sediment, truncate high flows and augment low summertime flows, which will affect aquatic resources downstream of the dams. These effects are considered at best beneficial and at worst long-term, minor impacts. As shown in Figures 6.3.1-2 through 6.3.1-18, generally, NID's Proposed Project will result in similar or better rainbow trout habitat than the habitat that would have occurred under unimpaired flow conditions. In addition, releases from Project dams generally provide cooler water in summer for fish as compared to conditions that would occur under unimpaired conditions.

The Project will continue to affect FYLF due to changes in flow and substrate, but these effects are also considered short-term (i.e., in most reaches occurring irregularly and in a minority of years), local (i.e., where breeding occurs) and minor. FYLF inhabits areas that are subject under natural conditions to extreme and rapid changes in flows in spring. The Project has minimum ability to affect these changes, particularly in Above Normal and Wet water years hen flows are high, and they would occur with or without the Project in place. On the Middle Yuba River, where relatively high numbers of FYLF occur, most FYLF breeding sites are many miles downstream of Project releases. Substrate conditions on parts of the Bear River (e.g., the lower part of the Dutch Flat Afterbay Dam Reach and all of the Chicago Park Powerhouse Reach) are the result of the legacy of mining in the basin, and Project effects on FYLF habitat in these areas are minor when compared to mining effects, and generally beneficial in the Dutch Flat Afterbay Dam Reach, where the Project produces flows that are more stable during the FYLF breeding period than would occur without the Project and relatively high numbers of FYLF occur.

The Project would affect aquatic resources in the Chicago Park Powerhouse Reach of the Bear River, but this effect is considered cumulative since the reach has been severely affected by mining. The effect is also considered minor given the condition of the habitat due to mining and the very short length (~1 mile) of the reach.

Project dams will also continue to block upstream movement of fish. This is also considered a minor impact since the reaches do not include anadromous fish and resident fish have ample spawning opportunities both upstream and downstream of the dams.

Project affects on benthic macroinvertebrate also are minor. Licensees' studies did not identify a relationship between releases from Project facilities and benthic macroinvertebrate matrices.

6.3.5.2 Drum-Spaulding Project

The Drum-Spaulding Project will continue to capture sediment behind Project dams, truncate high flows in spring, and augment low summertime flows. These activities will have, at best, beneficial and, at worst, direct and indirect minor impacts on aquatic resources. Figures 6.3.2-6 through 6.3.1-13 show that, in general, water releases from Project facilities have resulted in better habitat for rainbow trout, the dominant fish species in the reaches. In addition, releases from Project dams generally provide cooler water in summer for fish as compared to conditions that would occur under unimpaired conditions.

The Project will continue to affect FYLF, but these affects are also considered short-term, indirect (i.e., effects occur where breeding occurs) and minor. FYLF inhabit areas that are subject under natural conditions to extreme and rapid changes in flows in spring. The Project has a minimal ability to affect or ultimately control such changes, as the flow changes would occur with or without the Project in place. In addition, most FYLF breeding sites are many miles downstream of Project releases. Substrate conditions below Project dams in lower elevations (e.g., Drum Afterbay Dam Reach) are the result of the legacy of mining in the basin, and Project affects on FYLF habitat in these areas is minor when compared to those mining effects.

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6.4 Terrestrial Resources

The discussion of terrestrial resources is broken into four sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding terrestrial resources. Second, the affected environment is discussed in Section 6.4.1. Third, the environmental effects of each Project are discussed in Section 6.4.2. Fourth, proposed measures for each Project are listed in Section 6.4.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.4.4.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on terrestrial resources, Licensees developed and conducted the 9 studies listed in Table 6.4-1.[1]

Table 6.4-1. Terrestrial resource studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress[1]	Study Complete	Date Study is Scheduled to be Complete
2.4.1	Special-Status Wildlife – CWHR	4-1	9/8/10	- -	10/31/11
2.4.2	Wildlife: Movement	4-2	9/17/10	- -	10/31/11
2.4.3	Wildlife: Bats	4-3	--	8/5/10	--
2.5.1	Special-Status Plants	5-1	5/16/10	- -	10/31/11
2.6.1	Riparian Habitat	6-1	10/21/10	- -	10/31/11
2.6.2	Wetlands	6-2	--	7/23/10	--
2.7.4	CESA-Listed and Protected Wildlife – CWHR	7-4	9/13/10	- -	10/31/11
2.7.5	CESA-Listed Wildlife – Bald Eagle	7-5	--	6/25/10	--
2.7.6	CESA-Listed Plants	7-6	12/24/09	- -	10/31/11

[1] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, six studies listed in Table 6.4-1 are in progress. The most recent version of the interim technical memorandum for each of those studies and the final technical memorandum for each of the three completed studies have been posted to the Relicensing Website and are filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; variances to the FERC-approved study, if any; attachments to the technical memorandum; and references. The status of each of the six studies in progress, including the expected completion, is described below.

- Special-Status Wildlife – CWHR (Study 2.4.1). Licensees posted an interim technical memorandum to the Relicensing Website on September 8, 2010. Licensees have completed

[1] Threatened and endangered terrestrial species are addressed in Section 6.5 (Threatened and Endangered Species) of this Exhibit E.

all tasks in the FERC-approved study, including California Wildlife Habitat Relationships (CWHR) assessments on almost 71,000 acres, which included the area within a 0.25-mile buffer around all existing FERC Project boundaries. Licensees recently identified about 200 acres of land to add to the FERC Project boundaries that require performing CWHR assessments on about another 2,000 acres (the new area plus a 0.25 mile buffer). Licensees expect to complete the assessment and file with FERC the final technical memorandum by October 31, 2011.

- Wildlife: Movement (Study 2.4.2). Licensees posted an interim technical memorandum to the Relicensing Website on September 17, 2010. PG&E has identified one channel, the Nevada Diversion, which was not included in the September 17, 2010 technical memorandum. The Nevada Diversion is a transfer channel for moving water from Drum Canal to the South Yuba Canal. The diversion will be assessed for potential effects to wildlife movement. Licensees expect to complete the assessment and file with FERC the final technical memorandum by October 31, 2011.

- Special-Status Plants (Study 2.5.1). Licensees posted an interim technical memorandum to the Relicensing Website on May 16, 2010. Licensees had surveyed about 6,600 acres of land, but have identified some new areas to add to the existing FERC Project boundaries, which will require surveying about another 200 acres. Licensees expect to complete the survey and file with FERC the final technical memorandum by October 31, 2011.

- Riparian Habitat (Study 2.6.1). Licensees posted what they anticipated was a final technical memorandum to the Relicensing Website on October 21, 2010. However, Licensees have since identified that there was missing hydrology information for Bear River Reach #2 that necessitates revaluating the data. In addition, at the same time, although the Licensees do not expect it to significantly alter the analysis or conclusions in the technical memorandum, Licensees will revise the technical memorandum using the new Base Case hydrology directed by FERC. Licensees anticipate completing the revisions and filing with FERC the final technical memorandum by October 31, 2011.

- CESA-Listed and Protected Wildlife – CWHR (Study 2.7.4). Licensees posted an interim technical memorandum to the Relicensing Website on September 13, 2010. Licensees have completed all tasks in the FERC-approved study, including CWHR assessments on almost 71,000 acres, which included the area within a 0.25-mile buffer around all existing FERC Project boundaries. Licensees recently identified about 200 acres of land to add to the FERC Project boundaries that require performing CWHR assessments on about another 2,000 acres (the new area plus a 0.25 mile buffer). Licensees expect to complete the assessment and file with FERC the final technical memorandum by October 31, 2011.

- CESA-Listed Plants (Study 2.7.6). Licensees posted an interim technical memorandum to the Relicensing Website on December 24, 2009. Licensees had surveyed about 6,600 acres of land, but have identified some new areas to add to the existing FERC Project boundaries, which will require surveying about another 200 acres. Licensees expect to complete the survey and file with FERC the final technical memorandum by October 31, 2011.

6.4.1 Affected Environment

This section describes existing terrestrial resources conditions in two general areas: 1) botanical resources; and 2) wildlife resources, which includes terrestrial reptiles (Class Reptilia, snakes and lizards), but not turtles (Class Chelonia) or amphibians (Class Amphibia), which are discussed in Section 6.3 (Aquatic Resources).

The botanical resources discussion is divided into the following areas: 1) special-status[2] and CESA-listed plants; 2) vegetation distribution and abundance; 3) riparian habitat and wetlands; and 4) noxious weeds/invasive plants.[3]

Wildlife resources are discussed in five areas: 1) special-status,[4] CESA-listed, and California Fully Protected wildlife; 2) wildlife distribution and abundance; 3) barriers to wildlife movement; 4) wildlife mortality in Project canals (e.g., open conduits such as flumes or ditches); and 5) raptor collisions/electrocution at Project transmission lines.

6.4.1.1 Botanical Resources

6.4.1.1.1 <u>Special-Status and CESA-Listed Plants</u>

Based on a 2008 review of CDFG's California Natural Diversity Database (CNDDB) (CDFG 2009b,c), TNF's records (TNF 2007, Van Zuuk 2003a-d), and the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants database (CNPS 2009), Licensees indentified 52 special-status and CESA-listed plant species with the potential to occur in the vicinity of the projects (NID 2008, PG&E 2008a, PG&E 2008b).

In 2009, Licensees performed surveys for these 52 plants and other special-status plants that may occur in the vicinity of the projects following the botanical survey section of the CDFG's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009d). The study included the area surrounding all Project facilities (e.g., powerhouses and switchyards, dams, reservoirs, transmission lines, conduits, access roads) and Project recreation sites (e.g., campgrounds) within the FERC Project Boundary for each Project (NID and PG&E 2010w). At the request of the Forest Service, Licensees also

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2 For the purpose of this document, a special-status plant species is a plant that is: 1) found on NFS land and listed by the Forest Service as a Sensitive Species (FSS), Management Indicator Species (MIS) or Watch List (FSW) species; 2) found on public land administered by BLM and listed by BLM as a Sensitive Species (BLM-S); 3) CNPS 1 (considered by California Native Plants Society (CNPS) to be endangered in California and elsewhere), CNPS 2 (considered by CNPS to be threatened or endangered in California only), CNPS 3 (considered by CNPS to lack the necessary information to put the species on a list or to reject the species) and CNPS 4 (considered by CNPS to have limited distribution) on the CNPS Inventory of Rare Plants; or 4) listed under the ESA as Proposed or a Candidate for listing. Note that plants listed as endangered or threatened under the ESA are discussed in Section 6.5 (Threatened and Endangered Species) of this FLA.

3 For the purpose of this document, noxious weeds are defined as plant species listed as noxious weeds by the TNF or the California Department of Food and Agriculture (CDFA).

4 For the purpose of this document, a special-status wildlife species is considered one that is: 1) found on NFS land and listed by the Forest Service as a FSS or MIS; 2) found on public land administered by BLM and listed by BLM as BLM-S; or 3) listed under the ESA as Proposed or a Candidate for listing. Wildlife species listed as endangered or threatened under the ESA are discussed separately in Section 6.5 (Threatened and Endangered Species) of this Exhibit E.

surveyed for quaking aspen (*Populus tremuloides*) and three species of mushrooms (*Cudonia monticola*, *Dendrocollybia racemosa* and *Phaeocollybia olivacea*).

To date, Licensees have found 116 occurrences (i.e., either a single plant or a distinct geographic population of plants) of 13 different special-status plant species: 43 occurrences within the Yuba-Bear Hydroelectric Project FERC Project Boundary and 73 occurrences within the Drum-Spaulding Project FERC Project Boundary. No CESA-listed plant species were found. Three plant species represented 79 percent of the occurrences: Brandegee's clarkia (*Clarkia biloba* ssp. *brandegeeae*) (55 percent of occurrences), Humboldt lily (*Lilium humboldtii* ssp. *humboldtii*) (15 percent) and Congdon's onion (*Allium sanbornii* var. *congdonii*) (9 percent). Additionally, 54 occurrences of quaking aspen were documented. None of the three mushrooms identified by the Forest Service were found. Table 6.4.1-1 summarizes the 116 special-status plant and 54 quaking aspen occurrences by Project and land ownership (NID and PG&E 2010w).

Table 6.4.1-1. Special-status plant species and quaking aspen occurrences identified in the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project FERC boundaries.

Common Name/ Scientific Name	Status[1]	Number of Occurrences					
		Yuba-Bear Hydroelectric Project			Drum-Spaulding Project		
		NFS Land	BLM Land	Private	NFS Land	BOR[2]	Private
QUAKING ASPEN							
Quaking aspen *Populus tremuloides*	NA	10	--	12	6	--	26
SPECIAL-STATUS PLANTS							
Congdon's onion *Allium sanbornii* var. *congdonii*	FSW, CNPS 4	4	--	--	3	--	4
Sanborn's onion *Allium sanbornii* var. *sanbornii*	FSW, CNPS 4	--	--	--	--	--	1
Scalloped moonwort *Botrychium crenulatum*	FSS	--	--	--	--	--	1
Wooly-fruited sedge *Carex lasiocarpa*	CNPS 2	--	--	1	--	--	--
Brandegee's clarkia *Clarkia biloba* ssp. *brandageea*	FSS, BLM-S, CNPS 1B	--	2	16	--	1	45
Coralroot orchid *Corallorhiza trifida*	CNPS 2	1	--	1	--	--	--
Roundleaf sundew *Drosera rotundifolia*	FSW	1	--	1	--	--	--
Humboldt lily *Lilium humboldtii* ssp. *humboldtii*	FSW, CNPS 4	--	1	4	--	--	12
Northern bugleweed *Lycopus uniflorus*	CNPS 4	--	--	1	--	--	--
Sierra starwort *Psuedostellaria sierrae*	CNPS 4	5	--	2	2	--	--
Water bulrush *Scirpus subterminalis*	CNPS 2	--	--	1	--	--	--
Rocky Mountain chickweed *Stellaria obtusa*	CNPS 4	1	--	1	3	--	--
Felt-leaved violet *Viola tomentosa*	CNPS 4	--	--	--	1	--	--
	Total	**12**	**3**	**28**	**9**	**1**	**63**

1 Special-status:
BLM-S = Bureau of Land Management Sensitive Plants
FSS = Forest Service Sensitive Species
FSW = Tahoe National Forest Watch List Species
CNPS 1B = California Native Plant Society list endangered in California and elsewhere; CNPS 2 = California Native Plant Society list rare/threatened/endangered in California only; CNPS 4 = California Native Plant Society limited distribution, watch list
2 BOR= Bureau of Reclamation

Of the 116 occurrences of special-status plants, 91 occurrences were found on private property along roads and canals, and near lakes and reservoirs. A small number of occurrences were located along transmission lines associated with the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project, and a few occurrences were in campgrounds on private property. The remaining populations occurred on NFS land (21 occurrences) along roads, canals and transmission lines, and near lakes and reservoirs; on public lands administered by BLM (3 occurrences) near lakes and reservoirs, including one occurrence on BLM administered land along a road; and one occurrence located along a road on BOR land.

Approximately 40 percent of the special-status plant occurrences were in areas where no potential disturbances were identified by Licensees. In areas where Project disturbance might reasonably occur, the most prevalent threat was weed infestation. Weeds were present within or adjacent to 40 special-status plant occurrences (see Section 6.4.1.1.4 for further discussion of weeds in the Project area). Road maintenance and use, herbicide application along roads, recreation (including OHV use) associated with lakes and reservoirs, erosion near roads and canals, and routine vegetation management represent the majority of activities with the potential to disturb special-status plants.

6.4.1.1.2 Vegetation Distribution and Abundance

Distinct vegetation types in the vicinity of the projects are distributed along an elevation gradient creating bands with characteristic or dominant species. These bands somewhat overlap and intergrade with each other forming transition zones on their outer edges.

Vegetation in the foothills (i.e., below El. 2,000 ft) is dominated by an overstory of gray pine (*Pinus sabiniana*) and ponderosa pine (*Pinus ponderosa*), with a mixture of small stands of hardwoods including canyon live oak (*Quercus chrysolepis*), interior live oak (*Q. wislizeni*), and blue oak (*Q. douglasii*), and low-elevation chaparral shrubs such as wedgeleaf ceanothus (*Ceanothus cuneatus*), manzanitas (*Arctostaphylos* spp.), and coffeeberry (*Rhamnus* spp.). The forest is occasionally interrupted by patches of non-native annual grasslands dominated by a variety of bromes (*Bromus* spp.) with some medusahead grass (*Taeniatherum caput-medusae*). In some areas, pure stands of ponderosa pine exist where the conifer has been planted following fires and/or logging. In riparian areas, black cottonwood (*Populus balsamifera*), white alder (*Alnus rhombifolia*), and valley oak (*Q. lobata*) are common.

At mid elevations (i.e., El. 2,000 – 5,000 ft), dominant vegetation includes incense cedar (*Calocedrus decurrens*), Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), madrone (*Arbutus menziesii*) and sugar pine (*P. lambertiana*). Additionally, significant stands of Brewer’s oak (*Q. garryana* var. *breweri*) occupy south-facing slopes and areas of annual grasslands. Chaparral species include whiteleaf manzanita (*A. viscida*), greenleaf manzanita (*A. patula*), mountain whitethorn (*Ceanothus cordulatus*), wedgeleaf ceanothus, deerbrush (*C. integerrimus*), and poison oak (*Toxicodendron diversilobum*). Riparian areas are dominated by white alders, maple (*Acer* spp.), and willows (*Salix* spp.) In addition, the mid-elevation band includes several outcrops of habitat characterized by serpentine soil. Dominant plants in these areas are leather oak (*Q. durata*), gray pine, and wedgeleaf ceanothus. Additional serpentine indicators in these areas include milkwort jewelflower *(Streptanthus polygaloides)* and yellow pincushion (*Chaenactis glabriuscula*).

At higher elevations (i.e., above El. 5,000 ft), the forested areas are dominated by incense cedar, red fir (*Abies magnifica*), white fir, and Jeffrey pine (*P. jeffreyi*) overstory. Lodgepole pines (*Contorta* var. *murrayana)* exist in moist soils in meadows and along shorelines. Black oak (*Q. kelloggii*), willow (*Salix* spp.), quaking aspen, and mountain alder (*A. incana*) are common deciduous trees and may form a subcanopy beneath the conifer overstory. Some areas are barren, devoid of vegetation due to rocky and steep terrain with little to no soil layer. The shrub layer is dominated by mountain whitethorn, huckleberry oak (*Q. vacciniifolia*), pinemat manzanita (*Arctostaphylos nevadensis*) and bush chinquapin (*Chrysolepis sempervirens*).

The main disturbance affecting upland vegetation in the area of the projects is fire. The Sierra Nevada Forest Plan Amendment (USFS 2004) documents a trend of increasing acres burned on the National Forests within the Sierra Nevada Ecoregion from 1970 through 2003. The last significant fire in the vicinity of the projects occurred near Lake Valley Reservoir in 2001 and burned close to 2,500 acres. The fire was not related to the operation and maintenance of either Project. (USFS 2004).

6.4.1.1.3 Riparian Habitats and Wetlands

In 2008, Licensees reviewed information from Forest Service stream survey data sheets for the period of 1975 to 2001 (TNF 2001a), and riparian inventory data sheets available only for North Fork American River sub-basin (TNF 2001b); a series of watershed maps developed by the Nevada County Planning Department (Beedy 2002); USFWS National Wetlands Inventory (NWI) maps (USFWS 1987); and, low-elevation helicopter video imagery for each study site (HDR|DTA 2007) to identify the distribution, extent, and class of riparian and wetland habitat in the area of the projects.

In 2009, Licensees conducted Proper Functioning Condition (PFC) assessments of ten riparian habitat sites, in accordance with the protocol *Riparian Area Management, A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas* (Prichard et al. 1998), and seven wetlands, in accordance with the protocol *Riparian Area Management, A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic Areas* (Prichard et al. 2003). The sites were collaboratively selected with other Relicensing Participants to represent the range of riparian habitat and wetlands that could be affected by the projects. One site, Bear River Reach #2, was assessed for both riparian habitat and wetlands.

In addition to PFC assessments, Licensees collected vegetative transect data in three riparian areas. Vegetative transect data were collected in large plots for tree and shrub species and smaller plots for herbaceous species. Collected data consisted of percent canopy cover for each tree and shrub species, tree diameter, total percent cover for herbaceous species, and percent cover for non-vegetative parameters (e.g., bare soil or rock).

Seven of the 10 riparian habitat sites and five of the seven wetlands were rated as Properly Functioning. The remaining sites were rated Functional - At Risk. To make these determinations, the site-specific attributes and processes of hydrology, vegetation, and erosion/deposition for each site were considered along with historical site information and overall site reconnaissance. A summary of the study sites, survey locations, and PFC ratings is provided in Tables 6.4.1-2 and 6.4.1-3.

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Table 6.4.1-2. Riparian habitat study sites, locations, Proper Functioning Condition (PFC) ratings, and additional information for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

Stream Reach and Sub-reach (SR)[1]	Sub-Reach Upstream River Miles[2]	Sub-Reach Downstream River Miles	Study Site Name	Study Site Upstream River Mile	Study Site Downstream River Mile	Study Site Upstream UTM Coordinates	Study Site Downstream UTM Coordinates	PFC Survey Performed	PFC Rating	Vegetation Transect Performed	Transect UTM Coordinates	Additional Study Site development information, as collaboratively agreed upon during February 23, 2009 relicensing meeting[3]
YUBA-BEAR HYDROELECTRIC PROJECT												
Middle Yuba River, just upstream of the Milton Diversion Dam Impoundment	not applicable	not applicable	Jackson Meadows Dam Reach just upstream of the Milton Diversion Dam Impoundment	45.6 and 45.5	45.6 and 45.5	709029 4376847	709783 4376825	Yes	Properly Functioning	No	not applicable	Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Jackson Meadows Dam Reach upstream of Milton Diversion Dam Impoundment – Vegetative Transect Only	not applicable	not applicable	Jackson Meadows Dam Reach just upstream of the Milton Diversion Dam Impoundment	not applicable	not applicable	not applicable	not applicable	No	not applicable	Yes	0708735/4377340	Vegetation transects performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat. Transects were performed just downstream of the riparian habitat site; these data are not considered in PFC analyses, but were specifically requested by Relicensing Participants.
Middle Yuba River just upstream of Wolf Creek (Upper Milton Sub-Reach, Dead End Mine Site)	27	35	Milton Diversion Dam Reach	28	27.6	689596 4368130	690039 4368097	Yes	Properly Functioning	No	not applicable	This site replaces the Kanaka Creek Sub-reach identified in Table 6.0-1 of the revised study plan for 2.6.1, Riparian Habitat. Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Canyon Creek below Faucherie Lake Dam	not applicable	not applicable	Faucherie Lake Dam Reach	16.3	15	709122 4367475	707686 4368346	Yes	Properly Functioning	No	not applicable	Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Canyon Creek above Texas Creek and below Bowman-Spaulding Diversion Dam	8	6	Bowman-Spaulding Diversion Dam Reach[4]	9.7	6.4	699574 4364870	701125 4367977	Yes	Properly Functioning	No	not applicable	Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Bear River below Dutch Flat Afterbay Dam	not applicable	not applicable	Dutch Flat Afterbay Dam Reach	20.4	18.9	685116 4341919	684381 4340043	Yes	Functional - At Risk	No	not applicable	Site removed from the revised study plan for 2.6.1, Riparian Habitat; however, a full PFC assessment was performed in support of Study 1-1, Channel Morphology with results presented in the Technical Memorandum 6-1, Riparian Habitat.
DRUM-SPAULDING PROJECT												
Fordyce Creek (SR2)	8.5	6.5	Fordyce Lake Dam Reach	5.8	4.9	711453 4359491	710517 4359617	Yes	Functional - At Risk	No	not applicable	This site was added to Study 2.6-1, Riparian Habitat. Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Bear River, Meadow Sub-Reach (SR4)	35	32.7	Bear River Reach #2	35	27.4	700619 4353720	698544 4352721	Yes	Functional - At Risk	No	not applicable	Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat. However, the need for vegetation transect data collection was revisited after review of the Technical Memorandum 6-1, Riparian Habitat; Relicensing Participants agreed that additional data collection was not necessary.[5]
North Fork of the North Fork American River above Lake Valley Canal Diversion and below Lake Valley Reservoir (site near Six Mile Creek)	16	13	Lake Valley Reservoir Dam Reach	15.1	14.8	705821 4353045	705612 4353418	Yes	Properly Functioning	No	not applicable	Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Texas Creek, Bullpen Wetland	not applicable	not applicable	Lower Rock Lake Dam Reach 3.1	3.1	3.1	not applicable	not applicable	No	not applicable	Yes	0702844/4366354	Vegetation transects performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.
Texas Creek, Loney Meadows	not applicable	not applicable	Lower Rock Lake Dam Reach 2.8	2.8	2.8	not applicable	not applicable	No	not applicable	Yes	0702292/4366172	Vegetation transects performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat.

Table 6.4.1-2. (continued)

Stream Reach and Sub-reach (SR)[1]	Sub-Reach Upstream River Miles[2]	Sub-Reach Downstream River Miles	Study Site Name	Study Site Upstream River Mile	Study Site Downstream River Mile	Study Site Upstream UTM Coordinates	Study Site Downstream UTM Coordinates	PFC Survey Performed	PFC Rating	Vegetation Transect Performed	Transect UTM Coordinates	Additional Study Site development information, as collaboratively agreed upon during February 23, 2009 relicensing meeting[3]
YUBA-BEAR HYDROELECTRIC PROJECT AND DRUM-SPAULDING PROJECT												
Canyon Sub-Reach, upstream of Poorman Creek Confluence and downstream of Canyon Creek confluence	32	28	South Yuba River Reach #4	28.4	28	689117 4358454	688592 4358239	Yes	Properly Functioning	No	not applicable	This site replaces the South Yuba Reach #6, Humbug Creek Confluence Reach identified in Table 6.0-1 of the revised study plan for 2.6.1, Riparian Habitat. Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat study plan.
Bear River below Rollins Dam (SR 2)	10	9	Bear River Canal Diversion Dam Reach	10.1	9.5	676567 4333472	675792 4332936	Yes	Properly Functioning	No	not applicable	This site replaces the Bear River Canal Diversion Dam Reach (SR 1) identified in Table 6.0-1 of the revised study plan for 2.6.1, Riparian Habitat. Vegetation transects not performed as outlined in Step 4 - Collect Transect Data of section 6.3 Study Methods of the revised study plan for 2.6.1, Riparian Habitat study plan.

1 The revised study plan for 2.6.1, Riparian Habitat included a site on Bear River, identified as the Chicago Park Powerhouse Reach.
2 River miles were calculated using the National Hydrography Dataset (NHD) GIS data. River miles start at the confluence of a stream or river into another stream or river (river mile 0) and increase upstream to the terminus of the stream. Upstream and downstream river miles denoted here indicate the location of each study site that occur within the estimated river miles indicated in the letter to FERC from the Licensees dated May 29, 2009 (see footnote 3).
3 Modifications to the revised study plan for 2.6.1, Riparian Habitat, agreed upon with other Relicensing Participants on May 11, 2009, were detailed in letters from Licensee filed with FERC and dated May 29, 2009. A separate letter was drafted from NID and PG&E and sent to FERC, confirming the site changes and method modifications made during the relicensing meeting on May 11, 2009.
4 The name of this site has been changed for consistency of reporting to reflect the Project features that support each downstream reach; in the letter to FERC dated May 29, 2009 the site name was indicated as "Canyon Creek below Bowman Diversion Dam"(see footnote 3).
5 The results of Technical Memorandum 6-1, Riparian Habitat were discussed at a relicensing meeting on September 27, 2009.

Table 6.4.1-3. Wetland study sites and PFC ratings for the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

Wetland	PFC Rating
YUBA-BEAR HYDROELECTRIC PROJECT	
Jackson Meadows Dam Reach: Wetland RM 46.4	Properly Functioning
DRUM-SPAULDING PROJECT	
Meadow Lake Wetland	Properly Functioning
White Rock Lake Wetland	Properly Functioning
White Rock Lake Dam Reach #2: Wetland RM 2.2	Properly Functioning
Bear River Reach #2: Wetland RM 35	Functional – At Risk Trending upward
Lower Rock Lake Dam Reach #1: Wetland RM 2.8	Functional – At Risk Trending upward
Lower Rock Lake Dam Reach #1: Wetland RM 3.1	Properly Functioning

Each of the three riparian and two wetland sites determined to be Functional – At Risk is described below by Project.

Yuba-Bear Hydroelectric Project

<u>Dutch Flat Afterbay Dam Reach – Riparian Habitat</u>
Dutch Flat Afterbay Dam Reach is a 5.4-mile section of the Bear River between the Chicago Park Powerhouse at the downstream end and Dutch Flat Afterbay Dam at the upstream end of the reach. Historic mining deposits continue to affect the channel morphology by remobilization of gravels and cobbles generated from hydraulic mining of the ancient river deposits near the town of Dutch Flat. The closer to the dam, the less sediment input there is from these deposits; the uppermost mile is a confined, bedrock-controlled, low-sediment-supply section. Conditions were assessed near the upstream section, where the channel is confined to a single thread between lateral, resistant cobble and boulder bars. Increasing amounts of stored hydraulic mining sediment in the downstream direction has led to paired terraces and a multi-thread (braided) channel. Parts of the reach are incised between terraces up to 60 feet high that are composed of gravel spoils contributed from hydraulic mining. The bed splits across floodplains and low terraces, forming multiple channels. Just above Chicago Park Powerhouse, the multi-thread, braided channel is confined between the unstable banks formed by the one remaining incised terrace. The overall defining disturbance is the extensive historic mining gravel deposits and the continued reworking of the hydraulic mining debris.

Historical photographs show few significant changes to the river channel over time. The vegetative cover in areas directly adjacent to the main channel flows increased from 1939 to 1977. Photographs from 1939 show little to no vegetation near the water's edge; the channel appears defined by a narrow band of vegetation in 1977 and later photographs. Field observations indicate that the vegetation at the water's edge was dominated by willow and white alder shrubs. Upland areas of vegetation are denser.

Three plant associations occur within the study site: yellow willow (*Salix lutea*), white alder, and black locust (*Robinia pseudoacacia)*. Two wetland systems (Cowardin et al. 1979) occur within the study site: riverine and palustrine. The riverine wetland encompasses approximately 2.73

acres and includes the Bear River. Palustrine wetlands encompass 9.18 acres and consist of approximately 2.36 acres of palustrine scrub-shrub and 6.82 acres of unconsolidated bottom.

Palustrine scrub-shrub wetlands are intermittently located in narrow bands on both banks of the river where bedrock is not present. These wetlands are characterized as moderately open to dense patches of woody riparian vegetation. Dominant species include an overstory of white alder and yellow willow. Palustrine unconsolidated bottom wetlands are dominant in areas adjacent to water flow. These wetlands are characterized by yellow willow and young white alders.

Licensee determined the riparian area associated with this reach was Functional – At Risk with an upward trend. Historic sedimentation and large historic floods have impacted the functional capacity of the riparian areas. As described above, depositional mine tailings have formed terraces that prevent the river from being hydraulically connected to the banks, and upland species are present on these terraces. The coarse deposits and extensive sediment supply has also caused channel braiding. The riparian sediments are also composed of loosely-consolidated and coarse deposits and are non-cohesive and unstable. In areas where riparian habitat is establishing, it cannot withstand high flows because fine sediments have not accumulated and soils have not developed in the coarse material, which prevents strong root-holds. Table 6.4.1-4 provides a detailed justification for Licensees' determination.

Table 6.4.1-4. Dutch Flat Afterbay Dam Reach PFC checklist for lotic areas.

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY		
Floodplain above bankfull is inundated in "relatively frequent" events	Yes	Floodplains are connected to the main channel in many locations. There are long stretches, however, where channel is confined between resistant cobble terraces. T4 is an example of a low lateral bar within the active channel that is connected to the floodprone zone, then transitions to a higher terrace, and yet another terrace at the valley wall. All of these terraces are composed of hydraulic mining sediments. Statistically, bankfull discharge (return interval of 1.5 yrs using mean daily annual peak flow) is 76 cfs, while the field-based bankfull discharge is between 86 and 189 cfs, which is a 1.5 to 3 yr return interval. Between 617 and 2,199 cfs inundates the floodprone zone, which have return intervals of 4-25 years.
Where beaver dams are present they are active and stable	NA	Study site reconnaissance observations revealed no signs of beaver activity.
Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)	No	Reach is moderately entrenched, small-cobble dominated reach with a gradient of 1.3%, sinuosity of 1.1, and width-to-depth ratio of 34. The parameters have led to a Rosgen Class B3. W:D is at the upper end of what is expected in this channel type. It is likely that the channel is wider than expected due to non-cohesive banks and unstable lateral location. Sinuosity is about what is expected in this gradient, and is able to adjust through erosion; intermittent active floodplains are indicative of meander bends re-establishing.
Riparian-wetland area is widening or has achieved potential extent	Yes	This channel is moderately entrenched, with significant potential for lateral and vertical adjustments (Pfankuch score: 111/poor). The riparian area is widening, and the erodible substrates and high sediment load influence floodplain development. Stable banks occur when there are low-lying floodplain as they are reinforced by vegetation and are beginning to accumulate fine sediments, which created a positive feedback mechanism that enhances continued development of a strong riparian component (bank erodibility hazard - v low). Unstable banks, a significant portion of the reach, are composed of non-cohesive and eroding cobble/gravel mining sediment collected into multiple terraces (bank erodibility hazard – high to extreme). Average bankfull width is about 41', while predicted is about 33'. Further widening of riparian zone is possible.

Table 6.4.1-4. (continued)

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY (continued)		
Upland watershed is not contributing to riparian-wetland degradation	No	Re-worked hydraulic mining sediment continues to move through the system creating dynamic channel location. However, riparian zones are beginning to form, and floodplains are often connected to the active channel.
VEGETATION		
There is a diverse age-class distribution of riparian wetland vegetation (recruitment for maintenance/recovery)	Yes	Black locust, quaking aspen and white alder trees and saplings are present.
There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Yes	Black locust, quaking aspen and white alder woody vegetation and Sedges, deerweed (*Lotus scoparius*) and giantmonkeyflower herbaceous vegetation were found in the reach. These species represent 2 vegetation flow response guilds.
Species present indicate maintenance of riparian-wetland soil moisture	No	The overall reach does not pass the FAC-neutral test, with 9 species of OBL/ FACW and 24 species of UPL/FACU plant species. Former riparian terraces functioned well before the river downcut through the sediment, effectively stranding the developing riparian vegetation. Vegetation on the terraces is showing signs of stress and some dead plants were observed.
Stream bank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high stream flow events.	No	Plant species found within the reach are capable of withstanding flow events if rooted within substrates that can withstand the impacts of flow and flow changes. Highly mobile sediment appears to be undermining the plant's ability to bind soil and perpetuate riparian functions.
Riparian-wetland plants exhibit high vigor	No	Stressed and dying plants observed on terraces away from the edge of flowing water. Plants found near the waters edge appeared healthy.
Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows.	No	Riparian vegetation has become established on less than 50% of the riparian zone that does not have bedrock or cobble substrates.
Plant communities are an adequate source of course and/or large woody material (for maintenance and recovery)	No	Woody vegetation plays little role in habitat development of this riparian area.
Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	Yes	Channel has access to secondary flow channels during high flow, and floodprone area both stores sediment and dissipates energy. There is no LWD, however.
Point bars are revegetating with riparian-wetland vegetation	Yes	Point and lateral bars are beginning to form and be stabilized by riparian vegetation. Active floodplains are below low terraces, which can also be inundated with frequency.
Lateral stream movement is associated with natural sinuosity	No	Lateral stream movement is the adjustment to the heavy sediment loads and unstable banks. It may be that sinuosity is numerically what it would be without unstable banks, just given the gradient, but location of bends is largely determined by the more resistant bedrock outcrops in valley walls. There are increasing exposures of bedrock in the upstream direction that force scour and control lateral movement.
System is vertically stable	No	Bed is composed of deformable substrate and scour is enhanced with obstructions.
Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)	No	This is a response reach, and has responded to high sediment loads by coarse debris deposition. Sediment sources are mostly from remobilized mining sediment from terraces, beds, and inactive channels. Bed material is cobble-dominated (reach-averaged D_{50} = 73 mm). Channel continues to rework unstable hydraulic mining sediments. Channel is braided and there are many mid and lateral bars. Channel easily shifts across the valley. Many banks are actively eroding either older terraces or younger lag deposits. However, there are few fines in the system, which would help riparian recruitment. There were few sand-sized particles stored in the pools, nor was there accumulation of patches of spawning-sized gravels.

Drum-Spaulding Project

Fordyce Lake Dam Reach –Riparian Habitat

Fordyce Lake Dam Reach is a 10.5 mile long reach between Fordyce Lake Dam and Lake Spaulding. The riparian study site was 0.83 mile long, encompasses 5.44 acres in one section of the overall reach, and is at an approximate elevation of 6,300 ft. The channel is mostly confined within bedrock walls and has numerous falls and gorges that define the overall character. In the more bedrock-controlled sections, only small residual patches of fine sediment remain on the channel margin. Substrate is dominated by immobile material, and banks are bounded by bedrock. There are some short alluvial sections where fine-grained alluvial sediment deposits are stored in terraces and near-channel deposits and banks are composed of fine-grained sands and silts.

Review of historical aerial photographs did not reveal significant changes in the channel since 1939. Bedrock and boulder banks dominate the reach and limit the lateral movement and the vegetative potential of the channel for much of the reach.

Although the dominate substrate of the banks was bedrock or boulder, some banks were composed of soils (<15 percent of the site). In these areas the soils were loamy, indicating they are significantly influenced by the decomposition of organic matter and are not the result of recent sedimentation. Mature upland forests are established in most of these areas with sparse and sporadic presence of riparian vegetation, such as sedges (*Carex* spp.) or mountain alders along the water's edge. Some deposits of soils extend away from the river banks, but both soil and vegetation characteristics indicate these areas have not historically functioned as floodplains and did not historically support extensive riparian vegetation.

Historical flow data show the 1997 flood flow was much higher than normal high-flow events. This flood may have contributed to the erosion where soil banks are present, possibly stripping these areas of stabilizing riparian vegetation. Undercutting was present in these areas, with root masses of upland plants exposed, and a sparse presence of riparian plants. When present, riparian plants in these areas tended to be small, often with exposed root masses. It is unclear from either historical photos or field assessment if these are remnant plants from an eroded riparian community, or if they are new seedlings struggling to become established. In either case, current conditions indicate that existing flows may be causing continued undercutting, and riparian vegetation has not become established enough to prevent further erosion. However, these areas compose little of the overall reach length (<15 percent).

Five plant associations occur within the study site and include mountain alder, incense cedar, red fir, huckleberry oak, and pinemat manzanita. Two wetland systems (Cowardin et al. 1979) occur within the study site: riverine and palustrine. The riverine wetland encompasses approximately 4.3 acres and includes Fordyce Creek. Palustrine wetlands encompass approximately 1.14 acres and consist of unconsolidated bottom wetland. Palustrine unconsolidated bottom wetlands are scattered intermittently in a few unconnected areas along the creek. These wetlands are characterized by the presence of one or more riparian woody species, including mountain alder and Lemmon's willow (*Salix lemmonii*).

Throughout the majority of the reach, energy associated with large flow events is dissipated by bedrock and boulder substrate. Although there is limited riparian vegetation in these areas, it meets the potential for an area dominated by such substrates, and therefore does not adversely affect the PFC assessment. However, some areas did not meet riparian potential, such as where soil banks were present in small, intermittent pockets throughout the reach and at a relatively short upstream section of the study site (<15 percent total). Surveys indicate that riparian vegetation was not present in these areas with enough vigor or root stability to withstand high flow events, although these areas have the potential to support a more developed riparian community. Erosion undercutting of these banks was observed, and vegetation in these areas had exposed roots. These areas contributed to the Functional – At Risk rating because they do not meet their potential, although they comprise only a small percentage of the overall site. Table 6.4.1-5 provides a detailed justification for Licensee's determination.

Table 6.4.1-5. Fordyce Lake Dam Reach PFC checklist for lotic areas.

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY		
Floodplain above bankfull is inundated in "relatively frequent" events	NA	There are few floodplains connected to the main channel. Channel is incised and entrenched between bedrock walls (T7 and T13). The upper section (T19) is incised into cohesive, fine sediments, and there is some point bar and floodplain interaction. However, this type of morphology with fine-grained banks and substrate is uncommon within the reach. Statistically, bankfull discharge (return interval of 1.5 years, using mean daily annual peak flow) is 483 cfs, while the field-based bankfull discharge is 207-614 cfs, which has a return interval of between 1 and 1.5 years. About between 1,400 and 6,300 cfs inundates the defined floodprone surface, which translates to a return interval of between 3 to 150 years.
Where beaver dams are present they are active and stable	NA	Study site reconnaissance observations revealed no signs of beaver activity.
Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)	No	This is an entrenched-moderately entrenched reach with a relatively low gradient of 0.5% (lower section) and 0.1% (short, upper section within fine-grained terrace), sinuosity of 1.2, width-to-depth ratio of 21 and a gradient of 0.5% These parameters lead to Rosgen Classes of F3 and B3. Both classes are relevant as greater entrenchment in many locations within the reach is characteristic of the F-type channels. Width-to-depth ratio is within the dominant range for F3 and B3 channels. In bedrock-controlled channels planform does not conform to Rosgen classes. The geology is dominated by granite, granodiorite and diorite, which are coarse grained and can be detached from the parent material to provide sandy material to the channel, as seen in overbank deposits, accumulation of fines in deep pools, and on the intermittent bars and bends in velocity shadows. This sandy material once dominated the thin riparian corridor, which has been reduced through erosion.

Table 6.4.1-5. (continued)

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY (continued)		
Riparian-wetland area is widening or has achieved potential extent	Yes	This channel is entrenched, with little potential for lateral and vertical adjustments due to strong bedrock controls and resistant banks (Pfankuch: fair to good). Stable banks are boulder or bedrock controlled (bank erodibility hazard is very low). Unstable banks are located in the small patches of residual fine-grained deposits weakly sustained by willows and alders (*Alnus* spp.), and in the vertical cohesive banks that form the terrace (bank erodibility hazard is high to very high). It appears that the channel has incised the fine-grained sediments that had accumulated within this reach. These small sedimentation areas were never a large component of the reach, but were historically the only portion of the reach capable of supporting riparian vegetation, as most of the reach streamside areas are composed of bedrock. BFW is predicted to be about 38 feet given the drainage area and averages 41 feet in the bedrock-controlled section, but is 64 feet in the terrace section, which is more self-formed within alluvial material. It is unlikely that riparian zone will widen in the bedrock section as there are few storage sites for fine sediment upon which vegetation can grow, and riparian has achieved its potential extent. Further narrowing is also unlikely as current channel is dominated by bedrock and boulder banks. While there are some exposed vertical banks within the upper terraced section, there are also developing floodplains and riparian zone is widening.
Upland watershed is not contributing to riparian-wetland degradation	Yes	Bedrock gorge areas are insensitive to upland watershed disturbances.
VEGETATION		
There is a diverse age-class distribution of riparian wetland vegetation (recruitment for maintenance/recovery)	No	Riparian vegetation is limited; there is low potential for establishment of riparian vegetation throughout most of the reach, due to the bedrock/boulder substrate of the bed and banks. Recruitment is present in limited areas of the reach, but the recruits do not appear capable of withstanding high flows and may not reach maturity.
There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Yes	This study site has low potential for riparian-wetland due to the boulder and bedrock banks. The riparian-wetland vegetation was limited, but represented adequate diversity for this system. Alder and willow shrubs were sparsely distributed along the reach, occurring as lone individuals or in small clusters. At two locations, alder shrubs were more abundant and formed dense thickets; one location was where an ephemeral tributary joined the creek (near T7) and the other was at the "jeep crossing" near the middle of the study site. Sedges and rushes (*Juncus* spp.) were limited to a few areas where soil banks were present; root masses did not appear capable of withstanding high flow due to erosion and undercutting.
Species present indicate maintenance of riparian-wetland soil moisture characteristics	Yes	Eight wetland indicator plant species were observed in the riparian-wetland.
Stream bank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events	Yes	Most banks were dominated by bedrock and boulder with some in-stream cobbles, but some stream bank vegetation communities occurred in soil terraces and dominated by mature upland forest species (incense cedar, pines [*Pinus* spp.], and manzanita [*Arctostaphylos* spp.]) with a few mature riparian shrubs (alders and willows). The majority of this vegetation appeared capable of withstanding high flow events. In small localized areas where sediments were deposited on bedrock dominated banks, vegetation did not appear capable of withstanding high flow events, but seemed more vulnerable to erosion. In addition, establishment of new stream bank vegetation occurring during low/regular flow may be thwarted during high flows and developing root masses do not have time to become flow resistant.
Riparian-wetland plants exhibit high vigor	Yes	Although riparian plants were generally sparse, most were healthy and capable of withstanding high flows. Growth often appeared stunted due to limited soils. Riparian plants exhibited low vigor in small localized areas where sediments were deposited within the bedrock dominated banks. These plants had higher incidence of exposed root masses and were more vulnerable to erosion. In addition, establishment of new riparian vegetation occurring during low/regular flow may be thwarted during high flows and developing root masses do not have time to become flow resistant.

Table 6.4.1-5. (continued)

PFC Checklist	Yes | No | NA	Justification
VEGETATION (continued)		
Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows	No	Less than five percent of the stream bank is vegetated with riparian vegetation; the study site is dominated by bedrock/boulder banks, which is capable of withstanding high flows and dissipating energy. In the limited areas where soil banks exist, riparian vegetation has not established enough to protect remnant sandy and terrace banks from high flows. Undercutting is present in most of these areas.
Plant communities are an adequate source of coarse and/or large woody material (for maintenance and recovery)	Yes	A mature upland forest is intermittently present throughout the length of Fordyce Creek and extends into the adjacent hills; this forest is an adequate source of large woody debris. Surveyors observed limited large woody debris in the system; some was observed at the downstream end of the study site. This woody debris was deposited on boulders above regular flow level.
EROSION/DEPOSITION		
Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	Yes	There are neither side channels nor LWD. However, large boulder and bedrock outcrops and bed elements dissipate energy. Deep pools also act as capacitors for energy and dampen the slope at flood flow. Fine sediment does deposit within these deep pools during high flow events (11% volume filled). There is a channel in the upper terrace section (T19) that appears to be a high flow overflow channel. However, this would be accessed through upstream diversion and not overbank flow.
Point bars are revegetating with riparian-wetland vegetation	Yes	Point bars are not common within the lower section, but where they exist in the upper, terrace portion; they are revegetating.
Lateral stream movement is associated with natural sinuosity	Yes	Lateral stream movement is controlled by resistant banks. Some lateral movement is more possible within the terrace environment, but the extent is limited by cohesive-sediment, backed by bedrock.
System is vertically stable	Yes	Bed is often composed of imbricated cobbles and boulders, and bedrock. There is scour and lateral movement upstream within the terrace environment, but scour depth is limited by bedrock/boulder control.
Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)	No	Bed material is cobble-dominated in the lower-bedrock gorge area (reach-averaged D_{50} = 173 mm), but is gravel-dominated in the lower gradient terraced area (reach-averaged D_{50} = 48). This is a response reach and has responded to transport capability exceeding sediment availability through loss of channel margin deposits. There is incision and vertical unstable banks in the small remnant fine sediment deposits, which indicates continued removal of fine material. There is little storage or deposition within the active channel of material finer than cobbles. There was only gravel-sized material in the active channel within the lower-gradient terrace area.

Bear River Reach #2 – Riparian Habitat[5]

The riparian study site is approximately 1.65 miles long, is located within a reach of the Bear River near RM 35, and is at an approximate elevation of 4,000 feet. The function of this reach is related, in part, to Drum-Spaulding Project and Yuba-Bear Hydroelectric Project waters that are released from the Drum and South Yuba canals into the Bear River. In particular, water for both

[5] With regard to Bear River Reaches #1 and #2, PG&E does not divert water from these reaches, and, aside from a stream gage, PG&E does not have any Project facilities in these reaches. PG&E believes that in the Proposed Projects, Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches with NID because water from both projects is anticipated to be periodically moved through the reaches as is currently the case. NID disagrees with PG&E for three reasons. First, NID's Yuba-Bear Hydroelectric Project has no facilities in this section of the Bear River. Second, under historic as well as current conditions, PG&E at its sole discretion and without request by NID, releases water from Drum Canal into the Bear River at RM 35.3. Third, at this time, NID has made no decision regarding whether releases from the Drum Canal into the Bear River at RM 35.3 might be beneficial to NID in the future, and has not requested that PG&E include such releases in PG&E's application for a new Drum-Spaulding Project license.

projects is delivered via Bear River Reach #1 and #2 in various instances, including for safety purposes and for additional diversion during the winter and spring of wetter water years.

The Bear River Reach #2 (Meadow Sub-Reach) study site occurs near the headwaters of the Bear River drainage; the Bear River flows through Bear Valley the entire length of the study site. The reach was separated into three sections, with PFC assessments performed at each (upper, middle, and lower). In the upper section, the stream is confined cohesive alluvial sediments with exposed bedrock in the channel, and the meadow slopes steeply to the channel (Attachment 6-1D, Figure 26 in Technical Memorandum 6-1, Riparian Habitat). The upper meadow has springs and sub-surface flow that are not surficially connected to the channel. In the middle section, the Bear River flows through a terrace and includes a short berm. The berm, composed of cobbles and boulders, is located left bank ascending at the middle meadow site; it is approximately 4 feet high and 100 feet in length. It may have been man-made or the result of a large flood or series of high-flow events. The channel is steep through this portion of the meadow, and there is no apparent hydraulic connection between the channel and adjacent meadow (Attachment 6-1D, Figure 27 in Technical Memorandum 6-1, Riparian Habitat). Upland vegetation dominates a portion of the middle meadow, and bedrock is present along the south portion. The lower section is a meandering stream with fine-grained banks (Attachment 6-1D, Figure 28 in Technical Memorandum 6-1, Riparian Habitat). Springs appear to sustain flow in the channel and within the meadow in this lower section.

The review of historical photos revealed that the Bear River has remained largely along its present alignment since 1939, although some localized straightening of bends and small oxbow-type turns are apparent (Attachment 6-1A, Figure 7 in Technical Memorandum 6-1, Riparian Habitat). Field observations indicate the side channels present in the earliest aerial photographs continue to function at high flows. Both historical photos and field surveys show substantial increase in riparian vegetation has occurred along these side channels since 1939. Woody vegetation has increased along the main stream channel steadily since 1939. Field observations show this vegetation consists of riparian species of white alder trees with an understory of mountain alder and various willows. Vegetation throughout the main and side channel stabilize the banks and limit lateral movement. In addition, stream channel movement is limited near the California State Highway 20 crossing by the presence of bedrock.

There is a long history of land use at Bear Valley Meadow; it was used by the Tsi-Akim Maidu Tribe and other cultural groups for thousands of years before the arrival of settlers in the mid-1800s. The Emigrant Trail was established through the upper end of the site in 1844; a narrow gage rail was run through the valley during the last 20 years of the nineteenth century. The meadow was grazed by cattle from the mid-1880s until the 1990s. A wooden crib dam was constructed in the late 1800s on the west side of the valley to divert water out of the Bear River to form a small reservoir at the west end of Bear Valley Meadow. U.S. Highway 20 was constructed prior to 1966 and traverses both Bear River and Bear Valley.

A headcut migration from the main channel extending almost to Highway 20 is observable on aerial photographs beginning with the 1977 series. This headcut may be due to runoff from the highway concentrated in a single channel. The main channel is incised with vertical banks that were likely compacted by grazing and are susceptible to failure. Small, localized failures have occurred, although signs of recovery at this site are evident. Willows, sedges, and other wetland-associated plants have colonized the banks of the Bear River throughout the site, particularly in areas where restoration efforts have occurred. In October 1994, PG&E entered into an agreement with the Granite Bay Flycasters to allow site restoration efforts to take place along Bear River Reach #2, including brush sediment traps, log constrictors, and shrub plantings. Restoration work under this agreement continued up to August 2002. These site restoration efforts were still in evidence during site assessment in 2009. In combination with increased shrub cover resulting from the exclusion of cattle, these developments serve to generally improve wetland functions and habitat values and support the determination of an upward trend in functional condition.

Observed regulated flows and synthesized unimpaired flows indicate that releases through this reach have periodically exceeded estimated unimpaired values (Attachment 6-1C in Technical Memorandum 6-1, Riparian Habitat). Peak regulated flows for the past 30 years of record were often lower than unimpaired high flows, but peaks in excess of 100 cfs occurred with greater frequency. Under unimpaired conditions, there would generally be little flow through this reach during the months of May through October, with periodic high flow events in November through April that usually do not exceed 400 cfs. Under regulated conditions, there is a sustained 5 cfs minimum flow throughout the year (measured at YB-198), with frequent high flow winter and early spring events that generally do not exceed 400 cfs. Between 1993 and 1997 peak flows were higher, more frequent, and sustained longer than unimpaired conditions, with six high flow events that ranged from just over 300 cfs to nearly 580 cfs. The higher sustained flows in 1997 were primarily due to the New Year's Day flood event, which sent a large pulse of sediment into Drum Afterbay and incapacitated the hydroelectric powerhouses. The powerhouses were placed on an extended outage due to the sedimentation, and water diverted from NID's and PG&E's projects' facilities in the Middle and South Yuba rivers was subsequently moved through the Bear Valley and directly into Drum Afterbay as a result (typically, these flows would be moved into the Bear River watershed via the Drum Canal). Released flows over the last 10 years have primarily been below 400 cfs; however, in 2006 there were sustained flows above 400 cfs.

With regard to riparian habitat, Bear River Reach #2 was rated as Functional – At Risk with an upward trend. Although the channel is incised in the upper and middle portions, with intermittent bank failures in the middle meadow, the study site has many of the characteristics included in the PFC definition. There are active and frequent floodplains in the lower section of the study site. Localized floodplains show connectivity to the main channel, and a high water table, hydric soils, and fine-grained deposition suggest frequent inundation. More than 95 percent cover of woody and herbaceous riparian vegetation support bank stability, dissipate energy, and form root masses capable of withstanding high-flow events. Twenty-nine wetland indicator species were observed and may denote a healthy distribution of anaerobic soil and groundwater movement. There are no fan deposits or braids from upland sediment sources and no indication of current excessive erosion or deposition. Regulated flows in this reach are larger than would be expected given the small drainage area; the reach is used for spill conveyance during winter storm conditions and for conveyance into the Bear River watershed during the winter and spring of wetter water years. Tables 6.4.1-6, 6.4.1-7 and 6.4.1-8 list the overall justifications for the Functional – At Risk rating of the Bear River Reach #2 study sites.

Table 6.4.1-6. Bear River Reach #2 (Upper Meadow) PFC checklist for lotic areas.

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY		
Floodplain above bankfull is inundated in "relatively frequent" events	Yes	Channel is incised into the meadow, and there are few floodplains excepting in the lower section of the study site. Existing floodplains are connected to the main channel and inundated by relatively frequent events as seen by the high water table, hydric soils and fine grained deposition. Using physical and statistical interpretation at the gage at Hwy 20, bankfull discharge (return frequency of 1.5 years, using mean daily annual peak flow) is 95 cfs, while the field-based bankfull discharge is about 54 cfs, which has a return interval of less than one year. About 244 cfs inundates the floodprone zone, which is a return interval of about 3 years. At the Upper Meadow location, which is very similar in entrenchment to the gage site in certain locations, about 944 cfs inundates the floodprone zone, which has a return interval of over 500 years.
Where beaver dams are present they are active and stable	NA	Study site reconnaissance observations revealed no signs of beaver activity.
Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)	Yes	This is a slightly entrenched, small-cobble dominated reach with a gradient of 1%, sinuosity of 1.2, and width-to-depth ratio of 16. These parameters have led to a Rosgen Class of C3. W:D ratio at the cross section (and where a small floodplain exists) is typical of the C-type stream. It appears that incision is coincident with flow regulation, judging from the age of the trees adjacent to the channel. This did not appear to be a meandering, sinuous and low gradient channel prior to regulation, as there are no ox bows, cut off channels, nor other evidence to suggest a distinct change of plan form. Bed is coarser than would be expected, which may be due to slight straightening and steepening.
Riparian-wetland area is widening or has achieved potential extent	Yes	This channel is slightly entrenched where intermittent floodplains exist, with potential for lateral adjustments through fine grained, though cohesive, sediments (bank erosion hazard is high due to vertical, occasionally undermined banks in several locations, with little vegetative or root protection). Adjacent meadows (terraces) are significantly higher than the stream channel and appear to be supported by groundwater sources and not through hydraulic connection or overbank deposits from the river. The mature alder forest appears to be even-aged and may have emerged following a significant flood event. Bedrock and boulders appear to limit channel change within the current alignment. Riparian vegetation has and is continuing to establish in areas with suitable substrate and moisture conditions.
Upland watershed is not contributing to riparian-wetland degradation	Yes	There are slope failures upstream of the reach, where spill is released from the Drum Canal. There are few mid-channel or point bars that would indicate high sediment loads (i.e., increased sediment in this reach due to large amounts of upstream mass failures is not indicated). However, sediment transport capability may exceed sediment availability so bars are not prevalent. Pools do have some fine sediment (V* is 7%), and 13% of spawning gravels are less than one mm, likely from localized and perhaps upstream bank failures. These fines do not appear to be degrading the riparian condition.
VEGETATION		
There is a diverse age-class distribution of riparian wetland vegetation (recruitment for maintenance/recovery)	Yes	Mature alder trees, alder and willow shrubs, and recruits were observed throughout the riparian-wetland community.
There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Yes	Alder trees, alder and willow shrubs, sedges, and other herbaceous plants compose a diverse riparian-wetland community.
Species present indicate maintenance of riparian-wetland soil moisture characteristics	Yes	Twenty-nine wetland indicator plant species were observed within the wetland-riparian community.
Stream bank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events	Yes	The stream banks are dominated by grasses and sedges, with some alder and willow shrubs present. Root masses are capable of withstanding high flow events, but may be subject to undercutting if high flows are persistent.
Riparian-wetland plants exhibit high vigor	Yes	All riparian plants appeared to be healthy. No decadent, wilted, stunted or dying plants were observed.

Table 6.4.1-6. (continued)

PFC Checklist	Yes | No | NA	Justification
VEGETATION (continued)		
Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows	Yes	Alder trees and shrubs, willows, and sod-forming sedges all present and capable of dissipating energy.
Plant communities are an adequate source of coarse and/or large woody material (for maintenance and recovery)	Yes	White alder trees within the riparian-wetland, and adjacent upland coniferous forest are adequate to provide large woody debris.
EROSION/DEPOSITION		
Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	Yes	Channel has roughness composed of coarse boulder and cobble grains, from bedrock and boulder exposed in beds and from large woody debris. Large woody debris was counted within the wetted channel - 14 pieces in 0.3 mi, which is relatively high for this system.
Point bars are revegetating with riparian-wetland vegetation	NA	No point bars present.
Lateral stream movement is associated with natural sinuosity	Yes	Lateral movement is in the form of small, localized bank failures. There is not strong, obvious lateral movement, though existing channel is a bit wider than expected, except where inset, intermittent floodplains exist.
System is vertically stable	Yes	Vertical stability is controlled by bedrock control points and immobile substrate. There are bedrock and boulder controls that limit any further vertical incision (Pfankuch score: 108/good).
Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)	Yes	There is no indication of current excessive erosion or deposition. Bed material is fairly coarse (reach-averaged D_{50} = 125 mm). Mobility of D_{16}, D_{50}, D_{84} has not changed with the 50%, nor 25%, exceedance flows with the shift from regulated flow to unimpaired flow.

Table 6.4.1-7. Bear River Reach #2 (Middle Meadow) PFC checklist for lotic areas.

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY		
Floodplain above bankfull is inundated in "relatively frequent" events	Yes	Channel is incised into the meadow, and there are few floodplains. The narrow floodplains that do exist are connected to the main channel and inundated in relatively frequent events, as seen by high water table, hydric soils and fine grained deposition. Using physical and statistical interpretation at the gage at Hwy 20, bankfull discharge (return frequency of 1.5 years, using annual peak flow) is 95 cfs, while the field-based bankfull discharge is about 54 cfs, which has a return interval of less than one year. About 244 cfs inundates the floodprone zone, which has a return interval of about 3 years. However, at the Middle Meadow location, which is more entrenched than at the gage site, about 2,545 cfs inundates the floodprone zone, which has a return interval of over 500 years.
Where beaver dams are present they are active and stable	NA	Study site reconnaissance observations revealed no signs of beaver activity.
Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)	Yes	This is an entrenched, large-cobble dominated reach with gradient of 1.2%, sinuosity of 1.2, and width-to-depth ratio of 23. The parameters lead to a Rosgen Class of F3. W:D is as expected given the channel type. This is not a meandering, sinuous and low gradient channel at this location in the meadow.

Table 6.4.1-7. (continued)

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY (continued)		
Riparian-wetland area is widening or has achieved potential extent	Yes	The riparian wetland area appears to remain somewhat stable under current conditions. Because livestock no longer graze in the area, willows and other woody species have increased dramatically as seen on historical aerial photos. Woody riparian vegetation has served to stabilize affected stream banks. Lateral movement of the stream through the meadow is limited by the incised nature of the channel. The channel appears to have remained in its current position since before the 1939 photo. Soil pits within the wetland meadow do not reveal a depositional environment. Areas outside of the channel have very fine-grained silty soils or organic soils more associated with saturated systems or ponded areas. Upland rock outcrops and traditionally upland terrain occurs along the south stream bank and these areas are well vegetated with mature trees. Average BFW is 38 feet, which is wider than is predicted (19') given the drainage size. Riparian zone could widen, but widening will be restricted to the north side, as the south side is dominated by bedrock, boulders, or well-vegetated with mature trees. Alders and willows are encroaching upon the channel and deposition of fine grained material is possible within the incipient point and lateral bars.
Upland watershed is not contributing to riparian-wetland degradation	No	It appears that a large event or some other channel-modifying event created a berm and exposed alder roots. This is an older berm (at least 20-40 years, judging from the age of the mature trees growing on it). There is a road leading to this location in the meadow, so this berm may be completely artificial.
VEGETATION		
There is a diverse age-class distribution of riparian wetland vegetation (recruitment for maintenance/recovery)	Yes	Mature alder trees were present with willow and alder shrubs and sprouts.
There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Yes	Alder trees, alder and willow shrubs, sedges, and other herbaceous plants compose a diverse riparian-wetland community.
Species present indicate maintenance of riparian-wetland soil moisture characteristics	Yes	Twenty-nine wetland indicator plant species were observed within the wetland-riparian community.
Stream bank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events	Yes	Mature alder trees, and willow and alder shrubs occur along the banks with root masses capable of withstanding high flow events.
Riparian-wetland plants exhibit high vigor	Yes	All riparian plants appeared to be healthy. No decadent, wilted, stunted or dying plants were observed.
Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows	Yes	Mature alder trees occur along the banks with willow and alder shrubs capable of protecting the banks.
Plant communities are an adequate source of coarse and/or large woody material (for maintenance and recovery)	Yes	The mature alder trees within the riparian-wetland are an adequate source of large woody material.
EROSION/DEPOSITION		
Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	Yes	Channel has roughness composed of coarse boulder and cobble grains and from boulder exposed in beds. Bends and bars are also capable of dissipating energy.
Point bars are revegetating with riparian-wetland vegetation	Yes	Point bars are a minor component, but the ones that do exist are well vegetated with riparian wetland shrubs, such as willows.
Lateral stream movement is associated with natural sinuosity	Yes	Lateral movement is limited by resistant banks; sinuosity is low. This channel is entrenched, with little potential for lateral adjustments because banks are composed of a cobble-boulder berm/banks on one side and terrace slope with strong vegetative control on the other and bank erodibility hazard is low.
System is vertically stable	Yes	Vertical stability is controlled by immobile substrate. There is boulder and imbricated cobble material that limit any further vertical incision (Pfankuch score: 62/good).
Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)	Yes	There is no indication of current excessive erosion or deposition.

Table 6.4.1-8. Bear River Reach #2 (Lower Meadow) PFC checklist for lotic areas.

PFC Checklist	Yes | No | NA	Justification
HYDROLOGY		
Floodplain above bankfull is inundated in "relatively frequent" events	Yes	Floodplains are frequent and active. Vertical, eroding banks are becoming stabilized, and the bank opposite these vertical, unstable banks, are often active floodplains. These active floodplains are connected to the main channel and inundated in relatively frequent events, as seen by return frequency of depositional surfaces above bankfull, high water table, hydric soils, and fine grained deposition. Using physical and statistical interpretation at the gage at Hwy 20, bankfull discharge (return frequency of 1.5 years, using mean daily annual peak flow) is 95 cfs, while the field-based bankfull discharge is about 54 cfs, which has a return interval of less than one year. About 244 cfs inundates the floodprone zone, which has a return interval of about 3 years. At the Lower Meadow location, which is very similar in entrenchment to the gage site, about 356 cfs inundates the floodprone zone, which has a return interval of above 12 years.
Where beaver dams are present they are active and stable	NA	Study site reconnaissance observations revealed no signs of beaver activity.
Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)	No	This is a slightly entrenched, gravel-dominated reach with a 0.4% gradient, sinuosity of 1.3, and width-to-depth ratio of 13. These parameters have led to a Rosgen Class C4. W:D is what is expected for a channel of this type. This is a meandering, sinuous and low gradient channel, where the erosion is in expected places. However, there is some additional erosion in straight sections, which is continuous along both banks but only at intermittent locations. Width-to-depth ratio is expected to further decrease as banks continue to revegetate and streamside rushes and sedges downscale into the channel, creating a narrower and deeper channel. The in-channel weeds that have invaded may create immobile riffles from developed root structure which is storing fine sediment and forming a mat over the coarser gravels. This mat has changed the sediment transport dynamics and perhaps inhibits the recovery to a narrow, deep, stable channel.
Riparian-wetland area is widening or has achieved potential extent	Yes	This channel is slightly entrenched, with potential for lateral adjustment through natural meandering. The riparian wetland area appears to remain stable under current conditions. Since livestock have been removed from the area, willows and other woody species have increased dramatically, as seen on historical aerial photos. Woody riparian vegetation has served to stabilize affected stream banks. Lateral movement of the stream through the meadow is limited by the incised nature of the channel. The channel appears to have followed the current channel since before the 1939 photo. Soil pits within the wetland meadow do not reveal a depositional environment, however. Areas outside of the channel have very fine-grained silty soils or organic soils more associated with saturated systems or ponded areas. BFW is 21 feet, which is about what is predicted with this drainage area. While some bank erosion still exists, one or both banks are experiencing significant willow and sedge growth and riparian zone is widening where stream had widened in the past. Given the current trajectory, it is expected that the entire channel will be bounded by willows and sedges and will become a narrow, deep, meandering meadow channel.
Upland watershed is not contributing to riparian-wetland degradation	Yes	There is no excessive erosion or sediment supply that results in fan deposits or mid-channel bars. There is no change in condition of upland areas, other than removal of grazing pressure. Bank stability has improved since grazing has been excluded from the meadow. No fan deposits or braids from upland sediment sources.
VEGETATION		
There is a diverse age-class distribution of riparian wetland vegetation (recruitment for maintenance/recovery)	Yes	Vegetation cover along the majority of the riparian-wetland consists of mature willow and alder shrubs with recruits throughout. Sod-forming sedges were also present, forming a dense herbaceous layer.
There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Yes	Alder and willow shrubs, sedges, and other herbaceous plants compose a diverse riparian-wetland community.
Species present indicate maintenance of riparian-wetland soil moisture characteristics	Yes	Twenty-nine wetland indicator plant species were observed within the riparian-wetland.

Table 6.4.1-8. (continued)

PFC Checklist	Yes | No | NA	Justification
VEGETATION (continued)		
Stream bank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events	Yes	Sod-forming sedges, and alder and willow shrubs provide dense ground cover and are capable of withstanding high flow events.
Riparian-wetland plants exhibit high vigor	Yes	All riparian plants appear to be healthy. No decadent, wilted, stunted or dying plants were observed.
Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows	Yes	Sod-forming sedges, and alder and willow shrubs provide dense ground cover and bank protection.
Plant communities are an adequate source of coarse and/or large woody material (for maintenance and recovery)	No	Vegetation in this area consists of a herbaceous layer and shrubs, but does not include any trees.
EROSION/DEPOSITION		
Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	Yes	The channel has significant channel margin vegetation, which creates scour and roughness and bank resistance. Sharp bends and vegetated bars are also capable of dissipating energy.
Point bars are revegetating with riparian-wetland vegetation	NA	No point bars in this area.
Lateral stream movement is associated with natural sinuosity	Yes	Lateral movement is mostly consistent with a sinuous channel, with the exception of some localized bank failures that have not yet recovered to pre-grazing stability.
System is vertically stable	Yes	Vertical stability is controlled by cohesive silts and clays. There is a possibility for deep scour holes, but this is not instability.
Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)	Yes	Bed has deep scoured pools, separated by short, gravel low gradient riffles that are heavily vegetated with aquatic buttercup (*Ranunculus aquatilis)*, which change the sediment transport possibilities (Pfankuch score: 127/poor). Bed material is gravel-dominated, with significant parts of bed material comprised of cohesive silt and/or failed bank material (reach-averaged D_{50} = 32 mm). There is no indication of current excessive erosion or deposition.

Bear River Reach #2: Wetland RM 35[6]

Bear River Reach #2: Wetland RM 35 occurs approximately 2 miles southwest of Lake Spaulding. The site encompasses approximately 266.70 acres and is located in the Bear River Sub-basin at approximately 4,520 feet in elevation. This wetland complex is composed of wetlands associated with the river and wetlands created by upslope sources. The Bear River bisects the wetland west of Highway 20 and borders the northern boundary of the wetland east of Highway 20. Sources of water for this wetland include seeps, springs, the Bear River, and seasonal inflow from streams that drain the adjacent uplands. As discussed above, the function of this reach is related, in part, to Drum-Spaulding Project and Yuba-Bear Hydroelectric Project waters that are released from the Drum and South Yuba canals into the Bear River. In particular, water for both projects is delivered via Bear River Reach #1 and #2 in various instances, including for safety purposes and for additional diversion during the winter and spring of wetter water years. PG&E does not divert water from this reach, or other sections of Bear River above Drum Afterbay, but does maintain a year-round 5 cfs minimum streamflow at gage YB-198.

Examination of historical aerial photographs from 1939, 1966, 1983, and 2005 indicate Bear River Reach #2: Wetland RM 35 has not changed substantially over this period. The overall extent of the wetland has remained the same. The photographs show some increase in conifers

[6] As discussed in footnote number 5, PG&E believes that Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches. NID disagrees with PG&E.

along the wetland margins and an increase in overstory vegetation density in these areas. Shrub and forest wetland vegetation cover along the stream corridor throughout the wetland have also increased over time. The surrounding upland forest habitats also show an overall increase in density over this period.

Bear Valley has a long history as a pasture for livestock and, up until the 1990s, was heavily grazed. The emergence of woody vegetation throughout the stream margins is most likely related to the general decline of grazing pressure.

Eight plant associations occur within the wetland and include: sedge, rush, white alder, bulrush (*Scirpus* sp.), broadleaf cattail (*Typha latifolia*), willow, wet meadow, and dry meadow. The wetland system occurring in the study site is palustrine. The palustrine wetlands encompass approximately 266.70 acres and consist of approximately 234.68 acres of emergent wetlands, 17.80 acres of scrub-shrub wetlands, and 14.22 acres of forested wetlands.

Palustrine emergent wetlands dominate the study site and occur as “dry” or “wet” emergent (meadow) wetlands. Herbaceous perennial plants provide nearly 100 percent of the vegetation cover. “Dry” emergent wetlands are distinguished from “wet” emergent wetlands by their plant composition and physical characteristics (e.g., soil saturation, flooding). The “dry” emergent wetlands are dominated by Pacific foxtail (*Alopecurus saccatus*) interspersed with slender cinquefoil (*Potentilla gracilis*), Kentucky bluegrass (*Poa pratensis*), meadow barley (*Hordeum bracyantherum*), and common yarrow (*Achillea millefolium*). The “wet” emergent wetlands are dominated by inflated sedge (*Carex vesicaria*) interspersed with slender cinquefoil, Nebraska sedge (*C. nebraskensis*), Baltic rush (*Juncus balticus*), and willow weed *(Epilobium* sp.). Wetland modifiers include saturated, seasonally flooded, seasonally flooded/saturated, and semi-permanently flooded.

Palustrine scrub-shrub wetlands occur along the stream corridors in the study site and are characterized as open to dense patches of woody riparian shrubs with an herbaceous understory. Dominant plant species include an overstory of shining willow (*S. lasiandra*) and arroyo willow (*S. lasiolepis*) with an understory dominated by panicled bulrush (*S. microcarpus*). Other plants occurring in the understory include largeleaf avens (*Geum macrophyllum*) and primrose monkeyflower (*Mimulus primuloides* ssp. *primuloides*). Wetland modifiers include temporarily flooded, saturated, seasonally flooded, seasonally flooded/saturated, semi-permanently flooded, and permanently flooded.

Palustrine forested wetlands occur along portions of the Bear River corridor. These wetlands are characterized by deciduous and conifer forest stands with an understory of woody riparian shrubs and emergent vegetation. The dominant species include shining willow, white alder, and incense cedar, with yellow willow occurring in the understory. Herbaceous vegetation is dominated by Kentucky bluegrass and pine bluegrass (*P. secunda*) interspersed with slender cinquefoil, giant monkeyflower (*M. guttatus*), English plantain (*Plantago lanceolata*), wild rye (*Elymus* sp.), and common yarrow. Wetland modifiers include temporarily flooded, saturated, seasonally flooded, seasonally flooded/saturated, semi-permanently flooded, and permanently flooded.

Bear River Reach #2: Wetland RM 35 was rated as Functional – At Risk, trending upward, (as compared to a potentially higher rating) because one of the PFC Lentic Standard Checklist items has been answered "no." Specifically, the natural surface or subsurface flow patterns appear to have been altered by historic disturbance from grazing (PFC question #6). The assessment team also concluded that the characteristics of wetland hydrology are present in most of the study site, wetland habitats present are dominated by hydrophytic plant species, and significant erosion or degradation is currently not an issue. Three wetland habitats and six water regimes occur supporting many hydrophytic-dominated plant communities. The site consists mainly of a mosaic of dry and wet meadow, with occasional shrub and forest habitats. Historically, regulated flows in this reach have exceeded what would have been expected in unimpaired conditions given the small drainage area.

Although evidence of erosion and channel degradation from historical grazing practices is apparent on historic photos, natural succession and observed site restoration activities have occurred as well. Willows, sedges, and other wetland-associated plants have colonized the banks of the Bear River throughout the site, particularly in areas where restoration efforts have occurred. In October 1994, PG&E entered into an agreement with the Granite Bay Flycasters to allow site restoration efforts to take place along Bear River Reach #2, including brush sediment traps, log constrictors, and shrub plantings. Restoration work under this agreement continued up to August 2002. These site restoration efforts were still in evidence during site assessment in 2009. In combination with increased shrub cover resulting from the exclusion of cattle, these developments served to generally improve wetland functions and habitat values and support the determination of an upward trend in functional condition. Table 6.4.1-9 summarizes the justifications for the PFC rating for Bear River Reach #2 Wetland.

Table 6.4.1-9. Bear River Reach #2 Wetland (RM 35) PFC checklist for lentic areas.

PFC Checklist	Yes | No | NA	Justification[1]
HYDROLOGY		
Riparian-wetland area is saturated at or near the surface or inundated in "relatively frequent" events (1-3 years)	Yes	Inundation, saturation, and hydric soils observed throughout most of the site. Obligate wetland plants were present and no upland plants observed within the wetlands. Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document these wetland characters. Refer to photographs in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Fluctuation of water levels is not excessive	Yes	Water fluctuations are not apparent in this wetland. Drift lines observed in the floodplains along Bear River indicate that the river floods frequently. Normal flows do not appear to result in water elevation changes of more than 2 feet in Bear River and base flows appear to be fairly constant. Sample Points 1 and 2, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum document areas inundated by flooding. Figure 45, Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum, shows drift lines in the floodplain.

Table 6.4.1-9. (continued)

PFC Checklist	Yes | No | NA	Justification[1]
HYDROLOGY (continued)		
Riparian-wetland zone is enlarging or has achieved potential extent	Yes	The wetland is in a basin confined by the topographical parameters defining its potential extent. Seeps, springs, snowmelt, and intermittent and perennial streams from slopes north and south of the wetland contribute to the hydrology. Examination of aerial photographs from 1939, 1966, 1983, and 2005 indicate the outer parameters of the feature have not changed significantly over time. However, the density of trees has increased in the powerline corridor and some thinning has occurred on the southern slopes between the 1966 and 1983 photographs. Decades of cattle grazing have affected the wetland; however, restoration measures have been implemented to restore the wetland and improve the quality of the stream for the rainbow and brown trout fishery present. With the implementation of grade control and the exclusion of cattle grazing, the wetland is now trending toward recovery. A shift from willow dominated to sedge dominated vegetation types has occurred where restoration activities have taken place. Figure 38 and 43, Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum, shows restoration structures. Also, refer to Attachment 6-2B and Attachment 6-2D in Licensees' Riparian Habitat Technical Memorandum. The technical memoranda are filed with this FLA in Appendix E12.
Upland watershed not contributing to riparian-wetland degradation	Yes	Erosion caused by vegetation removal along the powerline corridors and the operation of the Drum Canal spillway south of the site may increase sediment loads in the Bear River. Because these flows are conveyed through an incised, eroded channel directly to the Bear River, increased sediment loads do not occur in the wetland.
Water quality is sufficient to support riparian-wetland plants	Yes	Water quality supports a healthy, diverse vegetation community. No nutrient-rich environments occur to support invasive plants or algal blooms. No other pollutants were detected.
Natural surface or subsurface flow patterns are not altered by disturbance (i.e., hoof action, dams, dikes, trails, roads, rills, gullies, drilling activities)	No	Historically, grazing altered the surface flow and subsurface flow patterns. Trampling and compaction eliminate vegetation, thereby increasing runoff and erosion, potentially resulting in stream-channel down cutting. Cattle have been removed from the wetland, and stream bank restoration measures have been implemented. Reduced grazing pressure and natural succession have improved meadow conditions. The meadow vegetation is primarily supported by other sources of water, including seeps, springs, and intermittent and perennial streams from the surrounding mountain slopes. Refer to photographs in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Structure accommodates safe passage of flows (e.g., no head cutting affecting dam or spillway)	N/A	The wetland outlet is at the upper Boardman Canal Diversion Dam, which was taken out of service in 1986 and no longer diverts water. No erosion or head cutting was observed at the dam.
VEGETATION		
Diverse age-class distribution (recruitment for maintenance/recovery)	Yes	Since the introduction of log structures in the Bear River, willows have colonized and now dominate the banks of the river. The 1939, 1966, and 1983 aerial photographs show a lack of willows growing along the stream. In 1994, grade control structures were placed in the Bear River at the western portion of the wetland creating sediment traps. Aerial photography of the site in 2005 shows a re-colonization of willows throughout the western portion of the Bear River. Young willow seedlings and sprouts are present throughout the site. Sod-forming herbaceous plants are present. All plants are healthy and thriving. Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document these wetland characters. Refer to photographs in Attachment 6-2C.
Diverse composition of vegetation (for maintenance/recovery)	Yes	The wetland supports a diverse wetland plant community with eight plant associations and three Cowardin habitat classes. Plant associations include sedge, rush, white alder, scirpus, cattail, willow, meadow (wet), and meadow (dry). Cowardin types include palustrine emergent, scrub-shrub, and forested types. Please see Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A; Attachment 6-2B, Wetland Habitat Maps; and photographs in Attachment 6-2C. in Licensees' Riparian Habitat Technical Memorandum, filed with this FLA in Appendix E12.

Table 6.4.1-9. (continued)

PFC Checklist	Yes | No | NA	Justification[1]
VEGETATION (continued)		
Species present indicate maintenance of riparian-wetland soil moisture characteristics	Yes	FAC, FACW, or OBL plants dominate the wetland. Obligate wetland woody and aquatic plants occur in the wetland. Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document wetland vegetation. Sample point 7 documents the "drier" wetland north of the Bear River. Prolonged saturation and hydric soils are absent from this portion of the wetland. Although the site drains quickly enough to establish wetland plants, it does not remain inundated for a sufficient duration to establish hydric soil or hydrology indicators. Photographs of the wetland are presented in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Vegetation is comprised of those plants or plant communities that have root masses capable of withstanding wind events, wave flow events, or overland flows (e.g., storm events, snow melt)	Yes	Overland flows may occur in this wetland. Willows and sedges abutting stream banks are starting to colonize stream channels. These plants are capable of vegetative expanding through rhizomes, runners, and roots effectively providing erosion control. Figure 37, in Attachment 6-2C, Photographs, in Licensees' Riparian Habitat Technical Memorandum shows re-colonization of stream banks.
Riparian-wetland plants exhibit high vigor	Yes	All wetland plants appear to be healthy. Because of hydrological changes as a result of restoration activities, there is a shift from willow to sedge-dominant vegetation along a relic oxbow. Although there was a hydrologic change, the wetland has not reverted to upland.
Adequate vegetative cover present to protect shoreline/soil surface and dissipate energy during high wind and wave events or overland flows	Yes	Grazing has contributed to the erosion of the stream channel. Vegetation cover along most of the bank is approximately 90 percent, and the feature is trending toward vegetation establishment. No other portion of the wetland is affected by wind and wave events.
Frost or abnormal hydrologic heaving is not present	N/A	Hydrologic heaving does not occur in this wetland.
Favorable microsite condition (i.e., woody debris, water temperature, etc.) is maintained by adjacent site characteristics	Yes	Downed trees were not observed in the wetland, but microsite development elements (logs, trees) are present around the perimeter of the wetland and are recruited from the riparian trees through most of the Bear River. Additionally, large trees are rooted within 20 feet of the wetland boundary. These trees provide shade for the wetland and a source of recruitment for downed wood micro sites.
Accumulation of chemicals affecting plant productivity/composition is not apparent	N/A	No sources of pollution to this wetland were observed.
Saturation of soils (i.e., ponding, flooding frequency and duration) is sufficient to compose and maintain hydric soils	Yes	Organic and hydric soils are present in the wetland. There is no evidence indicating soils are relic or from a different water regime. Histosols dominate spring driven wetlands occurring in the north and south side, and east of Highway 20. Other indicators of hydric soils include redox depressions. Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document the hydric soil conditions on the site. Sample point 7 documents the "drier" portion of the wetland on the north side of Bear River. Hydrology and soils are absent from this portion of the wetland. However, the site may drain quickly enough to establish wetland plants, but does not remain inundated for long duration to establish hydric soil or hydrology indicators.
Underlying geologic structure/soil materials/permafrost is capable of restricting water percolation	Yes	The hydrogeomorphic classification is slope and depression. The soil survey indicates that restrictive layers are at a depth of greater than 80 inches.
Riparian-wetland is in balance with the water and sediment being supplied with the watershed (i.e., no excessive erosion or deposition)	Yes	Grazing has contributed to erosion along the channels, but sediment traps installed in the stream has allowed vegetation to establish. This will eventually result in the channels filling and elevating the water table. Erosion caused by vegetation removal along the powerline corridors and the operation of the Drum Canal spillway south of the site may also increase sediment loads in the Bear River. Because these flows are conveyed through an incised, eroded channel directly to the Bear River, increased sediment loads do not occur in the wetland. Sample Points 1-3, 5, 6, and 8-10, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document the hydric soil conditions on the site.

Table 6.4.1-9. (continued)

PFC Checklist	Yes | No | NA	Justification[1]
SOILS-EROSION/DEPOSITION		
Islands and shoreline characteristics (i.e., rocks, coarse and/or large woody debris) adequate to dissipate wind and wave event energies	Yes	No islands or shorelines (lake) occur in the wetland.

[1] All references in this column refer to appendices to Technical Memorandum 6-1, Riparian Habitat (NID and PG&E 2010s), filed with this FLA in Appendix E12.

Lower Rock Lake Dam Reach #1: Wetland RM 2.8

Lower Rock Lake Dam Reach #1: Wetland RM 2.8 is approximately 39.03 acres and is located approximately 1.6 miles downstream of Lower Rock Lake Dam at an elevation of approximately 6,000 ft. The wetland is bisected by Texas Creek, which is controlled by the operation of Lower Rock Lake Dam. Other sources of water that support the wetland include seeps, springs, and inflow from several small streams draining the upland slopes northeast and southeast of the site.

The "drier" wetland in the southwestern portion of the meadow may be flooded early in the season but is quickly drained by channels that are present parallel to Texas Creek. The northwestern portion of the wetland appears spring-fed and inundated throughout the growing season, exhibiting hydrology, vegetation, and soils characteristic of wetland conditions. The outlet of the meadow contains a simple grade-control structure (rocks and logs) placed 1 ft high in front of a culvert. Water level fluctuations within Texas Creek and within the wetland vary less than 1 ft as measured at the small bridge near the outlet to the meadow.

Examination of historical aerial photographs from 1939, 1966, 1982, and 2005 indicate the wetland has not changed significantly over this period. The overall extent of the wetland has remained the same. The photographs show increase in conifers along the wetland margins and an increase in scrub-shrub overstory vegetation density in the western portion of the wetland. Stream channels, particularly distribution channels outside of Texas Creek, appear more devoid of woody vegetation between 1939 and 1966. This is expected to have resulted from ongoing grazing and the effects of cattle trampling of stream banks. Less vegetative cover associated with grazing could also have contributed to scour. A reduction of willow cover along the channels is evident during this period, and by 1966, most shrub vegetation along the channels was absent. The 1983 aerial photograph shows re-colonization of willows within the stream channels. The surrounding upland forest habitats also show an overall increase in density over the period between 1966 and 1983. According to interpretive signs placed by the Forest Service at the site, this meadow was heavily grazed by sheep and cattle for most of the twentieth century. Though the site is seasonally grazed by cattle and used for horse pasture late in the year following plant development, the site no longer is subject to the pressures it had experienced in the past, which may also have contributed to the ongoing recovery.

Nine plant associations occur within the wetland and include sedge, rush, corn lily (*Veratrum californicum*), mountain alder, willow, wet meadow, dry meadow, lodgepole pine, and quaking aspen. The wetland system occurring in the study site is palustrine and encompass approximately 39.03 acres consisting of approximately 36.50 acres of emergent wetlands (28.90

acres that are seasonally flooded and 7.60 acres that are semi-permanently or permanently flooded), 2.24 acres of scrub-shrub wetlands, and 0.29 acre of forested wetlands.

Palustrine emergent wetlands dominate the study site and occur as "dry" or "wet" meadow wetlands. Herbaceous perennial plants provide nearly 100 percent of the vegetation cover. "Dry" emergent wetlands are distinguished from "wet" emergent wetlands by their plant composition. Dominant plant species occurring in "drier" emergent wetlands include Rydberg's penstemon (*Penstemon rydbergii*), yampah (*Perideridia parishii*), Baltic rush, and longstalk clover (*Trifolium longipes*). Other plant species occurring in the "drier" emergent wetland include Oregon checker bloom (*Sidalcea oregana* ssp. *spicata*), tufted hairgrass (*Deschampsia cespitosa*), and little elephants head (*Pedicularis attollens*). "Wetter" emergent wetlands are dominated by beaked sedge (*C. utriculata*), Nebraska sedge, and Baltic rush. Wetland modifiers include seasonally flooded/saturated, semi-permanently flooded, and permanently flooded.

Palustrine scrub-shrub wetlands occur along the stream corridors in the study site and are characterized as open to dense patches of woody riparian shrubs with an herbaceous understory. Dominant plant species include an overstory of mountain alder with an understory dominated by panicled bulrush and lakeshore sedge (*C. lenticularis*). Other plants occurring in the understory include goldenrod (*Solidago* sp.) and meadow barley. Wetland modifiers include semi-permanently flooded and permanently flooded.

Palustrine forested wetlands occur in small patches in the northeastern portion of the site. These wetlands are characterized by deciduous forest stands with an understory of woody riparian shrubs and emergent vegetation. The dominant species include quaking aspen, willow, and mountain alder. Emergent wetland vegetation occurs in the understory and is dominated by lakeshore sedge with tall mannagrass (*Glyceria grandis*) and corn lily. Wetland modifiers include seasonally flooded/saturated.

Lower Rock Lake Reach #1: Wetland RM 2.8 was rated as Functional – At Risk, trending upward, (as compared to a potentially higher rating) because three of the PFC Lentic Standard Checklist items were answered "no." Specifically, the natural surface or subsurface flow patterns appear to have been altered by historic grazing disturbance (PFC question #6); plant species present did not fully indicate maintenance of riparian-wetland soil moisture characteristics (PFC question #10); and adequate vegetative cover was not present to fully protect the soil surface and dissipate energy during overland flow events (PFC question #13). The inability to dissipate energy during overland flow events pertains mostly to the distribution channels and not to the main Texas Creek channel. The distribution channels have been more severely impacted by grazing animals and show more evidence of scour and bank failure.

The assessment team concluded that the characteristics of wetland hydrology are present in most of the study site, wetland habitats present are dominated by hydrophytic plant species, and significant erosion or degradation is currently not an issue for the majority of the site. Four wetland habitats and three water regimes occur supporting many hydrophytic-dominated plant communities. The site consists mainly of a mosaic of dry and wet meadow, and shrub habitats. Although evidence of erosion and channel degradation from historical grazing practices was observed within some of the channels in the middle of the wetland, restoration measures such as the reduced grazing pressure, and the placement of a grade control structure at the outlet, indicate that the wetland is now trending toward recovery. The general increase of woody wetland habitat along the main channel of Texas Creek and the affected channels also points to the recovery to a more stable wetland system. Habitat values have increased with the added structure and diversity. Table 6.4.1-10 summarizes the justifications for the PFC rating for Lower Rock Lake Reach #1: Wetland Rm 2.8.

Table 6.4.1-10. Lower Rock Lake Dam Reach #1 Wetland (RM 2.8) PFC checklist for lentic areas.

PFC Checklist	Yes | No | NA	Justification[1]
HYDROLOGY		
Riparian-wetland area is saturated at or near the surface or inundated in “relatively frequent” events (1-3 years)	Yes	Inundation, saturation, and hydric soils observed throughout most of the site. Obligate wetland plants were present and no upland plants observed within most of the wetlands. Channels within the wetland have downcut resulting in a loss of prolonged soil saturation over portions of the southwestern portion of the wetland. Therefore, hydric soils and hydrology indicators were not observed. Refer to Sample Points 1 through 4, Attachment 6-2A and photographs in Attachment 6-2C in Licensees’ Riparian Habitat Technical Memorandum.
Fluctuation of water levels is not excessive	Yes	Excessive water fluctuations are not apparent in this wetland. Scouring and incision was observed in channels that have developed throughout the wetland, presumably from excessive grazing. Installation of a grade control has increased water retention and the wetland is recovering from a drop in water table. Typical water level fluctuations within Texas Creek appear to be less than 12-inches based on water marks on the existing bridge and streamside debris lines. Refer to Sample Points 1 through 4, Attachment 6-2A and photographs in Attachment 6-2C in Licensees’ Riparian Habitat Technical Memorandum.
Riparian-wetland zone is enlarging or has achieved potential extent	Yes	The wetland is in a basin confined by the topographical parameters defining its potential extent. Seeps and snowmelt from the Upper Loney Meadow contribute to the hydrology of this wetland, in addition to the seeps that occur within the wetland. Texas Creek has a limited contribution to the hydrology of the feature due to a lowered water table caused by historical excessive grazing. Examination of aerial photographs from 1939, 1966, 1983, and 2005 indicate the outer perimeters of the feature have not changed significantly over time. However, it appears that channels have developed between the time the 1939 and 1966 aerial photographs were taken. Extensive grazing has contributed to a shift in hydrologic regime in the southwestern portion of the wetland; however, restoration measures were implemented to restore the wetland. With the implementation of limited grazing and placement of a grade control on the outlet, the wetland is now trending toward recovery. The forest density in the uplands surrounding the meadow has increased between the 1939 and 1966 photographs. Forest density appears constant between 1966 and 2005. Figure 32 and 33, Attachment 6-2C in Licensees’ Riparian Habitat Technical Memorandum, shows revegetation of down-cut channels. Also, refer to map in Attachment 6-2B and photographs in Attachment 6-2D in Licensees’ Riparian Habitat Technical Memorandum, filed with this FLA in Appendix E12.
Upland watershed not contributing to riparian-wetland degradation	N/A	There are no disturbances within the watershed to provide excessive amounts of sediment and no sedimentation was observed.
Water quality is sufficient to support riparian-wetland plants	Yes	Water quality supports a healthy, diverse vegetation community. Algal blooms were observed in the stream channels. Limited grazing may provide additional nutrients in the water resulting in algal blooms. No other pollutants were detected.

Table 6.4.1-10. (continued)

PFC Checklist	Yes | No | NA	Justification[1]
HYDROLOGY (continued)		
Natural surface or subsurface flow patterns are not altered by disturbance (i.e., hoof action, dams, dikes, trails, roads, rills, gullies, drilling activities)	No	Grazing has altered the surface flow and subsurface flow patterns. Within the period between the photographs taken in 1939 and 1966, stream-channel down cutting has become apparent. Trampling and compaction eliminated vegetation, increased erosion and resulted in stream-channel down cutting. The downstream outlet has been modified to retain water for a longer period, contributing to the recovery of the wetland. Figure 32, Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum, shows stream-channel down cutting.
Structure accommodates safe passage of flows (e.g., no head cutting affecting dam or spillway)	Yes	The grade control is a crude structure composed of logs and rocks placed in the creek. The intention of this structure is to slow water so the wetland will stay inundated longer. Failure of the structure will not affect the current wetland function, but would lengthen the time it takes for the wetland to recover.
VEGETATION		
Diverse age-class distribution (recruitment for maintenance/recovery)	Yes	Willows are beginning to colonize channels. The 1939 aerial photograph showed willows growing along water corridors. By 1966, this vegetation was gone. The 1983 and 2005 aerial photographs show re-colonization of willows within the stream channels. Additionally, sod-forming herbaceous plants are present and are colonizing where they were previously absent. All plants are healthy and thriving. Refer to Sample Points 1 through 4, Attachment 6-2A and photographs in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Diverse composition of vegetation (for maintenance/recovery)	Yes	The wetland supports a diverse wetland plant community with 9 plant associations and 3 Cowardin habitat classes. Plant associations include sedge, rush, corn lily, mountain alder, willow, meadow (wet), meadow (dry), lodgepole, and aspen. Cowardin types include palustrine emergent, scrub-shrub, and forested types. Refer to Sample Points 1 through 4, Attachment 6-2A; map in Attachment 6-2B; and photographs in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Species present indicate maintenance of riparian-wetland soil moisture characteristics	No	FAC, FACW, or OBL plants dominate the wetland. Obligate wetland woody and aquatic plants occur in the wetland. Sample points 1-4, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document wetland vegetation. Sample point 3 documents the "drier" wetland that is affected by stream-channel down cutting. Prolonged saturation and hydric soils are absent from this portion of the wetland. However, the site may drain quickly enough to establish wetland plants, but does not remain inundated for long duration to establish hydric soil or hydrology indicators. Photographs of the wetland are presented in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
Vegetation is comprised of those plants or plant communities that have root masses capable of withstanding wind events, wave flow events, or overland flows (e.g., storm events, snow melt)	Yes	In-stream waves and limited overland flows may occur in this wetland. Willows and sedges abut stream banks and are starting to colonize stream channels since grazing management has been implemented. These plants are capable of vegetative expanding through rhizomes, runners, and roots effectively providing erosion control. Figure 33, in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum, shows re-colonization of stream channels reducing erosion.
Riparian-wetland plants exhibit high vigor	Yes	All wetland plants appear to be healthy. No plants appeared to have disease or exhibit decadence.
Adequate vegetative cover present to protect shoreline/soil surface and dissipate energy during high wind and wave events or overland flows	No	Grazing has resulted in the erosion of stream channels throughout the wetland. Vegetation cover is approximately 80 percent, but the feature is trending toward more vegetation establishment and cover. Figure 33, in Attachment 6-2C, in Licensees' Riparian Habitat Technical Memorandum,shows re-colonization of stream channels.
Frost or abnormal hydrologic heaving is not present	N/A	Hydrologic heaving does not occur in this wetland.

Table 6.4.1-10. (continued)

PFC Checklist	Yes | No | NA	Justification[1]
VEGETATION (continued)		
Favorable microsite condition (i.e., woody debris, water temperature, etc.) is maintained by adjacent site characteristics	Yes	There are few downed trees in the wetland, but microsite development elements (logs, trees) are provided around the perimeter of the wetland. Additionally, large trees are rooted within 20 feet of the wetland boundary. These trees provide shade for the wetland and a source of recruitment for downed wood microsites. Conifer stands providing microsite elements adjacent to the wetland are shown in Attachment 6-2C in Licensees' Riparian Habitat Technical Memorandum.
SOILS-EROSION/DEPOSITION		
Accumulation of chemicals affecting plant productivity/composition is not apparent	Yes	Continued cattle grazing may provide additional nutrients to the wetland; however, this does not appear to affect the plant productivity or composition of the wetland. No other pollutants were detected.
Saturation of soils (i.e., ponding, flooding frequency and duration) is sufficient to compose and maintain hydric soils	Yes	Hydric soils are present in the wetland. There is no evidence indicating soils are relic or from a different water regime. Histosols dominate spring driven wetlands on the north side of the wetland. Other indicators of hydric soils include depleted matrix. Sample Points 1-4, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document the soil conditions on the site. Sample point 3 documents the "drier" portion of the wetland that is affected by stream-channel downcutting. Prolonged saturation and hydric soils are absent from this portion of the wetland. Although the site drains quickly enough to establish wetland plants, it does not remain inundated for a sufficient duration to establish hydric soil characteristics.
Underlying geologic structure/soil materials/permafrost is capable of restricting water percolation	Yes	The hydrogeomorphic classification is slope and drainage. The soil survey indicates that restrictive layers are at a depth of greater than 80 inches. Grazing activity is the only evidence of disturbance. Sample Points 1-4, Attachment 6-2A in Licensees' Riparian Habitat Technical Memorandum, document the soil conditions on the site.
Riparian-wetland is in balance with the water and sediment being supplied with the watershed (i.e., no excessive erosion or deposition)	Yes	There is no evidence of excessive external sources of sediment in this wetland. Cattle grazing has resulted in the creation and incision of channels within the meadow. Since the annual period of grazing has been reduced in this meadow, vegetation has begun to establish within the stream channels This will eventually result in increased sediment capture, channel filling, and elevation of the water table.
Islands and shoreline characteristics (i.e., rocks, coarse and/or large woody debris) adequate to dissipate wind and wave event energies	N/A	No islands or shorelines (lake) occur in the wetland.

[1] All references in this column refer to appendices to Technical Memorandum 6-2, Riparian Habitat (NID and PG&E 2010s), filed with this FLA in Appendix E12

6.4.1.1.4 Noxious Weeds/Invasive Plants

In 2008, Licensees reviewed TNF survey data (Urie 2003, Van Zuuk 2003a-d, 2005a,b and 2006a-c) to identify noxious weeds and invasive plants with the potential to occur in the vicinity of the projects. Based on this analysis, 27 noxious weeds/invasive plant species were identified.

In 2009, Licensees performed surveys for these noxious weeds, and others that may occur, as part of its Special-Status Plants Study (NID and PG&E 2010w).

A total of 772 noxious weed occurrences, representing 15 plant species, were found. Forty of the occurrences were on NFS lands, 20 each within the Yuba-Bear Hydroelectric and Drum-Spaulding Project FERC boundaries, and 15 were on BLM lands within the Yuba-Bear Hydroelectric Project FERC Boundary. Table 6.4.1-11 summarizes the 772 noxious weeds/invasive plants occurrences by Project and land ownership (NID and PG&E 2010w).

Table 6.4.1-11. Noxious weeds/invasive plants occurrences identified within the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project FERC boundaries on public land.

Common Name/ Scientific Name	2007 CDFA[1] Rating	Number of Occurrences				
		Yuba-Bear Hydroelectric Project			Drum-Spaulding Project	
		NFS Land	BLM	Private	NFS Land	Private
Barbed goatgrass *Aegilops triuncialis*	B	--	--	4	1	14
Tree of heaven *Ailanthus altissima*	C	--	--	1	--	22
Italian thistle *Carduus pycnocephalus*	C	--	--	--	--	67
Slenderflower thistle *Carduus tenuiflorus*	C	--	--	---	--	1
Tocalote *Centaurea melitensis*	C	1	--	2	--	3
Yellow starthistle *Centaurea solstitialis*	C	2	4	30	--	70
Skeleton weed *Chondrilla juncea*	A	3	2	11	--	72
Scotch broom *Cytisus scoparius*	C	--	1	42	--	81
Common fig *Ficus carica*	Not rated	--	--	---	--	11
French broom *Genista monspessulana*	C	--	--	1	--	39
Klamath weed *Hypericum perforatum*	C	14	7	83	19	116
Tall whitetop *Lepidium latifolium*	B	--	--	3	--	3
Spanish broom *Spartium junceum*	Not rated	--	1	1	--	18
Johnson grass *Sorghum halepense*	C	--	--	--	--	6
Medusahead *Taeniatherum caput-medusae*	C	--	--	3	--	14
Noxious Weeds Total		**20**	**15**	**180**	**20**	**537**

[1] California Department of Food and Agriculture (CDFA) Rating:
A = Eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state.
B = Eradication, containment, control, or other holding action at the discretion of the commissioner. State endorsed holding action and eradication only when found in a nursery.
C = Action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a crop seed for planting or at the discretion of the commissioner (CDFA 2007).

In general, weeds are more abundant on private lands at lower elevations. The most common weeds are Klamath weed, skeleton weed, Scotch broom and yellow starthistle. Where they were found, these weeds are continuous in and out of the FERC Project areas. In the FERC Project areas, weeds are primarily found along roads, canals, transmission lines, and in campgrounds.

NID does not have a formal or informal noxious weed control program. However, vegetation management conducted as part of Project O&M may indirectly target some occurrences of noxious weeds.

PG&E's informal noxious weed control program includes utilizing herbicides on PG&E property around the dams, canal, and roads to treat weeds, pressure washing and cleaning heavy equipment rentals prior to delivery to PG&E and certifying rock and road base is weed free before delivery.

6.4.1.2 Wildlife

6.4.1.2.1 Special-Status Wildlife

In 2009, Licensees conducted a search of federal and state databases, consulted with Forest Service, CDFG and USFWS staff familiar with special-status wildlife species locations, and used the CWHR system program (see Wildlife Distribution and Abundance below) to determine that 48 special-status wildlife species could potentially occur in the vicinity of the projects (does not include federally listed threatened and endangered species known to occur or potentially occurring in the Project area; these are discussed in Section 6.5). This included two reptiles, 28 bird and 17 mammal species in the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project areas. Table 6.4.1-12 lists all special-status species identified as having potential to occur on or near Project lands and facilities.

Table 6.4.1-12. Special-status and CESA-listed wildlife with the potential to occur on or near (within 0.25 mi) Project lands or facilities.

Species	Species Classifications[1]
REPTILES	
Coast horned lizard (*Phrynosoma coronatum*)	BLM-S, SSC
Northern sagebrush lizard (*Sceloporus graciosus*)	BLM-S
BIRDS	
Barrow's goldeneye (*Bucephala islandica*)	SSC
Redhead (*Aythya Americana*)	SSC
Common loon (*Gavia immer*)	SSC
Greater sandhill crane (*Grus Canadensis*)	ST
Black tern (*Chlidonias niger*)	SSC
American white pelican (*Pelecanus erythrorhynchos*)	SSC
Willow flycatcher (*Empidonax traillii*)	SE
Vaux's swift (*Chaetura vauxi*)	SSC
Black swift (*Cypseloides niger*)	SSC
Bank swallow (*Riparia riparia*)	ST
Olive-sided flycatcher (*Contopus cooperi*)	SSC
Loggerhead shrike (*Lanius ludovicianus*)	SSC
Purple martin (*Stelgidopteryx serripennis*)	SSC
Yellow-breasted chat (*Icteria virens*)	SSC
Yellow warbler (*Dendroica petechia*)	SSC, MIS
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*)	SSC
Tri-colored blackbird (*Agelaius tricolor*)	BLM-S, SSC
Sooty (blue) grouse (*Dendragapus fuliginosus*)	MIS
Mountain quail (*Oreortyx pictus*)	MIS
Hairy woodpecker (*Picoides villosus*)	MIS
Black-backed woodpecker (*Picoides arcticus*)	MIS
Fox sparrow (*Passerella iliaca*)	MIS
Northern goshawk (*Accipiter gentilis*)	FSS, BLM-S
Northern harrier (*Circus cyaneus*)	SSC
White-tailed kite (*Elanus leucurus*)	FP
Ferruginous hawk (*Buteo regalis*)	BLM-S
Swainson's hawk (*Buteo swainsoni*)	ST

Table 6.4.1-12. (continued)

Species	Species Classifications[1]
BIRDS (continued)	
California spotted owl (*Strix occidentalis occidentalis*)	FSS, BLM-S, SSC, MIS
Great gray owl (*Strix nebulosa*)	SE
Short-eared owl (*Asio flammeus*)	SSC
Long-eared owl (*Asio otus*)	SSC
Burrowing owl (*Athene cunicularia*)	BLM-S, SSC
American peregrine falcon (F*alco peregrines*)	FP
Bald eagle (*Haliaeetus leucocephalus*)	SE
Golden eagle (*Aquila chrysaetos*)	FP, FSS, BLM-S
MAMMALS	
Flying squirrel (*Glaucomys sabrinus*)	MIS
Sierra Nevada mountain beaver (*Aplodontia rufa*)	SSC
Mule deer (*Odocoileus hemionus*)	MIS
American marten (*Martes americana*)	FSS, MIS
Pacific fisher (*Martes pennant*)	FSS, BLM-S, SSC
American badger (*Taxidea taxus*)	SSC
California wolverine (*Gulo gulo*)	ST, FP
Sierra Nevada Snowshoe hare (*Lepus americanus tahoensis*)	SSC
White-tailed jackrabbit (*Lepus townsendii townsendii*)	SSC
Sierra Nevada red fox (*Vulpes vulpes necator*)	ST
Western mastiff bat (*Eumops perotis*)	BLM-S, SSC
Pallid bat (*Antrozous pallidus*)	FSS. BLM-S, SSC
Townsend’s big-eared bat (*Corynorhinus townsendii*)	FSS, BLM-S, SSC
Spotted bat (*Euderma maculatum*)	BLM-S, SSC
Western small-footed myotis (*Myotis ciliolabrum*)	BLM-S,
Fringed myotis (*Myotis thysanoides*)	BLM-S,
Long-eared myotis (*Myotis evotis*)	BLM-S
Yuma myotis (*Myotis yumanensis*)	BLM-S
Western red bat (*Lasiurus blossevillii*)	FSS

[1] FSS – Forest Service Sensitive
MIS – Forest Service Management Indicator Species
BLM-S – BLM sensitive species
SSC – California species of special concern
FP – California fully protected
SE – California endangered
ST – California threatened

6.4.1.2.2 Wildlife Distribution and Abundance

Prior to Licensees’ studies in 2009, 10 of the 48 special-status species and five of the ten CESA-listed species with the potential to occur in the vicinity of the projects had been documented on or near (within 0.25 mi) Project lands or Project facilities. During the course of Licensees’ 2009 studies, an additional nine special-status species (all bats) were documented. Table 6.4.1-13 summarizes all historic (prior to 2009) and Licensee-documented known special-status species occurrences. Additionally, six species thought to be “common and widespread,” but do not have any reported occurrences in the vicinity of the projects have been included in Table 6.4.1-13. These six species have been designated as Management Indicator Species (MIS).

Table 6.4.1-13. Special-status and CESA-listed wildlife species known to occur on or near (within 0.25 mi) Project lands or facilities.

Species	Species Classification[1]	Location and Number of Occurrences[2, 3, 4, 5, 6]	
		Yuba-Bear Hydroelectric Project	Drum-Spaulding Project
REPTILES			
Coast horned lizard (*Phrynosoma coronatum*)	BLM-S, SSC	Chicago Park Conduit (1) Rollins Reservoir (6)	Bear River Canal (2)
BIRDS			
Barrow's goldeneye (*Bucephala islandica*)	SSC	--	Lake Spaulding
Willow flycatcher (*Empidonax traillii*)	SE	Milton Diversion Impoundment (7)	--
Sooty (blue) grouse (*Dendragapus fuliginosus*)	MIS	Common/widespread	Common/widespread
Mountain quail (*Oreortyx pictus*)	MIS	Common/widespread	Common/widespread
Hairy woodpecker (*Picoides villosus*)	MIS	Common/widespread	Common/widespread
Black-backed woodpecker (*Picoides arcticus*)	MIS	Common/widespread	Common/widespread
Fox sparrow (*Passerella iliaca*)	MIS	Common/widespread	Common/widespread
Northern goshawk (*Accipiter gentilis*)	FSS, BLM-S	Jackson Meadows Reservoir (5 outside, 2 inside) Milton-Bowman Tunnel (5 outside) Bowman Lake (1 outside) Bowman Tunnel (1 inside) Bowman-Spaulding Conduit (1 inside) Clear Creek Diversion Dam Fall Creek Diversion Dam (2 outside, 1 inside) Trap Creek Diversion Dam (3 outside)	Feely Lake (1, outside) Carr Lake (1 outside) Fordyce Lake (2 outside) Lake Valley Reservoir (1 inside) Lake Valley Canal South Yuba Canal (5 outside)
California spotted owl (*Strix occidentalis occidentalis*)	FSS, BLM-S, SSC, MIS	Jackson Meadows Reservoir (11 outside, 1 inside) Milton Diversion Impoundment (1 outside) Milton-Bowman Tunnel (3 outside, 1 inside) Bowman-Spaulding Conduit (1 outside) Clear Creek Diversion Dam (5 outside) Fall Creek Diversion Dam	Carr Lake Rucker Lake (3 outside) Fuller Lake (1 outside) Lake Valley Reservoir Dutch Flat Tunnel South Yuba Canal (7 outside, 4 inside) Chalk Bluff Canal (7 outside) Deer Creek Forebay (2 inside) Deer Creek Powerhouse Penstock (2 outside) Deer Creek Powerhouse and Switchyard (1 outside) Deer Creek-Drum 60kV (1 inside, 6 outside) Deer Creek Forebay Angler Access

Table 6.4.1-13. (continued)

Species	Species Classification[1]	Location and Number of Occurrences[2, 3, 4, 5, 6]	
		Yuba-Bear Hydroelectric Project	**Drum-Spaulding Project**
BIRDS (continued)			
American peregrine falcon (*Falco peregrines*)[7]	FP	Jackson Meadows Reservoir Bowman Reservoir	--
Bald eagle (*Haliaeetus leucocephalus*)	SE	Jackson Meadows Reservoir (13) Milton Reservoir (11) Faucherie Lake (1) Sawmill (3) Dutch Flat No. 2 Forebay (1) Bowman Lake (21) Chicago Park Powerhouse (1) Rollins Reservoir (8)	Meadow Lake (19) Culberson Lake (1) Lower Lindsey Lake (2) Feely Lake (1) Carr Lake (1) Blue Lake (1) Rucker Lake (1) Fuller Lake (4) Lake Sterling (1) Fordyce Lake (7) Lake Spaulding (23) Lake Valley Reservoir (1) Kelly Lake (9) Deer Creek (1)
Golden eagle (*Aquila chrysaetos*)	FP, FSS, BLM-S	Jackson Meadows Reservoir	Fuller Lake Chalk Bluff Canal Deer Creek Forebay Deer Creek Powerhouse Penstock
MAMMALS			
Flying squirrel (*Glaucomys sabrinus*)	MIS	Common/widespread	Common/widespread
Mule deer (*Odocoileus hemionus*)	MIS	Licensee observed throughout the Project	Licensee observed throughout the Project
American marten (*Martes americana*)	FSS, MIS	Jackson Meadows Reservoir Faucherie Lake	Lake Fordyce Lake Sterling
Pacific fisher (*Martes pennant*)	FSS, BLM-S, SSC	Jackson Meadows Reservoir Milton-Bowman Diversion Conduit Sawmill Lake	Meadow Lake Lake Fordyce Lake Sterling Lake Spaulding
California wolverine (*Gulo gulo*)	ST, FP, FSS	Jackson Meadows Reservoir (1)	--
Sierra Nevada red fox (*Vulpes vulpes necator*)	ST	--	Lake Valley Canal (1) South Yuba Canal (1)
Western mastiff bat (*Eumops perotis*)[8]	BLM-S, SSC	Sawmill Dam	Deer Creek Forebay Deer Creek Powerhouse Alta Powerhouse
Pallid bat (*Antrozous pallidus*)[8]	FSS. BLM-S, SSC	Bowman Dam/Powerhouse	Lake Spaulding Deer Creek Powerhouse
Townsend's big-eared bat (*Corynorhinus townsendii*)[8]	FSS, BLM-S, SSC	Rollins Dam/Powerhouse Bowman Dam/Powerhouse Sawmill Dam Milton Diversion Impoundment	Lake Spaulding Deer Creek Forebay Deer Creek Powerhouse Alta Powerhouse Lake Valley Diversion Halsey Powerhouse
Spotted bat (*Euderma maculatum*)[8]	BLM-S, SSC	Sawmill Dam Milton Diversion Impoundment	Deer Creek Forebay Alta Powerhouse
Western small-footed myotis (*Myotis ciliolabrum*)[8]	BLM-S,	Sawmill Dam	--

Table 6.4.1-13. (continued)

Species	Species Classification[1]	Location and Number of Occurrences [2, 3, 4, 5, 6]	
		Yuba-Bear Hydroelectric Project	Drum-Spaulding Project
MAMMALS (continued)			
Fringed myotis (*Myotis thysanoides*)[8]	BLM-S,	Milton Diversion Impoundment	Lake Spaulding Deer Creek Forebay Deer Creek Powerhouse Alta Powerhouse
Long-eared myotis (*Myotis evotis*)[8]	BLM-S	Milton Diversion Impoundment	Fuller Lake Dam Deer Creek Forebay
Yuma myotis (*Myotis yumanensis*)[8]	BLM-S	Dutch Flat Afterbay Dam Bowman Dam/Powerhouse Sawmill Dam Milton Diversion Dam Impoundment	Fuller Lake Dam Lake Spaulding Deer Creek Forebay Deer Creek Powerhouse Alta Forebay Alta Powerhouse Lake Valley Diversion Dutch Flat No. 1 Powerhouse Halsey Powerhouse
Western red bat (*Lasiurus blossevillii*)[8]	FSS	Rollins Dam/Powerhouse Chicago Park Powerhouse Dutch Flat Afterbay Dam Bowman Dam/Powerhouse Sawmill Dam Milton Diversion Impoundment	Lake Spaulding Deer Creek Powerhouse Alta Powerhouse Halsey Powerhouse

1 FSS – Forest Service Sensitive; MIS – Forest Service Management Indicator Species; BLM-S – BLM sensitive species; SSC – California species of special concern; FP – California fully protected; SE – California endangered; ST – California threatened.
2 Inside refers to occurrences within the FERC Project Boundary, Outside refers to occurrences outside of the FERC Project Boundary, but within 0.25 mi of the FERC Project boundary.
3 Data obtained from the TNF is point specific, which provides an exact location with respect to the FERC Project Boundary.
4 Data obtained from CNDDB is not point specific, thus occurrence information is only provided in terms of general area. Licensees cannot determine if the exact location of the occurrence is inside or outside of the FERC Project Boundary.
5 Two dashes (--) indicates no occurrence information was available prior to Licensees' studies.
6 Common/widespread species are generally not included in CNDDB records, but those listed here are expected to occur in suitable habitat throughout the Project area.
7 Observations reported by Tudor Engineering Company in 1981, but numbers observed were not available.
8 Occurrence data obtained by Licensees' for bats within the FERC Project boundary. However, numbers of individuals at each location cannot be determined because most occurrence data was collected via remote acoustic monitoring, which only provides presence/absence, or activity levels (bat calls over time), and not identification of a single individuals.

Each of the species listed in Table 6.4.1-13 that have documented occurrences available from the CNDDB or TNF occurrence database or that were documented during Licensees' studies is discussed below.

California Spotted Owl and Northern Goshawk

The Forest Service has established special management areas (Protected Activity Centers, or PACs) for two special-status wildlife species: northern goshawk (Accipiter gentilis) and California spotted owl (Strix occidentalis occidentalis). According to the Sierra Nevada Forest Plan Amendment, or SNFPA (USFS 2004), PACs are intended to protect northern goshawk and California spotted owl by providing a buffer between a nest and potential disturbances. For northern goshawk PACs, the buffer includes known and suspected nest stands and 200 acres of the best available forested habitat in the largest contiguous habitat patches around the nest. For California spotted owl PACs, the buffer includes known and suspected nest stands and 300 acres of the best available forested habitat in the largest contiguous habitat patches around the nest. In addition to the establishment of a PAC for each California spotted owl nest, the Forest Service has also established a Home Range Core Area (HRCA), which encompasses 1,000 acres of the best available habitat in the closest proximity to the owl activity center, including the 300-acre PAC (USFS 2004).

According to the TNF (USFS 2009), 15 California spotted owl and 20 northern goshawk nests have been documented in the vicinity of the Yuba-Bear Hydroelectric Project and Drum Spaulding Project. As a result, PACs for northern goshawk and PACs and HRCAs for California spotted owl have been established, and overlap with the FERC Project Boundary for both projects. Table 6.4.1-14 summarizes the location of each northern goshawk PAC and their associated nest, and Table 6.4.1-15 summarizes the location of each California spotted owl PAC and/or HRCA, and their associated nest.

Table 6.4.1-14. Location of northern goshawk PACs in relation to Project facilities.

Facility	Northern Goshawk PAC ID		
	PAC	Bearing and Distance from Nest(s) to Project Facility[1, 2]	Year(s) of Occupancy
YUBA-BEAR HYDROELECTRIC PROJECT			
Milton-Bowman Tunnel	Fir Hill	103°, 314 meters 103°, 402 meters 284°, 77 meters 284°, 84 meters	1992 1993 1997 1995 – 2002
Jackson Meadows Reservoir (Woodcamp Campground)	Woodcamp	253°, 429 meters 241°, 230 meters	1994 2002
Bowman Lake (Jackson Creek Campground)	Prairie Creek	172°, 221 meters	1991
Bowman-Spaulding 60kV Transmission Line	Trap Creek	86° 194 meters 244°, 482 meters 244°, 269 meters	2000 2002 2004
Bowman-Spaulding Conduit	Grouse	52°, 175 meters 7°, 679 meters	1993 2002
DRUM-SPAULDING PROJECT			
Meadow Lake	Fordyce	279°, 1661 meters 281°, 1657 meters 279°, 1694 meters 280°, 1869 meters	1990 1992 2002 2004
Fordyce Lake	Fordyce	--	--
Chalk Bluff/South Yuba Canal	Remington Hill	2°, 852 meters 330°, 1056 meters	1989 1990
	Zeibright	337°, 784 meters	1998
	Levy Ditch	--	--
Deer Creek-Drum 60Kv	Lowell Hill	236°, 692 meters	1994

[1] Bearing is the degrees from north, with north = 0°, east = 90°, south = 180° and west = 270°
[2] For many PACs alternate nests have been documented. Dates of occupancy for each nest have been included.
-- Nest location not known, thus bearing and distance from nest to Project facility not calculated.

Table 6.4.1-15. Location of California spotted owl PACs and HRCAs in relation to Project facilities.

Facility	California Spotted Owl PAC/HRCA ID		
	PAC or HRCA	Bearing and Distance from Nest(s) to Project Facility[1, 2]	Year(s) of Occupancy
YUBA-BEAR HYDROELECTRIC PROJECT			
Milton-Bowman Tunnel	PAC NEV0049	--	--
	HRCA NEV0048	--	--
	HRCA NEV0070	--	--
	HRCA NEV0049	--	--
Jackson Meadows Reservoir	PAC SIE0076	--	--
	HRCA SEI0076	--	--
Bowman-Spaulding 60kV Transmission Line, Bowman-Spaulding Conduit	PAC NEV0009	274°, 305 meters	2002
	HRCA NEV0009	274°, 305 meters	2002
Bowman Tunnel, Bowman-Spaulding 60kV Transmission Line	PAC NEV0058	108°, 641 meters	2002
DRUM-SPAULDING PROJECT			
Chalk Bluff/South Yuba Canal	PAC NEV0024	176°, 686 meters	1992
	PAC NEV0015	43°, 713 meters	1989
	PAC NEV0016	173°, 1643 meters	1992
	PAC NEV0072	341°, 276 meters	2006
	HRCA NEV0057	--	--
	HRCA NEV0015	43°, 713 meters	1989
	HRCA NEV0072	341°, 276 meters	2006
	HRCA NEV0051	0°, 31 meters	1992
	HRCA NEV0016	173°, 1643 meters	1992
	HRCA NEV0034	--	--
Deer Creek-Drum 60kV	PAC NEV0046	227°, 843 meters	1992
	HRCA NEV0057	--	--
Deer Creek Forebay	PAC NEV0057	--	--
Deer Creek Powerhouse	HRCA NEV0028	97°, 2556 meters 93°, 3517 meters 93°, 3532 meters	1992 2003 2004

[1] Bearing is the direction from the nest to the facility, with north = 0°, east = 90°, south = 180° and west = 270°
[2] Dates for each nest have been included in parenthesis.
-- Nest location not known, thus bearing and distance from nest to Project facility not calculated.

Pacific Fisher and American Marten

Carnivore Management Areas were established by the TNF for Pacific fisher (*Martes pennanti*) and American marten (*M. americana*). These areas contain the most suitable blocks of habitat as well as corridors connecting the habitat blocks. In 2009, Licensees' identified where overlap between the FERC Project Boundary for both projects and TNF lands designated as Carnivore Management Areas occurred. Within the Yuba-Bear Hydroelectric Project, portions of the FERC Project Boundary associated with Jackson Meadows Reservoir, Milton Diversion Impoundment, Milton-Bowman Diversion Conduit, Sawmill Lake, Bowman Lake, Bowman-Spaulding Conduit, and Dutch Flat No. 2 Conduit overlap with lands designated as Carnivore Management Areas. Within the Drum-Spaulding Project portions of the FERC Project Boundary associated with Lindsey Lake, Feely Lake, Carr Lake, Rucker Lake, Fuller Lake, Spaulding Lake, South Yuba Canal, Chalk Bluff Canal, Deer Creek Powerhouse Penstock and Deer Creek-Drum 60 kV Transmission Line overlap with lands designated as Carnivore Management Areas.

Mule Deer

Mule deer (*Odocoileus hemionus*) is a common species found throughout the vicinity of the projects. In 2009, Licensees compiled historic information regarding mule deer herds use of summer, critical summer, winter/critical winter, fawning and holding habitats, and migration routes in the vicinity of both projects. Three herds occupy the vicinity of the projects to varying degrees, and are: 1) the Nevada City Deer Herd, 2) the Downieville Deer Herd, and 3) the Blue Canyon Deer Herd.

According to Wagner and Finn (1985), the Nevada City Deer Herd occupies lands on the west slope of the Sierra Nevada. The boundary to the north includes the Middle Yuba River and Jackson Meadows Reservoir. The eastern boundary includes the area near White Rock Lake. The southern boundary parallels Interstate 80 and continues down the Bear River to the Chicago Park area. The western boundary runs from the Chicago Park area to the Middle Yuba River. The Nevada City Deer Herd's range encompasses the mid-elevation of both the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project.

The Downieville Deer Herd occupies lands on the western slope of the Sierra Nevada. The southern boundary includes the Middle Yuba River and Jackson Meadows Reservoir (Wagner and Finn, 1985). The herd occupies areas to the north and its range does not overlap with either Project, but abuts the FERC Project Boundary of the Yuba-Bear Hydroelectric Project.

The Blue Canyon Deer Herd occupies land on the western slope of the Sierra Nevada. The northern boundary of the herd extends from Norden down slope along Interstate 80 to Emigrant Gap. At Emigrant Gap, the northern boundary coincides with the Bear River terminating at about Chicago Park Powerhouse (Fowler and Wagner, 1982). The herd boundary extends south beyond the study area and encompasses the southern portion of the Drum-Spaulding Project near Lake Valley.

In general, summer habitat encompasses all Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities upslope of Drum Forebay and Deer Creek Forebay. Critical summer habitat is bounded on the north by the Middle Yuba River, with a western border that extends in a southerly direction from the Middle Yuba River to Fuller Lake. The southern boundary of critical summer habitat stretches from Fuller Lake east to Fordyce Lake. The eastern boundary of critical summer habitat sets just west of Fordyce Lake, and extends north to the border between Sierra County and Nevada County at Jackson Meadows Lake. Within the critical summer habitat four fawning areas have been identified: two are located west of Jackson Meadows Reservoir and north of Bowman Lake; one is south of Jackson Meadows Reservoir; and one is located south of Fordyce Lake. There are two holding areas along the north and west side of Canyon Creek below Bowman Lake.

Winter habitat is found down slope of Drum Forebay and Deer Creek Forebay. Within the winter habitat two areas have been identified as critical winter habitat, both of which do not overlap with Project lands or facilities associated with the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project.

According to Fowler and Wagner (1982) and Wagner and Finn (1985), migration routes for mule deer in the Sierra Nevada tend to follow the ridges between drainages as well as some canyons. Migration of the Nevada City Herd between summer and winter ranges appear to be concentrated on the east/west trending ridges between Jackson Meadows Reservoir and Bowman Lake, north of Canyon Creek. The Downieville Herd migrates along the ridge separating the North and Middle Yuba River. Migration routes of the Blue Canyon Deer Herd parallel the North Fork American River on both sides.

Willow Flycatcher

Licensees evaluated habitat suitability for willow flycatcher (*Empidonax traillii*) at each of the seven wetlands. Habitat suitability for these species was assessed relative to established criteria for each as described by Bombay et al. (2000). All but one (White Rock Lake Dam Reach #2 RM 2.2) of the sites evaluated provide some appropriate habitat for willow flycatcher.

Bats

Licensees performed a detailed study regarding special-status bats. The study, conducted in 2009, documented the presence, distribution, and roosts of bat species at Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities, and included visual inspection of Project related facilities, mist netting, acoustic monitoring and long-term-acoustic monitoring (LTAM). The study also included an evaluation of each projects' tunnels and adits as winter hibernacula (NID and PG&E 2010v).

Licensees' mist net sampling collected 108 individual bats representing ten species. Five additional species were recorded via acoustic and LTAM sampling, for a total of 15 bat species. Besides the nine special-status bat species listed in Table 6.4.1-12, Licensees identified six non-special-status bat species: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), California myotis (*M.s californicus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*).

Six Yuba-Bear Hydroelectric Project structures (Dutch Flat Afterbay Dam low-level outlet tunnel, penstock tunnel at the base of Rollins Reservoir, employee housing at Bowman Powerhouse, Bowman Lake campground, the storage shed at Chicago Park Powerhouse, and the Chicago Park Powerhouse Access Road Bridge over the Bear River) were found to have signs of bat use (i.e., presence of bats, guano, or staining). Three of the six structures had bats present at the time of inspection (daytime), suggesting that bats used the other three structures as night roosts. Eight Drum-Spaulding Project structures (Spaulding No. 1 Powerhouse, Deer Creek Powerhouse, Alta Powerhouse Intake Structure, Alta Powerhouse, Drum Powerhouse Butterfly Valve House, Drum No. 1 and 2 Powerhouse, Drum Forebay Intake Structure and Halsey Powerhouse storage shed) were found to have signs of bat use. The tunnels and adits of each Project were not suitable for hibernating bats.

6.4.1.2.3 General Wildlife Occurrence

The vicinity of the projects supports a diversity of habitats and associated wildlife species that reflect wide variations in elevation, topography, and soils and are typical of the west slope of the Sierra Nevada in Northern California. Based on a review of Forest Service vegetation data (USFS 2009) and using CDFG's California Wildlife Habitat Relationships (CWHR) system (CDFG 2008), Licensee identified 23 reptile, 234 bird, and 92 mammal species that have a potential to occur in the vicinity of the projects.

Reptiles in the vicinity of the projects include western terrestrial (or mountain) garter snake (*Thamnophis elegans elegans*), western aquatic (or Sierra) garter snake (*T. couchii couchii*), common garter snake (*T. sirtalis*), western rattlesnake (*Crotalus oreganus*), western fence lizard (*Sceloporus occidentalis*), western sagebrush lizard (*S. graciosus gracilis*), and Sierra alligator lizard (*Elgaria coerulea palmeri*). These species occur in a wide variety of habitats ranging from riverine to woodlands, forests, and grasslands. Most are active during the summer and inactive during the winter.

Common bird species expected to occur in the vicinity of the projects include raptors such as red-tailed hawk (*Buteo jamaicensis*) and Cooper's hawk (*Accipiter cooperii*); songbirds including dark-eyed junco (*Junco hyemalis*) and spotted towhee (*Pipilo maculatus*); woodpeckers such as white-headed woodpecker (*Picoides albolavatus*) and northern flicker (*Colaptes auratus*); and owls including great horned owl (*Bubo virginianus*) and western screech owl (*Otus kennicottii*). These birds are found in a variety of habitats ranging from streamside riparian habitats and wet meadows to sierra mixed conifer forests in the upper elevations of the projects (< El. 5,000 ft) and hardwood dominated woodlands common at the lower elevations of the projects (< El. 2,000 ft). Seasonally, some birds are only present between March and July for breeding, while others may be year-round residents.

Common mammal species in the vicinity of the projects, such as mule deer, black bear (*Ursus americanus*), and squirrels such as western grey squirrel (*Sciurus griseus*) are most often associated with the forested and woodland habitats. Some of the common mammals like black bear are active during the spring and summer months and hibernate during the colder winter months. Mule deer in the vicinity of the projects are migratory, and move from summer habitat at higher elevations to wintering habitat along the foothills.

6.4.1.2.4 Barriers to Wildlife Movement

In 2009, Licensees identified the location, type, and number of barriers to wildlife movement due to Project conduits (i.e., open canals, elevated flumes, non-elevated or bench flumes, siphons, tunnels, and penstocks) and other Project facilities. The study focused on five species: American marten, Pacific fisher, mule deer, black bear, and mountain lion (*Felis concolor*). Licensees documented the number and type of passage opportunities (i.e., over or under Project conduits) available to each of the five target species, as well as mapped deer migration corridors and seasonal habitat in relation to Project conduits.

Wildlife passage points were found to be generally common throughout the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project, with penstocks and tunnels having the greatest opportunity for passage to the five target species. These features are either buried completely, or were found to have passage opportunities at intervals less than 0.5 mi. throughout their entire length.

Throughout most of each Project's remaining conduits (open canals, elevated flumes, non-elevated or bench flumes and siphons), passage opportunities for all five of the target species were found to occur at least every 0.5 mi. The conduits containing segments that do not provide passage at least every 0.5 mi include the Yuba-Bear Hydroelectric Project Bowman-Spaulding Conduit, Dutch Flat No. 2 Conduit, and Chicago Park Conduit; and the Drum-Spaulding Project Drum Canal, Chalk Bluff/South Yuba Canal, Bear River Canal, Upper Wise Canal, Lower Wise Canal, and South Canal. The greatest distance between passage opportunities on the Drum-Spaulding Project occurs on the Bear River Canal (1.62 mi), while the greatest distance between passage opportunities on the Yuba-Bear Hydroelectric Project occurs on the Bowman-Spaulding Conduit (1.1 mi).

6.4.1.2.5 Wildlife Entrapment in Canals

NID reported one wildlife mortality, an adult mountain lion, in Yuba-Bear Hydroelectric Project canals in 2009. This is consistent with historic information from NID Operations staff that report few occurrences of wildlife mortality in Project canals.

Table 6.4.1-17 summarizes the 41 wildlife mortalities that were reported in Technical Memorandum 4-2, Special-Status Wildlife Movement, for the Drum-Spaulding Project canals. The study period occurred between August 28, 2008 and November 15, 2009, which overlaps with the annual migration cycle for mule deer found within the Project Area. The annual migration cycle includes fall migration from summer and critical summer habitat, downslope to winter and critical winter habitat and spring migration where mule deer return to summer range. Eleven of the wildlife mortalities were from 2008 while 30 were from 2009 (NID and PG&E 2010p). In general, few wildlife mortalities occurred in Drum, Chalk Bluff and Upper Wise canals, with higher numbers in Bear River and South canals. Of those, 66 percent (27) were young animals (26 young mule deer, likely less than one year old, and one black bear cub).

Mortality data collected during the wildlife movement study showed similarities to PG&E's reported wildlife mortality in 2007, with the highest and second highest number of mortalities recorded from the same canals (PG&E 2008a). The Bear River Canal had the highest number of mortalities with 21 in 2007 and 29 during the wildlife movement study period. The majority of all mortalities reported for the Bear River Canal during the wildlife movement study period were associated with segments of the canal above the Franklin and Ragsdale trash racks. The Franklin trash rack segment is that portion of the Bear River Canal between the Bear River Diversion Dam downstream to the Franklin trash rack, which is located near Weimar, CA. The Ragsdale segment is the portion of the Bear River Canal that extends downstream from the Franklin trash rack to where the Bear River Canal crosses under Placer Hill Road near Meadow Vista. The South Yuba Canal had the second highest number of mortalities with eight recorded during the wildlife movement study period and five in 2007. The Upper Wise Canal had reported mule deer mortalities reported during the wildlife movement study period and 2007 with one in each year. Drum Canal and Chalk Bluff Canal each had one recorded mule deer mortality reported during the wildlife movement study and none reported in 2007 (NID and PG&E 2010p, PG&E 2008a). Furthermore, the Chalk Bluff Canal had the only reported black bear mortality occurrence during the wildlife movement study period.

The higher proportion of reported young wildlife mortalities in PG&E canals suggests that young animals are more likely to become entrapped than adults. Presumably the smaller stature of young individuals makes it more difficult to escape from PG&E canals than adults.

Table 6.4.1-17. Summary of study specific wildlife species mortality occurrences along Drum-Spaulding Project conduits.

Conduit	UTM[1] Coordinates	Structure	Date	Species[2]	Age	Comments
Drum Canal	E 694764 N 4347470	Drum Siphon Trash rack	5/23/09	Mule Deer	Young	Female
Chalk Bluff Canal	E 687681 N 4351711	Deer Creek Forebay	7/28/09	Mule Deer	Young	Sex unknown, could have not been more than a few days old. Found on racks at end of canal
	E 692079 N4352577	Big Tunnel	8/21/09	Black Bear	Young	Female
Bear River Canal	E 674282 N 4328302	Canal	6/9/09	Mule Deer	Young	Sex unknown. Floating in Bear River Canal
	E 671070 N 4316683	Ragsdale Trash Rack	8/30/08	Mule Deer	Young	Sex unknown
			7/20/09	Mule Deer	Young	Male
			9/17/09	Mule Deer	Young	Sex unknown
			11/15/09	Mule Deer	Adult	Male
	E 672583 N 4323133	Franklin Trash Rack	8/28/08	Mule Deer	Adult	Female
			10/16/08	Mule Deer	Adult	Female
			11/5/08	Mule Deer	Adult	Male
			11/17/08	Mule Deer	Adult	Female
			12/3/08	Mule Deer	Young	Sex unknown
			12/15/08	Mule Deer	Adult	Female
			12/27/08	Mule Deer	Adult	Male
			12/28/08	Mule Deer	Young	Female
			1/12/09	Mule Deer	Young	Female
			1/12/09	Mule Deer	Young	Male
			1/28/09	Mule Deer	Adult	Female
			1/28/09	Mule Deer	Young	Female
			1/29/09	Mule Deer	Adult	Female
			1/29/09	Mule Deer	Young	Male
			3/3/09	Mule Deer	Young	Female
			6/7/09	Mule Deer	Young	Sex unknown
			6/26/09	Mule Deer	Young	Sex unknown
			6/30/09	Mule Deer	Young	Male
			6/30/09	Mule Deer	Young	Female
			7/1/09	Mule Deer	Adult	Female
			7/4/09	Mule Deer	Young	Male
			7/10/09	Mule Deer	Young	Male
			7/21/09	Mule Deer	Young	Male
			7/27/09	Mule Deer	Adult	Sex unknown

Table 6.4.1-17. (continued)

Conduit	UTM[1] Coordinates	Structure	Date	Species[2]	Age	Comments
Upper Wise Canal	E 669577 N 4313669	Halsey Afterbay	11/11/08	Mule Deer	Young	Sex unknown
South Canal	E 663019 N 4303068	Tunnel 14 Racks	7/1/09	Mule Deer	Adult	Female
	E662856 N 4305303	Tunnel 11 Racks	12/20/08	Mule Deer	Adult	Male
			12/23/09	Mule Deer	Young	Male
	E664111 N 4301007	Newcastle header Intake	3/16/09	Mule Deer	Young	Male
			6/2/09	Mule Deer	Young	Sex unknown
			6/5/09	Mule Deer	Young	Sex unknown
			6/12/09	Mule Deer	Young	Sex unknown
			9/6/09	Mule Deer	Adult	Male

1 Universal Trans Mercator System
2 In addition to documenting mortality of the five target species within the canal, Licensee also noted mortality of other non-target species (skunks, rabbits, various birds, grey fox, snakes, and livestock). The numbers of non-target species mortality was very low for all canals and is not included in this table.

6.4.1.2.6 Raptor Collision/Electrocution at Project Transmission Lines

NID has no reported raptor collisions or electrocutions at the Yuba-Bear Hydroelectric Project switchyards or Bowman-Spaulding 60 kV Transmission line, the only transmission line that is part of the Project.

PG&E has no reported raptor collisions or electrocutions at Drum-Spaulding Project switchyards and transmission lines.

PG&E has developed a generic Avian Protection Program (APP) (PG&E 2007) for all PG&E facilities, including Drum-Spaulding Project facilities, to reduce the detrimental effects of avian interaction with power lines. PG&E has also coordinated with the USFWS and CDFG in support of issuance of a federal permit for handling of migratory birds and their nests at all PG&E facilities.

6.4.2 Environmental Effects

6.4.2.1 Yuba-Bear Hydroelectric Project

This section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3), on terrestrial resources. The section is divided into the following areas: 1) effects on special-status/CESA-listed terrestrial species; 2) effects on vegetation; 3) effects on riparian habitat and wetlands; 4) effects due to the spread of noxious weeds; 5) effects due to entrapment in Project canals; 6) effects on wildlife movement; 7) effects on bald eagle (*Haliaeetus leucocephalus*); 8) effects on willow flycatcher; 9) effects on golden eagle (*Aquila chrysaetos*); 10) effects on California spotted owl and northern goshawk; 11) effects on American peregrine falcon (*Falco peregrines*); 12) effects on special-status forest carnivores; 13) effects on special-status bats; 14) effects on Coast horned lizard (*Phrynosoma* *coronatum*); 15) effects on management indicator species; and 16) effects of proposed powerhouse and recreation facilities.

6.4.2.1.1 Effects on Special-Status/CESA-Listed Terrestrial Species

Currently, 10 plants and 17 wildlife species with some form of special-status are known to occur in the Project Area (Tables 6.4.1-1 and 6.4.1-12). No CESA-listed plants are known to occur. Three species listed under the CESA as endangered (i.e., bald eagle, willow flycatcher and American peregrine falcon) are known to occur in the Project Area, while two species listed under the CESA as threatened (i.e., Pacific fisher and wolverine) are known to occur in the Project Area.

There is evidence that some occurrences of special-status plants are being adversely affected due to Project O&M, including ground-disturbing activities, vegetation management (e.g., mechanical clearing and herbicide use) and recreation use (e.g., trampling). On the Yuba-Bear Hydroelectric Project, impacts of Project O&M to occurrences of four different special-status plant species (i.e., Congdon's onion, Brandegee's clarkia, round-leaved sundew and Sierra starwort) were directly observed. These impacts generally affected a limited number of individuals within a larger occurrence. In all cases, the impacts were site-specific, though the duration could be long-term, if Project operations continue unchanged. However, relative to the number of individuals and the area of occurrences present on the Project, the overall affect of these impacts on a given species is minor.

Project effects on special-status, CESA-listed and Fully Protected wildlife and their habitats are more species specific, and are discussed below as appropriate.

NID's proposed Project includes five general measures that pertain in part and six measures that are specific to the management of terrestrial resources. Implementation of these measures would assure that the effects of the proposed Project on special-status terrestrial species would be minor. The five general measures are discussed below including how each measure would protect or enhance the environment. The specific terrestrial resource measures are discussed in context with their respective resource area.

The first measure, Annual Consultation, would: 1) assure that NID's planned activities are efficiently coordinated to the extent possible with the Forest Service and BLM activities; 2) make the Forest Service and BLM aware of NID's planned O&M activities on NFS land and on public land administered by BLM; and 3) make NID aware of all pertinent Forest Service and BLM orders, rules and policies that might affect the planned activities. NID would meet with the Forest Service, BLM and other agencies in the first quarter of each year to discuss NID's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate since NID normally develops an annual maintenance plan early in each calendar year. NID would file documentation of the meeting with FERC, including recommendations by the Forest Service and BLM, if requested by FERC. The measure does not imply that NID may not proceed with planned Project O&M activities until

NID has reviewed the planned O&M activity with the Forest Service and BLM, or relieve NID from obtaining all necessary approvals and permits for the planned maintenance work.

In the second measure, Employee Training, NID would prepare and maintain a map of "sensitive areas" within the FERC Project Boundary. The map would show known areas of special-status plant populations, noxious weed populations, and cultural sites as well as PACs and other protected or restricted areas. NID would provide environmental sensitivity training to Project O&M staff when they are assigned to the Project and provide group training to all Project O&M staff annually. Providing training to staff when they are hired will assure new staff are quickly trained, and periodic training will serve as a refresher for staff to note any changes since the last training. Training would include the general identification of the special-status species that are known to occur in the Project area and their location within the FERC Project Boundary, methods to avoid "sensitive areas" and minimize disturbance of special-status species during critical life stages, and a review of any pertinent Forest Service or BLM orders, rules or policies (e.g., limited operating periods [LOPs]) that pertain to these special-status species that may occur in the Project Area. Training would also include procedures for reporting to NID's management if staff observes any Project activity directly affecting these special-status species. To assure training is comprehensive and is accurate, NID would invite the Forest Service and BLM to assist in the annual training session.

In the third measure, Annual Review of Special-Status Species Lists and Assessment of New Species, NID would meet with the Forest Service and BLM annually to review pertinent special-status species lists. NID anticipates this would occur during the annual consultation meeting described above. An annual review is appropriate because changes to special-status species lists are usually very minor from year to year. If a species has been added to the list and has a reasonable likelihood of being directly affected by the Project and adequate information is not available to assess likely Project effects, NID would develop a study plan to assess potential Project effects, provide the plan to the Forest Service or BLM, as appropriate, and other appropriate resource agencies for review, and file the plan with FERC. NID would perform the study as approved by FERC, and develop a report, including recommended measures. NID would provide the report to the Forest Service and BLM, as appropriate, for review, file the report with FERC, and implement those measures as directed by FERC.

The next measure pertains to new ground disturbing activities. If during the term of the new license, NID proposes ground disturbing activities not addressed by the relicensing NEPA process; such activities have the potential to adversely affect special-status species and other resources on NFS lands and public lands administered by BLM. This measure would assure that reasonable PM&E measures are developed to address the potential effects of the new ground disturbing activities. Specifically, prior to performing the new ground disturbing activity, NID would consult with the Forest Service or BLM, as appropriate, to: 1) discuss potential effects; 2) determine if additional information is needed to assess effects; 3) gather additional information, if needed; and 4) upon Forest Service's receipt or BLM's request, as appropriate, enter into an agreement to fund a reasonable portion of Forest Service's staff or BLM's staff, as appropriate, to perform staff activities related to the proposed ground disturbing activity. This measure provides for the timely review of new ground disturbing activities.

The fifth measure, Consultation Regarding New Facilities, also pertains to activities not addressed in FERC's NEPA review. If, during the term of the new license, NID proposes new Project facilities that were not addressed in FERC's NEPA process, prior to construction NID would develop and submit a Biological Evaluation (BE) to the Forest Service or BLM, as appropriate. The BE would assess potential effects to special-status species, and would include procedures to minimize adverse effects to special-status species.

The sixth measure included in the proposed Project to protect and mitigate potential impacts to terrestrial special-status species deals with the use of pesticides and herbicides. Currently, NID contracts with a licensed vegetation management specialist to use herbicides. Typically, NID applies herbicides once in early summer at upper elevation (>5,000 ft) Project facilities and once each in early summer and fall at lower elevation (<5,000 ft) Project facilities. Accord is the only herbicide used on NFS land, and only used with prior approval by the Forest Service. Herbicide applications are usually on downstream dam faces and at foot of dams and in the immediate vicinity of Project facilities. No herbicides are used in water conduits. Under the proposed Project, NID's current restrictions regarding the use of herbicides would continue. Further, NID would only use pesticides on NFS land and public land administered by BLM with the approval on the Forest Service and BLM, as appropriate. NID would notify the Forest Service and BLM, as appropriate, of proposed uses of pesticides on NFS lands and public lands administered by BLM and obtain the appropriate agencies approval prior to application. The measure also provides that NID may provide to the Forest Service or BLM, an Integrated Pest Management Plan, that describes the planned regular use of pesticides, but submittal of the plan does not relieve NID of notification requirements.

6.4.2.1.2 Effects on Vegetation

NID routinely clears vegetation in the immediate vicinity of Project structures, including powerhouses, canals, flumes, transmission line poles, and on the rock- and earth-filled dams. Clearing is performed by mechanical means (e.g., chain saws and line trimmers), and occurs only in those areas needed by NID to maintain the structure (i.e., within about 25 ft of the structure) and to comply with federal and state laws, particularly in regards to fire prevention. NID does not use ground-disturbing equipment for vegetation clearing.

NID restricts work to those areas mandated by law and necessary to maintain facilities. Although the majority of vegetation is cleared from these locations, they represent a small percentage of the overall Project. Additionally, no Project facilities are located on sensitive vegetation associations (e.g., wet meadows and willow areas). Therefore, the majority of managed vegetation is comprised of common associations and only a small proportion of their acreage on the Project is affected. So, the affects of current vegetation management are minor (less than significant) and site-specific.

Under the proposed Project, NID would control the use of herbicides (and pesticides) on NFS land and public land administered by BLM and adhere to a formal vegetation management plan. The measure related to herbicide use would provide that NID only use herbicides (and pesticides) on NFS land and public land administered by BLM with each agencies' approval.

The vegetation management plan would establish procedures on NFS land and public land administered by BLM for activities such as hazard tree removal and trimming; transmission line clearing, general vegetation removal and re-vegetation of disturbed areas. Together, these measures would assure that the effect of the proposed Project to vegetation continues to be less than significant.

6.4.2.1.3 Effects on Riparian Habitat and Wetlands

NID, in collaboration with Relicensing Participants, examined seven riparian habitat areas and one wetland area potentially affected by the Yuba-Bear Hydroelectric Project. Six of the riparian/wetland areas were determined to be functioning properly. Project-related flows in study reaches support the properly functioning condition of riparian habitat. The proposed Project would have a less than significant impact on the riparian habitats and wetlands downstream of these sites because they are functioning properly under normal O&M.

The seventh site, a riparian site located in the lower Bear River downstream of the Dutch Flat Afterbay Dam, is in a section of stream that has been highly disturbed by historic gold mining operations. NID concluded that the riparian habitat was functional, but at risk with an upward trend. Historic sedimentation and large historic floods have impacted the functional capacity of the riparian areas. In many areas, depositional mine tailings have formed terraces that prevent the river from being hydraulically connected to the banks, and upland species are present on these terraces. The coarse deposits and extensive sediment supply has also caused channel braiding. Riparian sediments are composed of loosely-consolidated and coarse deposits and are non-cohesive and unstable. NID concluded that non-Project activities contributed to the current condition of the riparian habitat, and it was recovering. As riparian vegetation becomes established it stabilizes banks and traps sediments, creating a positive feedback cycle by then supporting the development of additional riparian vegetation. The recovery in this area is slow near the Dutch Flat Afterbay Dam, as intermittent high flows may scour establishing vegetation. These flows are related to high water years, when there is more water in the Bear River than the Dutch Flat Afterbay has the capacity to hold, and is not related to Project-related releases but instead is related to overtopping of the dam. The proposed Project would have a less than significant effect on the riparian habitat downstream of Dutch Flat Afterbay.

6.4.2.1.4 Effects Related to the Spread of Noxious Weeds

Currently, 11 noxious weed species are known to occur in the Yuba-Bear Hydroelectric Project Area (Tables 6.4.1-4). All of the surveyed weed species are documented as aggressive invaders that displace native plants and disrupt natural habitats. Their occurrences tend to be widespread and/or diffuse across the Project Vicinity and Region. All noxious weed species present on the Project can be spread by human activities. High-effect areas of noxious weeds, such as recreation areas and roadsides, particularly at lower elevations, are where spread is most likely. Project vehicles may transport noxious weed seeds from one area to another. Recreation activities can also spread noxious weeds, including through transport on boats, vehicles and clothing. Therefore, the proposed Project can contribute adversely in some degree to their spread. Project O&M activities, such as road grading and vegetation control remove existing vegetation and can also increase the spread of noxious weeds. However, vegetation management may be beneficial, retarding the spread of some noxious weeds occurrences by removing them from around Project facilities.

The proposed Project includes an invasive species management plan to assist in the control of noxious weeds on NFS land and public land administered by BLM, and a measure related to the use of herbicides (and pesticides) on NFS land and public land administered by BLM. As part of the invasive species management plan, NID would make a good faith effort to control existing populations of noxious weeds caused by Project O&M activities on NFS land and on public land administered by BLM within the FERC Project Boundary no later than one year after license issuance, and annually monitor for weed infestations. The plan would also identify specific actions that the NID would implement thereafter to control the spread of Project-caused noxious weeds. The measure related to the use of herbicides (and pesticides) would provide that NID only use herbicides (and pesticides) on NFS land and public land administered by BLM with each agencies' approval. NID believes that, with the implementation of these two measures, Project effects on noxious weeds would be less than significant. As part of the proposed Project, NID would not control noxious weed populations outside the FERC Project Boundary, or eradicate all populations of noxious weeds within the FERC Project Boundary, which may be prohibitively expensive.

6.4.2.1.5 Effects due to Entrapment in Project Canals

Animals, including deer, have a potential to be entrapped in Project canals. While NID's studies documented that this potential is low, and few animals have been found in Project canals, NID's proposed Project includes two measures to assure that existing escape devices remain in proper functioning order and that any changes in the current low entrapment rate are recognized so that appropriate measures could be taken. Implementation of these measures would assure that the Proposed Project's effects on wildlife due to entrapment in canals would be less than significant. Each measure is discussed below.

In the first measure, Canal Wildlife Escape Facilities, prior to replacing an existing wildlife escape facility, NID would consult with CDFG regarding the design of the replacement facility to be sure it meets the most current guidelines for such facilities. Current wildlife mortality in Project canals is low and wildlife escape ramps are in good condition and not in need of rehabilitation or repair at this time. However, if they become degraded and need replacement during the term of the new license, up-to-date standards should be applied to ensure the continued success of the escape ramps. This measure does not require NID to replace any existing facilities or add new facilities unless the facility is not in proper working condition. Existing wildlife escape ramps would be operated in substantially the same manner as they are currently operated. Any maintenance/replacement would be minor in nature (e.g., replacement of one device with another) and occur within the footprint of the existing facility.

Under the second measure, Monitor Animal Losses in Project Canals, NID would monitor wildlife mortality in Project canals, and annually report the results to CDFG, the Forest Service or BLM, as appropriate, and FERC. If there is an increasing trend in wildlife mortalities, additional measures to address suspected Project-related causes may be developed in consultation with the appropriate agencies. While current wildlife mortality in Project canals is low, mortality may increase over the term of the new license. This measure would assure that trends in canal mortality are identified and proper actions would be put in place if needed.

6.4.2.1.6 Effects on Wildlife Movement

NID found that wildlife passage points past Yuba-Bear Hydroelectric Project facilities (e.g., canals and penstocks) were common throughout the Yuba-Bear Hydroelectric Project. These passage points are suitable for a variety of species found throughout the Yuba-Bear Hydroelectric Project area, including mule deer, mountain lion and small mammals such as American marten and Pacific fisher. With the exception of mule deer, many of the land based mammals in the Project area are not migratory and generally tend to stay within established home ranges. Where home ranges overlap with Project facilities, it is likely that these areas are familiar and available passage points are integrated into daily movement patterns.

For species like mule deer, migration between summer and winter habitat generally follow ridges (Fowler and Wagener 1982, Wagner and Finn 1985). Like the mule deer migration routes, Project canals also follow ridges. This may limit the need to cross Project canals during migration, while more likely resulting in migration routes that parallel Project canals.

Common passage points and removal of only a few wildlife individuals from Project flumes and canals suggest that these do not constitute a barrier to wildlife movement. NID is unaware of any information indicating that Project facilities adversely affect wildlife movement. Since NID proposes no changes to the Project that would reasonably affect wildlife movement, the proposed Project would have a less than significant effect on wildlife movement.

6.4.2.1.7 Effects on Bald Eagle

Historically, bald eagles have been present in the Project area with most observations occurring in the vicinity of Jackson Meadows Reservoir, Milton Diversion Dam Impoundment, Bowman Lake and Rollins Reservoir. Many of these observations were reported as single individuals soaring or foraging. However, one historic nest site was reported in the Yuba-Bear Hydroelectric Project at the Milton Diversion Dam Impoundment. The Milton Diversion Dam Impoundment nest first appeared in the CNDDB in 1996, and was reported to have fledged one young that same year. Data provided by the TNF indicated that bald eagles had been reported at the Milton Diversion Dam Impoundment as early as 1980. The Milton Diversion Dam Impoundment eagles were listed by the TNF as ‘reproducing’ in 2002, 2003, and 2004, and were reported to have one nestling in 2005. It is unknown if the 2005 nestling successfully fledged. Helicopter surveys performed by NID in 2009 indicated that this nest is now absent, which was likely the result of winter storms.

During NID’s 2009 study, a single bald eagle at Jackson Meadows Reservoir was often observed hunting from two perches, the first located within a boat-in campground and the second near the inflow of the Middle Yuba River. This suggests that the foraging bald eagle is tolerant of current land and water based recreationists. NID's 2009 study also documented the highest number of wintering birds in the Project area at Rollins Reservoir, which is situated at an elevation of about 2,171 feet and remains ice free throughout the year. The presence of wintering birds at Rollins Reservoir indicates that this facility provides beneficial wintering habitat for bald eagle when other higher elevation Project reservoirs are largely iced over. The lack of ice during winter months coupled with CDFG's fish stocking program in Rollins Reservoir that plants about 30,000 fish annually provides foraging opportunities for bald eagles.

NID's proposed Project includes the addition of one powerhouse immediately adjacent to the existing Rollins Powerhouse, along with 13 improvements to seven recreation sites. The proposed additions to the Yuba-Bear Hydroelectric Project will result in various levels of construction activities with the proposed Rollins No. 2 Powerhouse being the most extensive. The proposed recreation improvements will require a range of construction activities from development of new parking areas to installation of an information kiosk.

The National Bald Eagle Management Guidelines (NBEMG) (USFWS 2007) suggests that construction activities, such as the proposed Rollins No. 2 Powerhouse, should maintain a minimum distance of at least 660 ft between construction activities and occupied nests. There are no known active bald eagle nests within the 660 ft buffer of the location for the proposed new powerhouse. The NBEMG also recommends the use of physical barriers (e.g., topography and forested areas) to reduce disturbances to nesting bald eagles, but barriers are also beneficial in reducing impacts to foraging areas and roost sites. The presence of Rollins Dam provides a physical barrier between the new Rollins powerhouse construction activities and the surface of Rollins Reservoir where bald eagles are known to winter. The proposed powerhouse will be located immediately adjacent to the existing Rollins Powerhouse, which is currently under routine use. The proposed powerhouse will be operated in the same manner as the existing powerhouse (i.e., remotely with limited human presence). This remote operation will make an increase in activity unlikely, and thus, not disturb bald eagles. Annual routine maintenance at the proposed powerhouse will be coordinated along with maintenance of the existing powerhouse, but may result in an increase in human presences during maintenance activities. Annual routine maintenance will be limited in duration. Given the physical barrier provided by Rollins Dam routine, intermittent maintenance activities are unlikely to disturb bald eagles.

Construction associated with the proposed recreation facilities changes or additions will result in a temporary increase in noise, ground borne vibration, fugitive air emissions, and general human activity. However, since no known nests occur within one mile of the proposed changes or additions, these temporary impacts are unlikely to disturb nesting bald eagles. Some of the proposed changes or additions do have the potential to disturb foraging bald eagles. However, the level of disturbance will be temporary and minor, since construction is proposed in areas where ongoing activities (recreation) already exist, and no known roosts or hunting perches have been reported.

Overall, recreation in the Project area is predicted to increase roughly 72 percent by 2050 (NID 2010b). At five of the facilities where changes or additions are proposed (i.e., Jackson Meadows Reservoir, Milton Diversion Impoundment, Canyon Creek Campground, Sawmill Lake, and

Bowman Lake) recreation use is predicted to increase roughly 59 percent. At the remaining two facilities (i.e., Dutch Flat No. 2 Forebay and Dutch Flat Afterbay) use is predicted to increase roughly 84 percent. According to NID's 2010 Recreation Use and Visitor Survey Study (NID 2010b) camping was identified as the most popular activity with 44 percent of the respondents indicating that it was their primary recreation activity, followed by fishing (16.8 percent), motorized boating (6.7 percent), swimming (6.6 percent), hiking/walking (4.4 percent), riding OHVs (4.3 percent) and non-motorized flat-water boating (2.6 percent). With respect to the estimated increase recreation use, non-motorized flat-water boating is expected to increase the greatest between 2010 and 2050 with an estimated increase of 56.2 percent. This is followed by motorized boating at 54.1 percent, hiking/walking at 50.4 percent, and camping at 45.4 percent. The remaining activities all have an estimated increase of less than 27 percent. While the estimated increase in non-motorized and motorized boating appears to be high, camping is predicted to be the predominant recreation activity in the Project area.

The increases in recreationists and their activities have the potential to disturb foraging bald eagles. The degree to which bald eagles may be disturbed is dependent on the type and level of increase in activities and the tolerance of the birds to such activity. Activities such as camping and swimming are least likely to disturb foraging bald eagles since they are generally restricted to specific areas and result in a minimal increase in noise. Activities that involve the use of motorized transportation (e.g., boating and OHVs) are most likely to disturb foraging bald eagles. Use of motorized boats results in increased noise and allows access to nearly all of a water body. While OHV use is restricted to land it may allow recreationists to access areas near foraging perches. Other activities, such as hiking/walking and non-motorized flat-water boating, are relatively non-invasive with respect to an increase in noise, but they do allow for an increase in human presence in and around Project reservoirs where bald eagles may forage. With the exception of Rollins Reservoir, the increase in recreationists and their activities will not overlap with bald eagles that winter in the Project area because of restricted access due to heavy winter snows. On the other hand, Rollins Reservoir is available for fishing year round due to its low elevation and lack of ice. While there are no estimates for increases in winter recreation at Rollins Reservoir, a slight increase should be expected.

Historical and continued presences of bald eagles within the Project area suggest that they have become tolerant of the incremental increases in recreationists and their activities during the course of the original Project license. This suggests that the expected incremental increases of recreationists (1.8% annually) and their activities will likely be tolerated over the course of the proposed license. NID believes that the Proposed Project and the associated increase in recreation use would have a less than significant effect on bald eagles.

6.4.2.1.8 Effects on Willow Flycatcher

Willow flycatcher is known to nest in the meadow habitat upstream of Milton Diversion Impoundment. Willow flycatcher is known to be sensitive to disturbances during the nesting period, which occurs between June and August. While known nesting habitat intersects the Project Boundary, NID believes that the proposed Project will not have an affect on willow flycatcher. The nesting habitat is located nearly 0.5 mile from Milton Diversion Dam, which is the closest Project facility that requires maintenance and inspection. Furthermore, NID does not engage in vegetation management activities (e.g., maintenance of fire breaks, noxious weed removal) in the meadow habitat upstream of Milton Diversion Impoundment.

6.4.2.1.9 Effects on Golden Eagle

Historic information indicated nine golden eagle occurrences have been reported within the Project Area, specifically at Jackson Meadows Reservoir (USFS 2009). None of these reported occurrences included nesting or activities associated with nesting, which suggests that golden eagle are occasional visitors (i.e., foragers) to the Project area. Since golden eagle is not known to nest within the Project Area, the proposed Project would not have an effect on nesting. However, occasional visitors may be disturbed by recreation activities, vegetation clearing (e.g., transmission line right of way (ROW) maintenance, maintaining fire clearances and noxious weed removal), and/or routine, intermittent facilities maintenance. These activities may lead to flushing of perched birds. However, given the infrequency of golden eagle visits to the Project Area, the concentrated nature of potential disturbances, and the intermittent duration of activities, the proposed Project would have a less than significant effect on golden eagle.

6.4.2.1.10 Effects on California Spotted Owl and Northern Goshawk

As discussed in Section 6.4.1.2.2, California spotted owl and northern goshawk have historically nested within 0.25 mile of the Project Area. Both of these species are known to be sensitive to disturbances while nesting. Disturbance while nesting may result in nest abandonment and nest failure. Project activities in the vicinity of the PACs and their associated nests that may disturb nesting birds include: vegetation management (e.g., removal of hazard trees, noxious weed control, defensible space maintenance and clearing of transmission line right of way), recreation activities (e.g., OHV use, camping and hiking), and facility maintenance (e.g., inspections, road grading and annual repairs and emergency repairs). In general, most of the activities identified above are ongoing, routine and limited in duration and area, and it is probable that both species have become acclimated to these activities. However, removal of hazard trees, emergency repairs and some recreation activities are not ongoing or routine and may occur in PACs. These activities are most likely to affect breeding activities if they occur during the breeding period. The California spotted owl breeding period begins with courtship as early as February, followed by egg laying in early April concludes in August and September with fledging. The northern goshawk breeding period begins with courtship as early as February, followed by egg laying in April and concludes in July and August with fledging.

NID's proposed Project includes two measures that would assure that disturbances to nesting California spotted owl and northern goshawk are mitigated and minor. Each measure is discussed below as they pertain to California spotted owl and northern goshawk.

During Annual Consultation with Forest Service and BLM (YB-GEN1, Appendix E3), NID will consult with the Forest Service and BLM annually to discuss various aspects of the Project, including foreseeable changes, needed protection measures and current year maintenance plans. With respect to California spotted owl and northern goshawk, the discussion will revolve around the location of PACs and their associated nests relative to foreseeable changes and non-routine maintenance that may have an effect on nesting success. If these discussions determine that the Project would have an effect on nesting success of these two species, additional mitigation measures will be developed. These measures may include implementation of LOPs for Project areas where PACs are known to exist; or in Project areas where PACs have not been established, the surrounding habitat will be evaluated for nesting suitability. If suitable nesting habitat is identified, NID will either implement LOPs for the activity, or perform necessary surveys to determine if nesting is occurring.

Under the measure, Employee Training, (YB-GEN2, Appendix E3), NID will ensure that staff and contractors are familiar with the location of sensitive areas (PACs) and the mitigations measures (e.g., LOPs) developed to protects them.

6.4.2.1.11 Effects on American Peregrine Falcon

Historically, American peregrine falcon has been observed in the Project Area at Bowman Lake and Jackson Meadows Reservoir (Tudor Engineering Company 1981). According to the TNF (USFS 2006), 12 American peregrine falcons were cross fostered into prairie falcon nests and successfully fledged in the Sierraville Ranger District. American peregrine falcon have relatively strict nesting requirements that include large vertical cliffs that are inaccessible to land predators and located near habitat with a high avian prey population (Monk et al. 1988 as cited by Tierney 2006). While features like large vertical cliffs exist in the vicinity of the Project Area, no American peregrine falcon nests have been identified in the Project Area. Since American peregrine falcon is not known to nest within the Project Area, the proposed Project would not affect nesting. However, occasional visitors may be disturbed by recreation activities, vegetation clearing (e.g., transmission lines ROW maintenance, maintaining fire clearances and noxious weed removal), and/or routine, intermittent facilities maintenance. These activities may lead to flushing of perched birds. Given the infrequency of American peregrine falcon visits to the Project Area, the concentrated nature of potential disturbances, and the intermittent duration of activities, the proposed Project would have a less than significant effect on American peregrine falcon.

6.4.2.1.12 Effects on Special-Status Forest Carnivores

Historically, special-status forest carnivores in the Project Area have included American marten, Pacific fisher and California wolverine. All three of these species have been reported within 0.25 mile of Jackson Meadows Reservoir, with additional occurrences of American marten within 0.25 mile of Faucherie Lake, and Pacific fisher within 0.25 mile of Sawmill Lake, and Milton-Bowman Diversion Conduit. However, studies by Zielinski et al (1995, as cited by NatureServe 2010) indicated that Pacific fisher in California are limited to areas in the southern Sierra Nevada and southern Cascade Range. While considered extirpated from California, the historic occurrence of California wolverine at Jackson Meadows Reservoir was from 1971 and is considered unverified by the TNF (CDFG 2009b). While all three species are generally associated with habitat types found in the upper elevations of the Project Area (above El. 4,000 ft), American marten and Pacific fisher habitat can be found at habitat types associated with lower elevations of the Project as well. In general, suitable habitats for the three species include mixed conifer, red fir, lodgepole pine, subalpine conifer and some riparian habitats. All three species are largely nocturnal, utilize cavities in trees, snags, down logs, rock crevices, slash, brush or rock piles for dens or shelter. They are sensitive to human disturbances and will avoid areas with high human presence (CDFG 2009e).

Project activities that may affect these three species include recreation and O&M activities that result in ground disturbance, such as hazard tree or brush pile removal during maintenance of fire breaks along roadsides, canals, transmission lines, and recreation facilities. With respect to recreation, Project related campgrounds are unlikely to have an effect on any of the three species since the campgrounds are restricted in area and period of use and are probably avoided by these species. However, dispersed recreation activities such as camping/hiking and OHV use may overlap with suitable habitat.

The number of hazard trees removed per year varies greatly. It is estimated to be between 10 and 15 along Project reservoirs and 25 to 35 along the Bowman-Spaulding Transmission Line (Pers com., Bill Morrow NID Hydropower Manager 2011). Furthermore, felled hazard trees are moved to a location that does not interfere with Project O&M and disposed of in accordance with the landowners, including the Forest Service's, direction (Pers com., Bill Morrow NID Hydropower Manager 2011). The practice of relocating felled hazard trees is unlikely to reduce and in some cases, may increase the number of den sites.

NID's proposed Project includes two measures that would assure that disturbances to special-status forest carnivores are mitigated. Implementation of these measures would assure that the proposed Project's effects on forest carnivores would be less than significant.

Under one measure, Annual Consultation with Forest Service and BLM (YB-GEN1, Appendix E3), NID will consult with the Forest Service and BLM and other agencies annually to discuss various aspects of the Project. With respect to forest carnivores, the discussion will revolve around the suitable habitat relative to foreseeable changes and non-routine maintenance that may have an effect on reproductive success of these species. If suitable breeding habitat is identified NID will either implement LOPs for the activity or perform necessary surveys to determine if breeding is occurring.

Under the measure, Annual Employee Training (YB-GEN2, Appendix E7), NID will ensure that their staff and contractors are familiar with the location of sensitive areas and mitigation measures developed to protect them.

6.4.2.1.13 Effects on Special-Status Bats

Six Yuba-Bear Hydroelectric Project structures were found to have signs of bat use. Three of the six structures were classified as day roosts, and the remaining three structures were classified as night roosts. Of those structures classified as night roost the occupying bats are unlikely to be affected by the proposed Project since their presence does not coincide with normal work hours by Project staff.

The three structures that were classified as day roosts include Dutch Flat Afterbay low-level outlet tunnel, employee housing at Bowman Powerhouse and the Bowman Lake Campground restroom. Due to human health concerns the bats occupying the employee housing at Bowman Powerhouse were humanely excluded in the fall of 2010. Project activities that may affect the two remaining day roosts include recreation and O&M activities.

NID's proposed Project includes one measure, Bat Management (YB-TR6, Appendix E3), to assure that known and future bat roosts are not disturbed. While current Project O&M activities have not resulted in disturbances to bat roosts, the measure would require NID to install exclusion measures at facilities where roosts are currently known and at facilities where new roosts are discovered. Exclusion measures would be installed after fall migration has occurred and before bats return in spring, and each roost will be surveyed to ensure that all bats have vacated the facility prior to installation. NID would install surrogate roosts (bat houses) adjacent to facilities where exclusion measures have been implemented. In addition, NID would consult with CDFG, BLM, and FERC regarding the need for a bat friendly gate at the low-level outlet tunnel below Dutch Flat Afterbay Dam. Since NID proposes no changes to the Project that would reasonably affect bats, the proposed Project would have a less than significant effect on bats.

6.4.2.1.14 Effects on Coast Horned Lizard

Historically, coast horned lizard has been documented along the Chicago Park Conduit and Rollins Reservoir. This species occupies a variety of habitats found in the Project area including coniferous forest, woodlands and chaparral. Coast horned lizard is attracted to open areas and patches of loose soils, specifically along sandy washes, and dirt roads because they provide basking, foraging and burrowing habitat. Road maintenance activities such as grading have the potential to affect this species. However, NID is unaware of any information indicating that Project facilities adversely affect coast horned lizard. Since NID proposes no changes to the Project that would reasonably affect coast horned lizard, the proposed Project would have a less than significant effect on coast horned lizard.

6.4.2.1.15 Effects on Management Indicator Species

Management Indicator Species (MIS) are considered common and widespread throughout the Project Area, occupying a variety of habitats ranging from subalpine to Blue Oak-Foothill Pine.

Project activities that have the potential to affect MIS include: vegetation management (e.g., removal of hazard trees, noxious weed control, defensible space maintenance and clearing of transmission line right of way), recreation activities (e.g., off-highway vehicle use, camping and hiking), and facility maintenance (e.g., inspections, road grading and annual repairs and emergency repairs).

Given the abundance and widespread occupancy of the Project Area, there is no evidence to suggest that Project facilities adversely affect MIS. Under the measure, Annual Review of Special-Status Species Lists and Assessment of New Species (YB-GEN3, Appendix E3), NID would meet with the Forest Service and BLM annually to review pertinent special-status species lists, which includes MIS. If a species designation has changed, and has a reasonable likelihood of being directly affected by the Project and adequate information is not available to assess likely Project effects, NID would develop and implement a study plan to assess potential Project effects, in consultation with the Forest Service or BLM, as appropriate, and other appropriate resource agencies, and file the plan with FERC. NID would develop a report and provide it to the Forest Service and BLM, as appropriate, for review, file the report with FERC, and implement those measures as directed by FERC.

6.4.2.1.16 Effects of Proposed Powerhouse and Recreation Facilities

Rollins No. 2 Powerhouse

NID proposes to include one new generating facility in the subsequent license: Rollins No. 2 Powerhouse. At this time, NID anticipates that the new powerhouse would be constructed entirely on privately-owned land adjacent to the existing powerhouse location in a lay down area just below the existing parking lot on the right bank of the river. The current design concept for the new powerhouse includes a 40 feet by 58 feet concrete building that would house a single Francis turbine with a maximum flow of 660 cfs and synchronous generator combination yielding a maximum capacity of 11.4 MW. This new facility would be a remotely operable, unmanned installation. The upgrade would require modifications to the existing penstock to allow for a new bifurcation to route flow to the new generation facility, and an underground interconnection to a new Rollins Powerhouse Switchyard which would service both the existing and the new powerhouse; the existing switchyard would be demolished. The upgrade would occur entirely within the existing FERC Project Boundary and affect less than 1 acre of privately-owned land.

Botanical Resources

The proposed site of the Rollins No. 2 Powerhouse is on a patch of land labeled as Barren by CalVeg, although there are non-native grasses and annuals growing in the location. No occurrences of special-status plants were observed growing on or directly adjacent to the site of the proposed powerhouse. In addition, the habitat is not suited to the special-status plants with the potential to grow in the Project Area. The closest special-status plant occurrences are two Brandegee’s clarkia populations on the Old Bridge Road above the proposed powerhouse location.

The area has several documented noxious weed occurrences including yellow starthistle, skeletonweed, Klamath weed and Scotch broom. The construction of the new powerhouse could lead to the spread of these noxious weeds, as construction equipment and clothing are vectors for carrying seed. Unwashed construction vehicles and equipment being brought in from outsides areas can also bring in seeds from noxious weeds not yet present on the Project. Additionally, dirt and straw used for construction, which have not been certified as weed-free, may also carry in weed seeds. Following BMPs during construction will reduce opportunities for the spread of weeds from and to the area of the proposed powerhouse.

Wildlife Resources

Two special-status bats, Western red bat and Townsend's big-eared bat, were recorded acoustically during NID's 2009 studies, while in flight at the site selected for the proposed Rollins No. 2 Powerhouse. The western red bat roosts singularly on the underside of tree branches, while the Townsend's big-eared bat roosts in caves, mines and within man-made structures. The initial construction will not involve the removal of any trees and thus, will not affect western red bats. No Townsend's big-eared bats are known to roost at the site proposed for the powerhouse and thus, will not be affected by construction of the proposed powerhouse.

Activities associated with the construction and future operation and maintenance of the proposed powerhouse are unlikely to affect other terrestrial wildlife species, because: 1) the powerhouse will be located immediately adjacent to an existing powerhouse, 2) construction will not require the removal of vegetation important to nesting activities for neotropical birds, or other avian species, 3) Rollins Dam will provide a physical buffer between the proposed powerhouse and the surface of Rollins Reservoir, an area that supports migratory waterfowl and shore birds.

Recreation Facilities

NID currently plans to include these additions to the following specific recreation facilities:

- Jackson Meadows Reservoir
  - Additional parking for up to 20 boats with trailers (double spaces) at or near the existing Pass Creek Boat Launch to accommodate boat ramp use during the high water period typically through July when the lower boat launch parking area is not useable.
  - Replace the existing Woodcamp Boat Launch with a similar1-lane concrete launch ramp.

- Milton Diversion Impoundment:
  - Up to two parking areas (native surface) with vehicle barriers and directional signage along north shoreline that allows parking in designated parking areas only and walk-in camping along impoundment shoreline.
  - One car-top boat launch that allows direct vehicle access to the shoreline for boat launching purposes only.

- Canyon Creek Campground:
  - Replace the existing restrooms with new, 2-unit vault restrooms.
  - Add bear-proof lockers at eight sites.

- Sawmill Lake:
  - Up to 10 primitive walk-in campsites with one tent pad per site (1 accessible campsite); install table, fire ring/grill site marker and signage at each campsite.
  - One gravel/native surface parking area with barriers including information kiosk.
  - One 2-unit vault restroom

- Bowman Lake:
  - One parking area (native surface) with vehicle barriers and informational signage at Jackson Creek inflow along the Bowman Lake Road.
  - Fourteen primitive campsites each with a picnic table, fire ring, site marker and signage along the north shoreline.

- Dutch Flat No. 2 Forebay:
  - One information kiosk

- Dutch Flat Afterbay:
  - One day use area along the shoreline of the afterbay if a suitable location can be found on either NID or BLM land. Potential improvements may include facilities such as picnic tables, a vault restroom, signage or information kiosk and a defined parking area.

Botanical Resources[7]
None of the proposed recreation facilities' changes or additions are located on or near known special-status plant occurrences. The closest occurrences of special-status plants are on the opposite bank of the reservoirs at both Milton Diversion Dam Impoundment and Dutch Flat Afterbay. Therefore, the proposed recreation facilities should not affect special-status plants.

Most of the proposed recreation facilities are on relatively common, non-sensitive CalVeg associations (Barren, Mixed Conifer-Fir, and Jeffrey Pine). However, the Milton Diversion Dam is close to Willow habitat. Depending on the exact placement of the proposed changes, some vegetation may need to be cleared in order to build the facilities. By maximizing the placement of changes to the existing footprint of current recreation facilities, impacts to vegetation will be minimized.

Only one recreation facility with proposed changes, Bowman Lake, has known noxious weeds occurrences (Klamath weed) in the area, so the overall affect of these proposed changes is likely to be minor, if any, for spreading seed from already present occurrences of weeds. However, at all sites, construction equipment and personnel have the potential to carry noxious weeds seed into the area. Following the invasive species management plan on federal lands and BMPs everywhere during construction will reduce the potential to spread noxious weeds.

Wildlife Resources
The proposed changes or additions to seven Yuba-Bear Hydroelectric Project recreation facilities will occur in various habitats which are dominated by Sierran Mixed Conifer, Mixed Conifer, Montane Hardwood, Montane Chaparral around Jackson Meadows Reservoir, Milton Diversion Impoundment, Canyon Creek, Sawmill Reservoir, and Bowman Lake to Douglas Fir, and Montane Hardwood dominated habitats around the Dutch Flat No. 2 Forebay and Afterbay. This

[7] The Canyon Creek recreation area will be surveyed for special-status plants and noxious weeds in the spring/summer of 2011. Affects on botanical resources by proposed changes to this recreation facility will be determined after these surveys are complete and included in the revised technical memorandum.

range of habitat types supports a wide range of species, many of which are special-status, and have known occurrences in the Project Area. Each of the proposed changes or additions and their effects on special-status wildlife are described below:

At Jackson Meadows Reservoir, the construction of the additional parking at Pass Creek Boat Launch will require removal of vegetation, grading, laying of asphalt and haul trucks and will result in increased noise and human presence during construction. Replacement of the existing Woodcamp Boat Launch will require removal of the existing facilities, grading, and pouring of new concrete, which will result in increased noise and human presence during construction. The proposed facilities will likely accommodate the expected increase in recreationists over the period of the subsequent license. Special-status species that have known occurrences within 0.25 mile of the Pass Creek Boat Launch include California spotted owl and Pacific fisher; and within 0.25 mi of Woodcamp Boat Launch include northern goshawk, California spotted owl, and American marten. However, studies by Zielinski et al (1995, as cited by NatureServe 2010) indicated that Pacific fisher in California are limited to areas in the southern Sierra Nevada and southern Cascade Range. Zielinski's studies suggest that Pacific fisher no longer occurs in the Project Area. With respect to California spotted owl and northern goshawk, both species are sensitive to disturbances during their respective breeding seasons. California spotted owl breeding begins with courtship as early as February, followed by egg laying in early April concludes in August and September with fledging. Northern goshawk breeding begins with courtship as early as February, followed by egg laying in April and concludes in July and August with fledging.

At Milton Diversion Dam Impoundment, construction of the parking areas will require removal of vegetation and grading, while construction of the walk-in campground will require vegetation removal and installation of campfire rings and picnic tables. Construction of the parking area and walk-in campground will result in increased noise from equipment as well as an increase in human presence. Construction of the car-top boat launch will likely require vegetation removal and some grading, which will also result in an increase in noise and human presence. Special-status species that have known occurrences within 0.25 mi of the proposed facilities at Milton Diversion Dam Impoundment include willow flycatcher and bald eagle. These species are sensitive to disturbances during their respective breeding seasons. There are no known occupied bald eagle nests within 1 mile of the proposed additions at Milton Diversion Dam Impoundment. Willow flycatcher is known to nest in a meadow adjacent to Milton Diversion Dam Impoundment

At Canyon Creek Campground, replacement of the existing restrooms will likely involve the use of heavy equipment for demolition, and trucks to transport materials. It is expected that the proposed facility improvements at Canyon Creek will be short in duration. No known special-status species occurrences have been reported in the vicinity of the proposed facility improvements.

At Sawmill Lake, construction of the parking area and information kiosk will require removal of vegetation and grading, while the walk-in campground will require vegetation removal and installation of campfire rings and picnic tables. Construction of the parking area, information kiosk and walk-in campground will result in increased noise from equipment as well as an increase in human presence. Special-status species that have known occurrences within 0.25 mi of the proposed facilities at Sawmill Lake include bald eagle and Pacific fisher. These species are sensitive to disturbances during their respective breeding seasons. However, no occupied bald eagle nests are known to exist within 1 mi of the proposed facilities at Sawmill Lake. With respect to Pacific fisher, studies by Zielinski et al (1995, as cited by NatureServe 2010) indicated that Pacific fisher in California is limited to areas in the southern Sierra Nevada and southern Cascade Range. Zielinski's studies suggest that Pacific fisher no longer occurs in the Project area.

At Bowman Lake, construction of the parking area will require removal of vegetation and grading, while construction of the campground will require vegetation removal and installation of campfire rings and picnic tables. Construction of the parking area and walk-in campground will result in increased noise from equipment, fugitive air emissions, as well as an increase in human presence. Special-status species that have known occurrences within 0.25 mi of the proposed facilities at Bowman Lake include one northern goshawk nest and associated PAC. Northern goshawks are sensitive to disturbances near their nests during the breeding season, which begins with courtship as early as February, followed by egg laying in April and concludes with fledging in July and August.

At Dutch Flat No. 2 Forebay, construction of the information kiosk will require minimal equipment, mostly hand tools and a few persons, resulting in a small increase in noise. No special-status species are known to occur within 0.25 mi of the proposed information kiosk.

At Dutch Flat Afterbay one day use area is proposed, if sufficient space is available. The day use area will include picnic tables, a restroom, defined parking area and signage or information kiosk. Construction will likely require removal of some riparian vegetation along the shoreline of Dutch Flat Afterbay, depending on the final location, grading and installation of picnic tables and restroom. Construction will result in an increase in noise from equipment as well as an increase in human activity. No special-status species are known to occur with 0.25 mi of the proposed facilities at Dutch Flat Afterbay.

NID believes that the measures in the proposed Project and existing protection measures (LOP's) will protect special-status wildlife during and after construction.

6.4.2.2 PG&E's Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on terrestrial resources. In some instances, it is concluded that the existing Project does not adversely affect a terrestrial resource, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific terrestrial resource, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed five PM&E measures that are relevant to this resource area, which are listed in Section 6.4.3.2.1 below. The complete text of the measure and the accompanying rationale is presented in Appendix E7 of this FLA.

This section is divided into the following areas: 1) effects on special-status/CESA-listed terrestrial species; 2) effects on vegetation and spread of noxious weeds; 3) effects on riparian habitat and wetlands; 4) effects due to entrapment in Project canals; 5) effects on wildlife movement; 6) effects on bald eagle; 7) effects on golden eagle; 8) effects on California spotted owl and northern goshawk; 9) effects on Barrow's goldeneye; 10) effects on forest carnivores; 11) effects on bats; 12) effects on coast horned lizard; and 13) effects on management indicator species.

6.4.2.2.1 Effects on Special-Status/CESA-Listed Terrestrial Plants and Wildlife

There is evidence that some occurrences of special-status plants are being adversely affected due to Project O&M, including ground-disturbing activities, vegetation management (e.g., mechanical clearing and herbicide use) and recreation use (e.g., trampling). On the Drum-Spaulding Project, impacts of Project O&M to occurrences of five different special-status plant species (i.e., Congdon's onion, Brandegee's clarkia, Humboldt lily, felt-leaved violet and Sierra starwort) were directly observed. These impacts generally affected a limited number of individual plants within a larger occurrence. Two occurrences, one Brandegee's clarkia and one Congdon's onion, were adversely impacted in their entirety, both by OHV use. However, relative to the number of individuals and the area of occurrences present on the Project, the overall affect of these impacts on a given species is minor.

Project effects on special-status, CESA-listed and Fully Protected wildlife and their habitats are more species specific, and are discussed below as appropriate.

PG&E proposes two measures related to special-status species in general. Implementation of these measures would assure that the effects of PG&E's Proposed Project on special-status terrestrial species would be less than significant. Each measure is discussed below, including how the measure would protect or enhance the environment.

The first measure, Annual Consultation, would: 1) allow PG&E's planned activities to be efficiently coordinated to the extent possible with the Forest Service, BLM and BOR activities; 2) make the Forest Service, BLM and BOR aware of PG&E's planned O&M activities on federal land; and 3) make PG&E aware of all pertinent Forest Service, BLM and BOR orders, rules and policies that might affect the planned activities. PG&E would meet with the Forest Service, BLM, BOR and other agencies annually to discuss PG&E's planned Project O&M activities for that calendar year, to the extent they are known.

In the second measure, Annual Employee Training, PG&E will train its operations staff annually to familiarize them with special-status species, noxious weed populations, and sensitive areas within the FERC Project Boundary. PG&E will direct staff to avoid disturbance to special-status species.

6.4.2.2.2 Effects on Vegetation and Spread of Noxious Weeds

The existing Drum-Spaulding Project does have some adverse effects on vegetation, primarily through vegetation removal and ground disturbance from routine operation and maintenance activities that can promote the spread of invasive weeds.

PG&E routinely clears vegetation in the immediate vicinity of Project structures, including powerhouses, canals, flumes, electric transmission ROWs, and on the rock- and earth-filled dams. Clearing is performed by mechanical means (e.g., chain saws and line trimmers), and occurs only in those areas needed by PG&E to maintain the structure (i.e., within about 25 ft of the structure). PG&E does not use ground-disturbing equipment for vegetation clearing.

PG&E restricts work to those areas mandated by law and necessary to maintain facilities. Although the majority of vegetation is cleared from these locations, the area affected represents a small portion of the overall Project. Additionally, no Project facilities are located on sensitive vegetation associations (e.g., wet meadows and willow); the majority of managed vegetation is comprised of common associations and only a small proportion of their acreage is affected. Thus, the affects of current vegetation management are minor (less than significant) and site-specific, although they will continue for the life of the Project in most areas.

Currently, 15 noxious weed species are known to occur in the Drum-Spaulding Project Area (Tables 6.4.1-11). All of the surveyed weed species are documented as aggressive invaders that displace native plants and disrupt natural habitats. Their occurrences tend to be widespread and/or diffuse across the Project Vicinity and Region. All noxious weed species present on the Project can be spread by human activities. High-effect areas of noxious weeds, such as recreation areas and roadsides, particularly at lower elevations, are the ones from which spread is most likely. Therefore, the Proposed Project has the potential to contribute in some degree to their spread. Project vehicles may transport noxious weed seeds from one area to another. Recreation activities can also spread noxious weeds, including through transport on boats, vehicles and clothing. Project O&M activities, such as road grading and vegetation control remove existing vegetation and may increase the spread of noxious weeds. However, vegetation management may also be beneficial, retarding the spread of some noxious weeds occurrences by removing them from around Project facilities.

To address the potential effects of Project O&M and other associated activities on vegetation and noxious weeds on federal lands, PG&E proposes a measure to develop an Integrated Vegetation Management Plan. Although PG&E currently follows O&M guidelines and procedures related to noxious weed/invasive species management, PG&E believes that the additional components and activities anticipated in this measure (including noxious weed removal, monitoring and equipment certification program; installation and maintenance of a boat wash station at Lake Spaulding; invasive species education, etc.) will further protect environmental resources. These activities and others that will be detailed in the plan, will provide additional protections for the resource. The measure, including a detailed rationale statement, is provided in Appendix E7.

6.4.2.2.3 Effects on Riparian Habitat and Wetlands

PG&E, in collaboration with other Relicensing Participants, examined five riparian habitat areas and six wetland areas potentially affected by the Drum-Spaulding Project. Seven of the riparian/wetland areas were determined to be functioning properly, and therefore effects of current operations are considered less than significant on these sites. Project-related flows in study reaches support the properly functioning condition of riparian and or wetland habitat. The remaining sites are discussed below.

Fordyce Lake Dam Reach – Riparian

The Fordyce Lake Dam Reach assessment as Functional – At Risk is predominantly based on the presence of bank erosion in the narrow residual riparian deposits, undercut banks, and limited development of riparian vegetation in a subsection of the larger study site. This area is unlikely to offer resilience to high-flow events, although the larger study site is functioning near potential. While many banks within the alluvial terrace area were vertical and exposed, there were also developing inset point bars and floodplains in some locations, which indicated a return to interaction of the active channel with a floodplain. On the steeper, more transport-oriented and bedrock-controlled sections, there is limited opportunity for riparian vegetation to become established due to channel confinement between bedrock walls. However, there is evidence of intermittent channel margin deposits that sustain early serral stages of a riparian community, with some graminoids and occasional willow seedlings. Establishment of new riparian vegetation to a secondary serral stage during low/regular flow may be reduced due to high flows in the period of developing root masses, and so plants do not have time to become flow resistant during the growing season. However, it is common for riparian vegetation to remain in early serral stages immediately adjacent to the water's edge, both from natural drawdown and irregular high flows.

At the time of the assessment, the site had both erosion of banks and the establishment of in-channel bars forming. Both are natural channel morphology processes associated with sinuosity and bed mobility that work in tandem to create channel equilibrium. The majority of the Fordyce Creek reach is composed of unyielding bedrock banks, which limits and concentrates areas of effects, dramatizing any changes in comparison with the bedrock areas. Under current Project O&M these transitioning areas are in the process of reaching equilibrium with point bars and banks that are expected to support the establishment of riparian vegetation that meets the potential of the site. Because PG&E proposes no changes to Project flows the site will meet equilibrium with banks becoming stabilized by reaching an angle of repose or establishing vegetation, and the Proposed Project would have a less than significant effect on riparian habitat and wetlands.

Lower Rock Lake Dam Reach #1 – Wetland RM 2.8

Lower Rock Lake Reach #1 Wetland was rated as Functional – At Risk, trending upward, because three of the PFC Lentic Standard Checklist items were answered "no." Specifically, the natural surface or subsurface flow patterns appear to have been altered by historic grazing disturbance; plant species present did not fully indicate maintenance of riparian-wetland soil moisture characteristics; and adequate vegetative cover was not present to fully protect the soil surface and dissipate energy during overland flow events. The inability to dissipate energy during overland flow events pertains mostly to the distribution channels and not to the main Texas Creek channel. The distribution channels have been more severely impacted by grazing animals and show more evidence of scour and bank failure. However, all areas are showing recovery; annual cattle grazing periods have been reduced compared to historic periods[8] and there has been a general increase of woody wetland habitat along the main channel of Texas Creek and the affected channels, as indicated by historical aerial photography comparisons. Habitat values have increased with the added structure and diversity.

Because PG&E proposes no changes to Project flows the site is likely to continue to recover, and the Proposed Project would have a less than significant effect on wetlands. Normal Project O&M support the recovery of the wetland in the reduced presence of cattle.

Bear River Reach #2 – Riparian and Wetland RM 35[9]

PG&E conducted two PFC assessments for Bear River Reach #2. A Riparian Habitat assessment was performed using the PFC protocol for lotic areas, with focus on the Bear River and the associated riparian vegetative community. A wetland assessment was performed for Wetlands Study using the PFC protocol for lentic areas with focus on the extended vegetative wetland community of the Bear Valley Meadow. Both assessments independently rated Bear River Reach #2 as Functional – At Risk with an upward trend.

The site has been impacted by a variety of historical and recent uses, including grazing, local diversions, high regulated sustained and pulse flows, as well as the crossing of a railway, the Emigrant trail, and Highway 20. The combined effects of past disturbance likely weakened the resiliency of the riparian system at Bear River Reach #2. Flows through the reach may have exacerbated this weakening by adding to channel incision and bank destabilization. Channel incision and continued bank failures may have occurred with sustained high flows. The hydrology data for the last 30 years of record indicate that both sustained and pulse regulated flows exceeded this systems estimated carrying capacity in unimpaired conditions, particularly flows released during the 1990s. However, damages incurred specifically by flow releases or other historical or recent land uses are unclear.

The riparian PFC assessment of the Bear River Reach #2 study site determined that the site is generally exhibiting a trend toward reaching its riparian-wetland potential. Although the channel is incised in the upper and middle portions, with intermittent bank failures in the middle meadow, the study site has many of the attributes included in the PFC definition. There are active and frequent floodplains in the lower section of the study site. Woody and herbaceous riparian vegetation support bank stability, dissipate energy, and form root masses capable of withstanding high-flow events. There are no fan deposits or braids from upland sediment

8 Tierney, Marylin, District Biologist. Tahoe National Forest, Camptonville, CA. Personal communications. July 14, 2009.
9 As discussed in footnote number 5 above, PG&E believes that Bear River Reach #1 and Bear River Reach #2 should be characterized as jointly affected reaches. NID disagrees with PG&E.

sources and no indication of current excessive erosion or deposition. Regulated flows in this reach are larger than would be expected given the small drainage area.

The wetland PFC assessment was made because not all attributes included in PFC question #6 (natural surface or subsurface flow patterns are not altered by disturbance) were met. This wetland is composed of wetlands associated with the Bear River and wetlands created by upslope water sources. The Bear River flows and water table levels provide hydrology for wetlands located adjacent to the river. Wetland hydrology for the meadows upslope from the Bear River is provided by seeps, springs, snowmelt, and small intermittent or perennial streams.

Project operation flows over the past ten years support the recovery of riparian habitat toward reaching Proper Functioning Condition. However, releases approaching high flows (approximately 400 cfs over the past ten years) may cause or exasperate channel incision, bank failures, or other signs of channel instability in Bear Valley. Licensee proposed a channel morphology and riparian vegetation assessment measure in Bear Valley that will determine if released flows greater than 350 cfs affect these conditions. The assessment will provide information to inform the development of protection and mitigation measures as necessary.

6.4.2.2.4 Effects due to Entrapment in Project Canals

PG&E found that wildlife passage points were common throughout the Drum-Spaulding Project except along Bear River Canal. To address the issue of wildlife loss in Project canals, PG&E proposed two measures, each of which is presented in Appendix E7 with an accompanying rationale statement. The first measure provides for annual monitoring of wildlife mortality in Project canals, and the second measure proposes an assessment of deer entrapment in Bear River Canal.

6.4.2.2.5 Effects on Wildlife Movement

PG&E found that wildlife passage points were common throughout the Drum-Spaulding Project except along Bear River Canal.

6.4.2.2.6 Effects on Bald Eagle

Historically, bald eagles have been present in the Project area with most observations occurring in the vicinity of Fordyce Lake, Fuller Lake, Kelly Lake, Lake Spaulding and Meadow Lake. Many of these observations were reported as single individuals soaring or foraging. Furthermore, reproductive pairs have been reported at Fordyce Lake, Lake Spaulding and Meadow Lake. Nesting surveys performed by Licensees in 2009 indicated the presence of only one active nest in the Drum-Spaulding Project at Lake Spaulding. Prior to Licensees' 2009 survey (2000 through 2008), the TNF reported the fledging of young in 2000, 2002 and 2007 from the Lake Spaulding nest.

Overall, recreation in the Project area is predicted to increase roughly 70 percent by 2050 (PG&E 2010b). According to PG&E's 2010 Recreation Use and Visitor Survey study (PG&E 2010b) camping was identified as the most popular activity with 33 percent of the respondents indicating that it was their primary recreation activity, followed by fishing (21 percent), hiking/walking (15 percent), non-motorized flat-water boating (7 percent), riding Off Highway Vehicle or OHV (6 percent), and swimming (4 percent). With respect to the estimated increase in recreation use, non-motorized flat-water boating is expected to increase the greatest between 2010 and 2050 with an estimated increase of 56 percent. This is followed by hiking/walking at 50 percent, and developed camping and swimming, both at 45 percent. The remaining activities all have an estimated increase of less than 24 percent. While the estimated increase in non-motorized and hiking/walking appears to be high, camping is predicted to be the predominant recreation activity in the Project Area.

The increases in recreationists and their activities outlined above have the potential to disturb nesting bald eagles. The degree to which bald eagles may be disturbed is dependent on both the type, increase in and location of activities relative to active nests. Activities such as camping and swimming are least likely to disturb nesting bald eagles because they are generally restricted to specific areas and result in a minimal increase in noise. Activities that involve the use of motorized transportation (boating, OHVs) are most likely to disturb nesting bald eagles. Use of motorized boats results in increased noise and allows access to nearly all of a water body. While OHV use is restricted to land it may allow recreationists to access areas near nesting trees. Other activities such as hiking/walking and non-motorized flat-water boating are relatively non-invasive with respect to an increase in noise, but they do allow for an increase in human presence in and around Project reservoirs where bald eagles may nest.

Historical and continued presences of bald eagles within the Project Area suggest that they have become tolerant of the incremental increases in recreationists and their activities during the course of the original Project license. Therefore, the expected incremental increases of recreationists (1.8 percent annually) and their activities will continue be tolerated over the course of the proposed license. Furthermore, PG&E's Proposed Project is generally consistent with current National Bald Eagle Management Guidelines or NBEMG (USFWS 2007). The guidelines describe measures to mitigate against disturbances to nesting bald eagles with specific emphasis on construction activities, timber operations and forestry practices, OHV use, motorized water craft use, non-motorized recreation and human entry, helicopters and fixed-winged aircraft and blasting and other loud intermittent noises. With respect to the activities outlined in the NBEMG, PG&E's Proposed Project does not include any construction activities, timber harvest or blasting and other loud intermittent noises. As described above OHV use and human entry (hiking) in the vicinity of the Lake Spaulding nest is unlikely to occur due to an absence of roads and trails. While PG&E does utilize helicopters to perform some O&M activities, PG&E expects that helicopter use in the vicinity of the Lake Spaulding nest will be infrequent and limited to fly-over's (i.e., no facilities exist adjacent to the nest, thus there is no need for PG&E staff to fly to the nest). Use of boats for O&M activities by PG&E in the vicinity of the Lake Spaulding nest is unlikely due to the absence of Project facilities at the nest site. With respect to recreational motorized boating the NBEMG suggests implementing a 330 ft buffer around the nest that does not allow: 1) use of jet skis (personal watercraft), and 2) concentrations of noisy vessels, except where eagles have demonstrated tolerance for such activity. According to Technical Memorandum 8-2a Recreation Use and Visitor Surveys (PG&E

2010b) jet skis make up only 5 percent of the motorized boat use at Lake Spaulding and that most recreational boat use involves fishing, which does not lend itself to a concentration of noisy vessels.

PG&E believes that the Proposed Project and the associated increase in recreation use would have a minor effect on bald eagles.

6.4.2.2.7 Effects on Golden Eagle

Historic information indicated golden eagle occurrences have been reported within the Project area, specifically at Fuller Lake, Chalk Bluff Canal, Deer Creek Forebay and Deer Creek Powerhouse Penstock (USFS 2009). None of these reported occurrences included nesting, or activities associated with nesting, which suggests that golden eagle are occasional visitors (i.e., foragers) to the Project Area. Because golden eagle is not known to nest within the Project Area, the Proposed Project would not have an adverse effect on nesting. However, occasional visiting golden eagles may be disturbed by recreation activities, vegetation clearing during maintenance of fire breaks along roadsides, canals, transmission lines, and recreation facilities, and/or routine, intermittent facilities maintenance. These activities may lead to flushing of perched birds. However, given the infrequency of golden eagle visits to the Project Area, the concentrated nature of potential disturbances (limited to the FERC Project Boundary), and the intermittent duration of activities (e.g., vegetation clearing and facilities maintenance), the Project would have a minor effect.

6.4.2.2.8 Effects on California Spotted Owl and Northern Goshawk

California spotted owl and northern goshawk have historically nested within 0.25 mi of the Project Area. Both of these species are know to be sensitive to disturbances while nesting. Disturbances while nesting may result in nest abandonment, which could further lead to nest failure. Project activities in the vicinity of the PACs and their associated nests that may disturb nesting birds include: vegetation management (e.g., removal of hazard trees, noxious weed control, defensible space maintenance and clearing of transmission line ROWs), recreation activities (e.g., OHV use and camping and hiking), and facility maintenance (e.g., inspections, road grading, annual repairs and emergency repairs). In general, most of the activities identified above are ongoing, routine and limited in duration and area, and it is probable that both species have become acclimated to these activities. However, removal of hazard trees, emergency repairs and some recreation activities are neither ongoing nor routine and may occur in PACs. These activities are most likely to affect breeding activities if they occur during the breeding period. The California spotted owl breeding period begins with courtship as early as February, followed by egg laying in early April and concludes in August/September with fledging. The northern goshawk breeding period begins with courtship as early as February, followed by egg laying in April and concludes in July/August with fledging.

PG&E's Proposed Project includes two measures that would assure that disturbances to nesting California spotted owl and northern goshawk are mitigated. Implementation of these measures would assure that the Proposed Project's effects on California spotted owl and northern goshawk would be minor. Each measure is discussed below as they pertain to California spotted owl and northern goshawk.

Under the first measure, Annual Consultation with Forest Service and BLM (DS-GEN1, Appendix E7), PG&E will consult with the Forest Service, BLM and BOR annually. With respect to California spotted owl and northern goshawk, the discussion will include the location of PACs and their associated nests relative to foreseeable changes and non-routine/non-emergency maintenance that may have an effect on nesting success of these two species. The discussion will also include potential mitigation measures (e.g., LOP's) to ensure that foreseeable changes and non-routine/non-emergency maintenance that overlap with PACs do not have an adverse effect on nesting California spotted owl and northern goshawk.

Under the second measure, Employee Training (DS-GEN 2, Appendix E7), PG&E's staff and contractors will become familiar with the location of sensitive areas (PACs) and the mitigations measures (e.g., LOPs) developed to protect them.

6.4.2.2.9 Effects on Barrow's Goldeneye

Historic information indicates that two occurrences of Barrow's goldeneye have been reported at Lake Spaulding. Barrow's goldeneye is a long-distance migratory bird, and an uncommon winter resident found along the central California Coast. Breeding typically occurs in Alaska, Canada, and the northwestern United States in mid to late May. Overlap of Barrow's goldeneye with Project O&M activities is highly unlikely due to their infrequent presence in the Project area. PG&E is unaware of any information indicating that Project facilities adversely affect Barrow's goldeneye.

6.4.2.2.10 Effects on Forest Carnivores

Historically, forest carnivores in the Project Area have included American marten, Pacific fisher and Sierra Nevada red fox. However, studies by Zielinski et al (1995, as cited by NatureServe 2010) indicated that Pacific fisher in California are limited to areas in the southern Sierra Nevada and southern Cascade Range. In general suitable habitat for the American marten and Pacific fisher species include mixed conifer, red fir, lodgepole pine, subalpine conifer and some riparian habitats. Both American marten and Pacific fisher are largely nocturnal, utilize cavities in trees, snags, downed logs, rock crevices, slash, brush or rock piles for dens or shelter. They are sensitive to human disturbances, and will avoid areas with high human presence (CDFG 2009e). Sierra Nevada red fox prefers forested habitat interspersed with meadow or alpine fell-fields for hunting. Like the American marten and Pacific fisher, Sierra Nevada red fox den sites include rock outcrops, hollow logs and stumps, and burrows in deep loose soil (CDFG 2009e).

Project related activities that have the potential to affect these three species include O&M activities resulting in ground disturbing activities, such as hazard tree removal or brush pile removal during maintenance of fire breaks along roadsides, canals, transmission lines, and recreation facilities. Recreation activities restricted to campgrounds and reservoirs (swimming and boating) are unlikely to have an effect on any of the three species because activities are restricted in area and period of use and are likely avoided by forest carnivores. However, dispersed recreation activities such as camping/hiking and OHV use may overlap with suitable habitat, and may result in disturbances to breeding activities.

PG&E's Proposed Project includes two measures will mitigate these potential disturbances to forest carnivores. Under the first measure, Annual Consultation with Forest Service, BLM and BOR (DS-GEN1, Appendix E7), PG&E will consult with the Forest Service, BLM and BOR annually and with respect to forest carnivores, the discussion will include the suitable habitat relative to foreseeable changes and non-routine/non-emergency maintenance that may have an effect on reproductive success of these species. The discussion will also include potential mitigation measures (e.g., LOP's) to ensure that foreseeable changes and non-routine/non-emergency maintenance that overlap with known forest carnivore denning sites do not have an adverse effect on forest carnivores. The second measure, Annual Employee Training (DS-GEN2, Appendix E7), will facilitate PG&E's staff and contractors becoming familiar with the location of sensitive areas and mitigation measures developed to protect them.

6.4.2.2.11 Effects on Bats

Eight Drum-Spaulding Project facilities were found to have signs of bat use. During Licensee's 2007 and 2009 inspections, Licensee found no evidence of day roosts. All eight facilities had guano and/or staining present but no bats present. These facilities are utilized by bats at night for shelter and protection from predators between foraging bouts along nearby water features. Normal Project operation and maintenance activities at these facilities, which occur during day light hours, would not affect night roosting bats. PG&E is unaware of any information indicating that Project facilities adversely affect bats. Because PG&E proposes no changes to the Project that would reasonably affect bats, the Proposed Project would have a minor effect on bats.

6.4.2.2.12 Effects on Coast Horned Lizard

Historically, coast horned lizard has been documented along the Bear River Canal. This species occupies a variety of habitats found in the Project Area, including coniferous forest, woodlands and chaparral. Coast horned lizard is attracted to open areas and patches of loose soils, specifically along sandy washes, and dirt roads because they provide basking, foraging and burrowing habitat. Road maintenance activities, such as grading, have the potential to affect this species. However, PG&E is unaware of any information indicating that the Project adversely affects coast horned lizard. Because PG&E proposes no changes to the Project that would reasonably affect coast horned lizard, the Proposed Project would have a minor effect on coast horned lizard.

6.4.2.2.13 Effects on Management Indicator Species

MIS are considered common and widespread throughout the Project Area, occupying a variety of habitats ranging from subalpine to Blue Oak-Foothill Pine.

Project activities that have the potential to affect MIS include: vegetation management (e.g., removal of hazard trees, noxious weed control, defensible space maintenance, clearing of transmission line right of ways), recreation activities (e.g., OHV use, camping and hiking), and facility maintenance (e.g., inspections, road grading, annual repairs and emergency repairs).

Given the abundance and widespread occupancy of the Project Area, there is no scientific evidence to suggest that the Project adversely affects MIS.

6.4.3 Proposed Measures

6.4.3.1 Yuba-Bear Hydroelectric Project

6.4.3.1.1 NID's Proposed Measures

NID has included in its proposed Project the following 11 measures related to terrestrial resources:

- Proposed Measure YB-GEN1: Annual Consultation
- Proposed Measure YB-GEN2: Employee Training
- Proposed Measure YB-GEN3: Annual Review of Special-Status Species Lists and Assessment of New Species
- Proposed Measure YB-GEN4: Consultation Regarding New Ground Disturbing Activities
- Proposed Measure YB-GEN5: Consultation Regarding New Facilities
- Proposed Measure YB-TR1: Implement Vegetation Management Plan
- Proposed Measure YB-TR2: Implement Invasive Species Management Plan
- Proposed Measure YB-TR2: Pesticide and Herbicide Use Restrictions
- Proposed Measure YB-TR4: Canal Wildlife Escape Facilities
- Proposed Measure YB-TR5: Monitor Animal Losses in Project Canals
- Proposed Measure YB-TR6: Bat Management

Refer to Appendix E3 for the full text of each measure. Management plans are included in Appendix E4.

6.4.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Develop Avian Protection Plan

The Forest Service, BLM, NPS and CDFG recommended in their joint letter recommended measures for avian protection:

> Include copies of the project Avian Protection Plans. (p. 2)
>
> The Avian Protection Plans need to address retrofitting transmission lines to meet the design and sighting standards established by APLIC for minimization of bird electrocutions and collisions. (p. 9)

The Project does not have an existing avian protection plan, nor has the need for one ever been identified.

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure. Further, the agencies have provided no evidence, nor is NID aware of any evidence, to suggest that the Bowman-Spaulding Transmission Line has caused any bird collisions or electrocutions. In its 2007 Pre-Application Document, NID stated it was unaware of any bird collisions or electrocutions related to the line, and no party disputed the statement of requested any study concerning avian collision or electrocution. Since the agencies have not provided any evidence to suggest that an Avian Protection Plan is needed, NID has not provided one in its proposed Project.

Survey Periodically for California Spotted Owl, Northern Goshawk and Willow Flycatcher

The Forest Service, BLM, NPS and CDFG recommended in their joint letter recommended the need that license conditions need to consider periodic surveys.

> The study uses habitat mapping at a course scale, to identify where special-status species may be present, and where project activities may have an effect. Portions of the projects have been surveyed by FS or other partners following standard protocols for some of these species – California spotted owl, northern goshawk – to determine nesting and territorial status, which will help to inform license conditions. However, not all habitats have been surveyed, and the lack of sighting information does not indicate the lack of species presence. The agencies did not request species-specific surveys for the majority of special-status species that may be affected by these projects. Because these areas are dynamic over time, survey protocols often require periodic updating, and license conditions will need to consider the need for periodic surveys in the future. (p. 8)
>
> The study uses habitat mapping at a course scale, to identify where special-status species may be present, and where project activities may have an effect. Some limited surveys have been conducted in the past by FS for willow flycatcher to determine nesting and territorial status, which will help to inform license conditions. However, not all habitats have been surveyed for all species and the lack of sighting information does not indicate the lack of species presence. Any license conditions would need to consider the need for periodic surveys in the future. (p. 9)

The agencies have provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

NID has not adopted the measure, even in its general form, for two main reasons. First, the agencies have provided no evidence to suggest that Licensees periodic performance of general surveys for the three bird species would provide any protection for birds and their habitats.

Second, the agencies have not described why Licensee's proposed measures would not provide adequate protection. Specifically, Licensee believes that its proposed measures do consider the need for species-specific surveys when the survey relates to a specific Project activity, changes in a species status or habitat, groundbreaking activities and new facilities. These measures include: 1) YB-GEN1, Annual Consultation with Forest Service and BLM; 2) YB-GEN3 Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land; 3) YB-GEN4, Consultation Regarding New Ground Disturbing Activities on Federal Land; and 4) YB-GEN5, Consultation Regarding New Facilities on Federal Land. The proposed Project measures allow NID and resource agencies to focus the need for surveys where activities would have an effect on California spotted owl, northern goshawk and willow flycatcher rather than monitoring for the sake of monitoring.

Monitor Riparian Vegetation, Wildlife Escapement Facilities Effectiveness, Wildlife Passage Structures Effectiveness, Invasive Species – Terrestrial and Aquatic, Special-Status Plants and Special-Status Wildlife

The Forest Service, BLM, NPS and CDFG recommended in their joint letter six monitoring plans:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion.
>
> - Riparian
> - Wildlife Escape Facilities Effectiveness
> - Wildlife Passage Structures Effectiveness
> - Invasive Species – Terrestrial and Aquatic
> - Special-Status Plants
> - Special-Status Wildlife
>
> (pp. 51 & 52)

The agencies have provided insufficient detail for NID to perform an in depth analysis of any of the recommended monitoring plans, or for NID to estimate the cost associated with implementing any of them.

NID has not included in its proposed Project the agencies' recommended riparian monitoring plan because the agencies have not described how inclusion of their recommended measure would provide greater protection to the resource; the agencies have not identified the need for monitoring, which by itself does not provide resource protection.

NID has not included in its proposed Project the agencies' recommended general invasive species monitoring plan because NID's Invasive Species Management Plan provides guidelines for the monitoring of invasive species' occurrences. An additional plan for monitoring is unnecessary, and the agencies' have provided no evidence to suggest that NID's proposed detail plan is lacking or will not provide adequate protection for the resource.

NID has not included in its proposed Project the agencies' recommended general special-status plant monitoring plan for two reasons. First, NID's proposed Project includes three measures that address potential effects to special-status plants: 1) YB-GEN1: Annual Consultation; 2) YB-GEN2: Employee Training; and 3) YB-GEN3: Annual Review of Special-Status Species Lists and Assessment of New Species. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures, would provide greater protection to the resource. Second, Licensees' Special-Status Plants and CESA-listed Plants Studies did not identify any ongoing effects to special-status plants that are not addressed by NID's proposed measures. Additionally, the agencies have not identified the need for monitoring, which by itself does not provide resource protection.

NID has not included in its proposed Project the agencies' recommended Wildlife Escapement Facilities Effectiveness monitoring plan for two reasons. First, NID's proposed Project includes two specific measures that address the effectiveness of wildlife escapement facilities. These measures include: 1) YB-TR4, Consult When Replacing Canal Wildlife Escape Facilities; and 2) YB-TR5, Monitor Animal Losses in Project Canals. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures, would provide greater protection to the resource. Second, the agencies have not identified a need to monitor the effectiveness of escapement facilities within Project canals. Licensees' Wildlife Movement Study indicated that wildlife mortality associated with Yuba-Bear Hydroelectric Project canals is almost nonexistent. This suggests that existing facilities are adequate (either few wildlife enter the canals, or those that due use the existing escape facilities effectively). However, if an increase in animal losses in canals occurs, implementation of NID's proposed measures, specifically YB-TR5, will: 1) allow for the identification of facilities that have become deficient in their ability to allow escape; and 2) provides an avenue for development and implementation of mitigation measures necessary to address escapement deficiencies associated with Project canals through consultation with the agencies.

Licensee has not included in its proposed Project the agencies recommended Wildlife Passage Structure Effectiveness monitoring plan for two reasons. First, NID's proposed Project includes two specific measures that address the effectiveness of wildlife passage structures. These measures include: 1) YB-TR4, Consult When Replacing Canal Wildlife Escape Facilities; and 2) YB-TR5, Monitor Animal Losses in Project Canals. The agencies have not described how inclusion of their recommended measure, in comparison to or in combination with NID's proposed measures, would provide greater protection to the resource. Second, the agencies have not identified a need to monitor the effectiveness of passage structures within Project canals. Licensees' Wildlife Movement Study indicated that wildlife mortality associated with Project canals is almost nonexistent. This suggests that existing facilities are functioning properly. However, if an increase in animal losses in canals occurs, implementation of Licensee's proposed measures, specifically YB-TR5, will: 1) allow for the identification of facilities that have become deficient in their ability to allow; and 2) provides an avenue for development and implementation of mitigation measures necessary to address passage deficiencies associated with Project canals through consultation with the agencies.

Licensee has not included in its proposed Project the agencies' recommended Special-Status Wildlife monitoring plan for two reasons. First, NID's proposed Project includes four general measures that do consider species monitoring as it relates to Project activities, changes in a species status or habitat, groundbreaking activities and new facilities. These measures include: 1) YB-GEN1, Annual Consultation with Forest Service and BLM; 2) YB-GEN3 Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land; 3) YB-GEN4, Consultation Regarding New Ground Disturbing Activities on Federal Land; and 4) YB-GEN5, Consultation Regarding New Facilities on Federal Land. The agencies have not described how inclusion of their recommended measure, in comparison to, or in combination with NID's proposed measures would provide greater protection to the resource. Second, the agencies have not identified the need for monitoring of special-status wildlife (What reason is there to believe that monitoring is needed?). Without such evidence, monitoring would provide no environmental protection – but would be monitoring for monitoring's sake.

Monitor Animal Losses in Project Canals

The Forest Service, BLM, NPS and CDFG recommended in their joint letter inclusion of standard methods, reporting requirements and suggested discussion for the development of a trigger for additional measures to address suspected Project-related causes of wildlife mortalities.

> Section E3.5.5, Proposed measure YB-TR5: A standard methodology for gathering data, similar to that identified in the Wildlife Movement Study (i.e., include age, sex) should be used. In addition, because many species are wide ranging, and canals traverse multiple ownerships, reporting should be broad-based, with all mortality reported to all agencies, rather than limited to the agencies with jurisdiction over the land in which the canal is located.
>
> Because of the general lack of long-term mortality data, we are interested in further discussions regarding how to determine "increasing trend in wildlife mortalities" as a trigger point for additional measures to address suspected Project-related causes. (p. 54)

This recommendation has been adopted and incorporated into Proposed Measure YB-TR5. NID has also included metrics in Proposed Measure YB-TR5 that would trigger the need for additional measures to address suspected Project-related causes.

Bat Management

The Forest Service, BLM, NPS and CDFG recommended in their joint letter performing assessments prior to installation of bat exclusion devices.

> Section E.3.5.6, Proposed Measure YB-TR6: Proper assessments need to be conducted prior to any implementation of bat exclusion devices, so that bats are not trapped inside structures. For example, if structures are placed between November 1 and February 28, proper assessments need to be conducted to be sure that hibernating bats are not using the structures. (p.54)

This recommendation has been adopted and incorporated into NID's Proposed Measure YB-TR6.

Develop Flows to Enhance Riparian Recruitment in Chicago Park Powerhouse Reach

FWN recommended the following measure:

> NID's FLA should include flows to enhance riparian recruitment to this reach. The streambed in this reach looks like a rocky channel devoid of plants, trees, and large boulders, woody debris. Flows should be developed in coordination with a Vegetation Management Plan for this reach. (p. 59)

FWN has provided insufficient detail for NID to perform an in depth analysis of the recommended measure, or for NID to estimate the cost associated with implementing the measure.

NID has not adopted FWN's recommended measure for three reasons. First, FWN has provided no information to support that a change in flows would enhance riparian vegetation. Second, historic mining debris yields non-cohesive sediment in the reach, resulting in a lack of vegetation. This condition was not a result of the Project but caused by past mining practices. Third, FWN has provided no information to support that a vegetation management in this area would provide any environmental protection and the cost of such a measure is not warranted given that the Project did not create the condition and a short section of stream (1.3 miles) affected.

6.4.3.2 Drum-Spaulding Project

6.4.3.2.1 PG&E's Proposed Measures

PG&E has included in its Proposed Project the following six measures related to terrestrial resources:

- Proposed Measure GEN1: Annual Consultation with Forest Service, BLM and BOR
- Proposed Measure GEN2: Annual Employee Training
- Proposed Measure DS-TR1: Develop and Implement Integrated Vegetation Management Plan
- Proposed Measure DS-TR2: Monitor Animal Losses in Project Canals
- Proposed Measure DS-TR3: Bear River Canal Deer Assessment
- Proposed Measure DS-TR4: Channel Morphology and Riparian Vegetation Assessment in Bear Valley

Refer to Appendix E7 of this FLA for the full text of each measure and accompanying rationale statement.

6.4.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no requests for PM&E measures or study requests that provided the level of information that is required by the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). While PG&E identified certain requests for actions, PG&E was unable to thoroughly assess the scope, purpose and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposal as required by the regulations and FERC PM&E Guidance. However, some commenters made requests that provided PG&E with enough information that PG&E could address at least components of the request. Below PG&E has made its best effort to capture each of these proposals and PG&E's response to each proposal, including whether the proposal was consistent with study results that relate to this resource area.

Include Integrated Vegetation Management Plan

In their January 28, 2011 joint letter (providing comments to the DLA), the Forest Service, BLM, NPS and CDFG recommended that PG&E develop an integrated vegetation management plan:

Section E7-5.1: Any integrated vegetation management plan needs to be developed in consultation with the resource agencies. The resource agencies are interested in moving forward with the licensee in developing a plan, and we offer that the plan submitted by Nevada Irrigation District (and the comments to that plan) as a basis for these discussions. The following are some comments to provide an overview of content we would like in such a plan:

Invasive Species: The plan should address both aquatic and terrestrial invasive weeds within the project boundary and adjacent to project features, including roads and distribution and transmission lines that directly affect public lands. This plan must include the following elements:

- Inventory and mapping of new populations that is updated periodically and shared with resources agencies in a compatible database and GIS software format.
- Actions and strategies to prevent and control the spread of known populations or introductions of new populations (e.g. washing equipment).
- An implementation schedule for controlling weeds designated by resource agencies.
- Revegetation of treated sites.
- Ongoing annual monitoring of known populations that are tied to project actions or effects and reporting results to resource agencies.
- Adaptive management actions in preventing and monitoring aquatic invasives that may include:
  - Public education and signing.
  - An Aquatic Plant Management Plan developed and approved by the FS, BLM, and CDFG.
  - Boat inspections and washing stations.

Vegetation Management: The Vegetation Management section needs to include the following:

- Treatment of hazard trees (removal and trimming).
- Powerline/transmission line clearing.
- Revegetation of disturbed sites.
- Soil protection and erosion control.
- Use of weed-free seed.
- Fuels management (including stand improvement and view enhancement) in and around recreation sites. (pp. 120-121).

PG&E has proposed measure DS-TR1 - Develop and Implement Integrated Vegetation Management Plan – which states that within one year of license issuance, Licensee will develop an Integrated Vegetation Management Plan. PG&E intends that the plan will address numerous resource agency suggestions, including provisions for revegetation, management of invasive terrestrial and aquatic weeds, and general vegetation management.

PG&E also intends that its proposed plan will include a provision to monitor CDFA A- and B-listed weeds and occurrences that are being actively managed.

Licensee does not intend to include in its proposed plan a fuels management section. PG&E's existing Project has not had a significant effect on fire occurrence (see Section 6-7, Table 6.7.1-28 of this Exhibit E). PG&E does not propose significant changes to the facilities or how they are maintained and operated. As a result, the Proposed Project would not increase the risk of Project-related fires. Additionally, PG&E complies with all Forest Service and BLM rules and California public laws that are applicable to Project operations pertaining to fire, so a fuels management section would be redundant.

Include Avian Protection Plan

The Forest Service, BLM, NPS and CDFG recommended in their joint letter proposals related to avian protection:

> Include copies of the project Avian Protection Plans. (p. 2).
>
> The Avian Protection Plans need to address retrofitting transmission lines to meet the design and sighting standards established by APLIC for minimization of bird electrocutions and collisions. (p. 9).

PG&E has not included an Avian Protection Plan in its Proposed Project for two reasons. First, PG&E has no reported raptor collisions or electrocutions at Drum-Spaulding Project switchyards and transmission lines. Second, PG&E has developed an internal Utility Standard S2321 entitled "Avian Protection Plan" (APP) and Work Procedure WP2321-01 entitled "Avian Protection Plan Implementation," both of which are designed to protect migratory birds and raptors from collisions and/or electrocution resulting from contact with transmission and distribution lines within PG&E's service territory, including the Drum-Spaulding Project. These operating standards and work procedures were developed as a result of a Settlement Agreement dated April 25, 2002, between PG&E and the U.S. Fish and Wildlife Service for the protection of migratory birds and raptors. The Settlement Agreement expired in June 2007 coinciding with the effective date of PG&E's Utility Standard and Work Procedure. In addition, the resource agencies have not provided adequate specificity (including scope, timing, standards and cost) for PG&E to fully evaluate this request for FERC.

Survey Periodically for California Spotted Owl, Northern Goshawk and Willow Flycatcher

In their joint letter the Forest Service, BLM, NPS and CDFG also recommended:

> The study uses habitat mapping at a course scale, to identify where special-status species may be present, and where project activities may have an effect. Portions of the projects have been surveyed by FS or other partners following standard protocols for some of these species – California spotted owl, northern goshawk – to determine nesting and territorial status, which will help to inform license conditions. However, not all habitats

> have been surveyed, and the lack of sighting information does not indicate the lack of species presence. The agencies did not request species-specific surveys for the majority of special-status species that may be affected by these projects. Because these areas are dynamic over time, survey protocols often require periodic updating, and license conditions will need to consider the need for periodic surveys in the future. (p. 8).
>
> The study uses habitat mapping at a course scale, to identify where special-status species may be present, and where project activities may have an effect. Some limited surveys have been conducted in the past by FS for willow flycatcher to determine nesting and territorial status, which will help to inform license conditions. However, not all habitats have been surveyed for all species and the lack of sighting information does not indicate the lack of species presence. Any license conditions would need to consider the need for periodic surveys in the future. (p. 9).

While Licensee has not included in its Proposed Project a measure that is specific to, and solely responsible for periodic monitoring of California spotted owl, northern goshawk or willow flycatcher, Licensee believes that Proposed Project measure DS-GEN1, Annual Consultation with Forest Service, BLM and BOR does consider the need for species specific monitoring as it relates to ongoing and planned Project activities. Proposed Project measure DS-GEN1 allows the Licensee and resource agencies to focus the need for surveys where Project activities would otherwise have an effect on California spotted owl, northern goshawk and willow flycatcher.

Licensee also believes that the Proposed Project measure DS-GEN2, Annual Employee Training will provide employees with information to better recognize California spotted owl, northern goshawk and willow flycatcher. This is beneficial because it provides procedures for reporting to Licensee’s management if staff observe any Project activity directly affecting these species.

Furthermore, the agencies have provided insufficient detail for Licensee to perform an in-depth analysis of the recommended proposal, or for Licensee to estimate the cost associated with implementing the measure. Also, the agencies have not indicated how their proposed measure would protect California spotted owl, northern goshawk and willow flycatcher more than PG&E’s Proposed Project Measures.

Additional Wetland Studies at Lower Rock Lake Dam Reach 2.8 – Loney Meadows and Bear River Reach # 2 - Bear Valley Meadow

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that two of the seven wetland sites, which were studied and were determined to be Functional - At Risk, be viewed as priority sites for further investigation:

> Two of the seven wetland sites studied were determined to be Functional—At Risk. These sites represent priority sites for further investigation regarding the extent to which project activities contribute towards degrading meadow function and for monitoring trend. (p. 32)

Licensee is unclear as to what type of further investigation the resource agencies are requesting. Both meadows are recovering from historical cattle grazing, a condition not caused by the Project. The frequency and duration of grazing has been reduced in Loney Meadows (Marylin Teirny Tahoe Forest Service) and grazing stopped in Bear Valley Meadow in the early 1990s.

Recent historic regulated flows through Bear Valley are not believed to have been a factor in contributing toward a degraded meadow function (i.e., compared to higher magnitude flows released in the 1990s). At current flows, study results suggest the meadow is recovering as seen in vigorous riparian growth, a narrowing of the active channel due to sedge and willow growth, re-vegetation of many banks, and inset floodplains that interact with the active channel. Licensee believes the inability to dissipate energy during overland flow events observed at Loney Meadows pertains mostly to the small branches of the river that flow away from the main channel and not to the main Texas Creek channel, and therefore, are not related to the Project.

The agencies have provided insufficient detail for Licensee to perform an in-depth analysis of the recommended proposal, or for Licensee to estimate the associated implementation costs. The agencies have also not explained how their requested investigation would provide greater protection than Licensee's various measures (including DS-GEN1, DS-GEN2 and DS-TR4).

Include Monitoring

In their joint letter the resource agencies stated that they would like to further discuss monitoring and provided a list of potential items to assist in that dialogue:

> The proposed measures do not appear to include monitoring plans. The resource agencies believe that conducting monitoring of new license conditions, reviewing data to determine if license conditions are resulting in desired conditions, and consulting to discuss results and determine if adjustments are necessary are an essential part of the proposed measures. The resource agencies would like to further discuss monitoring and provide the following list of potential items that may need to be monitored to assist in that discussion.
>
> - Riparian
> - Wildlife Mortality and Escape Features Effectiveness
> - Wildlife Passage Structure Effectiveness
> - Invasive Species – Terrestrial and Aquatic
> - Special-Status Plants
> - Special-Status Wildlife [These bullets are a sub-set of the list, related to Terrestrial Resources] (p. 119).

The agencies have provided insufficient detail for Licensee to perform an in-depth analysis of any of the recommended monitoring, or for Licensee to estimate the cost associated with implementing any such monitoring, as discussed below.

Riparian

Licensee has not included in its Proposed Project the agencies' recommended riparian monitoring plan. The agencies have not identified the need for monitoring, which by itself does not provide resource protection.

Licensee does not release flows into Bear Valley at the level of flows believed to have been a factor in bank failures and incision (i.e., high magnitude flows in the 1990's). Additionally, a contributor to stream morphologic changes was cattle grazing, which has been discontinued. As noted above, the channel within the meadow is undergoing recovery as seen in vigorous riparian growth, a narrowing of the active channel due to sedge and willow growth, re-vegetation of many banks, and inset floodplains that interact with the active channel.

The proposed measure DS-TR4, Channel Morphology and Riparian Vegetation Assessment in Bear Valley provides for observational assessment to determine if certain released flows cause or exasperate channel incision, bank failures, or other signs of channel instability in Bear Valley. Licensee's implementation of DS-TR4 will determine if sustained released flows greater than 350 cfs affect these conditions. If it is determined that Project operations affect these conditions, the assessment will provide information to inform the development of protection and mitigation measures.

Wildlife Mortality and Escapement Facilities Effectiveness

Licensee has not included in its Proposed Project a Wildlife Escapement Facilities Effectiveness monitoring plan for three reasons. First, Licensee's Proposed Project includes two specific measures that address the effectiveness of wildlife escapement facilities. These measures include: 1) DS-TR2, Monitor Animal Losses in Project Canals; and 2) DS-TR3, Bear River Canal Deer Assessment. Licensee recognized that the Bear River Canal has historically posed a problem to wildlife movement and as a result proposed measure DS-TR3, which will provide information regarding the effectiveness of escape facilities in the Bear River Canal. With respect to all other Project canals, the agencies have not described how inclusion of their recommendation, in comparison to or in combination with Licensee's proposed measures, would provide greater protection to the resource.

Second, the resource agencies did not provide enough information in their proposal so that the Licensee could evaluate the scope of the request or the cost of implementation.

Third, the resource agencies have not identified a need to monitor the effectiveness of escapement facilities within Project canals. Licensees' Technical Memorandum 4-2, Special-Status Wildlife Movement, indicated that with the exception of Bear River Canal, wildlife mortality associated with Project canals is low. This suggests that existing facilities are functioning properly. However, if an increase in animal losses in canals occurs, implementation of Licensee's proposed measures, specifically DS-TR2 and DS-GEN1 (Annual Consultation with Forest Service, BLM and BOR), will allow for the identification of facilities that may have become deficient, and provides an avenue for development and implementation of mitigation measures necessary to address escapement deficiencies associated with Project facilities through consultation with the agencies.

Wildlife Passage Structure Effectiveness

Licensee has not included in its Proposed Project a Wildlife Passage Structure Effectiveness monitoring plan. As discussed above, Licensee's Proposed Project includes two specific measures that address the effectiveness of wildlife passage structures. These measures include: 1) DS-TR2, Monitor Animal Losses in Project Canals; and 2) DS-TR3, Bear River Canal Deer Assessment. Licensee recognized that the Bear River Canal has historically posed a problem to wildlife movement and as a result proposed measure DS-TR3 that is intended to evaluate the effectiveness of escape facilities in the Bear River Canal.

Invasive Species – Terrestrial and Aquatic

Licensee has not included in its Proposed Project a general invasive species monitoring plan because the proposed measure to Develop and Implement an Integrated Vegetation Management Plan, will provide guidelines for the monitoring of invasive species' occurrences - both terrestrial and aquatic. It is unclear how the resource agencies' suggestion would provide additional benefit to the resource beyond what PG&E has proposed.

Special-Status Plants

Licensee has not included in its Proposed Project a general special-status plant monitoring plan. Licensees' Special-Status Plants and CESA-listed Plants studies did not identify any ongoing effects to special-status plants that are not addressed by Licensee's proposed measures. Additionally, the agencies have not identified the need for monitoring, which by itself does not provide environmental protection. In addition, Licensee's Proposed Project includes two measures that address potential effects to special-status plants: 1) GEN1: Annual Consultation with Forest Service, BLM and BOR; and 2) GEN2: Annual Employee Training. The agencies have not described how inclusion of their recommendation, in comparison to or in combination with Licensee's proposed measures, would provide greater protection to the resource.

Special-Status Wildlife

Licensee has not included in its Proposed Project a Special-Status Wildlife monitoring plan. The resource agencies have not identified the need for monitoring special-status wildlife and have not provided enough information in their proposal so that the Licensee could evaluate the details of implementation, including cost. Nevertheless, Licensee's proposed measure DS-GEN1, Annual Consultation with Forest Service and BLM, will provide an opportunity for annual consultation to discuss special-status species monitoring as it relates to ongoing and planned Project activities. The agencies have not described how adoption their proposal, either by itself, or in combination with Licensee's proposed measures would provide greater protection to the resource.

Monitor Animal Losses in Project Canals

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that License develop a monitoring plan in consultation with the resource agencies to monitor animal losses in Project canals:

> Section E7-5.2: A monitoring plan needs to be developed in consultation with the resource agencies that includes:

- Standardized methodology for data collection (e.g. Wildlife Mortality Data Sheet in Wildlife Movement Study, Appendix 4-2A).
- Mapping in GIS format and shapefiles that are agreed to by the resource agencies so they can be used for additional analysis.
- Annual reporting of all data to resource agencies (FS, BLM, and CDFG at a minimum). (p. 121).

> Monitoring the effectiveness of crossings and escape features that are identified in the Wildlife Movement Technical Memo is needed. (p. 121)

The resources agency proposal does not provide sufficient information in order to develop a monitoring plan or cost estimate. Licensees' Technical Memorandum 4-2, Special-Status Wildlife Movement, identified 746 passage opportunities and 278 escape features within the Drum-Spaulding Project. With over 1,000 passage and escape features, monitoring would be very labor and equipment intensive and prohibitively expensive.

While Licensee has not fully adopted this recommendation with respect to development of a plan, Licensee has included measure DS-TR2, which specifically addresses the monitoring of animal losses in Project canals (including collection of wildlife mortality data and annual reporting of such data to the resource agencies for discussion during annual consultation).

Licensee does not expect to develop any GIS maps as a result of measure DS-TR2, but does expect to provide the resource agencies with the location of wildlife mortalities in Universal Trans Mercator (UTM) NAD 83 format, which is acceptable for use with all GIS mapping programs. In addition to the location data, Licensee will provide the shapefiles developed for Licensees' Technical Memorandum 4-2, Special-Status Wildlife Movement. The shapefiles from the technical memorandum and mortality location information collected under proposed measure DS-TR2 can be integrated into the resource agencies GIS database for resource agency use.

Licensee believes that proposed measure DS-TR2 will provide data that allows for the identification of effective and ineffective crossing and escape features. This will allow Licensee and resource agencies to focus efforts on Project Facilities where problems are identified.

Bear River Canal Deer Study

The Forest Service, BLM, NPS and CDFG recommended development of a Bear River Canal Study:

> Deer mortality in the Bear River Canal continues to be a problem. Ongoing problems will continue to go unnoticed without any license conditions that include: monitoring and reporting mortality; maintenance of structures intended to provide escape, exclusion, or passage; or monitoring the effectiveness of escape features. (p. 121).

> A plan that makes these structures safe and permeable to a wide array of wildlife species needs to be in place. (p. 122).
>
> The resource agencies are interested in developing an integrated plan that provides for the safety and permeability of project conduits for wildlife over the course of the license. Furthermore, we encourage the licensee to consider developing an implementation plan for submittal to FERC during the relicensing process. This should minimally include:
>
> - Establishing priorities and an action plan for installing wildlife crossings.
> - Ongoing monitoring of the effectiveness of structures (i.e. crossings, exclosures, escapes).
> - Routine reporting of all monitoring results for all land ownerships to the resource agencies (FS, BLM, and CDFG at a minimum).
> - An adaptive management component that periodically re-evaluates which conduits are considered to provide passage, in context with the latest available scientific information on wildlife interactions with structures and other landscape factors; how frequent crossings should occur; and local plans or studies that identify migration of movement areas. (p. 122).

Licensee agrees with the resource agencies that the Bear River Canal poses a problem for wildlife, and as a result Licensee has included in its Proposed Project measure DS-TR3: Bear River Canal Deer Assessment to address this issue. However, Licensee disagrees with the resource agencies' conclusion that "additional conduits are considered barriers to one or more of the species selected for the study." Licensees' study revealed only one black bear mortality has been reported, and no mountain lion, marten or fisher mortalities have been reported for Drum-Spaulding Conduits. In addition, the resource agencies' proposal does not provide sufficient information regarding the scope or costs of their requested plan.

While Licensee has not fully adopted this recommendation with respect to development of a plan, Licensees' proposed measure DS-TR3 will require Licensee to identify locations along the Bear River Canal where mule deer are most often entering the canal and becoming entrapped. As a result, trends in canal mortality would be indentified and proper actions would be put in place, if needed. The resource agencies have not provided any information as to how their proposal would be more effective than the measure proposed by the Licensee.

Riparian Management Plan for Bear River Valley

FWN, in its February 1, 2011 letter, recommended that PG&E should include a Riparian Management Plan as part of a larger Bear Valley Restoration Plan:

> PG&E's FLA should include a Riparian Management Plan as part of a larger Bear Valley Restoration Plan that restores geomorphic function to the Bear River in Bear Valley. The Riparian Management elements should include assessments and measures related to vegetation for restoration options for returning the Bear River to the meadow surface. (p. 75).

Licensee has not included in its Proposed Project the FWN's recommendation for a riparian management plan. FWN has not explained the need for the plan, has not explained how the proposed plan would provide environmental protection, and has provided insufficient detail for Licensee to perform an in-depth analysis of the scope or cost of the recommendation.

Current released flows into this area are well below the high magnitude flows that were believed to have contributed to bank failures and incision in the 1990's. Additionally, cattle grazing, which contributed to stream morphologic changes, has ceased. Study results suggest the channel within the meadow is undergoing recovery as seen in vigorous riparian growth, a narrowing of the active channel due to sedge and willow growth, re-vegetation of many banks, and inset floodplains that interact with the active channel. As further protection, PG&E has included proposed measure DS-TR4, Channel Morphology and Riparian Vegetation Assessment in Bear Valley. This measure provides for observational assessment to determine if certain released flows (greater than 350 cfs) may cause or exasperate channel incision, bank failures, or other signs of channel instability in Bear Valley. If it is determined that released flows above 350 cfs affect these conditions, the assessment will provide information to inform the development of protection and mitigation measures.

6.4.4 Unavoidable Adverse Impacts

6.4.4.1 Yuba-Bear Hydroelectric Project

The proposed Project would have both short- and long-term minor impacts on terrestrial resources. Vegetation clearing around Project facilities would continue to occur, however the impact would be minor because the area affected and the amount of clearing is very small, and the areas have been subject to clearing for many years. In addition, implementation of NID's Vegetation Management Plan would reduce Project effects.

Continued Project maintenance and recreation use has the potential to contribute to the spread of noxious weeds and invasive plants. However, the weeds are ubiquitous occurring throughout the region, and implementation of NID's Invasive Species Management Plan would reduce Project effects.

Project maintenance activities and recreation have potential to affect special-status wildlife species. However, these affects are considered to be minor. Forest carnivores are rare in the area and avoid human interaction. There is no evidence that special-status raptors are injured due to collision with Project facilities or electrocution at Project switchyards and transmission lines. Bald eagles use some Project reservoirs, but there appears to be little disturbance to their nesting or foraging activities: overall, the Project reservoirs are a benefit to raptors providing valuable foraging habitat. Though an occasional loss of wildlife in Project canals, the numbers are very low and do not constitute a risk to wildlife populations. Licensee's proposal to monitor wildlife loss in canals would assure an additional level of protection.

Construction of NID's proposed new Rollins Powerhouse and recreation facilities would have site-specific, minor effects on terrestrial resources. Construction activities would be short in duration, occur in areas previously disturbed and not at any unique habitat. Adherence to BMPs and LOPs would assure that construction did not affect sensitive species.

6.4.4.2 Drum-Spaulding Project

As described above for the proposed Yuba-Hydroelectric Project, PG&E's proposed Drum-Spaulding Project would have both short- and long-term minor impacts on terrestrial resources. Vegetation clearing around Project facilities would continue to occur, however the impact would be minor because the area affected and the amount of clearing is very small, and the areas have been subject to clearing for many years. In addition, the development and implementation of Licensee's Integrated Vegetation Management Plan would reduce Project effects.

Continued Project maintenance and recreation use has the potential to contribute to the spread of noxious weeds and invasive plants. However, the weeds are ubiquitous, occurring throughout the region, and development and implementation of Licensee's Integrated Vegetation Management Plan will reduce Project effects.

Continued Project operations may have an effect on riparian vegetation and channel stability in the section of the Bear River known as Bear River Reach #2 (Meadow Sub-Reach), which flows through Bear Valley. Study results suggest that released flows over the past ten years support the recovery of riparian habitat toward reaching Proper Functioning Condition. However, sustained releases approaching 400 cfs may cause or exasperate channel incision, bank failures, or other signs of channel instability in Bear Valley. Licensee's implementation of an observational assessment measure will determine if released flows greater than 350 cfs affect these conditions. If it is determined that Project operations affect these conditions, the assessment will provide information to inform the development of protection and mitigation measures.

Project maintenance activities and recreation have potential to affect special-status wildlife species. However, these effects are considered to be minor. Forest carnivores are rare in the area and avoid human interaction. There is no evidence that special-status raptors have been injured due to collision with Project facilities or electrocution at Project switchyards and transmission lines. Bald eagles use some Project reservoirs, but there appears to be little disturbance to their nesting or foraging activities: overall, the Project reservoirs are a benefit to raptors providing valuable foraging habitat. With the exception of Bear River Canal, wildlife loss in Project canals has been very low and does not constitute a risk to wildlife populations. Licensee's proposals to conduct a Bear River Canal Deer Assessment and to generally monitor wildlife loss in canals would provide additional protection to wildlife.

Operating and maintaining the Drum-Spaulding Project consistent with PG&E's proposed measures would not create any significant and unavoidable adverse effects.

6.5 Threatened and Endangered Species[1]

This section discusses species listed as threatened and endangered under the federal Endangered Species Act (ESA), and is broken into five sections. Immediately below is a list and status of the studies Licensees conducted regarding threatened and endangered species. Section 6.5.1 describes Licensees' actions to identify threatened and endangered species and their designated Critical Habitats with a potential to be affected by each of the proposed projects. Section 6.5.2 describes Licensees consultation and coordination with USFWS, NMFS and other Relicensing Participants regarding ESA-listed species. Section 6.5.3 describes the affected environment for the identified species, and Section 6.5.4 discusses the effects of each project. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.5.5.

It is important to note that, while NID and PG&E are coordinating the relicensings of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project (including the preparation of a multi-project Exhibit E, of which this Section 6.5 is a part), the two projects will be licensed separately, and therefore their compliance under Section 7 of the ESA is also ultimately separate. For example, it is possible that, as a result of consultation, a conclusion could be reached that one project has no effect on a particular ESA-listed species, while it is concluded that the other project is not likely or likely to adversely affect the same species. To avoid confusion but maintain the efficiency of a joint Exhibit E section, Licensees have made every effort to be clear regarding conclusions that apply to one or both projects.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on species listed as threatened or endangered under the ESA, Licensees developed and conducted the three studies, applicable to both projects, listed in Table 6.5-1.

Table 6.5-1. Threatened and endangered species studies conduced by Licensees.[1]

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress[1]	Study Complete	Date Study is Scheduled to be Complete
2.7.1	ESA-Listed Amphibians – California Red-Legged Frog (CRLF)	7-1	--	7/9/10	--
2.7.2	ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle	7-2	4/16/10	--	10/31/11
2.7.3	ESA-Listed Plants	7-3	2/15/10	--	10/31/11

[1] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, two of the three studies listed in Table 6.5-1 are in progress. For these, the most recent version of the interim technical memorandum, as well as for a technical memorandum for the completed study have been posted to the Relicensing Website

[1] This Section 6.5 (in conjunction with description of Project facilities and operations set forth in Section 5 of this FLA) has been prepared by NID and PG&E to establish the record and otherwise meet the requirements of 18 CFR 5.18(b)(3)(ii) regarding providing the status of informal Section 7 consultation and a draft biological assessment under the Endangered Species Act.

and are being filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; and lists of variances to the FERC-approved study; attachments to the technical memorandum; and references.

The status of each study, including expected completion date, is described below.

- ESA-Listed Wildlife-Valley Elderberry Longhorn Beetle (Study 2.7.2). Licensees have completed all tasks in the FERC-approved study with the exception of: 1) completing surveys on some new areas added to the Drum-Spaulding Project Boundary, including Project roads; 2) updating information for areas removed from the Drum-Spaulding Project Boundary; 3) preparing an addendum to the April 16, 2010 technical memorandum (7-2) to include the above information. PG&E expects to complete the study and file the technical memorandum addendum in October 2011.

- ESA-Listed Plants (Study 2.7.3). Licensees have completed all tasks in the FERC-approved study with the exception of: 1) completing surveys on some new areas added to the FERC project boundaries, including Project roads, for both projects; 2) updating information for areas removed from the FERC projects boundaries for both projects; and 3) preparing an addendum to the February 15, 2010 technical memorandum (7-3) to include the above information. Licensees expect to complete the study and file the technical memorandum addendum in October 2011.

6.5.1 Identification of Potentially Affected Species and Critical Habitat

Licensees identified threatened and endangered species that could be affected by one or both of the projects in three screening steps that occurred at different times in the relicensings. Each of these steps, and the final list of potentially affected threatened and endangered species, is described below.

6.5.1.1 Initial Screening for Potentially Affected Species

On May 3, 2007, early in the relicensings, Licensees identified threatened and endangered species that may be affected by one or both of the projects by generating an official list of threatened and endangered species that occur, or are suspected to occur, within the 7.5-minute USGS topographic quadrangles that include the vicinity of the projects. Licensees used the on-line request service available at USFWS's website at (http://www.fws.gov/sacramento/es/spp_lists/auto_list_ form.cfm) to generate the list. The USFWS official list for the two projects combined included 17 species, if one counts Chinook salmon (*Oncorhynchus tshawytscha)* spring-run Evolutionary Significant Unit (ESU) and Chinook salmon winter-run ESU as two separate species.

Initially, Licensees eliminated 6 of the 17 species from further consideration because they do not occur near either of the projects and have a very low potential to be affected by either of the projects. The species eliminated in this step included: Conservancy fairy shrimp (*Branchinecta conservatio*, listed as endangered); vernal pool fairy shrimp (*Branchinecta lynchi*, listed as threatened); vernal pool tadpole shrimp (*Lepidurus packardi*, listed as endangered); California tiger salamander (*Ambystoma californiense*, listed as threatened); giant garter snake (*Thamnophis gigas*, listed as threatened); and Delta smelt (*Hypomesus transpacificus*, listed as threatened).

Similarly, a seventh species – Lahontan cutthroat trout (*O. clarki henshawi*, listed as threatened) – was eliminated because it is an inland subspecies of cutthroat trout endemic to the physiographic Lahontan basin of northern Nevada, eastern California, and southern Oregon. This federally threatened population segment does not occur in the vicinity of either project.

Licensees also eliminated from further consideration Sacramento River winter-run Chinook salmon ESU (listed as endangered) and Central Valley spring-run Chinook salmon ESU (listed as threatened). The reasons Licensees eliminated winter-run and spring-run Chinook salmon from further consideration for either project during this initial screening are provided below.

Sacramento River winter-run Chinook salmon is one of four races of Chinook salmon occurring within the Sacramento-San Joaquin River watersheds. Winter-run Chinook salmon are unique because they spawn during summer months when air temperatures usually approach their yearly maximum. As such, winter-run spawning and rearing is primarily restricted to the mainstem Sacramento River. They occur in the Sacramento River downstream of the geographic scope affected by the two projects, as the area is defined in FERC's Revised SD2. Winter-run Chinook salmon do not occur in the Feather or American river basins (NMFS 2009). Because the species does not occur in the geographic scope of the projects, it was eliminated from further consideration.

NMFS (1993) has designated the Sacramento River as Critical Habitat for winter-run Chinook salmon. The designated reach within the vicinity, but outside the geographic scope of the two projects, is in the Sacramento River, downstream of its confluence with the Feather River. Winter-run Critical Habitat does not occur in the Yuba, Feather, Bear, or American Rivers, nor in Auburn Ravine. The primary constituent elements[2] (PCEs) provided in that reach include adult and juvenile migration. Adult migration occurs from December through July, with a peak during the period extending from January through April (USFWS 1995). Juvenile emigration occurs between November and March, peaking in December, with some emigration continuing through May in some years (Snider and Titus 2000a; Snider and Titus 2000b).

Central Valley spring-run Chinook salmon is an anadromous fish restricted to runs in the Sacramento and San Joaquin rivers and many of their tributaries. The Central Valley spring-run Chinook salmon ESU includes populations downstream of the two projects, in the Sacramento, Feather, Yuba, Bear, and American Rivers. The migration path of this species upstream into the reaches potentially affected by one or both of the projects is blocked in the Bear River watershed

[2] Primary constituent elements are those physical and biological features of a landscape that a species needs to survive and reproduce, which for anadromous salmonids typically includes migration, rearing and spawning.

by the Vanjop Diversion Dam, which is downstream of South Sutter Water District's Camp Far West Dam, and in the Yuba River watershed by USACE's Englebright Dam. The migration path of this species into the upper American River watershed, where some Drum-Spaulding Project facilities exist, is blocked by BOR's Folsom Project at Nimbus Dam. The Vanjop Diversion Dam, Englebright Dam, and Nimbus Dam are not part of either of the two projects. Spring-run Chinook salmon do not occur within the American River Basin, including Auburn Ravine, which is a low elevation watershed that is outside of the historic range of spring-run Chinook salmon.

NMFS has designated the Sacramento, Feather, Yuba, Bear and American Rivers downstream of the two projects as Critical Habitat for the Central Valley spring-run Chinook salmon. All of the reaches designated as Critical Habitat for spring-run Chinook salmon within the vicinity of the two projects are downstream of the lowermost boundary of the projects' geographic scope. The PCEs essential for the conservation of the ESU are those sites and habitat components that support one or more life stages, including:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
- Freshwater rearing sites with:
  - Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility.
  - Water quality and forage supporting juvenile development.
  - Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. Over summer holding for adult spring-run Chinook salmon is a component of the freshwater migration PCE.

The PCEs that define Critical Habitat within the vicinity of the two projects include adult and juvenile migration within the accessible reaches of the Sacramento, Feather, and Yuba rivers, and spawning and rearing in the Yuba River downstream of Englebright Dam. The Bear River, downstream of the Vanjop Diversion, has been designated Critical Habitat that provides spring-run Chinook salmon juveniles non-natal rearing and refuge from high flow conditions and catastrophic events. No spring-run Chinook salmon critical habitat has been designated in Auburn Ravine.

As stated above, PCE conditions vulnerable to water diversions and other actions associated with hydroelectric power production (PFMC 1999) include water quality, water temperature, and flow magnitude and fluctuations, as well as channel habitat components such as sediment and woody debris, and fish passage. All of the reaches designated as Critical Habitat for spring-run Chinook salmon within the vicinity of the two projects are downstream of the lowermost boundary of the projects' geographic scope. As such, since 1) the effects on flow within these reaches has been determined by FERC to be controlled by non-project facilities, downstream of the two projects; 2) all project facilities and maintenance activities occur outside of areas designated as Critical Habitat; and 3) spring-run Chinook salmon are blocked from migrating into the river reaches within the geographic scope by non-project facilities, Licensees eliminated the spring-run Chinook salmon ESU and designated Critical Habitat from further consideration at this stage of screening.

California Central Valley Steelhead (*O. mykiss irideus*), occurs within the vicinity of the two projects in the Sacramento, Feather, Yuba, Bear, and American rivers, and in Auburn Ravine. As with spring-run Chinook salmon, steelhead Critical Habitat has been designated within the Sacramento, Feather, Yuba, Bear and American rivers, all of which occurs downstream of the geographic scope of the two projects. Critical Habitat has also been designated in Auburn Ravine from South Sutter Water District's East Side Canal (RM 0.0) upstream to RM 26.6, just above PCWA's Auburn Tunnel outlet (RM 26.4).

The PCEs include migration, in the reaches of the Sacramento, Feather, and Yuba rivers downstream of the projects; spawning and rearing, in the Yuba River, downstream of Englebright Dam and the Project, and, non-natal rearing and refugia from catastrophic events, in the Bear River downstream for Vanjop Dam and the area of the projects. Critical Habitat has been designated in Auburn Ravine, from its mouth upstream to RM 26.6 to include migration, spawning, and rearing.

Steelhead in the Sacramento, Feather, Bear, Yuba and American rivers was eliminated from further consideration for the same reasons discussed above regarding spring-run Chinook salmon. Access and all Critical Habitat occurs downstream of USACE's Englebright Dam on the Yuba River, Vanjop Dam on the Bear River, and Nimbus Dam on the American River. As such, steelhead cannot access the projects' geographic scope within these rivers, Critical Habitat does not occur within the geographic scope, and operations of the projects do not control flow and related conditions such as temperature, that could affect steelhead or their PCEs. PG&E, however, has retained steelhead in Auburn Ravine for consideration.

At this stage of screening, Licensees also narrowed the geographic area of potential effects for three species, though the species were otherwise retained for consideration. Eliminated from further considerations were the area above elevation 5,000 ft for California red-legged frog, or CRLF (*Rana draytonii*, listed as threatened) and the area above elevation 3,000 ft for Valley elderberry longhorn beetle, or VELB *(Desmocerus californicus dimorphus,* listed as threatened). These higher elevation areas are outside the geographic range of these species.[3]

At the end of the initial screening process, eight species - five plant species, one frog species, one insect species and one fish species - remained on Licensees' list of threatened and endangered species potentially affected by one or both of the projects. These were:

[3] Unless otherwise indicted, elevation data are in United States Department of Commerce (USDOC), National Oceanic and Atmospheric Association (NOAA), National Geodetic Survey Vertical Datum of 1929 (NGVD29).

- Endangered:
  - Stebbins' morning-glory (*Calystegia stebbinsii)*
  - Pine Hill flannelbush (*Fremontodendron decumbens)*
  - Pine Hill ceanothus (*Ceanothus roderickii)*
  - Eldorado bedstraw *(Galium californicum* ssp. *sierrae)*

- Threatened:
  - Layne's butterweed (*Packera layneae)*
  - California red-legged frog, or CFLF (*Rana draytonii*)[4]
  - Valley elderberry longhorn beetle, or VELB *(Desmocerus californicus dimorphus*)[5]
  - Steelhead, California Central Valley ESU (*O. mykiss irideus*)[6]

6.5.1.2 Second Screening for Potentially-Affected Species

On October 14, 2009, Licensees updated their May 3, 2007, official list of ESA-listed species using the USFW's website and found one change to the list. The Southern Distinct Population Segment (DPS) of North American green sturgeon (Southern DPS green sturgeon) (*Acipenser medirostris*) had been listed by NMFS as a threatened species in June 2006. In October 2009, NMFS designated Critical Habitat for the Southern DPS green sturgeon and the designation included the lower Yuba River downstream of USACE's Daguerre Point Dam and the Sacramento River.

Upon review, Licensees eliminated Southern DPS North American green sturgeon from further consideration for both projects. In the vicinity of the projects, the lower Yuba, lower Feather and Sacramento Rivers are considered to provide green sturgeon habitat. However, Englebright Dam on the Yuba River isolates any project-related effects from sturgeon and their critical habitat downstream in the Yuba, Feather, and Sacramento Rivers. Similarly, Vanjop Dam on the Bear River isolates any project-related effects from sturgeon and their critical habitat downstream in the Feather and Sacramento Rivers and Folsom Dam on the American River, and Auburn Ravine I Diversion Dam on Auburn Ravine isolate any project-related effects from sturgeon and their critical habitat downstream in the Sacramento River.

Also in the fall of 2009, Licensees reviewed current versions of the United States Department of Agriculture's (USDA) PLANTS database (USDA 2009) and the California Native Plants Society's (CNPS) database within the USGS quadrangle maps encompassing the Project vicinity for each Project. Based on the latter lists, Licensees added two species, both plants, to the list of threatened and endangered species with a potential to occur in the vicinity of one or both of the projects. The additions were:

4 Below an elevation (El.) of 5,000 feet.
5 Below El. 3,000 feet.
6 In Auburn Ravine only.

- Endangered:
  - Sacramento Orcutt grass (*Orcuttia viscida*)
  - Hartweg's golden sunburst (*Pseudobahia ahiifolia*)

6.5.1.3 Third Screening for Potentially-Affected Species

In 2009, Licensees reconsidered whether to eliminate from consideration for both projects spring-run Chinook salmon and steelhead in the Yuba River downstream of USACE's Englebright Dam. Comments from NMFS requested that, even though FERC terminated the geographic scope of the projects' effects in the area upstream of Englebright Dam and noted that other water projects are the primary controller of flows in these reaches, further analysis be conducted on whether the diversion of water by the projects could potentially affect anadromous fish in the lower Yuba River.

To provide a more comprehensive assessment of the potential for the projects' water diversions to affect anadromous fish populations in the lower Yuba River, Licensees augmented their analysis to address effects on Central Valley spring-run Chinook salmon and steelhead and their designated Critical Habitats.

The first step undertaken by Licensees was to identify effects of out-of-basin diversions (by South Feather Water and Power Agency [SFWPA], NID and PG&E) on seasonal flow in the lower Yuba River, in conjunction with other flow regulation (e.g., New Bullards Bar Reservoir), and on water temperature. A comprehensive description of Critical Habitat, the PCEs and known stressors is provided below to identify any potential linkages between the stressors' effects on PCEs and the Licensees' two projects, followed by a discussion of the potential for each project to affect Critical Habitat, the lower Yuba River spring-run Chinook salmon and steelhead populations, and their ESUs.

To assess potential effects of each project on the lower Yuba River's anadromous fish populations, Licensees evaluated the potential effect of project water diversions on flow. A summary of monthly out-of-basin diversions and reregulation was developed for Water Years representing dry, normal and wet Water Year conditions, to describe seasonal influences of the hydroelectric projects'[7] diversions on flow conditions in the Yuba River downstream of USACE's Englebright Dam near Smartville.[8]

Diversion rates during a typical dry water year are consistently high in the spring months, with relatively low winter, summer and fall diversion rates (Figures 6.5.1-1 and 6.5.1-2). The largest out-of-basin diversions occur in the South Yuba River followed by the North Yuba River and

[7] Major projects include the Yuba River Development Project, Drum-Spaulding Project, Yuba-Bear Hydroelectric Projects and the South Feather Power Project.

[8] The Haypress Creek Hydroelectric Project is the only other hydroelectric development in the watershed. The project is located on Haypress and Milton creeks, tributaries to the North Yuba River, several miles upstream of New Bullards Bar Reservoir. The diversion dams have a total capacity of 173 cfs, but the project returns all flows to Haypress Creek, above the confluence with the North Yuba River. The project does not divert water out-of-basin and is therefore not considered here in this analysis (SWRCB 1986).

then the Middle Yuba River (Figure 6.5.1-1). Figure 6.5.1-2 shows the hydrologic influence of each of the four major hydroelectric projects in the Yuba River watershed. The largest hydrologic influence is created by the Yuba River Development Project (Yuba County Water Agency's, or YCWA's Project),[9] though most of the influence is due to storage in New Bullards Bar Reservoir. After YCWA's Project, the major hydrologic influences due to project operations in most dry years, in order of magnitude, are Drum-Spaulding, Yuba-Bear Hydroelectric, and the South Feather Power projects (Figure 6.5.1-2).

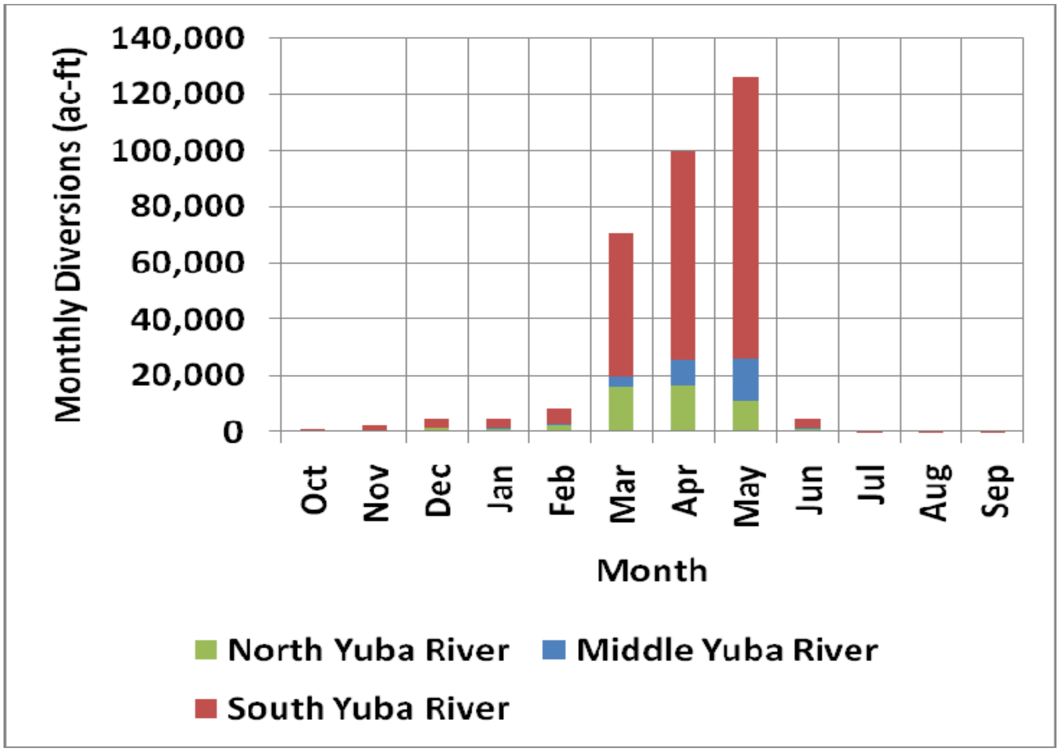

Figure 6.5.1-1. Monthly average diversions from upper forks of the Yuba River during Water Year 2001 (representative dry year).

[9] The Yuba River Development Project (FERC Project No. 2246) is currently in relicensing. YCWA filed a NOI and a Pre-Applictaion Document for its Yuba River Development Project on November 4, 2010.

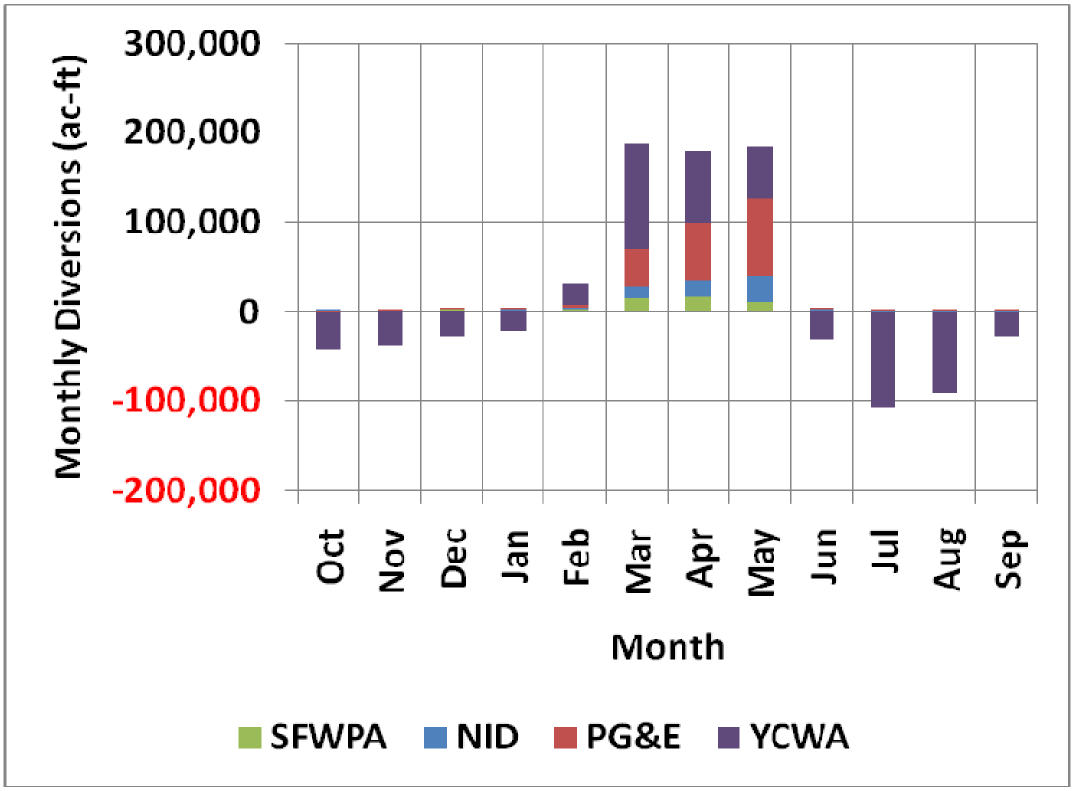

Figure 6.5.1-2. Monthly average diversions from Yuba River watershed (by SFWPA, NID and PG&E) as compared to diversions to storage/augmentations from storage primarily in New Bullards Bar Reservoir by YCWA during Water Year 2001 (representative dry year).

As during dry water years, diversion rates during normal water years are highest in the spring months, but are relatively greater during winter and early spring (Figures 6.5.1-3 and 6.5.1-4). Also, as during dry water years, the largest out-of-basin diversions occur in the South Yuba River followed by the North Yuba River, and the Middle Yuba River has the least diversions (Figure 6.5.1-3). The largest diversions, which are diversions to storage, are made by the Yuba River Development Project, though as in dry water years most of the water diverted is returned to the system, and the Drum-Spaulding Project is the next-largest diverter (Figure 6.5.1-4).

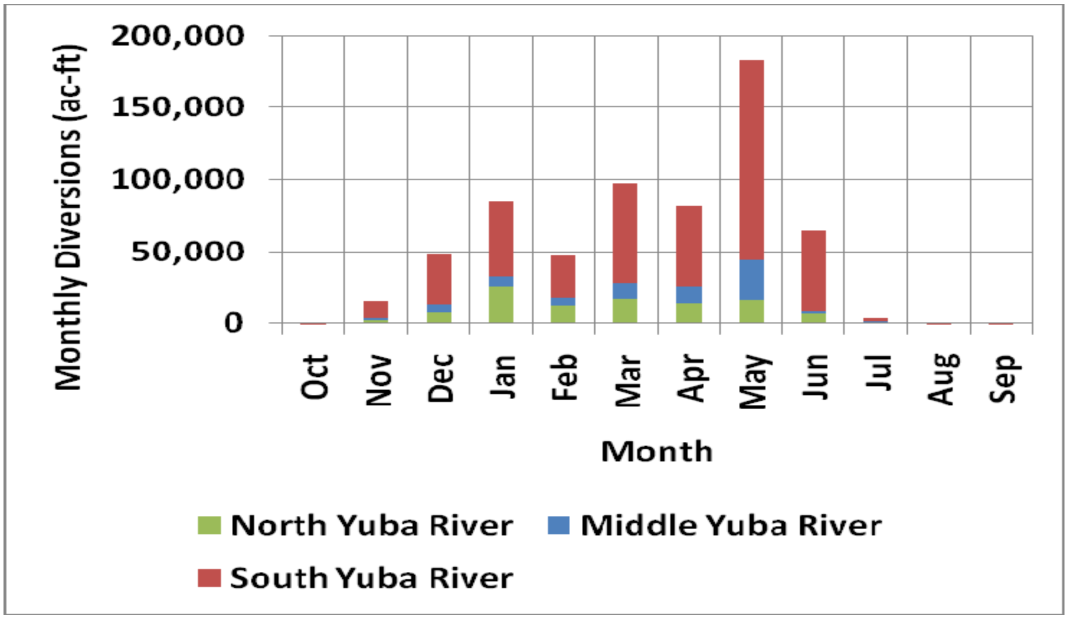

Figure 6.5.1-3. Monthly average diversions from upper forks of the Yuba River during Water Year 2003 (representative normal year).

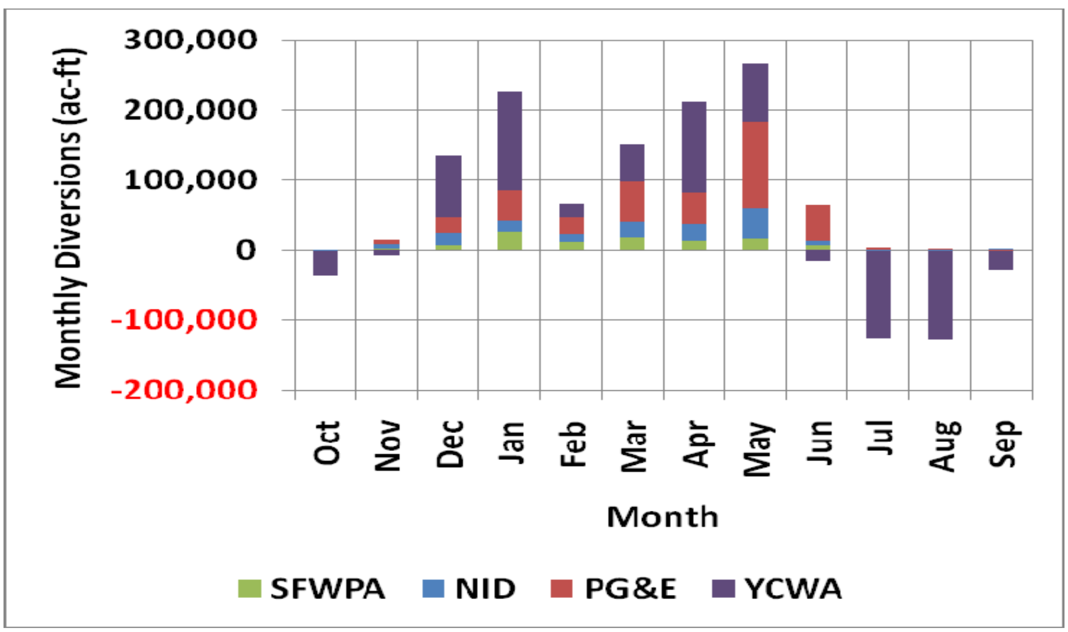

Figure 6.5.1-4. Monthly average diversions from Yuba River watershed (by SFWPA, NID and PG&E) as compared to diversions to storage/augmentations from storage primarily in New Bullards Bar Reservoir by YCWA during Water Year 2003 (representative normal year).

During wet years (e.g., 1995 or 2006), diversion rates are similar to normal year rates, with the exception that significant diversions typically extend into early summer due to late snowmelt (Figures 6.5.1-5 and 6.5.1-6). All relevant data for Water Year 2006 as needed for this analysis were not readily available; consequently, Licensees used Water Year 1995 as the representative wet water year to develop the two figures below. Also, the patterns in diversions are similar to the dry and normal water years: most of the out-of-basin diversions occur in the South Yuba River and the least diversions occur in the Middle Yuba River; most of the total diversions are diversions to storage in New Bullards Bar Reservoir by the Yuba River Development Project (which returns most of the water to the system.) (Figure 6.5.1-6)

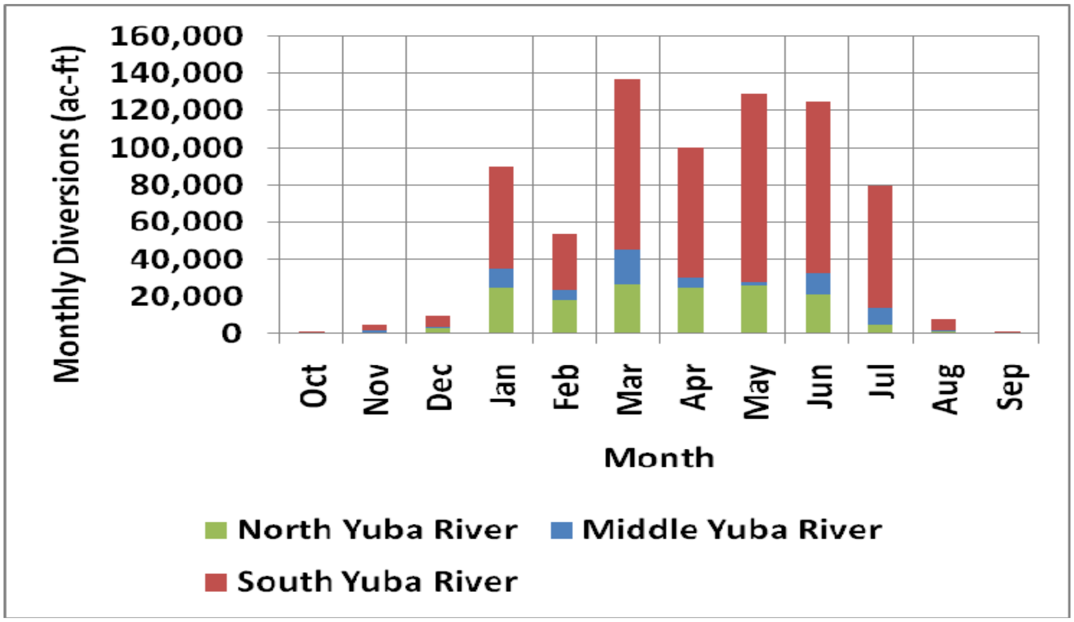

Figure 6.5.1-5. Monthly average diversions from upper forks of the Yuba River during Water Year 1995 (representative wet year).

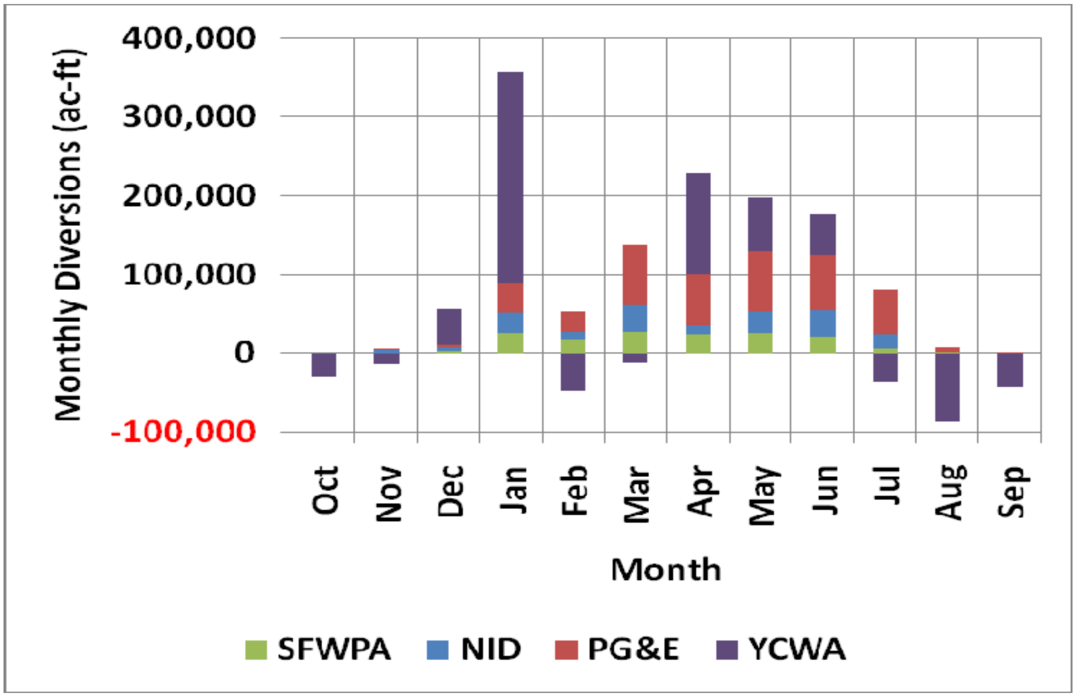

Figure 6.5.1-6. Monthly average diversions from Yuba River watershed (by SFWPA, NID and PG&E) as compared to diversions to storage/augmentations from storage primarily in New Bullards Bar Reservoir by YCWA during Water Year 1995 (representative wet year).

Licensees also examined influences on water temperature in the Lower Yuba River. Water temperatures in the Yuba River basin under unimpaired conditions are not available. In 2007, summer stream temperatures were collected in the Middle Yuba River upstream of the Yuba-Bear Hydroelectric Project's Jackson Meadows Reservoir and in the South Yuba River upstream of features of one or both of the projects. The results of these data collection efforts are provided in Figures 6.5.1-7 through 6.5.1-9. The data provide a context for the cooling potential generated by Jackson Meadows Reservoir and the Drum-Spaulding Project's Lake Spaulding, respectively. Summer unimpaired estimates show a negligible change in summer flow rates in both the Middle and South Yuba rivers as compared to the historical regulated condition, particularly in dry and normal water years, as shown in Table 6.5.1-1. Consequently, it is virtually impossible that the unimpaired condition provided a greater insulating effect on stream temperatures in the reaches below Jackson Meadows and Lake Spaulding dams. This is also true for the Middle Yuba River downstream of Milton Diversion Dam, since the Milton Diversion Dam Impoundment has only minimal storage, the primary insulating and storage effects on the Middle Yuba River are from Jackson Meadows Reservoir.

Table 6.5.1-1. Summertime 50 percent exceedance (median) regulated and unimpaired flows on the Middle Yuba River and South Yuba River (statistics based on data from WY 1976-2008)

	Middle Yuba River above YCWA's Our House Dam[1]		South Yuba River at Langs Crossing	
Month	50% Exceedance Unimpaired flow (cfs)	50% Exceedance Regulated flow (cfs)	50% Exceedance Unimpaired flow (cfs)	50% Exceedance Regulated flow (cfs)
August	37.6	37.4	7.6	6.2
September	35.7	34.5	7.8	6.6

[1] Calculated based on the full record of available regulated flows from WY 1976 through 2008. Statistics for Middle Yuba River include estimated flow for WY 1976-1988, when only monthly average diversion rate to YCWA's Lohman Tunnel is available.

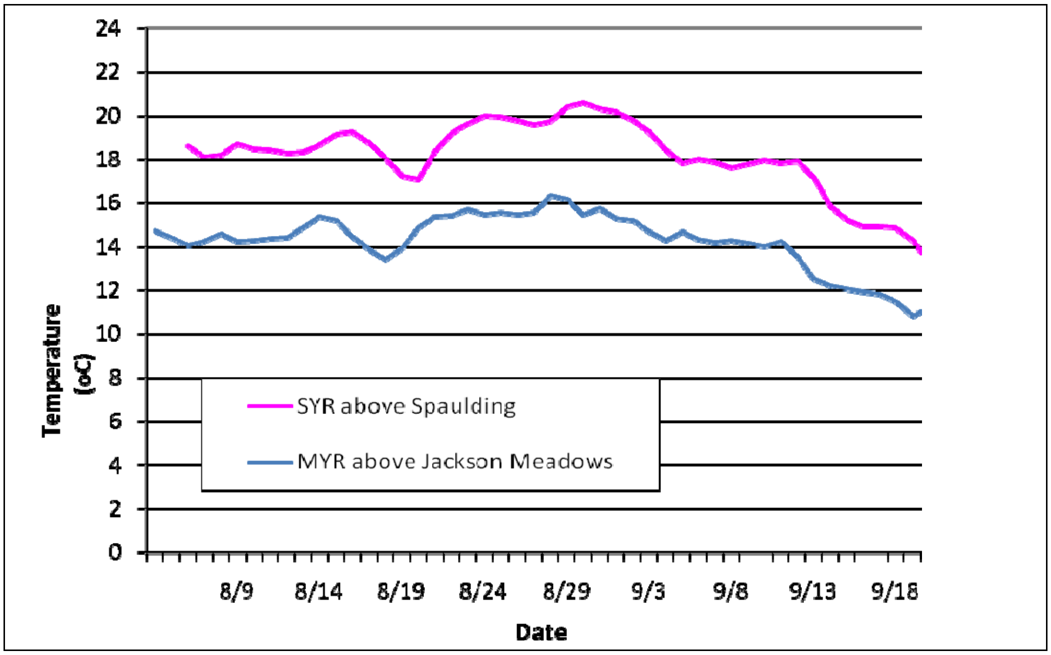

Figure 6.5.1-7. Mean daily water temperatures in the Middle and South Yuba rivers above Jackson Meadows Reservoir and Lake Spaulding, August-September 2007.

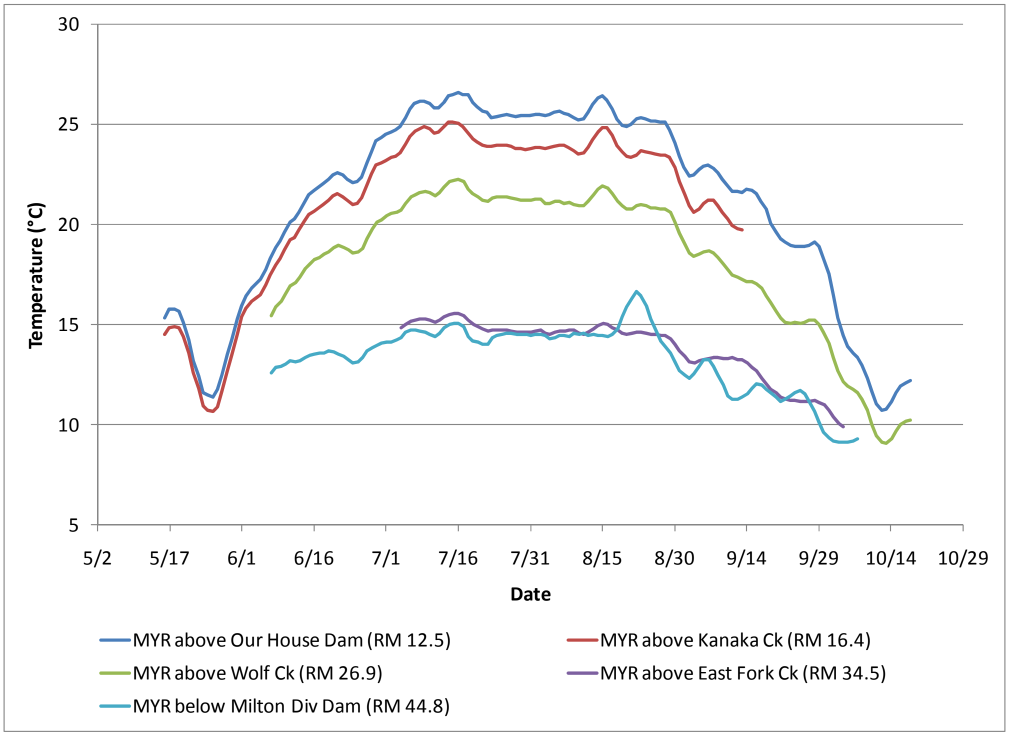

Figure 6.5.1-8. Mean daily water temperatures in the Middle Yuba River below Milton Diversion Dam, May-October 2008.

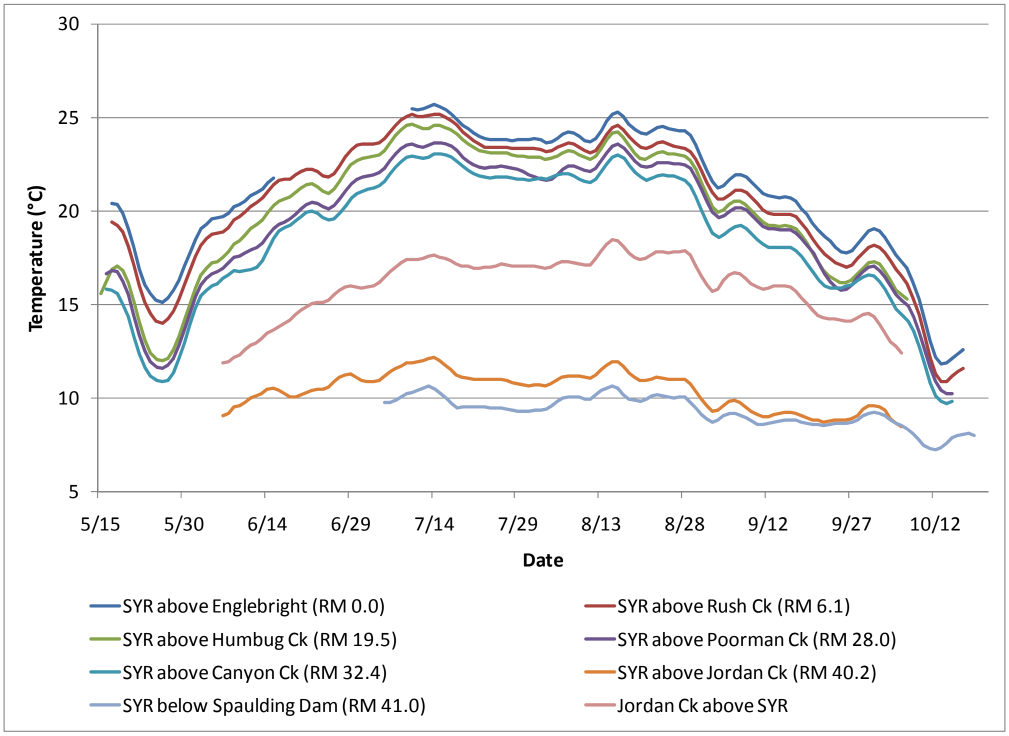

Figure 6.5.1-9. Mean daily water temperatures in the South Yuba River below Lake Spaulding, May-October 2008.

Although water temperature data in the Yuba River basin under unimpaired conditions are not available, Licensees used the HFAM water temperature model of the South Yuba River developed during relicensing to evaluate potential water temperatures under synthesized unimpaired flows. Figure 6.5.1-10 shows the modeled mean daily water temperature under synthesized unimpaired flow conditions for the South Yuba River below Spaulding Dam. The Licensees' HFAM water temperature model was run for the simulation period from July 1, 2008 through September 30, 2008, using the 2008 meteorological conditions and synthesized unimpaired flow for WY 2008. Starting water temperature downstream of Spaulding Dam (South Yuba River) and Bowman Dam (Canyon Creek, tributary to the South Yuba River) was approximated using the recorded water temperature immediately upstream of Spaulding Reservoir on the South Yuba River from 2009. The South Yuba River above Lake Spaulding is minimally regulated and is therefore fairly representative of "unimpaired" water temperatures. Modeled water temperatures under synthesized unimpaired flow conditions during the modeled period (using WY 2008 meteorology) are similar to or slightly higher than the actual recorded water temperatures during July-September of 2008; these results illustrate the unlikelihood that unimpaired flow conditions would have provided colder water than current regulated flow conditions in the South Yuba River.

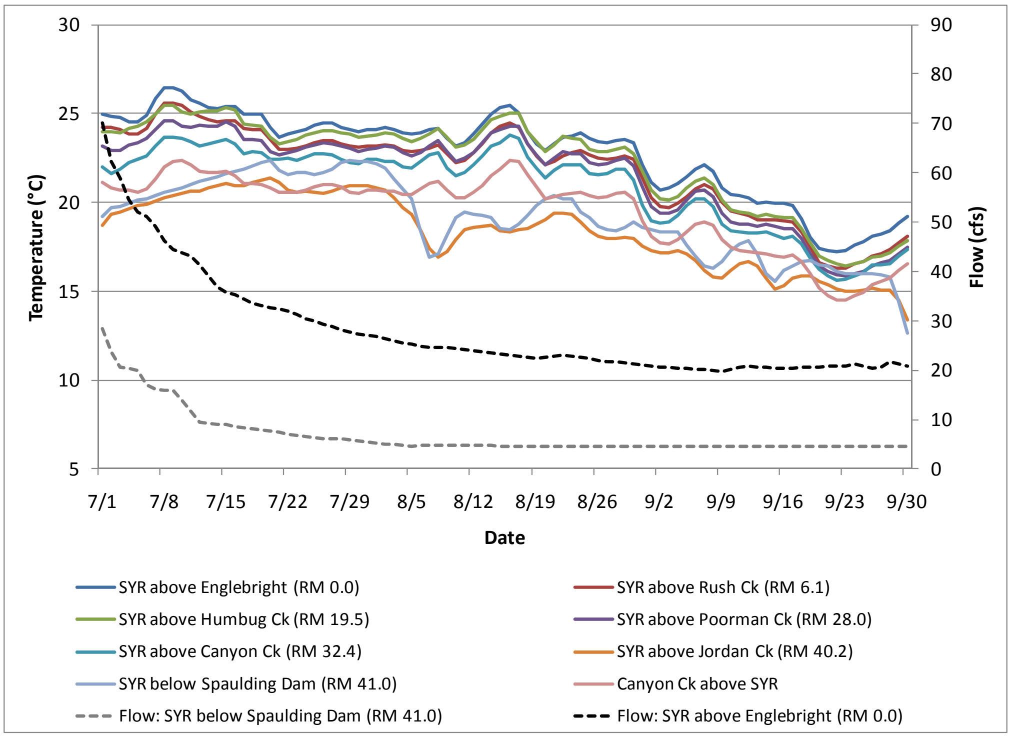

Figure 6.5.1-10. Modeled mean daily water temperatures in the South Yuba River between Lake Spaulding and Englebright Reservoir under synthesized unimpaired flow conditions below Spaulding Dam, July-September 2008.

Figure 6.5.1-11 includes stream temperature data collected by YCWA in the Yuba River at Smartville, which is located approximately 0.3 mi downstream of Englebright Dam (downstream of YCWA's Narrows 2 Powerhouse and PG&E's Narrows 1 Powerhouse10), for the period from Water Year 2003 through Water Year 2007. These data show that stream temperatures at this location are maintained in a very consistent band, ranging from 7° - 9° C during the winter months to 11° - 13° C during the summer months. This consistently cool temperature regime occurs due to the availability of abundant cold water at the bottom of YCWA's New Bullards Bar Reservoir, the ability of the USACE's Englebright Reservoir to insulate cold water releases from New Bullards Bar Reservoir due to a deep bathymetric profile, and the year-round operation of YCWA's Yuba River Development Project that provides consistent, cold flows in the reach immediately downstream of Englebright Dam (as measured at Smartsville). Temperatures in the lower Yuba River remain relatively cool in spite of much warmer inflows from the Middle and South Yuba rivers into Englebright Reservoir in the summer months, primarily because the magnitude of flows being contributed from these tributaries is low compared to the larger, colder releases typically being made from New Bullards Bar Reservoir for year-round environmental benefits and irrigation deliveries during the summer.

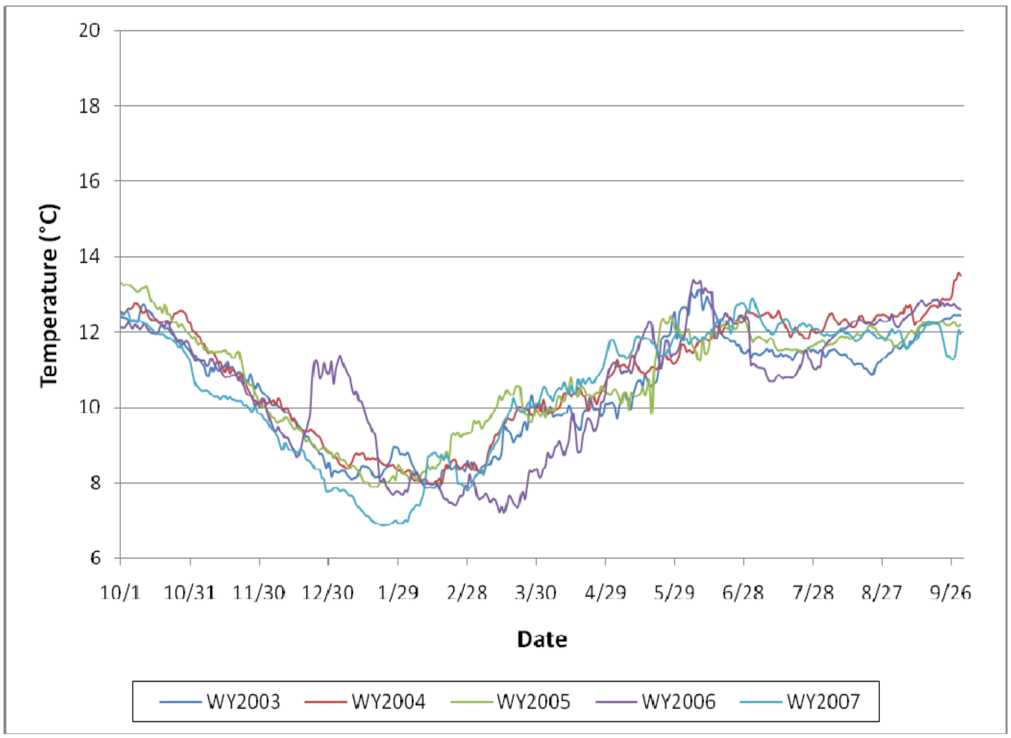

Figure 6.5.1-11. Mean daily water temperatures in the Yuba River at Smartsville for Water Years 2003-2007.

[10] PG&E's Narrows 1 Powerhouse is not part of PG&E's Drum-Spaulding Project, but part of PG&E's Narrows Project (FERC Project No. 2467).

6.5.1.3.1 Status of Critical Habitat Downstream of Englebright Reservoir

NMFS has designated Critical Habitat for both Central Valley spring-run Chinook salmon and Central Valley steelhead in the Lower Yuba River Hydrologic Sub-area (HSA), the Marysville Hydrologic Unit (HU), the Browns Valley and Englebright HSAs, within the Yuba River HU, which encompass the lower Yuba River downstream of USACE's Englebright Dam, and in Dry Creek tributary to the lower Yuba River (Figure 6.5.1-12 and 6.5.1-13) (NMFS 2005). Deer Creek, a tributary to the lower Yuba River that is reportedly utilized by steelhead and spring-run Chinook salmon, was excluded from the Critical Habitat designation for both Central Valley steelhead and spring-run Chinook salmon (NMFS 2005).

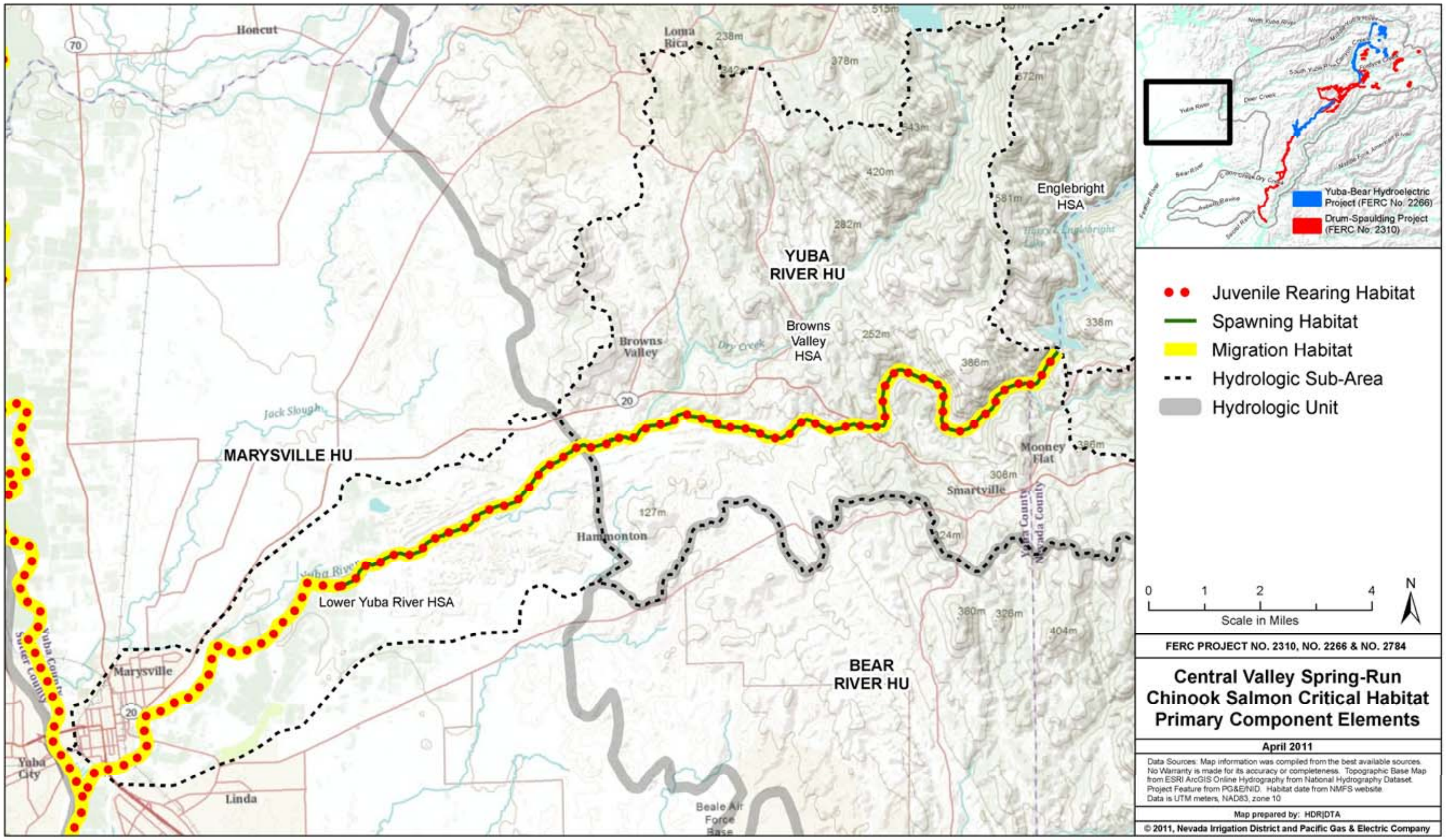

Figure 6.5.1-12. Central Valley spring-run Chinook salmon Critical Habitat and Primary Component Elements (PCEs).

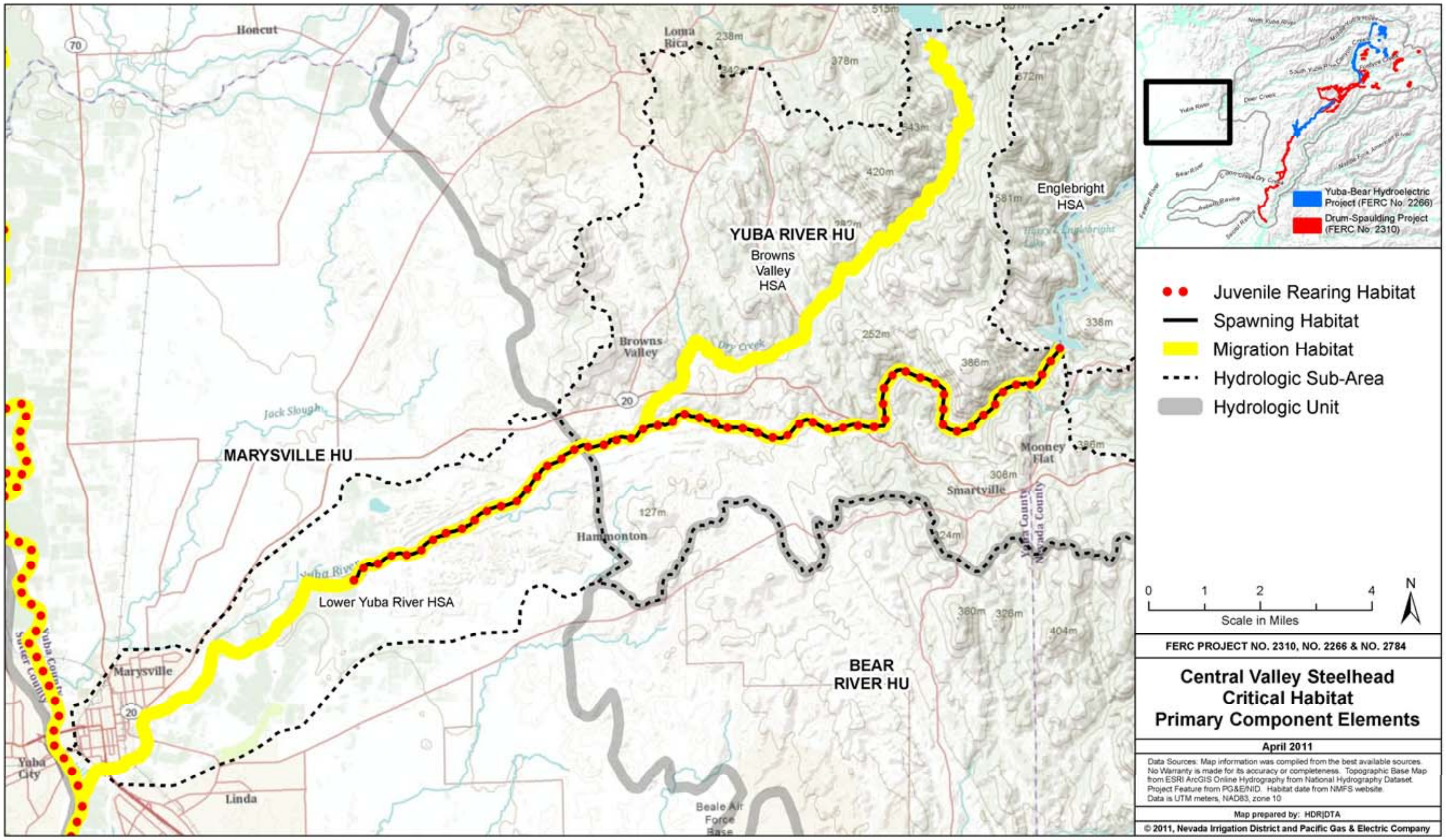

Figure 6.5.1-13. Central Valley steelhead Critical Habitat and Primary Component Elements (PCEs).

In the Lower Yuba River HSA (within the Marysville HU), NMFS (2005) identified 19 stream miles that support both Central Valley steelhead and spring-run Chinook salmon spawning, rearing and migration PCEs. NMFS (2005) also identified 17 stream miles that support steelhead and spring-run Chinook salmon spawning, rearing, and migration PCEs in the Browns Valley HSA, and 1 mile that supports steelhead and spring-run Chinook salmon spawning, rearing, and migration PCEs in the Englebright HSA (within the Yuba River HU) (shown in Figures 6.5.1-12 and 6.5.1-13). NMFS (2005) rated the Lower Yuba River, Browns Valley, and Englebright HSAs as having “high” conservation value to both Central Valley steelhead and spring-run Chinook salmon, on a scale of low, medium, and high.

NMFS did not identify any unoccupied areas in the Marysville HU as essential to the conservation of the Central Valley steelhead or spring-run Chinook salmon ESUs. NMFS (2005) determined that it was premature to designate unoccupied areas in the Yuba River above USACE’s Englebright Dam as Critical Habitat until ongoing recovery planning efforts identify specific unoccupied habitat areas in the Central Valley that are essential to the conservation and recovery of the Central Valley spring-run Chinook salmon and steelhead ESUs. NMFS (2005) also stated that the CalFed-sponsored, Upper Yuba River Studies Program (UYRSP) was expected to provide relevant information for the recovery planning process of both ESUs, and that NMFS intended to await the findings of this program as well as recovery planning efforts before making a determination. To date, these areas have not been proposed for designation as Critical Habitat. Therefore, no Critical Habitat exists above USACE’s Englebright Dam.

As described above, the three primary PCEs for anadromous salmonids in freshwater are migration, including over-summer holding, spawning, and rearing.

6.5.1.3.2 Spring-Run Chinook Salmon Critical Habitat Downstream of Englebright Reservoir

Major factors (not directly flow-related) influencing the status of naturally spawning spring-run Chinook salmon and steelhead in the lower Yuba River include: (1) blockage of historic spawning habitat resulting from the construction of Englebright Dam in 1941, which has implications for the spatial structure of the populations; (2) impaired adult upstream passage at Daguerre Point Dam; (3) unsuitable spawning substrate in the uppermost area (i.e., Englebright Dam to the Narrows) of the lower Yuba River; (4) limited riparian habitats, riverine aquatic habitats for salmonid rearing, and natural river function and morphology; and (5) impaired juvenile downstream passage at Daguerre Point Dam (CALFED and YCWA 2005).

This section discusses Critical Habitat for spring-run Chinook salmon located outside of the geographic scope of action and downstream of Englebright Dam.

Migration

Adult spring-run Chinook salmon immigration and holding in California’s Central Valley Basin occurs from mid-February through September (CDFG 1998; Lindley et al. 2004). Suitable water temperatures for adult upstream migration reportedly range between 57ºF (13.9ºC) and 67ºF

(19.4ºC) (NMFS 1997). In addition to suitable water temperatures, adequate flows are required to provide migrating adults with olfactory and other cues needed to locate their spawning reaches (CDFG 1998). Adult migration into the Yuba River appears to peak in May and June (NMFS 2007).

Holding

Chinook salmon hold in areas downstream of spawning grounds during the summer months until their eggs fully develop and become ready for spawning. NMFS (1997) states, "*Generally, the maximum temperature for adults holding, while eggs are maturing, is about 59- 60°F (15-15.6°C), but adults holding at 55-56 °F (12.8-13.3°C) have substantially better egg viability*." In the lower Yuba River, adult spring-run Chinook salmon apparently hold over the summer in the deep pools and cool water downstream of PG&E's Narrows Powerhouse and YCWA's Narrows 2 Powerhouse (non-Project), or further downstream in the Narrows Reach (CDFG 1991a; SWRCB 2003), where water depths exceed 40 ft.

Spawning

Chinook salmon spawning and embryo incubation has been reported to primarily occur during September through mid-February, with spawning peaking in mid-September (DWR 2004a; DWR 2004b; Moyle 2002; Vogel and Marine 1991).

Juvenile Rearing

Spring-run Chinook salmon juveniles are believed to rear in the lower Yuba River year-round. In general, juvenile Chinook salmon have been observed throughout the lower Yuba River, but with higher abundances above USACE's Daguerre Point Dam. Rearing from emergence until emigration can be from December through the following December, likely from December through March.

Juvenile Emigration

The timing of juvenile emigration from the spawning and rearing grounds varies among the tributaries of origin, and can occur during the period extending from October through April (Vogel and Marine 1991). In the Feather River, data on juvenile spring-run emigration timing and abundance have been collected sporadically since 1955 and suggest that November and December may be key months for spring-run emigration (DWR and Reclamation 1999; Painter et al. 1977). In Butte Creek, the bulk of emigration is reported to occur between January and March, with some emigration continuing through April (Lindley et al. 2004). Some juveniles continue to rear in Butte Creek through the summer and emigrate as yearlings from October to February, with peak yearling emigration occurring in November and December (CDFG 1998).

The spring-run Chinook salmon emigration period in the Yuba River below USACE's Englebright Reservoir may extend from November through June, although based on CDFG's run-specific determinations, the vast majority (~94%) of spring-run Chinook salmon were captured as post-emergent fry during November and December, with a relatively small percentage (nearly 6 percent) of individuals remaining in the lower Yuba River and captured as young-of year (YOY) from January through March. Only 0.6 percent of the juvenile Chinook salmon identified as spring-run were captured during April, 0.1 percent during May, and none were captured during June (YCWA et al. 2007).

6.5.1.3.3 Steelhead Critical Habitat Downstream of Englebright Reservoir

The following section discusses Critical Habitat in the lower Yuba River in terms of life stages. A discussion on Critical Habitat and how it pertains to Auburn Ravine can be found in section 6.5.1.1.

Migration

Adult steelhead immigration into Central Valley streams typically begins in August and continues into March (McEwan 2001; NMFS 2004b). Steelhead immigration generally peaks during January and February (Moyle 2002). Optimal immigration and holding temperatures have been reported to range from 46°F (7.8°C) to 52°F (11.1°C) (CDFG 1991b). Unlike Chinook salmon, many steelhead do not die after spawning. Those that survive return to the ocean (kelts), and may spawn again in future years.

Spawning

Spawning usually begins during late-December and may extend through March, but also can range from November through April (CDFG 1986). Optimal spawning temperatures have been reported to range from 39°F (3.9°C) to 52°F (11.1°C) (CDFG 1991b). Optimal egg incubation temperatures have been reported to range from 48 °F (8.9°C) to 52°F (11.1°C) (CDFG 1991b).

Rearing

Preferred water temperatures for fry and juvenile steelhead rearing are reported to range from 45°F (7.2°C) to 65°F (18.3°C) (NMFS 2002a). Each degree increase between 65°F and the upper lethal limit of 75°F (23.9°C) reportedly becomes increasingly less suitable and thermally more stressful for the fish (Bovee 1978). Although the reported preferred water temperatures for fry and juvenile steelhead rearing range from 45°F to 65°F, most of the literature on steelhead smoltification suggest water temperatures of 52°F (Adams et al. 1975; Myrick and Cech 2001; Rich 1987), or less than 55°F (12.7°C) (EPA 2003; McCullough et al. 2001; Wedemeyer et al. 1980; Zaugg and Wagner 1973) are required for successful smoltification to occur.

Smolt Emigration

The primary period of steelhead smolt emigration occurs from March through June (Castleberry et al. 1991). It has been reported that steelhead move downstream as YOY in the lower Yuba River (YCWA 2005) and in the lower American River (Snider and Titus 2000b) from late-spring through summer.

6.5.1.3.4 Threats and Stressors

Key threats and stressors common to Central Valley spring-run Chinook salmon and steelhead in the Yuba River watershed include the following (NMFS 2009):

- Passage impediments/barriers at Englebright Dam and Daguerre Point Dam, affecting adult immigration and holding
- Passage impediments/barriers at Englebright Dam affecting adult spawning, redd superimposition, competition for habitat, hybridization and genetic integrity
- Hatchery effects associated with redd superimposition, competition for habitat and genetic integrity affecting adult spawning
- Physical habitat alteration associated with limited supplies of instream gravel, reduced spawning habitat availability and habitat suitability affecting adult spawning
- Flow conditions (i.e., flow fluctuations) and water quality effects on embryo incubation
- Entrainment effects from individual diversions in the Yuba River and Daguerre Point Dam affecting juvenile rearing and outmigration
- Non-site specific and structure related predation effects affecting juvenile rearing and outmigration
- Loss of natural river morphology, riparian habitat and instream cover, and floodplain habitat affecting juvenile rearing and outmigration

Management activities identified as potentially affecting steelhead and spring-run Chinook salmon PCEs in the Lower Yuba River HSA include point and non-point water pollution, agricultural water withdrawals, municipal water withdrawals, diking, streambed stabilization for flood control, and fish passage (NMFS 2005). Management activities identified as potentially affecting steelhead and spring-run Chinook salmon PCEs in the Browns Valley HSA include agricultural and municipal water withdrawals, and in the Englebright HSA agricultural water withdrawals, fish passage, and dam operations (NMFS 2005).

Shaded riverine aquatic habitat generally occurs in the lower Yuba River as scattered, short strips of low-growing woody riparian species adjacent to the shoreline (CALFED and YCWA 2005). The most extensive and continuous segments of shaded riverine aquatic habitat reportedly occur along bars where channel migrations have cut new channels through relatively large, dense stands of riparian vegetation (Beak 1989). Due to a lack of riparian vegetation throughout much of the lower portion of the stream, in addition to USACE's Englebright Dam reducing the downstream transport of woody material, instream woody material also is limited in the lower Yuba River (CALFED and YCWA 2005).

The Narrows Reach below Englebright Dam is steep and consists of a series of rapids and deep pools confined by a bedrock canyon. Spawning gravels are scarce in the Narrows Reach because of the lack of upstream gravel recruitment that resulted from the construction of USACE's Englebright Dam in 1941, and the high-energy nature of this reach. Spring-run Chinook salmon and steelhead can migrate as far as USACE's Englebright Dam, but because spawning gravels are scarce in the Narrows Reach, spawning activity in that reach is severely limited. Although montane hardwoods occupy much of the Narrows Reach, the steep-walled canyons prevent immediate riparian growth, limiting the potential for positively affecting the instream aquatic habitat (CALFED and YCWA 2005).

Conversely, downstream of the Narrows Reach, spawning gravels are abundant and generally of high quality throughout the Garcia-Gravel Pit and Daguerre Point Dam, which was constructed in 1910, reaches. Spawning gravels have been supplied to the river largely from local sources including deposition of hydraulic mining debris in the riverbed between the mid-1800s and 1941 (Beak 1989). In the Garcia Gravel Pit and Daguerre Point Dam reaches, spawning gravel consists of unconsolidated cobbles and gravels and occurs in the existing bars and dredge tailings. Much of this material is within the preferred size range for spawning Pacific salmon species. With the exception of moderate gradient riffles, the proportion of mesohabitat compositions of the Garcia Gravel Pit Reach and Daguerre Point Dam Reach are more evenly distributed than in the Narrows Reach, with run and glide habitats comprising the largest proportion of habitat types (CALFED and YCWA 2005).

The Simpson Lane Reach is dominated by deep pools and has lower proportions of the remaining habitat types. Spawning gravels are abundant and generally of high quality throughout both the Garcia Gravel Pit and Daguerre Point Dam reaches (YCWA et al. 2000). The quality of gravels in the Garcia Gravel Pit and Daguerre Point Dam reaches is reportedly considered excellent for Chinook salmon spawning (CDFG 1991). The occurrence of fine interstitial sediments increases in the downstream portions of the Simpson Lane Reach, resulting in less suitable salmonid spawning habitat (CDFG 1991). In the vicinity of Daguerre Point Dam, the Yuba River is largely devoid of sufficient riparian vegetation to provide suitable juvenile salmonid rearing habitat conditions (CALFED and YCWA 2005).

The Yuba Goldfields area near USACE's Daguerre Point Dam is largely devoid of any riparian vegetation. Land use in the Simpson Lane Reach is comprised primarily of agricultural activities and provides little shading to this portion of the lower Yuba River. In addition, the Simpson Lane Reach is bordered by levees and is subject to backwater influence of the Feather River, further preventing the establishment of riparian vegetation in this area (CALFED and YCWA 2005).

6.5.1.3.5 Lower Yuba River Accord

In 2008, the SWRCB approved the consensus-based, comprehensive Yuba Accord to protect and enhance 24 miles of aquatic habitat in the lower Yuba River extending from USACE's Englebright Dam downstream to the river's confluence with the Feather River near Marysville.

> The Lower Yuba River Accord (Yuba Accord) concludes a 20-year California controversy, and enables the Yuba County Water Agency to successfully operate the Yuba River Development Project (FERC 2246, 362 MW) for hydropower, irrigation, flood control, recreation and fisheries benefits – all in an innovative manner that

> surpasses the project's original requirements. As a settlement agreement, the Yuba Accord is the final product of nearly three years of intense negotiations among 17 stakeholders, including local irrigation districts, state and federal resource agencies, and conservation groups. Based upon the success of two one-year pilot programs (2006/2007), the State of California approved the agreement in 2008, and it is now fully operational. The Yuba Accord is unprecedented in that it combines increased instream fisheries flows – for wild, native salmon and steelhead – with increased supplemental water supplies for California cities and farms, while preserving all of the project's clean, renewable hydropower generation capacity. The Yuba Accord also reaffirms the water rights of the Yuba County Water Agency and its member irrigation districts. The Yuba Accord represents a nexus of smart engineering, collaborative partnership and strategy development in the pursuit of a sustainable solution to a complex controversy. [11]

According to YCWA's public website, the terms of the Yuba Accord and the Fisheries Agreement, "will be from the effective date [2008] until FERC issues a new FERC Long-Term License for the Yuba Project [YCWA's Yuba River Development Project]…".

In addition, the SWRCB ordered that studies be conducted to further evaluate flow fluctuations and potential effects on redd dewatering and juvenile isolation and fry stranding, which continue to be conducted (NMFS 2009). Since the issuance of the SWRCB Yuba Accord Decision, a full-flow bypass structure has been installed on the Narrows 2 Powerhouse, which will reportedly reduce or even eliminate the potential for flow fluctuations to occur in the lower Yuba River associated with maintenance and operation of the Narrows 2 Powerhouse (NMFS 2009).

Implementation of the lower Yuba River flow schedule specified in the Fisheries Agreement of the Yuba Accord (YCWA et al. 2007) is expected to address the flow-related major stressors to salmonids including flow-dependent habitat availability, flow-related habitat complexity and diversity, and water temperatures. Water temperature evaluations conducted for the Yuba Accord EIR/EIS indicate that lower Yuba River water temperatures generally remain suitable for all life stages of spring-run Chinook salmon and steelhead. Water temperatures generally remain below 58°F (14.4°F) year-round (including summer months) at Smartville, and generally remain below 60°F (15.6°C) year-round at Daguerre Point Dam (YCWA et al. 2007). At Marysville, water temperatures generally remain below 60°F from October through May, and generally remain below 65°F (18.3°C) from June through September (YCWA et al. 2007).

6.5.1.3.6 Spring-run Chinook Salmon Critical Habitat and Primary Constituent Elements

Migration

The primary stressor to adult immigration is fish passage due to barriers. The impediment to fish passage at USACE's Daguerre Point Dam and the complete barrier to passage at USACE's

[11] http://www.yubaaccordrmt.com/Yuba%20Accord%20Documents/Forms/AllItems.aspx?RootFolder=%2fYuba%20Accord% 20Documents%2fYuba%20Accord%20Documents&FolderCTID=&View=%7bB86CA5B0%2d7D95%2d45E5%2dA951%2d795AB3A3A8AF%7d.

Englebright Dam are the principal components affecting adult immigration (January–June). Entrainment and impingement affects juvenile emigration (December–May).

Holding

Water temperature is the primary factor affecting adult holding (July–September). Forced to over-summer in the lower Yuba River due to the passage barrier presented by USACE's Englebright Dam, steelhead and spring-run Chinook salmon are subjected to remain in an area that historically only provided unsuitably warm summer and fall water temperatures that cause reduced fecundity and egg survival, increased susceptibility to disease, and increased mortality rates (CDFG 1991; JSA 1992). Because there was no significant storage devoted to the lower Yuba River before the construction of New Bullards Bar Dam, there was little water available in the summer and fall to support habitat for juvenile steelhead and spring-run Chinook salmon summer rearing, or adult spring-run Chinook salmon summer holding and fall spawning in the lower Yuba River. The operation of New Bullards Bar Dam has generally improved water temperatures in the lower Yuba River, notably with implementation of the Yuba Accord. In its technical memorandum addressing temperature objectives for the Lower Yuba River, the River Management Team (2010) concluded that implementation of the Yuba Accord provides a suitable thermal regime for target species in the lower Yuba River, and did not recommend water temperature-related operational or infrastructure modifications.

Spawning

The primary condition influencing spawning appears to be related to channel morphology and sediment. Spawning (September–March) distribution may be affected by temperature. The earliest spawning generally occurs in the upper reaches of the highest quality spawning habitat (i.e., bellow the Narrows pool) and progressively moves downstream throughout the spawning season (NMFS 2007). Stressors to spawning are primarily related to channel morphology and sediment composition resulting from historic mining and loss of gravel recruitment to dams. Water temperature may influence spawning during the early spawning period (September and October), in the lower reaches of the Yuba River, downstream of Daguerre Point Dam.

Rearing

The lower Yuba River, in providing suitable temperature conditions year round, is unique for a Central Valley tributary. Temperatures in Central Valley tributaries generally become too warm during summer and fall months to provide year round optimal rearing habitat for salmonids. The quantity and quality of suitable rearing habitat in the lower Yuba River is primarily related to stressors related to channel morphology, substrate composition and limited cover, similar to the conditions affecting spawning habitat.

6.5.1.3.7 <u>Conclusions Regarding Effects of the Projects</u>

Licensees conclude the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project, individually and collectively, do not affect Central Valley spring-run Chinook salmon and steelhead in the lower Yuba River. Specifically, in the summertime when adult holding, juvenile rearing, and the initiation of spring-run Chinook salmon spawning is most vulnerable to flow and temperature there is no substantial difference between the regulated flows and the unimpaired flows in the Middle and South Yuba rivers. Table 6.5-2 shows the regulated and unimpaired flows for the Middle and South Yuba rivers for the summertime months of August and September, when temperature is most critical; additional hydrology data is included as Attachment 2-4E to the Hydrologic Alteration Technical Memorandum. In the remainder of the year, minimum flows in the lower Yuba River below USACE's Englebright Dam are currently dictated by the Yuba River Accord.

As shown above, regulated flows during the summer are similar between regulated and unimpaired conditions. Because regulated flows are essentially the same as unimpaired flows during the summer months, PG&E's project operations do not affect flow or temperature upstream, and ultimately fish species or Critical Habitat downstream of Englebright Dam.

Similarly, the Yuba-Bear Hydroelectric Project does not influence flow and temperature conditions downstream of Englebright Dam during the more critical summer period. On whole, the Yuba-Bear Hydroelectric Project diverts the least amount of water as compared to other diversions from upstream of USACE's Englebright Dam. Flow released from storage by the Yuba River Development typically constitute higher flows than would occur in the lower Yuba River without the Project in the summer, fall and sometimes winter seasons (Figures 6.5.1-1 through 6.5.1-6). In addition, the water temperatures in the Middle Yuba River upstream of YCWA's Our House Diversion Dam are much warmer than the water temperature in the lower Yuba River (Figures 6.5.1-8 and 6.5.1-11). For these reasons, the Yuba-Bear Hydroelectric Project's Middle Yuba River diversions do not adversely affect ESA-listed fishes in the Yuba River downstream of Englebright Dam or their Critical Habitat.

With regard to water temperature, Figures 6.5.1-8 through -10 show that New Bullards Bar Reservoir controls water temperatures below USACE's Englebright Dam, and more so during the summer months when cold water in the South and Middle Yuba Rivers would be lacking in the unimpaired condition. Water temperature data below the USACE's Englebright Dam indicate that water cold enough for anadromous fish is currently available year round. If anadromous fish need colder water below USACE's Englebright Dam during the summer, it is not a Yuba-Bear or Drum-Spaulding Project effect because regulated and unimpaired flows are essentially the same during this period.

This section does not address springtime hydrology data as it relates to fish habitat below Englebright Dam because releases from Englebright Reservoir are made consistent with the Yuba River Accord. As a result of the control exerted by the Yuba River Accord, NID's and

PG&E's projects do not cause adverse effects to springtime conditions below Englebright Dam and therefore do not adversely affect fish species or Critical Habitat.[12]

Based on this analysis, both NID and PG&E affirmed their earlier decision to eliminate from further consideration for each project spring-run Chinook salmon and steelhead and their designated Critical Habitats in the Yuba River downstream of USACE's Englebright Dam.

6.5.1.4 Final List of Potentially Affected Species

Based on the above screening process, Licensees concluded that 10 species, four for the Yuba-River Hydroelectric Project and 10 for the Drum-Spaulding Project, listed as threatened or endangered under the ESA have a potential to be affected by one or both of the projects. The species are listed in Table 6.5.1-2.

Table 6.5.1-2. ESA listed species that have a potential to be affected by one or both of the projects.

Common Name ***Scientific Name***	**Yuba-Bear Hydroelectric Project**	**Drum-Spaulding Project**
THREATENED		
Layne's butterweed *Packera layneae*	--	X
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	X (Only below El. 3,000 ft)	X (Only below El. 3,000 ft)
California red-legged frog *Rana draytonii*	X (Only below El. 5,000 ft)	X (Only below El. 5,000 ft)
Steelhead, California Central Valley Distinct Population Segment (DPS) *Oncorhynchus mykiss irideus*	--	X (Only in Auburn Ravine)
ENDANGERED		
Stebbins' morning-glory *Calystegia stebbinsii*[1]	X	X
Pine Hill flannelbush *Fremontodendron decumbens*	X	X
Pine Hill ceanothus *Ceanothus roderickii*	--	X
Eldorado bedstraw *Galium californicum* ssp. *sierrae*	--	X

[12] On January 31, 2011, YCWA filed with FERC a letter commenting on both PG&E's Drum-Spaulding Project's DLA and NID's Yuba-Bear Hydroelectric Project's DLA. As a reference, YCWA's Yuba River Development Project's primary project facility is the 969,600 ac-ft New Bullards Bar Reservoir on the North Yuba River, which was completed in 1970. New Bullards Bar Reservoir captures water from the North Yuba River and Middle Yuba River and releases from this reservoir through YCWA's Colgate Powerhouse into the Yuba River are the primary factor controlling flows in the Yuba River below Englebright Reservoir.

In its January 31, 2011 letter, YCWA concluded that the projects have "significant adverse impacts" on the lower Yuba River "flows and temperatures." This conclusion is not supported by YCWA's analysis. As to temperature effects, YCWA did not provide any water temperature data or any analysis of water temperatures. Therefore, YCWA did not demonstrate that the projects have a significant adverse impact to water temperatures below Englebright Reservoir.

As to flow effects, YCWA concludes that the projects would have affected the YCWA's Yuba Accord flows below Englebright Dam in 4 out of 33 years (1976-2008 water years). However, YCWA's analysis assumes that the projects do not exist. This assumption is not supportable, rendering YCWA's analysis irrelevant; because all reservoirs in the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project existed before YCWA's New Bullards Bar Reservoir, it is improper to analyze the lower Yuba River as if the projects did not exist. Further, the water rights for the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project pre-date YCWA's Yuba River Development Project's water rights.

Additionally, YCWA's analysis did not distinguish between supposed effects of the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project. For instance, the Drum-Spaulding Project does not divert water from the Middle Yuba River; therefore, it is inappropriate to group the Drum-Spaulding Project with the Yuba Bear Hydroelectric Project when assessing affects in the Middle Yuba River watershed. Consequently, neither PG&E nor NID can independently evaluate YCWA's assertions regarding their respective projects.

Table 6.5.1-2. (continued)

Common Name/ Scientific Name	Yuba-Bear Hydroelectric Project	Drum-Spaulding Project
Sacramento Orcutt grass *Orcuttia viscid*	--	X
Hartweg's golden sunburst *Pseudobahia ahiifolia*	--	X

[1] Stebbin's morning-glory is listed as endangered under the California Endangered Species Act (CESA) as well.

Note that, while Table 6.5.1-2 indicates which project might affect the species, to be conservative, Licensees' relicensing studies (listed in Table 6.5-1) focused on the area surrounding both projects.

6.5.2 Consultation with USFWS, NMFS and Other Relicensing Participants

Beginning in mid-2007, over 9 months prior to filing their NOIs and PADs, Licensees together began to meet with other Relicensing Participants to familiarize them with the projects and their operations, discuss process, identify issues, and, most importantly, to collaboratively develop study proposals, including for species listed as threatened and endangered under the ESA. Since that time, Licensees together have held over 150 meetings with other Relicensing Participants, to discuss process and study methods and results. The USFWS and NMFS were each specifically notified of and invited to each meeting, and NMFS has participated in some of the meetings during which ESA fish-related items were discussed. NMFS indicated it views those meetings as section 7 meetings. Because USFWS has been unable to attend many Relicensing Participants meetings, Licensees together have made a special effort to meet with USFWS one-on-one at appropriate times.

Some major milestones specific to ESA consultation are listed below.[13]

- February 6, 2007. Licensees met with USFWS to provide USFWS staff with an overview of each project and each relicensing, and invited USFWS to participate in Relicensing Participant meetings.
- September 24, 2007. NMFS participated in a workshop to develop study proposals related to aquatic resources.
- October 15, 2007. NMFS participated in a workshop to develop an instream flow study.
- October 17, 2007. NMFS participated in a workshop to develop an instream flow study.
- October 29, 2007. NMFS participated in a workshop to develop an instream flow study.
- November 28, 2007. NMFS participated in a workshop to develop an instream flow study.
- December 4, 2007. NMFS participated in a workshop to develop an instream flow study.

[13] Licensees have not listed each Relicensing Participant meeting in which NMFS staff may have participated or every meeting in which ESA-related items (e.g., water temperature modeling, western Placer County streams, and fish passage) may have been discussed.

- January 10, 2008. NMFS participated in a workshop regarding operations of the projects.
- January 14, 2008. NMFS participated in a workshop to develop study proposals related to aquatic resources.
- January 24, 2008. NMFS participated in a workshop to develop study proposals related to aquatic resources.
- February 11, 2008. NMFS participated in a meeting to discuss anadromous fish.
- February 19, 2008. NMFS participated in a field visit to the Western Placer County Streams area.
- March 14, 2008. Licensees provided to USFWS and NMFS copies of the PAD for each project.
- May 22, 2008. FERC issued SD1 that described issues and the geographic scope of the projects' potential effects
- June 10, 2008. FERC issued its Notice of Commencement of Proceeding. In the notice, FERC initiated for each project informal consultation with USFWS and NMFS as required under Section 7 of the ESA and the interagency cooperation regulations at 50 C.F.R., Part 402, and designated each Licensee as FERC's non-federal representative for their respective for purposes of informal consultation.
- June 17, 18, and 19, 2008. FERC conducted a visit to the projects. USFWS did not participate in the site visit to the projects, but NMFS did.
- June 24, 2008. FERC held public NEPA scoping meetings, which were recorded and transcribed by FERC, for the combined projects. USFWS did not attend. NMFS attended and provided oral comments.
- August 11, 2008. NMFS filed comments with FERC on the PADs and FERC's SD1 in a joint letter from NMFS, Forest Service, BLM, NPS, CDFG and SWRCB. With regard to SD1, the joint letter requested that studies be expanded to include anadromous fish, that the geographic scope of the cumulative effects analysis be expanded to include the Yuba River below USACE's Englebright Dam and Deer Creek, and that analysis of consumptive water be expanded to understand potential effects on anadromous fish. With regard to the PADs, the joint letter commented on several of Licensees' study proposals. USFWS did not file comments with FERC or provide any comments to Licensees.
- August 11, 2008. In addition to the joint letter described above, which provided NMFS comments on both of Licensee's PADs and FERC's SD1, NMFS filed a separate letter with FERC. NMFS's letter focused on ESA-related items and described NMFS's resource management goals, and provided NMFS's preliminary analysis of the projects' effects on anadromous fish. NMFS requested that FERC include effects on anadromous fish in many studies, expand the geographic scope of analysis to include the Yuba River below USACE's Englebright Dam and western Placer County streams, and instruct Licensees to perform an analysis of each project's effects on the reintroduction of anadromous fish into the Yuba River basin. Also, NMFS requested two studies: 1) Water Usage and Efficiency, and 2) Anadromous Ecosystem Effect.

- September 22, 2008. Licensees together met with USFWS, NMFS and FERC to discuss and provide copies of the three ESA-related studies proposals planned at that time by Licensees. CDFG attended. The study proposals included: 1) ESA-Listed Plants, 2) ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle, and 3) ESA-Listed Amphibians - California Red-Legged Frog.
- September 25, 2008. FERC issued SD2.
- October 6, 2008. FERC issued Revised SD2.
- October 20 and 21, 2008. Licensees held meetings to discuss each of their Proposed Study Plans, as required by FERC regulations. This was one of numerous meetings held by Licensees to discuss study proposals. USFWS did not attend. FERC and NMFS attended.
- October 27 and 28, 2008. NMFS attended Relicensing Participants meetings regarding potential entrainment and fish passage studies.
- November 17, 2008. FERC, NMFS and Licensees met to discuss FERC's geographic scoping determination.
- November 18, 2008. Relicensing Participants met with Relicensing Participants, including NMFS, to discuss NMFS's proposed study modifications and new studies, including western Placer County streams.
- December 17, 2008. NMFS filed comments with FERC on FERC's SD2.
- December 23, 2008. NMFS filed comments with FERC on Licensees' Proposed Study Plans. USFWS did not file comments with FERC or provide any comments to Licensees.
- February 9, 2009. NMFS filed comments with FERC on Licensees' Revised Study Plans. USFWS did not file comments.
- March 16, 2009. Deadline for filing comments on FERC's Study Plan Determination; USFWS and NMFS did not file comments.
- January 20, 2010. Licensees held a Section 7 consultation meeting with USFWS to discuss potential effects of the projects, USFWS's recommendations, and further actions.
- March 23, 2010. Licensees held an additional Section 7 consultation meeting with USFWS to discuss potential effects of each project, USFWS's recommendations, and further actions. USFWS agreed no additional data gathering is needed for either project regarding ESA plants and VELB.
- May 14, 2010. Deadline for filing comments with FERC on Licensees' Initial Study Reports. USFWS and NMFS did not file comments.
- May 26, 2010. Licensees held a Section 7 consultation meeting with USFWS and FERC to: confirm no additional consultation was required regarding for each project regarding VELB; and to discuss CRLF potential studies.
- June 23, 2010. Relicensing Participants met to begin discussions regarding potential flow-related measures in the Middle Yuba River. NMFS participated.

- June 30, 2010. Licensees held a Section 7 consultation meeting via telephone with USFWS and FERC to continue discussions regarding CRLF for each project.
- July 15, 2010. NMFS attended Relicensing Participants meeting regarding water temperature modeling.

6.5.3 Affected Environment

This section describes existing conditions for: 1) ESA-listed plants; 2) CRLF; 3) VELB; and 4) steelhead. For the latter three, information regarding historical and current distribution of the species in the region, status and Critical Habitat in the region and life history is provided. In addition, the results of Licensees' studies with regard to the presence and distribution of the species and its Critical Habitat in the area of the projects is provided below.

6.5.3.1 Plant Species

Table 6.5.3-1 provides general information for each of the seven listed plant species that has a potential to be affected by one or both of the projects, as listed in Table 6.5.1-1. Designated Critical Habitat for any of the plant species does not occur in the vicinity of the two projects.

Table 6.5.3-1. ESA-listed plant species potentially occurring in the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project boundaries.

Common Name/ Scientific Name	Flowering Period	Elevation Range (ft)	Habitat Requirements	Occurrence in Project Vicinity
Stebbins' morning-glory *Calystegia stebbinsii*	Apr-Jul	607-2,394	Chaparral, cismontane woodland	Shingle Springs, Coloma, Pilot Hill, Grass Valley, Lake Combie
Pine Hill flannelbush *Fremontodendron decumbens*	Apr-Jun	1,394-2,493	Chaparral, cismontane woodland	Shingle Springs, Clarksville, Grass Valley
Pine Hill ceanothus *Ceanothus roderickii*	Apr-Jun	853-2,066	Chaparral, cismontane woodland	Shingle Springs, Clarksville, Pilot Hill Two records within the project vicinity listed on the CNDDB, but not within the FERC Project Boundary
Eldorado bedstraw *Galium californicum* ssp. *sierrae*	May-Jun	328-1,919	Chaparral, cismontane woodland, lower montane coniferous forest	Shingle Springs, Clarksville, Pilot Hill Four records within the project vicinity listed on the CNDDB, but not within the FERC Project Boundary
Sacramento Orcutt grass *Orcuttia viscida*	Apr-Jul	98-328	Vernal pools	Folsom
Layne's butterweed *Packera layneae*	Apr-Aug	656-3,280	Chaparral, cismontane woodland	Shingle Springs, Clarkville, Coloma, Pilot Hill Five records within the project vicinity listed on the CNDDB, but not within the FERC Project Boundary
Hartweg's golden sunburst *Pseudobahia bahiifolia*	Mar-Apr	49-492	Cismontane woodland, valley and foothill grassland	Clarksville

Licensees performed botanical surveys for the seven target ESA-listed plants and other plants within the existing FERC Boundaries for both projects. The surveys began on April 1, 2009, at the lower elevation sites and concluded by August 31, 2009 at the upper elevation sites. In conformance with the FERC-approved study, the surveys followed CDFG's *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and*

Natural Communities (CDFG 2000), were floristic in nature and were conducted on foot and by boat by qualified botanists.

Over 1,400 species of plants were identified for the combined projects during Licensees' floristic surveys for ESA-listed plants, special-status plants and CESA-listed plants.[14] None of the plant species that were found were ESA-listed plants. In addition, no ESA-listed plants were identified as incidental observations during Licensees' other relicensing studies in 2008, 2009 and 2010, and Licensees are unaware of any historic records of ESA-listed plants within the project boundary for either project.

Of the two potentially occurring ESA-listed plant species on the Yuba-Bear Hydroelectric Project, Pine Hill flannelbush is unlikely and Stebbins' morning-glory has the potential to colonize within the Project boundary, based on suitable, available habitat. Pine Hill flannelbush has been indentified exclusively on the Pine Hill formation (there have been reports of Pine Hill flannelbush in some small scattered populations in Yuba County and Nevada County, but other reports describe these individuals as aberrant California flannelbush [*Fremontodendron californicum* ssp. *californicum*]), which does not occur in the Project area (USFWS 2002b). Pine Hill flannelbush, therefore, is unlikely to colonize the Project. Stebbins' morning-glory is known to occur primarily on gabbro soils in the Pine Hill formation; however, an occurrence was also discovered on serpentine soil in Nevada County (USFWS 2002b). On the Yuba-Bear Hydroelectric Project, appropriate habitat occurs primarily along the Dutch Flat No. 2 Conduit. Therefore, this species could potentially colonize the Project area in the future.

Of the seven potentially occurring ESA-listed plant species on the Drum-Spaulding Project, five are unlikely and two have the potential to colonize either Project Area, based on suitable, available habitat. Sacramento Orcutt grass is only known to occur at elevations below the minimum elevation of the Project (below 328 ft) and is unlikely to occur within the Project Area (USFWS 2006a). Hartweg's golden sunburst is only known to occur at elevations below 492 ft and grows only on mima mounds (USFWS 2001a). A small section of the Drum-Spaulding Project near Newcastle Powerhouse is at an elevation range appropriate for Hartweg's golden sunburst, but the mima mounds on which the species grows are not present, so the plants would be unlikely to colonize in the area. Pine Hill flannelbush, Eldorado bedstraw and Pine Hill ceanothus have been identified exclusively on the Pine Hill formation (there have been reports of Pine Hill flannelbush in some small scattered populations in Yuba County or Nevada County, but other reports describe these individuals as aberrant California flannelbush [*Fremontodendron californicum* ssp. *californicum*]), which does not occur in the Project Area (USFWS 2002b). Suitable habitat is not available within the Project Area for Sacramento Orcutt grass, Hartweg's golden sunburst, Pine Hill flannelbush, Eldorado bedstraw and Pine Hill ceanothus; therefore, are unlikely to colonize the Project Area. Stebbins' morning-glory is known to occur primarily on gabbro soils in the Pine Hill formation; however, an occurrence was also discovered on serpentine soil in Nevada County (USFWS 2002b). On the Drum-Spaulding Project, appropriate habitat occurs primarily near the Drum Powerhouse and along the Drum Powerhouse Road.

[14] As detailed in Section 6.5, the ESA-Listed Plants Study is incomplete. Additional areas will be surveyed in the spring/summer of 2011 and updated information included in a revised Technical Memorandum by October 31, 2011.

Therefore, this species could potentially colonize the Project Area in the future. Layne's butterweed is also primarily known from gabbro soils in El Dorado County (including the Pine Hill formation), but has also been found on serpentine soil, including in Yuba County (USFWS 2002b). On the Drum-Spaulding Project, appropriate habitat occurs primarily near the Drum Powerhouse and along the Drum Powerhouse Road. Therefore, this species could potentially colonize the Project Area in the future.

6.5.3.2 California Red-Legged Frog

6.5.3.2.1 Current and Historical Range

The historical range of the CRLF extends through Pacific slope drainages from Shasta County, California, to Baja California, Mexico, including the Coast Ranges and the west slope of the Sierra Nevada Range at elevations below 4,000 feet. The current range of this species is greatly reduced, with most remaining populations occurring along the coast from Marin County to Ventura County. In the Sierra Nevada region, there are only eight known extant populations of CRLF, most of which contain few adults (Shaffer et al. 2004; USFWS 2006b, Tatarian and Tatarian 2010). The species is nearly extirpated in the Sierra Nevada foothills.

The known occurrences nearest to the projects are isolated populations ranging from 2,100 to 3,200 feet located in Butte (private land), Yuba (Plumas National Forest), Nevada (private), Placer (El Dorado National Forest and private land), and El Dorado (BLM) Counties.

According to the CRLF Recovery Plan (USFWS 2002c), factors associated with declining populations of the frog include degradation and loss of its habitat through: 1) agriculture, 2) urbanization, 3) mining, 4) overgrazing, 5) recreation, 6) timber harvesting, 7) the introduction of non-native plants that affect the frog's habitat, 8) impoundments, 9) water diversions, 10) degraded water quality, 11) use of pesticides, and 12) introduced predators (e.g., bullfrogs, crayfish, and a variety of non-native predatory fish).

6.5.3.2.2 Status and Critical Habitat

The CRLF was listed as a threatened species under the ESA by the USFWS on May 23, 1996 (USFWS 1996).

Critical Habitat is defined in the ESA ((16 U.S.C. §1532(5)(A)) as, "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed…upon a determination by the Secretary that such areas are essential for the conservation of the species." Critical Habitat was originally designated for CRLF on March 13, 2001 and redesignated on April 13, 2006 (USFWS 2006b). However, due to court challenges and questions about scientific validity, USFWS made a series of proposed revisions to Critical Habitat for the CRLF. The Final Critical Habitat designation was issued on March 17, 2010 (USFWS 2010a, b).

The PCEs for the CRLF Critical Habitat are: a) suitable aquatic habitat; b) associated uplands; and c) suitable dispersal habitat connecting suitable aquatic habitat (Allen and Tennant 2000; USFWS 2001b). At a minimum, this will include two or more suitable breeding locations, one of which must be a permanent water source, associated uplands surrounding these water bodies (extending to 500 ft from the water's edge), all within 1.25 mi of one another and connected by barrier-free dispersal habitat of at least 500 ft in width.

Suitable aquatic habitat consists of permanent and seasonal water bodies of virtually still or slow-moving fresh water including natural and man made ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds. CRLF are not characteristically found in deep lacustrine habitats (e.g. deep lakes and reservoirs). A minimum water depth of 20 cm during the entire tadpole rearing season is required. Dense, shrubby riparian vegetation (e.g. willow and tule [*Scheonoplectus*] species), and bank overhangs are important features of CRLF breeding habitat. CRLF tend to be found in greater numbers in deeper, cooler pools with dense emergent and shoreline vegetation (Allen and Tennant 2000).

Suitable upland habitat consists of all upland areas (riparian or otherwise) within 500 ft of the water's edge, but not further than the watershed boundary. This upland habitat is important in maintaining the integrity of CRLF aquatic/breeding habitat, as land use activities adjacent to and upstream of suitable aquatic habitat greatly affect the quality of aquatic/breeding habitat downstream (Allen and Tennant 2000).

Suitable dispersal habitat consists of all upland and wetland habitat that connect two or more patches of suitable aquatic habitat within 1.25 mi of one another. Dispersal habitat must be at least 500 ft wide and free of barriers such as, heavily traveled roads (roads with more than 30 cars per hour), moderate to high-density urban or industrial developments, and large reservoirs (Allen and Tennant 2000). The healthiest CRLF populations persist and flourish where suitable breeding and non-breeding habitats are interspersed throughout the landscape and are interconnected by un-fragmented dispersal habitat (Allen and Tennant 2000).

CRLF is not listed as threatened or endangered under CESA, is not formally listed as a sensitive species by the Forest Service or BLM, and is not considered a Species of Special Concern by CDFG.

6.5.3.2.3 Life History

CRLF breeding occurs from late November to late April in ponds or in backwater pools or creeks. Egg masses are attached to emergent vegetation such as cattails and bulrushes. Larvae remain in these aquatic habitats until metamorphosis. Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae typically metamorphose between July and September, and most likely feed on algae (Jennings and Hayes 1994).

Outside of the breeding season, adults may disperse upstream, downstream, or upslope of breeding habitat to forage and seek sheltering habitat. Live frogs are known to take shelter in small-mammal burrows, leaf litter, and other moist sites in or near (up to 200 feet from) riparian areas (Jennings and Hayes 1994; USFWS 2006b). During wet periods, long distance dispersal of up to a mile may occur between aquatic habitats, which may require traversing upland habitats or ephemeral drainages (USFWS 2006b). Seeps and springs in open grasslands can function as foraging habitat or refugia for wandering frogs (USFWS 1997).

CRLF is primarily associated with perennial ponds or pools and perennial or seasonal streams where water remains for a minimum of 20 weeks beginning in the spring (i.e., sufficiently long for breeding to occur and larvae to complete development) (Jennings and Hayes 1994, USFWS 2006b). Locations with the highest densities of CRLF exhibit dense emergent or shoreline riparian vegetation closely associated with moderately deep (greater than 2.3 ft), still, or slow-moving water. The types of vegetation that seem to provide the most suitable structure are willows, cattails, and bulrushes at or close to the water level, which shade a substantial area of the water (Hayes and Jennings 1988). Another correlate to CRLF occurrence is the absence or near-absence of introduced predators such as American bullfrog and predatory fish—particularly Centrarchids (i.e., freshwater sunfishes), which feed on the larvae at higher rates than native predatory species (Hayes and Jennings 1988)—and mosquitofish. Hiding cover from predators may be provided by emergent vegetation, undercut banks, and semi-submerged root wads (USFWS 2005). Some habitats that are not suitable for breeding (e.g., shallow or short-seasonal wetlands, pools in intermittent streams, seeps, and springs) may constitute habitats for aestivation, shelter, foraging, predator avoidance, and juvenile dispersal.

6.5.3.2.4 Licensees' ESA-Listed Amphibians – CRLF Study

In 2009, Licensees reviewed CRLF records and conducted site (habitat) assessments for CRLF at all reservoirs and impoundments below 5,000 ft elevation associated with the two projects and 165 other aquatic habitat sites within 1 mi of these facilities. Habitat conditions in stream reaches affected by the two projects were also evaluated using existing information. No CRLF were observed during the site assessments nor were there any incidental sightings of CRLF during performance of the other relicensing studies from 2007 through 2010.

The review of CRLF records and site assessments were designed to evaluate the likelihood that CRLF or suitable habitat currently exists in the vicinity of a project's facilities or features, and if the projects have a potential to affect CRLF. As part of the study, Licensees consulted with the USFWS to assess whether the study and existing and available information were sufficient to make a determination as to how CRLF issues should be addressed. USFWS concluded that additional information was not needed.

The review of records indicated that there are no known CRLF populations and no Critical Habitat in the immediate vicinity of the two projects. The nearest known extant occurrences are within the following Critical Habitat Units:

- NEV-1, 4.58 mi west of Deer Creek Forebay (Drum-Spaulding Project),
- PLA-1, 11.49 mi southeast of Rollins Reservoir (Yuba-Bear Hydroelectric Project), and
- YUB-1, 19.36 mi northwest of Deer Creek Forebay (Drum-Spaulding Project).

Two historical CRLF records are in the vicinity of project features. A 1939 CRLF record from the town of Dutch Flat is less than 1 mi from Dutch Flat Afterbay and Dutch Flat No. 2 Forebay (Yuba-Bear Hydroelectric Project), and a 1946 record from the town of Auburn is slightly more than 1 mi from Wise Forebay (Drum-Spaulding Project). Suitable habitat is not currently evident at the location of either of these historical records, and there are no known extant CRLF populations in either area.

Aquatic habitats potentially suitable for CRLF within the 1.0-mi radius assessment areas surrounding each project's facilities and features were identified from aerial imagery, National Wetland Inventory (NWI) maps and other available information. All possible, accessible habitat locations were assessed in the field to determine whether the site met criteria for potential breeding habitat (locations on private property were typically evaluated from the nearest adjacent public road), whereas locations not accessible were evaluated from aerial imagery. Locations included stock ponds, irrigation ponds, water detention ponds, natural ponds, emergent and shrub wetlands, streams, reservoirs, forebays, and afterbays. Sites were categorized as possessing the essential components of CRLF breeding habitat where dense, shrubby, or emergent vegetation was closely associated with deep, still, or slow-moving water that persists for a sufficient portion of the breeding season in order for larvae to reach metamorphosis. The presence of predatory fish was considered an unfavorable habitat feature which reduced potential habitat quality.

The site assessment determined that 119 sites have or are presumed to have the essential components of CRLF breeding habitat. Most of these sites are on private property, two sites are on NFS land, and two sites are on public land administered by BLM. American bullfrog, a predator and competing species with CRLF, and bass or sunfish, which are CRLF predators, were documented at 17 of these 119 sites and likely occur at other sites, diminishing the potential suitability for CRLF at those locations.

Fifteen of the assessment sites were reservoirs and other impoundments associated with the Drum-Spaulding Project and Yuba-Bear Hydroelectric Project, of which eight sites may meet the criteria for potential CRLF breeding habitat, although habitat at each is likely of marginal quality because of the presence of predatory fish, generally artificial conditions (e.g., steep banks with little or no vegetation), and in some instances, isolation from any other potential breeding habitat (Table 6.5.3-2).

Table 6.5.3-2. Project reservoirs and impoundments that may meet breeding habitat criteria for CRLF.

Project Feature	Type of Feature	Locations with Suitable Aquatic Habitat Within 1.0 Mile of Project Site	Conclusion
YUBA-BEAR HYDROELECTRIC PROJECT			
Dutch Flat No. 2 Forebay	Re-regulating reservoir. Artificial habitat	None	Dutch Flat No. 2 Forebay is isolated, artificial habitat. Use by CRLF is highly unlikely.
Dutch Flat Afterbay	Re-regulating reservoir. Artificial habitat	Two (a seasonal and a perennial pond, with bullfrogs)	Dutch Flat Afterbay is potential artificial habitat, but only marginally suitable (fish present).

Table 6.5.3-2. (continued)

Project Feature	Type of Feature	Locations with Suitable Aquatic Habitat Within 1.0 Mile of Project Site	Conclusion
DRUM-SPAULDING PROJECT			
Little York Basin	Impoundment along Chicago Park Conduit	One (perennial pond of low quality)	Little York Basin is potential artificial habitat, but only marginally suitable (fish present).
Chicago Park Forebay	Re-regulating reservoir. Artificial habitat	Three wetlands, including a stock pond	Chicago Park Forebay is artificial habitat without emergent vegetation. Use by CRLF is highly unlikely.
Deer Creek Forebay	Re-regulating reservoir. Artificial habitat	None	Deer Creek Forebay is potential artificial habitat, but only marginally suitable (fish present, including brown trout, common carp and bluegill) and isolated. Shoreline vegetation (potential hiding cover) is periodically cut.
Drum Afterbay	Afterbay (receives canal water and returns water to Bear River)	None	Drum Afterbay is potential artificial habitat, but only marginally suitable (fish present, including rainbow trout, common carp, bluegill, and redear sunfish) and is isolated.
Halsey Afterbay	Re-regulating reservoir. Artificial habitat	Five sites, including perennial ponds, all on private property.	Halsey Afterbay is potential artificial habitat, but only marginally suitable (fish present, including bluegill).
Rock Creek Reservoir	Re-regulating reservoir. Artificial habitat	Twelve sites, including perennial ponds, all on private property.	Rock Creek Reservoir is potential artificial habitat, but only marginally suitable (fish present, including largemouth bass, crappie, and green sunfish).

Stream reaches potentially affected by one or both of the projects that were assessed as part of Licensees’ study generally lack the essential components of CRLF breeding habitat, although they could serve as dispersal habitat. Pools or backwaters with suitable associated emergent or margin vegetation were documented only on parts of three stream reaches potentially affected by the Drum-Spaulding Project: Bear River Reach #2 (Bear River above Drum Afterbay), Halsey Afterbay Dam Reach (Dry Creek), and Rock Creek Dam Reach (Rock Creek). Most of the project-affected stream reaches are relatively large streams that do not constitute potential breeding habitat, although they might be suitable non-breeding habitat if CRLF breeding populations occur within dispersal distance.

The results of the assessments on non-project sites (e.g., facilities or features that are not part of either project, but located within 1 mi of a one of the project’s facilities or features) indicated that the essential components of CRLF breeding habitat were present at about 67 percent of the non-project sites. These non-project sites with potential CRLF breeding habitat were within 1 mi of the following project facilities: Dutch Flat Afterbay, Little York Basin, Chicago Park Forebay, Rollins Reservoir (Yuba-Bear Hydroelectric Project), Lake Spaulding, Halsey Forebay, Halsey Afterbay, Rock Creek Reservoir, and Wise Forebay (Drum-Spaulding Project). Most (78 percent) of the non-project sites with potential CRLF breeding habitat were located on private property and the surrounding land-use was predominately urban/residential, agriculture, forestry, mining, and recreation.

Five of the non-project sites that were assessed are located on NFS land and two of these sites, both within the Lake Spaulding assessment area, possess the essential components of CRLF breeding habitat. Three of the non-project sites are situated on public land administered by BLM; none of these locations possesses the essential components of CRLF breeding habitat.

6.5.3.3 Valley Elderberry Longhorn Beetle

6.5.3.3.1 Current and Historical Range

VELB ranged historically throughout the Central Valley, extending up river canyons in the Sierra Nevada foothills to an elevation of about 3,000 ft. The beetle is completely dependent upon its host plant, elderberry (*Sambucus* spp.), for all of its life stages (e.g., eggs, larvae, and adults). Elderberry is a common component of riparian forests and adjacent uplands. The beetles' use of elderberries is not easily detectable; often the only exterior evidence is an exit hole created by the larva just prior to pupation.

6.5.3.3.2 Status and Critical Habitat

On August 8, 1980, USFWS listed VELB as threatened under ESA (Federal Register 45:52803). Critical Habitat has been designated for the species, including the American River Parkway and Sacramento Zones.

The USFWS issued a VELB Recovery Plan on August 28, 1984.

On February 14, 2007, the USFWS completed a 5-year review, which resulted in USFWS's recommendation that the species be de-listed. However, a de-listing proposal has not yet been released.

VELB is not listed as threatened or endangered under CESA, is not formally listed as a sensitive species by the Forest Service or BLM, and is not considered a Species of Special Concern by CDFG.

The USFWS considers VELB, though wide-ranging, to be in long-term decline due to human activities that have resulted in widespread alteration and fragmentation of riparian habitats and, to a lesser extent, upland habitats, which support the beetle. The primary threats to survival of the beetle include:

- Loss and alteration of habitat by agricultural conversion
- Over grazing
- Levee construction
- Stream and river channelization
- Removal of riparian vegetation
- Rip-rapping of shoreline
- Non-native animals such as the Argentine ant, which may eat the early phases of the beetle
- Recreational, industrial, and urban development

Indiscriminant insecticide and herbicide use in agricultural areas and along road right-of-ways may be factors limiting the beetle's distribution. The age and quality of individual elderberry shrubs/trees and stands may also be a factor in its limited distribution because elderberry leaves and flowers are also the beetle's only food source (USFWS 2009).

USFWS issued Conservation Guidelines (the Guidelines) in 1999 for VELB. Under the Guidelines, where there are elderberry plants with stems that meet the 1.0-inch-diameter threshold on or adjacent to a project site, the plants must be thoroughly searched for beetle exit holes to evaluate potential impacts to VELB habitat. Elderberry plants lacking stems 1.0 inch or greater in diameter at ground level are considered unsuitable for use by the beetle and are not protected under the Guidelines.

6.5.3.3.3 Life History

The VELB life cycle takes 1 or 2 years to complete, with most of that time spent as larva living within the stems of the elderberry plant. Eggs are laid on elderberry leaves or bark and hatch within 2 days; the emerged larvae live within the stems of the plants, feeding on pith for 1 to 2 years. Adults emerge from the stems through holes made by larva prior to pupation. Adults generally emerge from late March through June and are short-lived (USFWS 2009).

6.5.3.3.4 Licensees' ESA-Listed Wildlife – VELB Study

The Yuba-Bear Hydroelectric Project and Drum-Spaulding Project facilities are outside of the Critical Habitat zones designated by USFWS for VELB, but portions of each project fall within the potential range of the beetle.

Licensees' study began on April 1, 2009, at lower elevation sites and concluded by June 30, 2009, at upper elevation sites. In conformance with the FERC-approved study, field surveys were conducted for the beetle's host plant, elderberry. Qualified botanists followed CDFG's *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities* (CDFG 2000). Surveyors examined the elderberry plants for evidence of VELB presence, counted the number of stems greater than 1 inch in diameter, and counted exit holes, if they occurred.

No elderberry plants or VELB were found in the Yuba-Bear Hydroelectric Project.[15] Other relicensing studies did not find any incidental observations of elderberry plants or VELB in the vicinity of the Yuba-Bear Hydroelectric Project, and NID is unaware of any historical records of VELB within the Yuba-Bear Hydroelectric Project FERC Project Boundary.

A total of 26 occurrences (e.g., locations) of elderberry plants was found within the FERC Project Boundary of the Drum-Spaulding Project, 22 on the Bear River Canal, 3 on a drainage between Wooley Creek and the Bear River Canal, and one in Mormon Ravine near the

[15] As detailed in Section 6.5, the ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle is incomplete. Additional areas will be surveyed in the spring/summer of 2011 and updated information included in a revised Technical Memorandum by October 31, 2011.

Newcastle Powerhouse. VELB indicators (i.e. boreholes) were located at three occurrences: 14 holes at one location (occurrence 7), 10 holes at another site (occurrence 19) and three holes at the last site (occurrence 22). For more detailed information on these occurrences please see Technical Memorandum 7-2 in Appendix E12 of this Exhibit E.

6.5.3.4 Steelhead in Auburn Ravine

6.5.3.4.1 Current and Historical Range

The historic distribution of steelhead in the Central Valley is not known, but in rivers where the species still occurs, steelhead are normally more widely distributed than Chinook salmon (Voight and Gale 1998, cited in McEwan 2001; Yoshiyama et al. 1996). Steelhead are typically tributary spawners.

Lindley et al. (2006) predicted the historical distribution of steelhead, using an Intrinsic Potential habitat model. They found that at least 81 independent populations of *O. mykiss* were widely distributed throughout the Central Valley, but that populations were relatively less abundant in San Joaquin River tributaries than in Sacramento River tributaries because of natural barriers to migration.

Naturally spawning steelhead populations have been found in the: upper Sacramento River downstream from Keswick Dam; in portions of the Feather, Yuba, American, and Mokelumne rivers; and in Mill, Deer, and Butte creeks (McEwan 2001). The steelhead population in the mainstem San Joaquin River was extirpated; however, small populations of steelhead persist in the lower San Joaquin River tributaries (i.e., the Stanislaus and Tuolumne rivers and possibly the Merced River) (McEwan 2001, Zimmerman et. al. 2008). Naturally spawning populations may exist in many other streams, but remain undetected because of the lack of monitoring or research programs. Steelhead also rear in and migrate through the Delta.

NMFS has concluded that populations of naturally reproducing steelhead have been experiencing a long-term decline in abundance throughout their range. Populations in the southern portion of the range have experienced the most severe declines, particularly in streams from the Central Valley south, where many stocks have been extirpated (NMFS 1996a). Since the early 20th Century, 23 naturally reproducing populations of steelhead are believed to have been extirpated in the western United States. Many more are thought to be in decline in Washington, Oregon, Idaho, and California. The decline of stocks in California has been particularly steep.

The historic run size of Central Valley steelhead is difficult to estimate given limited data, but may have approached 1 to 2 million adults annually (McEwan 2001). In the past 30 years, populations of naturally spawned steelhead in Central Valley streams have declined substantially. Hallock and others (1961) estimated that the average annual steelhead run size in the Sacramento River system (above the mouth of the Feather) during the 1950s was 20,540 adults. Steelhead counted at Red Bluff Diversion Dam (RBDD) averaged 11,187 for the period of 1967–1977, declining to an average of 2,000 through the 1980s into the early 1990s. The estimated total annual run size for the entire Sacramento–San Joaquin system, during that same period, was about 10,000 adults (McEwan 2001). Steelhead escapement surveys at RBDD ended in 1993 because of changes in dam operations (NMFS 2009).

6.5.3.4.2 Status and Critical Habitat

Central Valley steelhead is the only federally listed fish species known to occur in the geographic scope of one or both of the projects. It is currently listed as a threatened species under the ESA and NMFS (70 FR 52488- 52627) has designated steelhead critical habitat in Auburn Ravine from RM 0 to RM 26.6. PCEs within Auburn Ravine include adult and juvenile migration, spawning and incubation, and juvenile rearing.

In designating Central Valley steelhead Critical Habitat, NMFS considered the known physical and biological features (PCEs) within the current and historically occupied areas that are essential to the species' conservation and that may require special management considerations or protection. These PCE's include sites essential to support one or more life stages of the DPS (Distinct Population Segment – a regional grouping of a species) including spawning, rearing, migration and foraging. These sites in turn contain physical or biological features essential to the conservation of the DPS (e.g., spawning gravels, water quality and quantity, side channels, or forage species). The lateral extent of the designated Critical Habitat for Central Valley steelhead is proposed as the width of the stream channel at ordinary high water or its bankfull elevation (70 FR 52488-52627).

PG&E's stream habitat surveys in 2007 indicate that the Auburn Ravine channel has two forms that strongly influence Critical Habitat PCEs. The lowermost stream section (RM 0.0 at East Side Canal to RM 22.6) is low gradient, unconfined, incised, straightened, with significant grazing, bank failures, residences, recreation, and diversions and dams. Bank material is erosive when exposed, both through bank failures and surface erosion. Sediment supply greatly exceeds transport capability and channel is filled with fine gravel and sand. There are no limits to vertical or lateral movement as stream energy appears sufficient to move the material available and there are extensive sections with no streamside vegetation or other sort of bank protection. Per Bailey (2003), the lowermost 13.4 mi of Auburn Ravine is primarily a migration corridor. Flow and water quality, including temperature conditions, within this lower reach need to be suitable for migration, including depths, velocities, temperature and chemical constituents to attract and support migration.

In the uppermost section of Auburn Ravine, beginning near RM 22.6 and moving upstream, substrate size increases (yielding gravel and cobble for food production and spawning habitats), bank stability increases, and the channel becomes a narrow, confined transport reach interspersed with wider depositional sections (yielding riffles and complex pools habitats for potential spawning and rearing). In the area below the Wise powerhouses (RM 22.6 to RM 27.6), lateral and vertical stability are provided by resistant parent material and coarse substrate. The coarser substrate of gravel and cobble, provide suitable spawning habitats. The pools and riffles, along with the diversity of channel configurations, provide adult holding and juvenile rearing. And likely the most important PCE component, cool water temperatures, especially during late spring and summer when sustained by irrigation flow releases, support early life stage rearing and over summer growth, which is critical to a successful salmonid population. Stream reaches at elevations similar to Auburn Ravine are ephemeral or intermittent, with warm surface waters during critical periods of salmonid life stages, and do not support trout or other coldwater fish populations that require suitable, year-round temperatures.

6.5.3.4.3 Life History

Central Valley steelhead can enter the Sacramento River drainage, including many of its tributary streams, year round. However, the majority of the spawning run in the vicinity of Auburn Ravine occurs from late fall to early spring when streamflow is high enough and cool enough for migration and spawning. Typically this occurs between December and April; however, spawning within the streams around Auburn Ravine usually occurs from late January through March. Fry emerge about 4 to 6 weeks after spawning, typically from late March to May. Juveniles can remain in freshwater for one to three years before migrating to the ocean to grow and mature. However, within the lower elevation streams of the Central Valley, including the American and Feather Rivers, most steelhead spend just one year in the natal stream with emigration typically occurring by the spring following emergence between January and May, and occasionally as early as October (McEwan 2001). Steelhead juveniles appear to remain within the same area occupied at the beginning of the summer, when they reach fingerling size, and do not leave that area until they begin to smolt and commence migrating toward the ocean. In the American River, this downstream migration appears to begin in late summer. Some steelhead juveniles can remain in freshwater until they mature, or for life. Such polymorphic behavior can be a response to food availability and habitat conditions in the natal stream and can provide a life history scenario that allows various portions of the populations to sustain variable hydrology, ocean conditions, including the capability for multiple generations to be sustained by the resident component of the populations (McEwan 2001).

6.5.3.4.4 PG&E's Western Placer County Streams Study

Licensees did not perform a specific study for steelhead in Auburn Ravine. However, PG&E's Western Placer County Streams Study (Study 2.3.13) provides relevant information on water resources issues, hydroelectric operations, fisheries and habitat within Auburn Ravine, which is summarized below. This section also includes a description of historical information regarding steelhead in Auburn Ravine. For more details on results of the Western Placer County Streams study, please see the technical memorandum (3-13) in Appendix E12 of this Exhibit E.

Water Resources in Auburn Ravine

PG&E's Western Placer County Streams Study (Study 2.3.13) identified two stream reaches in Auburn Ravine (Upper and Lower), based on potential project influence on flows. Upper Auburn Ravine is 1.2 miles long and extends from the confluence of Auburn Ravine and the point of discharge or spill from PG&E's two Wise powerhouses (RM 27.6) downstream to PCWA's Auburn Tunnel (RM 26.4). Water from PG&E's two Wise powerhouses discharges into PG&E's South Canal. During the non-consumptive water delivery season (i.e., November–April), PG&E typically releases up to 80 cfs into Upper Auburn Ravine from the South Canal due to a mismatch in capacities between the upstream powerhouses and the canal. Normally, once the consumptive water delivery season (i.e., mid-April–mid-October) commences, NID begins requesting PG&E make water releases from the South Canal for NID's water deliveries. The water released by PG&E into Auburn Ravine then begins to increase in order to meet the NID demand up to a maximum of 170 cfs. In some years NID may begin requesting water prior to mid-April.

From PCWA's Auburn Tunnel, Lower Auburn Ravine extends another approximately 26.4 miles downstream to SSWD's East Side Canal. East Side Canal connects with the Cross Canal and any water that is not otherwise diverted out of Lower Auburn Ravine, East Side Canal, or Cross Canal then passes into the Sacramento River just below the confluence of the Sacramento River and the Feather River. A simplified schematic of typical water diversions into and out of Auburn Ravine is provided as Figure 6.5.3-1 below. A complete schematic of the Auburn Ravine and Western Placer County Streams area is included as Figure 6.5.3-2. The Western Placer County Streams Technical Memorandum (3-13) also includes this schematic with the locations of major features in Auburn Ravine and other parts of the western Placer County area, and a map of the same general area covered by the schematic.

The Drum-Spaulding Project does not divert any water from Auburn Ravine. Auburn Ravine has a natural year-round base flow generally in the range of 5-10 cfs (as measured at the City of Auburn Waste Water Treatment Plant at RM 27, gage AR-1). The Project delivers water into Auburn Ravine, which, from approximately November 5th through mid-April, is primarily associated with hydroelectric operations (NID and PCWA occasionally request water deliveries from PG&E during this time period); however, periodic high flow spikes between November and April would occur with or without the hydroelectric Project, due to natural precipitation-related high-flow events. During the November–April period in higher flow conditions, the two Wise powerhouses can be operated at full capacity. However, due to a limited canal capacity in South Canal in such cases, excess water spills into Auburn Ravine.[16] Water from the Project's two Wise powerhouses discharges into the Project's South Canal. Together, Wise Powerhouse and Wise No. 2 Powerhouse can pass a total of 473 cfs into South Canal. South Canal has a capacity of approximately 393 cfs beginning approximately 1,500 feet downstream from Wise Powerhouse and Wise No. 2 Powerhouse. During the winter and early spring months of wetter years (i.e., approximately 7 out of 10 years), PG&E operates Wise Powerhouse and Wise No. 2 Powerhouse at capacity and, when there are spills, those spills are generally in the range of 40 cfs and 80 cfs into Upper Auburn Ravine from the upper end of South Canal in order not to exceed the canal capacity of 393 cfs downstream.

[16] The majority of water added to Auburn Ravine comes from the lower Drum System, which originates at the Project's Bear River Canal Diversion Dam on the Bear River immediately below NID's Rollins Reservoir and Powerhouse. Water in the lower Drum System is imported from other watersheds including the Middle Yuba River (NID), South Yuba River (PG&E and NID), Bear River (PG&E and NID), and North Fork of North Fork American River (PG&E).

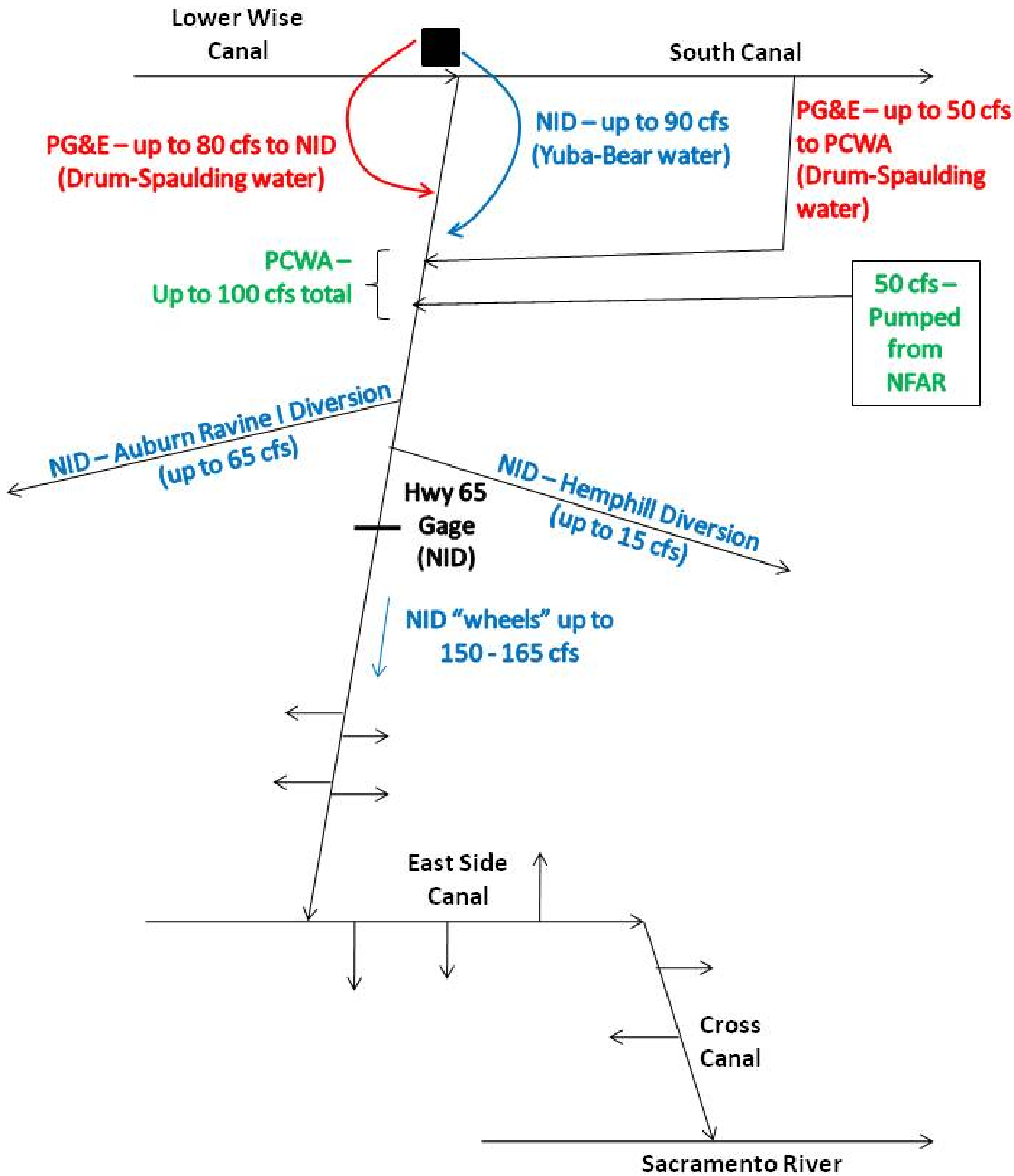

Figure 6.5.3-1. Simplified schematic of typical diversions into and out of Auburn Ravine during the irrigation season (April 15 to October 15).

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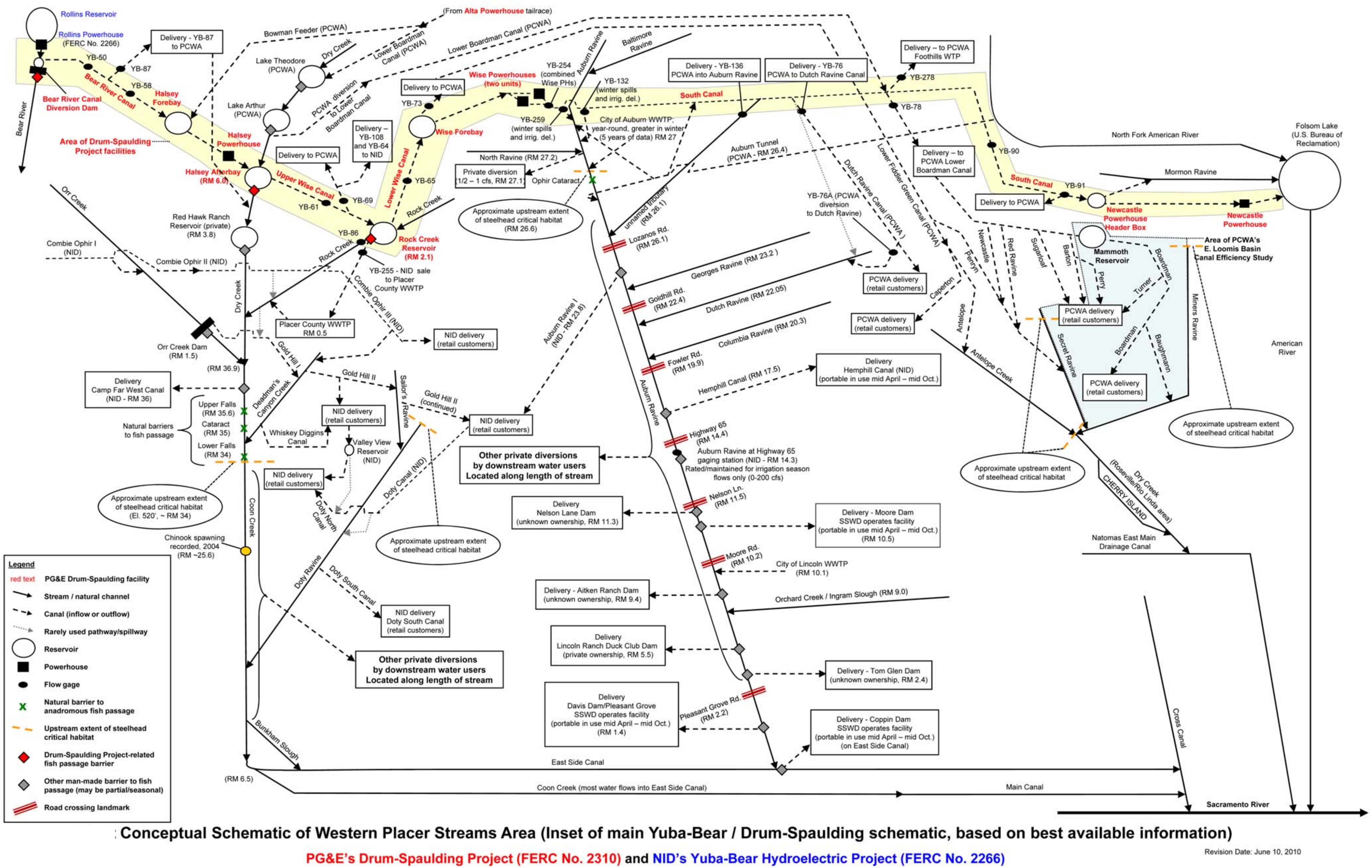

Figure 6.5.3-2. Western Placer County Streams Area, complete schematic.

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From mid-April through mid-October, water is delivered for consumptive water delivery purposes, and would be delivered irrespective of hydroelectric operations. Once the consumptive water delivery season commences, under its current contracts with PG&E, NID begins requesting water from the South Canal to be released into Upper Auburn Ravine. NID sets the timing, amount and frequency of those releases, up to a maximum of 170 cfs. Also between mid-April and mid-October, under its contracts with PG&E, PCWA begins requesting up to 50 cfs from the South Canal at YB-136 into an unnamed tributary to Lower Auburn Ravine. PCWA also takes up to 78 cfs from South Canal at YB-76, up to 20 cfs of which may be sent during the consumptive water delivery season via a PCWA canal to Dutch Ravine[17] and then down to Lower Auburn Ravine at RM 22. PCWA sets the timing, amount and frequency of those releases, up to a maximum of 128 cfs. PCWA also adds water to Lower Auburn Ravine via their Auburn Tunnel using pumps on the North Fork American River above Folsom Lake.

Outside of PG&E, NID and PCWA, multiple other entities also operate facilities on or adjacent to Auburn Ravine that affect flows in the ravine. North Ravine enters Lower Auburn Ravine at RM 27.3, 0.3 mile below the Project's Wise powerhouses. A private diversion dam located near RM 27.2 just below North Ravine diverts approximately 0.5 cfs (according to NID) during the consumptive water delivery season.[18]

At RM 27.0, the City of Auburn Wastewater Treatment Plant (WWTP) discharges effluent (at a secondary treatment level) year-round into Lower Auburn Ravine. The City of Auburn maintains a streamflow gage in Lower Auburn Ravine just upstream of their effluent discharge point to determine the amount of effluent they can discharge according to their permit requirements. The level of discharge since 2005 has ranged from 1 to 9 cfs but averaged close to 2 cfs. At RM 26.4, PCWA imports up to 50 cfs of water into Lower Auburn Ravine from the North Fork American River via the Auburn Tunnel from PCWA's American River Pump Station, situated on the North Fork American River just above Folsom Lake. These deliveries typically extend from May through October, peaking in July or August.

PCWA uses Lower Auburn Ravine to seasonally (mid-April to mid-October) convey up to 70 cfs from South Canal (via deliveries from YB-136 and YB-76) and up to 50 cfs from the Auburn Tunnel to Zone 5 agricultural customers (primarily rice farmers) in western Placer and southeast Sutter counties via the diversions between NID's Highway 65 gage and East Side Canal. PG&E's understanding is that PCWA relies upon SSWD to distribute the water. The PCWA Auburn Tunnel delivery of North Fork American River water is limited to 50 cfs through a commitment associated with the American River Pump Station EIR/RIS, to avoid impacts to fish (including anadromous fish), and aquatic and terrestrial (riparian) resources. Additionally, PCWA committed to a flow and water temperature monitoring program, including installation of several new flow gages and temperature recorders along Auburn Ravine, as a conservation measure associated with the American River Pump Station EIR/EIS (PCWA 2002). PCWA determines the amount delivered through each point by balancing the supply, demand, and cost

[17] PCWA has not used the diversion into Dutch Ravine since water year 2003.
[18] This private dam appears to be capable of diverting substantially more water from Auburn Ravine than the 0.5-1 cfs estimated diversion noted above. PG&E has no control over this diversion, and has no way to regularly or reliably determine how much water is diverted by third parties at this location.

of the water. The cost of pumped North Fork American River water is the highest of PCWA's water sources, but must be used to replace South Canal supplies if irrigators require water when the Wise powerhouses and South Canal are shut down in October for annual maintenance. The supply of PG&E water is lower in drier years whereas the available supply at the North Fork American River Pump Station typically remains constant.

NID's Auburn Ravine I Diversion Dam, located at RM 23.8, is a permanent diversion (i.e., operates year-round) with peak diversion capacity of 65 cfs. At RM 20.3, the natural flows of Columbia Ravine converge with Lower Auburn Ravine. NID's Hemphill Diversion Dam, located at RM 17.5, operates seasonally and has a peak diversion capacity of approximately 25 cfs. This diversion dam generally operates during the consumptive water delivery season. The Hemphill Diversion Dam diverts water from Auburn Ravine from mid-April to mid-October for 10 agricultural customers and two golf courses. NID also has a non-firm agreement with SSWD, providing water to the water district in Lower Auburn Ravine when it is available.

Further downstream, a seasonal diversion of unknown ownership is located at RM 11.3 at Nelson Lane. At RM 10.5, South Sutter Water District (SSWD) maintains a seasonal diversion (operated between mid-April and mid-October) at Moore Dam. The City of Lincoln WWTP also discharges treated wastewater into Auburn Ravine at RM 10.5. At RM 9.5 Aitken Ranch Dam is a seasonal diversion of unknown ownership. Orchard Creek/Ingram Slough converges with Lower Auburn Ravine at RM 9.2. At RM 5.4, Lincoln Duck Club operates a seasonal diversion for an extended period into November, whereas the other seasonal diversions cease operation in mid-October (Bailey and Buell 2005). At RM 2.3, the Tom Glen Dam is a seasonal diversion of unknown ownership. SSWD maintains seasonal diversions at RM 1.4 near Pleasant Road and at Coppin Dam on the East Side Canal near the point where Lower Auburn Ravine enters East Side Canal.

Figures 6.5.3-3 through 6.5.3-22 provide representative photographs of Auburn Ravine, including unidentified diversion dams at various locations in Lower Auburn Ravine, and Coppin Dam on East Side Canal immediately downstream of the confluence with Lower Auburn Ravine. These photographs are also included as a part of the Western Placer County Streams Technical Memorandum (3-13).

Figure 6.5.3-3. Aerial photograph of Wise Powerhouse and Wise Powerhouse No. 2, November 5, 2007.

Figure 6.5.3-4. Aerial photograph of South Canal (flume section above Auburn Ravine is shown) below Wise Powerhouses, November 5, 2007.

Figure 6.5.3-5. PCWA's American River Pump Station on the North Fork American River.

Figure 6.5.3-6. Aerial photograph of South Canal and other non-Project facilities below the Wise Powerhouses, November 5, 2007. Wise Powerhouse is in the upper-right corner of the photograph.

Figure 6.5.3-7. Private diversion dam located near RM 27.2 just below North Ravine. The diversion canal is located to the right of the person standing next to Auburn Ravine.

Figure 6.5.3-8. City of Auburn's Wastewater Treatment Plant Discharge into Auburn Ravine at RM 27.0.

Figure 6.5.3-9. PCWA's discharge point into Auburn Ravine.

Figure 6.5.3-10. NID's Auburn Ravine I Diversion Dam at RM 23.8.

Figure 6.5.3-11. An aerial view of NID's Auburn Ravine I Diversion Dam.

Figure 6.5.3-12. NID's Hemphill Diversion Dam at RM 17.5.

Figure 6.5.3-13. NID's stream gage (BR-200) located at RM 14.3.

Figure 6.5.3-14. Lower Auburn Ravine and rice fields.

Figure 6.5.3-15. Lower Auburn Ravine showing channelization within rice fields.

Figure 6.5.3-16. Unidentified diversion dam on Lower Auburn Ravine.

Figure 6.5.3-17. Unidentified diversion dam on Lower Auburn Ravine.

Figure 6.5.3-18. Unidentified diversion dam on Lower Auburn Ravine.

Figure 6.5.3-19. Auburn Ravine entering East Side Canal just above Coppin Dam. Auburn Ravine enters East Side Canal from the top of the photograph.

Figure 6.5.3-20. East Side Canal between Auburn Ravine and Cross Canal.

Figure 6.5.3-21. Cross Canal between East Side Canal and the Sacramento River.

Figure 6.5.3-22. Cross Canal entering Sacramento River.

Lower Drum-Spaulding Canal System Outages

The lower Drum-Spaulding Canal System outage occurs when demand for irrigation deliveries cease in mid-October. Therefore, effects of flow changes in Auburn Ravine during the mid-October time period are due to cessation of irrigation deliveries and not initiation of the hydroelectric-related canal outage. In general, the annual canal outages for the Project's Lower Drum-Spaulding Canal System involve phased outages of the Bear River Canal, Upper Wise Canal, Lower Wise Canal, and South Canal. Outages are scheduled after the consumptive water delivery season is over (approximately mid-October) and flows have returned to natural conditions. Outages are phased depending on the specific inspections and maintenance work that needs to take place. The outages are very complex, and are timed to accomplish the required maintenance work, given weather limitations and the contractual requirement to deliver water to Placer County Water Agency throughout the year.

The Bear River Canal is the first canal that is taken out of operation and the outage usually lasts 2-3 weeks depending upon the amount of shotcrete work that may be needed and the available budget. Halsey Forebay, Halsey Afterbay, Rock Creek Reservoir, and Wise Forebay are brought up to maximum storage the week before the Bear River Canal outage to ensure minimum water deliveries to NID and PCWA are met. The Halsey Forebay low level outlet is opened to drain water around to Halsey Afterbay. Halsey Afterbay delivers minimal water down the Upper Wise Canal to Rock Creek Reservoir. Flashboards are installed immediately below Rock Creek Reservoir, and submersible pumps are installed in order to pump the water releases from the reservoir back into PCWA's Fiddler Green Canal for delivery to PCWA customers. NID is also able to take water from Rock Creek Reservoir through YB-255 to its water treatment plant. Once the Bear River Canal returns to service, approximately 50 cfs is brought down the canal in order to deliver water to PCWA and backfill Halsey Forebay, Halsey Afterbay, and Rock Creek Reservoir.

The Upper Wise Canal outage takes place after the Bear River Canal outage and lasts approximately one week. In 2009, the outage lasted approximately three weeks due to more extensive work in the Tunnel 9 liner, which further affected how water could be moved around for consumptive water deliveries. The Lower Wise Canal outage also lasts approximately one week. This outage can overlap with the Upper Wise Canal outage depending upon the scope of work involved. The South Canal outage lasts approximately one week, and occurs after the Lower Wise Canal outage.

PCWA will typically pump water from the North Fork American River into the South Canal during the Bear River and Wise Canal outages in order to feed their water treatment plant, as the storage in the Drum-Spaulding Project facilities west of the Bear River Canal Diversion Dam is not adequate to entirely satisfy PCWA consumptive water demands during the outage period. PG&E can accommodate PCWA to some extent by scheduling the work in the South Canal by location (i.e., above the pump inflow or below) in order to allow PCWA to pump for as long as possible. Appendix E9 (Discussion of Wise Powerhouse Operations) of this Exhibit E provides additional information on the operations of Wise Powerhouse and associated canal system.

Water Temperature in Auburn Ravine

Stream water temperatures were recorded at two sites in 2008 and 2009 in the Upper Auburn Ravine area: one site about 500 feet upstream of Wise Powerhouse and a second site in South Canal about 0.25 mile downstream of Wise Powerhouse near the City of Auburn's Water Treatment Plant. Water temperatures in South Canal reflect water temperatures released or spilled into Auburn Ravine. At the upstream site, mean daily water temperature ranged from 58°F to 72°F (14.6°C to 22.1°C) in 2008 and from 60°F 68°F (15.5°C to 20.2°C) in 2009. Daily variation in water temperature ranged from about 5.5°F to 9.0°F (3.0°C to 5.0°C). In comparison, mean daily water temperature at the downstream site ranged from 50°F to 68°F (10.2°C to 19.9°C) in 2008 and from 47°F to 67°F (8.4°C to 19.3°C) in 2009, with small diurnal variations (< 5.5°F , <3.0°C). For more information on stream temperatures in Upper Auburn Ravine, refer to Technical Memorandum (2-2), Water Temperature, in Appendix E12 of this Exhibit E.

Fisheries Resources in Auburn Ravine

Historically, low elevation streams such as Auburn Ravine likely were essentially dry during the summer and fall, at least in the foothill sections. Streams such as Auburn Ravine likely were not conducive to supporting significant or consistent fall-run Chinook salmon or steelhead populations. According to NMFS (2009) and Bailey (2003), project operations, through flow augmentation, may be what has attracted anadromous fish into what historically may have been ephemeral West Placer County Stream habitats.

Local area residents have reported that as many as several hundred fall-run Chinook salmon spawned just upstream of Lincoln in the fall of 1985, and that steelhead routinely spawned near Auburn (City of Lincoln 1999). To the extent that such anadromous fisheries existed in Auburn Ravine, an important component of the population likely would have been strays from more productive river systems downstream. It has been reported that source populations from stable Central Valley rivers, such as the American, Feather, Yuba and Sacramento rivers, historically provided recoloniziation of, and gene flow between, "sink" populations in less persistent and hydrologically unstable streams (i.e., streams such as Auburn Ravine) (IEP 1999, CDFG 1999 and McEwan 2001 as cited in PCWA and Reclamation 2002).

Upper Auburn Ravine was regularly stocked with rainbow trout from 1930 until 1965 (CDFG Region 2 files, Bailey, 2003). The last time rainbow trout were stocked in Auburn Ravine was in 1989, when brown and rainbow trout were stocked upstream of the Marguerite Mine intersection (near RM 31) as part of a mitigation agreement with Morrison-Knudsen Construction Inc. due to a pollution event which occurred in February of 1989. Auburn Ravine was also stocked with fingerling fall-run Chinook salmon during the 1990s and with Feather River spring-run Chinook salmon in the mid-1980s at Garden Bar Road and Highway 65 at RM 14.4 (CALFED 2000b).

Fall-run Chinook salmon and steelhead have been reported to occur in various sections of Auburn Ravine (CALFED 2000b; Placer County 2002; Bailey 2003). A summary of past survey information is provided in Table 6.5.2-1. Adult fall-run Chinook salmon have been documented in Auburn Ravine upstream to a 4-foot high waterfall at about RM 22.9, approximately 0.5 miles upstream of the Gold Hill Road crossing and Dutch Ravine (Meyer 1986) (Table 6.5.3-2). CDFG estimated the 1985 and 1986 the fall-run population size to range from 100 to 400 individuals (including poached fish) (CDFG Region 2 Files). In 1965, CDFG trapped 63 juvenile Chinook salmon in 515 hours just downstream of the Fowler Road crossing (RM 19.9), approximately 2 miles above Hemphill Diversion Dam (Gerstung 1965).

Anecdotal reports place adult steelhead in Auburn Ravine. Juvenile steelhead have been reported upstream to Wise Powerhouse; however, the surveyed trout were not confirmed to be steelhead, and were identified as steelhead/rainbow trout, versus rainbow trout, owing to the remote possibility that steelhead may access Auburn Ravine, upstream of several substantial fish barriers such as NID's Auburn Ravine I Diversion Dam. Adult steelhead have also been reported from Lower Auburn Ravine (Hiscox 1992), as well as what were either large resident trout or "half-pounders" (2-year-old returning steelhead) (Bailey 2003). The exact locations of these fish is poorly documented; however, since steelhead are stronger swimmers and jumpers than fall-run Chinook salmon, they probably can migrate upstream as far as the Auburn Ravine I Diversion Dam (RM 23.8), which is a formidable, and conceivably a perennial, complete barrier to upstream migration, as described by Bailey and Buell (2005):

> *This dam is clearly a migration barrier to upstream-migrating salmon and steelhead except at high stream flows approaching drown-out, when it would become an impediment.*

Based on PG&E's review of available information, the current uppermost extent of steelhead and Chinook salmon in Lower Auburn Ravine appears to be NID's Auburn Ravine I Diversion Dam located at RM 23.8, though federally designated Critical Habitat for steelhead extends to RM 26.6 (PG&E 2010a). Although it is uncertain how much flow constitutes "drown-out" of Auburn Ravine I Dam ("drown-out" is a phenomenon where water surface elevations upstream and downstream of a river obstruction, such as a diversion dam, begin to converge at high flows), flows of approximately 200-250 cfs during irrigation season, which are higher than hydroelectric spills during November-April 15, are not uncommon in Auburn Ravine, and do not approach drown-out. Flow conditions to provide the drown-out flow required for passage would be significantly higher, likely in the several-hundred to thousand-cfs range. Based on available hydrologic information for Auburn Ravine and estimated unimpaired flows, natural high flows in excess of 200 cfs occur occasionally during the winter period when hydroelectric spills may occur (November-April 15), but not with great frequency. For the period from October 1, 1997 through September 30, 2009, only 14 days with estimated natural flows over 200 cfs at Auburn Ravine I Dam have occurred.[19] In only two of these days does the estimated flow exceed 400 cfs: flows are estimated at approximately 570 cfs on February 3, 1998 and just under 450 cfs on December 31, 2005. The likelihood of flows approaching a drown-out flow at a time when adult steelhead are in the vicinity of the dam, therefore, is extremely low, which strongly suggests that

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[19] Unimpaired flows were estimated using the Morrison Creek gage as a reference basin. Although data are available for the AR-1 gage at the City of Auburn's WWTP, the data at flow extremes are of questionable quality and could not be used to estimate the approximate recurrence interval of naturally-occurring storm flows. Flows referenced above represent mean daily flows.

steelhead are not present and spawning and rearing does not occur upstream of Auburn Ravine I Dam.

PG&E conducted electrofishing surveys in Auburn Ravine on April 22, 2009, within two accessible sections of Upper Auburn Ravine (PG&E 2010a). The estimated flow on the day of the survey was 35 cfs. The upper section began at the City of Auburn's Wastewater Treatment Plant (RM 27.4) and extended approximately 765 feet upstream to a weir located just below the point where flows from Wise Powerhouse can be released into Auburn Ravine (RM 27.6). The lower section began at PCWA's Auburn Tunnel outlet near the stream crossing at Lozanos Road (RM 26.4) in Newcastle, California, and extended upstream approximately 350 feet. Forty-three fish, representing three species, were collected (Western Placer County Streams Technical Memorandum, PG&E 2010a). The upper stream section was dominated by rainbow trout (n=11, 92 percent), with only one speckled dace (8 percent). The lower stream section was numerically dominated by riffle sculpin (n=27, 87 percent) with fewer rainbow trout (n=4, 13 percent). Rainbow trout ranged from 102 mm to 210 mm in length with an average length of 130 mm. Condition factors for rainbow trout averaged 0.92 (PG&E 2010a).

CDFG conducted electrofishing at seven locations within Auburn Ravine in 2004 and 2005 (CDFG 2008a). During the 2004 fall/winter electrofishing survey a total of 689 fish were collected in Auburn Ravine, 76.9 percent of which were collected downstream of NID's Auburn Ravine I Diversion Dam (Table 6.5.3-3). In 2005, during the spring/summer electrofishing survey, the total number of fish caught was 705, with 69.5 percent caught downstream of the PCWA Auburn Tunnel outlet (CDFG 2005, unpublished data).

No Chinook salmon were observed during the 2004 fall/winter survey, and only one Chinook salmon was observed (82-mm long) during the 2005 spring/summer survey. The single salmon was found in the lowermost section of Auburn Ravine, and had an adipose clip, indicating it was a hatchery-produced Chinook salmon. It was reportedly classified as a spring-run (CDFG 2005, unpublished data), but based on the time of capture (April) and size, it is more likely that the salmon was a fall-run Chinook salmon.

The absence of Chinook salmon juveniles upstream of PCWA's Auburn Tunnel Outlet (RM 26.4) and their extreme scarcity downstream of the Auburn Tunnel Outlet in the November, December and April surveys suggest that Auburn Ravine is not likely to be a rearing ground for the species. As discussed above, Chinook salmon were recorded in Auburn Ravine upstream to RM 22.9 during a period when CDFG was stocking Chinook salmon in the stream.

CDFG (2008) reported steelhead upstream and downstream of the Auburn Tunnel Outlet during the 2004 fall/winter survey and 2005 spring survey. Forty-five percent of fish collected in 2004 (309 out of 689 fish) were classified as steelhead and 37 percent of the steelhead (113 out of 309 fish) were collected upstream of the Auburn Tunnel Outlet in 2004. In 2005, 36 percent of the captured fish (254 out of 705 fish) were classified as steelhead; 56 percent (143 out of 254 fish) were collected upstream of the Outlet in 2005. However, these fish were not confirmed to be steelhead by CDFG; the distinction between resident and anadromous-parented fish is not possible based on visual assessment and no other assessment were made to determine anadromy of the parents. The fish were recorded as steelhead based on the assumption that steelhead can access the upper reaches of Auburn Ravine (R. Titus, personal communication, January 21, 2011).

Table 6.5.3-3. Summary table of historical fish distribution and sampling survey data for Auburn Ravine.

Date	Location	River Mile[1] (approximate)	Species Present	Method	Source
March 3, 1959	Goldhill Rd. Bridge	22.4	rainbow trout (few); brown trout; suckers; hitch; green sunfish (few)	Electrofishing	Unsigned, unidentifiable author note in CDFG, Region 2 files, as referenced in Bailey (2003).
Spring, 1965	Downstream of Fowler Road	19.9	juvenile Chinook salmon, no other spp. reported	Riffle traps	May 25, 1965 memorandum in CDFG, Region 2 files, handwritten draft of May 25, 1965 memo, and other handwritten notes, as referenced in Bailey (2003).
August 27, 1971	Unknown (possibly near city of Auburn)	27.4	rainbow trout, green sunfish	Seining	Unsigned, unidentifiable author note in CDFG, Region 2 files, as referenced in Bailey (2003).
March, 1979	City of Auburn (estimated)	27.4	rainbow trout, green sunfish, roach, largemouth bass	Electrofishing	Unsigned, unidentifiable author note in CDFG, Region 2 files as referenced in Bailey (2003).
Feb, Apr, May – 1984	Moore Rd. and Fowler Rd.	10.2 and 19.9	Chinook salmon, sucker, rainbow trout, squawfish	Seining and Electrofishing	Unidentifiable author note in CDFG, Region 2 files as referenced in Bailey (2003).
November 03, 1984	Wise Rd, downstream of Auburn WWTP	26.8	Rainbow trout, Sacramento sucker, green sunfish, speckled dace	Electrofishing	Vanicek Report in CDFG, Region 2 files, as referenced in Bailey (2003).
October 1995, April 1996	I-80 to 1,500 ft downstream of Lozanos Rd.	29 to 26.1	Rainbow trout, brown trout, Sacramento sucker, speckled dace and green sunfish.	Electrofishing	City of Auburn (1996), Auburn Stream Surveys
November, 1997 & November, 1998	Moore Road Crossing	10.2	Steelhead, Sacramento pikeminnow, Sacramento sucker, Redear sunfish, Hitch, Green sunfish, Bluegill, Lamprey, Prickly sculpin, and Mosquitofish	Electrofishing	DEIR City of Lincoln Wastewater Treatment and Reclamation Facility, September 1999, as referenced in Bailey (2003)..
December, 2004	Various locations (5) from Catlett Road upstream to Bridge Lane	0.5 to 19.9	Steelhead, Sacramento pikeminnow, Sacramento Sucker, logperch, hitch, sculpin spp., speckled dace, Pacific lamprey, mosquito fish, green sunfish, red shiner, pumpkinseed, bluegill, redear sunfish, spotted Bass	Electrofishing	Summary of 2004 and 2005 fish community surveys in Auburn Ravine and Coon Creek (Placer County), CDFG Memorandum, January 2008.
December, 2004	Various locations (3)Chaparral Lane to Wise Road	20 to 27.6	Steelhead[2],, brown trout, speckled dace	Electrofishing	Summary of 2004 and 2005 fish community surveys in Auburn Ravine and Coon Creek (Placer County), CDFG Memorandum, January 2008.
April, 2005	Various locations (5) from Catlett Road upstream to Bridge Lane	0.5 to 19.9	Steelhead, Chinook salmon[3/], Sacramento pikeminnow, Sacramento Sucker, logperch, hitch, sculpin spp., speckled dace, Pacific lamprey, brown trout, mosquito fish, green sunfish, red shiner, pumpkinseed, bluegill, redear sunfish, spotted Bass	Electrofishing	Summary of 2004 and 2005 fish community surveys in Auburn Ravine and Coon Creek (Placer County), CDFG Memorandum, January 2008.

Table 6.5.3-3. (continued)

Date	Location	River Mile[1] (approximate)	Species Present	Method	Source
April, 2005	Various locations (3)Chaparral Lane to Wise Road	20 to 27.6	Steelhead[2], brown trout, speckled dace, sunfish	Electrofishing	Summary of 2004 and 2005 fish community surveys in Auburn Ravine and Coon Creek (Placer County), CDFG Memorandum, January 2008.

1 River miles estimated by PG&E.
2 Licensee notes that neither CDFG nor Placer County verified that the fish were steelhead.
3 One marked, hatchery-produced Chinook salmon collected at the lowermost survey site was the only Chinook observed during CDFG 2004-2005 surveys.

Fish Passage

Fish passage in Lower Auburn Ravine[20] for both adult migration and juvenile emigration has been identified as an issue by the local community. Many seasonally operated flashboard dams are used for agricultural irrigation throughout Auburn Ravine (Bailey and Buell 2005). There are six water diversion structures, gage weirs, or seasonal dams identified below in Table 6.5.2-4 with significant instream structures that could be a barrier during the low flow adult Chinook salmon and steelhead migration period (mid-October through December (Yoshiyama et. al. 2001) for fall Chinook salmon and between December and April for steelhead). However, the portability and seasonal use of the flashboard irrigation dams typically occur during months when adult anadromous salmonids are not migrating upstream. None of the diversion structures pose a barrier to adult migration at very high flows, though at low flows, migration barriers exist due to diversion dam configuration, inadequate water depth in the natural channel, beaver dams, and a lack of a thalweg in some locations (Bailey 2003). The altered hydrology created by water deliveries may confound the natural timing of emigration. A modified summary table of fish passage and screening assessments in the Auburn Ravine/Coon Creek Ecosystem Restoration Plan (Placer County 2002) is provided below (Table 6.5.2-4).

Table 6.5.3-4. Summary of fish passage and screening recommendations from the Auburn Ravine/Coon Creek Ecosystem Restoration Plan (2002), from upstream to downstream.

Site and operator, if known	Approx. River Mile	Characteristics	Assessment	Priority (Dam/Dvrsn)	Recommend Solution
Ophir Tunnel Cataract	26.4	Natural cataract	Significant impediment	Med	Backwater lower portion w/ concrete sill series
Auburn Ravine I Dam (NID)	23.8	Gravity arch dam w/ ditch, debris sluice	Barrier / significant impediment, depending on flow	High / High	Dam: Formal slotted fishway to upper end of canal Diversion: Oblique vert. screen; bypass to fishway
Hemphill Dam (NID)	17.5	Seasonal flashboard dam; elevated sill, sloped apron. Unscreened diversion	Significant barrier / impediment. Diversion needs screen	High / Med-High	Dam: Replace apron w/ pool-and-chute fishway. Diversion: Screen w/ vert or oblique screen on bank
NID Gage – Auburn Ravine at Highway 65	14.3	Concrete flume	Barrier	High	Replace w/ pool-and-chute fishway

20 Lower Auburn Ravine is defined here as Auburn Ravine from the inflow of PCWA's Auburn Tunnel outlet at RM 26.4 downstream to South Sutter Water District's (SSWD) East Side Canal at RM 0.0.

Table 6.5.3-4. (continued)

Site and operator, if known	Approx. River Mile	Characteristics	Assessment	Priority (Dam/Dvrsn)	Recommend Solution
Nelson Lane Dam (operator unknown)	11.3	Seasonal flashboard dam	Minor Impediment; sill/apron	Med / Med	Dam: Install timbers to concentrate flow Diversion: Analyze need; screen if needed
Moore Dam (SSWD)	10.5	Seasonal flashboard dam	Not a barrier; seasonal operation	Low / Med	Dam: Do nothing Diversion: Analyze need; Screen if needed
Aitken Ranch Dam (operator unknown)	9.6	Seasonal flashboard dam	Not a barrier; seasonal operation	Low / Med	Dam: Do nothing Diversion: Analyze need; Screen if needed
Lincoln Ranch Duck Club Dam (private)	5.4	Seasonal flashboard dam; extended operation	Barrier during extended operation; unscreened diversion with extended operation	Med-High/Low-Med	Dam: Excavate sump; extend pump; vortex weirs. Diversion: Analyze need; screen if needed
Tom Glenn Dam (operator unknown)	2.3	Seasonal flashboard dam	Not a barrier; seasonal operation	Low	Do nothing
Davis Dam (SSWD)	1.4	Seasonal flashboard dam	Not a barrier; seasonal operation	Low	Do nothing
Coppin Dam (SSWD)	On Cross Canal, 0.1 mi downstream of Auburn Ravine confluence	Seasonal flashboard dam	Not a barrier; seasonal operation	Low	Do nothing

Source: Placer County (2002)

There are no confirmed occurrences of anadromous fish in Upper Auburn Ravine or between PCWA's Auburn Tunnel Outlet at RM 26.4 and NID's Auburn Ravine I Diversion Dam at RM 23.8. Steelhead and fall-run Chinook salmon do occur in the section of the Auburn Ravine downstream of NID's Auburn Ravine I Diversion Dam (DFG 2008). As described above, Auburn Ravine I Diversion Dam is essentially impassable by anadromous salmonids except during extraordinary periods of high flows and drown-out. Per Bailey and Buell (2005), the leap height during their survey was about 11 ft, as shown in the photograph in Figure 6.5.3-23 that was taken during PG&E's survey.

Figure 6.5.3-23 NID Auburn Ravine I Dam and upper end of NID Ditch. Dam height is about 11 feet. (Flow pictured is approximately 110 cfs. No diversion to Auburn Ravine I canal is occurring at this time and water at the head of the canal is being returned to Auburn Ravine at the left of the photograph.)

Hydrology

Attachment 3-13C of the Western Placer County Streams Technical Memorandum includes figures that show available flow data associated with Lower Auburn Ravine for Water Years 2002 through 2009. Plots for WY 2009, which has the most complete dataset, are included here as Figures 6.5.3-24 and 6.5.3-25. Some data shown represent inflows to Lower Auburn Ravine (i.e., solid-shaded series, shown "stacked"); some data show in-ravine flows (i.e., blue and thin black lines); and some data show diversions out of Lower Auburn Ravine (i.e., colored lines). Inflows to Lower Auburn Ravine include YB-259, which gages Wise Powerhouse Overflow during winter months and consumptive water deliveries to NID from April through October (YB-259 occasionally over-reports deliveries in the winter spill season, due to backwater influences caused by natural high flows). These periods have been filtered in the data set by 1) capping winter hydroelectric spills at 80 cfs during the spill season, and 2) comparison of upstream and downstream canal flows to eliminate reported deliveries that are actually a result of backwater influences. The hydrographs for Auburn Ravine also show the other following inflows to Auburn Ravine: YB-132, which gages additional consumptive water deliveries to NID; YB-136, which gages consumptive water deliveries to PCWA; and for water years 2006 and 2009 only, the PCWA Auburn Ravine Tunnel deliveries to Auburn Ravine (data for other water years is not available at this location). Instream flows shown are at the Highway 65 gage (i.e., blue line) and the estimated unimpaired flow for Auburn Ravine near Highway 65 (i.e., thin black line). Outflows, or diversions, from the ravine shown are the Auburn Ravine I Diversion (purple line) and the Hemphill Diversion (turquoise line). Sites for which flows are not shown, but where some data exist, include the inflows from the cities of Auburn and Lincoln wastewater treatment plants and PCWA's Dutch Ravine Canal (YB-76A; although a portion of these flows are returned to Auburn Ravine), estimated unimpaired flow at the Wise Powerhouse Overflow location, and instream flow at City of Auburn's AR-1 gage or the Auburn WWTP instream gage. Other ungaged inflows to and diversions from Lower Auburn Ravine exist, but data are not available for private diversions. NID is currently allowed by contract with PG&E to transport up to 120 cfs in the Bear River Canal. Only 90 cfs of that water, as shown in the simplified schematic above, Figure 6.5.3-1, is delivered to Auburn Ravine because NID has some deliveries to customers off of the Lower Wise Canal, and because some water is subtracted due to evaporation. Any deliveries requested by NID in excess of 120 cfs are purchased from PG&E pursuant to its current contracts with NID.

Water releases between mid-October and mid-April from South Canal to Upper Auburn Ravine are shaded pink and represent hydroelectric operations; water releases between mid-April and mid-October are shaded in blue and green representing deliveries to NID and PCWA, respectively. The 2009 water year represents the only period where flow data at the Highway 65 gage are available between the months of November and April. The data indicate that the periods of hydroelectric releases into Upper Auburn Ravine during the winter generally coincide with natural high flow events in Auburn Ravine.

The plots of Water Year 2009 show the transition of flow releases in April due to hydroelectric operations to flow releases for consumptive water demand. Actual flows during the consumptive water delivery season contrast to a much greater degree with unimpaired flows in comparison to the hydroelectric spills during the October-April period. In 2009, during mid-May unimpaired flows would be about 8 cfs whereas consumptive water deliveries were around 90 cfs. During August and September, unimpaired flows drop to the 3-8 cfs range whereas consumptive water deliveries ranged from 210-225 cfs. In general, the majority of water years 2002-2009 show substantially higher flows in Auburn Ravine during the consumptive water delivery season than would occur under unimpaired flows.

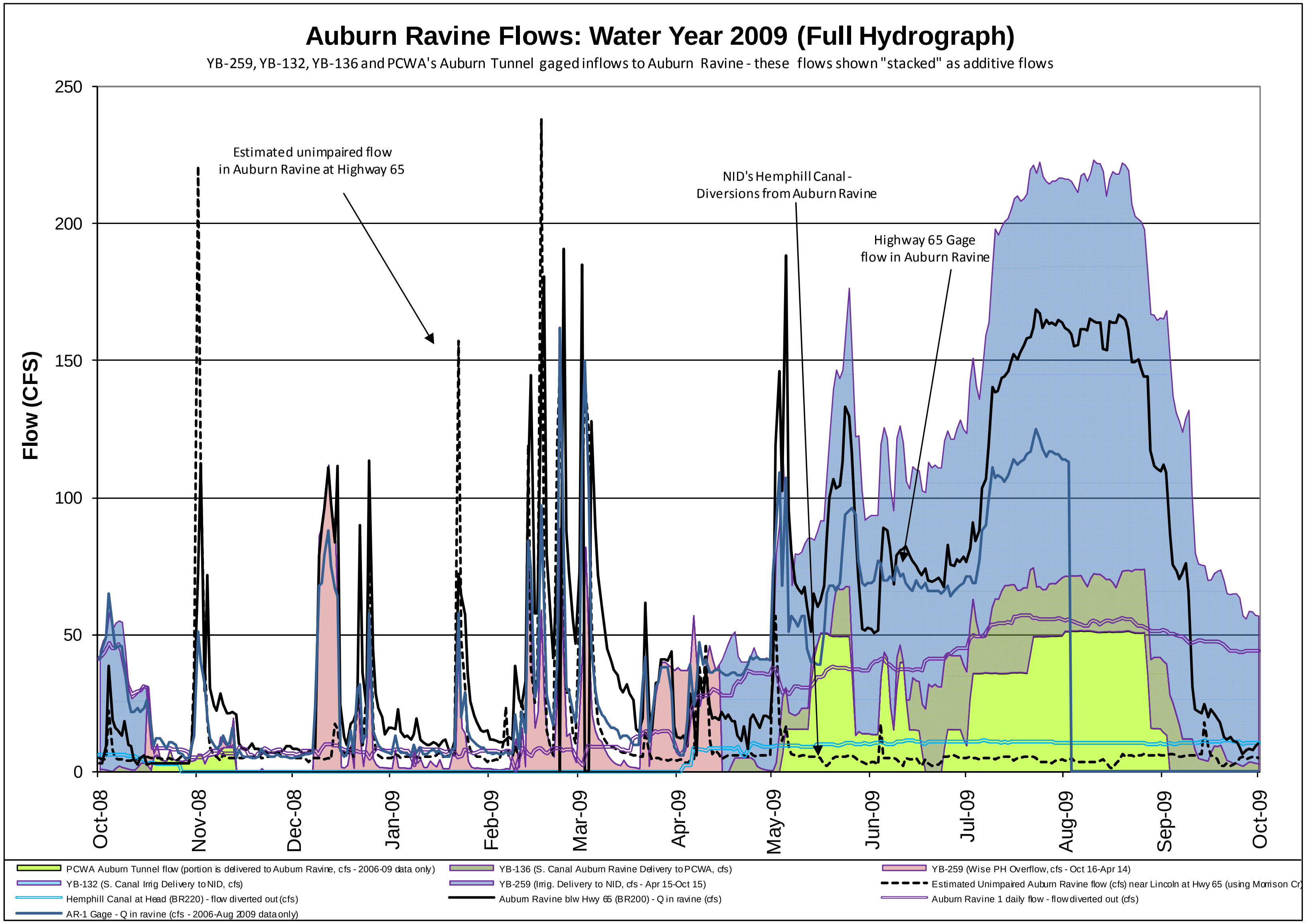

Figure 6.5.3-24. Hydrographs for various Auburn Ravine flow components (Water Year 2009).

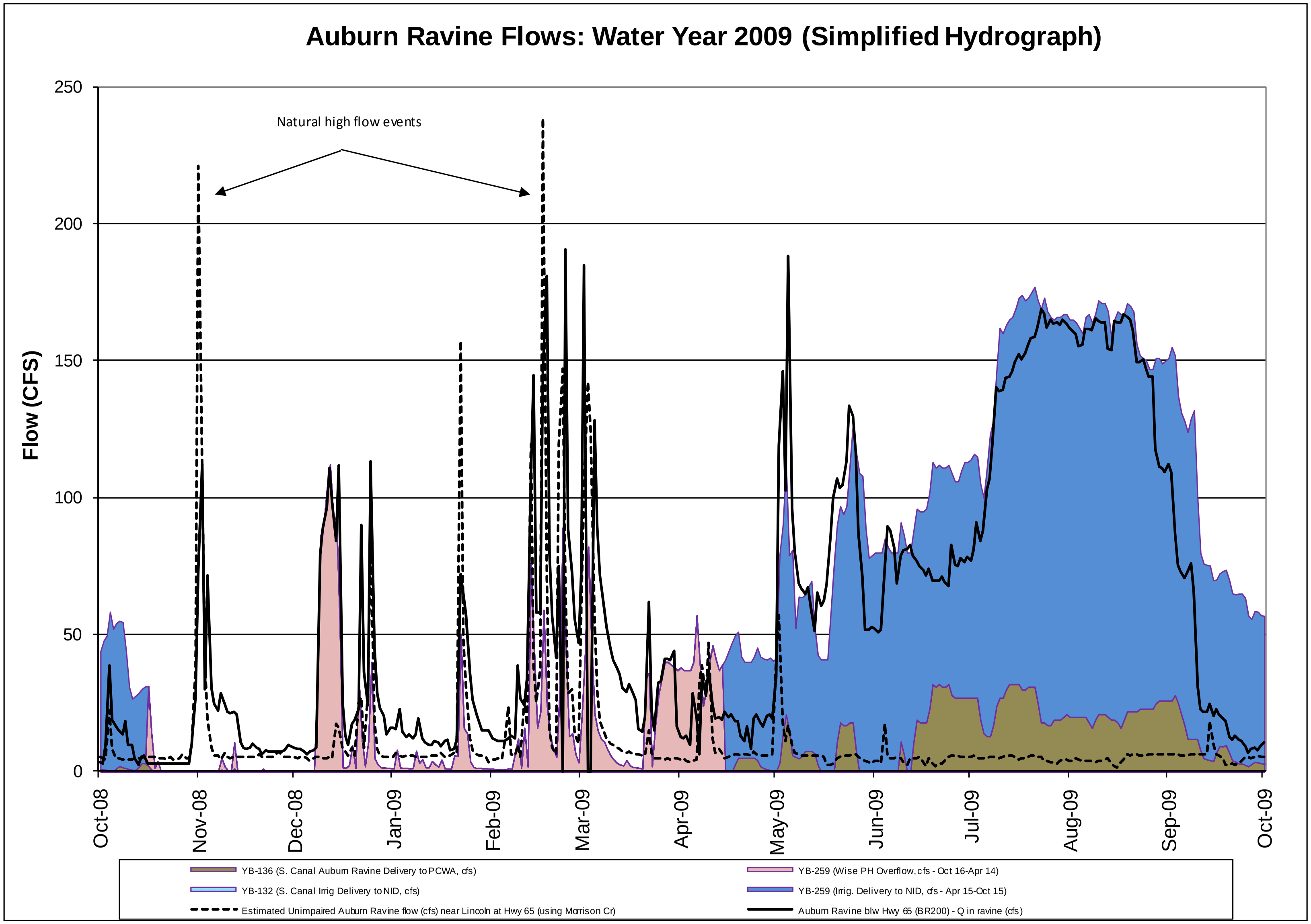

Figure 6.5.3-25. Simplified hydrograph of inflows to Auburn Ravine from Wise Powerhouse and South Canal (Water Year 2009).

6.5.4 Environmental Effects

6.5.4.1 Yuba-Bear Hydroelectric Project

This section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3), on threatened and endangered species. The section is divided into the following areas: 1) plants; 2) CRLF; and 3) VELB.

6.5.4.1.1 Plants

As described above, Licensees' studies did not find ESA-listed plants in the Yuba-Bear Hydroelectric Project area, nor are ESA-listed plants or available and suitable habitat for ESA-listed plant species known to occur in this area.

Of the two potentially occurring ESA-listed plant species on the Yuba-Bear Hydroelectric Project, Pine Hill flannelbush is unlikely and Stebbins' morning-glory has the potential to colonize within the Project boundary based on suitable, available habitat.

Pine Hill flannelbush has been indentified exclusively on the Pine Hill formation (there have been reports of Pine Hill flannelbush in some small scattered populations in Yuba County and Nevada County, but other reports describe these individuals as aberrant California flannelbush [*Fremontodendron californicum* ssp. *californicum*]), which does not occur in the Project area (USFWS 2002b). Pine Hill flannelbush, therefore, is unlikely to colonize the Project.

Stebbins' morning-glory is known to occur primarily on gabbro soils in the Pine Hill formation; however, an occurrence was also discovered on serpentine soil in Nevada County (USFWS 2002b). On the Yuba-Bear Hydroelectric Project, appropriate habitat occurs primarily along the Dutch Flat No. 2 Conduit. Therefore, this species could potentially colonize the Project area in the future.

The proposed Project would have no effect on ESA-listed plants.

6.5.4.1.2 CRLF

The nearest known CRLF population and Critical Habitat is about 11.5 mi from the Project and is unaffected by the Project. There were no observations of CRLF during any of the Licensees' studies and there is only one documented record of this species within 1 mi of the Project, a 1939 record from 0.5 mi NE of Dutch Flat, Placer Co., where CRLF is presumed extirpated. Licensees' study indicated that the essential components of CRLF breeding habitat (i.e., potentially suitable habitat) were present at four Project facilities, Dutch Flat No. 2 Forebay, Dutch Flat Afterbay, Little York Basin, and Chicago Park Forebay. However, each of these would represent marginal habitat because of the presence of predatory fish and other factors described in 6.5.3.2.4. In addition, there are only a few other sites within the 1 mi dispersal distance of any of these Project facilities which could potentially support CRLF breeding: a small, seasonal stock pond and two perennial tailings ponds on private property in the vicinity of

Dutch Flat Afterbay, at least one of which is inhabited by American bullfrogs; a perennial mine tailing pond on PG&E land near Little York Basin; and three wetlands on private property near Chicago Park Forebay that were not accessible for field assessment. The project has no effect on any of these potentially suitable sites in the vicinity of the Project facilities, which are all located on private property outside the FERC Project Boundary.

Dutch Flat No. 2 Forebay is an off-stream, man-made re-regulating reservoir on a ridge above the Bear River. Dutch Flat Afterbay is a re-regulating reservoir formed by the Dutch Flat Afterbay Dam on the Bear River located in part on public land administered by BLM. Dutch Flat No. 2 Forebay receives water from Drum Afterbay via the Dutch Flat No. 2 Conduit. Both Dutch Flat No. 2 Forebay and Afterbay are characterized by perennial, deep, slow-moving water and steep banks with dense Himalayan blackberry in places; these features may constitute potential breeding habitat for CRLF. However, introduced fish that likely occur, including brown trout and green sunfish, diminish habitat potential for CRLF.

Little York Basin is a small impoundment along the Chicago Park Conduit and receives water from the Chicago Park Flume. Water exits the flume through a canal into the Chicago Park Forebay. This impoundment has essential components of CRLF breeding habitat, including deep, slow-moving water and dense margin and overhanging vegetation (mostly willow and alder), but introduced fish are present. Chicago Park Forebay is a man-made reservoir with steep banks, no emergent vegetation, vegetation along less than half of the shoreline, and introduced fish are present.

Other Project facilities and features are not potentially suitable breeding habitat, although numerous more suitable non-project sites (e.g., perennial stock ponds) occur with 1 mi of Rollins Reservoir. Fish and bullfrogs were documented at several of these sites, and likely occur at others (access restrictions limited the field assessments). The project has no effect on any of these non-project sites, which are outside the FERC Project Boundary and mostly on private property.

Stream reaches affected by the Project do not contain potential CRLF breeding habitat, although they might be suitable non-breeding habitat (e.g., summer habitat) if CRLF breeding populations occur within dispersal distance. It is unlikely that the proposed project flows would have any discernible effect on potential use of these streams as non-breeding habitat.

Overall, there is a low probability that CRLF occurs at any facility of the Yuba-Bear Hydroelectric Project, where potentially suitable habitat is either absent or of marginal quality, or at non-project sites (e.g., stock ponds) within 1 mi of the Project, where habitats are more suitable. However, the presence of the species cannot be disproved without extensive surveys throughout this area, most of which is on private property. Based on this information, the proposed project may affect, but is not likely to adversely affect CRLF.

6.5.4.1.3 VELB

No elderberry plants or VELB were found near the Yuba-Bear Hydroelectric Project, nor does the Project include Critical Habitat for VELB. Other relicensing studies did not find any incidental observations of elderberry plants or VELB, and NID is unaware of any historic records of VELB within the FERC Project Boundary for the Yuba-Bear Hydroelectric Project. The proposed Project would have no effect on VELB.

6.5.4.2 Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on threatened and endangered species. The section is divided into the following areas: 1) plants; 2) CRLF; 3) VELB; and 4) steelhead.

6.5.4.2.1 Plants

As described above, Licensees' studies did not find ESA-listed plants in the Drum-Spaulding Project area, nor are ESA-listed plants known to occur in this area.

Of the seven potentially occurring ESA-listed plant species on the Drum-Spaulding Project, five are unlikely and two have the potential to colonize either Project area, based on suitable, available habitat.

Sacramento Orcutt grass is only known to occur at elevations below the minimum elevation of the Project (below 328 ft) and is unlikely to occur within the Project Area (USFWS 2006a).

Hartweg's golden sunburst is only known to occur at elevations below 492 ft and grows only on mima mounds (USFWS 2001a). A small section of the Drum-Spaulding Project near Newcastle Powerhouse is at an elevation range appropriate for Hartweg's golden sunburst, but the mima mounds on which the species grows are not present.

Pine Hill flannelbush, Eldorado bedstraw and Pine Hill ceanothus have been indentified exclusively on the Pine Hill formation (there have been reports of Pine Hill flannelbush in some small scattered populations in Yuba County or Nevada County, but other reports describe these individuals as aberrant California flannelbush [*Fremontodendron californicum* ssp. *californicum*]), which does not occur in the Project Area (USFWS 2002b).

Suitable habitat is not available within the Project Area for Sacramento Orcutt grass, Hartweg's golden sunburst, Pine Hill flannelbush, Eldorado bedstraw and Pine Hill ceanothus; therefore, are unlikely to colonize the Project Area.

Stebbins' morning-glory is known to occur primarily on gabbro soils in the Pine Hill formation; however, an occurrence was also discovered on serpentine soil in Nevada County (USFWS 2002b). On the Drum-Spaulding Project, appropriate habitat occurs primarily near the Drum

Powerhouse and along the Drum Powerhouse Road. Therefore, this species could potentially colonize that part of the Project Area in the future.

Layne's butterweed is also primarily known from gabbro soils in El Dorado County (including the Pine Hill formation), but has also been found on serpentine soil, including in Yuba County (USFWS 2002b). On the Drum-Spaulding Project, appropriate habitat occurs primarily near the Drum Powerhouse and along the Drum Powerhouse Road. Therefore, this species could potentially colonize that part of the Project Area in the future.

All data collected as of April 2011 indicates that the proposed Project would have no effect on ESA-listed plants. If surveys in 2011 locate ESA-listed plants on the Drum-Spaulding Project, this conclusion will be updated.

6.5.4.2.2 CRLF

The nearest known CRLF population and Critical Habitat is about 4.6 mi from the Drum-Spaulding Project and is unaffected by the Project. There were no observations of CRLF during any of the Licensees' studies and there is only one documented record of this species within 1 mi of the Project, a 1946 record from the town of Auburn, Placer Co., where CRLF is presumed extirpated. Licensees' study indicated that the essential components of CRLF breeding habitat (i.e., potentially suitable habitat) were present at four Project facilities: Deer Creek Forebay, Drum Afterbay, Halsey Afterbay, and Rock Creek Reservoir. However, each of these is known to support predatory fish and thus represent marginal habitat. American bullfrog is also known to occur at Rock Creek Reservoir. Deer Creek Forebay and Drum Afterbay are isolated from any other potential CRLF breeding habitat. None of these sites are within 1 mi of an historical or known current CRLF occurrence.

Deer Creek Forebay is characterized by deep, still or slowly moving water; areas of emergent vegetation occur; and overhanging shrubby vegetation is present along the east bank. These characteristics constitute essential components of CRLF breeding habitat. However, the presence of fish, including brown trout, diminishes habitat potential. No other sites potentially suitable for CRLF occur within 1 mi of this project site and the nearest known CRLF occurrence is 4.6 mi to the west. Based on all this information, CRLF is unlikely to occur at Deer Creek Forebay.

Licensee previously conducted USFWS protocol-level CRLF surveys (two day surveys and two night surveys) at Drum Afterbay and no CRLF were observed (PG&E 1997). Drum Afterbay was characterized as having the essential components of CRLF breeding habitat on the basis of deep, still or slowly moving water and overhanging vegetation which is dense in places. However, the banks are mostly very steep, submergent vegetation is absent, and predatory fish occur. In addition, no other sites potentially suitable for CRLF occur within 1 mi of Drum Afterbay and there are no historical records or currently known populations of CRLF in the vicinity. Given the absence of known occurrences and the lack of other potentially suitable habitats in the vicinity, CRLF is unlikely to occur at Drum Afterbay.

Halsey Afterbay is characterized by perennial, deep, still or slow-moving water, and the margins are adequately vegetated to constitute the essential components of CRLF breeding habitat. However, introduced fish species at Halsey Afterbay, including brown trout and green sunfish, diminish habitat potential. There are no historical records or currently known CRLF populations in the vicinity. A total of five aquatic habitats within 1 mi of Halsey Afterbay, primarily stock ponds on private land and unaffected by the Project, are evidently suitable habitat, although the occurrence of CRLF in an area of substantial suburban development is unlikely and roads would likely impede CRLF dispersal.

Rock Creek Reservoir was categorized as having the essential components of CRLF breeding habitat on the basis of an area of dense emergent vegetation on the southeastern margin of the reservoir (most of the reservoir is characterized by sparsely vegetated shorelines with no emergent vegetation). There are no historical records or currently known CRLF populations in the vicinity. Suitable aquatic habitats (stock ponds and golf course ponds on private land) occur within 1 mi of Rock Creek Reservoir. It is uncertain whether suburban development in this area would preclude occurrence of CRLF; however, roads would likely impede CRLF dispersal if the species occurs.

Other Project facilities and features, including Lake Spaulding, Halsey Forebay, and Wise Forebay, are not potentially suitable breeding habitat, although more suitable non-project sites occur with 1 mi of these three project facilities. Fish and bullfrogs were documented at several of these sites, and likely occur at others (access restrictions limited the field assessments). The project has no effect on any of these non-project sites, which are outside the FERC Project Boundary and mostly on private property.

Stream reaches potentially affected by the Project generally lack the essential components of CRLF breeding habitat. Pools or backwaters with suitable, associated, emergent or margin vegetation were documented only on parts of three stream reaches: Bear River Reach #2, Halsey Afterbay Dam Reach (Dry Creek), and Rock Creek Dam Reach (Rock Creek). Most of the project-affected stream reaches are relatively large streams that do not constitute potential breeding habitat, although they might be suitable non-breeding habitat if CRLF breeding populations occur within dispersal distance. It is unlikely that the proposed project flows would have any discernible effect on potential use of these streams as non-breeding habitat.

Overall, there is a low probability that CRLF occurs at any facility of the Drum-Spaulding Hydroelectric Project, where potentially suitable habitat is either absent or of marginal quality, or at non-project sites (e.g., stock ponds) within 1 mi of the Project, where habitats are more suitable. However, the presence of the species cannot be disproved without extensive surveys throughout this area, most of which is on private property. Based on this information, the proposed project may affect, but is not likely to adversely affect CRLF.

6.5.4.2.3 VELB

On March 23, 2001, the Forest Service initiated formal consultation with the USFWS to evaluate the potential effects to the VELB associated with PG&E’s Transmission Line Separation Project in the Plumas, Sequoia, and Sierra National Forests. On July 1, 2002, BLM requested formal consultation for potential impacts to VELB on public lands administered by BLM for PG&E's Transmission Line Separation Project. During the course of these consultations, it became apparent that a greater scope of actions should be analyzed in the biological opinion. On January 10, 2003, a final Memorandum of Understanding (MOU) was executed between PG&E, the USFWS, the Forest Service, and the BLM, defining the respective roles of each party in the consultation and subsequent implementation of the Programmatic Biological Opinion (PBO - USFWS file 1-1-01-F-0014). The original consultations were combined and the resulting PBO approved on June 27, 2003 covers the effects of PG&E's routine O&M activities within the potential range of the VELB. This PBO forms the basis for PG&E's VELB Conservation Program (PG&E and USFWS 2003).

The PBO was developed to ensure that PG&E's facilities and operations, including the Drum-Spaulding Project, are in compliance with the ESA and that PG&E's actions proactively work to support VELB recovery. The PG&E VELB Conservation Program, as articulated in the PBO, includes transmission lines associated with FERC-licensed projects owned and operated by PG&E, as well as various PG&E linear facilities associated with hydroelectric generation projects (e.g., canals, penstocks, dams, weirs, flumes, culverts, powerhouses, and associated roads). PG&E performs maintenance activities in order to ensure safe access to, and operations of, these facilities. The PG&E VELB Conservation Program addresses potential effects of the Project by providing avoidance and minimization measures. The proposed Project includes an VELB management measure which will state PG&E's intention to comply with the PBO. As a result, the Project is not likely to adversely affect VELB.

6.5.4.2.4 Steelhead in Auburn Ravine

As stated above, existing information indicates that NID's Auburn Ravine I Diversion Dam (RM 23.8), is "clearly" a migration barrier to upstream-migrating steelhead except at high stream flows approaching drown-out, when it would become an impediment (Bailey and Buell 2005). As such, although suitable steelhead habitat conditions exist upstream of Auburn Ravine I Diversion Dam, Licensee considers Upper Auburn Ravine as essentially inaccessible and very likely unoccupied by steelhead.

Central Valley steelhead Critical Habitat designation extends to RM 26.6, with the uppermost 13.2 stream miles, from RM 13.4 to RM 26.6, supporting potential spawning, incubation and rearing habitat for steelhead. Upper Auburn Ravine encompasses about 0.2 miles of the designated Critical Habitat, from Auburn Tunnel Outlet (RM 26.4) upstream to a cataract that appears to be the upstream extent of Critical Habitat. Again, the uppermost portion of the Critical Habitat reach is upstream of a substantial, fish passage barrier at RM 23.8 (NID's Auburn Ravine I Diversion Dam), and is essentially inaccessible and likely unoccupied by steelhead. Effects to this unoccupied Critical Habitat from PG&E's project are minimal because winter spills for hydroelectric operations closely mimic unimpaired conditions. Similarly, in the upper part of Lower Auburn Ravine between PCWA's Auburn Tunnel and NID's Auburn Ravine I Diversion Dam, migration, spawning and rearing PCEs exist, but designated Critical Habitat in this reach is essentially inaccessible and unoccupied.

PG&E's study showed that there is no nexus between the hydroelectric Project operations and the water deliveries that occur between approximately mid-April and mid-October each year; these water deliveries occur solely for consumptive water purposes. The primary PCE supported in Lower Auburn Ravine during the irrigation season is juvenile rearing. Juvenile emigration and adult emigration also occur during this period.

As NID had noted, summer irrigation water deliveries in Auburn Ravine would occur even if PG&E was not granted a new license for the Drum-Spaulding Project. Both NID and PCWA have stated in relicensing meetings that these deliveries are important components of their water supply and demands are likely to increase in future years. Additionally, NID and PCWA have asserted that they have few other reasonable alternatives to provide the water to Auburn Ravine.

Outside of the irrigation season (mid-October to mid-April), water discharges due to Project operations mimic natural fluctuations. Streamflow in low elevation foothill streams, such as Auburn Ravine, are rainfall driven and return quickly to low flows after precipitation events. Generally, PG&E spills into Upper Auburn Ravine for two reasons: short-term spills in anticipation of precipitation events, and longer-term sustained spills due to an abundance of water from upstream sources. Hydroelectric Project spills during late-fall and winter generally increase the frequency and duration of high flow events as compared to the unimpaired condition. However, the magnitude and timing of hydroelectric spills are in the same range as natural runoff events in this watershed.

PCEs supported in Lower Auburn Ravine during the non-irrigation season include adult and juvenile migration, spawning, incubation, and juvenile rearing.

Adult migration – The hydroelectric spills (early November through mid-April) correspond to the timing of adult steelhead migration and may improve migration conditions depending on the duration and magnitude of the spill. Upstream passage of adult steelhead; at least upstream to NID's Auburn Ravine I Diversion Dam is likely restricted to a window of opportunity confined by high and low flows. Moderate flows enable migrating adults to pass shallow areas that are not passable during low flows. Low flows create barriers at riffles too shallow for the fish to swim across (Thompson 1972). Extremely high flows impede the progress of migrating adults by increasing stream velocities sufficiently to impede or obstruct passage (Bell 1986). Conversely, sudden decreases in flow could cause adults to become trapped prior to reaching potential spawning areas in Lower Auburn Ravine below NID's Auburn Ravine I Diversion Dam. However, during hydroelectric spills, flows are ramped down to ambient conditions to avoid adverse effects to migrating steelhead. As such, the Project is not likely to adversely affect steelhead migration.

Spawning – Although steelhead spawning and spawning habitat has not been specifically identified within Auburn Ravine, the results of the fish population surveys conducted by CDFG (2008) and PG&E (2010), coupled with the channel and substrate attributes described above, make it highly likely that steelhead spawning occurs between RM 13.4 and RM 22.6.

Hydroelectric spills can also enhance steelhead spawning opportunities in Lower Auburn Ravine, downstream of NID's Auburn Ravine I Diversion Dam by providing sufficient flow to sustain suitable spawning conditions and intergravel flow, and providing well oxygenated flow through the redds to support successful incubation and emergence. Periodic high flows help remove sediment from spawning gravels, increasing egg survival and emergence. However, extremely high flows can scour gravel beds containing redds, and severely reduce spawning success (Slater 1958). However, as noted above, the magnitude and timing of hydroelectric spills are in the same range as natural runoff events in this watershed. As such, the hydroelectric-related spills are not likely to adversely affect steelhead spawning.

Juvenile Rearing – Juvenile steelhead rearing in Lower Auburn Ravine during the hydroelectric spill period includes smolt (yearling) rearing likely through March and juvenile (young-of-the-year) rearing, from March until the irrigation season begins, in mid-April. Cessation of the irrigation flows during mid-fall, has the potential to increase temperatures and reduce the quality and quantity of rearing habitat. During the hydroelectric spill period, the potential for minor increases in frequency of higher flows could increase the occurrence of stranding and isolation associated with rapid changes in flow and short-term changes in inundation of side channels and other off-channel areas. Such conditions occur naturally in Lower Auburn Ravine and since hydroelectric-related spills are associated with the natural hydrograph, the likelihood of substantial increase in frequency and magnitude of flow spikes due to project operations is low. As such, the hydroelectric-related spills are not likely to adversely affect steelhead rearing.

In conclusion: 1) the Drum-Spaulding Project does not withdraw any water out of Lower Auburn Ravine at any time; 2) the Project does not have any facilities on Lower Auburn Ravine, including any facilities that would serve as a barrier to anadromous fish; 3) there is no causal nexus between the hydroelectric Project operations and the water deliveries that occur between approximately mid-April and mid-October each year, which occur solely for consumptive water delivery purposes; 4) periodic high flow spikes in Auburn Ravine between early November and mid-April would occur irrespective of the hydroelectric operations of the Project; 5) numerous entities contribute water into, or divert water out of, Lower Auburn Ravine; and 6) the evidence strongly suggests that steelhead are not present upstream of Auburn Ravine I Dam. Given these factors, PG&E concludes that the proposed Drum-Spaulding Project is not likely to adversely affect steelhead in Auburn Ravine or designated steelhead Critical Habitat.

6.5.5 Proposed Measures

6.5.5.1 Yuba-Bear Hydroelectric Project

6.5.5.1.1 NID's Proposed Measures

Because the proposed Project is not likely to adversely affect any threatened and endangered species, NID does not propose any measures related to threatened and endangered species.

6.5.5.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

At the time Licensee files its FLA, the USFWS and NMFS, the agencies with jurisdiction over species listed as threatened or endangered under the ESA, have not filed with FERC any formal recommendations regarding measures to be included in the new license for the Yuba-Bear Hydroelectric Project.

6.5.5.2 Drum-Spaulding Project

6.5.5.2.1 PG&E's Proposed Measures

PG&E has included in its proposed Project the following measure related to threatened and endangered resources:

- Proposed Measure DS-AQR-1: Streamflows (Part 4: Ramping Rates)
- Proposed Measure DS-TR-1: Develop and Implement Integrated Vegetation Management Plan

Refer to Appendix E7 for the full text of the measure and accompanying rationale statement.

6.5.5.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposal as required by the regulations. However, some commenters made requests or proposals that provided PG&E with enough information that PG&E could address at least components of the request (including whether the proposal was consistent with study results). Below PG&E has made its best effort to capture each of these proposals (and PG&E's response to each proposal) that relate to this resource area.

Increased Instream Flows

In numerous locations throughout its February 1, 2011 comment letter on Licensees' DLAs, FWN recommends increased streamflows in various reaches for the projects. However, with the exception of Auburn Ravine, none of these streams have any threatened or endangered fish species. With regard to Auburn Ravine, FWN makes requests including: "minimum instream flow and outage measures"; minimum flows to "increase wetted perimeter" for aquatic macroinvertibrates; “minimum instream flows…that are higher than 100% WUA [specific species not specified]”; and “minimum instream flows…during planned and emergency outages”. FWN’s proposal for increased instream flows in Auburn Ravine does not specify the actual flows requested, or the timing of all such flows. Further, PG&E does not divert water from Auburn Ravine and therefore does not believe a minimum streamflow requirement is appropriate. With regard to FWN’s request that a minimum instream flow should be maintained during periods of PG&E’s planned and emergency outages, it should be noted that during the outage periods it is not possible for the Project to convey water to Auburn Ravine, and therefore PG&E cannot provide a minimum instream flow during either planned or emergency outages. Any other entity providing flow to Auburn Ravine at that time (e.g., PCWA) would not be governed by the Project’s FERC license. Thus PG&E cannot propose measures that would need to be executed by a third party. Based on the above, PG&E cannot evaluate the potential environmental benefits or costs associated with FWN’s proposals regarding instream flows in Auburn Ravine.

6.5.6 Unavoidable Adverse Effects

6.5.6.1 Yuba-Bear Hydroelectric Project

Because NID’s proposed Yuba-Bear Hydroelectric Project is not likely to adversely affect threatened and endangered species, it would also not create any significant, unavoidable adverse effects on threatened or endangered species.

6.5.6.2 Drum-Spaulding Project

Operating and maintaining the proposed Drum-Spaulding Project would not create any significant and unavoidable adverse effects on threatened and endangered species or designated Critical Habitat.

Continued operation of PG&E’s Drum-Spaulding Project has the potential to affect elderberry plants used by VELB. However, these effects are addressed and mitigated by adherence to PG&E’s VELB Conservation Program. For more information see the ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle technical memorandum (7-2), filed with this FLA in Appendix E12.

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6.6 Recreational Resources

The discussion of recreational resources is broken into four sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding recreational resources. Second, the affected environment is discussed in Section 6.6.1. Third, the environmental effects of the projects are located in Section 6.6.2. Fourth, proposed measures are listed in Section 6.6.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.6.4.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on recreational resources, Licensees developed and conducted the studies listed in Table 6.6-1.

Table 6.6-1. Recreational resources studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number[1]	Study in Progress[2]	Study Complete	Date Study is Scheduled to be Complete
2.8.1	Recreational Flow	8-1	1/28/11	--	10/31/11
2.8.2[1]	Drum-Spaulding Recreational Use and Visitor Surveys	8-2a	9/9/10	--	10/31/11
	Yuba-Bear Recreational Use and Visitor Surveys	8-2b	9/13/10	--	10/31/11

[1] Because there was no overlap between the two projects in the performance of this study, Licensees prepared separate technical memorandum for each Project: Technical Memoranda 8-2a address Recreation Use and Visitor Surveys for the Drum-Spaulding Project, and Technical Memoranda 8-2b address Recreation Use and Visitor Surveys for the Yuba-Bear Hydroelectric Project.

[2] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, the three studies listed in Table 6.6-1 are in progress. The status of each study is described below:

- Recreation Flow (Study 2.8.1). FERC's comments on Licensees' DLAs directed Licensees to use a revised Base Case hydrology to characterize existing flow conditions. In the main text of the FLA, Licensees summarized the estimated number of boatable flow days under existing conditions based on this revised Base Case hydrology. The technical memorandum for the Recreation Flow Study contained in Appendix E12 of the FLA was originally completed and posted to the Relicensing Website on January 28, 2011. By October 31, 2011, Licensees anticipate filing with FERC an updated version of this technical memorandum to reflect the revised Base Case hydrology. Licensees note that the differences between the Base Case that was used in Licensees' DLAs and the Base Case that FERC has directed Licensees to now use are relatively minor and will have little effect on the study conclusions, including the estimated number of boatable flow days under existing conditions.

- Recreation Use and Visitor Surveys Study (Study 2.8.2) for the Yuba-Bear Hydroelectric Project. Licensee posted what it anticipated was a final technical memo for this study on

September 13, 2010. However, in their comments on Licensee's DLA, the Forest Service requested Licensee change the seasonal presentation of facility occupancy (i.e., Forest Service requested a change in the analysis period). Licensee has used the Forest Service's requested recreation season in this FLA, and intends, by October 31, 2011, to revise and file with FERC the Recreation Use and Visitor Surveys Technical Memorandum (8-2b) for the Yuba-Bear Hydroelectric Project, which used a different recreation season, so that the information in the technical memorandum will be consistent with the information in the FLA. Licensee notes that the analysis in the current technical memorandum is not incorrect or in error, and expects that changing the analysis period will have a minor effect on the study conclusions.

- Recreation Use and Visitor Surveys Study (Study 2.8.2) for the Drum-Spaulding Project. The Forest Service requested that Licensee change the presentation of seasonal facility occupancy from its open season (open to close dates) to the summer season (Memorial Day weekend to Labor Day weekend), which the Forest Service felt would be a more useful indicator regarding whether facilities are meeting recreation needs. The facility occupancies have been updated in the FLA to represent summer season occupancies, as requested. Licensee intends to make this same revision to the Recreation Use and Visitor Surveys Technical Memorandum (8-2b) for the Drum-Spaulding Project (contained in Appendix E12 of the FLA) and to file this revised technical memorandum with FERC by October 31, 2011. Licensee notes that the analysis in the current technical memorandum is not incorrect or in error, and expects that changing the analysis period will have a minor effect on the study conclusions.

An interim technical memorandum for each of the studies listed in Table 6.6-1 is filed with this FLA in Appendix E12. Each technical memorandum includes: an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by the Licensee or Licensees; variances to the FERC-approved study, if any; attachments to the technical memorandum; and references.

6.6.1 Affected Environment

This section describes existing recreational resources, and is divided into the following four areas: 1) recreational setting; 2) recreational resources within the FERC Project Boundary; 3) recreational use; and 4) recreation flow, including whitewater boating and non-whitewater boating flow-related recreation on Project-affected river reaches.

6.6.1.1 Recreational Setting

6.6.1.1.1 Yuba-Bear Hydroelectric Project

The Project's recreation facilities and opportunities are found in three basins – the South Yuba River Basin; Canyon Creek Basin; and the Bear River Basin. Most of the Project's recreation facilities occur at seven Project reservoirs (i.e., Jackson Meadows, Milton, French, Faucherie, Sawmill, Bowman, and Rollins), and include overnight camping, picnicking and a variety of other recreation opportunities. Based on the geographic dispersion of the recreation facilities, the Project facilities and opportunities are divided into seven general areas: Jackson Meadows Reservoir, Milton Diversion Impoundment, French Lake, Faucherie Lake, Sawmill Lake, Bowman Lake, and Rollins Reservoir as well as the interconnecting trails and tributaries between the reservoirs. Recreation activities in the Project Area are numerous and varied and include, but are not limited to camping, fishing, boating, swimming, hiking, scuba diving, picnicking, sightseeing, wildlife viewing, four-wheel driving, hunting and winter activities.

6.6.1.1.2 Drum-Spaulding Project

Recreation activities in the Project Area are numerous and varied and include camping, fishing, boating, swimming, hiking, picnicking, sightseeing, wildlife viewing, off-highway vehicle (OHV) driving, and hunting. The Project Vicinity includes many reservoirs and lakes with some accessible by vehicle and others only accessible by developed trails or cross-country travel. In the Grouse Ridge area, in particular, there are dozens of natural non-Project lakes, most of which are connected via an existing, developed, hiking trail system. Some of the Project reservoirs are also connected to this extensive trail system. In addition, along many of the river reaches in the Project Vicinity existing non-project recreation facilities offer visitors the opportunity for day use (picnicking, swimming, angling, etc.) and overnight activities. These lands and facilities are managed by a broad range of entities including the Licensees; public land managing agencies (e.g., Forest Service and BLM); and, state and local organizations (i.e., California Department of Parks and Recreation (CDPR) and other local and regional management entities).

6.6.1.2 Recreational Resources within the FERC Project Boundary

6.6.1.2.1 Yuba-Bear Hydroelectric Project

Yuba-Bear Hydroelectric Project recreation facilities can be divided into five recreation areas, which in most cases include several Project reservoirs and varying land ownership. Table 6.6.1-1 provides an overview of the recreation areas and general land ownership. All of the existing Project recreation facilities are located within the FERC Project boundary as filed with the FLA.

Table 6.6.1-1. Yuba-Bear Hydroelectric Project recreation areas and land ownership.

Recreation Area/Project Reservoir or Site	Land Ownership
JACKSON MEADOWS RECREATION AREA	
Jackson Meadows Reservoir	NFS[1]/NID/Private
Milton Diversion Impoundment	NFS/NID
FRENCH LAKE RECREATION AREA	
French Lake	NFS/NID
BOWMAN LAKE RECREATION AREA	
Bowman Lake	NFS/NID
Sawmill Lake	NFS/NID
Canyon Creek	NFS
Faucherie Lake	NFS/NID
DUTCH FLAT RECREATION AREA	
Dutch Flat No. 2 Forebay	NID
Dutch Flat Afterbay	BLM/NID/PG&E/Private
Chicago Park Forebay	BLM/NID
ROLLINS RESERVOIR RECREATION AREA	
Rollins Reservoir	BLM/NID

[1] NFS land managed by the Forest Service.

A detailed description of Project recreation facilities the condition of the facilities is provided below.

Jackson Meadows Reservoir Recreation Area

The Jackson Meadows Recreation Area consists of two Project reservoirs - Jackson Meadows Reservoir and Milton Diversion Dam Impoundment.

Jackson Meadows Reservoir

Jackson Meadows Reservoir lies at an elevation of 6,036 feet. Access to the reservoir occurs by three routes. The only paved route occurs from the east via Henness Pass Road (Forest Service Road 07) approximately 18 miles from Highway 89. Access from the west (dirt/gravel roads) is via Sierra County Road 401 and Henness Pass Road (Sierra County Road 301) approximately 25 miles from Highway 49 (Downieville, CA). Access from the south is via the partially paved Bowman Lake Road (Forest Road 18) and dirt/gravel Nevada County Road 843 and 956 approximately 23 miles from Highway 20.

At maximum water surface elevation, Jackson Meadows Reservoir is 1,008 acres with 9.9 miles of shoreline (NID 2010b). Maximum speed on the reservoir is 35 mph from official sunrise to sunset and 10 mph from sunset to sunrise. A "flat wake" zone of 5 mph occurs within 200 feet of the Woodcamp Boat launch (Nevada County 2004). California Department of Fish and Game (CDFG) stocks rainbow trout in the reservoir monthly from May through August, and the reservoir supports year round fishing (CDFG 2007b).

Jackson Meadows Reservoir Recreation Area consists of eight campgrounds, two picnic areas and two boat launches – all located on either NFS land or NID land. As a whole, the recreation area provides overnight camping at 131 developed family campsites, five group camping sites

(150 Persons-at-one-time [PAOT]), and 10 boat-in campsites. In addition, the recreation area provides 17 total picnic sites. Currently, all facilities are managed by the Forest Service through a concessionaire. The primary recreation activities at the reservoir are camping, boating, fishing, picnicking, swimming and hiking (NID 2010b). In 2009, the peak recreation use estimate was 20,185 Recreation Days[1] (RDs) comprised mostly of overnight use (16,770 RDs). Developed facilities on NID land include Aspen Group Campground and Silvertip Group Campground (Table 6.6.1-2). These lands are classified as Roaded Natural in the Forest Service ROS classification system (USDA 2004).

Table 6.6.1-2. Recreation facilities at Jackson Meadows Reservoir located on NID land.

Facility	Season (open/close)	Manager	Restrooms	Boat launch	Parking Spaces	Picnic sites	Camp sites	Animal resistant containers	PAOT Capacity
Aspen Group Campground	mid May/ late Sept	Forest Service (concessionaire)	3 vault (8 stalls)	none	35	none	3	2 (dumpsters)	100
Silvertip Group Campground	mid May/ late Sept	Forest Service (concessionaire)	2 vault (4 stalls)	none	15 (informal)	none	2	1 (dumpster)	50

Source: NID 2010b, TNF 2007.

At Aspen Group Campground, one of the three group sites (Hill Unit) is universally accessible with an accessible vault restroom, water spigot, tables, fire rings, grills and associated access routes (NID 2008). At Silvertip Group Campground, accessibility is partial with an accessible CXT vault restroom, but both group sites lack accessible outdoor recreation access routes (ORAR) (steep trail/road access) and site components (tables, fire rings, etc.) (NID 2008).

The condition and level of accessibility at each of the developed recreation sites on NID land are detailed in Table 6.6.1-3.

Table 6.6.1-3. Condition and level of accessibility (based on FSORAG) at the recreation facilities at Jackson Meadows Reservoir located on NID land.

Facility	Parameter	Rating	Details/Comments
Aspen Group Campground	Condition	Good to Fair	Most tables, fire rings and grills are in good condition; however, restrooms at Spring and Ridge units are in disrepair (weathered exteriors, roofs and stalls are tight/aging). Parking areas lack barriers. Hill Unit=Good; Spring & Ridge units=Fair.
	Accessibility	Universally Accessible	One of three group sites (Hill Unit) is universally accessible including CXT vault, water spigot, tables, fire rings, grills, and access routes.
Silvertip Group Campground	Condition	Fair	Some tables are old and weathered with loose benches. Lower flush restroom building is old and wood exterior is damaged.
	Accessibility	Partially Accessible	Neither of the group campsites are designed to accessible standards; however, the CXT vault restroom in the parking area is universally accessible. Access routes from the accessible restroom to the campsites are not designed to accessible standards either (steep slope from parking area to campsites).

Source: NID 2008.

Developed facilities on NFS land include Aspen Picnic Area, Pass Creek Campground, Pass Creek Overflow, Pass Creek Boat Launch, East Meadow Campground, Findley Campground, Fir Top Campground, Woodcamp Campground, Woodcamp Picnic Area, Woodcamp Boat Launch, Jackson Meadows Vista and Jackson Point Boat-In Campground. The Project recreation

[1] Each visit by a person to a development for recreation purposes during any portion of a 24-hour period.

facilities at Jackson Meadows Reservoir Recreation Area on NFS land are summarized in Table 6.6.1-4. These lands are classified as Roaded Natural in the Forest Service ROS classification system (USDA 2004).

Table 6.6.1-4. Recreation facilities at Jackson Meadows Reservoir located on NFS land.

Facility	Season (open/close)	Manager	Restrooms	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	Animal Resistant Containers	PAOT Capacity
East Meadow Campground	mid May/ late Sept	Forest Service (concessionaire)	3 flush (9 stalls)	none	6 (overflow)	none	46	46 food lockers; 2 dumpsters	230
Pass Creek Campground	mid May/ late Sept	Forest Service (concessionaire)	2 flush/ 1vault (10 stalls)	none	None	none	30 (9 overflow)	4 (dumpsters)	150 (45 overflow)
Pass Creek Boat Ramp	mid May/ late Sept	Forest Service (concessionaire)	1 vault (2 stalls)	2, 2-lane concrete	43 (23 main/20 auxiliary)	none	none	1 (dumpster)	n/a
Aspen Picnic Area	mid May/ late Sept	Forest Service (concessionaire)	2 vault (5 stalls)	none	30 (informal)	11	none	2 (dumpsters)	55
Jackson Meadows Vista Point	mid May/ late Sept	Forest Service (concessionaire)	1 vault (1 stall)	none	8	none	none	none	32
Fir Top Campground	mid May/ late Sept	Forest Service (concessionaire)	1 flush (2 stalls)	none	None	none	12	1 (dumpster)	60
Findley Campground	mid May/ late Sept	Forest Service (concessionaire)	1 flush (4 stalls)	none	None	none	14	1 (dumpster)	70
Woodcamp Campground	mid May/ late Sept	Forest Service (concessionaire)	1 flush/1 vault (6 stalls)	none	None	none	20	2 (dumpsters)	100
Woodcamp Picnic Area	mid May/ late Sept	Forest Service (concessionaire)	2 vault (5 stalls)	none	35 (informal)	6	none	1 (dumpster)	30 (picnic) 100 (beach)
Woodcamp Boat Ramp	mid May/ late Sept	Forest Service (concessionaire)	1 vault (2 stalls)	1-lane concrete	36 (informal)	none	none	none	n/a
Jackson Point Boat-In Campground	mid May/ late Sept	Forest Service (concessionaire)	2 pit (2 stalls)	none	None	none	10	none	50

Source: NID 2010b, TNF 2007.

The condition and level of accessibility at each of the developed recreation sites on NFS land are detailed in Table 6.6.1-5.

Table 6.6.1-5. Condition and level of accessibility (based on FSORAG) at the recreation facilities at Jackson Meadows Reservoir located on NFS land (NID 2008).

Facility	Parameter	Rating	Details/Comments
Aspen Picnic Area	Condition	Fair	Several tables are in fair condition; lower 4-unit restroom is all wood construction with a dilapidated wood shingle roof. Upper sites and restroom are all in good condition.
	Accessibility	Partially Accessible	The CXT restroom and 1 picnic site are accessible but the path to the site is too steep with loose dirt. Lower/waterfront picnic sites are not designed to accessible guidelines.
Pass Creek Campground	Condition	Good	Recent site rehabilitation and new CXT restroom. Most amenities in good condition. Flush restroom is older wood construction and shows signs of use/aging.
	Accessibility	Partially Accessible	The new CXT vault restroom is accessible including access routes. None of the campsites are accessible; however, several campsites have some accessible site components, but access routes to campsites are not designed to accessible guidelines.

Table 6.6.1-5. (continued)

Pass Creek Boat Launch	Condition	Good	Paved parking areas and launch ramp (concrete) with new CXT restroom and path. Dock in good condition as well.
	Accessibility	Universally Accessible	The CXT restroom, path and parking spaces meet accessible standards.
East Meadow Campground	Condition	Good	All campground components in good condition with newly re-paved spurs in Loop A. Restrooms have recently been rehabilitated and well maintained (interior and exterior). Some water spigots are aging.
	Accessibility	Universally Accessible	The campground has 6 accessible campsites (4 standard and 2 RV campsites) with accessible site components (including table, fire ring, spurs and bear lockers. Of note, some spur sizes have departures from the standards in order to maintain a useable campsite footprint without altering the campground layout/size. Also, some but not all access routes to the site amenities within each campsite are compliant. Restrooms have some accessible components but retrofitted restrooms have narrow access routes to the buildings.
Jackson Meadows Vista Point	Condition	Good	The restroom and facility identification sign are in good condition. The gravel parking area is also in good condition.
	Accessibility	Partially Accessible	The newer CXT vault restroom is accessible including entrance route; however, the access routes are not designed to accessible standards.
Findley Campground	Condition	Good	Campsite amenities and restrooms are in good condition; however, the road and spur surfaces have areas of cracked, sunken and eroding asphalt.
	Accessibility	Inaccessible (Not Designed to Accessible Guidelines)	The facility does not have any accessible components at the campground.
Fir Top Campground	Condition	Fair	Most of the site amenities are in fair condition with tables in poor condition (low to ground, damaged benches/tops).
	Accessibility	Inaccessible (Not Designed to Accessible Guidelines)	The facility does not have any accessible components at the campground.
Woodcamp Campground	Condition	Fair	Most of the site amenities are in fair condition with tables and the flush restrooms in poor condition. Shows signs of heavy use.
	Accessibility	Inaccessible (Not Designed to Accessible Guidelines)	The facility does not have any accessible components at the campground.
Woodcamp Picnic Area	Condition	Fair	Most site amenities in fair condition with tables and fire rings showing signs of aging; weathered and splitting wood.
	Accessibility	Partially Accessible	One restroom (parking area) is accessible, but the picnic area and swimming beach are not designed to accessible guidelines due to steep and rough access routes. The Picnic tables are not designed to accessible guidelines (ADAAG).
Woodcamp Boat Launch	Condition	Fair	Restroom is old and in disrepair (wood exterior is dilapidated). Concrete ramp is eroding at edges (and very narrow and long).
	Accessibility	Inaccessible (Not Designed to Accessible Guidelines)	The facility does not have any accessible components at the boat ramp facility.
Jackson Point Boat-In Campground	Condition	Fair	Virtually all of the sites amenities are showing signs of age and deterioration (tables, rings, grills, and restrooms).
	Accessibility	Inaccessible (Not Designed to Accessible Guidelines)	None of the amenities or access routes are accessible, but the experience is not designed to be accessible due to the nature of boat-in access along a steep shoreline access to the point.

Associated facilities within the FERC Project Boundary include Jackson Meadows Administrative Center. The center is located on Nevada County Road 956 and includes four buildings – a general store/warehouse, 3-bedroom residence, barracks and utility shed - and a parking/storage area. In addition, two propane tanks are located adjacent to several of the buildings. The general store is the only public access. The center was constructed by NID, and is located on NFS land. The center is maintained by the Forest Service's concessionaire under a SUP and is primarily used by Forest Service-authorized personnel only and generally for administration and maintenance needs associated with the Project recreation facilities at Jackson Meadows Reservoir. Thus, the center is generally not a public use site except for the small general store. NID has very little involvement in the center. Under the Forest Service's SUP with the concessionaire, fifteen percent of the general store revenue is returned to the Forest Service.

Two additional recreation facilities are located at Jackson Meadows Reservoir, and are not within the existing FERC Project Boundary. These facilities include the Jackson Meadows Sanitary Dump Station and the Woodcamp Interpretive Trail.

Woodcamp Interpretive Trail is a 0.5-mile long interpretive loop trail that winds along and across Woodcamp Creek. The trail is entirely on NFS land, and the trailhead that includes the parking area and kiosk, but not the trail itself, is within the existing FERC Project Boundary. The trail is maintained by the Forest Service. The trailhead includes a parking area for 4 vehicles and an information kiosk; and is located at the junction of Nevada County Road 956 and the entrance road to the Project recreation facilities on the west shoreline of Jackson Meadows. The narrow dirt trail has 26 wooden posts, each of which is numbered to coincide with an interpretive message on a flyer provided at the information kiosk at the road junction/trailhead. The trail also includes three wooden bridges over creeks. The trail setting is entirely forested and riparian habitat along the Woodcamp Creek drainage. The trail does not provide any views of the reservoir, and does not link to or approach any of the Project recreation facilities at Jackson Meadows Reservoir.

The Jackson Meadows Sanitary Dump Station is located on Henness Pass Road and includes a sanitary dump station, dumpster and potable water station. The station is on NID land, and is not within the existing FERC Project Boundary. The nearest Project facility is Pass Creek Campground directly across Henness Pass Road. The dump station is managed by the concessionaire under permit to the Forest Service, and services recreational vehicles and campers that utilize the area. The dump fee was $15 in 2010.

In addition to developed facilities, dispersed day use occurs along the shoreline of Jackson Meadow Reservoir within the FERC Project Boundary, primarily along the western and northern shoreline between the dam and the developed recreation complexes. The dispersed use occurs on a combination of NID, NFS, and private lands depending upon the location. Along the western shoreline (from the dam to the Woodcamp complex turn), the land ownership is predominantly NID land. Along the northern shoreline (from the dam to the Aspen Picnic Area), the land ownership is a combination of NFS, NID and private land. Visitors generally utilize the reservoir shoreline for day use activities, particularly for fishing. Of note, the Pacific Crest Trail traverses the boundary of the Jackson Meadows Recreation Area.

<u>Milton Diversion Impoundment</u>

Milton Diversion Impoundment lies at an elevation of 5,690.0 feet. Access to the reservoir occurs by two routes. From the east, access is approximately 2 miles from Jackson Meadows Reservoir via Henness Pass Road (Sierra County Road 301). Access from the west is via Sierra County Road 401 and Henness Pass Road (Sierra County Road 301) approximately 23 miles from Highway 49 (Downieville, CA).

At maximum water surface elevation, Milton Diversion Impoundment is 100 acres with 1.3 miles of shoreline (NID 2010b). Milton Reservoir is designated as a fishing/special use area and the operation of internal combustion engines is illegal. CDFG manages the reservoir to maintain an abundant population of trophy-size trout. Milton Diversion Impoundment is the only non-flowing surface water in CDFG's Wild Trout Program with a maximum size limit; and requires barbless lures or flies and a two fish limit with a maximum size of 12 inches (CDFG 2007b). Milton Diversion Impoundment has an ROS classification of Roaded Natural (USDA 2004).

All the facilities at Milton Diversion Impoundment are located on NFS land, which are classified as Roaded Natural in the Forest Service ROS classification system (USDA 2004). A single unit vault restroom and informational signs (site identification and angler information sign) are located on the north shoreline near the impoundment inflow. The restroom building is in good condition and is designed to accessibility (FSORAG) standards (NID 2008); however the access route to the restroom is not designed to accessible guidelines. The informational signs are in fair condition (NID 2008). Dispersed day use and camping occurs along the north shoreline at roughly three shoreline access areas and six dispersed campsites with rock fire rings.

French Lake Recreation Area

The French Lake Recreation Area consists of one Project reservoir – French Lake.

French Lake

French Lake lies in the southeastern portion of the Project Area at an elevation of 6,660 feet. Road access to French Lake occurs via two routes. First, access from Jackson Meadows Reservoir occurs on dirt roads leading south via Graniteville Road (Nevada County Road 956) and then southeast via Meadow Lake Road (Nevada County Road 843). Second, access from Webber Lake occurs on dirt roads approximately 15 miles leading south and west on Meadow Lake Road (Forest Route 86, Nevada County Road 843). A locked gate is located approximately two miles from the reservoir, where visitors may park their vehicles and continue on foot to the shoreline (NID 2010b).

At maximum water surface elevation, French Lake is 356 acres with 5.3 miles of shoreline (NID 2010b). French Lake is classified as Semi-Primitive Non-Motorized in the Forest Service ROS classification system (USDA 2004). In addition, Nevada County classifies French Lake as a "small lake" and, as a result, has a maximum speed limit of 10 mph (Nevada County 2004). Primary recreation activities are hiking, backpacking, camping, and fishing (NID 2010b). The reservoir does not have any developed recreation facilities.

No recreation facilities exist at the reservoir; however, two undeveloped campsites with fire rings are located near the dam on NID land or lands classified as Semi-Primitive Non-Motorized ROS class (USDA 2004).

Bowman Lake Recreation Area

The Bowman Lake Recreation Area consists of three project reservoirs – Bowman Lake, Sawmill Lake and Faucherie Lake – all along Canyon Creek.

Bowman Lake

Access to Bowman Lake (El, 5,562 ft) occurs via two routes. From the south, access to the reservoir is by the partially paved Bowman Lake Road (Forest Route 18) leading north from State Highway 20. The first six miles of the road are paved, and the remaining ten miles to the reservoir are gravel and dirt. From the east, Bowman Lake is reached by driving approximately six miles from Jackson Meadows Reservoir along Graniteville Road (Nevada County Road 956) and Meadow Lake Road (Nevada County Road 843). At maximum water surface elevation, Bowman Lake is 827 acres with 7.6 miles of shoreline (NID 2010b). The north, west, and east shorelines of Bowman Lake have a Semi-Primitive Motorized ROS classification; and the south shore is classified as Semi-Primitive Non-Motorized (USDA 2004). The primary recreation activities at the reservoir are camping, boating, fishing, hunting, and picnicking. Recreation opportunities are dispersed along the shoreline along Bowman Lake Road from the dam to the inflow of Jackson Creek on either NID or NFS land.

Bowman Lake Campground is the only developed recreation facility at Bowman Lake, and is located on NID land and is owned by NID. The rustic campground near the Milton-Bowman Tunnel outlet at the northeastern end of the reservoir is managed by the USDA Forest Service. The facility has a toilet, a camping information sign, and consists of 11 campsites each with a fire ring, and picnic table. A gravel road extending down from the campground to the shoreline serves as a boat launch ramp. Another gravel access road just east of the dam serves as a second informal boat launching ramp. The rustic campground is in fair condition with many aging and dated site amenities; and the campground is inaccessible to persons with disabilities (NID 2008).

In addition, six other designated recreation sites (5 camping areas totaling 9 primitive campsites and an informal boat launch) are located on NID land along the north shoreline from the Jackson Creek inflow to the dam. The six designated recreation sites include the: Jackson Creek, Inflow, Milton-Bowman Tunnel outlet, Big Rock, McMurray Road Junction and Rock Road boat ramp sites. All of these designated primitive campsites consist only of a steel fire ring, which are generally in good condition; and none of the sites are designed to accessibility (FSORAG) standards. All of these sites are accessed via Bowman Lake Road and provide camping and/or day use opportunities along the shoreline.

Four other designated recreation sites (4 primitive campsites) are located on NFS land (Semi-Primitive Motorized ROS class) along the north shoreline of Bowman Lake. These sites include the Tree Camp, Burnt Tree, Peninsula and Graniteville Road sites. These sites are accessed via Bowman Lake Road and provide camping and day use opportunities along the shoreline. Most of these designated recreation sites consist only of a steel fire ring, which are generally in good condition; and none of the sites are designed to accessibility (FSORAG) standards.

Sawmill Lake

Sawmill Lake is located at an elevation of 5,860 ft. Access to the reservoir is from the north end of Bowman Lake via Nevada County Road 843 and Forest Road 843-37 leading southeast along Canyon Creek from Jackson Creek Campground. The north side of Sawmill Lake is classified as Roaded Natural in the Forest Service ROS classification system, and the south side is classified Semi-Primitive Non-Motorized (USDA 2004). At maximum water surface elevation, Sawmill Lake is 113 acres with 2.6 miles of shoreline (NID 2010b). Sawmill Lake is classified by Nevada County as a "small lake" and has a 10 mph speed limit (Nevada County 2004). CDFG stocks rainbow trout in the reservoir once a year in conjunction with their "free fishing day" program (CDFG 2007b).

No developed campground or day use facilities are located at Sawmill Lake; however, several designated recreation sites (steel fire rings present) and undeveloped recreation sites (user-created rock fire rings present) are located in four general areas along the northern shore of the reservoir from the inflow of Canyon Creek downstream to the dam – Peninsula, East-North Shore, North Shore and Dam sites.

Two other designated recreation sites (camping areas) are located on NID land ("Roaded-Natural" ROS class) along the north shoreline of Sawmill Lake – North Shore and Dam sites. The North Shore site consists of a cluster of 13 dispersed campsites occur between the peninsula sites and the Sawmill Dam access road. This cluster includes seven steel fire rings/grills, including one site with a wood picnic table; and seven rock fire rings, including one site with a makeshift plywood table built into the trees. The steel fire rings are generally in good condition; and none of these sites are designed to accessibility (FSORAG) standards (NID 2008). Access to these sites occurs primarily along a user-created spur that winds through the trees parallel to the dispersed campsites (off of Forest Service Road 843-37). General parking is not available but vehicles park between trees where possible.

The dam site consists of a cluster of dispersed campsites in the general area of the Sawmill Dam, where eight distinct sites are located (three with steel fire rings/grills and five with rock fire rings). The three steel fire ring/grills all overlook the dam and lower end of the reservoir. The steel fire rings are generally in good condition; and none of these sites are designed to accessibility (FSORAG) standards (NID 2008). Dispersed parking is available for as many as eight vehicles. The other five rock fire rings are set back from the reservoir near the outflow of Canyon Creek.

Two undeveloped (dispersed) recreation sites (camping areas) are located on NFS land ("Roaded-Natural" ROS class) along the northern shore of Sawmill Lake – Peninsula and East-North Shore sites. At the Peninsula site, as many as nine rock fire rings are located along the reservoir near the inflow of Canyon Creek to the large peninsula on the north shore (Peninsula sites). The sites nearest the inflow consist of three large rock fire rings and are accessed via a rough four-wheel drive (4WD) spur road which provides parking for approximately four VAOT at the end of the spur road. The sites near the peninsula consist of six additional rock fire rings are located on a peninsula overlooking the reservoir. These sites are also accessed via a rough 4WD spur road with dispersed parking for approximately eight vehicles. The East-North Shore site is located near the road leading to Faucherie Lake (set back from the reservoir) that consists of several rock fire rings accessed via a rough 4WD spur road with dispersed parking for approximately two vehicles.

Canyon Creek

A single Project campground, Canyon Creek Campground, is located along Canyon Creek at an elevation of 6,010 feet on NFS land. The campground is situated approximately 1.1 miles downstream of Faucherie Lake and 0.7 mile upstream of Sawmill Lake. The campground is located on lands classified as Roaded Natural in the Forest Service ROS classification system. The rustic campground consists of 16 campsites, each with a picnic table and fire ring. In addition, seven of the campsites also have animal-resistant food lockers. The campground also has a paved asphalt circulation road and two, double-unit vault toilets. Currently, the campground does not require a camping fee.

Faucherie Lake

Access to the Faucherie Lake (El. 6,123 ft) is by Forest Service Road 843-37 leading southeast two miles from Sawmill Lake. At maximum water surface elevation, Faucherie Lake is 150 acres with 2.4 miles of shoreline (NID 2010b). The primary recreation activities at the reservoir are camping, picnicking, boating, fishing, swimming, hiking, and backpacking. The Faucherie Lake area is classified primarily as Semi-Primitive Non-Motorized in the Forest Service ROS classification system (USDA 2004). However, the northern edge of the reservoir is managed for Roaded Natural objectives where the developed recreation sites, dam, and boat ramp are located.

All of the developed recreation facilities are located on NID land, including Faucherie Lake Group Campground and Day Use and Boat Launch facilities. Faucherie Lake Group Campground is located on the north shore of the reservoir, and accommodates 50 PAOT at two group sites (25 PAOT per site). NID received a state grant under the DWR's Davis-Grunsky Act for the construction of the group campground facility. Overall, the group camp consists of eight picnic tables, two steel fire rings, six animal resistant food lockers, three animal resistant trash receptacles, one animal resistant recycling receptacle, and a single, two-unit toilet building. On-site parking accommodates six VAOT (3 VAOT at each group site); however, additional parking is available at the day use and boat launch parking area. Each group site has four to five tent pads available. In addition, the sites also have several user-created rock fire rings dispersed throughout the area. The campground is inaccessible to persons with disabilities (NID 2008). Overall, the group facility is in fair condition. The steel fire rings and trash/recycling receptacles are new and in good condition; however, the tables and toilet building are in poor condition with splitting and weathered wood. The campground is inaccessible to persons with disabilities (NID 2008).

The Faucherie Lake Day Use and Boat Launch facility consists of an informal single-lane boat ramp, double-unit vault restroom, and a parking area (14 VAOT). The paved facility road and restroom are in poor condition (old structures showing sings of aging); whereas the primitive gravel parking area is in fair condition. This rustic facility is inaccessible to persons with disabilities (NID 2008).

In addition, the undeveloped parking area and informal boat launch are located on NID land across the dam. The site has a capacity for as many as 25 VAOT in the gravel lot and along the road across the dam.

Dutch Flat Recreation Area

The Dutch Flat Recreation Area consists of three project impoundments - Dutch Flat No. 2 Forebay, Dutch Flat Afterbay and Chicago Park Forebay.

<u>Dutch Flat No. 2 Forebay</u>
Dutch Flat No. 2 Forebay lies in the western portion of the Project Area at an elevation of 3,330 feet outside of the TNF. Access to the forebay occurs by two routes. The most direct and mostly paved access to is via Diggins Hill Road leading north approximately two miles from the town of Dutch Flat. More remote access is also available from the north, west and east via Lowell Hill Road. At maximum water surface elevation, Dutch Flat No. 2 Forebay is 8 acres with roughly 0.5 miles of shoreline. Dutch Flat No. 2 Forebay does not have any developed recreation facilities, but provides day use opportunities including shoreline fishing, picnicking, and hiking/walking along the shoreline at an undeveloped parking area on NID land.

<u>Dutch Flat Afterbay</u>
Dutch Flat Afterbay lies in the western portion of the Project Area at an elevation of 2,741 feet outside of the Tahoe National Forest. Access to the afterbay occurs by two routes. The most direct, paved access is via Diggins Hill Road leading north less than one mile from the town of Dutch Flat. More remote access is also available from the north, west and east from Lowell Hill Road – less than two miles from the junction with Diggins Hill Road. At maximum water surface elevation, Dutch Flat Afterbay is 38 acres with roughly 1.9 miles of shoreline. Dutch Flat Afterbay does not have any developed recreation facilities; however, three undeveloped roadside parking areas, an informal launch and general roadside parking provide visitors with access to the shoreline. The afterbay provides opportunities for shoreline and boat fishing, picnicking, and swimming. Land ownership at these five access areas varies between NID, PG&E, BLM and private lands. Several undeveloped recreation sites are located at Dutch Flat Forebay. On NID land, an undeveloped parking area is located to the east of where the Dutch Flat Penstock enters the afterbay. An undeveloped parking area and informal launch ramp are located on PG&E land to the west of where the Dutch Flat Penstock enters the afterbay. The parking area provides vehicles access near the shoreline, but not directly to the shoreline. The informal launch ramp provides vehicle access to the shoreline and provides a launch for small watercraft. A single undeveloped parking area is located on private land on the south side of the afterbay. Several roadside parking areas beyond the dam on the north side of the afterbay for approximately 0.25 mile are located on BLM land.

<u>Chicago Park Forebay and Powerhouse Area</u>
Chicago Park Forebay lies in the western portion of the Project Area at an elevation of 2,716 feet. Access to the reservoir is by foot or non-motorized vehicle behind locked gates. Vehicle access to the Forebay ends near Chicago Park Powerhouse via Chicago Park Powerhouse Road.

Access to the upper end of the Forebay, by way of vehicle, is possible via Lowell Hill Road from the north.

At maximum water surface elevation, Chicago Park Forebay is 7 acres with roughly 0.7 miles of shoreline. Chicago Park Forebay does not have any developed recreation facilities. Types of day-use opportunities include OHV use, shoreline fishing, picnicking, biking, and hiking/walking. In addition, undeveloped recreation occurs in the powerhouse area at a large gravel bar where the Chicago Park Powerhouse Road Bridge spans the Bear River. Both of these locations are on BLM land.

Undeveloped recreation use occurs on a portion of the bridge area land (adjacent to the Bear River and Steephollow Creek), which is located on NID land. Undeveloped recreation occurs along the Chicago Park Forebay shoreline and a portion of the bridge area, which is located on BLM land.

Rollins Reservoir Recreation Area

The Rollins Reservoir Recreation Area only contains Rollins Reservoir.

<u>Rollins Reservoir</u>
Rollins Reservoir is at an elevation of 2,171 feet and is located near Grass Valley outside of the Tahoe National Forest. General access to the reservoir occurs from Highway 80 via Highway 174 or Rollins Lake Road, or from Highway 49/20 in Grass Valley via Highway 174. Access to Orchard Springs Recreation Complex is via Highway 174 then Orchard Springs Road. Access to Greenhorn Recreation Complex is via Highway 174 then Greenhorn Access Road. Access to Peninsula Recreation Complex is via Highway 174 then You Bet Road. Access to Long Ravine Recreation Complex is via Highway 174, Rollins Lake Road and the Old You Bet Road.

At maximum water surface elevation, Rollins Reservoir is 788 acres with 19 miles of shoreline. The maximum speed limit unless otherwise noted is 50 mph from sunrise to sunset and 10 mph otherwise. A 5 mph speed limit is in effect for designated launch and mooring areas as well as fishing areas. Boats are prohibited in designated swimming areas (Placer County ordinance). Fishing is available from a boat or shore for a wide variety of trout and warm water species. CDFG stocks rainbow trout every other week from February through May (CDFG 2007b). Land based activities include camping, hiking and picnicking.

Four recreation complexes are located at Rollins Reservoir, each of which includes a campground, boat launch and day use area(s). These complexes include Orchard Springs, Greenhorn, Peninsula and Long Ravine - all on NID land (Table 6.6.1-6). In all, these campgrounds provide 332 developed campsites that offer different camping opportunities for tents, RVs and small wood/log cabins. Each campground complex offers a boat launching facility. Orchard Springs, Greenhorn and Long Ravine campgrounds offer a predominantly high-density camping experience with minimal space and screening between campsites, and many sites grouped together in tight loops/areas. Peninsula Campground offers a low-to-medium density camping experience at three major loops with moderate screening between sites in a predominantly forested setting. Typically, all the campgrounds, except Peninsula Campground, are open year-round (Table 6.6.1-6). The level of accessibility is roughly the same at all four recreation complexes. Each of the campgrounds and picnic areas (and swim beaches, where applicable) do not have any accessible features; however, the boat launching facilities (upgraded in the late 1990's with California Department of Boating and Waterways, CDBAW, grants) each have a universally accessible restroom and parking spaces. The boat launch ramps and docks are all ADA inaccessible.

Table 6.6.1-6. Rollins Reservoir developed recreation facilities located on NID land.

Recreation Facility	Typical Season	Manager	Boat Launch	Parking	Picnic Sites	Camp Sites	PAOT Capacity
Orchard Springs	Year-round	NID	2-lane concrete	150	--	101	Unknown
Greenhorn	Year-round	NID (concessionaire)	2-lane concrete	143	3	79	Unknown
Peninsula	Apr 1-Sept 15	NID (concessionaire)	2-lane concrete	50	unknown	67	Unknown
Long Ravine	Year-round	NID (concessionaire)	2-lane concrete	72	--	85	Unknown

Source: Nevada County 2007, NID 2010b.

Orchard Springs Campground consists of 101 campsites, four flush toilet buildings, a boat launching facility, two beach areas and a common area with a stage and beach volleyball court. In addition, the campground includes a marina, general store, restaurant and boat rentals. The campsites provide tent, recreational vehicle (RV) and cabin camping opportunities in either a forested or waterfront setting.

Greenhorn Campground consists of 79 campsites, three picnic units, a boat launch facility and two flush toilet buildings; as well as a beach volleyball court and swimming beach. In addition, the facility offers a general store and arcade with restroom facilities.

Peninsula Campground consists of 67 campsites, a boat launching facility, swimming beach (with volleyball court and horseshoe pit), and four toilet buildings (three flush/one vault). In addition, the campground offers a general store and boat rentals. Camping opportunities include tents, RV and cabins at the boat launch facility, in a forested setting and atop a bluff overlooking the reservoir. Peninsula Campground is open from April 15 to September 15.

Long Ravine Campground consists of 85 campsites, four flush toilet buildings (including showers at two toilet buildings), a boat launching facility and a beach. The facility also offers a beach, general store and grill, boat rentals and gas. The campsites provide tent, RV and group camping opportunities along the shoreline and in a forested setting away from the reservoir.

The condition and level of accessibility at each of the developed recreation complexes on NID land at Rollins Reservoir are detailed in Table 6.6.1-7.

Table 6.6.1-7. Condition and level of accessibility (based on FSORAG) at the recreation facilities at Rollins Reservoir located on NID land.

Facility	Parameter	Rating	Details/Comments
Orchard Springs Recreation Complex	Condition	Fair to Poor	The restrooms in the main campground are older designs but updated; and all the amenities at the launching facility are in good condition (parking, roads, restroom and ramp). However, the campsite amenities throughout the campground are falling apart, particularly the wood Picnic tables, concrete/wood tables, and the steel fire rings and pedestal grills. All are showing signs of aging (split wood, corroding steel, and eroding concrete).
	Accessibility	Partially Accessible	The main campground does not provide any accessible features. Only the launching facility has a universally accessible restroom with associated parking spaces. The primary activities offered (camping, swimming and boating) are not accessible to disabled persons.
Greenhorn Recreation Complex	Condition	Fair to Poor	The launch facility restroom is in good condition; however, the remaining campground amenities (tables, fire rings and grills) are mostly in poor condition. Half of the tables are metal frames with wood tops and benches and are in good condition, but the other half are all wood and in poor condition (splitting wood, holes and burn damage). The water spigots are functional and good condition. The wood tables at the picnic area are in poor condition while the pedestal grills are in fair condition.
	Accessibility	Partially Accessible	The main campground and picnic area does not provide any accessible features. Only the launching facility has a universally accessible restroom with associated parking spaces. The primary activities offered (camping, picnicking and boating) are not accessible to disabled persons.
Peninsula Recreation Complex	Condition	Fair	The restroom buildings are in good condition with clean, well-kept interiors. The campsite amenities are showing signs of aging, as most tables are splitting/rotting and the older concrete/steel grill units (majority of rings) have cracked and broken concrete bases and are overall in poor condition. The paved vehicle spurs are generally in good condition with only a few spurs at "The Point" eroding away at the edges (steep terrain); and the wood vehicle barriers are in place, but showing signs of splitting and rotting at most sites. The roads and parking area are in good condition with few spots of cracking or upheaval. Boat ramp and dock are in good condition.
	Accessibility	Partially Accessible	The main campground does not provide any accessible features. Only launching facility has a universally accessible restroom with associated parking spaces. The primary activities offered (camping, swimming, boating) are not accessible to disabled persons.
Long Ravine Recreation Complex	Condition	Poor	The campground and launching facility buildings are in good condition (bathrooms and showers). The remaining campsite amenities (tables, fire rings, pedestal grills and water spigots) all show signs of aging (bent, damaged and split wood, spigots low to ground). The only trash receptacles are basic aluminum cans that are loosely stationed throughout the site. The launch facility campsites are in very poor condition. The paved spurs in the main campground are eroding at the edges and the barriers are falling apart and loose in areas.
	Accessibility	Partially Accessible	The main campground does not provide any accessible features. Only the launching facility has a universally accessible restroom with associated parking spaces. The primary activities offered (camping, picnicking and boating) are not accessible to disabled persons.

Source: NID 2008

6.6.1.2.2 Drum-Spaulding Project

The Project's recreation resources and facilities (i.e., located within the Project Area) provide a variety of recreation opportunities, including camping, picnicking, boating, and fishing. Table 6.6.1-8 provides an overview of the recreation areas and general land ownership at each Project reservoir. The following section describes the existing Project resources and recreation facilities at Project reservoirs.

Description of Recreation Areas and Land Ownership

The Project recreation resources in this Plan are divided into recreation areas, which in many cases include numerous Project reservoirs and their associated Project recreation facilities.

Table 6.6.1-8. Drum-Spaulding Project recreation areas and land ownership within the FERC Project boundary.

Recreation Area	Project Reservoir or Site	Land Ownership
White Rock Lake Recreation Area	White Rock Lake	Forest Service/PG&E
Fordyce Lake Recreation Area	Meadow Lake	Forest Service/PG&E
	Lake Sterling	Forest Service/PG&E
	Fordyce Lake	Forest Service/PG&E
Lake Spaulding Recreation Area	Lake Spaulding	Forest Service/PG&E
	Bear Valley - Sierra Discovery Trail and Bear Valley Group Campground	PG&E
	Fuller Lake	Forest Service/PG&E
	Rucker Lake	Forest Service/PG&E
	Blue Lake	Forest Service/PG&E
Grouse Lakes Recreation Area	Feeley Lake	Forest Service
	Carr Lake	Forest Service/PG&E
	Lower Lindsey Lake	Forest Service/PG&E
	Middle Lindsey Lake	PG&E
	Upper Lindsey Lake	PG&E
	Culbertson Lake	Forest Service/PG&E/Private
	Lower Rock Lake	PG&E
	Upper Rock Lake	PG&E
Kidd Lake Recreation Area	Kidd Lake	PG&E/Private
	Upper Peak Lake	Forest Service/PG&E
	Lower Peak Lake	Forest Service/PG&E
Lake Valley Recreation Area	Kelly Lake	PG&E/Private
	Lake Valley Reservoir	PG&E
Alta-Drum Recreation Area	Deer Creek Forebay	PG&E
	Drum Forebay	PG&E
	Drum Afterbay	PG&E
	Alta Forebay	PG&E/Private
	Halsey Afterbay	PG&E
	Wise Forebay	PG&E
Halsey Forebay Recreation Area	Halsey Forebay	PG&E
Rock Creek Reservoir Recreation Area	Rock Creek Reservoir	PG&E/Private

All of the Project's recreation facilities are managed by PG&E, regardless of whether they are located on PG&E or NFS land. The following section describes the existing Project resources and recreation facilities at the Project recreation areas as set forth in Table 6.6.1-8 above.

White Rock Lake Recreation Area

The White Rock Lake Recreation Area contains White Rock Lake and is located in the east central portion of the TNF, approximately six miles north of I-80. Elevations in this area range from 7,500 to 8,500 feet.[2] At 7,820.0 feet, White Rock Lake is the highest reservoir in the Project. Landowners in the area are PG&E, Sierra Pacific Industries (SPI), and the Forest Service. The NFS land at White Rock Lake Recreation Area is within the Forest Service's Semi-Primitive Motorized Recreation Opportunity Spectrum (ROS)[3] class as defined in the TNF Land and Resource Management Plan (USDA 2004). There are no recreation fees for this area.

Primary access to the White Rock Lake area occurs via Highway 89 north from Truckee, CA. From Highway 89 two primary routes access White Rock Lake. The first access route is from Jackson Meadows Reservoir on dirt roads leading south via Graniteville Road (Nevada County Road 956) and then southeast via Meadow Lake Road (Nevada County Road 843). The second access route is from Webber Lake on dirt roads for approximately 15 miles leading south and west on Meadow Lake Road (Forest Route 86, Nevada County Road 843). Private logging roads provide access beyond Meadow Lake Road to the reservoir. The Forest Service and logging roads are improved dirt with gravel, but the last couple of miles to the lake require a four-wheel drive vehicle. Recreational facilities in the White Rock Lake Recreation Area are summarized below and in Table 6.6.1-9.

Table 6.6.1-9. Project Recreation facilities in the White Rock Lake Recreation Area.

Project Reservoir	Recreation facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
White Rock Lake	White Rock Lake Primitive Campsites	Semi-Primitive Motorized	Early July	Mid Sept	Forest Service/ PG&E	--	--	--	6	30

White Rock Lake

White Rock Lake is located 34.4 miles from Truckee, California. At its maximum water surface elevation of 7,820.0 feet, White Rock Lake has 88.9 water surface acres and 1.6 miles of shoreline. Approximately 60 percent of the shoreline is accessible by foot. Foot access to the remainder of the shoreline is difficult due to steep, bare granite terrain. Nearly 40 percent of the shoreline is accessible to high clearance 4-wheel drive vehicles. White Rock Lake provides recreational opportunities for camping, hiking, fishing, hunting, and small motorized and non-motorized boating and is located on Forest Service and PG&E land.

Recreation amenities at White Rock Lake include two primitive camping areas (non-fee) that are located along the western shoreline near the dam (NFS land) and the north shoreline (PG&E land). In total, the two camping areas provide six designated campsites, each with steel fire rings

2 All elevations are in National Geodetic Vertical Datum of 1929 (NGVD 29).

3 The Forest Service uses the Recreation Opportunity Spectrum (ROS) land classification system to guide the management of recreation use and development of recreation facilities on NFS land. The spectrum uses seven ROS classes as follows: Primitive, Semi-primitive Non-Motorized, Semi-primitive Motorized, Roaded Natural, Roaded Modified, Rural, and Urban. The TNF Forest Plan has developed ROS designations for the NFS land within the Project area. This Plan also identifies the general ROS setting for PG&E land and waters associated with the Project reservoirs within the TNF boundary.

and site markers. The primitive camping facility is not designed to accessible standards; and is a pack-it-in/pack-it-out facility.

Fordyce Lake Recreation Area

The Fordyce Lake Recreation Area is located in the central portion of the TNF north of I-80 with elevations ranging from 6,200 to 7,800 feet. The area contains three Project reservoirs—Lake Sterling, Meadow Lake, and Fordyce Lake. Landowners in the Fordyce Lake Recreation Area are PG&E, private, and the Forest Service. Forest Service has designated ROS classes for NFS land within the Fordyce Recreation area as either Semi-Primitive Motorized or Roaded Natural. Lake Sterling and Fordyce Lake are designated Semi-Primitive Motorized, while Meadow Lake is designated Roaded Natural. Primary access to Fordyce Lake and Lake Sterling is via Forest Service roads, Rattlesnake Road (Forest Service Road 85) from I-80 (Cisco Grove exit) and then Fordyce Road. The road to Fordyce Lake is improved dirt with gravel except for the last two miles, which is very steep and rocky and is only passable by four-wheel drive vehicles. The primary road to the west shoreline of Lake Sterling (where the campground is located) is steep for the last 0.8 miles. Although it is accessible by vehicles in the summer, the road to Lake Sterling is not recommended for travel with trailers. There is a secondary user-created access route to the east shoreline of Lake Sterling on PG&E property, which occurs off Forest Route 85 past Magonigal Summit and includes rough, four-wheel drive roads. Recreational facilities in the Fordyce Lake Recreation Area are summarized below and in Table 6.6.1-10.

Table 6.6.1-10. Project Recreation facilities in the Fordyce Lake Recreation Area.

Project Reservoir	Recreation Facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Meadow Lake	Meadow Lake Campground	Roaded Natural	Early July	Mid Sept	Forest Service	unimproved	--	--	15	75
	Meadow Lake Shoreline Campsites	Roaded Natural	Early July	Mid Sept	Forest Service/ PG&E	unimproved	--	--	10	50
	Meadow Knoll Group Campground	Roaded Natural	Early July	Mid Sept	Forest Service	--	20	--	2	50 (25 each)
Lake Sterling	Lake Sterling Walk-In Campground	Semi-Primitive Motorized	Early July	Mid Sept	Forest Service	--	10	--	6	30
Fordyce Lake	None	Semi-Primitive Motorized	Early July	Mid Sept	Forest Service/ PG&E	--	--	--	--	--

Meadow Lake

Meadow Lake is located approximately 32 miles from Truckee at the I-80/Highway 89 junction. Vehicle access to the lake from Truckee is along Highway 89 and Henness Pass Road (Forest Service Road 07). From Henness Pass Road, Meadow Lake is also accessed by way of Meadow Lake Road (Forest Service Road 86) at Webber Lake or Meadow Lake Road (Nevada County Road 843) at Jackson Meadows Reservoir. Most of the route is unpaved and rough beyond Webber Lake and Jackson Meadows Reservoir, and use of high clearance vehicles is recommended. Meadow Lake provides recreation opportunities for rustic, group, and recreational vehicle (RV) camping, as well as fishing, swimming, boating (motorized and non-motorized) and operating off highway vehicles (OHV). When possible, the California Department of Fish and Game (CDFG) stocks the reservoir annually with rainbow trout (CDFG 2007b). PG&E manages the Meadow Lake facilities on NFS and PG&E land and collects a recreation use fee.

At its maximum water surface elevation of 7,281.8 feet, Meadow Lake has 245 water surface acres and 3.3 miles of shoreline. The entire shoreline of Meadow Lake is accessible by foot, and approximately 60 percent of the shoreline is accessible by vehicle. The access road at the reservoir extends from the dam along the west shore, to the northeast corner of the lake. There are no access roads along the southeast shore, where access is only by foot.

Meadow Lake Campground

This campground is located on NFS land along the southwest shoreline of the reservoir, and includes 15 campsites. Each campsite contains a wood picnic table, steel fire ring, gravel spur, animal-resistant food lockers and site marker. Parking is available for OHVs and RVs, and two accessible vault restrooms (a single and a double-unit). The campground is a pack-it-in/pack-it-out facility and has a host on-site. The campground is partially accessible with accessible double and single-unit and single-vault restroom buildings.

Meadow Lake Shoreline Campsites

The shoreline campsites include 10 rustic campsites, with picnic tables, fire rings, animal-resistant food lockers, site markers, and also OHV and RV parking. These are located along the north and northwest shoreline of the reservoir. The camping facilities provide campers with two different camp settings: one is a heavily wooded setting, and the other is an open meadow setting along the west shoreline. The campground is a pack-it-in/pack-it-out facility and does not have any accessible features. Most campsites are located on NFS land, and a few are on PG&E land. Two reservoir access locations are designated along the west shoreline between the two camping areas, including two informal boat launch areas (dirt and gravel).

Meadow Knoll Group Campground

The Meadow Knoll Group Campground is a rustic group campground, located at the north end of the reservoir, with two group sites for 25 people each (50 people total), and two accessible double-unit vault restrooms. Each group site consists of four wood picnic tables, one wood food preparation table (with no benches), two large steel fire rings, and a gravel parking area for approximately 10 vehicles. In addition, one group site has a large rectangular concrete pad assembly area. RV and OHV parking areas and designated tent sites are located at the group campground. This facility is a pack-it-in/pack-it-out facility. The campground is partially accessible with accessible double-unit vault restroom buildings. The group campground is located on NFS land.

Lake Sterling

Lake Sterling is located 6.1 miles north of I-80 at the Cisco Grove exit. Vehicle access is by Forest Service Road 85 and Lake Sterling Road to the east shoreline, and Forest Service Road 85 by Magonigal Summit. At its maximum water surface elevation of 6,987.9 feet, Lake Sterling has 104.7 water surface acres and 1.8 miles of shoreline. The entire shoreline is accessible by foot, and 20 percent of the shoreline is accessible by vehicle. A Boy Scout summer camp is located adjacent to the public campground on TNF and PG&E land. The shoreline landscape is mostly dense forest with some small areas of steep rock outcrops. Lake Sterling provides recreational opportunities for developed camping, hiking, hunting, swimming, fishing, and small motorized and non-motorized boating. A walk-in campground is located at Lake Sterling on the south shoreline.

Lake Sterling Walk-In Campground

The Lake Sterling Walk-In Campground is a rustic six-unit campground. Each unit has a wood picnic table, steel fire ring, and site marker. A double-unit vault restroom is located at the southern end of the campground. This facility is a pack-it-in/pack-it-out facility, and does not have potable water or trash receptacles. A dirt and gravel parking area bounded by large boulders, with a capacity of 10 vehicles, is located approximately 100 yards uphill of the campsites. The campground does not have any accessible features. PG&E manages the facilities on NFS land and collects a recreation use fee.

Fordyce Lake

Fordyce Lake is located 6.5 miles off I-80 via Forest Service Road 85 and Fordyce Lake Road. At its maximum water surface elevation of 6,405.1 feet, Fordyce Lake has 716.2 water surface acres and 10.4 miles of shoreline. During high water, 60 percent of the shoreline is accessible by foot, and 30 percent by vehicle. As water recedes, vehicle access to the shoreline and lakebed increases. Steep granite bluffs and thick brush around the reservoir limits access. Fordyce Lake provides opportunities for a wide variety of recreational activities, including undeveloped camping, OHV use, hiking, hunting, swimming, fishing, and small motorized and non-motorized boating. Most of the undeveloped camping occurs along the west shore of the southern arm of the lake. Six dispersed campsites are located along the reservoir side of Fordyce Lake Road up to the peninsula, and just south of the dam. Four of the dispersed campsites have one rock fire ring, and two sites have two rock fire rings. Most of the sites are accessible by vehicle, using short dirt and gravel spur roads off Fordyce Lake Road.

Lake Spaulding Recreation Area

The Lake Spaulding Recreation Area is located in the east central portion of the TNF, north of the I-80/Highway 20 interchange, and ranges from 5,000 to 6,000 feet in elevation. The Lake Spaulding Recreation Area contains four Project reservoirs including Lake Spaulding, Rucker Lake, Fuller Lake, and Blue Lake. Many landowners, including the Forest Service, PG&E, timber companies, and other private landowners are located in the area. At the Project reservoirs in this recreation area, the Forest Service has designated NFS land into three ROS classes – "Semi-Primitive Motorized," "Roaded Natural" and "Rural." The NFS land surrounding Rucker and Fuller Lakes are designated "Rural" class; Blue Lake and the west shoreline of Lake Spaulding, located on PG&E lands, are "Roaded Natural." The east shoreline of Lake Spaulding is in the "Semi-Primitive Motorized" class.

Access to the Lake Spaulding Recreation Area occurs along two routes: Highway 20 is access for Lake Spaulding, and Bowman Lake Road is the access for the other three reservoirs and the Bear Valley facilities. From Bowman Lake Road, Blue Lake is accessible by a four-wheel drive trail, and the remaining three Project reservoirs are accessible by automobiles.

Recreational facilities in the Lake Spaulding Recreation Area are summarized in Table 6.6.1-11.

Table 6.6.1-11. Project Recreation facilities in the Lake Spaulding Recreation Area.

Project Reservoir	Recreation Facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Lake Spaulding	Lake Spaulding Campground	Roaded Natural	Mid May	Mid Sept	PG&E	--	--	--	25 (19 family/ 6 walk-in)	125
	Lake Spaulding Overflow Campground		Mid May	Mid Sept		--	--	--	10	50
	Lake Spaulding Boat Launch		May 1	Oct 31		2-lane concrete	67 (45 single, 22 double)	3	--	15
Bear Valley (non-reservoir)	Bear Valley Group Campground[1]	--	Mid May	Mid Sept	PG&E	--	16	--	1 group	50[1]
	Sierra Discovery Trail		Mid May	Mid Oct		--	9	4	--	120
	Overflow Parking		Mid May	Mid Oct		--	23	--	--	--
Fuller Lake	Fuller Lake Day Use Area & Boat Launch	Rural	Mid May	Mid Oct	Forest Service	1-lane concrete	14 (single)	8	--	40
	Fuller Lake Angler Access		Mid May	Mid Oct	PG&E	--	6	--	--	18
Rucker Lake	Rucker Lake Walk-In Campground	Rural	Mid May	Mid Oct	Forest Service	--	15	--	7	35
Blue Lake	Blue Lake Primitive Hike-in Campsites	Roaded Natural	June	Mid Sept	PG&E	--	15	--	10	50

[1] The Bear Valley Group Campground is also available for day-use group reservations (100 PAOT).

Lake Spaulding

The Lake Spaulding Recreation Area is managed by PG&E, and has a developed campground, boat launch, picnic area, and parking area. At its maximum water surface elevation of 5,014.6 feet, Lake Spaulding has 682 water surface acres and 8.6 miles of shoreline. Approximately 40 percent of the shoreline is accessible by foot. The shoreline remaining is inaccessible by foot or vehicle, due to steep granite bluffs, and thick vegetation. Most of the Lake Spaulding shoreline is steep, exposed granite, with a few beaches. Some dispersed boat-in camping occurs along the shorelines of the reservoir, particularly along the north and northeast shoreline near the mouth of South Yuba River and Fordyce Creek. The Lake Spaulding Recreation Area facilities provide opportunities for land-based activities, such as developed camping, picnicking, sightseeing, and water-based activities including boating, swimming, fishing, and water skiing. Lake Spaulding has three developed facilities – a campground, a picnic area, and a boat launch facility. All the recreation improvements are on land owned by PG&E. The NFS land is located on the northerly tip of the lake, where Fordyce Creek enters Lake Spaulding. The Forest Service manages a parcel on the west side of the lake near Spaulding 3 Powerhouse, but that parcel does not adjoin the lake.

Lake Spaulding Campground

The campground consists of two camping areas with a total of 25 campsites. The upper camping area has 19 campsites. Twelve of the sites have vehicle spurs, including one accessible site, and six of these sites are walk-in sites from a nearby gravel parking area. The vehicle campsites are accessed via a single lane loop road (paved asphalt and gravel), and includes two accessible double-unit vault restrooms and a potable water system. The vehicle campsites each have a vehicle spur (some paved and some gravel), picnic table, steel fire ring, and a storage unit. The campground has a host on-site and PG&E charges a camping fee. The upper camping area is partially accessible with an accessible vault restroom located at the walk-in sites with an adjacent fully accessible campsite including the picnic table, pedestal grill and fire ring. The remaining campsites were not designed to accessible guidelines; however, both vault restrooms have an accessible stall.

The lower camping area has six walk-in campsites located adjacent to the parking area and an adjacent accessible, double-unit vault restroom. Each site has a wood picnic table on a concrete slab, a steel fire ring, and a tent pad. An information kiosk is located at the entrance to the campsites. The lower area also includes an overflow camping area (10 sites) within the boat launch parking area, which is used primarily by RVs. There is trash service at this site and PG&E charges a camping fee. The lower camping area is partially accessible with an accessible restroom building.

Lake Spaulding Boat Launch

The boat launch has a concrete, two-lane ramp with concrete curbing. A paved parking area is available for boaters, picnickers, the lower walk-in campsite users, and overflow campers. The parking area can accommodate 67 vehicles (45 single spaces and 22 double spaces), although this capacity is often less with the presence of large vehicles and trailers. The facility includes an accessible, double-unit vault restroom. A beach area is located between the parking area and the reservoir. The amount of usable beach area varies depending upon the reservoir levels. A day-use fee and a boat-launching fee are charged. The boat launch is partially accessible with a single accessible parking space and restroom, but an accessible route between these two elements does not exist. There is potable water and trash service at this site.

Lake Spaulding Picnic Area

The picnic area has three sites, consisting of wood picnic tables, and is located along the boat launch facility overlooking the reservoir. There is potable water and trash service at this site. The picnic area does not have any accessible features.

Bear Valley (non-reservoir)

The Bear Valley area consists of three developed recreation facilities – Bear Valley Group Campground, Sierra Discovery Trail, and an overflow parking area. These sites are located directly off Bowman Lake Road via Highway 20 and not at a Project reservoir.

Bear Valley Group Campground

The Bear Valley Group Campground, elevation 4,500 feet, is located downstream of Lake Spaulding on the Bear River, about 1/4 mile from Highway 20 on Bowman Lake Road (Forest Service Road 18). The Bear Valley Group Campground can accommodate 100 people for day-use, and may be reserved for overnight use by 50 people. The group campground is available for a fee by reservation only, and includes 12 picnic tables, 2 accessible double-unit vault restrooms, 2 barbeque grills, an outdoor food preparation area, a large group fire ring (with benches), and parking for 16 VAOT, in a paved parking area (on-site). Potable drinking water and trash service is available at this facility. The site also has five horseshoe pits and a sand volleyball court. The site accommodates both tent and RV camping. The campground has a host on-site and PG&E owns and manages this facility. The group campground is partially accessible with a level, paved parking area that has concrete accessible routes to the accessible stalls of the restroom buildings.

Sierra Discovery Trail

The Sierra Discovery Trail facility, located adjacent to the Bear Valley Group Campground, provides interpretation and education related to the Bear Valley environment. The one-mile, self-guided, loop trail joins wetlands, forest, and streamside habitats, bypasses a waterfall, and exhibits interpretive signs at regular intervals along the trail. The facility includes a picnic area with 4 picnic tables, 2 barbeque pits, an accessible double-unit vault restroom, animal-resistant trash receptacles, potable water, and parking for 9 VAOT. An interpretive kiosk is located near the parking area, and displays 16 educational panels about the natural environment, California's river systems, and PG&E's hydroelectric system. This facility provides opportunities for hiking, wildlife viewing, and picnicking (including accessible picnic opportunities). No fees are charged for use of this facility. The trail facility is partially accessible with an accessible parking space, picnic unit, educational kiosk/gazebo, and accessible routes between these features, but the interpretive trail (including the boardwalk) was not designed to accessible guidelines.

Overflow Parking Area

A paved parking area for 23 VAOT is located between the Bear Valley Group Campground and Sierra Discovery Trail facilities. This parking area provides overflow parking for both facilities.

Fuller Lake

Fuller Lake is located roughly four miles from Highway 20 on Bowman Lake Road (Forest Service Road 18). At its maximum water surface elevation of 5,341.5 feet, Fuller Lake has 70.2 water surface acres and 1.3 miles of shoreline. Although more than 80 percent of the shoreline is accessible by foot, private ownership restricts public access on much of the northern shoreline. Fuller Lake offers day-use and water-based recreation opportunities, a picnic area, and an angler access facility. The angler access facility is located near the dam on PG&E land. The picnic area and boat launch is on NFS land. Several private homes and the Grass Valley Rod and Gun Club are located on the reservoir's western shore. Fuller Lake is one of the least remote and most popular reservoirs in the Lake Spaulding Recreation Area. Every year, CDFG stocks the reservoir with rainbow or brown trout every other week, from May through July (CDFG 2007b). Popular activities at Fuller Lake include picnicking, fishing, and small motorized and non-motorized boating. Most of the recreational activity at this lake is fishing-related.

Fuller Lake Day Use Area and Boat Launch

The day use area and boat launch facility is located on the northwest corner of the reservoir on NFS land. The facility provides recreational opportunities for fishing, picnicking, and boating (speed limit of 15 mph). The facility includes eight picnic sites (including one accessible site), each with a picnic table, steel fire ring and pedestal grill. The facility also includes a paved parking area for up to 14 VAOT (single spaces), a concrete single-lane boat ramp, and an accessible double-unit vault restroom. The facility also has a host on-site and trash service is available. The facility has a recreation fee. The facility is partially accessible and includes a universally accessible picnic unit (table, ring, grill and path) with an accessible parking space, restroom building, and routes between each of the site features.

Fuller Lake Angler Access

Located to the west of the dam, the angler access facility is owned and managed by PG&E, and no recreation fee is charged for use of this facility. This site provides easy access to the reservoir for anglers along the shoreline. The facility has parking for up to six VAOT (in an informal gravel parking area bounded by large boulders), an accessible, single-unit vault restroom building, and an information board. The angler access is partially accessible with an accessible restroom building. The access routes to the restroom and parking area were not designed to accessible guidelines due to the site terrain.

<u>Rucker Lake</u>

Rucker Lake is located 5.5 miles from Highway 20 on Bowman Lake Road (Forest Service Road 18) and Rucker Lake Road (Forest Service Road 18-6). At its maximum water surface elevation of 5,464.2 feet, Rucker Lake has 78.6 water surface acres and 1.5 miles of shoreline. Approximately 50 percent of the shoreline is accessible to the public by foot, with roughly 15 percent accessible by vehicle. Private landowners (private homes) and a TNF permittee, Camp Liahona, restricts public access to much of the northwest shoreline (roughly one-third), while marsh areas restrict access elsewhere along the shoreline. Typically, vehicle access to Rucker Lake is seasonal, with two-wheel drive access in dry summer months, and four-wheel drive access in the fall and spring. Rucker Lake provides opportunities for camping, hiking, small non-motorized boating, and swimming. A Nevada County ordinance prohibits internal combustion engines on the lake.

Rucker Lake Walk-In Campground

A gravel parking area is located on the north side of the reservoir for 15 VAOT, and includes an informational board, and a self-pay station. The walk-in campground is located a short hike from the parking area, along a trail. The camping area consists of an accessible double-unit vault restroom and seven campsites, each with a fire ring, animal-resistant food locker, and site marker. Four out of the seven campsites have wood picnic tables. The campground is on Forest Service land, but managed by PG&E. The facility is a pack-it-in/pack-it-out site without trash receptacles, and includes a recreation use fee. The campground is partially accessible with an accessible restroom stall near the walk-in campsites.

Blue Lake

Blue Lake is located 6.3 miles from Highway 20 on Bowman Lake Road (Forest Service Road 18) and Rucker Lake Road (Forest Service Road 18-6). The access road to Blue Lake is a rough, unimproved, four-wheel drive trail, and is not recommended for vehicles with low clearance and trailers. At the request of the Forest Service, PG&E closed vehicular access to the campsites on the northeast side of the lake in 1998, to minimize use impacts to the shoreline areas. At its maximum water surface elevation of 5,931.6 feet, Blue Lake has 59.7 water surface acres, and 1.3 miles of shoreline. Vehicle access (4-wheel drive) to Blue Lake occurs near the dam up to a dirt parking area at a locked gate with informal parking for 15 VAOT; all other access to the reservoir is blocked to vehicles. The entire shoreline is accessible to the public by foot, although this access can be difficult during times of high water. Overall, Blue Lake provides opportunities for both day-use and overnight recreation activities including camping, hiking, fishing, and swimming.

Two primitive camping areas are located along the west and northeast shoreline of Blue Lake and consist of nine sites, each with a steel fire ring. In addition, a single campsite, with a wood picnic table, and steel and rock fire rings, is located adjacent to the parking area locked gate. This facility is a pack-it-in/pack-it-out facility. PG&E owns, manages and built the facility on PG&E land; however, the Forest Service owns the land underlying the reservoir. There are no recreation use fees at this facility. The hike-in camping facility does not have any accessible features.

Grouse Lakes Recreation Area

The Grouse Lakes Area contains eight Project reservoirs, located north of the Interstate 80/ Highway 20 interchange. The Grouse Lakes Area is a Forest Service designated non-motorized area, with more than 20 lakes, and over 14 miles of trails. Elevations in this area range from 5,000 to 7,000 feet. Landowners in the area include the Forest Service, PG&E, NID, timber companies, and other private landowners. The Forest Service has designated NFS land within the Grouse Lakes Area into two ROS classes—Roaded Natural and Semi-Primitive Non-Motorized. NFS land around Lower Lindsey, Feeley, and Carr lakes are designated as Roaded Natural. NFS land around Middle and Upper Lindsey, Culbertson, and Upper and Lower Rock lakes are designated as Semi-Primitive Non-Motorized. PG&E charges a user fee for recreation use of the developed camping facilities at Lower Lindsey and Carr Lakes while the other reservoirs have no recreation user fee.

Primary access to the Grouse Lakes Area occurs via Bowman Lake Road (Forest Service Road 18); access to the Project reservoirs is provided by TNF roads and trails. Road conditions in the area are generally favorable for vehicular access. Bowman Lake Road (Forest Service Road 18) is paved up to the Carr-Lindsey Road (Forest Service Road 17) junction. The Carr-Lindsey Road is an improved dirt road with gravel, and provides access to the two vehicle accessible reservoirs—Lower Lindsey and Carr lakes.

Access to the Grouse Lakes Area is by a network of trails used by hikers, backpackers, mountain bikers, and horseback riders. Much of the recreational opportunities in the Grouse Lakes Area are undeveloped (Table 6.6.1-12). The Project reservoirs provide opportunities for a variety of activities, including camping, picnicking, swimming, and fishing.

Table 6.6.1-12. Project Recreation facilities in the Grouse Recreation Lakes Area.

Project Reservoir	Recreation Facility	ROS Classification	Typical Season	Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Carr Lake	Carr-Feeley Trailhead	Roaded Natural	Late May-Mid Sept	Forest Service/ PG&E	--	30	--	--	40
	Carr Lake Walk-In Campground		Late May-Mid Sept	Forest Service	--	---	--	11	55
Feeley Lake	None	Roaded Natural	Late May-Mid Sept	Forest Service	unimproved	--	--	--	--
Lower Lindsey Lake	Lower Lindsey Lake Trailhead	Roaded Natural	Late May-Mid Sept	Forest Service	--	20	--	--	--
	Lower Lindsey Lake Campground	Roaded Natural	Late May-Mid Sept	Forest Service/ PG&E	unimproved	--	--	12	60
Middle Lindsey Lake	Middle Lindsey Lake Primitive Hike-in Campsites	Semi-Primitive Non-Motorized	Late May-Mid Sept	PG&E	--	--	--	3	15
Upper Lindsey Lake	None	Roaded Natural	Late May-Mid Sept	PG&E	--	--	--	--	--
Culbertson Lake	Culbertson Lake Primitive Hike-in Campsites	Semi-Primitive Non-Motorized	Late May-Mid Sept	Forest Service	--	--	--	3	15
Lower Rock Lake	Lower Rock Lake Primitive Hike-in Campsites	Semi-Primitive Non-Motorized	Late May-Mid Sept	PG&E	--	--	--	3	15
Upper Rock Lake	Upper Rock Lake Primitive Hike-in Campsites	Semi-Primitive Non-Motorized	Late May-Mid Sept	PG&E	--	--	--	3	15

<u>Carr Lake</u>

Carr Lake is located approximately 20 to 30 minutes (12.6 miles) from Highway 20 on Bowman Lake Road (Forest Service Road 18), Carr-Lindsey Road (Forest Service Road 17), and Forest

Service Road 17-6. At its maximum water surface elevation of 6,663.7 feet, Carr Lake has 15.8 water surface acres and 0.6 miles of shoreline. Approximately 60 percent of the lakeshore is accessible by foot. Foot access to the remaining shore is limited by steep terrain and thick brush. Carr Lake has a walk-in campground and trailhead facility primarily located on NFS land, with a portion on PG&E land. Common recreational activities include fishing, small motorized and non-motorized boating, and camping.

Carr Lake Walk-In Campground

The walk-in campground has 11 campsites and one double unit vault restroom. Each campsite consists of a steel fire ring and site marker. PG&E manages the campground, and charges a camping fee (using a self-pay fee tube). The campground is a pack-it-in/pack-it-out facility and does not have any accessible features.

Carr-Feeley Trailhead

The trailhead parking area is located on the northeast shore of the reservoir and accommodates approximately 30 VAOT in a gravel parking area with boulder and log barriers. In addition, a trailhead information board provides user information for Carr Lake and Feeley Lake. Recreation fees are not charged at this facility. The trailhead does not have any accessible features.

<u>Feeley Lake</u>
Feeley Lake is within walking distance (0.2 miles) from Carr Lake and is accessed via a trail from the Carr Lake Trailhead. At its maximum water surface elevation of 6,723.6 feet, Feeley Lake has 51 water surface acres and 1.6 miles of shoreline.

Public vehicle access is restricted beyond the north end of Carr Lake and is prohibited at Feeley Lake. However, there are ample shoreline recreation opportunities, as approximately 90 percent of Feeley Lake is accessible by foot. An informal, unimproved boat launch is located near Feeley Lake Dam. Feeley Lake provides opportunities for day hiking, backpacking and fishing, but due to the terrain, does not provide shoreline camping opportunities. No recreation fees are charged at Feeley Lake. All land within the FERC Project Boundary is NFS land.

<u>Lower Lindsey Lake</u>
Lower Lindsey Lake is located 13.2 miles from Highway 20 on Bowman Lake Road (Forest Service Road 18) and Carr-Lindsey Road (Forest Service Road 17). The road is accessible by passenger vehicle until the final 0.3 miles, where high-clearance vehicles are highly recommended. At its maximum water surface elevation of 6,235.6 feet, Lower Lindsey Lake has 29.4 water surface acres and 0.9 mile of shoreline. Approximately 80 percent of the shoreline is accessible by foot. Vehicle access is possible along the north shoreline of the lake through the developed campground. Steep terrain and thick brush limit access to portions of the south and east shoreline. Overall, Lower Lindsey Lake provides recreational opportunities for developed camping, fishing, boating, and access to trails for hiking, mountain biking, and horseback riding.

Lower Lindsey Lake Campground

Managed by PG&E, the camping facility has 12 campsites, each with a fire ring, picnic table, gravel vehicle spur with vehicle control barriers, and site markers. The majority of the improvements are on NFS land; however, one campsite is located on PG&E land. The camping area includes an accessible double-unit vault restroom and an unimproved boat launch. There is a self-pay fee tube at the campground and bulletin board. The campground is a pack-it-in/pack-it-out facility. The campground is partially accessible with an accessible restroom stall.

Lower Lindsey Lake Trailhead

The trailhead parking facility accommodates up to 20 VAOT, and is located approximately one-quarter mile below Lower Lindsey Lake Dam. The trailhead facility includes a graveled parking area, and is located entirely on NFS land. No fees are charged at the trailhead, and visitors are encouraged to pack-it-in/pack-it-out. This facility does not have any accessible features.

<u>Middle Lindsey Lake</u>

Middle Lindsey Lake is located in the Grouse Lakes Recreation Area (less than a mile hike from Lower Lindsey Lake). At its maximum water surface elevation of 6,435.7 feet, Middle Lindsey Lake has 21 water surface acres and 1.2 mile of shoreline. Approximately 75 percent of the shoreline is accessible by foot, with some areas inaccessible due to steep rock outcrops. The shoreline is predominantly flat and wooded, providing opportunities for hike-in camping. Three designated primitive campsites with fire rings are on the north shoreline. The hike-in camping facility is a pack-it-in/pack-it-out facility and no fees are charged at this location. Hiking, picnicking, swimming, mountain biking, and fishing opportunities are available. Non-motorized boating use occurs occasionally. The property around Middle Lindsey Lake is owned by PG&E.

<u>Upper Lindsey Lake</u>

Upper Lindsey Lake is a small and secluded lake, surrounded by a steep high ridge. The reservoir is a 1.3-mile hike from the Lower Lindsey Lake Trailhead. At its maximum water surface elevation of 6,482.6 feet, Upper Lindsey Lake has 3.9 water surface acres and 0.5 miles of shoreline. Approximately 40 percent of the shoreline is accessible by foot. Recreation opportunities are limited because much of the shoreline is steep, rocky, and covered with thick willows and manzanita, making foot travel and hiking difficult. Due to topography, camping opportunities are limited at Upper Lindsey Lake. Day-use activities are most common, and include hiking, swimming, and fishing. Boat use is rare. Upper Lindsey Lake does not have any developed site amenities (i.e., no steel fire rings) and no fees are charged. This is a pack-it-in/pack-it-out site. The property around Upper Lindsey Lake is owned by PG&E.

<u>Culbertson Lake</u>

Culbertson Lake is a 1.3-mile hike from the Lower Lindsey Lake trailhead. At its maximum water surface elevation of 6,436.4 feet, Culbertson Lake has 70 water surface acres and 2.0 miles of shoreline. The majority of the north, south, and west shoreline is accessible by foot, while a steep talus slope prevents access along the east shoreline. There are two cabins on a small parcel of private land located along the west shoreline near the dam, and public access is prohibited in that location. The remaining property is on NFS land and PG&E land. Culbertson Lake provides day-use opportunities, including hiking, swimming, fishing, and overnight camping at three designated primitive campsites on NFS land with steel fire rings on the west shore. No fees are charged. The hike-in camping facility is pack-it-in/pack-it-out and does not have any accessible features.

Lower Rock Lake

Lower Rock Lake is a 2.3-mile hike from the Lower Lindsey Lake trailhead, in a remote setting that offers overnight and day-use recreation opportunities. At its maximum water surface elevation of 6,625.8 feet, Lower Rock Lake has 7.6 water surface acres, and 0.2 miles of shoreline. Approximately 70 percent of the shoreline is accessible by foot, although the southeast shoreline is difficult to access due to extremely steep terrain. Land around Lower Rock Lake is owned by PG&E.

Day-use opportunities at Lower Rock Lake include hiking, swimming, and fishing. Boating is rare here. Camping is available at three hike-in designated primitive campsites along the northwest shore. Each site has a steel fire ring and site marker. No fees are charged. The hike-in camping facility is pack-it-in/pack-it-out and does not have any accessible features.

Upper Rock Lake

Upper Rock Lake is the most remote Project reservoir in the Grouse Lakes Area. Upper Rock Lake is a 2.8-mile hike from the Lower Lindsey Lake trailhead. At its maximum water surface elevation of 6,714.5 feet, Upper Rock Lake has 19.8 water surface acres and 0.9 miles of shoreline. Approximately 70 percent of the shoreline is accessible by foot, along the north, east, and west portions of the reservoir, while steep topography limits access along the south shoreline. Land around Upper Rock Lake is owned by PG&E.

Upper Rock Lake provides overnight and day-use recreation opportunities. Day-use opportunities at Upper Rock Lake include hiking, swimming, and fishing. Boating use is rare at Upper Rock Lake, primarily due to the 2.8-mile hike to the reservoir. Camping is available at three hike-in designated primitive campsites on the north and west sides of the lake. Each site has a steel fire ring and site marker. No fees are charged. The hike-in camping facility is pack-it-in/pack-it-out and does not have any accessible features.

Kidd Lake Recreation Area

The Kidd Lake Recreation Area contains three Project reservoirs, which are located south of Interstate 80. Elevations in this area range from 6,000 to 7,700 feet. Landowners in the area include PG&E, the Forest Service, private landowners, and the Girl Scouts. The Forest Service has designated most of the NFS land in the area as Roaded Natural ROS class. Several small sections are in the Semi-Primitive Motorized and Rural ROS classes. Primary access to the Kidd Lake Recreation Area from I-80 is by county roads: Donner Pass Road (paved), Soda Springs Road (paved), and Pahatsi Road (paved) and Kidd Lakes Road (dirt). In general, road conditions in the area allow easy access by vehicles, except during the late spring/early summer, when melting snow causes large puddles and potholes.

Project recreational facilities in the Kidd Lake Recreation Area are summarized below (Table 6.6.1-13).

Table 6.6.1-13. Project Recreation facilities in the Kidd Lake Recreation Area.

Project Reservoir	Recreation Facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Kidd Lake	Kidd Lake Group Campground	Roaded Natural	Mid May	Mid Sept	PG&E	--	20	--	3	100
Upper Peak Lake	None	Semi-Primitive	Early June	Mid Sept	Forest Service/ PG&E	--	--	--	--	--
Lower Peak Lake	None	Semi-Primitive	Early June	Mid Sept	Forest Service/ PG&E	--	--	--	--	--

Kidd Lake

Kidd Lake is located 3.8 miles from the I-80 Norden exit, via Kidd Lake Road (a county road). At its maximum water surface elevation of 6,627.6 feet, Kidd Lake has 86.7 water surface acres and 1.7 miles of shoreline. The entire shoreline is accessible by foot. The group campground provides foot access to 20 percent of the shoreline. A Girl Scout summer camp is located on the nearby Palisade Lake, but the associated Girl Scout dining hall is located outside the FERC Project Boundary with a view of Kidd Lake. There is a private landowner on the northwest side of the lake. Kidd Lake has a relatively flat, wooded shoreline, and provides recreational opportunities for developed camping, hiking, small motorized and non-motorized boating, and fishing.

Kidd Lake Group Campground

Kidd Lake Campground provides recreational opportunities for camping, fishing, swimming, and boating (speed limit of 15 mph). The facility is available for a fee and by reservation only. The facility can accommodate up to 100 people in three group sites. The facility has two paved parking areas (20 VAOT), group barbeques and two storage buildings. The campground has potable drinking water and trash service, as well as a host on-site. The group campground is partially accessible with two accessible double unit vault restrooms and concrete/asphalt accessible routes from the parking areas; however, none of the group camping areas where the tables and fire rings are located have accessible routes to and from the central parking and restrooms.

Upper and Lower Peak Lakes

The Upper and Lower Peak lakes are located 5.5 miles from the I-80 Norden exit. Vehicle access is by Donner Pass Road, Soda Springs Road, Pahatsi Road and Kidd Lake Road; all county roads. The Upper and Lower Peak lakes provide opportunities for recreational activities, including hiking, undeveloped camping, fishing, and small motorized and non-motorized boating. A non-Project trailhead for Palisades Creek Trail is located near the Upper Peak Lake Dam on NFS land and provides access to the Wild and Scenic North Fork of the American River.

The land around the reservoirs contains public lands managed by the Forest Service and land owned by PG&E. There is no recreation fee at either reservoir.

At its maximum water surface elevation of 6,607.4 feet, Upper Peak Lake has 83.8 water surface acres and 2.4 miles of shoreline. Access to the majority of the Upper Peak Lake shoreline is difficult, due to steep, rocky terrain and heavy brush. Approximately 25 percent of the shoreline is accessible by foot, although with some difficulty.

At its maximum water surface elevation of 6,581.9 feet, Lower Peak Lake has 33 water surface acres and 1.1 miles of shoreline. The shoreline is more accessible at Lower Peak Lake than Upper Peak Lake, and is more conducive to recreation activities. Approximately 25 percent of the shoreline is accessible by vehicle, and 70 percent by foot. The remainder of the shoreline is too steep for foot access.

Lake Valley Reservoir Recreation Area

The Lake Valley Reservoir Recreation Area is located south of I-80 at the Yuba Gap exit, and ranges in elevation from 5,500 to 6,000 feet. The area contains two Project reservoirs (Lake Valley Reservoir and Kelly Lake), and are accessible by vehicles. PG&E owns all of the land surrounding these two reservoirs, with the exception of a private parcel on the northeast corner of Kelly Lake. The Forest Service ROS designates NFS lands in the areas as a Roaded Natural ROS class. Primary access to the area is by Lake Valley and Crystal Lake roads from I-80. Access to Lake Valley Reservoir is by the gravel and paved roads maintained by the Forest Service, PG&E, and PG&E's lessee. Project recreational facilities in the Lake Valley Recreation Area are summarized below (Table 6.6.1-14).

Table 6.6.1-14. Project Recreation facilities in the Lake Valley Recreation Area.

Project Reservoir	Recreation Facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Kelly Lake	Kelly Lake Picnic	Roaded Natural	June	Mid Sept	PG&E	unimproved	6	5	--	25
Lake Valley Reservoir	Lodgepole Campground	Roaded Natural	Mid May	Mid Sept	PG&E	--	5 (overflow)	--	35	175
	Silvertip Picnic Area/Boat Launch	Roaded Natural	Mid May	Mid Sept		1-lane concrete	20 (single)	10	--	50

<u>Kelly Lake</u>

Kelly Lake is located 3.4 miles from I-80, and is accessed by the Yuba Gap exit, via Crystal Lake Road. At its maximum water surface elevation of 5,907.9 feet, Kelly Lake has 28 water surface acres and 0.8 miles of shoreline. The only vehicle access to Kelly Lake is along the east shore of the reservoir, at the picnic area. Approximately 60 percent of the shoreline is accessible to the public by foot, with the remainder inaccessible by foot, due to steep terrain and privately-owned land. Kelly Lake provides recreational opportunities for picnicking, fishing, swimming, and boating. CDFG stocks this lake with rainbow trout annually, when possible (CDFG 2007b). The reservoir has a speed limit of 15 mph for boats. Kelly Lake is on PG&E-owned land; however, there is one parcel adjoining the lake, which is privately-owned. The access to Kelly

Lake is by Kelly Lake Road located off Lake Valley Road. Kelly Lake Road runs through a private campground and visitors are required to check-in at the guard station before driving through the private campground. No fees are charged for recreation use at Kelly Lake.

Kelly Lake Picnic Area

Kelly Lake Picnic Area is located on the east shore of the reservoir. The facility consists of five picnic units, two single-unit vault restrooms, and an undeveloped parking area (6 vehicles). The picnic area is a pack-it-in/pack-it-out facility and does not have any accessible features.

<u>Lake Valley Reservoir</u>
Lake Valley Reservoir is located 3.1 miles from I-80, via the Yuba Gap exit and Lake Valley Road. At its maximum water surface elevation of 5,784.9 feet, Lake Valley Reservoir has 303.9 water surface acres and 4.7 miles of shoreline. The only vehicle access to Lake Valley Reservoir is along the north shore of the reservoir at Silvertip Picnic Area parking area. Approximately 40 percent of the shoreline is accessible to the public by foot; the remainder is inaccessible by foot, due to steep terrain. The reservoir provides opportunities for developed camping, and picnicking, fishing, swimming, and boating. CDFG stocks fish (rainbow trout) from June through August (CDFG 2007b). Lake Valley Reservoir has two developed recreation facilities, including a campground, picnic area, and a boat launch ramp.

Lodgepole Campground

Lodgepole Campground is located on the banks of the North Fork of the North Fork American River just below Lake Valley Reservoir Dam accessed via Lake Valley Road and Six Mile Valley Road. The facility is a developed campground with 35 campsites (2 accessible), paved loops and camping spurs, three accessible double-unit vault restrooms, trash service, information board and a potable water system. Each campsite has a vehicle spur, fire ring, picnic table, and storage locker. The facility has an overflow parking area for five VAOT. There is a camping fee charged at this facility. The campground is partially accessible with accessible campsites and restroom buildings, but lacks access routes and water spigots designed to accessible standards.

Silvertip Picnic Area and Boat Launch

Silvertip Picnic Area and Boat Launch is located along the north shore of the reservoir (opposite the dam) off Lake Valley Road and Forest Service Road 19. The facility has 10 picnic units, a single lane road, 1-lane concrete boat launch (with launch fee), parking area for up to 20 VAOT (single, unmarked spaces), trash service, and an accessible double-unit vault restroom. Each picnic unit has a wood picnic table. None of the picnic sites have accessible features or routes.

Alta-Drum Recreation Area

The Alta-Drum Recreation Area consists of six Project reservoirs located along the I-80 corridor in the Sierra foothills, with elevations ranging from 1,200 to 4,500 feet. The main landowners in the area are PG&E, the Forest Service, timber companies, and private land/homeowners. The

Forest Service designates NFS land in this area as Rural ROS class. There is no NFS land adjoining Project reservoirs. There are no fees charged for recreation use in this area. Primary access to Drum Forebay, Drum Afterbay, Halsey Afterbay, and Alta Forebay is by county roads from I-80. Access to Deer Creek Forebay is by Deer Creek Road from Chalk Bluff Road, linked to Highway 20. Access to Wise Forebay is by Merry Knoll Road from Highway 49. All six reservoirs and associated facilities are accessible by vehicle. For safety reasons, there is no swimming allowed at any of the reservoirs. Recreational facilities in the Alta-Drum Recreation Area are summarized below (Table 6.6.1-15).

Table 6.6.1-15. Project Recreation facilities in the Alta-Drum Recreation Area.

Project Impoundment	Recreation Facility	ROS Classification	Typical Season		Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
			Open	Close						
Deer Creek Forebay	Deer Creek Forebay Access	Rural	June	Sept	PG&E	--	5	--	--	--
Drum Forebay	none	Rural	May	Oct	PG&E	--	informal	--	--	--
Drum Afterbay	none	Rural	May	Oct	PG&E	--	informal	--	--	--
Alta Forebay	none	Rural	May	Oct	PG&E	--	informal	--	--	--
Halsey Afterbay	none	Rural	Year-round		PG&E	--	informal	--	--	--
Wise Forebay	none	Rural	Year-round		PG&E	--	informal	--	--	--

Deer Creek Forebay

Deer Creek Forebay is located 9.6 miles from Highway 20, via Chalk Bluff Road (county road) and Deer Creek Forebay Road (PG&E road), (both of which are improved dirt roads). At its maximum water surface elevation of 4,473.0 feet, Deer Creek Forebay has 3.3 water surface acres and 0.2 miles of shoreline. The area is accessible by vehicle at a gravel parking area (five VAOT) that provides day-use access primarily for shoreline fishing on PG&E land. This is a pack-it-in/pack-it-out facility and does not have any accessible features.

Drum Forebay

Drum Forebay is located 1.6 miles from I-80 via the Drum Forebay exit and Drum Forebay Road (county road). At its maximum water surface elevation of 4,756.0 feet, Drum Forebay has 23 water surface acres and 0.8 miles of shoreline. The entire shoreline is gently sloped and accessible by foot. The property surrounding the Forebay is owned by PG&E. Both east and west shores have vehicle access. The Forebay shoreline is devoid of vegetation except for a stand of mixed cedar and conifer on its west shoreline.

Drum Forebay does not have any developed recreation facilities. It provides undeveloped day-use opportunities only. Overnight use is not allowed. The Forebay has two unimproved, dirt parking areas, on the east and west shores and it is a pack-it-in/pack-it-out site.

Drum Afterbay

Drum Afterbay is located 6.6 miles from I-80 and is accessed via the Alta exit, Alta Bonnynook Road and Drum Powerhouse Road (county roads). The reservoir is located away from residential development on PG&E's property. At its maximum water surface elevation of

3,383.25 feet, Drum Afterbay has 10 water surface acres and 1.0 mile of shoreline. Approximately 5 percent of the shoreline is accessible by foot. There is an informal parking area on the south side of the Afterbay. Both sides of the Afterbay have steep canyon walls. The Afterbay does not have any developed recreation facilities. It provides undeveloped day-use only and it is a pack-it-in/pack-it-out site. Overnight use is not allowed.

Alta Forebay

Alta Forebay is located 1.5 miles from I-80 and is accessed via Crystal Springs and Alta Reservoir county roads. The access road to the site is paved for 0.6 miles then becomes improved dirt to the Forebay. The Forebay is not located near any large residential developments; however, in addition to PG&E's ownership there are several privately owned properties located around the Forebay. At its maximum water surface elevation of 4,240.0 feet, Alta Forebay has 5 water surface acres and 0.3 miles of shoreline. Approximately 40 percent of the shoreline is accessible by foot and vehicle, while the rest of the shoreline is privately owned or inaccessible due to thick vegetation.

Alta Forebay provides undeveloped day-use opportunities, primarily shoreline fishing. There are no developed recreation facilities and it is a pack-it-in/pack-it-out site.

Halsey Afterbay

Halsey Afterbay is located 0.3 miles from I-80 on Dry Creek Road (county road) near a residential development. The shoreline areas of Halsey Afterbay are characterized by a mix of marshlands, oaks, and berry bushes. At its maximum water surface elevation of 1,494.0 feet, Halsey Afterbay has 10 water surface acres and 0.5 miles of shoreline. Approximately 40 percent of the shoreline is accessible by foot. The rest of the shoreline is covered with thick berry brambles. There is a gravel parking area, approximately 30 feet from the shoreline.

The area does not have any developed recreation facilities, and is designated for day-use activities only. These typically include shoreline fishing, picnicking, and hiking/walking. This is a pack-it-in/pack-it-out site.

Wise Forebay

Wise Forebay is located in a rural residential area 0.3 miles from Highway 89 via Mount Vernon and Merry Knoll roads (county roads). The site has a sparsely wooded shoreline with thick berry bushes. At its maximum water surface elevation of 1,418.0 feet, Wise Forebay has five water surface acres and 0.3 miles of shoreline. Approximately 80 percent of the shoreline is accessible by foot. The shoreline is gated and used by service vehicles and pedestrians.

There are no developed recreation facilities at Wise Forebay and this is a pack-it-in/pack-it-out site. It has day-use opportunities for picnicking, hiking/walking, and fishing. No overnight use is allowed.

Halsey Forebay Recreation Area

The Halsey Forebay Recreation Area contains only Halsey Forebay, and is located four miles north of Auburn, California. Elevations in this area range from 1,400 to 2,000 ft. PG&E owns all the property around Halsey Forebay. No fees are charged for recreation use in this area. Vehicle access to Halsey Forebay is by paved roads, from I-80 to Dry Creek Road, onto Christian Valley Road, and then to Bancroft Road. For safety reasons, there is no swimming allowed at any of the reservoirs. Recreational facilities in the Halsey Forebay Recreation Area are summarized below (Table 6.6.1-16).

Table 6.6.1-16. Project Recreation facilities in the Halsey Forebay Recreation Area.

Project Impoundment	Recreation Facility	ROS Classification	Typical Season	Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Halsey Forebay	Halsey Forebay Picnic Area	Rural	Year-round	PG&E	--	12	9	--	45

<u>Halsey Forebay</u>

Halsey Forebay is located 2 to 3 miles from I-80 by either the Placer Hills Road or Dry Creek Road exit. From the Dry Creek Road exit, the Forebay is accessible by Christian Valley and Bancroft county roads. From the Placer Hills Road exit, the Forebay is accessible by Placer Hills Road, Pinewood Way, and Bancroft county roads. At its maximum water surface elevation of 1,816.7 feet, Halsey Forebay has 18 water surface acres and 0.6 miles of shoreline. Approximately 75 percent of the shoreline is accessible by foot. Vehicle access to the Forebay is only at the developed parking area at the Forebay picnic area, located on its north shore. Picnicking and shoreline fishing are the primary activities at the Forebay. Camping is not allowed. CDFG regularly stocks Halsey Forebay.

Halsey Forebay Picnic Area

The facility is open year-round and has nine picnic units, a paved parking area for 12 VAOT, an accessible double-unit vault restroom, and trash service. There is no recreation fee charged at this facility.

Rock Creek Reservoir Recreation Area

The Rock Creek Reservoir Recreation Area contains only Rock Creek Reservoir, located 2.5 miles north of Auburn, California. The main landowners in the area are PG&E, commercial owners and one homeowner. The two main access routes to the Rock Creek Reservoir Recreation Area are county roads. The New Airport Road off Bell Road provides access to the northeast portion of the area, and Rock Creek Road off Highway 49 provides access to the west portion. Vehicle access to the reservoir shoreline is restricted. No fees are charged for recreation use of the reservoir.

Table 6.6.1-17. Project Recreation facilities in the Rock Creek Reservoir Recreation Area.

Project Reservoir	Recreation facility	ROS Classification	Typical Season	Land Ownership	Boat Launch	Parking Spaces	Picnic Sites	Camp Sites	PAOT Capacity
Rock Creek Reservoir	None	Rural	Year-round	PG&E	--	informal	--	--	--

Rock Creek Reservoir

Rock Creek Reservoir is located 3.3 miles from I-80 on Bell Road and 0.5 miles from Highway 49 on Rock Creek Road. At its maximum water surface elevation of 1,442.1 feet, Rock Creek Reservoir has 58 water surface acres and 1.8 miles of shoreline. The reservoir is situated on rolling hills in an urban area. The area provides day-use opportunities only including shoreline fishing and hiking/walking. The reservoir does not have any developed recreation facilities, but there are two information boards with safety information. This is a pack-it-in/pack-it-out site. Camping is not allowed; however, a non-Project Kampgrounds of America (KOA) campground is located 0.2 miles away from the reservoir off Rock Creek Road. The site has a sparsely wooded shoreline and thick berry bushes, and is located in a residential and commercial neighborhood.

6.6.1.3 Recreation Use

In 2009, Licensees conducted a Recreational Use and Visitor Study at each of the projects' reservoirs.[4] The primary field effort consisted of completing recreation visitor use questionnaire and spot counts (observation surveys) of recreationists during: 1) the peak recreation season (Memorial Day Holiday weekend through Labor Day Holiday weekend); and 2) during selected shoulder season months (September 8 through October 31, 2009) at selected reservoirs. Licensees used a random, stratified sampling approach, with varying sampling frequencies depending upon the extent of known recreation use at each Project reservoir. Licensees visited each reservoir and study site briefly during each survey day to administer visitor surveys, record observed recreation uses (number and type), and document recreational activities. The time of day and day of week at each reservoir/study site varied to ensure a range of visitation over the course of the survey period. Licensees analyzed the information from visitor questionnaires and observation surveys, as well as from statewide and regional recreation information to: 1) characterize the existing recreational use (number and type of use) at the projects' recreation sites; 2) identify activities with unmet demand; 3) project future recreation use levels and activity participation at each of the projects' recreation sites through 2050; and 4) analyze the uniqueness of each Project's recreational opportunities. The results of Licensees' study, by Project, are described below.

[4] At the request of the Forest Service, NID performed recreation surveys at recreation areas along Canyon Creek, which are not Project facilities or within the FERC Project Boundary. The results of these surveys will be provided as an appendix to the Recreational Use and Visitor Surveys Technical Memorandum (No. 8-2b), when posted to the Relicensing Website.

6.6.1.3.1 Yuba-Bear Hydroelectric Project

Project Recreation Use Levels

Overall, the Project's recreation use is significantly skewed towards the peak recreation season (90 percent) from Memorial Day through Labor Day. In 2009, the peak season use estimate for the Project was 157,599 RDs and most of the use was overnight (101,351 RDs or 64 percent) compared day use (56,237 RDs or 36 percent). The first tier of use, or greater than 5,000 RDs, included Rollins Reservoir and Jackson Meadows Reservoir (both highly developed recreation areas), which together accounted for 86 percent of all recreation use (Table 6.6.1-18). Rollins Reservoir accounted for 73 percent of the Project's recreation use during the peak season, with 115,455 RDs; and Jackson Meadows Reservoir accounted for 13 percent of all use with 20,185 RDs during the peak season. The second tier of use ranges from roughly 1,000 to 5,000 RDs and includes the largest grouping of reservoirs - Milton Diversion Impoundment, Bowman Lake, Sawmill Lake, Faucherie Lake, and Chicago Park Forebay and Powerhouse area. Tier 2 reservoirs account for 13 percent of the total use. The third tier of use is less than 1,000 RDs and includes Dutch Flat Afterbay, Dutch Flat No. 2 Forebay, and French Lake. Tier 3 reservoirs account for roughly one percent of total use.

Table 6.6.1-18. Overview of the Project's peak season recreation use estimates by tiered levels of use in Recreation Days (RDs).

Tier	Project Reservoir	Total RDs	Day Use RDs	Overnight RDs
Tier 1 (Greater than 5,000 RDs)	Rollins Reservoir	115,455	45,065	70,389
	Jackson Meadows Reservoir	20,185	3,414	16,770
Tier 2 (1,000 to 5,000 RDs)	Chicago Park Forebay & Powerhouse	4,103	3,517	586
	Bowman Lake	5,372	648	4,723
	Faucherie Lake	4,671	1,136	3,534
	Sawmill Lake	3,547	339	3,206
	Milton Diversion Impoundment	2,591	863	1,728
Tier 3 (Less than 1,000 RDs)	Dutch Flat Afterbay	973	823	149
	Dutch Flat No. 2 Forebay	381	318	63
	French Lake	324	117	206
	Total	**157,599**	**56,237**	**101,351**

Furthermore, overnight recreation use is the predominant type of use at the Project, accounting for roughly 60 percent of all use during the peak season. Again, this trend is driven by the Tier 1 reservoirs, both of which are highly developed recreation reservoirs (Rollins Reservoir and Jackson Meadows Reservoir). However, Jackson Meadows Reservoir also experiences a similar level of day use visitation compared to overnight visitation. In general, the Tier 2 reservoirs are predominantly overnight destinations, except for Chicago Park Forebay. The Tier 3 reservoirs/areas are a mixture of day and overnight visitation, but again, at very low use levels relative to the Tier 1 and 2 reservoirs.

Overall, when examining the use projections for the peak season through 2050, recreation use is projected to grow to nearly 270,000 RDs, a 71 percent increase in overall use. Rollins Reservoir may potentially grow to more than 200,000 RDs, a 74 percent increase in use. Jackson Meadows may grow to nearly 32,000 RDs by 2050, a 50 percent increase in use. Growth at these two reservoirs is important to note and watch into the future since both reservoirs are already highly developed recreation areas. In comparison, at the other reservoirs where undeveloped uses are the primary recreation activities, continued growth will require a focus on how undeveloped recreation opportunities are managed.

Developed Facility Occupancies

A very important component of the Project's recreation use is the peak season (Memorial Day-Labor Day) developed facility occupancies at present, and how they project into the future. The key capacities to monitor as use increases are weekend capacities. Holiday capacities are less of a concern since most recreation areas are typically at or near full capacity on holidays during the peak recreation season, particularly in Northern California. At Jackson Meadows Reservoir, note that the percent of capacity or occupancy data in 2009 was collected on a weekly basis by the TNF concessionaire; and in March 2011, the Forest Service only provided partial weekend occupancy data to Licensee for the months of July through September. Without weekend occupancy data for June, Licensee is not able to accurately calculate the weekend occupancy for 2009. Therefore, seasonal occupancy was the only available type of occupancy to project over the course of the new license period. In addition, occupancy data at Canyon Creek Campground (16 sites) is not available (no fee campground); and thus, the campground is not discussed as part of this section.

Developed Campgrounds

At the Jackson Meadows Reservoir family campgrounds for the peak season (Memorial Day-Labor Day holiday weekends), the combined seasonal capacity was 30 percent in 2009; and is projected to reach 46 percent by 2050 (Table 6.6.1-19). At the group campgrounds, peak season occupancy data was only available for one of the two group campgrounds (Silvertip Group Campground) in 2009.[5] The seasonal occupancy for Silvertip Group Campground was 41 percent in 2009 and projected to reach 63 percent by 2050 (Table 6.6.1-19).

At Faucherie Lake Group Campground (two group sites), the overall peak season occupancy is projected to exceed full capacity (101 percent) by 2050 (Table 6.6.1-19). Both holiday and weekend days are already at full capacity in 2009 and both are projected to be at 154 percent of capacity by 2050.

Rollins Reservoir consists of four developed family campgrounds with a total of 332 campsites. For all four family campgrounds combined, the seasonal occupancy was 55 percent in 2009; and is projected to reach 84 percent by 2050 (Table 6.6.1-19). Combined weekend occupancies were at 83 percent in 2009; and projected to reach full capacity by 2030 and 128 percent by 2050. It is important to note that the reservoir is already substantially built out with developed recreation facilities.

[5] The TNF's concessionaire did not collect occupancy data for Aspen Group Campground in 2009.

Table 6.6.1-19. Projected overall peak season occupancies for Yuba-Bear Hydroelectric Project campgrounds through 2050 (Memorial Day-Labor Day).

Reservoir	Campground	Percent of Capacity			
		2009 Data		2050 Projection	
		Seasonal	Weekend	Seasonal	Weekend
Jackson Meadows Reservoir	East Meadow Campground (46 sites)	33	--	50	--
	Pass Creek Campground (30 sites)	28	--	43	--
	Findley Campground (14 sites)	20	--	31	--
	Fir Top Campground (12 sites)	29	--	44	--
	Woodcamp Campground (20 sites)	33	--	51	--
	Combined Family Campgrounds (122 sites)	**30**	**--**	**46**	**--**
	Aspen Group Campground (3 sites)	--	--	--	--
	Silvertip Group Campground (2 sites)	41	--	63	--
	Combined Group Campgrounds (5 sites)	**41**	**--**	**63**	**--**
Faucherie Lake	Faucherie Lake Group Campground (2 sites)	66	100	101	154
Canyon Creek	Canyon Creek Campground (16 sites)	--	--	--	--
Rollins Reservoir	Orchard Springs Campground (101 sites)	35	62	54	96
	Greenhorn Campground (79 sites)	59	90	91	139
	Peninsula Campground (67 sites)	63	90	97	139
	Long Ravine Campground (85 sites)	67	95	103	146
	Combined Family Campgrounds (332 sites)	**55**	**83**	**84**	**128**

Developed Parking Areas

Jackson Meadows Reservoir has four developed parking areas including two boat launches and two picnic areas. Importantly, the Pass Creek Boat Launch parking area is divided into two distinct periods during the peak season (Memorial Day-Labor Day): 1) the high water period when the main parking area (23 VAOT) is the only parking area available/above the high water line (typically Memorial Day weekend through July; and 2) the low water period when both the main and auxiliary parking areas (43 VAOT) are available (typically August through Labor Day weekend).

During the high water period when parking capacity is limited to 59 VAOT, the combined occupancy of the two boat launch parking areas was 38 percent on weekends in 2009, and is projected to reach 63 percent by 2050. During the low water period when the parking capacity is greater (79 VAOT), the combined occupancy of the two boat launches was 40 percent on weekends in 2009, and is projected to reach 66 percent by 2050. When evaluated individually, the occupancy levels are highest at Pass Creek Boat Launch during the high water period at 83 percent on weekends (Table 6.6.1-20). Notably, the parking occupancies dropped to 67 percent on weekends during the low water period when both parking areas were available and the parking capacity was greater (43 VAOT compared to 23 VAOT). By 2050, the projected weekend occupancies are expected to reach 138 percent during the high water period, and 111 percent during the low water period. In contrast, the weekend occupancy levels at Woodcamp Boat Launch was 8 percent in 2009, and projected to reach no more than 13 percent by 2050.

The weekend occupancy levels at the two picnic area parking areas (Woodcamp Picnic Area and Aspen Picnic Area) are at or below 7 percent in 2009; and project to reach no more than 10 percent by 2050.

At the Faucherie Lake Day Use and Boat Launch facility, the 2009 weekend parking area occupancy was 52 percent in 2009, and is projected to reach 82 percent by 2050.

Rollins Reservoir consists of five developed parking areas – one each at Orchard Springs, Peninsula and Long Ravine recreation complexes; and two at Greenhorn recreation complex. The combined occupancy at all four Rollins Reservoir boat launch parking areas was 67 percent on weekends in 2009 and is projected to exceed full capacity (112 percent) by 2050. Occupancies at two of the parking areas at Rollins Reservoir were at or exceeded 75 percent on weekends in 2009 – Greenhorn and Long Ravine boat launches (Table 6.6.1-20). These two boat launches are projected to exceed full capacity by 2050 on weekends. In 2009, occupancies at the other three parking areas were no higher than 51 percent on weekends. Of these three parking areas, only Peninsula Boat Launch is projected to exceed 80 percent on weekends (96 percent).

Table 6.6.1-20. Projected overall peak season occupancies for Yuba-Bear Hydroelectric Project parking areas by reservoir through 2050 (Memorial Day-Labor Day).

Reservoir	Parking Facility	Percent of Capacity			
		2009 Data		2050 Projection	
		Seasonal	Weekend	Seasonal	Weekend
Jackson Meadows Reservoir	Pass Creek Boat Launch (23 VAOT, high water)	60	83	99	138
	Pass Creek Boat Launch (43 VAOT, low water)	36	67	60	111
	Woodcamp Boat Launch (36 VAOT)	10	8	16	13
	Combined Boat Launches (59 VAOT, high water)	**31**	**38**	**50**	**63**
	Combined Boat Launches (79 VAOT, low water)	**24**	**40**	**40**	**66**
	Woodcamp Picnic Area (35 VAOT)	6	6	8	9
	Aspen Picnic Area (30 VAOT)	4	7	6	10
	Combined Picnic Area (65 VAOT)	**5**	**6**	**7**	**9**
Faucherie Lake	Faucherie Lake Day Use and Boat Launch (14 VAOT)	23	52	36	82
Rollins Reservoir	Orchard Springs Boat Launch (150 VAOT)	19	40	31	66
	Greenhorn Boat Launch (108 VAOT)	50	76	82	126
	Peninsula Boat Launch (50 VAOT)	34	51	63	96
	Long Ravine Boat Launch (72 VAOT)	56	119	93	199
	Combined Boat Launches (380 VAOT)	**37**	**67**	**61**	**112**
	Greenhorn Picnic Area & Swim Beach (35 VAOT)	16	24	23	34

<u>Developed Picnic Areas</u>

Two developed picnic areas with defined picnic units exist on the Yuba-Bear Hydroelectric Project – both at Jackson Meadows Reservoir. In 2009, the weekend occupancies at the picnic areas (Aspen and Woodcamp picnic areas) were at less than 10 percent and neither is projected to reach more than 14 percent by 2050.

Usable Periods of Project Boat Launch Ramps

The following section identifies the periods of the recreation season that the Project developed boat ramps are usable based on the daily median reservoir water surface elevation (WSE) in feet under the existing Project operations. A boat ramp is considered usable when the median reservoir WSE is no less than three feet above the end of the constructed ramp per the California Department of Boating and Waterways (DBAW) design guidelines (CDBAW 1991). Table

6.6.1-21 lists the minimum usable WSE and the usable period by water year type for each of the Project developed boat ramps at Jackson Meadows and Rollins reservoirs.

Table 6.6.1-21. Functional WSE of Yuba-Bear Hydroelectric Project developed boat launch ramps.

Boat Launch	Minimum Usable WSE (ft.)	Boat Ramp Usable Period by Water Year Type				
		Wet	Above Normal	Below Normal	Dry	Critically Dry
JACKSON MEADOWS RESERVOIR						
Pass Creek Boat Launch	5,996.5	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1-Sep 15	May 1-July 15
Woodcamp Boat Launch	6,016.0	May 1-Sep 15	May 1-Sep 15	May 1-Sep 1	May 15-Aug 1	--
ROLLINS RESERVOIR						
Orchard Springs Boat Launch	2,133.0	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1–Jul 15
Greenhorn Boat Launch	2,133.0	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1–Jul 15
Peninsula Boat Launch	2,146.0	May 1 –Sep 15	May 1 –Sep 15	May 1 –Sep 15	May 1 –Sep 15	May 1–Jul 15
Long Ravine Boat Launch	2,137.0	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1-Sep 30	May 1–Jul 15

At Jackson Meadows Reservoir, one of the two boat launch ramps (Pass Creek Boat Launch ramp) is usable for at least the entire peak season (Memorial Day through Labor Day) and through September in all water year types except Dry (September 15) and Critically Dry (July 1) water years. Woodcamp Boat Launch ramp is usable for the entire peak season in only Above Normal and Wet water years.

At Rollins Reservoir, three of the four boat launch ramps are usable for the entire recreation season, May 1 through September 30 in all water year types except Critically Dry water years. In Critically Dry water years, these three ramps are only usable from May 1 through July 15.

Key Visitor Use Characteristics and Preferences

<u>Jackson Meadows Recreation Area</u>

Jackson Meadows Reservoir

Visitors to Jackson Meadows Reservoir generally engaged in camping, hiking/walking, fishing, swimming, OHV use, and flat-water non-motorized and motorized boating activities. Overnight visitors to Jackson Meadows Reservoir typically stayed from two to four days, whereas day use visitors stayed four to six hours. The majority of overnight visitors stayed at the Pass Creek and East Meadows campgrounds on the east side of the reservoir. Angling was a popular activity at Jackson Meadows Reservoir, with most anglers spending roughly four hours per day fishing, generally from the shoreline. Rainbow trout was the most common fish species caught and kept. Nearly 75 percent of anglers rated their fishing experience as average to good overall.

Jackson Meadows Reservoir is generally of regional importance recreationally, as indicated by the fact that the majority of respondents drove over 1 hour and up to 3 hours from their home to recreate. Visitors rated road access as acceptable. One exception was Bowman Lake Road, which visitors rated as unacceptable. Visitors to Jackson Meadows indicated the reservoir water level did not inhibit their recreation experience or scenic quality of the shoreline. The majority of anglers indicated that the reservoir water level had no effect on their fishing experience.

The majority of visitors found the facilities acceptable, with the unacceptable ratings related to general maintenance of the facilities (toilet facilities, trash, etc.) and the lack of food storage lockers. With respect to a desire for new facilities or facility improvements, the questionnaire results indicated some general trends noted by a majority of respondents, including overall boating improvements, such as boat-in campsites and boat trailer parking; additional vehicle and trailer parking; an accessible fishing pier; and swim areas. Overnight visitors indicated a desire for camping area improvements, such as food storage lockers; additional vehicle parking; showers; and an expansion of potable water.

Crowding, user conflicts and safety were not an issue overall. Visitors at the developed facilities who indicated those facilities were crowded generally did not alter their behavior. In these cases, they simply moved to a new location. Similarly, the majority of respondents indicated that they felt safe at the reservoir. Of the minority who felt unsafe, the most common reasons were speeding boats, speeding vehicles, or discharging of firearms.

Milton Diversion Dam Impoundment

Most visitors reside within the region or a one to three hours drive. Primary activities at Milton Diversion Dam Impoundment generally consisted of camping, hiking/walking, fishing, and wildlife viewing. Anglers comprised nearly 75 percent of visitors at Milton Diversion Dam Impoundment. While day use visitors spent an average of five hours at the impoundment, overnight visitors spent an average of just under three days. Overnight visitors generally stayed at the impoundment, with some also identifying nearby camping areas at Jackson Meadows Reservoir. The majority of day use visitors recreated alone, and these were usually anglers. Day use groups averaged two people (one vehicle), and overnight visitors averaged less than four people per group (two vehicles). Most visitors reported that water levels did not influence their ability to recreate.

Overall, anglers rated their fishing experience as very good. Most anglers used flies to fish and fished from a boat using the cast and retrieve method; rainbow and brown trout were the most common types of fish caught.

Recreationists rated road access, typically Henness Pass Road, as acceptable. And, most visitors rated the limited facilities as acceptable, overall. Restroom maintenance was the primary unacceptable rating, followed by a desire for potable water, food storage lockers, and trash receptacles. The majority of day and overnight users did not prefer any new recreation facilities.

Less than 20 percent of respondents reported any type of conflict with other users at Milton Diversion Dam Impoundment, with most attributing conflicts to loud visitors, noisy OHVs, fishermen ignoring regulations, and trash. Most visitors did not perceive any crowding and recreated at their preferred location.

French Lake Recreation Area

French Lake

Most visitors to French Lake reside within the region or a one to three hours drive. Primary activities generally consisted of fishing, hiking/walking, camping, and wildlife viewing. Anglers comprised more than half of the visitors at French Lake. Access is by foot over about 2 mi from a gated road. Day use visitors spent just less than six hours at the reservoir, whereas overnight visitors spent an average of 1.5 days. Overnight visitors generally stayed in dispersed areas along the shoreline, although some visitors camped at Jackson Meadows Reservoir. Visitor group size was less than three people (one vehicle). Visitors reported that reservoir water levels did not affect their ability to recreate.

Most anglers felt the reservoir water level had no impact on their experience and rated their fishing experience as average, overall. Rainbow and brown trout were the most common species caught.

Meadow Lake Road was the primary road access and recreationists rated it as acceptable. Some visitors indicated the parking area was too rough and cited the inability to keep OHVs out of the reservoir area.

Less than 28 percent of visitors reported any type of conflict with other users at French Lake; most attributed any conflicts to the rowdiness and loudness of OHV use in the area. Crowding was not an issue for visitors to French Lake, and they all recreated at their preferred location. The only safety issues mentioned were speeding vehicles on Meadow Lake Road, OHV use, and firearm discharge.

Bowman Lake Recreation Area

Bowman Lake

Most visitors to Bowman Lake reside in the region (1 to 3 hours drive). The primary activities were camping, hiking/walking, fishing, swimming, and flat-water non-motorized boating. OHV was also noted, primarily by those staying overnight at the Bowman Lake Campground. Anglers comprised approximately half of the visitors at Bowman Lake. Day use visitors spent just over five hours at the lake, whereas overnight visitors stayed nearly three days, on average. Overnight visitors generally stayed in dispersed areas along the north shoreline, with some staying at Bowman Lake Campground. Day use group size was less than three people (1-2 vehicles), on average, whereas overnight group size was less than five people (2 vehicles) per group. Most recreationists felt that water levels did not affect their ability to recreate.

Most anglers felt the reservoir water level had no impact on their experience and rated their fishing experience as good, overall. Most anglers fished from the shore and some by boat. Brown trout were the most common species caught.

Bowman Lake Road was the primary access road and rated acceptable by most visitors. Access condition was rated as acceptable overall. Facilities were generally acceptable, although some visitors indicated a desire for restrooms, the need for food storage lockers, and noted a general lack of facilities. The majority of visitors did not prefer new recreation facilities, but several visitors identified desired improvements, such as food storage lockers, restrooms, potable water, and trash receptacles.

Most visitors did not experience conflicts with other users at Bowman Lake; however, of those that did experience conflict, most attributed it to the rowdiness and loudness of campers and speeding OHV use. Most visitors did not perceive any crowding and recreated at their preferred location. The only safety issues mentioned were firearm discharge at undeveloped camping areas and dogs off leash.

Sawmill Lake

Most visitors to Sawmill Lake reside within the region (1 to 3 hours drive). Primary activities at Sawmill Lake were hiking/walking, fishing, and flat-water non-motorized boating. Anglers comprised nearly one-third of visitors at Sawmill Lake. Day use visitors spent just over four hours at the lake, whereas overnight visitors stayed less than four days, on average. Overnight visitors generally stayed in dispersed areas along the north shoreline, with some also identifying nearby camping areas near the Sawmill Lake dam and at Jackson Meadows Reservoir. Day use group size was slightly less than three people (two vehicles) per group, whereas overnight group size was roughly four people (two vehicles) per group. Most visitors reported that reservoir water levels did not affect their ability to recreate.

Most anglers felt the reservoir water level had no impact on their experience, rating their fishing experience as very good to good, overall. Brown and rainbow trout was the most common species caught.

Bowman Lake Road was the primary access road and was rated acceptable by most visitors. Access conditions were also noted as acceptable, overall. Most visitors found that facilities were generally acceptable. However, some indicated a desire for restrooms, food storage lockers, and identifiable campsites. The majority of visitors did not prefer new recreation facilities.

Roughly, 25 percent of visitors reported conflicts with other users at Sawmill Lake. Of those that did experience negative interactions, most attributed the conflicts to the rowdiness and loudness of OHV use and other types of users. Most visitors did not perceive any crowding and recreated at their preferred location. The only safety issues mentioned were speeding vehicles and boats, firearm discharge, and one unattended campfire.

Faucherie Lake

Most visitors to Faucherie Lake reside within the region (1 to 3 hours drive). Primary activities were camping, hiking/walking, fishing, non-motorized flat-water boating, and wildlife viewing. Anglers comprised slightly more than half of the visitors. Day use visitors stayed five hours, and overnight visitors stayed nearly four days at the group camp and less than three days at other undeveloped camping areas, on average. Nearly 65 percent of the overnight visitors stayed either at the group campground or at the undeveloped camping clusters along Canyon Creek (non-Project) below Faucherie Lake. Overnight users to the group campground were generally large groups averaging 17 people and six vehicles per group, whereas other overnight groups averaged roughly four people and less than two vehicles per group. Day users generally traveled in groups of two with one vehicle. Visitors reported that reservoir water levels did not affect their ability to recreate.

Overall, anglers felt that reservoir water level had no impact on their experience and rated their fishing experience as average. Most anglers used artificial lures and fished while wading. Rainbow trout were the most common species caught.

Bowman Lake Road was the primary access road and rated as acceptable, overall. Visitors reported that facilities were generally acceptable. The majority of visitors did not prefer new recreation facilities. A few visitors identified some existing facilities as unacceptable, such as the restrooms. Desired improvements included food storage lockers, trash receptacles, and a proper boat launch.

More than half of the visitors at the group campground reported some conflict with other users. These conflicts included loud OHVs, loud boats, and loud/obnoxious groups. Most visitors did not perceive any crowding and recreated at their preferred location. Most visitors felt safe, but the most common reasons for feeling unsafe were the discharge of firearms and speeding vehicles.

Dutch Flat Recreation Area

Dutch Flat No. 2 Forebay and Dutch Flat Afterbay

Dutch Flat No. 2 Forebay had very low use, with an estimated 142 to 1,310 RDs, while use at Dutch Flat Afterbay was slightly higher, ranging from 301 to 3,689 RDs. Most of the use was day use, with use split between the peak and shoulder seasons, as this area is generally accessible year-round. Visitors generally stayed roughly four hours and averaged two people (1-2 vehicles) per group. The forebay and afterbay were locally important, with the majority of visitors traveling less than an hour.

The primary activities at these reservoirs were fishing, OHV use, and some swimming. Nearly three-quarters of all visitors were anglers fishing in at the afterbay and forebay, and they spent approximately four hours fishing with bait/artificial lures. All anglers fished from the shoreline, generally catching brown and rainbow trout. None of the visitors was affected by reservoir water levels.

Diggins Hill Road was the primary access road and was rated as acceptable by most visitors. Access was generally acceptable.

Most visitors did not prefer new recreation facilities except for several Dutch Flat Afterbay visitors who identified a desire for trash receptacles. Some visitors mentioned a desire for restrooms, potable water, and better fishing access.

Most visitors did not report conflicts with other users; however, several issues with OHVs (speed and noise) and suspicious users were noted at Dutch Flat Afterbay. Crowding was not an issue, and most visitors indicated they were recreating at their preferred location.

Chicago Park Forebay and Powerhouse Area

The Chicago Park Forebay recreation survey area included the forebay, which has two access roads with locked gates, and the gravel area near the Chicago Park Powerhouse where Chicago Park Powerhouse Road crosses the Bear River. This area is accessible year-round. Fall appeared to be the most popular shoulder season. OHV use was the primary activity, by far, accounting for more than 65 percent of visitors, overall. Other activities included hiking/walking, swimming, and camping. Visitors generally stayed for four hours and averaged four people per group.

Few visitors participated in angling, but those who did fished in the Bear River, not in the forebay, for rainbow trout using flies; most anglers stated the fishing experience was poor. Chicago Park Powerhouse Road was the primary access road and rated acceptable by most visitors. Access was not an issue. A few visitors desired new facilities, such as a restroom and trash receptacles. Conflict and crowding were not significant issues, and all of the visitors were recreating at their preferred location. The only unsafe feature noted in the area was the discharge of firearms.

<u>Rollins Reservoir Recreation Area</u>

Rollins Reservoir

Rollins Reservoir has four major developed recreation complexes, each with a campground, boat launch, and swim beach. The reservoir is at a low elevation and is within an hour of the greater Sacramento area. Visitors reside in a range of counties with a local (less than 1-hour drive) and regional draw (1 to 3 hour drive). Visitors came from a variety of locations, but the majority of day use visitors resided in Placer County, and the overnight visitors mostly resided in Sacramento County. Overall, less than 30 percent of visitors to Rollins Reservoir completed the angler questions. Most were general anglers fishing for trout species. On average, anglers spent four hours fishing, used bait, and fished from the shoreline. Anglers rated their fishing experience as average, overall.

Rollins Reservoir respondents generally found facilities, roads, and the reservoir levels acceptable. The roads utilized to travel to Rollins Reservoir were considered acceptable, overall. Improvements suggested for facilities included, increasing maintenance of restroom facilities and additional trash and food locker facilities.

The majority of visitors did not experience negative interactions or conflicts with other recreationists. Among visitors who did report negative interactions, the most common incidents reported involved campers and motorized boaters and focused on loud and rowdy behavior. When asked to rate the levels of crowding at Rollins Reservoir, most visitors perceived it as "not crowded" and were able to recreate at their preferred location. Furthermore, most visitors indicated they felt safe, although the few that did not feel safe noted the following reasons (by complex): unleashed dogs and speeding at the Long Ravine and Greenhorn recreation complexes, and speeding boats at Orchard Springs and Peninsula complexes. Comments from visitors to Long Ravine mainly focused on late night activities and rowdy behavior by other campers.

6.6.1.3.2 Drum-Spaulding Project

Project Recreation Use Levels

Overall, the Project's recreation use is significantly skewed towards the peak recreation season from May through September. In 2009, the peak-recreation-use estimate for the Project was 85,351 RDs of which 52 percent (44,121 RDs) is day use (Table 6.6.1-22).

Table 6.6.1-22. Overview of the Drum-Spaulding Project's recreation use estimates (average of low and high use estimates) for the peak season by tiered levels of use (in Recreation Days).

Tier of Use	Reservoir	Peak Season Use Estimate (RDs)		
		Total	Day Use	Overnight
Tier 1 (10,000 RDs to 20,000 RDs)	Lake Valley Reservoir	18,184	6,566	11,618
	Fuller Lake	16,178	16,178	0
	Lake Spaulding	15,361	4,510	10,851
Tier 2 (2,000 RDs to 9,999 RDs)	Halsey Forebay	6,144	6,144	0
	Meadow Lake	5,077	396	4,681
	Sierra Discovery Trail (non-reservoir)	3,445	3,445	0
	Kidd Lake	3,229	0	3,229
	Lower Lindsey Lake	2,483	328	2,155
	Upper & Lower Peak Lakes	2,428	1,477	951
	Fordyce Lake	2,389	249	2,140
Tier 3 (less than 2,000 RDs)	Bear Valley Group Campground (non-reservoir)	1,303	0	1,303
	Rucker Lake	1,166	219	947
	White Rock Lake	1,159	158	1,001
	Carr and Feeley Lakes	1,127	346	781
	Drum Forebay	947	947	0
	Wise Forebay	889	889	0
	Lake Sterling	860	172	688
	M. Lindsey, U. Lindsey, Culbertson, Rock Lakes	851	587	264
	Blue Lake	847	226	621
	Kelly Lake	673	673	0
	Halsey Afterbay	511	511	0
	Rock Creek Reservoir	84	84	0
	Deer Creek Forebay	16	16	0
	Alta Forebay	0	0	0
	Drum Afterbay	0	0	0
	Total	**85,351**	**44,121**	**41,230**

The Project reservoirs are grouped in three tiers of use levels. The first tier of use includes reservoirs with 10,000 to 20,000 RDs. Three Project reservoirs (Lake Valley Reservoir, Fuller Lake, and Lake Spaulding) fall within this first tier. These are all highly developed reservoirs and accounted for 58 percent of all peak season recreation use. The second tier use includes reservoirs with 2,000 to 9,999 RDs. The second tier of use and accounted for 30 percent of the Project's peak season use (Table 6.6.1-22). In general, the Tier 2 reservoirs were moderate in size with some developed recreation facilities. The third tier of use includes reservoirs with less than 2,000 RDs; and accounted for roughly 12 percent of all the peak season recreation use (Table 6.6.1-22). In general, the Tier 3 reservoirs are all small in size and either lacked developed recreation facilities or had a minimal level of recreation development.

Overall, day use was only slightly higher during the peak season (44,121 RDs) compared to overnight use (41,230 RDs) in 2009. There are no overnight facilities at Fuller Lake. As a result, day use was most common at Fuller Lake (primarily fishing and picnicking) with 16,178 RDs. Reservoirs with moderate day use levels (1,400 RDs to 7,000 RDs) were Lake Valley Reservoir, Halsey Forebay, Lake Spaulding, Sierra Discovery Trail, and Upper/Lower Peak Lakes. All of these reservoirs (except Upper/Lower Peak Lakes) offer developed day use/picnic facilities. When examining overnight use, two reservoirs (Lake Valley Reservoir and Lake Spaulding) accounted for more than 50 percent of all peak season overnight use with 11,618 RDs and 10,851 RDs, respectively. These two reservoirs offer developed campgrounds and are easily accessible by vehicle (paved roads) off Interstate 80.

Overall, when examining the use projections for the peak season through 2050, recreation use is projected to grow to between 100,000 to 190,000 RDs, or a 71 percent increase in overall use. Lake Valley Reservoir and Fuller Lake are again expected to have the highest use levels by 2050, with between 30,000 and 40,000 RDs annual peak season use.

Developed Facility Occupancies

It is important to note that the peak season (Memorial Day to Labor Day holiday weekends) occupancy projections for the campgrounds, picnic/day use areas and parking areas through 2050 are speculative and many factors may change the actual projections over the course of the next 40 or more years. Thus, these projections are informative, but by no means precise, and should be utilized to generally assess potential peak season occupancy by 2050.

Of all the Project developed campgrounds, seven campgrounds are projected to be at more than 80 percent of weekend occupancy during the peak season by 2050, including three campgrounds at or exceeding full capacity (Table 6.6.1-23). The campgrounds projected to reach or exceed full capacity include two group campgrounds (Bear Valley Group and Kidd Lake Group), as well as Rucker Lake Hike-In Campground. The five campgrounds that are projected to exceed 80 percent during peak season weekend occupancy (but not reach full capacity) include Lodgepole (94 percent), Lake Spaulding (86 percent), Meadow Lake (84 percent), and Lower Lindsey Lake (92 percent) campgrounds. All the remaining campgrounds are projected to be no more than 50 percent occupancy on peak season weekend days.

Table 6.6.1-23. Projected seasonal and weekend occupancy (% of capacity) by 2050 at Drum-Spaulding Project campgrounds for the peak season (Memorial Day-Labor Day).

Project Reservoir	Campground	2009 Occupancy		2050 Projected Occupancy	
		Season	Weekend	Seasonal	Weekend
Meadow Lake	Meadow Lake Campground and Shoreline Campsites (25 sites)[1]	32	54	50	84
	Meadow Knoll Group Campground (2 sites)	10	25	15	39
Lake Sterling	Lake Sterling Walk-In Campground (6 sites)	10	32	16	50
Lake Spaulding	Lake Spaulding Campground (25 sites)	29	56	45	86
	Lake Spaulding Overflow Campground (10 sites)	10	21	16	32
Bear Valley (non-reservoir)	Bear Valley Group Campground (1 site)	49	92	76	142
Rucker Lake	Rucker Lake Hike-In Campground (7 sites)	33	68	50	105
Carr Lake	Carr Lake Campground (11 sites)	14	31	21	48
Lower Lindsey Lake	Lower Lindsey Lake Campground (12 sites)	23	60	36	92
Kidd Lake	Kidd Lake Group Campground (3 sites)	38	71	59	109
Lake Valley Reservoir	Lodgepole Campground (35 sites)	43	61	67	94

[1] Occupancy data for Meadow Lake Campground and Shoreline Campsites was recorded for the combined 25 campsites and not the 15 sites at Meadow Lake Campground the 10 sites at the Shoreline Campsites.

For the peak season for day use/picnic facilities, only the Halsey Forebay Picnic Area was above 10 percent seasonal and weekend occupancy in 2009 (14 percent), and is projected to reach roughly 20 percent above on weekends by 2050 (Table 6.6.1-24). The remaining five picnic areas are all at less than 10 percent of seasonal and weekend occupancy in 2009, and are projected to remain at or below 12 percent seasonal and weekend occupancy by 2050.

Table 6.6.1-24. Projected seasonal and weekend occupancy (% of capacity) by 2050 at Drum-Spaulding Project picnic areas for the peak season (Memorial Day-Labor Day).

Project Reservoir	Picnic/Day Use Area	2009 Occupancy		2050 Projected Occupancy	
		Seasonal	Weekend	Seasonal	Weekend
Lake Spaulding	Lake Spaulding Picnic Area (3 sites)	6	6	9	8
Bear Valley (non-reservoir)	Sierra Discovery Trail (4 sites)	6	4	8	6
Fuller Lake	Fuller Lake Day Use Area (8 sites)	4	8	6	12
Kelly Lake	Kelly Lake Picnic Area (5 sites)	4	2	5	2
Lake Valley Reservoir	Silvertip Day Use Area (10 sites)	3	8	5	11
Halsey Forebay	Halsey Forebay Picnic Area (9 sites)	14	14	21	20

For the peak season, weekend occupancy at Fuller Lake Angler Access (6 VAOT) currently exceeds full capacity. The Carr-Feeley Trailhead (30 VAOT) is currently nearing full capacity (91 percent) on weekends and is projected to reach full capacity by 2020 (147 percent by 2050). However, the 2009 relicensing study determined that 90 percent of the trailhead parking use was for non-Project recreation use (mostly hiking/backpacking in the non-Project Grouse Lakes Area). Silvertip Day Use and Boat Launch parking area (20 VAOT) is also projected to near full capacity on peak weekends by 2050 (99 percent). These three parking facilities are the only locations where peak weekend occupancies are projected to reach the 80 percent occupancy level by 2050. Most of the remaining parking facility occupancies are projected to range between 18 and 77 percent on peak weekends by 2050. (Table 6.6.1-25).

Table 6.6.1-25. Projected seasonal and weekend occupancy (% of capacity) by 2050 at Drum-Spaulding Project recreation parking areas for the peak season (Memorial Day-Labor Day).

Project Reservoir	Parking Facility	2009 Occupancy		2050 Projected Occupancy	
		Seasonal	Weekend	Seasonal	Weekend
Lake Sterling	Lake Sterling parking area (10 VAOT)	33	44	50	67
Lake Spaulding	Lake Spaulding Boat Launch (67 VAOT)	24	46	40	76
Bear Valley (non-reservoir)	Sierra Discovery Trail (9 VAOT)	21	24	35	40
Fuller Lake	Fuller Lake Angler Access (6 VAOT)	84	110	106	138
	Fuller Lake Day Use and Boat Launch (14 VAOT)	42	60	53	77
Blue Lake	Blue Lake Hike-In Campsite parking (15 VAOT)	14	25	19	35
Carr Lake and Feeley Lake	Carr-Feeley Trailhead (30 VAOT)	61	91	99	147
Lower Lindsey Lake	Lindsey Lake Trailhead (20 VAOT)	6	11	9	18
Lake Valley Reservoir	Silvertip Day Use and Boat Launch (20 VAOT)	44	65	67	99
Halsey Forebay	Halsey Forebay Picnic Area (12 VAOT)	24	33	35	48

Usable Periods of Project Boat Launch Ramps

The following section identifies the periods of the recreation season that the Project developed boat ramps are usable based on the median daily reservoir water surface elevation (WSE) in feet under the existing Project operations. A boat ramp is considered usable when the median daily reservoir WSE is no less than three feet above the end of the constructed ramp per the DBAW design guidelines (CDBAW 1991). Table 6.6.1-26 identifies the minimum usable WSE and the usable period by water year type for each boat ramp.

Table 6.6.1-26. Usable periods of Drum-Spaulding Project boat ramps by water year type under existing Project Operations.

Boat Launch	Minimum Usable WSE (ft.)	Boat Ramp Usable Period by Water Year Type				
		Wet	Above Normal	Below Normal	Dry	Critically Dry
Lake Spaulding Boat Ramp	4,942.6	May 1–Sep 30	May 1–Sep 30	May 1–Sep 30	May 1–Sep 30[1]	--
Fuller Lake Boat Ramp	5,328.9	year-round	year-round	year-round	year-round	year-round
Silvertip Boat Ramp	5,783.1	May 15-Jul 1	May 15-Jul 1	Jun 1-Jul 1	Jun 15	--

[1] At Lake Spaulding, the boat ramp is briefly not usable during the middle of September in Dry water years, but becomes usable again in late September.

At Lake Spaulding, under existing Project operations, the boat ramp is usable from May 1 through September 30 in all water year types except critically dry water years when the ramp is not usable during any period. Of note, during Dry water years, the Lake Spaulding boat ramp is not usable for approximately a one-week period in the middle of September, but becomes usable again in late September. At Fuller Lake, the boat launch ramp is usable year-round. At Lake Valley Reservoir, Silvertip Boat Launch ramp is usable from May 15 through July 1 in Wet and Above Normal water years; June 1 through July 1 in Below Normal water years; mid-June only in Dry water years; and not at all useable in Critically Dry water years.

Key Visitor Use Characteristics and Preferences

White Rock Recreation Area

White Rock Lake

The average peak season use estimate at White Rock Lake was 1,159 RDs of which 86 percent was overnight use. White Rock Lake draws recreationists regionally, as most visitors drove 1 to 3 hours from their home. Visitors rated White Rock Lake as a "unique" opportunity. Most visitors participated in flat-water non-motorized boating, camping, fishing, and hiking activities. Of those visitors who fished, the most common fish species caught was trout, and the experience was viewed as "average" or less. Overall, the reservoir water level did not create a problem for visitors participating in recreation activities (including fishing) or the scenic quality of the shoreline. Most visitors rated the road access to the reservoir as acceptable. The vast majority of visitors stayed overnight and learned about the lake by word of mouth.

The majority of visitors generally found the facilities acceptable (only steel fire rings are available), and only the lack of food storage lockers was found to be unacceptable. Crowding, conflicts, and safety were not issues identified by visitors overall.

Fordyce Lake Recreation Area

Meadow Lake

The average peak season use estimate at Meadow Lake was 5,077 RDs of which 92 percent was overnight use. Meadow Lake draws recreationists regionally, as most visitors drove 1 to 3 hours from their home. Visitors rated Meadow Lake as a "unique" opportunity. Most visitors participated in OHV, camping and hiking activities. Of those that participated in fishing, anglers rated their fishing experience as "average" to "good" overall, and Rainbow trout was the most common fish species caught. Overall, the reservoir water level did not inhibit visitors' fishing or other recreation activities, or the scenic quality of the shoreline. Most visitors rated the road access as acceptable via Meadow Lake Road/County Road 843. Nearly all the visitors camped overnight (92 percent) and learned about Meadow Lake by word of mouth.

The majority of visitors found the facilities acceptable (three developed campgrounds and two undeveloped boat ramps are provided). Overall, general preferences for facility improvements included boating improvements, picnic sites, and trash receptacles. A majority of overnight visitors preferred camping area improvements such as additional restrooms, potable water (over 60 percent), and some preferred trash receptacles (34-50 percent).

Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their recreation behavior. Firearm discharge and hazardous trees were the two reasons a few visitors felt unsafe.

Lake Sterling

Lake Sterling Walk-In Campground provides recreational opportunities for walk-in camping, picnicking, hiking, and fishing. Lake Sterling draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Lake Sterling as a "unique" opportunity. Most visitors participated in hiking, camping, and fishing activities. Anglers rated their fishing experience from "average" to "good" and primarily caught brown and rainbow trout. Overall, the reservoir water level had no effect on visitors' recreation activities or fishing experience. Visitors rated the road access as acceptable via Rattlesnake and Lake Sterling roads. The majority of visitors camped overnight and learned about Lake Sterling by word of mouth.

The vast majority of visitors found the facilities acceptable, with only a few identifying some facilities as unacceptable. Crowding, conflicts and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. Some of the conflict issues addressed by visitors included the presence of OHV users and trash at the campsites. A few visitors felt unsafe due to firearm discharges. The majority of visitors surveyed did not prefer any particular improvements. In 2009, visitors noted few additional signs of use impact, except for trash left at the campsites.

Fordyce Lake

Fordyce Lake provides opportunities for a wide variety of recreational activities, including operating OHVs, undeveloped camping, hiking, hunting, swimming, fishing, and small motorized and non-motorized boating.

In 2009, the average peak season use estimate at Fordyce Lake was 2,389 RDs of which 90 percent was overnight use. Fordyce Lake draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Fordyce Lake as a "unique" opportunity. Most visitors participated in OHV, camping, fishing, and hiking activities. Anglers rated their fishing experience from "average" to "good" and primarily caught rainbow trout. Overall, the reservoir water level did not inhibit visitors' recreation activities (including fishing) or the scenic quality of the shoreline. Most visitors rated the road access as acceptable overall via Rattlesnake and Fordyce Lake roads. The majority of visitors camped overnight and learned about Fordyce Lake by word of mouth.

Overall, the majority of the visitors to Fordyce Lake reported the facilities are acceptable or they had no opinion. The majority of visitors to Fordyce did not prefer facilities improvements. Restrooms were an exception, however, and were identified as a preferred or slightly preferred recreation facility improvement overall. Crowding, conflicts, and safety were generally not an issue and visitors who felt crowded typically did not alter their behavior. In 2009, visitors indicated few signs of additional use impact with nominal signs of human waste/toilet paper and domestic animal waste.

Lake Spaulding Recreation Area

Lake Spaulding

Lake Spaulding Campground has 25 campsites with an upper and lower camping area. The upper camping area consists of 19 total campsites including 12 sites with vehicle spurs (including one accessible site), and seven walk-in sites with an adjacent gravel parking area. The vehicle camping area is accessed via double and single lane loop roads (paved asphalt and gravel), and includes two accessible, double-unit vault restrooms, and a potable water system. The vehicle campsites each have a vehicle spur (some paved and some gravel), picnic table, steel fire ring, and storage locker. The lower camping area consists of six walk-in campsites with a parking area (gravel) and an accessible, double-unit vault restroom. Each campsite consists of a steel fire ring and picnic table. In addition, at Lake Spaulding Campground, an overflow camping area (10 sites) is located on the far side of the boat launch parking area and is used primarily for RVs. Each overflow campsite includes a picnic table, fire ring, and vehicle spur.

In 2009, the average peak season use estimate at Lake Spaulding was 15,361 RDs of which 71 percent was overnight use. Lake Spaulding draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Lake Spaulding as a "unique" opportunity. Most visitors participated in camping, hiking, fishing, flat-water non-motorized and flat-water motorized activities. Anglers rated their fishing experience from "poor" to "good" overall and primarily caught trout species. Visitors also found that the reservoir water level did not inhibit their recreation activities (including fishing) or the scenic quality of the shoreline. Most visitors rated the road access as acceptable overall via the paved Lake Spaulding Road.

The majority of visitors found the facilities acceptable, but a few found the bathrooms (cleanliness), potable water, and food storage lockers as unacceptable. Fifty percent or more visitors preferred facility improvements that include boat-in campsites, potable water, food storage lockers, and showers. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior.

With respect to the upper and lower camping areas, in 2009, visitors noted some additional signs of use impact related to human waste/toilet paper and domestic animal waste. In 2009, visitors did not note any additional signs of use impact at the boat launch and picnic area.

Bear Valley Group Campground

Bear Valley Group Campground is a non-reservoir Project facility available by reservation only for a fee. The campground hosts both tent and RV campers. In 2009, the average peak season use estimate at Bear Valley Group Campground was 1,303 RDs of which 100 percent was overnight use. The group campground generally draws recreationists from the local area, as most visitors drove just under one hour from their home. Visitors rated the campground as a "common" opportunity. Most visitors participated in camping, hiking, and picnicking activities and rated the road access as acceptable via Bowman Lake Road and Highway 20. Most visitors learned about the campground by word of mouth.

The majority of visitors found the facilities acceptable. With respect to facility improvements, very few indicated improvements overall, with the exception that over 50 percent of visitors indicated a preference for restroom improvements. In 2009, visitors indicated a few additional signs of use impact related to human waste/toilet paper and domestic animal waste. Crowding, conflicts, and safety were not an issue overall. Visitors that did indicate they were crowded generally did not alter their behavior. Of the few that felt unsafe, the most common reason was rattlesnakes in the grass around the site.

Sierra Discovery Trail

The Sierra Discovery Trail facility, located adjacent to the Bear Valley Group Campground, is an interpretive and educational facility related to the Bear Valley environment. This facility provides opportunities for hiking, wildlife viewing and picnicking (including accessible picnic opportunities).

In 2009, the average peak season use estimate at Sierra Discovery Trail was 3,445 RDs of which 100 percent was day use. The Sierra Discovery Trail draws recreationists from the local area, as most visitors drove just under one hour from their home. Visitors rated the Sierra Discovery Trail as a “unique” opportunity. Most visitors participated in hiking and picnicking; and because there was no reservoir and only a small stream, fishing was not popular at this site. Most visitors rated the road access as acceptable via Bowman Lake Road and Highway 20 and had learned of the site by word of mouth. Facilities were rated as acceptable, and most visitors did not have an opinion on new improvements. Conflict, crowding, and safety were not issues overall. In 2009, visitors indicated nominal signs of additional use impact related to human waste/toilet paper and domestic animal waste.

Fuller Lake

The day-use and boat launch facility is located on the northwest corner of the reservoir, at 5,341 feet above mean sea level. This facility provides recreational opportunities for fishing, picnicking, and boating (the speed limit is 15 mph).

In 2009, the average peak season use estimate at Fuller Lake was 16,178 RDs of which 100 percent was day use. In 2009, the day use and boat launch picnic area seasonal occupancy was at 4 percent for the peak season; whereas the parking area seasonal occupancy was at 42 percent (projected to reach 53 percent by 2050). In 2009, the angler access parking area seasonal occupancy was at 84 percent (projected to exceed 100 percent by 2050). Fuller Lake draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Fuller Lake as a “unique” opportunity. Most visitors participated in fishing. Visitors on average stayed for five hours. Anglers rated their fishing experience as “good” to “very good” overall and primarily caught trout species. The reservoir water level did not inhibit visitors’ recreation activities, or the scenic quality of the shoreline. Most visitors rated the road access on Bowman Lake Road as acceptable; however, some visitors indicated the access road to the boat launch facility could be improved (rough and narrow for boat trailers). Visitors generally had learned of the lake by word of mouth.

The majority of visitors found the facilities acceptable, and only the restroom (angler access) and the parking (day use and boat launch) were found to be unacceptable. With respect to facility improvements, the majority of visitors did not prefer improvements or had no opinion. The exceptions included additional vehicle parking and restrooms. With respect to the day use and boat launch, in 2009, visitors noted nominal signs of additional use impact related to human waste/toilet paper and domestic animal waste. With respect to the angler access, in 2009, visitors indicated moderate signs of additional use impact related to human waste/toilet paper and domestic animal waste at this site. Crowding, conflicts, and safety were not an issue overall. A few visitors indicated they were crowded but generally did not alter their behavior. For the few visitors that felt unsafe, the reason was a bear sighting on the trail near the dam.

Rucker Lake

Facilities at Rucker Lake include a gravel parking area, located on the north shore, with a capacity for 15 VAOT. The parking area includes an informational kiosk and a self-pay station. The walk-in campground is located a short hike from the parking area along a trail. In 2009, the average peak season use estimate at Rucker Lake was 1,166 RDs of which 81 percent was overnight use. In 2009, the hike-in campground seasonal occupancy was at 27 percent and is projected to reach 47 percent by 2050.

Rucker Lake draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Rucker Lake as a "unique" opportunity. Most visitors participated in camping, fishing, hiking, and flat-water non-motorized boating activities. Anglers rated their fishing experience as "good" to "very good" and primarily caught bass. Overall, the reservoir water level did not inhibit visitors' recreation activities (including fishing) or the scenic quality of the shoreline. Most visitors rated the road access as acceptable via Rucker Lake Road. The majority of use at Rucker Lake was from overnight visitors, who learned about the lake by word of mouth. The majority of visitors found the facilities acceptable. However, visitors did prefer facility improvements, which included potable water and trash receptacles. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. For the few that felt unsafe, the most common reason was due to leaving the car so far from the campsite. In 2009, visitors indicated moderate signs of additional use impact related to human waste/toilet paper and domestic animal waste. The only accessible feature of the campground is a restroom stall near the campsites.

Blue Lake

Overall, Blue Lake provides opportunities for both day-use and overnight recreation activities including camping, hiking, fishing, and swimming.

In 2009, the average peak season use estimate at Blue Lake was 847 RDs of which 73 percent was overnight use. Blue Lake draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Blue Lake as a "unique" opportunity. Most visitors participated in camping, hiking, fishing, and swimming activities. Overall, the reservoir water level did not inhibit visitors' recreation activities (including fishing) or the scenic quality of the shoreline.

Most visitors rated the road access via Rucker Lake Road as slightly acceptable. The majority of users were overnight visitors, with approximately one-third day use. The majority of visitors learned about Blue Lake by word of mouth.

Most visitors found the facilities acceptable (gravel parking area and steel fire rings are provided), but a few found access restrictions (locked gate), potable water, and trash as unacceptable. Overall, the majority of visitors indicated preferences for facility improvements that included campsites, food storage lockers, restrooms, potable water, trash receptacles, and restrooms. In 2009, the visitors indicated moderate signs of additional use impact, particularly human waste/toilet paper. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. Of the few who felt unsafe, the most common reasons were wild animals, car vandalism, and loud intoxicated campers.

<u>Grouse Lakes Recreation Area</u>

Carr Lake and Feeley Lake

Facilities at Carr Lake and Feeley Lake include a walk-in campground, which has 11 campsites and two single pit restrooms. The campground provides recreational opportunities for camping, picnicking, fishing, and access to trails for hiking, mountain biking, and horseback riding.

In 2009, the average peak season use estimate at Carr and Feeley lakes was 1,127 RDs of which 69 percent was overnight use. Visitors heavily use the trailhead parking area but the vast majority of this use is for non-Project lakes beyond Carr and Feely lakes (hiking and backpacking). Roughly 10 percent of the total use at the trailhead is attributed to the Project reservoirs - Carr or Feeley lakes. The vast majority of users (90 percent) are hiking into the Grouse Lakes Area (non-Project lakes).

Carr and Feeley lakes draw recreationists regionally, as most visitors drove 1 to 3 hours to the reservoirs. Visitors rated these lakes as a "unique" opportunity. Most visitors participated in hiking, camping, fishing, backpacking, and wildlife viewing activities. Anglers generally fished for trout from the shoreline and rated their fishing experience as "average" to "very good" overall. The reservoir water level did not inhibit visitors' recreation activities overall or the scenic quality of the shoreline. Most visitors rated the road access via Forest Route 17 as acceptable overall; however, some visitors found the road unacceptable due to rough conditions for two-wheel drive vehicles. A majority learned about Carr and Feeley lakes by word of mouth.

Most visitors found the facilities acceptable and identified only a few conditions, such as the lack of trash receptacles and the need for more restrooms, as unacceptable. Some rated access conditions as unacceptable due to signage and the condition of the road (Forest Route 17). Visitors also indicated a lack of information resources related to safety and fire. Overall, the majority of visitors did not prefer or noted "no opinion/not applicable" concerning facility improvements. In 2009, visitors indicated significant signs of additional use impact including human waste/toilet paper and domestic animal waste at the campground, and significant signs of domestic animal waste at the trailhead and along the trails near Carr Lake and Feeley Lake. In addition, a number of visitors noted the large amounts of range animal waste along the Carr Lake shoreline.

Some visitors experienced conflicts. Approximately one-third of visitors experienced negative interactions with other visitors due to loud/rowdy campers, large camping groups, off-leash dogs, firearm discharges, and litter. Nevertheless, most visitors responded that they felt safe. Of the visitors that felt unsafe, the most common reasons were wild animals, unleashed dogs, firearm discharges, campfires, and loud visitors. With respect to crowding, the camping area, trail and trailhead, and "other" shoreline areas appear to be approaching crowded conditions.

Lower Lindsey Lake

Overall, Lindsey Lake provides recreation opportunities for developed camping, fishing, and access to trails for hiking, mountain biking, and horseback riding. Lower Lindsey Lake Campground has 12 campsites. In 2009, the average peak season use estimate at Lower Lindsey Lake was 2,483 RDs of which 87 percent was overnight use.

Lower Lindsey Lake draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Lower Lindsey Lake as a "unique" opportunity. Most visitors participated in camping, hiking, picnicking, swimming, and fishing activities. Anglers generally fished for brown trout from the shoreline and rated their fishing experience as "average" to "very good" overall. The reservoir water level did not inhibit visitors' recreation activities, or the scenic quality of the shoreline. Most visitors rated the road access via Forest Route 17, Lindsey Lake Road, or Bowman Lake Road as acceptable. Visitors to Lower Lindsey Lake for the most part, learned about the area by word of mouth. Most visitors found the facilities acceptable and the majority of visitors did not prefer improvements for Lower Lindsey Campground, except for trash receptacles and potable water. In 2009, visitors indicated significant signs of additional use impacts including both human waste/toilet paper and domestic animal waste near the reservoir. One-third of visitors experienced conflicts due to loud/rowdy campers, speeding/disruptive OHVs, and firearm discharges. For the few visitors that felt unsafe, the most common reason was firearm discharges. Crowding was experienced by just over half of visitors at the campground.

Middle Lindsey Lake, Culbertson Lake, Upper Rock Lake and Lower Rock Lake

This area includes shoreline opportunities for dispersed hike-in camping at Middle Lindsey, Culbertson, Lower Rock, and Upper Rock lakes; as well as hiking, picnicking, swimming, mountain biking, and fishing. Non-motorized boating use occurs occasionally.

In 2009, the average peak season use estimate for this cluster of hike-in reservoirs was 851 RDs of which 69 percent was day use. This grouping of reservoirs draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated this grouping of hike-in reservoirs as a "unique" opportunity. Most visitors participated in camping, hiking, and fishing activities. Anglers generally fished for Brown trout from the shoreline and rated their fishing experience as "average" to "very good" overall. The reservoir water levels did not inhibit visitors' recreation activities, or the scenic quality of the shoreline. Most visitors rated the road access via Forest Route 17, Lindsey Lake Road, or Loney Meadow Road as acceptable.

Most visitors found the facilities acceptable, except for the lack of signage at/within the recreation sites. The majority of visitors to these areas did not identify preferences for facility improvements, although more than 40 percent of respondents preferred trash receptacle improvements at the trailhead. Overnight visitors preferred camping area improvements such as food storage lockers and restrooms. In 2009, visitors using the trailhead and hiking trails noted nominal signs of additional use impact. Crowding, conflicts, and safety were not an issue overall. Of the few visitors who felt unsafe, the most common reason was vehicle break-ins at the trailheads.

Kidd Lake Recreation Area

Kidd Lake

Kidd Lake Campground provides recreational opportunities for camping, fishing, swimming, and boating (speed limit of 15 mph). The facility is available for a fee and by reservation only. In 2009, the average peak season use estimate at Kidd Lake was 3,229 RDs. Kidd Lake draws recreationists from around the state, as most visitors drove more than 3 hours to the reservoir.

Visitors rated Kidd Lake as a "unique" opportunity. Most visitors participated in swimming, camping, flat-water non-motorized boating, and hiking activities. Fishing was not a very popular activity; however, of those who did fish, they generally fished from the shoreline or by boat and rated their fishing experience as "average" to "very good" overall. The reservoir water level did not inhibit visitors' recreation activities (including fishing), or the scenic quality of the shoreline. Most visitors rated the road access via Kidd Lake Road as unacceptable, primarily due to large potholes. Because Kidd Lake is a group camp, reserved in advance, all respondents were overnight visitors. The majority of visitors learned about Kidd Lake by word of mouth. Most visitors found the facilities acceptable, but a few found the lack of food storage lockers unacceptable. Thus, visitors preferred food storage locker improvements. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. In 2009, visitors indicated nominal signs of additional use impact related to human waste/toilet paper and domestic animal waste.

Upper and Lower Peak Lakes

The Upper and Lower Peak lakes provide opportunities for recreational activities, including hiking, undeveloped camping, fishing, and small motorized and non-motorized boating. A non-Project trailhead for Palisades Creek Trail is located near the Upper Peak Lake Dam and provides access to the Wild and Scenic NFAR.

Both reservoirs provide undeveloped recreation opportunities. In 2009, the average peak season use estimate at Upper and Lower Peak lakes was 2,248 RDs of which the majority was day use. In 2009 the non-Project Palisades Creek Trailhead parking area is used regularly, but over 75 percent of the use is for hiking and other activities on trails beyond the Project lakes, which is not included in the Project use estimate of 2,249 RDs.

Upper and Lower Peak lakes draw recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Upper and Lower Peak lakes as "unique" opportunities. Most visitors participated in hiking, picnicking, fishing, and swimming activities. However, fishing was not a popular activity. Overall, the reservoir water level did not inhibit visitors' recreation activities or the scenic quality of the shoreline. Most visitors rated the road access via Kidd Lakes Road (County Road 9146) as acceptable. Visitors surveyed at the non-Project Palisades Creek Trailhead identified trash receptacles as a preferred improvement at Upper Peak Lake. Very few visitors mentioned improvements at Lower Peak Lake. In 2009, visitors indicated nominal signs of additional use impact related to human waste/toilet paper and domestic animal waste. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. For the few that felt unsafe, the most common reasons were wild animals and unleashed dogs.

Lake Valley Reservoir Recreation Area

Kelly Lake

Kelly Lake provides recreational opportunities for picnicking, fishing, swimming, and non-motorized boating. CDFG stocks the lake with rainbow trout annually, when possible (CDFG 2007b). The reservoir has a boating speed limit of 15 mph. Kelly Lake Picnic Area is located on the east shore of the reservoir. The facility consists of five rustic picnic units, two single-unit pit restrooms, and an undeveloped parking area (6 VAOT).

In 2009, the average peak season use estimate at Kelly Lake was 673 RDs of which 100 percent was day use. Kelly Lake and nearby facilities (i.e., campgrounds) draw recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Kelly Lake as a "unique" opportunity. Most visitors participated in flat-water motorized boating activities. Fishing was not a popular activity. Overall, the reservoir water level did not inhibit visitors' recreation activities or the scenic quality of the shoreline. Most visitors rated the road access via Crystal Lake Road as acceptable. The vast majority of visitors stayed overnight at the adjacent Snowflower campground (a nearby privately-owned, non-Project campground), and were visiting for the day. The majority of visitors learned about Kelly Lake by word of mouth.

Most visitors found the facilities acceptable, but a few rated the restrooms and picnic sites as unacceptable, and preferences for facility improvements by over 50 percent of respondents included trash receptacles. Some overnight visitors preferred camping area improvements such as boat-in campsites, potable water, and improved restrooms. Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior.

Lake Valley Reservoir

Lodgepole Campground is a developed campground with 35 campsites, paved circulation and camping spurs, three accessible, double-unit vault restrooms, and a potable water system. In 2009, the average peak season use estimate at Lake Valley Reservoir was 18,184 RDs of which 64 percent was overnight use. Lake Valley Reservoir draws recreationists regionally, as most visitors drove 1 to 3 hours to the reservoir. Visitors rated Lake Valley Reservoir as a "unique" opportunity. Most visitors participated in camping, swimming, fishing, non-motorized boating, hiking, and picnicking activities. Anglers rated their fishing experience as "average" to "very good" overall and primarily caught rainbow trout. Generally, the reservoir water level did not inhibit visitor's recreation activities (including fishing) or the scenic quality of the shoreline. Most visitors rated the road access via Lake Valley Road as acceptable. The majority of visitors learned about Lake Valley Reservoir by word of mouth.

Crowding, conflicts, and safety were not an issue overall. For the few visitors who experienced conflict, the most common reasons were loud/rowdy campers, speeding OHVs, and unleashed dogs. The few visitors who felt crowded generally did not alter their behavior. Most visitors indicated they felt safe at the reservoir. Of the few visitors who felt unsafe, the most common reasons were speeding OHVs, unleashed dogs, and wild animals. Most visitors found the facilities acceptable. Preference for facility improvements identified by a majority of visitors included food storage lockers and foot trails to the shoreline. With respect to Lodgepole Campground, in 2009, visitors indicated nominal signs of additional use impact related to human waste/toilet paper and domestic animal waste. Visitors indicated few signs of additional use impact related to human waste/toilet paper and domestic animal waste.

<u>Alta-Drum Recreation Area</u>

Deer Creek Forebay

In 2009, the average peak season use estimate at Deer Creek Forebay was 16 RDs. Licensee did not receive any completed surveys at this reservoir for the 2009 survey season, and very rarely observed recreation use at this location. The reservoir has a gravel parking area for 5 VAOT.

Drum Forebay

Drum Forebay does not have any developed recreation facilities, and provides undeveloped day-use opportunities (overnight use is not allowed). The forebay has two unimproved, dirt parking areas, on the east and west shores. In 2009, the average peak season use estimate at Drum Forebay was 947 RDs, of which 100 percent was day use. Drum Forebay draws recreationists from the local area, as most visitors drove up to one hour to the reservoir. Visitors rated Drum Forebay as a "common" opportunity. Most visitors participated in fishing at the Forebay, generally from the shoreline, for rainbow trout. Anglers rated their fishing experience as "average" to "good" overall. The reservoir water level did not inhibit visitors' recreation activities or the scenic quality of the shoreline. Most visitors rated the road access via Drum Forebay Road as acceptable. All of those surveyed were day use visitors and learned about

Drum Forebay by word of mouth. Most visitors found the limited facilities acceptable (parking areas). Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. In 2009, visitors indicated few signs of additional use impact related to human waste/toilet paper and domestic animal waste. The forebay area was not designed for accessibility.

Drum Afterbay

In 2009, the average peak season use estimate at Drum Afterbay was zero RDs, as the Licensee did not observe any use at this location. Licensee did not receive any completed surveys at this reservoir for the 2009 survey season. The reservoir does not have any developed recreation facilities.

Alta Forebay

In 2009, the average peak season use estimate at Alta Forebay was zero RDs, as the Licensee did not observe any use at this location. Licensee did not receive any completed surveys at this reservoir for the 2009 survey season. The reservoir does not have any developed recreation facilities.

Halsey Afterbay

In 2009, the average peak season use estimate at Halsey Afterbay was 511 RDs of which all was day use, based on vehicles counts and observations. In 2009, the parking area seasonal occupancy was at 6 percent. The Licensee did not receive any completed surveys at this reservoir for the 2009 survey season during which the Licensee very rarely observed recreation use at this location. The reservoir does not have any developed recreation facilities. There is a small parking area.

Wise Forebay

There are no developed facilities at Wise Forebay. However, the forebay does provide recreational opportunities for day-use only, for picnicking, hiking/walking, and fishing (no overnight use is allowed). In 2009, the average peak season use estimate at Wise Forebay was 889 RDs of which 100 percent was day use. Wise Forebay was of regional importance recreationally, as most visitors drove 1 to 3 hours to the forebay. Visitors rated Wise Forebay as a “common” opportunity. Licensee received six completed surveys from visitors who participated in hiking and fishing activities. Anglers generally fished from the shoreline for brown trout and rated their fishing experience as “average” overall. The reservoir water level did not inhibit visitors’ recreation activities, or scenic quality of the shoreline. Most visitors rated the road access via Merry Knoll Road as acceptable. Visitors surveyed learned of the Forebay word of mouth and driving by. The majority of visitors found the facilities acceptable and did not identify facility improvements. Crowding, conflicts, and safety were not an issue overall. For the few visitors who felt unsafe, the most common reason was unleashed dogs. In 2009, visitors did not indicate any signs of additional use impact.

Halsey Forebay Recreation Area

Halsey Forebay

The forebay provides day-use opportunities at a developed picnic area on the north shore of the forebay. No overnight camping is allowed at Halsey Forebay. Halsey Forebay Picnic Area provides recreational opportunities for picnicking and shoreline fishing. The facility is located at an elevation of 1,800 feet, and is open year-round.

In 2009, the average peak season use estimate at Halsey Forebay was 6,144 RDs of which 100 percent was day use. Most recreationists to Halsey Forebay are from the region, as most drove from 1 to 3 hours to the reservoir. Visitors rated Halsey Forebay as a "common" opportunity. Most visitors participated in fishing and hiking activities. Anglers generally fished from the shoreline for rainbow trout and most rated their fishing experience as "average" to "good" overall. The reservoir water level did not inhibit visitors' recreation activities, or the scenic quality of the shoreline. Most visitors rated the road access via Christian Valley Road as acceptable. Visitors primarily learned about the area by word of mouth. Most visitors found the facilities acceptable, but a few rated the lack of an accessible fishing pier/platform, restrooms, shade, and drinking water as unacceptable. The majority of visitors did not prefer facility improvements or responded "not applicable/no opinion." Crowding, conflicts, and safety were not an issue overall. The few visitors who felt crowded generally did not alter their behavior. Of the few who felt unsafe, the most common reasons were speeding OHVs/vehicles, unleashed dogs, and the general behavior of others. In 2009, visitors indicated nominal signs of human waste/toilet paper, but moderate signs of domestic animal waste.

Rock Creek Reservoir Recreation Area

Rock Creek Reservoir

Rock Creek Reservoir is situated on rolling hills, in an urban area. The area provides day-use opportunities only (overnight camping is not allowed), including shoreline fishing and hiking/walking. The reservoir does not have any developed recreation facilities, shows few signs of use impact, and was not designed for accessibility. The peak season recreation-use estimate was as high as 84 RDs, comprised almost entirely of day-use. Licensee received three completed surveys from visitors at the reservoir (those visitors had participated in hiking and gold panning activities). Respondents learned of the reservoir by word of mouth, walking by, or because they live nearby. Visitors spent less than one hour at the reservoir, on average. Most Rock Creek Reservoir visitors drove from one to three hours to the reservoir, with visitors identifying the area as unique to extremely unique. In general, visitors rated road access as acceptable via Rock Creek Road. Overall, the reservoir water level did not inhibit visitors' recreation activities or the scenic quality of the shoreline. Most visitors found the area acceptable. One visitor preferred improvements including a shoreline trail, restrooms, a picnic area, a swim area, trash receptacles, and showers. Crowding, conflicts, and safety were not an issue, overall.

6.6.1.4 River Recreation

In 2008, 2009, and 2010, Licensees gathered information on whitewater boating and other non-whitewater boating flow-related recreational activities (i.e., fishing, swimming, and tubing) in stream reaches potentially affected by the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project. All Project-affected river reaches were considered for potential whitewater boating and non-whitewater boating opportunities.

6.6.1.4.1 Whitewater Boating

Of the 24 potential whitewater boating reaches, Licensees with agreement from other Relicensing Participants removed 12 reaches from further consideration because data collected during the three phases of the Recreation Flow Study indicated a lack of whitewater boating opportunities. The study reaches removed were:

- Middle Yuba River from the Yuba-Bear Hydroelectric Project's Jackson Meadows Dam (RM 47.0) to Milton Diversion Dam Impoundment (RM 44.8)
- Canyon Creek from Bowman Lake Dam (RM 10.4) to Artic Mine (RM 3.3)
- South Yuba River from Kingvale (RM 56.0) to Indian Springs Campground (non-project campground) (RM 46.7)
- South Yuba River from Indian Springs Campground (RM 46.7) to Drum-Spaulding Project's Lake Spaulding (RM 43.4)
- South Yuba River from the Drum-Spaulding Project's Lake Spaulding Dam (43.4) to Langs Crossing (40.0)
- Bear River from Bear Valley (RM 34.0) to the Drum-Spaulding Project's Drum Afterbay (RM 26.9)
- Bear River from Drum-Spaulding's Drum Afterbay Dam (RM 26.9) to Yuba-Bear Hydroelectric Project's Dutch Flat Afterbay (RM 21.9)
- Bear River from Yuba-Bear Hydroelectric Project's Dutch Flat Afterbay (RM 21.9) to Chicago Park Powerhouse (RM 15.9)
- Bear River from the Yuba-Bear Hydroelectric Project's Chicago Park Powerhouse (RM 15.9) to Rollins Reservoir (RM 14.4)
- Bear River from Ben Taylor Road (RM 7.9) to Lake Combie (RM 0.0)
- North Fork of North Fork American River from Six Mile Creek (RM 14.9) to North Fork Campground (RM 10.0)
- North Fork of North Fork American River from North Fork Campground (RM 10.0) to North Fork American River confluence (RM 0.0)

Twelve study reaches were considered for whitewater boating; and went through Phase 2 of the whitewater boating element of the study, which included collecting whitewater boating survey information at various flow levels via opportunistic flows and Licensee-augmented or controlled flow releases. Of note, Relicensing Participants (including Licensees) determined that one of the original study reaches (Langs Crossing to Golden Quartz) should actually be divided into two study reaches (Langs Crossing to Jolly Boys Mine; and Jolly Boys Mine to Golden Quartz). Thus, the total number of study reaches with existing or potential whitewater boating opportunities is 13 reaches.

Licensees only have the ability to reliably provide augmented or controlled flows in three of the 13 reaches (Table 6.6.1-25). Licensees are unable to provide reliable flows in the two study reaches on the Middle Yuba River and seven study reaches on the South Yuba River. Nearly all these study reaches require the water in the reservoir to be up on the spill gates in order for the Licensees to provide reliable flows in the boatable range for most types of craft. As a result, the time period for these flows is generally limited to the spring season when natural runoff is at its peak; and is dependent upon the water year. In addition, the four South Yuba River study reaches downstream of the Town of Washington are sufficiently downstream of the two projects that the projects' influence over flows is minor relative to the flows contributed from numerous tributaries and accretions within these study reaches. Based on study results and in consultation with other Relicensing Participants, Licensees identified the acceptable boating flow ranges by craft type for each study reach (Table 6.6.1-27).

The following section summarizes the existing and potential whitewater boating opportunities on these 13 reaches including an analysis of the number of boatable flow days (days when flows are within the boatable range) using unimpaired flow data and the existing flow conditions. "Unimpaired flows" are defined as synthesized mean daily stream flows that would have occurred in the absence of flow regulation (e.g., storage, diversion or release) by the projects or other parties in the basins. These synthesized mean daily unimpaired flow data were developed by Licensees in collaboration with Relicensing Participants. The hydrology period encompasses water years 1976 to 2008. The existing flow condition is referred to as the No Action Alternative or Base Case and describes the existing flow condition. Refer to Exhibit E, Section 3.6 for a more detailed explanation of the unimpaired and No Action Alternative conditions and assumptions.

Table 6.6.1-27. Operational flow constraints by reach and boatable flow ranges by craft for Project affected reaches with existing or potential whitewater boating opportunities.

Study Reach	Licensee Control	Maximum Operational Flow Capacities of Upstream Project Features: Low-Level Outlet	Maximum Operational Flow Capacities of Upstream Project Features: Spillway	Boatable Flow Range (cfs) by Craft Type	Does An Operational Constraint Exist?
MIDDLE YUBA RIVER					
Milton Div. Dam (RM 44.8) to Plumbago (RM 26.4)	NID	113 cfs at Milton Diversion Main Dam (low level & auxiliary outlets combined)	50,000 cfs at Milton Diversion Main Dam	300-400 cfs (hardshell kayak)	Yes (requires water over spillway and problematic indirect control of spills)
Plumbago (RM 26.4) to YCWA's Our House Div. Dam (RM 12.5)				800-1,000 cfs (hardshell kayak) 800-1,200 (raft) 400-700 cfs (inflatable kayak)	Yes (if Project is only water source)
CANYON CREEK					
French Lake Dam (RM 18.4) to Bowman Lake (RM 13.0)	NID	650 cfs at French Lake Dam 288 cfs at Faucherie Lake Dam 160 cfs at Sawmill Lake Dam	3,810 cfs at French Lake Dam 10,000 cfs at Faucherie Lake Dam 15,000 cfs at Sawmill Lake Dam	120-150 cfs (hardshell kayak)	No
Artic Mine (RM 3.3) to South Yuba River (RM 0.0)	NID/ PG&E	400 cfs at Bowman Lake North Dam Low-Level Outlet (can be spilled over Bowman-Spaulding Div. Dam)	4,000 cfs gated at Bowman Lake South Dam	300-400 cfs (kayak/inflatable kayak)	No
FORDYCE CREEK					
Fordyce Lake Dam (RM 10.3) to Lake Spaulding (RM 0.0)	PG&E	590 cfs at Fordyce Lake Dam	17,500 cfs at Fordyce Lake Dam	350-550 cfs (all kayaks) 400-550 cfs (rafts)	Yes (Low level outlet flows are dependent upon the water level of Fordyce Lake)
SOUTH YUBA RIVER					
Langs Crossing (RM 40.0) to Jolly Boys Mine (RM 35.2)[1]	PG&E	41 cfs total 16 cfs at Lake Spaulding Dam No. 1 25 cfs at Fuller Lake Dam	62,925 cfs total 55,000 cfs at Lake Spaulding Dam No. 2 7,500 cfs at Dam No. 3 425 cfs at Fuller Lake Dam	250-400 cfs (hardshell kayak)	Yes (requires water on spill gates at Lake Spaulding)
Jolly Boys Mine (RM 35.2) to Golden Quartz (RM 32.9)[1]				1,100-1,200 cfs (hardshell kayak) 700-1,000 cfs (raft/inflatable kayak)	Yes (requires water on spill gates at Lake Spaulding)
Golden Quartz (RM 32.9) to Washington (RM 29.0)[2]	NID/ PG&E	441 cfs Needs coordination between projects: • 400 cfs-Bowman Lake North Dam Low-Level Outlet (can be spilled over Bowman-Spaulding Div. Dam) • 16 cfs at Lake Spaulding Dam No. 1 • 25 cfs at Fuller Lake Dam	66,925 cfs Needs coordination between projects: • 4,000 cfs at Bowman Lake South Dam gated section • 62,500 cfs at Lake Spaulding Dam No.2 & No.3 • 425 cfs at Fuller Lake Dam	1,000-2,200 cfs (hardshell kayak/raft 250-350 cfs (inflatable kayak)	Yes (requires water on spill gates/ too far downstream to control)

Table 6.6.1-27. (continued)

Study Reach	Licensee Control	Maximum Operational Flow Capacities of Project Features		Boatable Flow Range (cfs) by Craft Type	Does An Operational Constraint Exist?
		Low-Level Outlet	Spillway		
SOUTH YUBA RIVER (CONTINUED)					
Washington (RM 29.0) to Edwards Crossing (RM 15.3)		Same as above	Same as above	700-2,200 cfs (hardshell kayak) 900-3,200 (raft) 250-350 cfs (inflatable kayak)	Yes (requires water on gates/ too far downstream to control)
Edwards Crossing (RM 15.3) to Purdon Crossing (RM 11.1)		Same as above	Same as above	800-2,200 cfs (hardshell kayak/raft) 300-700 cfs (inflatable kayak)	Yes (requires water on gates/ too far downstream to control)
Purdon Crossing (RM 11.1) to Highway 49 (RM7.1)		Same as above	Same as above	600-1,500 cfs (hardshell kayak) 800-2,200 (raft)	Yes (requires water on gates/ too far downstream to control)
Highway 49 (RM7.1) to Bridgeport (RM 0.0)		Same as above	Same as above	500-1,100 cfs (hardshell kayak) 800-1,100 (raft)	Yes (requires water on gates/ too far downstream to control)
BEAR RIVER					
Highway 174 (RM 10.4) to Ben Taylor Road (RM 7.9)	NID/ PG&E	Approximately 2,000 cfs Rollins Lake Dam (NID)	70,000 cfs Rollins Lake Dam (NID)	600-1,000 cfs (hardshell kayak)	No (within the operational limits of the Yuba-Bear Hydroelectric Project)

[1] Data from the study determined that the original study reach is actually 2 separate study reaches – 1) Langs Crossing to Jolly Boys Mine and 2) Jolly Boys Mine to Golden Quartz.
[2] Canyon Creek enters the South Yuba River at RM 32.4.

Middle Yuba River

Milton Diversion Dam (RM 44.8) to Plumbago (RM 26.4)
This reach is 18.4 miles in length, which spans in elevation from of 5,890 ft to 3,000 ft. The average gradient is 157 fpm. There are several portages in Box Canyon No. 2 and throughout the middle portion of the reach. The access to put-in is below Milton Diversion Dam via the Henness Pass Road/Sierra County Road 301. There is parking available along the several short access and spur roads to the river on the north and south sides. The takeout road is via the paved Our House Dam Road on the north side of the river. The road is paved but steep and narrow in sections. Parking is available at the end of the road in a large dirt and gravel parking area. The shuttle is approximately 22 miles or 75 to 90 minutes via Lafayette Road/Forest Route 84 and Henness Pass Road/Sierra County Road 301. The overall quality of the access is slightly unacceptable due to the difficulty in accessing the reach in spring and early summer due to the high elevations and often remaining snowpack when the reach has natural runoff flows in the boatable range. The estimated run time was identified ideally as a two-day trip, with an expected run of 5-6 hours per day. Information on flow levels are somewhat available from Licensee and provided on the Dreamflows website (www.dreamflows.com) for the Middle Yuba River below Milton Diversion Dam.

This reach is a solid Class V reach with challenging whitewater throughout much of the 18 miles, with a boatable range for kayakers of 300 to 400 cfs.

The number of boatable days was greater under unimpaired hydrology (an average of 14 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 2 days per year) for the period of record across all water year types. However, the study reach is generally only in a boatable range during the spring months of April, May and June, and during this period, access to the put-in below Milton Diversion Dam (roughly 5,600 ft elevation) is under several feet of snowpack. As a result, access to this reach during boatable months is generally prohibitive.

This reach has multi-day/overnight trip options due to its length and amount of challenging whitewater. Access is the biggest issue on this reach as it historically only runs during the spring runoff when the snowpack and road conditions are prohibitive. The three box canyons provide whitewater challenges on the upper stretch of the reach, but the lower stretch also provides many challenging rapids throughout. Results from focus groups and surveys indicate that very few boaters have run this reach.

Plumbago (RM 26.4) to YCWA's Our House Diversion Dam (RM 12.5) Reach
This reach is 13.9 miles in length and ranges in elevation from 2,970 ft to 1,958 ft, with an average gradient of 73fpm. The reach is typically runnable from April to May. There are two options for entry into the reach and both put-in locations are via rough, gravel roads, requiring a 4WD vehicle. The South side put-in option is via North Bloomfield or Graniteville roads down to Plumbago Road, which is steep and muddy. The North side put-in option is via Ridge Road and the Town of Alleghany down Plumbago Road, which is also a steep, gravel road with several narrow switchback turns. Parking is available from either option on the shoulder of Plumbago

Road, which provides ample space for the relatively low demand for boating on this reach. The take-out is via the paved Our House Dam Road on the north side of the river. The road is steep and narrow in sections. Parking is available at the end of the road in a large dirt and gravel parking area. The shuttle for the North side option takes approximately 75 to 90 minutes (roughly 20 miles), depending upon Plumbago Road conditions. The South side option takes approximately 90 to 105 minutes (32 miles) depending upon the Plumbago Road conditions. The access to the put-in is manageable, but the road sections to the river on the north and south side (Plumbago Road) are steep, 4WD roads, and lack signage. With respect to the reach, boaters identified up to 2 portages which took them 10 minutes or less to navigate. A range of watercraft was utilized including hardshell kayaks, inflatable kayaks, and rafts.

The reach generally takes 4-5 hours to run, with boatable flows of 800 to 1200 cfs (rafts and hardshell kayaks) and 250-450 cfs for inflatable kayaks.

The number of boatable days for hardshell kayaks was slightly greater under unimpaired hydrology (an average of 13 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 8 days per year); for rafts was greater under unimpaired hydrology (an average of 23 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 12 days per year); and for inflatable kayaks was slightly greater under unimpaired hydrology (an average of 42 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 42 days per year) for the period of record across all water year types. The reach generally had boatable flows in this range in the spring months (April through June).

Historically, flow data have been available to some degree from YCWA upon request. As of 2010, however, YCWA has agreed to share data for the Middle Yuba River above Our House Dam in perpetuity. Since 2010, real-time flows are provided on the Dreamflows website (www.dreamflows.com) for the Middle Yuba River above Our House Dam from YCWA-supplied data. These data consist of the sum of the flows below Our House Diversion Dam plus the YCWA Lohman Tunnel Diversion (up to 840 cfs.) Flows for further upstream in this reach may be approximated if the user subtracts an estimate of possible natural accretions from the Middle Yuba River above Our House Diversion Dam flows, which represent flows at the bottom end of the reach.

This reach is similar to other boating reaches in the Project Region, particularly several South Yuba River reaches (Washington to Edwards Crossing and Edwards Crossing to Purdon Crossing); however, the put-in access difficulties and the shuttle length make this reach slightly less desirable compared to the other South Yuba River reaches.

Canyon Creek

French Lake Dam (RM 18.4) to Bowman Lake (RM 13.0) Reach

Classified as Class IV to V+, this reach is 5.4 miles for all three segments - French Lake Dam to Faucherie Lake; Faucherie Lake Dam to Sawmill Lake; and Sawmill Lake Dam to Bowman Lake. The reach ranges in elevation from 6,650 ft to 5,565 ft, with an average gradient of 203 fpm, ranging from 140 to 400 fpm overall. The put-in below French Lake Dam is accessible via a hike in from the parking area. The parking area accommodates up to five vehicles at the locked gate which is approximately 1.5 miles from French Lake Dam along the access road to the dam. Multiple options for take-outs exist, including a take-out at Faucherie Lake, along Canyon Creek between Faucherie and Sawmill Lake, and at Sawmill Lake. Most boaters do not travel beyond Sawmill Lake due to the lack of quality whitewater below Sawmill Lake. There is ample parking available at all of these take-out locations. The primary shuttle (French Lake to Sawmill Lake) takes approximately 45 minutes via 8 miles on Meadow Lake Road. The shuttle from French Lake to Faucherie Lake takes approximately 60 minutes, via 11 miles on Meadow Lake Road. The put-in was considered marginal, primarily due to the restricted vehicle access, which requires boaters to hike-in approximately 1.5 miles to the river. Boaters rated the access at take-out acceptable overall, as access to the river is easy. The put-in and take-out areas are located off very rough, often 4-wheel drive necessitated roads. Restrooms are available in the vicinity of the take-out areas, including Faucherie Lake and Canyon Creek Campground. The reach is boatable by hardshell kayaks at flows of 120 to 150 cfs, with several portages, all considered manageable boaters. The typical runnable months are May and June. Since 2010, real-time flows have been provided on the Dreamflows website (www.dreamflows.com) for Canyon Creek below French Lake Dam from Licensee-supplied data. Data for Canyon Creek below Faucherie Lake Dam and Sawmill Lake Dam are not available at this time.

This reach has a narrow boatable flow range (120-150 cfs) and is best suited for hardshell kayaks with some large drops/waterfalls dispersed throughout the top end of the run.

The number of boatable days was greater under unimpaired hydrology (an average of 5 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 3 days per year) for the period of record across all water year types. For Faucherie Lake Dam to Sawmill Lake, the number of boatable days was greater under unimpaired hydrology (an average of 11 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 6 days per year) for the period of record across all water year types. For both segments of this reach, these flows typically occur in May and June.

Artic Mine (RM 3.3) to South Yuba River Confluence (RM 0.0) Reach

This reach is a high quality Class V opportunity with low flow levels needed to make it boatable (300-400 cfs) compared to most of the other similar reaches in the Project Region, especially on the South Yuba River, which generally require higher flows to boat. However, the access issues make it a marginal reach compared to the other boatable reaches in the Project Region, which typically have easy road access to the reaches (particularly the South Yuba River reaches above and below Lake Spaulding). Kayakers have typically done multiple laps on this reach in a single day because the reach is short with high quality whitewater or combine this reach with other adjacent South Yuba River reaches in a day or weekend trip.

The reach has a boatable range of 300 to 400 cfs (hardshell and inflatable kayaks), which is within the combined operational limits of the low-level outlet at the Bowman Dam and ability of Licensee to spill these releases over the Bowman-Spaulding Diversion Dam.

The number of boatable days for hardshell and inflatable kayaks was greater under unimpaired hydrology (an average of 16 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 6 days per year) for the period of record across all water year types; flows were in this range mostly in April through June. Access to the put-in during these spring months is generally available.

Fordyce Creek

Fordyce Lake Dam (RM 10.3) to Lake Spaulding (RM 0.0) Reach
Classified as a Class V run, this reach is 10.3 miles long, ranging in elevation from 6,240 ft to 5,010 feet, with an average gradient of 119 fpm. The put-in is below Fordyce Lake Dam via Rattlesnake and Fordyce Lake Dam roads (rough 4WD gravel roads). Boater put-in parking is available on river left adjacent to Fordyce Lake Dam. From this parking area an established trail provides access to the river. The primary take-out is at the Lake Spaulding Boat Launch. This takeout requires a flat-water paddle on Lake Spaulding for approximately 1 mile. Parking is available at the Lake Spaulding Boat Launch. The boat launch includes developed parking area, a launch ramp, trash receptacles, and restroom facilities. The shuttle for this take-out is approximately 14 miles, yet takes 60 to 75 minutes via Highway 20, Rattlesnake Road, and Fordyce Lake Dam road. There is a secondary take-out at the Eagle Lakes (RM 2.9), but the road access is also very rough 4WD. Limited parking is available at Eagle Lakes Crossing, but this takeout is not as common. The shuttle is approximately 11 miles and takes 50 to 65 minutes via Highway 20 and Eagle Lakes Road. Boaters rated the quality of the overall access (put-in and takeout) as acceptable. Boaters reported up to 6 portages, which took 10 to 20 minutes to complete. The run time was estimated at 4 to 6 hours, and generally is accessible a little later (i.e., June and July) due to snowpack, compared to some of the other spring runs. As of 2010, PG&E has been providing flow data to the Dreamflows website (www.dreamflows.com) for PG&E's YB-200 gage, Fordyce Creek below Fordyce Lake Dam. The reach consists of numerous natural hazards but these add to the appeal and challenge of the reach, which can also be easily scouted and portaged, if necessary. The reach consists of several Class V rapids that are evenly spaced throughout the reach; some of these rapids are likely portages for most boaters. The entire reach is easily scouted and the more difficult rapids and hazards are easily portaged. Of note, the last mile of the reach is inundated with rocks/boulders, which some boaters chose to walk around with ease. Overall, the reach is a steep, technical, low volume creek with high quality scenery.

The reach has a boatable range from 350 to 550 cfs for hardshell and inflatable kayaks and 400 to 550 cfs for rafts, which are within the operational limits of the low level outlet (590 cfs maximum capacity).

The number of boatable days for hardshell and inflatable kayaks is greater under modeled regulated hydrology under the No-Action Alternative (an average of 16 days per year) compared to unimpaired hydrology (an average of 12 days per year) for the period of record across all water year types. For rafts, the number of boatable days was greater under unimpaired hydrology (an average of 14 days per year) compared to modeled regulated hydrology under the

No-Action Alternative (an average of 9 days per year). These boatable days typically occurred in April through June and occasionally in July.

South Yuba River

Langs Crossing (RM 40.0) to Jolly Boys Mine (RM 35.2) Reach
This reach is classified as Class V to V+, and is 5.1 miles long, with an elevation range from 4,400 ft to 3,150 ft, and an average gradient of 245 fpm. The put-in is located at the bridge on Bowman Lake Road (paved) over the South Yuba River. Parking is available at several pullouts along the road near the bridge. The take-out is located at Jolly Boys Mine via Maybert Road (rough 4WD road) from the Town of Washington. There is limited roadside parking along Maybert Road near the Jolly Boys Mine. The shuttle is approximately 23 miles and takes 60 to 75 minutes to drive. The road access is easy to the put-in via Bowman Lake Road. The take-out road is very rough, high clearance 4WD road (Maybert Road) from the Town of Washington upstream to Jolly Boys Mine. There are 10 or more portages on this reach. Many portages are difficult and generally take 30 to 60 minutes to complete. Some boaters (hardshell kayakers only) spent as much as 2 hours portaging in some areas. The run in kayaks takes 4 to 6 hours (8 hour maximum). This reach could be an overnight trip, especially if combined with other downstream reaches, and is generally runnable during April and May. As of 2010, PG&E has been providing flow data to the Dreamflows website (www.dreamflows.com) for the South Yuba River at Langs Crossing. This reach borders on expedition boating and is not comparable to many others in the Project Region. It likely has a small user group/demand due to the very high level of difficulty and relatively short length of the reach.

The boatable flow range is 250 to 400 cfs, primarily for hardshell kayaks. This flow range exceeds the existing capacity of the regulating structures upstream of this reach (16 cfs at the low level outlet at Lake Spaulding Dam and 25 cfs at Fuller Lake Dam, for a total regulating capacity of 41 cfs). Thus, the flows would have to be provided via the spillway during periods when the water level is high enough to be on the spillway gates. This typically occurs in late spring/early summer months in Above Normal and Wet water years.

The number of boatable days is greater under unimpaired hydrology (an average of 32 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 5 days per year) for the period of record across all water year types. Boatable days typically occur during the winter/early spring months under unimpaired hydrology and late spring months under regulated hydrology.

Jolly Boys Mine Reach (RM 35.2) to Golden Quartz (RM 32.9) Reach
The reach is classified as Class V to V+, and is 2 miles long, with an elevation range of 3,150 ft to 2,915 ft, and gradient of 118 fpm. The put-in is at Jolly Boys Mine via Maybert Road (rough 4WD road) from the Town of Washington. Limited roadside parking is available along Maybert Road near the Jolly Boys Mine. The take-out is at Golden Quartz (former day use area). Ample parking is available in several gravel parking areas adjacent to the river (river left). Restrooms are also available at the day use area. The shuttle is approximately 2.5 miles and takes 20 to 30 minutes, via Maybert Road (rough 4WD). The access is considered marginal due to a very rough

4WD road that requires high clearance in some sections as you approach the put-in at Jolly Boys Mine. The reach has two portages, which boaters considered manageable. The run takes approximately 1 hour and is runnable during April, May, and June. Flow information is not available on this reach. Boaters must extrapolate the flows based on flows approximately 15 miles upstream of the reach at the South Yuba River at Langs Crossing and the local weather conditions. Overall, this is a short but challenging reach with some quality whitewater. Some boaters will often continue downstream to Washington or combine this reach with other reaches in the area (particularly the Canyon Creek from Artic Mine to the South Yuba River reach) for the day or as part of an overnight trip.

The boatable flow range is 700 to 1,000 cfs for rafts and inflatable kayaks and 1,100 to 1,200 cfs for hardshell kayaks, which Licensees are able to reliably provide in this reach. For rafts and inflatable kayaks, the number of boatable days was greater under unimpaired hydrology (an average of 20 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 8 days per year) for the period of record across all water year types. For hardshell kayaks, the number of boatable days was slightly greater under unimpaired hydrology (an average of 5 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 2 days per year) for the period of record across all water year types. These boatable days typically occur during the late winter and spring months.

Golden Quartz (RM 32.9) to Washington (RM 29.0) Reach

Downstream of Golden Quartz (RM 32.9) on the South Yuba River, Licensees are not able to provide reliable flows within the reaches for operational and geographic reasons. Operationally, the nearest project control structures are at least eight miles upstream of Golden Quartz (RM 32.9). Specifically, the nearest Project structure on the South Yuba River is the Drum-Spaulding Project's Lake Spaulding Dam at RM 41.0. In addition, NID has some influence on the South Yuba River flows via Canyon Creek, which enters the South Yuba River at RM 32.4 (only 0.5 mi. downstream of Golden Quartz). The nearest Project structures on Canyon Creek are the Yuba-Bear Hydroelectric Project's Bowman-Spaulding Diversion Dam (RM 10.4) and Bowman Lake Dam (RM 10.6), which are both more than 10 miles upstream of the confluence with the South Yuba River. Geographically, natural accretion from numerous tributaries into the South Yuba River typically dictates the majority of instream flow within the reaches downstream of the town of Washington (RM 29.0) (near the confluence of Poorman Creek with the South Yuba River), especially at the height of spring runoff. Consequently, Licensees are not able to provide reliable flows within the South Yuba River reaches downstream of Golden Quartz due to the combination of operational and geographic factors on the South Yuba River and Canyon Creek.

The Golden Quartz to Washington reach is classified as Class IV and is 3.9 miles long, with an elevation range from 2,915 ft to 2,590 ft, and an average gradient of 83 fpm. The put-in is at the Golden Quartz Day Use Area. Ample parking is available in several gravel parking areas adjacent to the river. Restrooms are also available at the day use area. The take-out is located at the town of Washington. Public takeout access is available at the bridge over the river and at the River Rest Campground (downstream of the bridge). Limited parking is also available along the roadside adjacent to the bridge and at River Rest Campground. The shuttle is approximately 4 miles long and takes 20 to 30 minutes via Maybert Road (rough 4WD). The access was identified as marginal to acceptable, with the marginal aspects being the rough road and limited take-out options. The reach has up to 4 portages, which boaters identified as manageable (approximately 10 minutes each). The run generally takes between 2 to 3 hours and as a result is considered a lap reach, or one that is done multiple times during a day. Flow information on this reach is not available. Boaters extrapolate the flows based on flows at the bottom end of the South Yuba River at Jones Bar and the local weather conditions. Most of this reach is downstream of the confluence with Canyon Creek (approximately RM 32.4), which provides the furthest-downstream regulated inflow to the South Yuba River. However, the reach is still substantially upstream of several other unregulated tributaries of considerable size, the flow from which is included in the South Yuba River at Jones Bar gage flow measurements. This reach is very similar to the downstream study reaches on the South Yuba River. However, this reach is generally a lower quality boating experience compared to similar runs in the Project Region and in Northern California. The reach is primarily used by the local population due to its short length and local accessibility.

The boatable flow range for hardshell kayaks and rafts is 1,000 to 2,200 cfs. The number of boatable days for hardshell kayaks and rafts is greater under unimpaired hydrology (an average of 46 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 20 days per year) for the period of record across all water year types. The boatable days occur mostly during the months of March through June. The boatable flow range for inflatable kayaks is 250 to 350 cfs. The number of boatable days for inflatable kayaks is greater under modeled regulated hydrology under the No-Action Alternative (an average of 18 days per year) compared to unimpaired hydrology (an average of 14 days per year) for the period of record across all water year types. The boatable days occur most frequently during the months of November through February under unimpaired hydrology; and during the months of January through June under modeled regulated hydrology.

<u>Washington (RM 29.0) to Edwards Crossing (RM 15.3) Reach</u>
This reach is classified as Class III to IV, and is 13.9 miles long with an elevation range from 2,590 ft to 1,940 ft, and an average gradient of 47 fpm. The put-in is located at the Town of Washington. Public takeout access is available at the bridge over the river and at the River Rest Campground (downstream of the bridge). There is limited parking available along the roadside adjacent to the bridge and at River Rest Campground. The take-out is at Edwards Crossing bridge. There is roadside parking and restrooms available near the bridge over the river. The shuttle is approximately 21 miles, which takes 45 to 60 minutes to drive via Washington Road (paved), Highway 20 (paved) and North Bloomfield Road (paved and gravel). The access was identified as totally acceptable. Boaters identified 1 to 2 portages, including 1 major portage that can take 30 to 60 minutes for some. The run takes approximately 5 to 6 hours. The reach is generally runnable January through June. No flow information is currently available; therefore, boaters must extrapolate the flows based on flows at the bottom end of the South Yuba River at Jones Bar and the local weather conditions. Boaters indicated that this reach has the potential for many hundreds of boaters per weekend, primarily due to the moderate difficulty level (Class III to IV) which appeals to a much broader group of potential boaters compared to the majority of the other whitewater boating opportunities in the Project Area that appeal to a smaller group of Class V and above boaters.

The boatable flow range for hardshell kayaks is 700 to 2,200 cfs. The number of boatable days for hardshell kayaks is greater under unimpaired hydrology (an average of 76 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 36 days per year) for the period of record across all water year types. The boatable flow range for rafts is 900 to 2,200 cfs. The number of rafting boatable days is greater under unimpaired hydrology (an average of 57 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 27 days per year) for the period of record across all water year types. The boatable flow range for inflatable kayaks is 250 to 350 cfs. The number of boatable days for these kayaks is greater under modeled regulated hydrology under the No-Action Alternative (an average of 21 days per year) compared to unimpaired hydrology (an average of 17 days per year) for the period of record across all water year types. Most of the boatable days occur during the late winter and spring months.

Of note, boaters run this reach above 2,200 cfs up to 6,000 cfs for big water boating opportunities, but this type of boating is not typical and thus not considered in the boatable range identified for this reach.

Edwards Crossing (RM 15.3) to Purdon Crossing (RM 11.1) Reach

This reach is classified as Class IV to V and is 4.2 miles long, with an elevation from 1,940 ft to 1,680 ft. The average gradient is 62 fpm. The put-in location is at Edwards Crossing bridge. There is roadside parking and restrooms available near the bridge over the river. The take-out is at the Purdon Crossing bridge. Roadside parking is available on both sides of this bridge. The shuttle is approximately 10 miles and takes 40 to 50 minutes via North Bloomfield Road (paved and gravel), Rock Creek Road (gravel) and Purdon Road (gravel). The overall quality of the access to the reach is generally considered acceptable by boaters. The boatable flow range for hardshell kayaks and rafts is 800 to 2,200 cfs, with big water boating occurring up to 6,000 cfs and higher. For inflatable kayaks, the boatable range is 300 to 700 cfs. There are up to 2 portages – all manageable (less than 10 minutes). The estimated run time is 2 to 4 hours, and the reach is runnable from January to May. Flow information is available at the Jones Bar gage near the Highway 49 intersection (RM 6.1). The Jones Bar gage flow information is available at several websites, including the Department of Water Resources, California Data Exchange Center (http://cdec.water.ca.gov) and Dreamflows (www.dreamflows.com); although boaters must still make some extrapolations to estimate the flow in this reach, which is roughly 5 to 9 miles upstream of the gage.

The boatable flow range for hardshell kayaks and rafts is 800 to 2,200 cfs. The number of boatable days for hardshell kayaks and rafts is greater under unimpaired hydrology (an average of 70 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 39 days per year) for the period of record across all water year types. The boatable flow range for inflatable kayaks is 300 to 700 cfs. The number of boatable days for inflatable kayaks is greater under modeled regulated hydrology under the No-Action Alternative (an average of 54 days per year) compared to unimpaired hydrology (an average of 43 days per year) for the period of record across all water year types. Most of the boatable days occur during the late winter and spring months.

As with the upstream reach, boaters run this reach above 2,200 cfs up to 6,000 cfs for water boating opportunities, but this type of boating is not typical and thus not considered in the boatable range identified for this reach.

Purdon Crossing (RM 11.1) to Highway 49 (RM 7.1) Reach

This reach is classified as Class V and is 4.0 miles long, ranging in elevation from 1,680 ft to 1,180 ft, with an average gradient of 125 fpm. The put-in is at Purdon Crossing bridge. Roadside parking is available on both sides of the bridge. The take-out is at the Highway 49 bridge, where a day use facility with parking, restrooms and picnic facilities are located as part of the South Yuba River State Park. There are two options for the shuttle, on the north and south side of the river. The north side is approximately 11 miles (30 to 40 minutes) via Purdon Road (paved and gravel), Tyler Foote Road (paved) and Highway 49 (paved). The south side is approximately 13 miles (35 to 45 minutes) via Purdon Road (paved and gravel) and Highway 49 (paved). The access to the river is acceptable overall. There are up to 4 portages with 1 mandatory portage. The estimated run time is 2 to 3 hours. The reach is runnable from November through March. Flow information is available at the Jones Bar gage near the Highway 49 intersection (RM 6.1). The Jones Bar gage flows are available at several websites, including the Department of Water Resources, California Data Exchange Center (http://cdec.water.ca.gov) and Dreamflows (www.dreamflows.com). Whitewater boating use on this reach can range in the hundreds of boaters for a weekend in the spring months.

The boatable flow range for hardshell kayaks is 600 to 1,500 cfs. The number of boatable days for hardshell kayaks is greater under unimpaired hydrology (an average of 65 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 46 days per year) for the period of record across all water year types. The boatable flow range for rafts is 800 to 2,200 cfs. The number of rafting boatable days is greater under unimpaired hydrology (an average of 71 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 43 days per year) for the period of record across all water year types. Most of the boatable days occur during the winter and spring months (January through June).

Of note, boaters run this reach above 2,200 cfs up to 6,000 cfs for big water boating opportunities, but this type of boating is not typical and thus not considered in the boatable range identified for this reach.

Highway 49 (RM 7.1) to Bridgeport (RM 0.0) Reach

This reach is classified as Class IV to V and is 7.1 miles in length, with an elevation range from 1,180 ft to 530 ft, and an average gradient of 92 fpm. The put-in is located at the Highway 49 bridge, where a day use facility with parking is located as part of the South Yuba River Recreation Area. The take-out is at the Bridgeport State Park and covered bridge. The state park provides ample parking at the visitor center (river left) and at a gravel parking area (river right). The shuttle is approximately 12 miles and takes 25 to 35 minutes via Highway 49 (paved) and Pleasant Valley Road (paved). The access to the river is totally acceptable. The boatable flow range for hardshell kayaks and rafts: is 500 to 1,100 cfs. There are up to 2 portages, both easy/manageable, with one mandatory portage. The run time is generally 2.5 to 4 hours, during the months of February through May. Flow information is available at the Jones Bar gage near the Highway 49 intersection (RM 6.1). The Jones Bar gage flows are available at several websites, including the Department of Water Resources, California Data Exchange Center (http://cdec.water.ca.gov) and Dreamflows (www.dreamflows.com). Boaters indicated that this reach receives the most whitewater boating use of all the South Yuba River reaches.

The boatable flow range for hardshell kayaks is 500 to 1,100 cfs. The number of boatable days for hardshell kayaks is the same (47 days) under modeled regulated hydrology under the No-Action Alternative and unimpaired hydrology for the period of record across all water year types. The boatable flow range for rafts is 800 to 1,100 cfs. The number of rafting boatable days was slightly greater under unimpaired hydrology (an average of 23 days per year) compared to modeled regulated hydrology under the No-Action Alternative (an average of 17 days per year) for the period of record across all water year types. Most of the boatable days occur during the winter and spring months (January through June).

Bear River

Highway 174 (RM 10.4) to Ben Taylor Road (RM 7.9) Reach
This reach is classified as Class IV+ to V, and is 2.5 miles in length, with an elevation range of 1,920 ft to 1,800 ft, and an average gradient of 48 fpm. The put-in is located at the Highway 174 bridge. Parking is available at a pullout adjacent to the bridge (river right) as well as an established trail to the river. The take-out is located at Ben Taylor Road (river left). Parking is available at several pullouts near the river and along the roadside. The shuttle is approximately 5 miles and takes 15 to 20 minutes, primarily via Highway 174 (paved) and Ben Taylor Road (gravel). The put-in access road and parking is acceptable, but the take-out access road and parking is marginal. The boatable range for hardshell kayaks is 600 to 1,000 cfs. While no data exists for rafts, some focus group boaters felt the reach could be boatable with rafts. There are no portages on this reach. The estimated run time is approximately 1 hour and kayakers often boat the reach multiple times in a day. The reach is generally runnable year round. Real-time flow information is provided on the Dreamflows website (www.dreamflows.com) for the Bear River below Rollins Reservoir/Bear River Canal Diversion Dam from NID-supplied data. Overall, while this reach is boatable throughout the year, it is not as high quality as other reaches in the Project Region.

The boatable flow range for hardshell kayaks is 600 to 1,000 cfs. The number of boatable days was greater under modeled regulated hydrology under the No-Action Alternative (an average of 41 days per year) compared to unimpaired hydrology (an average of 20 days per year) for the period of record across all water year types. Most of the boatable days occur during the winter, spring and early summer months (January through July).

6.6.1.4.2 Non-Whitewater Boating Recreation

The non-whitewater boating flow element of the study identified several reaches where angling is of high quality and/or popular. These reaches include the Middle Yuba River from Jackson Meadows Dam to Milton Diversion Dam Impoundment; Canyon Creek immediately downstream of Bowman Lake and at the confluence with the South Yuba River; and the South Yuba River near the Town of Washington and upstream of the Golden Quartz area.

The study also identified locations where swimming and tubing are popular. These areas include: the South Yuba River where swimming is popular at Langs Crossing; and Edwards Crossing, Purdons Crossing, Highway 49 and the towns of Washington and Bridgeport and along the Bear River where swimming and tubing were popular below Rollins Reservoir at the Bear River Campground/Day Use Area and at Dog Bar Road. The study also developed acceptable flow ranges for fishing, swimming and gold panning activities. Licensees were only able to develop these flow ranges at locations where reliable site-specific flows were available from nearby gages and where stage-discharge relationships were available from the Physical Habitat Simulation model (PHABSIM) transects (as part of the Instream Flow relicensing study).

Middle Yuba River

The Tyler Foote Crossing (RM 26.4) is a popular river access for swimming, fishing, and mining. The access is via single lane road, paved then gravel, with limited turn-outs for passing. The access is best navigated by vehicles with high clearance. The flow during is the assessment (August 15, 2009) was approximately 35 cfs. Fishing appears best at lower flows, with bank anglers typically wading in the stream from shore. Swimming opportunities are numerous, with many pools sheltered from the main river channel.

South Yuba River

The Langs Crossing site (RM 40.0) is upstream of the Bowman Lake Road Bridge, accessed via a trail on NID’s land. Access to the pools upstream of the bridge is good. There is a gravel parking area for approximately 8-10 vehicles, on river right. There is additional parking less than ¼ mile from the bridge, which provides parking for 4 vehicles. There is a clear and level sand trail to the primary pool. The site is popular as a swimming hole, which is approximately 100 feet across and long, and depths ranging from 10-15 feet with rock slabs for sunning. The are additional pools upstream that are suitable for swimming, which is popular during summer months when water and air temperatures are warmer and flows are lower (10 to15 cfs).

The Golden Quartz Day Use and Picnic Area provide access to the South Yuba River for swimming, fishing, and recreational mining. The access to the river is good, with a level walk from the parking area to the river’s edge. The site has two large parking areas for approximately 50 vehicles. This recreation site provides 4 picnic units (each with a table and grill stand). The flow at this site during the site assessment was 8 cfs (September 4, 2009). This flow appeared slightly low for swimming adjacent to shoreline. Therefore, flows slightly higher, or greater than 8 cfs, would be more suitable for increased swimming opportunities. There are several other large pools that were not stagnated, with good beach access.

- The site located upstream of the bridge over the South Yuba River in the town of Washington (RM 29) provides opportunities for swimming, recreational mining, and fishing. A user-created trail extends from the bridge to a beach access, where the shoreline slopes sharply to the water. The flow during the site assessment was approximately 12.5 cfs (September 4, 2009), which provided access and opportunity for swimming and recreational mining. The site is mostly protected from the current due to a bend in the river, which allows for swimming at much higher flows (potentially even with an increase in the river depth of 5-6 feet) when the beach would be eliminated and make swimming difficult. Such an increase in flows would not be likely, except potentially during the height of spring runoff.

Edwards Crossing (RM 15.3) located on BLM managed lands, consists of successive pools immediately upstream and downstream of the bridge. The pools range in depth from 6 to 8 feet, and provide swimming and tubing opportunities. The access to the pools within the bridge vicinity is good (right off the road), however parking is limited to roadside pull-off sites for approximately 6 vehicles. Swimming generally occurs at flows of 35 cfs (August 15, 2009), while tubing likely occurs at slightly higher flows up to 200 cfs (or an approximate increase of 1 to 2 feet in depth) according to focus groups.

Purdons Crossing (RM 11.1), located on California State Park land, consists of successive pools and boulder fields that are located up and downstream of a historic iron bridge. Parking is along the road, with vehicles parking up to a ½ mile away. Access to the river is steep, from the bridge, and the primary recreational activity is swimming. The flow during the site observation was approximately 35 cfs (August 15, 2009). A 35 cfs flow with a potential 3 to 5 foot rise in the depth of the river appears to be ample flow for swimming. Due to the large boulder fields, cobble, and nature of the reach, recreational mining fishing, and tubing appear unlikely.

The Highway 49 Bridge Crossing (RM 7.1) is also on California State Park land, and provides access and parking facilities, including a built trail staircase. Swimming is popular at this site, with large pools, sunning rocks and protected pools with good shoreline access downstream of the bridge. While mining and tubing are unlikely, fishing is likely due to the good shoreline and wading potential. The flow during the site observation was approximately 35 cfs (August 15, 2009). Flows of 35 cfs and slightly greater most likely provide the best access for various swimming options. Flows during the summer fluctuate between 2 to 3 feet in depth.

The access at Bridgeport at the South Yuba State Park provides a range of swimming and recreational mining opportunities. Three primary river access sites were identified within the State park, Kneebone beach, the picnic area, and the Covered Bridge. This site has a developed parking area for 30 vehicles and additional roadside parking along Pleasant Valley Road. The parking areas provide access to numerous sites. An easy 0.3 mile trail provides access to Kneebone beach. Dirt trails provide immediate access to picnic sites and beach below the bridge from the developed parking area. The roadside parking provides shoreline access upstream of the Covered Bridge on river right. A vault restroom is located adjacent to the parking lot. There is a range of swimming opportunities, from beach access to pools with large sunning rocks. The flow during the site observation was 35 cfs (August 15, 2009), and it appears similar recreation opportunities would exist with a depth increase of 1 to 2 feet.

Bear River

The access to Ben Taylor Road is on private land. Therefore assessments were not carried out at this location. Two other access areas were identified and included the Bear River Campground and Day Use area, and the Dog Bar Road access.

Bear River Campground and Day Use Area provide opportunities primarily for fishing and swimming. The campground has several roadside pull-offs for day use access, whereas campers have immediate access to the shoreline of the river from their campsites. The day use access area has a large gravel parking area that can accommodate approximately 50 vehicles. The access areas showed evidence of recreational mining and panning. The flow during the site assessment was 156 cfs (August 14, 2009). Tubing was unlikely at the observed flows as rocks/boulders were above or just below the water surface. However, tubing would be likely with a depth increase of 1 to 2 feet. Overall, visitors at this flow were observed cooling off; however water play and swimming was limited by the shallow water and lack of substantial deeper pools. Both access areas appear good for fishing and would be wadeable at the observed 156 cfs flow and somewhat higher flows - up to approximately 325 cfs before flow velocity and depth would make fishing difficult.

Dog Bar Road Crossing (RM 3.1) is on Licensee land and the river is primarily accessed by a trail upstream of the bridge, which leads to several swimming holes and sunning rocks. The areas on river right support large boulders for sunning and picnicking. The site showed signs of recreational mining and panning. The flow during the site observation was 156 cfs (August 14, 2009). Tubing generally occurs after the middle of June, at lower early summer flows. The typical run is from Milk Ranch Road to Dog Bar Road, which is approximately 2 miles, and taking 3 to 4 hours to tube. The primary activity at this location is swimming, with numerous deep pools with sunning rocks and some beach access with shallower water. Gold panning and recreational mining were observed during the assessment.

North Fork of the North Fork of the American River

Two primary areas were observed on the North Fork of the North Fork of the American River. These included the Lake Valley Gap Fire area (RM 14.9) and at the North Fork Campground (RM 10.0). The flow during the site assessment was 5.1 cfs (August 14, 2009).

Two areas at the Lake Valley Gap Fire access to the North Fork of the North Fork of the American River were evaluated. The Bridge Crossing site can be accessed via a good gravel road off Lake Valley Road. Four small pull-out areas can accommodate up to 6 vehicles. Due to the vegetation, size of the stream and inconsistent channel, tubing, swimming, and mining are highly unlikely in the Lake Valley Gap Fire area. Focus groups did not identify this area for fishing. The access further downstream has large amounts of woody debris and logjams within the channel, making access for recreational activities less than desirable.

The North Fork Campground and access points within this area are located on NFS land. Access to the bridge, day use areas, and campground are good via the paved Texas Hill Road, and secondary gravel spur, which runs through the campground and day use areas. Several direct access points exist from the campground, and downstream of the bridge for day-use parking for approximately 10 vehicles. There is also day use parking for approximately three vehicles downstream from the bridge. There were several man-made weirs in the stream made of cobble. While tubing and swimming are unlikely at this flow level, the area does appear to attract recreational mining and fishing.

Lindsey Creek

The sites observed on Lindsey Creek, were along the road, from Lower Lindsey Dam to Bowman Lake Road. There are a few sites that appear to be used for dispersed camping, with one clearly for equestrian use. The flow during the site observations was 1 cfs (September 4, 2009) which is typical during summer months. At this flow, the stream is shallow, generally 6 to 12 inches deep, and narrow, 6 to 8 feet wide, in much the of the reach. The stream is also lined with thick bushy vegetation, making access difficult; the stream is completely overgrown in some areas. As a result, it is unlikely the stream is utilized for any substantial recreational opportunities, including tubing, swimming, mining, or fishing. There are groups that camp along the stream and utilize one open area in particular for equestrian camping activities.

6.6.2 Environmental Effects

6.6.2.1 Yuba-Bear Hydroelectric Project

This section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3), on recreational resources. The section is divided into the following areas: 1) adequacy of recreation facilities; 2) whitewater boating opportunities; 3) real-time stream flow information; and 4) fish stocking.

6.6.2.1.1 Adequacy of Recreation Facilities

NID's relicensing studies determined that most of the existing recreational facilities are adequate to meet recreational demand associated with the Project now and in the reasonably foreseeable future. However, some of the facilities have already reached capacity at certain Project reservoirs. In addition, some of the facilities are currently in need of replacement or rehabilitation to maintain the proper functioning condition of the facility and to provide for ADA accessibility, or will require replacement or rehabilitation during the term of the new license to maintain the facilities in proper functioning condition.

NID's proposed Project includes a Recreation Facilities Plan. The primary goal of the plan is to manage public recreation use of the Project's recreation facilities over the term of the license, and minimize recreation-use impacts to natural, historic, and prehistoric resources within the Project area. The plan includes the following objectives to help achieve this goal:

- To provide recreation facilities that meet the needs of Project recreation users and that are consistent with federal, state, and local legal requirements and guidelines.

- To monitor recreation use over the term of the license to help ensure Project recreation users achieve quality recreation experiences and that recreation use impacts are minimized.
- To describe NID's responsibilities regarding recreation facilities and monitoring under the new license.
- To enhance accessibility opportunities throughout the Project recreation area.

The plan includes the following primary sections:

- Section 1 – Introduction.
- Section 2 – Existing Recreation Resources. This section describes existing Project recreation resources, facilities, landownership, and 2009 use levels.
- Section 3 – Recreation Facility Enhancement Measures. This section describes the Project's proposed recreation-capital improvement measures, including development of new recreation facilities and rehabilitation of existing recreation facilities.
- Section 4 – Recreation Monitoring Program. This section describes the recreation-monitoring program that defines how Project recreation facilities, use, needs, and potential associated impacts will be monitored and addressed over the license term.
- Section 5 – Plan Revision. This section describes how plan revisions will occur over the term of the new license.

Provided below is a description of some of the facility changes included in the Yuba-Bear Hydroelectric Project Recreation Facilities Plan and the reason for the proposed change.

NID conducted the appropriate resource surveys at all the existing and proposed Project recreation facilities within the FERC Project Boundary and found only minor, temporary concerns relative to terrestrial resources (refer to Exhibit E, Section 6.4.2.1), cultural resources (Exhibit E, Section 6.8.2.1), and water quality (Exhibit E, Section 6.2.2.1.2). At proposed recreation facilities outside the FERC Project Boundary, NID has not conducted these resource surveys, but proposes to do so and submit a biological evaluation to Forest Service or BLM, as appropriate, before taking action to construct a new Project facility on federal land that might affect special-status species or their habitat (refer to Proposed Measure YB-GEN5 in Appendix E3 in Exhibit E).

Furthermore, NID has proposed to develop in consultation with appropriate agencies and file with FERC construction hazardous materials spill prevention, control, and countermeasure plans for the recreation facilities work prior to any ground disturbing activity (refer to Proposed Measure YB-WR2 in Appendix E3 in Exhibit E). NID also included measures regarding erosion control during construction of recreation facilities. The measures require that NID develop in consultation with appropriate agencies and file with FERC construction erosion control and site restoration plans for recreation facilities work prior to any ground disturbing activity (refer to Proposed Measure YB-G&S2 in Appendix E3 in Exhibit E).

Jackson Meadows Reservoir

Jackson Meadows Reservoir provides developed camping, boating and picnic opportunities. The condition of the campgrounds are in fair condition (at minimum), but most are in good condition; however, most campgrounds do not provide accessible camping opportunities. Based on the condition of the campgrounds and combined seasonal occupancy levels of the five family campgrounds and two group campgrounds, the facilities should be adequate to handle an increase in use over the new license term (Table 6.6.1-18) with routine maintenance of the facilities. As the campground facilities require replacement-in-kind, NID will upgrade the camping facilities to provide accessible opportunities commensurate with accessibility standards at that time.

In addition, the two picnic areas have very low utilization for picnicking and parking (all at less than 10 percent of seasonal capacity) should be more than adequate to handle an increase in use over the new license.

The two boat launches at Jackson Meadows Reservoir provide boating opportunities. The Pass Creek Boat Launch on the east side of reservoir is in good condition. However, the parking capacity is an issue early in the summer/prime recreation season when the water level is high since the auxiliary boat ramp and parking (20 VAOT) is under water and only the primary launch ramp parking is available (23 VAOT). In August (typically), the auxiliary parking area is exposed at lower water levels and provides parking for an additional 20 VAOT. The Pass Creek boat ramp has a minimum usable WSE of 5,996.5 feet or three feet above the constructed end of the concrete ramp (5,993.5 ft.) per DBAW guidelines. Under existing Project operations, Pass Creek boat ramp is usable, at a minimum, from May through September 15 in all water year types, except Critically Dry water years (July 1). Under Licensee's Proposed Project, the usable period is shortened slightly during Dry water years to Labor Day rather than September 15; and in Critically Dry water years, the ramp is only usable through mid- to late June rather than July 1.

The second boat launch facility at Jackson Meadows Reservoir is the Woodcamp Boat Launch on the west side of the reservoir. This launch facility consists of a one-lane concrete launch ramp, gravel parking area (24 VAOT) and vault restroom. As of 2009, parking capacity is not a concern at this launch facility, but the concrete launch ramp is in poor condition. The Woodcamp boat ramp has a minimum usable WSE of 6016.0 feet or three feet above the constructed end of the concrete ramp (6013.0 ft.). Under existing Project operations, Woodcamp boat ramp is usable from May through Labor Day (entire peak recreation season) in Above Normal and Wet water years. In Below Normal water years, the ramp is usable through September 1; through July 15 in Dry water years; and not at all in Critically Dry water years. Under Licensee's Proposed Project, the usable period is shortened during Dry water years from May 1 through July 1 rather than July 15. However, under Licensee's Proposed Project, the other boat ramp at Jackson Meadows Reservoir, Pass Creek boat ramp, provides visitors with a usable boat ramp throughout the peak recreation season (Memorial Day through Labor Day) when Woodcamp boat ramp is not usable, except in Critically Dry water years.

NID's proposed Project includes the following major capital improvement to address the existing conditions and parking capacities at each of the boat launch facilities at Jackson Meadows Reservoir.

- NID will provide an additional 20 parking spaces (boat with trailer or double spaces) by either: 1) expanding the existing Pass Creek Boat Launch parking area within the existing FERC Project Boundary (if feasible based on the site terrain and useable space); or 2) converting the Pass Creek Overflow Campground to provide the additional parking spaces.
- NID will replace the existing one-lane concrete launch ramp at Woodcamp Boat Launch with a launch ramp that will meet the standards established in the California Department of Boating and Waterway's "Layout, Design and Construction Handbook for Small Craft Boating and Launching Facilities" (March 1991).

All of the proposed facilities at Jackson Meadows Reservoir are located within the existing FERC Project Boundary.

Milton Diversion Impoundment

Dispersed day use and camping occurs primarily along the north shoreline, where a single unit vault restroom and informational signs are located. The restroom building is in good condition. Notably, the impoundment is designated as a fishing/special use area, and the CDFG manages the impoundment to maintain an abundant population of trophy-size trout. Recreation use levels are low with nearly 3,500 RDs. NID's approach is to maintain the existing recreation opportunities (day use and overnight), but improve vehicle management and minimize the vehicle impact of the dispersed recreation uses along the shoreline of the impoundment. NID proposes the following two measures to address these issues.

- Manage vehicle use along the impoundment shoreline by establishing 2 parking areas (native surface) with vehicle barriers and directional signage along north shoreline.
  - Parking allowed in designated parking areas only (and prohibits vehicle access directly to the shoreline.
  - Walk-in camping allowed along impoundment shoreline.
- Install a car-top boat launch that allows direct vehicle access to the shoreline for boat launching purposes only.

All of the proposed facilities at Milton Diversion Impoundment are located within the existing FERC Project Boundary.

Bowman Lake

Most of the recreation opportunities at Bowman Lake are dispersed along the north and east shorelines along Bowman Lake Road from the dam to the inflow of Jackson Creek on either NID or NFS land. NID owns Bowman Lake Campground, a rustic campground near the Milton-

Bowman Tunnel outlet, which consists of 11 campsites - each with a fire ring, and picnic table; and a vault toilet. A gravel road extending down from the campground to the shoreline serves as a boat launch ramp. Another gravel access road just east of the dam serves as a second informal boat launching ramp. The rustic campground is in fair condition and is not designed to accessible guidelines. In addition, ten other designated recreation sites are located along the north shoreline on NID land (6 sites) and NFS land (4 sites). The six sites on NID land include the: Jackson Creek, Inflow, Milton-Bowman Tunnel outlet, Big Rock, McMurray Road Junction and Rock Road boat ramp sites. The four other designated recreation sites located on NFS land include Tree Camp, Burnt Tree, and Peninsula and Graniteville Road sites. Most of these designated recreation sites consist only of a steel fire ring, except at the Graniteville and Rock Road Ramp sites.

NID proposes to continue to allow shoreline camping, but only at the designated, rustic campsites off Bowman Lake Road. At each of the seven designated campsites, NID proposes to rehabilitate/replace the existing fire ring/grill units at each site, as needed. In addition, NID proposes to enhance these sites by installing site markers, additional steel fire rings and directional signage at each location (all above the high water line). The number of fire rings per site will be as follows:

- Jackson Creek – 2 steel fire rings;
- Inflow site – 2 steel fire rings;
- Milton-Bowman Tunnel outlet site – 3 steel fire rings;
- Big Rock site – 1 steel fire ring; and
- McMurray Road Junction site – 1 steel fire ring.
- Tree Camp site – 2 steel fire rings;
- Burnt Tree – 2 steel fire rings; and
- Peninsula site – 1 steel fire ring.

In addition, NID proposes to establish one parking area at the east end (Jackson Creek/Inflow site) of the reservoir along Bowman Lake Road. The designated parking area will be a native surface with vehicle barriers for up to 10 VAOT, and signage including an information kiosk that identifies the opportunities (overnight and day use) available and the regulations for camping at Bowman Lake.

All but one of the proposed Project recreation facilities at Bowman Lake are located within the existing FERC Project boundary. The one proposed facility outside the FERC Project boundary is the primitive campsites at the "Tree Camp" located along the north shoreline of Bowman Lake on NFS land. NID proposes to expand the FERC Project Boundary to include this proposed facility once the final design of the facility is complete and prior to construction.

Sawmill Lake

No developed campground or day use facilities are located at Sawmill Lake; however, several designated recreation sites (steel fire rings present) and undeveloped recreation sites (user-created rock fire rings present) are located in four general areas along the northern shore of the reservoir from the inflow of Canyon Creek downstream to the dam – Peninsula, East-North Shore, North Shore and Dam sites. In 2009, the recreation use was estimated at 4,000 RDs.

NID proposes to maintain the existing day use and camping opportunities along the north shoreline of the reservoir. However, NID proposes to consolidate and enhance the existing camping opportunities by designating a walk-in campground along the north shore off the dam access road on NID land. NID selected walk-in campsites in order to minimize the site impacts, which are significantly greater when vehicle access is allowed directly to the sites, which approach the shoreline. NID proposes to establish a parking area that will provide foot access to the designated walk-in campground. Depending upon site terrain, the walk-in campground will consist of 10 campsites. NID proposes to maintain the existing parking area and informal launch ramp at the dam, but make the site for day use only; and remove all designated campsites/fire rings. Overnight camping will only be allowed at the walk-in campground. In addition, NID proposes to install a two-unit vault toilet building at a location central to all the walk-in campsites to deal with sanitation related to the overnight camping.

The proposed walk-in campground is located outside the FERC Project boundary on NID land. NID proposes to expand the FERC Project Boundary to include this proposed facility once the final design of the facility is complete and prior to construction.

Canyon Creek (non-reservoir)

At present, overnight camping is provided at the Canyon Creek Campground on NFS land between Faucherie and Sawmill lakes. NID proposes to upgrade the campground facilities in need of immediate replacement and where certain existing facilities are lacking. Specifically, NID proposes to enhance the rustic Canyon Creek Campground (16 sites) by installing new vault toilet buildings, which are in need of immediate replacement. In addition, NID will install nine animal-resistant food lockers at the campsites that currently lack these food lockers.

Dutch Flat No. 2 Forebay

Dutch Flat No. 2 Forebay does not have any developed recreation facilities, but provides day use opportunities including shoreline fishing, picnicking, and hiking/walking at an undeveloped parking area located between the dam and the Dutch Flat No. 2 Forebay spillway. The parking area is located on NID land. Overall, recreation use is low (less than 400 RDs per year) at this forebay; however, NID proposes to maintain the existing undeveloped parking area and install an information kiosk along the shoreline side for public safety and area recreation information. The proposed information kiosk is located within the existing FERC Project Boundary.

Dutch Flat Afterbay

Dutch Flat Afterbay does not have any developed recreation facilities; however, three undeveloped roadside parking areas, an informal launch and general roadside parking provide visitors with access to the shoreline. Land ownership at these shoreline access areas varies between NID, PG&E, BLM and private lands. NID proposes to maintain the existing undeveloped parking areas, but develop a day use area if a suitable location can be found on NID or BLM land along the shoreline. Potential improvements may include facilities such as picnic tables, a vault restroom, signage or information kiosk and a designated parking area.

At this time, the proposed day use facilities at Dutch Flat Afterbay are located within the existing FERC Project Boundary. If during design, NID determines that the new facility will be outside the FERC Project Boundary, NID will expand the FERC Project Boundary to include the proposed facility prior to construction.

Rollins Reservoir

Rollins Reservoir includes four developed recreation complexes (Orchard Springs, Greenhorn, Peninsula and Long Ravine) each of which includes a campground, boat launch, and day use facilities. The recreation complexes provide a high-density recreation experience, but visitors surveyed generally did not feel crowded and did not identify the need for improved or new facilities. The usable periods for the boat ramps at Rollins Reservoir are the same under existing Project operations and Licensee's Proposed Project. Three of the four boat launch ramps are usable for the entire recreation season, May 1 through September 30, in all water year types except Critically Dry water years when the ramps all of the ramps are usable from May 1 through July 15. Therefore, NID does not propose any new facilities at Rollins Reservoir, but rather will replace the existing facilities over the term of the new license to continue to provide safe and functional recreation facilities. Over the term of the new license, the weekend occupancy at the campgrounds and boat launches may reach levels in excess of 90 percent; however, the reservoir is already substantially built-out with recreation facilities (332 campsites and 4 boat launches) and, therefore, enhanced management measures may be needed to address any capacity concerns rather than developing additional facilities.

6.6.2.1.2 Whitewater and Non-Whitewater Recreational River Opportunities

Whitewater Boating Opportunities

Based on the results of Licensee's recreational flow relicensing studies, there is a demand for additional Class IV and V whitewater boating opportunities. While the demand for these opportunities is not high, NID believes the demand could reasonably be met in Above Normal and Wet Water Years on Canyon Creek below French Dam. Therefore, NID has included in its proposed Project measures to provide these opportunities. The measure provides that NID would operate the Project by releasing into Canyon Creek below French Dam in fall a range of flows (120 - 150 cfs) that fall within the optimum boatable flow range.

The following section describes how the whitewater boating opportunities using the modeled regulated hydrology under the No Action Alternative are potentially impacted based on the Licensees' Proposed Projects and the Foothill Water Network (FWN) proposals. These flow proposals are defined below (see Exhibit E, Section 3.6 for a more detailed explanation of the proposals and assumptions).

- Licensees' Proposed Projects - the flow, reservoir and generation conditions that would occur if FERC included in the new licenses NID's and PG&E's proposed PM&E measures as described in this Exhibit E.
- FWN Flow Proposal - the flow, reservoir and generation conditions that would occur if the measures proposed by FWN in its DLA comments, which were subsequently modified, were included in the new licenses. FWN's proposal was the only detailed flow measures provided in DLA comments.

All of the changes discussed in this section are in reference to the No Action Alternative.

For the reaches affected by the Yuba-Bear Hydroelectric Project, there was no significant change (less than 10 percent change) in the number of boatable flow days on nine reaches for the modeled regulated hydrology under Licensees' Proposed Projects; and on four reaches under the FWN proposal (Table 6.6.2-1). Of note, for inflatable kayaks only, there was also no significant change in the average number of boatable days on two other reaches under the FWN proposal. The seasonality of the boatable flow days did not change significantly from the No Action Alternative to the Licensees' Proposed Projects or the FWN proposals.

For one reach under the Licensees' Proposed Projects, the average number of boatable flow days per year increased (more than 10 percent) based on the Licensees' Proposed Projects - Canyon Creek reach from French Lake to Bowman Lake, which is divided into 2 key sub-reaches due to the presence of Project dams (Table 6.6.2-1). For the French Lake Dam to Faucherie Lake sub-reach, the average number of boatable flow days doubled under the Licensees' Proposed Projects from 3 day to 6 days. For the Faucherie Lake Dam to Sawmill Lake sub-reach, the average number of boatable flow days per year increased by three days under the Licensees' Proposed Projects from six days to nine days. On both these reaches, the additional boatable flow days occur in September which did not occur under the No Action Alternative (or under the FWN proposal); and, mostly in Critically Dry, Dry, and Wet water year types.

On five reaches under the FWN proposal, the average number of boatable flow days per year increased (more than 10 percent). The seasonality of the boatable flow days did not change significantly under the FWN proposal. These reaches included:

- Golden Quartz to Washington - increased by 14 days for hardshell kayaks and rafts; and 3 days for inflatable kayaks.
- Washington to Edwards Crossing - increased by 23 days for hardshell kayaks; and 18 days for rafts.
- Edwards Crossing to Purdon Crossing - increased by 20 days for hardshell kayaks and rafts.

- Purdon Crossing to Highway 49 - increased by 17 days for hardshell kayaks; and 20 days for rafts.
- Highway 49 to Bridgeport - increased by 8 days for hardshell kayaks; and 7 days for rafts.

On one reach (Bear River from Highway 174 to Ben Taylor Road) under the FWN proposal, the average number of boatable flow days per year decreased by 9 days (22 percent) from 41 days to 32 days across all water years. The seasonality of the boatable flow days did not change significantly for this reach.

Table 6.6.2-1. Comparison of the average number of boatable flow days across all water year types by craft for regulated hydrology under the No-Action Alternative, Licensees' Proposed Projects, and FWN's Proposed Project.

River Reach	Craft Type	Boatable Flow Range (cfs)	Average No. of Boatable Flow Days per Year[1]		
			No-Action Alternative	Licensees' Proposed Projects	FWN's Proposed Project
MIDDLE YUBA RIVER					
Milton Diversion Dam (RM 44.8) to Plumbago (RM 26.4)	Hardshell/Inflatable Kayak	300-400	2	2	2
Plumbago (RM 26.4) to YCWA's Our House Diversion Dam (RM 12.5)	Hardshell Kayak	800-1,000	8	8	8
	Inflatable Kayak	250-450	42	43	43
	Raft	800-1,200	12	12	12
CANYON CREEK					
French Lake Dam (RM 18.4) to Faucherie Lake (RM 16.5)[2]	Hardshell Kayak	120-150	3	6 ▲	3
Faucherie Lake Dam (RM 16.5) to Sawmill Lake (RM 12.5)[2]	Hardshell Kayak	120-150	6	9 ▲	6
Artic Mine (RM 3.3) to South Yuba River Confluence (RM 0.0)	Hardshell/Inflatable Kayak	300-400	6	5	5
SOUTH YUBA RIVER[3]					
Golden Quartz (RM 32.9) to Washington (RM 29.0)	Hardshell Kayak/Raft	1,000-2,200	20	20	34 ▲
	Inflatable Kayak	250-350	18	19	21 ▲
Washington (RM 29.0) to Edwards Crossing (RM 15.3)	Hardshell Kayak	700-2,200	36	37	59 ▲
	Inflatable Kayak	250-350	21	23	23
	Raft	900-2,200	27	27	45 ▲
Edwards Crossing (RM 15.3) to Purdon Crossing (RM 11.1)	Hardshell Kayak/Raft	800-2,200	39	39	59 ▲
	Inflatable Kayak	300-700	54	57	56
Purdon Crossing (RM 11.1) to Highway 49 (RM 7.1)	Hardshell Kayak	600-1,500	46	47	63 ▲
	Raft	800-2,200	43	43	63 ▲
Highway 49 (RM 7.1) to Bridgeport (RM 0.0)	Hardshell Kayak	500-1,100	47	48	55 ▲
	Raft	800-1,100	17	17	24 ▲
BEAR RIVER					
Highway 174 (RM 10.4) to Ben Taylor Road (RM 7.9)	Hardshell Kayak	600-1,000	41	41	32 ▼

[1] Symbols: ▲= increased more than 10%; ▼= decreased more than 10%; no symbol = no significant change (less than or equal to 10%).
[2] These river segments are sub-reaches of the French Lake Dam to Bowman Lake reach.
[3] As described in Section 6.6.1.4.1, Licensees are not able to provide reliable flows in the reaches from Golden Quartz downstream.

Non-Whitewater Boating Opportunities

Based on the results of the non-whitewater relicensing study, there are numerous opportunities for low-flow recreational activities such as swimming, tubing, angling, and mining. These activities correspond to lower flows during summer months, when air and water temperatures are conducive to water play. NID does not propose any significant changes to summer flows. Therefore, no measures are proposed that would significantly affect current non-flow related activities.

6.6.2.1.3 Real-Time Flow Information

Projected increased demand for whitewater boating would likely result in more users along the Project-affected river reaches over the term of the new license. Providing real-time flow information would allow boaters to take advantage of conditions that provide suitable, opportunistic flows for their activities. Therefore, NID's proposed Project includes a measure under which NID would provide real-time access to its streamflow gages.

6.6.2.1.4 Fish Stocking

NID's proposed Project includes a measure whereby NID would continue stocking fish in Bowman Lake and Rollins Reservoir at the recent historic levels stocked by CDFG. This would assure that the reservoir remains an attractive fishing opportunity through the term of the new license.

6.6.2.2 PG&E's Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on recreational resources. In some instances, it is concluded that the existing Project does not adversely affect a recreational resource, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific recreational resource, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed four PM&E measures that are relevant to this resource area, which are listed in Section 6.6.3.2.1 below. The complete text of the measure and the accompanying rationale is presented in Appendix E7 of this FLA.

6.6.2.2.1 Project Reservoir Recreation Opportunities

As part of the existing License, to accommodate the public demand to recreate at Project reservoirs, PG&E has provided a variety of recreation facilities including campgrounds, picnic areas, boat launches, and fishing accesses. PG&E's relicensing studies determined that most of the existing recreational facilities are adequate to meet recreational demand associated with the Project, both now and in the reasonably foreseeable future. However, some facilities will reach capacity before 2050. In addition, some of the facilities are currently in need of replacement or rehabilitation to maintain the proper functioning condition of the facility and to provide for ADA accessibility, or will require replacement or rehabilitation during the term of the new license to maintain the facilities in proper functioning condition.

Relicensing studies have identified at certain areas that unmanaged recreation use is resulting in affects to soils, vegetation, water, and cultural resources. These affects in particular occur at the

Project's more remote reservoirs where recreation users create informal campsites and drive off established roads and parking areas. In addition, fire safe vegetation clearance frequently do not exist around the rock fire rings typical of most informal campsites, which pose the danger of possible forest fires.

PG&E has also determined that under both the No-Action Alternative and the Licensee's Proposed Project, the Project's Silvertip Boat Ramp will only provide boating access to Lake Valley Reservoir from May 1 through August 15 during most water year types.

To enhance the Project's recreation facilities, to minimize resource impacts from recreation use, PG&E has included a measure (DS-RR1) that would implement a Recreation Facilities Plan.

PG&E, as part of relicensing the Project, conducted resource surveys at all the existing and Proposed Project recreation facilities within the FERC Project Boundary and found only minor, temporary concerns relative to terrestrial resources (refer to Exhibit E, Section 6.4.2.1), cultural resources (Exhibit E, Section 6.8.2.1), and water quality (Exhibit E, Section 6.2.2.1.2).

Below is a summary of the principal facility proposals included in PG&E's Recreation Facilities Plan and the rationale for those proposed changes. All but one of the proposed improvements are located within the existing FERC Project Boundary The proposed primitive campground at Fordyce Lake will extend beyond the existing FERC Project boundary; however, Licensee's Proposed Project expands the FERC Project Boundary to include the entire primitive campground (see Exhibit G-4). In addition, at Lake Valley Reservoir, PG&E has proposed a new group campground to be constructed during the license which is expected to be located within the existing FERC Project Boundary adjacent to Silvertip Picnic Area and Boat Launch. However, if any portion of this proposed facility is located outside the existing FERC Project Boundary, PG&E will expand the Project Boundary to include it and conduct appropriate resource surveys as part of the planning and construction process.

White Rock Lake

At White Rock Lake, PG&E proposes the following changes or improvements.

- Re-grade the dirt road from the north shoreline near the intersection with the dam access road to the bottom of the hill where rough, 4WD conditions exist by the first few primitive campsites.
- Install 6 animal resistant food storage lockers, one at each campsite.
- On the information board, provide appropriate education information on land and water related resource protection messages emergency contacts, and a map of the reservoir's primitive campsites, and recreation, and water surface regulations. PG&E will specifically provide information on camping only in designated campsites, leave no trace camping (emphasize human and animal sanitation), proper waste and food storage, and preventing the spread of amphibian chytrid fungus.
- Close campsites below the dam in a sensitive resource area.

- Install up to 4 new directional signs, from the Meadow Lake Road (Nevada County Road 843) along the dirt and gravel roads leading directly to the reservoir and back from the reservoir.

The designated primitive campsites are located on PG&E and NFS land and were in fair condition, and the use impact minimal, with small areas of bare ground and vegetation loss, and nominal amounts of litter. Nearly all visitors found the facilities acceptable and the majority did not prefer any improvements. However, the primitive campsites along the north shoreline on PG&E land are often accessible only by high clearance, 4WD vehicles due to several very rough sections. In order to maximize the use of these campsites, PG&E proposes to grade the road through the rough sections, therefore enhancing vehicle access to these campsites. The campsites at White Rock Lake have a pack-it-in/pack-it-out policy and PG&E proposes to install additional resource protection signage at the information board as you approach White Rock Lake to reinforce and educate visitors on the policy and standards.

Meadow Lake

At Meadow Lake, PG&E proposes the following changes or improvements. Note that one of the existing 10 shoreline campsites is being converted to a picnic area (see proposed Meadow Lake Picnic Area above) reducing the Meadow Lake Shoreline Campsites to 9 sites.

<u>Meadow Lake Campground</u>

- Install an information board with appropriate educational information on land and water related resource protection measures, including prohibiting vehicles below the high water line, emergency contacts, and recreation and water surface regulations.
- Install up to 6 new directional signs along the roads leading to and from Meadow Lake.
- Upgrade one existing campsite adjacent to the accessible double vault restroom to be a fully accessible campsite meeting FSORAG. The upgrade will consist of the following improvements:
  - Grade and level the campsite.
  - Grade and level access routes from the restroom to the campsite.
  - Install an accessible picnic table and fire ring.
- Within 15 years, PG&E proposes to reconstruct the campground that will include new tables, fire rings, potable water, re-grading and graveling roads and spurs to meet universal design guidelines. Redesign/relocation of campsite locations and campground circulation roads will be reviewed at that time. Signs will be provided at the Meadow Lake Day Use Area and Meadow Lake Shoreline Campsites informing users that potable water is available at the campground.

<u>Meadow Lake Shoreline Campsites</u>

- Convert one existing campsite to a picnic area (see proposed Meadow Lake Picnic Area above) reducing the total number of Meadow Lake Shoreline Campsites to 9 sites.

- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, and recreation and water surface regulations. Specific information to be provided includes no camping outside designated campsites, no driving below high water elevation, and camping practices to reduce human and animal waste.
- Install a 1-unit accessible vault toilet.
- When the campground is scheduled for rehabilitation, re-construct the campground to Development Level 2 standards, which will include:
  - Relocating and reinforce vehicle barriers to improve vehicle management at each campsite.
  - Replacing all tables and fire rings with accessible features.
  - Providing a clear, level compacted surface adjacent to all constructed features in compliance with FSORAG.
  - Providing appropriate signing that meets Forest Service and other applicable agency standards.
  - Replacing entrance information board.

<u>Meadow Knoll Group Campground</u>

- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, and recreation and water surface regulations. Specific information to be provided includes no camping outside designated campsites, no driving below high water elevation, and camping practices to reduce human and animal waste.

<u>Meadow Lake Picnic Area (New Facility)</u>

- Develop a rustic 3-unit picnic and parking area near the Meadow Lake Campground and the existing informal boat launch. This will be accomplished by converting an existing campsite from the Meadow Lake Shoreline Campsites into the proposed picnic area.
- The new rustic picnic facility shall include the following components:
  - 3 picnic units, each with a picnic table and pedestal grill to meet universal design criteria of FSORAG.
  - 1 designated accessible picnic unit including a picnic table, pedestal grill and access route from the parking area.
  - Parking area for up to 8 vehicles, with vehicular barriers, and information signs indicating the parking and picnic areas are for day-use only. The parking area will include an accessible parking space, with an accessible route to the accessible picnic unit.
  - An information board with appropriate educational information on land and water related resource protection measures, including no vehicles below high water level, emergency contacts, and recreation and water surface regulations.

- An interpretive panel about the historic town of Summit City. PG&E will provide the interpretive information to the Forest Service for review and comment prior to installation of the panel.

The existing and Proposed Project recreation facilities are on National Forest System (NFS) land, except for the shoreline campsites, which are also partially on PG&E land.

The Meadow Lake Campground (15 campsites) is in good condition, including nearly new vault restroom buildings. The visitor use impact is minimal at the facility, with some moderate-to-large areas of bare ground and vegetation loss typical of developed campgrounds. The campground is partially accessible with an accessible double-unit vault restroom building. The Meadow Lake Shoreline Campsites (10 campsites) are in poor condition with deteriorating picnic tables and damaged fire rings/grills. The use impact is significant around the shoreline campsites with obvious signs of tree cutting and large areas of bare ground. The shoreline campsites are rustic sites that were not designed to accessible guidelines. In 2009, the peak season campground occupancy levels were 32 percent for the season and 54 percent on weekends. Projected 2050 occupancy is expected to reach 50 percent for the season and 84 percent on weekends. In 2009, the visitors surveyed indicated preferences for boating improvements and picnic sites.

The Meadow Knoll Group Campground is in good condition, and visitor use impact is minimal, with some areas of bare ground around the tables and fire rings. During 2009, Licensee observed a minimum level of use at this site. The campground is partially accessible with an accessible restroom stall in each restroom building and accessible picnic tables. In 2009, the campground occupancy levels were 10 percent for the season and 25 percent on weekends. Projected 2050 occupancy is expected to reach 15 percent for the season and 39 percent on weekends.

Thus, based on the occupancy levels of each of the Meadow Lake campgrounds, both facilities should be adequate to handle an increase in use over the new license term. However, the poor condition of the Meadow Lake Shoreline Campsites will require rehabilitation to provide a functional and safe facility for overnight visitors. In addition, Meadow Lake Campground needs a campsite designed to current accessible guidelines to improve the facility for persons with disabilities.

Regarding PG&E's proposed new day use facility, Meadow Lake only provides facilities for overnight camping. Visitors seeking day use opportunities do not have a defined location to park and recreate. And, in 2009, visitors surveyed indicated a need for picnic sites and boating improvements. As such, PG&E has proposed to convert a single shoreline campsite at Meadow Lake Campground into a rustic picnic area with an associated day use and boat launch parking area. The new facility will be located adjacent to the main loop of Meadow Lake Campground on the southwest side of the lake. PG&E has concluded that reducing the shoreline campsites by one site is reasonable due to the low occupancy rates at the campground. Furthermore, the reduction of one campsite allows for the addition of a facility and opportunities that do not currently exist at Meadow Lake. The installation of the interpretive display will enhance the day use area and provide visitors with educational materials on the area history.

Lake Sterling

At Lake Sterling, PG&E proposes the following changes or improvements:

Lake Sterling Primitive Campsites (New Facility)
- On the east shoreline where informal, dispersed camping occurs, install 3 primitive campsites (each with a steel fire ring) and an information board with site appropriate resource protection, camping and regulation information. Monitor (by host) and limit the camping in this area to these 3 primitive campsites.

Lake Sterling Walk-In Campground
- Replace the existing picnic tables and fire rings to meet the universal design criteria of FSORAG, and site markers at each of the 6 campsites.
- Relocate the campsites if necessary to protect the resources. If the opportunity exists, add up to 2 additional campsites.
- Replace the existing double vault restroom with an accessible double-unit vault restroom.
- Install 6 new animal-resistant food lockers – one at each campsite.
- On the information board, provide appropriate education information on land and water related resource protection messages emergency contacts, recreation area and campground layout maps, and recreation and water surface regulations.
- Install up to 4 new directional signs along the roads leading to and from the reservoir from Rattlesnake Road junction.
- Install a host site in the vicinity of the campground to manage Lake Sterling and Fordyce Lake.
- Pending Division of Safety of Dam's (DSOD) approval, install a safety rail on the dam for hiker safety.
- Improve the path from the parking area to the camping area.

General/Public Safety
- Pending DSOD approval, install a railing on the dam for hiker safety.

The existing walk-in campground is on NFS land and the proposed primitive campsites are on PG&E land.

This rustic, walk-in campground is in fair condition. The site amenities and buildings are frequently subjected to harsh winter conditions because they are located at an elevation of nearly 7,000 feet in a lake basin with high weather exposure. The use impact is moderate, with large, contiguous areas of bare ground and vegetation loss that include as many as four tent pads radiating out from some of the campsites. This hike-in camping facility was not designed to accessible guidelines, particularly because the access to the campsites is located along a steep shoreline slope. At present, the Lake Sterling Walk-In Campground provides walk-in camping at six sites; the peak season occupancy levels were very low; in 2009 occupancy was 10 percent for the season and 32 percent on weekends. Projected 2050 occupancy is expected to reach only 16 percent for the season and 50 percent on weekends. Thus, the existing facility should be adequate to meet the current and future camping demand; however, nearly all of the facilities (tables, fire rings, site markers and restroom) will need near-term rehabilitation/replacement to provide a functional and safe facility for overnight visitors.

At present, unmanaged dispersed camping also occurs outside of the campground facility on the east shoreline at four locations. PG&E proposes to formalize the three most suitable dispersed camping locations into primitive campsites with a pack-it-in/pack-it-out policy. Furthermore, PG&E proposes to establish a host site in the vicinity of Lake Sterling that would allow PG&E to better manage all recreation use at Sterling and Fordyce lakes, including use and compliance at the primitive campsites on the east shoreline.

In addition to the camping opportunities at Lake Sterling, an informal dirt parking area for up to 10 vehicles provide day use visitors with access to Lake Sterling for a variety of recreation activities. The peak season parking area occupancy levels were moderate in 2009 with 33 percent for the season and 44 percent on weekends. By 2050, these levels are projected to only reach 50 percent for the season and 67 percent on weekends. As result, PG&E does not propose any changes to the parking area because the existing parking facility meets the current and projected future recreation demand.

PG&E may install a railing across the dam at Lake Sterling for public safety because hikers cross the dam to access the existing trail system along the north shoreline and in/around the Mossy Lakes area (non-Project). PG&E will work with the DSOD to determine if installation of a railing is allowed on the dam structure. If DSOD authorizes the installation of the railing, PG&E will install the railing.

Fordyce Lake

At Fordyce Lake, PG&E proposes the following key changes:

<u>Fordyce Lake Primitive Campground (New Facility)</u>

- Install up to 10 primitive campsites along Fordyce Lake Road (on PG&E land). Each campsite will include a fire ring, an animal-resistant food locker, and a site marker.
- Install a composting design single-unit toilet.
- Install a facility identification sign.
- On the existing information board, provide appropriate education information on: camping regulations; maps of the Tahoe National Forest's new OHV route designations; land and water related resource protection measures, including no vehicular travel below the reservoirs high water mark; emergency contacts; and recreation and water surface regulations.

At present, Fordyce Lake does not provide any developed recreation facilities. However, based on the 2009 relicensing studies, a substantial demand for primitive camping exists along the south arm of the reservoir accessed by Fordyce Lake Dam Road. Overall in 2009, three dispersed camping groups were observed on average; however PG&E observed as many as 11 dispersed camping groups on weekends. As a result, PG&E proposes to construct a primitive campground with up to 10 campsites (based on suitable land for campsites), each with a fire ring, animal-resistant food locker and site marker to focus camping use at managed campsites, and install a single unit composting toilet. Existing user-created rock fire rings within 200 feet of the high water line will be dismantled and dispersed. Furthermore, PG&E proposes three resource management measures to minimize the impacts of vehicles below the high water line. These include:

<u>Resource Protection Measures</u>

- Pursue a Nevada County ordinance that prohibits motorized vehicle use below the high water line at Fordyce Lake.
- Provide management presence through a host who will patrol Fordyce Lake and Sterling Lake during the prime recreation season (generally, July 1 through October 15). The patrol person will manage recreation use and enforce appropriate regulations, particularly regulations that protect cultural and other sensitive resources and enforce the no camping outside of the designated campsites rule.
- Install regulatory signage at logical vehicle access points, to discourage vehicle use below the high water line. In the event that the Nevada County ordinance is obtained, the signage shall reference it.

Lake Spaulding

At Lake Spaulding, PG&E proposes the following key changes or improvements:

<u>Lake Spaulding Campground</u>

- Retro-fit the existing accessible campsite, or relocate the site, to meet current Americans with Disabilities Act Guidelines for Buildings and Facilities (ADAAG), including:
  - ➢ Install an accessible access route to the restroom and water spigot, and
  - ➢ Pave the accessible spur.
- Re-pave the campground circulation road(s).
- Re-pave the existing paved vehicle spurs and pave the existing native surface vehicle spurs.
- Replace picnic tables, fire rings, site markers and vehicle barriers as necessary at each campsite.
- Install 25 animal-resistant food lockers (one at each campsite).

<u>Lake Spaulding Boat Launch</u>

- Remove the 2 existing double-vault restrooms at the boat launch (one is located by the walk-in campground, and the other by the parking area), and install one 4-unit accessible vault restroom building, or two double-vault restrooms, as appropriate.

- Provide 3 accessible parking spaces and access routes to the new restroom(s).
- Retrofit or create 1 picnic unit to meet accessible guidelines (ADAAG), if the site terrain allows. The retrofit shall include leveling the picnic site, installing an accessible picnic table, and providing an access route from the parking area.
- Improve the paved access road to the boat launch parking area, where possible.
- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, recreation and water surface regulations, boat-in camping information, and recreation area and site layout maps.

<u>Boat-In Camping Use</u>

- Designate 3 boat-in shoreline campsites with steel fire rings and animal resistant food lockers at least 100 feet from the high water line. Establish and maintain appropriate fire safe vegetation clearances at boat-in campsites. Manage the lake to allow boat-in camping at these 3 designated sites only.
- Provide resource protection signs about boat-in camping on the information board located at the boat launch.
- Dismantle all other user-created shoreline fire rings.

All of the existing and Proposed Project recreation facilities at Lake Spaulding are on PG&E land.

Regarding the campground facility, the upper portion of Lake Spaulding Campground (19 sites) is in fair condition. The visitor use impact at the upper camping area was moderate with large, contiguous areas of bare ground and vegetation loss resulting in sites merging together. This camping area is partially accessible with an accessible vault restroom located at the walk-in sites with an adjacent fully accessible campsite including the picnic table, pedestal grill and fire ring. The remaining campsites were not designed to accessible guidelines; however the second vault restroom has an accessible stall. At the lower camping area, the walk-in campsites adjacent to the boat launch are in fair condition; use impacts are moderate with large, contiguous areas of bare ground devoid of any vegetation, and with exposed roots throughout the camping area. Of note, the six walk-in campsites are in close proximity and trail access runs between the sites, so this type of use impact is typical in tight clusters of sites. The lower camping area walk-in campsites were not designed to any accessible guidelines. In 2009, the peak season campground occupancy levels were 29 percent for the season and 56 percent on weekends. Projected 2050 occupancy is expected to reach 45 percent for the season and 86 percent on weekends. In 2009, the majority of visitors surveyed at Lake Spaulding indicated a preference for improvements such as boat-in campsites, potable water, and food lockers. PG&E is proposing formalization of campsites and installation of food lockers at these campsites. Based on PG&E proposed improvements and use levels, PG&E believes the existing facility should be adequate to meet the current and future camping demand.

The basic 10-unit overflow area is in the boat launch parking area for recreational vehicles. The facility is in good condition, but was not designed to accessible guidelines. The overflow area occupancy was low in 2009 with 10 percent for the season and 21 percent on weekends; by 2050 the projected peak season occupancy is expected to reach 16 percent for the season and 32 percent on weekends, respectively. The facility should meet the current and future use demands.

The picnic area consists of three picnic sites, which are in fair condition with older (but still functional) picnic tables. Use impact is low with some areas of bare ground and vegetation loss around the tables; it was not designed to accessible standards. In 2009, PG&E observed very low peak season weekend occupancy at the picnic area (6 percent) and occupancy is projected to reach 8 percent on weekends in 2050. The picnic facility is adequate to meet the minimal current recreation use and the expected future increase. However, one of the picnic sites should be upgraded to meet accessible guidelines if the site terrain allows. Otherwise, routine rehabilitation of the site will provide periodic improvement of the existing facilities over the term of the new license.

The boat launch parking area provides parking for 67 vehicles (45 single spaces and 22 double spaces) including a single accessible parking space and restroom, but lacks an access route designed to accessible guidelines between these two elements. The facility is in fair-to-good condition with an older restroom building. While the existing layout is adequate, a new restroom(s) is needed with an accessible route to an accessible parking area. In 2009, occupancy of the boat launch parking area was at 24 percent for the season and 46 percent on weekends, but is projected to reach 40 and 76 percent, respectively by 2050. At present, the parking area is meeting the current recreation demand and will likely continue to meet the expected demand through the new license term. The parking area lacks level, suitable land for expansion or new developments due to surrounding steep and rocky terrain. Under both the existing Project operations and Licensee's Proposed Project, the boat ramp is usable from May 1 through September 30 in all water year types, except critically dry water years when the ramp is not usable during any period.

Bear Valley

The Bear Valley area consists of two facilities – Sierra Discovery Trail and Bear Valley Group Campground. PG&E proposes the following improvements to these areas:

<u>Sierra Discovery Trail</u>

- Repair or replace the existing trail boardwalk, as needed.

<u>Bear Valley Group Campground</u>

- Grade and level the group area around the large group fire ring.
- Provide 2 accessible campsites adjacent to the central group area.
    - ➢ Grade and level two tent pad areas and an access route from the central group area.
- Create a space within the existing food preparation and cooking area that meets accessibility guidelines (ADAAG). This area will include a hardened surface (e.g., concrete) with accessible food preparation tables. The area shall also have an accessible path from the central paved access area.

- Install 5 new animal-resistant food lockers adjacent to the central food preparation and cooking area.

All of the existing and Proposed Project recreation facilities in Bear Valley are on PG&E land.

The Sierra Discovery Trail facility, located adjacent to the Bear Valley Group Campground, is an interpretive and educational facility related to the Bear Valley environment. The trail facility is in good condition overall, except for the raised wooden boardwalk at the outset of the trail. Use impact is minimal. The trail facility is partially accessible with an accessible parking space, picnic unit and adjacent educational kiosk/gazebo, but the trail was not designed to accessible guidelines. In 2009, the picnic area occupancy was at only 6 percent for the season and on weekends. The peak season parking area occupancy was at 21 percent for the season and 24 percent on weekends and is projected to reach 35 and 40 percent by 2050, respectively. In 2009, the vast majority of visitors surveyed indicated the facilities were acceptable and did not have an opinion on new improvements. Thus, PG&E believes the existing facility is adequate to meet current and future recreation demand, but the existing boardwalk needs near-term rehabilitation to make the facility functional and safe for visitor use.

Bear Valley Group Campground provides both tent and RV camping. The group campground is in good condition, and use impact is minimal with some large areas of bare ground and vegetation loss at some of the site amenities (typical of developed campgrounds). The group campground is partially accessible with a level, paved parking area that has concrete accessible routes to the accessible stalls of the restroom buildings. The natural terrain provides access routes (level, firm and stable dirt surface) from the parking/camping area to the common group area with a fire ring. Elements of the cooking area are accessible (several tables) but the barbecue grills and cleaning station are not accessible. In 2009, the peak season campground occupancy was at 49 percent for the season and 92 percent on weekends. By 2050, the seasonal occupancy is projected to be near 76 percent and weekend occupancy will likely exceed capacity (142 percent). At present, the group campground is nearing weekend capacity. In addition, the facility is in need of accessibility upgrades, particularly by providing accessible campsites and a group cooking/food preparation area. In 2009, the majority of visitor survey respondents found the facilities acceptable. Regarding the capacity concerns, PG&E is proposing a new group campground at the nearby Lake Valley Reservoir.

Fuller Lake

Fuller Lake has two developed facilities along the western shore – a day use and boat launch facility and a shoreline access. PG&E proposes the following key changes or improvements:

<u>Fuller Lake Day Use Area and Boat Launch</u>

- Install 2 animal-resistant trash receptacles at the picnic area with corresponding trash service.
- Expand the parking area by lengthening the parking spaces to 40 feet for vehicles and trailers; and re-route the paved entrance road to allow for the expanded parking. Re-routing the road may result in removal of several picnic units.

- Replace all remaining grills, fire rings and tables with accessible features that meet the universal design of FSORAG. Provide clear level floor space around each constructed feature and accessible routes between constructed features, as required by FSORAG.
- Resurface and re-stripe parking lot while providing appropriate accessible parking with accessible path to restroom.
- Relocate the fee station (fee tube and sign) to be more visible to visitors during the parking area/road improvements.
- Install an accessible fishing pier including accessible parking and access route to the pier.
- Install a courtesy dock.
- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, recreation and water surface regulations, and recreation area maps.

Fuller Lake Angler Access

- Re-grade and place gravel on the existing dirt parking area.
- On the information board, provide appropriate information on land and water related resource protection measures and emergency contacts.

Fuller Lake Angler Access is located on PG&E land; and Fuller Lake Day Use and Boat Launch is located on NFS land.

The Fuller Lake Day Use and Boat Launch facility consists of eight picnic sites, a parking area for 14 vehicles and a boat launch ramp and is used primarily for fishing (shoreline and by boat). The day use and boat launch facility is in good condition with new or recently new amenities. The site has minimal use impact with only the few sites near the shoreline exhibiting large areas of bare ground, vegetation loss, and exposed roots. Overall, the facility is partially accessible and includes a fully accessible picnic unit (table, ring, grill and path) with an accessible parking space, restroom building, and routes between each of the site components. In 2009, the peak season parking area occupancy was at 42 percent for the season and 60 percent on weekends. By 2050, the seasonal occupancy is projected to be 53 and 77 percent, respectively. In addition in 2009, the picnic sites had a very low occupancy (4 percent for the season and 8 percent on weekends). In 2009, the majority of visitors surveyed indicated the facilities were acceptable and did not prefer improvements or had no opinion. Based on the condition, user preferences, and use levels, the existing day use and boat launch facility is adequate to meet the current and future recreation demands. Under both the existing Project operations and Licensee's Proposed Project, the boat ramp is usable year-round in all water year types.

In general, routine rehabilitation and replacement of the existing facilities will continue to provide a functional and safe facility for visitor use with selected upgrades including animal-resistant trash receptacles with corresponding trash service. In addition, PG&E proposes to enhance the facility by improving the parking area for vehicles with trailers up to 40 feet; and providing an accessible fishing pier to allow disabled persons to participate in shoreline fishing –

one of the primary recreation activities at Fuller Lake. The proposed parking area expansion and resultant re-routing of the facility circulation road is expected to reduce up to four picnic sites. PG&E believes this removal is acceptable because picnic site occupancy is extremely low and most visitors participate in fishing from the shoreline and by boat.

The Fuller Lake Angler Access provides day use parking for up to six vehicles in a dirt/gravel area that is used primarily for fishing. The angler access facility is in good overall condition with a relatively new vault restroom building. Use impact is low with only small areas of bare ground and vegetation loss near the high water mark. The angler access facility is partially accessible with an accessible restroom building, but the access route is not designed to accessible guidelines. In 2009, the peak season parking area occupancy levels were high with 84 percent for the season and 110 percent on weekends. By 2050, seasonal occupancy levels are also projected to exceed capacity. While the existing parking facility was at full capacity on weekends in 2009, the site terrain does not allow for expansion of this parking area. Private lands prohibit expansion of the parking facility on the north side; the dam prohibits expansion to the south; the reservoir prohibits expansion to the east; and Bowman Lake Road prohibits expansion to the west. Overflow parking is available along the shoulder of Bowman Lake Road and requires a short walk to the facility. However, the existing parking area is in need of improvements including re-grading and placing gravel.

Rucker Lake

PG&E proposes the following key changes or improvements at Rucker Lake:

<u>Rucker Lake Walk-In Campground</u>

- Replace the picnic table, fire ring, and site markers at each of the existing 7 walk-in campsites that meet the universal design guidelines of FSORAG.
- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, and recreation (including no camping outside of campsites) and water surface regulations.
- Clearly define the trail to the walk-in campsites from the parking area. The trail may be re-routed to improve the grade and avoid immovable tread obstacles (large boulders, root systems, etc.) along the existing trail.
- If space allows, develop three additional walk-in campsites (bringing the total number of campsites to 10). Each new walk-in campsite will consist of a picnic table, a fire ring, animal-resistant food locker, and a site marker that meets universal design of FSORAG.
- Replace existing animal-resistant food lockers with 30-cubic foot models, if necessary.
- Install a heavy-duty directional sign at Bowman Road. However, due to regular vandalism and removal of this sign in the past, if the sign is vandalized and/or removed 3 times in a 6-year period, Licensee will no longer replace the sign.

The existing walk-in campground is located on NFS land.

The walk-in campground is located a short hike from the parking area along a trail and consists of an accessible, double-unit vault restroom and seven walk-in campsites. The facility is a pack-it-in/pack-it-out site without trash receptacles. The facility is in poor-to-fair condition and the only accessible feature is a restroom stall near the walk-in campsites.

In 2009, the walk-in campground peak season occupancy was at 33 percent for the season and 68 percent on weekends; and by 2050 is projected to reach 50 and 105 percent, respectively. The poor condition of the campsite facilities requires replacement of the tables, fire rings and site markers at each of the seven campsites. And, while the campground is not currently at capacity, Licensee intends to examine the potential to expand the campground with three additional campsites, which would better ensure that the facility meets any potential future recreation demand. However, the existing seven campsites are located on the best available shoreline lands and much of the available surrounding lands to the east are not ideal for campsite development due to prolonged wet and marshy conditions throughout the spring and early summer months. Lands may be available to the north and away from the shoreline, but use and attractiveness of sites located further from the shoreline is expected to be low in comparison to the shoreline campsites.

Blue Lake

PG&E proposes the following changes at Blue Lake:

<u>Blue Lake Primitive Hike-In Campsites</u>

- On the information board at the lake's parking area, provide appropriate educational information on land and water related resource protection measures (including proper human waster disposal), emergency contacts, recreation and water surface regulations, and project recreation area and reservoir recreation maps.
- Maintain existing vehicle barriers adjacent to the gate to prevent vehicle access around the gate to the west side of Blue Lake.

Blue Lake provides opportunities for both day-use and overnight recreation activities including hike-in camping at primitive campsites with designated steel fire rings. Vehicle access is limited to the parking area located below the dam and all access to the reservoir is by foot travel. In 2009, the peak season parking area seasonal occupancy was at only 14 percent for the season and 25 percent on weekends; and is projected to reach 19 percent for the season and 35 percent on weekends by 2050. In 2009, the majority of visitors found the existing facilities acceptable, although some visitors noted resource impacts associated with human waste. As a result, PG&E proposes to install additional resource protection information at the existing information board at the parking area and at the hike-in campsites. In addition, PG&E proposes to maintain the existing vehicle barriers adjacent to the gate in the parking are to prohibit vehicle access to Blue Lake, which is not suitable for vehicles.

Carr Lake

PG&E proposes the following key changes or improvements at Carr Lake:

Carr Lake Walk-In Campground

- Install a single-unit accessible vault restroom to replace the double unit restroom.
- Install an additional accessible double-unit restroom conveniently located for the walk-in campers and trailhead users. Provide directional signs to the restroom for campers.
- Review location of existing campsites and propose new locations if appropriate. If possible, identify additional suitable locations for campsites at Carr Lake that could be considered for construction if the existing campground reaches its monitoring trigger.
- At each of the campgrounds 11 campsites, install new animal-resistant food lockers and accessible picnic tables (one locker and picnic table at each campsite), grade tent pads, and replace fire rings as necessary. Provide clear, level compacted surfaces around constructed features, as required by FSORAG.
- On the campground's information board, provide educational information on land and water related resource protection measures, emergency contacts, project recreation area and campground layout maps and camping and water surface regulations.
- Provide appropriate signing that meets Forest Service standards.
- Provide formal paths from campsites to restrooms, lake, and parking. Close excess informal trails within the campground

Carr-Feeley Trailhead

- Regrade and add gravel to parking area.
- Designate 5 parking spaces in the parking area closest to the campground for campground visitors only.

The existing trailhead facility is located on NFS and PG&E land; whereas the walk-in campground is located on NFS land only.

Facilities at Carr Lake include an 11-unit walk-in campground with two single pit restrooms and a trailhead facility with parking for up to 30 vehicles. The trailhead provides access to the Grouse Lakes Area, which is managed by the Forest Service as a non-motorized area. Carr Lake Walk-In Campground is in good condition, and use impacts are low. Of note, in 2009, visitors surveyed indicated significant signs of human waste/toilet paper at the campground and identified the need for restroom and trash improvements. Neither of these facilities is designed to accessible guidelines. In 2009, campground peak season occupancy was low with only 14 percent for the season and 31 percent on weekends. By 2050, these levels are projected to reach 21 and 48 percent, respectively. Based on the low levels of use at the campground, PG&E believes the existing facility is adequate to meet the current and future recreation demand. However, the poor condition of the pit toilets, sanitation concerns noted by visitors surveyed in 2009, and lack of toilet facilities near the trailhead warrants an additional restroom facility at

Carr Lake. In addition, PG&E will replace the existing two pit toilets that serve the three walk-in campsites located across the creek (between Feeley and Carr lakes) with one toilet (consistent with the rehabilitation schedule in the Plan). PG&E also proposes to install animal resistant food lockers at each campsite.

The Carr-Feeley Trailhead experienced moderate to high levels of use in 2009 with occupancy at 61 percent for the season and 91 percent on weekends. By 2050, these levels are projected to be 99 and 147 percent, respectively. Notably, the 2009 relicensing study determined that 90 percent of the recreation use at the trailhead facility was related to non-Project recreation, primarily at the non-Project Grouse Lakes trail system and lakes. While the trailhead facility is quickly approaching full capacity in the future, instead of expanding the facility it likely makes more sense to better distribute use to three other less utilized Grouse Lakes Area trailheads. These facilities include the Project's Lower Lindsey Lake Trailhead (approx. 3 mi to the north) and the Forest Service's Grouse Ridge Trailhead (approx. 10 mi to the south) and Loney Meadows Trailhead (approx. 3 mi to the north). By providing additional information and management direction for these other trailheads in the area, the capacity concerns at Carr-Feely Trailhead may be lessened.

Lower Lindsey Lake

PG&E proposes the following key changes or improvements at Lower Lindsey Lake:

<u>Lower Lindsey Lake Campground</u>

- Install 12 new animal-resistant food lockers (one at each campsite).
- Replace the existing one-panel entrance station information board.
- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, recreation area and campsite layout maps, safety, and recreation and water surface regulations. This information board will specifically contain information about fire, sanitation, and safety and that the campground is only available for use by campers, not day users.
- Improve and define campsite vehicle spurs with barriers including removing protrusions, lengthening, widening, and leveling.
- Gravel the road and vehicle spurs; and, as needed, install and replace existing vehicle barriers along road and vehicle spurs.
- Determine if a better location outside the campground is available for the boat ramp. If a suitable location can be identified, PG&E will move the boat ramp and close the existing ramp. The new ramp will be a gravel ramp and will provide a turnaround.
- Within 15 years of license issuance, redesign and reconstruct the campground as a Development Scale 2 campground to meet the current Forest Service design standard. The following includes, but is not necessarily limited to, the specific elements of this reconstruction:

- ➢ Replace toilet if needed. If toilet is not in need of replacement, retrofit toilet to provide lighting (solar tube/skylight), assisted venting (with solar panel powered fans) and an accessible path to entrance.
- ➢ Grade tent pads and provide clear, level compacted floor space around constructed features (table, grill, food storage) to meet FSORAG.
- ➢ Replace tables and fire rings to meet universal design of FSORAG.
- ➢ Provide appropriate signing that meets Forest Service standards.
- ➢ Replace unit markers.
- ➢ Re-gravel road and spurs and barrier as needed.

<u>Lower Lindsey Lake Trailhead</u>

- Install site identification signage at trailhead parking area.
- Install an information board, with appropriate educational information on land and water related resource protection measures, emergency contacts, a recreation map with trails and camping in the area, and recreation regulations. This information board will specifically contain information about fire, sanitation, safety, and that the Lower Lindsey Campground is for camping-use only, not day-use.
- Gravel the existing parking area and install additional barriers, as needed.

Lower Lindsey Lake has two developed facilities – Lower Lindsey Lake Campground (located on NFS and PG&E land) and Lower Lindsey Lake Trailhead (located on NFS land). The campground consists of 12 campsites and an accessible, double-unit vault restroom. A trailhead parking facility accommodates up to 20 vehicles and is located approximately a quarter mile below Lower Lindsey Lake Dam and the campground. The campground was in fair to good condition, and the recreation use impact is low. The only signs of impact are the large areas of bare ground and vegetation loss at many of the campsites (typical of developed campgrounds). However, in 2009, visitors surveyed noted significant signs of human waste/toilet paper at the campground. The campground was not designed or constructed for accessibility. However, the existing two-unit vault restroom does have accessible stalls, but lacks accessible routes. The trailhead parking facility is in good condition; but lacks a trailhead identification sign, which may contribute to its low usage.

In 2009, the peak season campground occupancy was at 23 percent for the season and 60 percent on weekends and is projected to reach 36 and 92 percent by 2050, respectively. The Lindsey Lake Trailhead parking area occupancy was at 6 percent for the season and 11 percent on weekends in 2009 and is projected to be at 9 and 18 percent by 2050, respectively. In 2009, a majority of the visitors surveyed indicated a need for trash receptacles/food storage. The existing campground and trailhead facilities are adequate to meet current and future recreation demand. Minor enhancements (signage and animal-resistant lockers at the campground) and routine maintenance and rehabilitation during the term of the new license will help these facilities remain functional and safe in the future. PG&E proposes to maintain the campground as a pack-it-in/pack-it-out facility and not install trash receptacles. PG&E does not have a host on-site but manages the facility, including liter pick up during regular patrols.

Kidd Lake

PG&E proposes the following key changes or improvements at Kidd Lake:

<u>Kidd Lake Group Campground</u>

- Upgrade one campsite to meet current accessibility guidelines (ADAAG). The rehabilitation work will provide accessibility improvements to the group site, including:
  - Grade and level the central group area where all site components are located.
  - Install 2 accessible picnic tables, one accessible large group fire ring, and an accessible pedestal grill (with two grill surfaces).
  - Install an accessible route from the site's accessible parking area to the central group area.
  - Provide 2 accessible tent sites adjacent to the central group area by grading and leveling 2 tent pad areas and access routes from the central group area.
  - Retrofit the existing restroom, access route and parking area to meet current accessibility guidelines.
- Install 5 animal-resistant food lockers at the two hillside group sites.
- Install new benches and a group fire ring around the group campfire areas at each of the three group sites.

Kidd Lake Campground is located on PG&E land, and consists of three group campsites (100 PAOT), two parking areas; two accessible double unit vault restrooms, and an animal-resistant food storage building (at the lower camp site). The group campground is in good condition, shows few signs of use impact, and is partially accessible as both vault restrooms have accessible stalls and concrete/asphalt accessible routes from the parking areas. However, none of the group areas have accessible routes to and from the central parking and restrooms. In 2009, most visitors surveyed found the facilities acceptable, but preferred food storage locker improvements. In 2009, the peak season campground occupancy was at 38 percent for the season and 71 percent on weekends and is projected to reach 59 and 109 percent by 2050, respectively. As mentioned above, though, PG&E proposes to construct a new group campground at Lake Valley Reservoir, which will hopefully alleviate future capacity concerns at Kidd Lake Group Campground. At this time, though, PG&E proposes to upgrade one group site to meet current accessible guidelines; provide new animal-resistant food lockers at the two group sites, and provide new group fire rings and benches at all three group sites.

Lower Peak Lake

At Lower Peak Lake, PG&E proposes the following changes or improvements.

Lower Peak Lake Primitive Campsites (New Facility)

- Install up to 5 campsites with fire rings and animal resistant food lockers along the shoreline of Lower Peak Lake.
- Install an information board with appropriate education information on land and water related resource protection measures, a reservoir map showing campsites, emergency contacts, and recreation regulations.
- Install up to 4 directional signs to and from the lake from Kidd Lake Road.

PG&E proposes to designate primitive campsites with fire rings on PG&E and NFS land to meet the demand for primitive camping along the shoreline as identified during the 2009 relicensing study. The campsites will have a pack-it-in/pack-it-out policy and PG&E proposes to install additional resource protection signage at the campsites and provide a management presence/patrol via the caretaker at Kidd Lake Group Campground.

Kelly Lake

Considering the very low use at Kelly Lake, PG&E proposes the following at the picnic area:

Kelly Lake Picnic Area

- Remove the 2 single-unit pit restrooms due to low use.
- Replace three picnic tables and remove 2 picnic tables due to low use.
- Replace, as appropriate, vehicle barriers around the parking area.
- Add 2 directional signs leading to the private Snowflower Resort gate entrance and 2 directional signs from the gate entrance to Kelly Lake.
- Approach Sunflower Resort about providing directional signage to Kelly Lake at their gate.

Recreation use at the picnic area is very low. In 2009, the peak season occupancy was at 4 percent for the season and 2 percent on weekends and is projected to reach 5 and 2 percent by 2050, respectively. As a result, PG&E proposes to remove the aging pit toilets and 2 of the picnic tables because the very low use levels do not warrant the high cost of replacing and maintaining the toilets and all five picnic sites going forward.

Lake Valley Reservoir

PG&E proposes the following key changes or improvements at Lake Valley Reservoir:

Lodgepole Campground

- Retrofit the water spigots to accessible standards (ADAAG) nearest to the 2 existing accessible campsites.
- Install 35 new animal-resistant food lockers (one at each campsite).

Silvertip Picnic Area and Boat Launch

- Widen (to 20 feet) and pave the site's access road, from Forest Service Road 19 to the parking area.
- Re-configure the existing parking area to provide spaces for up to 15 single parking spaces and 10 double parking spaces that will accommodate vehicles with trailers.
- Provide one single-accessible parking space and one double-accessible parking space.
- Pave and stripe the parking area.
- If necessary, replace or relocate the existing double-vault restroom with a double-vault accessible restroom to accommodate an expanded parking area.
- Install up to 5 pedestal grills in a central location.
- Install up to 5 additional picnic sites.
- Retrofit one picnic unit to meet accessibility guidelines (ADAAG). The accessible picnic site will need to be near the parking area, because much of the terrain towards the shoreline is significantly sloped.
- Extend the boat ramp to provide launching capabilities through Labor Day for all water year types, except Critically Dry.

Lake Valley Group Campground (New Facility)

- Develop a new group campground (Lake Valley Group Campground) for 50 to 100 people adjacent to the Silvertip Picnic Area and Boat Launch facility. During design of the facility, PG&E will determine if a suitable location is available within the FERC Project Boundary. If not, then PG&E will propose to expand the boundary to include the facility where it is ultimately located.

Lake Valley Campground (New Facility) (Dependent upon Meeting Monitoring Triggers)

- A new campground is proposed if the campground facility occupancy-monitoring trigger for Lake Valley Reservoir (i.e., Lodgepole Campground) is met as outlined in the Recreation Facilities Plan.

Lake Valley Reservoir has two developed recreation facilities – Lodgepole Campground and Silvertip Day Use and Boat Launch Area. Lodgepole Campground is a developed campground with 35 campsites and is in good condition. The only amenity that is in poor condition is the aging, wooden, storage cabinets. The use impacts are minimal and typical of most developed campgrounds with large areas of bare ground and vegetation loss around the picnic tables and fire rings. The campground is partially accessible with two accessible standard campsites and three restroom buildings each with an accessible stall and access route. However, none of the RV campsites were designed for accessibility. In 2009, most visitors surveyed found the facilities acceptable, but preferred food storage locker improvements at the campground. The peak season campground occupancy was 43 percent for the season and 61 percent on weekends in 2009. By 2050, the seasonal occupancy will be 67 percent and 94 percent on weekends. PG&E will be monitoring the occupancy level of the campground over the term of the new license term. If the campground does reach capacity, based on monitoring trigger standards, PG&E proposes a new 35-unit family campground at Lake Valley Reservoir.

PG&E is proposing a new group campground at Lake Valley Reservoir, because relicensing information suggests that the Bear Valley Group Campground is near capacity and Kidd Lake Group Campground may reach capacity during the license term. Lake Valley Reservoir is a good location for a new group campgrounds; it provides a natural setting, gentle terrain, good road access, and good shoreline access.

The Silvertip Picnic Area and Boat Launch facility is in fair condition with some picnic tables in poor condition. Use impacts are low, which is typical of developed sites, with small areas of bare ground around the picnic tables. The facility is partially accessible with an accessible restroom building. None of the picnic sites have accessible routes or features. In 2009, the Silvertip Day Use Area and Boat Launch picnic area peak season seasonal and weekend occupancy was at only 3 percent and 8 percent, respectively; and the parking area was at 44 percent and 65 percent in 2009. The parking area weekend occupancy is projected to reach 99 percent by 2050. Clearly, the picnic area has plenty of ability to meet future demand. While the parking area is currently below its capacity, it lacks striped parking spaces and is constructed of dirt and gravel on uneven terrain. Thus, the disorganized nature of the parked vehicles often reduces the actual capacity of 20 vehicles. Therefore, PG&E proposes to pave, stripe and expand the parking area as needed to accommodate 15 vehicles (single spaces) and 10 vehicles with trailers (double spaces) to differentiate the parking areas for picnickers/general day users and boaters and to improve the utilization of the parking area.

Under both the existing Project operations and Licensee's Proposed Project, the boat ramp is only usable from May 15 through July 1 in Wet and Above Normal water years; June 1 through July 1 in Below Normal water years; mid-June only in Dry water years; and not at all useable in Critically Dry water years. Thus, PG&E proposes to extend the boat ramp provide launching capabilities through Labor Day for all water year types, except Critically Dry water years.

Wise Forebay

PG&E proposes the following key changes or improvements at Wise Forebay:

<u>Wise Forebay Parking Area (New Facility)</u>
- Install an asphalt parking area for up to 5 vehicles on Licensee's property on the southwest corner of Wise Forebay. One parking spot will be designed and constructed to meet accessibility guidelines (ADAAG). Licensee will remove the existing turnstile and install an information board with resource protection and safety information. Additionally, Licensee will install suitable fencing between the parking lot and the adjacent private property.

There are no existing developed facilities at Wise Forebay. However, the forebay does provide recreational opportunities for day-use only, for picnicking, hiking/walking, and fishing (no overnight use is allowed), although vehicle access is limited to the road shoulder with limited space. In 2009, the average peak season use estimate at Wise Forebay was 889 RDs of which

100 percent was day use. The forebay did not have any signs of additional use impact. In order to enhance the recreation opportunities at the forebay, PG&E proposes to construct a parking area to provide designated parking for visitors to park without using the limited and narrow parking along the shoulder of the road.

Halsey Forebay

PG&E proposes the following key changes or improvements at Halsey Forebay Picnic Area:

Halsey Forebay Picnic Area

- Upgrade the picnic site adjacent to the existing accessible vault restroom to meet current accessibility guidelines (ADAAG). The upgrade work will include the following:
  - Grade and level the picnic site, if needed.
  - Install an accessible picnic table and a pedestal grill.
  - Provide an accessible parking space in the parking area (this may require some re-grading and paving work).
  - Install an accessible route between the accessible parking space, accessible picnic site, accessible fishing station, and existing accessible vault restroom.
- Develop an accessible fishing station, by providing an accessible surface (i.e., paving or concrete) up to the railing. Include safety stops and modify the existing railing, if needed, to comply with the ADAAG.

The Halsey Forebay is located on PG&E land and provides day-use opportunities at a developed picnic area on its north shore. Camping is not allowed at Halsey Forebay. Halsey Forebay Picnic Area provides recreational opportunities for picnicking and shoreline fishing – the most common activity. The facility includes nine picnic units, a paved parking area for 12 vehicles, and an accessible double-unit vault restroom, with accessible routes from the parking area.

The picnic area is in good condition, and the use impact is minimal, with only small areas of bare ground around the picnic units. In 2009, the peak season weekend picnic area occupancy was at 14 percent (projected to reach 20 percent by 2050); and the associated parking area weekend occupancy was at 33 percent (projected to reach 48 percent by 2050). Crowding, conflicts, and safety were not an issue overall for visitor surveyed in 2009; and most did not prefer any facility improvements.

Based on the condition and low-to-moderate use levels at Halsey Forebay, the existing facilities should meet current and future recreation demand. However, in order to upgrade the facility for accessibility, PG&E proposes to retrofit a picnic site, the parking area, and restroom to current accessibility guidelines. In addition, PG&E will develop an accessible basic fishing station at the Forebay.

Reservoirs with Primitive Facilities or Undeveloped Recreation Sites

The Drum-Spaulding Project has 18 reservoirs that provide primitive camping facilities or undeveloped shoreline access. The reservoirs that provide primitive camping facilities are White Rock Lake, Blue Lake, Middle Lindsey Lake, Culbertson Lake, Upper and Lower Rock lakes, and Lower Peak Lake. These campsites, which primarily contain steel fire rings, experienced low use in 2009 and should be adequate to meet current and near-term recreation demand. PG&E proposes routine maintenance, rehabilitation, replacement of the campsite facilities, and installation of resource protection signage on existing information boards in order to maintain them in functional and safe condition throughout the term of the new license. At the remaining reservoirs with undeveloped recreation, the existing use levels are low or very low and generally provide adequate recreational access to the shoreline for picnicking, hiking, fishing and other recreation activities. These undeveloped reservoirs include Upper Lindsey Lake, Feeley Lake, Alta Forebay, Drum Forebay, Drum Afterbay, Halsey Afterbay, Rock Creek Reservoir, Upper Peak Lake, Lower Peak Lake, and Wise Forebay. At Wise Forebay and Lower Peak Lake, though, PG&E is proposing some recreation facility improvement to better accommodate the current recreation use occurring a these reservoirs. At Deer Creek Forebay, PG&E provides a gravel parking area for fishing access.

6.6.2.2.2 River Recreation Opportunities

Based on the results of PG&E's recreational flow relicensing studies, whitewater boating swimming, tubing, angling, and recreational mining opportunities are available downstream of many of the Project's dams. Whitewater boating generally occurs during spring and early summer months, when river flow levels can vary greatly as a result rainfall and snowmelt. The other recreation opportunities generally occur during summer months, when rivers flows are lower and more stable.

Relicensing study results also identify that existing flow related recreation opportunities downstream of Project dams are currently under utilized because real time flow information for many reaches is not available for the public to schedule their visits during periods when flows are within an acceptable range for their recreation activity (i.e. whitewater boating, fishing). Therefore, PG&E has included in Appendix E7 a measure (DS-RR2) to provide real-time recreation flow information that would allow boaters, anglers, tubers and other recreationists to schedule their trips to the river when opportunistic flows are within acceptable ranges for their recreation activity.

As part of the Licensee's Proposed Project, PG&E is proposing to enhance aquatic resources in some of the Project affected reaches with an increase in Project flow releases. Based on the results of the 2009 Recreation Flow Study, these releases should not significantly affect summer recreation activities occurring in the river. The potential affect of Proposed Project flow releases to whitewater boating opportunities is discussed below.

Potential Affects from PG&E's and Foothill Water Network's (FWN) Proposed Flow Releases to Whitewater Boating Opportunities within the Project's Affected By-pass Reaches

This section assesses the potential affects to whitewater boating opportunities within the Project's affected bypasses reach from PG&E's and the Foothill Water Network's (FWN) proposed Project flow release. FWN's proposal was the only detailed flow measures provided in comments to Licensees' DLAs. The affects of each of these proposed releases is compared to the no action alternative (i.e. existing flow conditions) and is represented in estimated number of whitewater boatable that will likely be available under each flow proposal. Each flow proposal is summarized below and more thoroughly described along with the modeled hydrology in Exhibit E, Section 3.6.

- Licensees' Proposed Projects Flow Releases - the flow, reservoir and generation conditions that would occur if FERC included in the new licenses NID's and PG&E's proposed PM&E measures as described in this Exhibit E.
- FWN's Proposed Project Flow Releases - the flow, reservoir and generation conditions that would occur if the measures proposed by FWN in its DLA comments and represented in Exhibit E, Section 3.6, were included in the new licenses.

The estimated boatable flows under the Project's no action alternative and PG&E's and FWN's proposed Project flow releases is provided in Table 6.6.2-2 below.

Table 6.6.2-2. Average number of boatable flow days across all water year types by craft under the No-Action Alternative, Licensees' Proposed Projects, and FWN's Proposed Project.

River Reach	Craft Type	Boatable Flow Range (cfs)	Average No. of Boatable Flow Days per Year[1]		
			No-Action Alternative	Licensees' Proposed Projects	FWN's Proposed Project
FORDYCE CREEK					
Fordyce Lake Dam (RM 10.3) to Lake Spaulding (RM 0.0)	Hardshell/Inflatable Kayak	350-450	16	16	16
SOUTH YUBA RIVER[2]					
Langs Crossing (RM 40.0) to Jolly Boys Mine (RM 35.2)	Hardshell Kayak	250-400	5	5	9 ▲
Jolly Boys Mine Reach (RM 35.2) to Golden Quartz (RM 32.9)	Hardshell Kayak	1,100-1,200	2	2	4 ▲
	Inflatable Kayak/Raft	700-1,000	8	7	18 ▲
Golden Quartz (RM 32.9) to Washington (RM 29.0)	Hardshell Kayak/Raft	1,000-2,200	20	20	34 ▲
	Inflatable Kayak	250-350	18	19	21
Washington (RM 29.0) to Edwards Crossing (RM 15.3)	Hardshell Kayak	700-2,200	36	37	59 ▲
	Inflatable Kayak	250-350	21	23	23
	Raft	900-2,200	27	27	45 ▲
Edwards Crossing (RM 15.3) to Purdon Crossing (RM 11.1)	Hardshell Kayak/Raft	800-2,200	39	39	59 ▲
	Inflatable Kayak	300-700	54	57	56
Purdon Crossing (RM 11.1) to Highway 49 (RM 7.1)	Hardshell Kayak	600-1,500	46	47	63 ▲
	Raft	800-2,200	43	43	63 ▲
Highway 49 (RM 7.1) to Bridgeport (RM 0.0)	Hardshell Kayak	500-1,100	47	48	55 ▲
	Raft	800-1,100	17	17	24 ▲

[1] Symbols: ▲= increased more than 10%; ▼= decreased more than 10%; no symbol = no significant change (less than or equal to 10%).
[2] As described in Section 6.6.1.4.1, Licensees are not able to provide reliable flows in the reaches from Golden Quartz downstream.

The information in Table 6.6.2-2 above indicates that PG&E's Proposed Project flow release would likely result in less than 10 percent increase or decrease in the number of boatable flow days within any Project affected river reach.

Under the FWN flow release proposal no significant changes (less than 10 percent) in the average number of boatable days are expected for:

- All watercraft type for Fordyce Creek from Fordyce Lake Dam to Lake Spaulding
- Inflatable kayaks for South Yuba River reaches from Washington to Edwards Crossing and Edwards Crossing to Purdon Crossing

More significant changes (greater than 10 percent) in boatable days, as identified below, are expected for the remaining South Yuba River Reaches (under FWN's proposal). For all reaches the affect is an increase in boatable days that ranges from 2 to 23 days.

- Langs Crossing to Jolly Boys Mine - increased by 4 days for hardshell kayaks.
- Jolly Boys Mine to Golden Quartz - increased by 2 days for hardshell kayaks; and 10 days for inflatable kayaks and rafts.
- Golden Quartz to Washington - increased by 14 days for hardshell kayaks and rafts; and 3 days for inflatable kayaks.
- Washington to Edwards Crossing - increased by 23 days for hardshell kayaks; and 18 days for rafts.
- Edwards Crossing to Purdon Crossing - increased by 20 days for hardshell kayaks and rafts.
- Purdon Crossing to Highway 49 - increased by 17 days for hardshell kayaks; and 20 days for rafts.
- Highway 49 to Bridgeport - increased by 8 days for hardshell kayaks; and 7 days for rafts.

The seasonality of the boatable flow days did not change significantly under the FWN proposal.

6.6.3 Proposed Measures

6.6.3.1 Yuba-Bear Hydroelectric Project

6.6.3.1.1 NID's Proposed Measures

As described above, NID's proposed Project includes nine measures specifically related to the protection and enhancement of recreational resources:

- Proposed Measure YB-GEN1: Annual Consultation with Forest Service, BLM, and BOR
- Proposed Measure YB-GEN5: Consultation Regarding New Facilities on Federal Land

- Proposed Measure YB-G&S2: Development and Implementation of Recreation Facilities Construction Erosion Control and Restoration Plan
- Proposed Measure YB-WR2: Development and Implementation of Recreation Facilities Construction Hazardous Material Spill Prevention, Control and Countermeasures Plan
- Proposed Measure YB-AQR2: Fish Stocking in Bowman Lake
- Proposed Measure YB-AQR7: Fish Stocking in Rollins Reservoir
- Proposed Measure YB-RR1: Implement Recreation Facilities Plan
- Proposed Measure YB-RR2: Provide Recreation Flow Information
- Proposed Measure YB-RR3: Provide Supplemental Flows in Canyon Creek Below French Dam for Whitewater Boating
- Proposed Measure YB-LU2: Implement Fire Prevention and Response Plan on Federal Land

Each of these measures is provided in full in Attachment E3.

6.6.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Recreation Management and Other Plan Proposals by Agencies and Other Relicensing Participants

Develop Information and Education Plan
The Forest Service, BLM, NPS and CDFG recommended that NID develop an information and education plan:

> Information and Education Plan (Drum-Spaulding and Yuba-Bear Recreation Plans): Within 2 years of license issuance, develop an information plan which includes maps, information, brochures, signs, websites etc. to provide information to enhance the project recreation opportunities and protect and interpret the area natural and cultural resources. Include educational material aimed at reducing the spread of aquatic invasive species (including amphibian chytrid fungus) and preventing animal habituation. An implementation schedule shall be part of this plan, with all actions implemented within 5 years of the license issuance. (p. 74).

NID did not adopt the agencies recommendation. Rather, NID's Recreation Facilities Plan includes measures that address information/educational information, and signage to an appropriate degree at each Project recreation facility (Section 3 of the Recreation Facilities Plan). Where specific types of information and education documents will be provided at specific Project recreation facilities, NID included measures for these facilities/sites within the Recreation Facilities Plan. In addition, NID will post educational materials at the information board related to reducing the spread of amphibian chytrid fungus as provided by CDFG and/or Forest Service at Project recreation facilities where this is a specific concern. Specifically, the

Project reservoirs/sites where this is of concern include Faucherie Lake at the day use/boat launch and Canyon Creek Campground.

Develop Bowman/Faucherie Lake Area Basin Management Plan

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID develop a Bowman/Faucherie Lake Area basin management plan:

> Bowman/ Faucherie Lake Area: Within 2 years of license issuance, prepare a basin-wide recreation management plan for the Bowman/Faucherie Corridor to further refine the concepts and proposals at the areas addressed below. This plan should address the need to concentrate all overnight camping, in this corridor, into facilities where fire prevention and resource protection, (toilets and vehicle controls) are provided for. The plan should provide for construction of sufficient facilities to meet current use and projected demand of this area through the term of the license, to the degree topographically feasible. It should address implementation of camping restrictions to coincide with development of additional camping capacity. This corridor spans Semi-primitive Motorized and Roaded Natural ROS classes. Based on the ROS classes; and the results of the recreation surveys summarized in Technical Memorandum 8-2 and 2000 Revised Exhibit R (which included surveys of users of Canyon Creek Campground) a range of development scale 2 and 3 family campgrounds should be included in this plan.
>
> This recreation management plan is to be approved by Forest Service and other applicable Resource Agencies. The licensee shall be responsible for the development of sites and/or implementation of measures identified in this plan after approval of the plan. Depending on the results of this plan, some of the site-specific actions or schedules provided below may be modified. The following elements shall be addressed in the plan:
>
> - Existing and projected future use levels of the entire Bowman to Faucherie area (including Jackson Creek Campground).
> - Physical overnight carrying capacity (based on the suitable land for overnight camping at locations with toilets). Address both group and family camping facilities.
> - Opportunities to meet demand for day use facilities (including boating access and picnicking). In determining if additional picnic sites should be developed, address the benefits and risk of providing these facilities, since these sites may become de facto campsites. If picnic sites are provided, develop appropriate management responses to assure picnic sites do not attract frequent overnight use.
>   - Sanitation and garbage.
>   - Reducing the resource effects of recreation (including uncontrolled vehicle use and fire)
>   - Information and education
>   - Site closures & rehabilitation

  - ➢ Schedule for implementation and construction
  - ➢ Reducing user conflicts
  - ➢ User fees

- Development of a centrally located potable water source in this corridor. (Note: Canyon Creek Campground or Sawmill Group Campground may be the best suited location. A potable water system was addressed in the original design of Canyon Creek Campground.)
- A boat management plan for Bowman Reservoir and Faucherie Lake (developed in conjunction with USFS, county sheriff and other interested agencies) addressing boat speed, motor size, and type of motor (gas or electric). (p. 91-92).

NID did not adopt the agencies' recommendation for a basin-wide management plan. While aspects of the plan are outlined by the agencies, the full scope and details of the plan are not provided and thus NID cannot evaluate the request without a specific plan with scope and responsibilities. In addition, the proposed basin-plan includes non-Project recreation facilities and recreation use that occurs outside of the FERC Project Boundary. NID is only responsible for providing and maintaining recreation facilities and opportunities at Project reservoirs. Regardless, NID's Recreation Facilities Plan addresses many of the outlined items at NID's Project reservoirs (Bowman, Sawmill, and Faucherie lakes) as well as Canyon Creek Campground located on Canyon Creek. Furthermore, the proposed basin-plan proposes a significant level of recreation facility development along this corridor, which NID does not support. The Project provides substantial and highly developed recreation facilities at Jackson Meadows and Rollins reservoirs; and NID believes that Bowman, Sawmill, and Faucherie lakes should continue to provide a less developed, more primitive recreation experience. By providing developed recreation facilities at the Project reservoirs in this corridor, NID would significantly reduce less developed, primitive recreation opportunities that visitors surveyed in 2009 sought out in this corridor. Furthermore, this type of recreation experience is scarce in the Tahoe National (TNF) Forest according to the TNF Land and Resource Management Plan, which specifically identifies the importance of and need to avoid losing areas that provide semi-primitive non-motorized settings/opportunities (USDA 2004). NID believes it's recreation facility proposals in the Recreation Facilities Plan are in line with maintaining the semi-primitive non-motorized opportunities at the Project reservoirs along this corridor.

General Recreation Proposals by Agencies and Other Relicensing Participants

<u>Real-Time Flow Information</u>
FWN also made requests for NID to provide real-time flow information:

> FLAs should include a condition that online gauge information will be 15-minute data. The condition should also say that both instantaneous and historical data should also be posted online. The online real-time gauge information should be made available to CDEC for posting also. (p. 69).

NID did not adopt this proposal. NID currently provides real-time flow information on NID's website and Dreamflows for the following gages: Middle Yuba River below Milton Diversion Impoundment, Canyon Creek below Bowman Lake, and the Bear River below Rollins Reservoir.

Weekly Forecasting of Flow Information

FWN also made requests regarding providing weekly forecasting of flow information:

> The Network requests that the Licensees' FLA's include a condition for weekly forecasting of flows on below Milton diversion, Bowman Reservoir, Spaulding Reservoir, Drum Afterbay, Dutch Flat Afterbay, and Rollins Reservoir to facilitate angler, boater, and trail crossing recreational use. It is our understanding that the Licensees provide predicted flows as submitted to the Cal ISO every week throughout the year. We understand that the electricity market is in constant flux, and can change the Licensees' operations. We suggest Licensees include a caveat with its weekly flow predictions that flows may not meet the predictions and can change without notice, but that Licensees will make a good faith effort to post changes to the flow predictions to the website as they become known. This weekly service will provide information for anglers about when flows will rise, thereby ameliorating the safety issues involved in wading and angling activities (i.e., prevent anglers from becoming stranded on one or the other side of the river because of rising water). Forecasting will also notify anglers of prime angling opportunities. The weekly forecasting will also aid trail crossers in planning their equestrian rides and trail runs so they time their crossings when the flow is appropriate. The forecasting will allow boaters to plan to take advantage of the flows provided to the Confluence and Mammoth Bar Runs a week in advance. (p. 69-70)

NID did not adopt this proposal. NID does not provide the Cal ISO with predicted flows. As noted by FWN, weekly flow forecasts can change unpredictability based on weather conditions, power demand and water availability. Any prediction would be constantly in flux. In addition, the "Confluence" and "Mammoth Bar" runs are not related to the Project, but rather part of the PCWA's Middle Fork American River Project license.

Install Signs Along the South Yuba River Regarding River Fluctuation

FWN recommended in their letter that NID provide signs regarding fluctuating flows along the South Yuba River:

> We recommend that licensees work with the California Dept of Parks and Recreation to develop signs to inform the general public about fluctuating water levels and the potential danger and that the licensees' FLA include a condition that they will provide the appropriate signage. (p. 70).

NID did not adopt this proposal. The FWN has provided insufficient detail for NID to perform an in depth analysis of any of the proposal, or for NID to estimate the cost associated with implementing the proposal. However, NID currently has internal procedures to notify appropriate entities whenever there is a potential to spill from Bowman Lake. Specifically, NID notifies Nevada County Sheriff; and the following in the town of Washington: Joe Shipley (town Director), the water treatment operator, the store, Consolidated Fire/Swift Water Rescue, School, Hotel, and the River Rest Resort.

Support, Invest, and Provide Facilities and Access for Proposed Bear River Trail Parkway
FWN recommended NID support, invest, and provide facilities and access for the proposed Bear River Trail Parkway:

> FLA's should include measures to support and invest in the Bear River Trail Parkway. (p. 71).
>
> FLA's should include measures for the following proposed access, facilities, and trail related to their properties on the Bear River Trail Parkway [includes a table with general trail segments, access and uses] (p. 72-75).

NID did not adopt these proposals. The proposal does not provide enough detail for NID to clearly evaluate the impacts or even the nexus to the Projects. However, NID understands that the proposed Bear River Trail Parkway is located on lands outside the FERC Project Boundary and thus the trail is not affected by the operations and maintenance of the Yuba-Bear Hydroelectric Project.

Recreation Facilities Plan Content
The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID address the following general proposals in their Recreation Facilities Plan:

> Drum-Spaulding and Yuba-Bear Recreation Plans: Address the following, at a minimum, related to the Recreation Plans (if full plans cannot be developed in time for the FLAs).
>
> - Place toilets in most areas where camping is encouraged.
> - Limit or concentrate camping to developed sites (with toilets) in various areas.
> - Collect garbage at additional sites.
> - Recognize that rather than replacing constructed features in kind when they reach the end of their useful life, there is a need to address redesign to meet FSORAG and assure the site and features are in the optimum location.
> - Include a schedule for reconstruction.
> - Address silvicultural treatment, view enhancement, and fuels reduction in and around developed sites.
> - Patrol project area and clean dispersed sites.
> - Improve signing to and from lakes and interpretive/ informational signing.

- Include various smaller heavy maintenance/minor reconstruction projects. Examples are rebuilding retaining at Jackson Meadow and providing accessible access at Fuller Angler access. (p. 3).

NID did not adopt this proposal since the proposal does not provide enough detail for NID to evaluate the impacts and costs of the items proposed.
However, NID does address most of these items individually, where the agencies provide more detailed PM&E requests later in their comment letter. In addition, NID addresses some of these items specifically in their Recreation Facilities Plans on a facility-by-facility basis. Regarding silviculture treatment and fuels reduction, NID addresses vegetation management in its Vegetation Management Plan and the Recreation Facilities Plan references this plan.

<u>Develop Project Patrol Plan</u>
The Forest Service, BLM, NPS and CDFG recommended in their joint letter that NID implement a Project patrol for the Project recreation facilities and sites:

> Project Patrol (Drum-Spaulding and Yuba-Bear Recreation Plans): Within 2 years of license issuance, develop and implement a Project Patrol component for Project and Project-affected National Forest System and BLM lands. At the Annual Coordination Meeting, the licensee shall coordinate with the resource agencies and interested parties to review information from the prior season and plan any adjustments for the next recreation season. This component shall outline duties of a seasonal Project Patrol to implement, at a minimum, the following:

- Monitor and seek compliance with safety, camping closures, fire clearance, and other measures.
- Monitor and seek compliance with regulations associated with camping, parking, food storage, whitewater boating, and other use.
- Whitewater boating program management including patrolling, permitting, monitoring, and educating the public.
- Install and maintain signs; adjust as seasonally needed.
- Disperse information to the public including appropriate OHV and firearm use, campfire safety, leave no trace, and other messages to reduce resource impacts and inter-user conflicts.
- Patrol dispersed public use areas within 1/4 mile of all Project and Project-affected waterways.
- Monitor and report vandalism of facilities, cultural sites or other resource damage.
- Report illegal activities and cooperate with law enforcement agencies, as needed.
- Remove trash and clean fire rings from dispersed campsites and other areas of concentrated public use within 1/4 mile of all Project and Project-affected waterways.

- Maintain fuels clearance within 100 feet of all dispersed campsites (including Project provided steel fire rings and user created fire rings) surrounding Project lakes.
- Remove visitor created fire rings in areas where camping is limited to designated sites.
- Perform other duties that provide for the safety of the public and protection of Project-affected resources.
- Maintain a log of activities, key resource issues and public concerns to summarize in an annual report provided at least 30 days prior to the annual coordination meeting. (p. 71).

NID did not adopt this proposal. The agencies have provided insufficient detail for NID to perform an in depth analysis of the proposal, or for NID to estimate the cost associated with implementing the proposal. While the agencies provide some detail related to the minimum level of responsibilities for such a patrol, the proposal does not provide the full details related to the responsibilities, staffing, and overall scope of the patrol. However, NID proposes to continue handling the patrol of the Project recreation facilities on NFS land through the existing collection agreement between the Forest Service and NID outside of the license.

Obtain Forest Service and BLM Approvals

The Forest Service, BLM, NPS and CDFG proposed in their joint letter that NID obtain Forest Service and BLM approval on a list of recreation-related items, as follows:

> The licensee will be responsible for the following items requiring Forest Service or BLM approval: survey; design; contract preparation and administration; environmental analysis (including any required additional site specific resource studies) and documentation (including any permits) necessary for construction of proposed facilities; and preparation of "as-built" drawings. The licensee will be responsible for funding the actual capital costs of the below-listed measures. Timelines specified are within a given number of years following plan approval. (p. 77-78).

NID did not adopt this proposal as the agencies did not provide adequate detail that identifies what NID would be responsible for each general item listed. Furthermore, NID did not adopt all of the agencies proposals and thus will not be responsible for funding/developing all the recreation projects proposed by the agencies. However, NIDs' Recreation Facilities Plan provides the specific recreation improvement and replacement projects at the Project recreation facilities and new facility construction, which takes into consideration the agencies proposals. Furthermore, NID identified a timeline for each of the proposed recreation facility projects (reconstruction, improvements, and new facility construction). NID addressed each of the agencies detailed facility proposals individually in Table 6.6.3-1.

Include Primary Access Roads to Recreation Facilities in Recreation Facilities Plan

The Forest Service, BLM, NPS and CDFG proposed in their joint letter that NID should include roads with the primary purpose of accessing recreation facilities in NID's Recreation Facilities Plan, as follows:

> Section 3.2.1, Roads: Roads for which the primary purpose is to access recreation facilities should be included, not just roads within facilities. As examples, Woodcamp, and Pass Creek Roads should be included. When restriping, add accessible parking designation to the list of responsibilities. (p. 63).

NID did not adopt this proposal since the agencies did not provide a comprehensive list of the roads that should be included. In addition, where the agencies did identify roads (e.g., Pass Creek and Woodcamp roads), it is not clear where these roads start/stop so NID cannot evaluate whether to include these roads in the Recreation Facilities Plan or not. General access roads and primary Project roads are addressed in NID's Roads and Trails Management Plan and not the Recreation Facilities Plan.

However, NID did include the following specific recreation facility access road segments in NID's Recreation Facilities Plan to be maintained, repaired and replaced by NID per the standards in the plan - road to Pass Creek Boat Launch facility from the intersection with Henness Pass Road; and Woodcamp Access Road from the intersection with Graniteville Road.

Specific Proposals Related to Recreation Facilities and NID's Recreation Facilities Plan

The Forest Service, BLM, NPS and CDFG in their joint letter proposed that NID add or modify recreation facilities and provide specific proposals for the Recreation Facilities Plan elements (e.g., monitoring, operation and maintenance, rehabilitation standards, plan review, and consultation), NID has collated the requests and its reply to the requests in Table 6.6.3-1.

Table 6.6.3-1. NID's replies to proposals to add or modify recreation facilities and other elements of NID's Recreation Facilities Plan by the agencies for the Yuba-Bear Hydroelectric Project.

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
AGENCIES	
Tables 3.1-1 and 3.1-2: Some key tasks that need to be added or clarified to include the following: • Maintain all recreation facilities in good working order. This includes keeping toilet doors in operating and locking conditions. If a structure is deemed to be unsafe, it will be closed until repairs are completed. • During the prime season all facilities will be inspected on a regular basis (as much as daily or more)… • This section needs to address waste removal/ treatment at Jackson Point. • Developed boat ramps will be inspected for obstacles, and deterioration. • If tables have sunk during the winter due to snow loads, they will be brought up to the level of the surrounding ground and placed on level ground. • Once a facility has been rehabilitated to provide for accessibility, clear floor space surrounding constructed features, graded tent pads and ORAR shall be maintained. • Developed sites will be free of litter, human, and domestic animal waste. • Ashes will be disposed of in the proper waste receptacle and not scattered or piled at the site. • Straighten, and replace as needed as, vehicle barriers and signs. • The chart specifies painting under some maintenance items but should include the option for staining as well. Note: The resource agencies are concerned about the licensee's proposal to require approval of the paint and recommend that the Forest Service and licensee develop alternate language to facilitate maintenance while meeting the intent of this requirement. • User Conduct and Law Enforcement: See resource agency additional measures below, which include development of a plan for project patrol. • It is not always practical to assess the road conditions prior to opening day and this should be reworded to reflect this. • Develop a Pavement Management System for all paved roads within project recreation sites and access roads that primarily serve these recreation sites, see comments to the Project Access above. • Currently the toilets are pumped when three-quarters full but not at the end of the season. (Pumping at the end of the season would incur additional expenses to what is being expended today.) In some instances, where toilets are placed in low spots, pumping at the end of the season can be ineffective since snow melt fills the vaults. In these cases, grading should be done to eliminate this problem to make end of season pumping effective. • Cleaning Recreation Sites" recommends that ashes be removed when the fire pit is half full. This is less stringent (and less costly than what is being proposed) and would meet the USFS standards. However, inspections in the Bowman area should be at least twice a week until after Labor Day. • Litter and Trash Collection should be in compliance with "Cleaning Recreation Sites" and be of a frequency that does not encourage animal encroachment, is not overflowing and does not emit offensive odors. Receptacles shall be animal proof. The frequency will depend on the type of container. Two to four-yard dumpsters need to be dumped at least once a week. The resource agencies disagree with licensee proposed once a month dumping since it would attract animals and provide an unpleasant odor for recreationists. • Rocks removed from unauthorized fire rings should be turned burned side down. (p. 61).	NID did not adopt this proposal since not all tasks have enough detail or direction on how NID should clarify the maintenance tasks or what level of responsibility and cost NID would be accepting if NID adopted the tasks. However, where agencies provided clearly detailed tasks, NID incorporated them into Tables 3.1-1 and 3.1-2 in their Recreation Facilities Plan. To be clear, NID did not adopt the proposals related to user conduct/law enforcement and developing a Pavement Management System. Neither of these tasks have sufficient detail for NID to determine whether the tasks should be adopted or not.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Annual Coordination Meeting (Drum-Spaulding and Yuba-Bear Recreation Plans): • Each year during the term of the licenses, NID will arrange to meet with interested resource agencies (FS and BLM at a minimum) for an Annual Coordination Meeting to discuss the measures needed to ensure public safety, and protection and utilization of the recreation facilities listed in of this Plan. The date of the meeting will be mutually agreed to by NID and the resource agencies but in general will be held within the first 90 days of each calendar year. A detailed agenda will be provided to the resource agencies when the meeting date is proposed to assure that the appropriate parties are present. • During the annual meeting with resource agencies, NID will review the status of recreation projects from the previous year. This will include rehabilitation of existing recreation facilities, the establishment of new recreation facilities, and any other recreation measures or programs that were implemented. The resource agencies will provide NID with any available recreational use data from the previous year for the facilities listed in this Plan. • At the coordination meetings, NID will provide the resource agencies with a summary list of the recreation facilities scheduled for rehabilitation and any other Plan measures or programs to be implemented. Work on recreation facilities scheduled for the forthcoming years will be presented to the resource agencies for review and will include logistical and coordination planning, and an implementation schedule. The NID and the resource agencies will identify any coordination needs in regards to other resource agency projects being implemented in the area. Permitting requirements and other key resources that will need to be protected from potential impacts associated with the implementation of the scheduled recreation projects will be addressed. • The NID will review with the resource agencies the long-term planning and implementation schedule for the rehabilitation and heavy maintenance of existing recreation facilities, and development of the new capital improvements proposed in this Plan. • The NID and the resource agencies may consider potential adjustments in specific actions or schedules, if appropriate. The resource agencies will be asked to approve any revisions to the schedule, and the revised schedule will be submitted to the FERC. Within 60 days following such consultation, the NID shall file with the FERC evidence of the meeting, which summarizes any comments made by the resource agencies, and any agreements or Plan revisions that were reached by NID and the resource agencies. • The Annual Coordination Meeting is a minimum requirement; it is anticipated that meetings will occur throughout each year as needed to implement the Recreation Plans." (p. 72-73).	In Section 5.1 in the Recreation Facilities Plan, NID incorporated the additional language to reflect these agency proposals. Some of the agencies proposed language was updated to reflect required action by the NID, instead of required action by agencies, since FERC only has jurisdiction over NID. In addition, language has been updated to reflect that the NID may make a request to the land management agencies (i.e., Forest Service and BLM) for co-funding using grant money available to them for improvements on lands that they manage (i.e., CDBAW funding). NID has included a proposal in their Recreation Facilities Plan for annual coordination meeting with the appropriate agencies (Forest Service, BLM, and any other applicable agencies).
The resource agencies concur with combining the two 5-unit camping areas (previously proposed in August version of the licensee's Recreation Plan) into a single area with a toilet. However, the capacity of the campground should be based on the demand and available developable land. If camping on the surrounding National Forest System land and NID land is limited to designated-camping areas, there will be likely be a need for more than the eight campsites that the licensee proposes. (p. 66).	While the agencies did not provide a specific number of walk-in campsites that NID should provide at the walk-in camping area, NID did increase the number of proposed campsites to up to 10 walk-in campsites on NID land in the latest version of the Recreation Facilities Plan. By providing up to 10 campsites, NID will provide adequate camping opportunities since NID observed an average of four occupied campsites at Sawmill Lake on weekends in 2009.
Section 3.4.2.1, Milton: The resource agencies concur with the need for vehicle management. In order to assess if we concur with the proposal to limit camping to walk in sites, we would like to review this proposal in the field with the licensee during the summer of 2011. We agree with the intent to keep unregulated vehicle use from damaging the lakeshore. However, it may be more appropriate to provide individual parking sites with barriers at individual campsites instead. The resource agencies expect this would have better public compliance than limiting campers to walk-in sites. (p. 66).	NID did not adopt this proposal as it does not provide adequate detail on how and where NID would provide the individual campsites with vehicle spurs given the additional space required to provide individual vehicle spurs along the limited lands available. Rather, NID proposed to establish up to five walk-in campsites along the shoreline and limit vehicle access to defined parking areas as the most effective means to limit resource damage along the shoreline associated with vehicles.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Operations and Maintenance (Drum-Spaulding and Yuba-Bear Recreation Plans): • Follow the cleaning and policing requirements in "Cleaning Recreation Sites," USDA Forest Service, San Dimas Technology and Development Center, August 1995 (SDTC 9523-1206), and meet FS Recreation Site National Quality Standards February 5, 2002 (or the current FS standards if these change). Determine frequencies of servicing based on these standards. Ashes are to be removed from fire rings and grills, cooled and extinguished and disposed of at a county landfill. • Ashes are not to be disposed of onsite and ashes which have been previously disposed of onsite (including those disposed of onsite by users) shall be properly disposed of as described above. • At the beginning of each recreation season, and as needed throughout the season, replace, reset, improve, and reinstall barriers within and adjacent to all project recreation sites; along the roads surrounding Project lakes, and along Project roads and trails where there is uncontrolled vehicle use. • Annually place tables on a level surface and bring the legs up to the surrounding ground level, prior to Memorial Day (or within 2 weeks of facility opening if not before Memorial Day.) Maintain grading following establishment of tent pads, clear floor space, graded living areas, Outdoor Recreation Access routes (ORARs), and other areas. • Hardware on toilet doors shall be maintained in a functioning condition. Toilet doors shall be capable of locking and open and close smoothly without sticking. • Remove trash from toilet vaults when pumped. • Remove trash from (road accessed) dispersed sites on a weekly basis between Memorial Day and Labor Day and twice monthly after Labor Day, until the facilities are closed for the winter. (p. 71-72).	NID adopted this proposal on NFS land. NID will specifically reference these documents in the Operations and Maintenance section of the Recreation Facilities Plan for facilities on NFS land only.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Recreation Survey and Monitoring (Drum-Spaulding and Yuba-Bear Recreation Plans) NOTE: The monitoring program shall incorporate the salient details of the licensee's proposal for monitoring presented in the Licensee's draft Recreation Plan, amended to include the resource agency comments. Implement Recreation Survey and Monitoring program on a 6-year interval concurrent with FERC's Recreation Form 80. This is in addition to Form 80. A Recreation Survey and Monitoring Report shall be prepared following the monitoring. A copy of the Report shall be provided to the resource agencies and filed with FERC after resource agency approval. The resource agencies may, based upon review of the information, require revisions to the recreation conditions. The Survey and Monitoring program shall address the following: At facilities where fees are required or passes are issued, licensee shall annually collect use data that includes use numbers by location, dates, occupancy, and party size (if collected). Where a host is not on site it should be anticipated that the fee collection will be inconsistent; and thus licensee shall, provide 4- annual Saturday counts between June 15 and August 16 at these sites. Annual data will be included in the 6-year Report. Licensee shall conduct a Recreational Survey once every 6 years (concurrent with FERC's Recreation Form 80) starting from license issuance. Survey methods and questions shall be reviewed and approved by the resource agencies in advance. The Recreation Survey shall be focused to address the key issues at the time. Survey information shall be reviewed by all interested parties. Licensee shall conduct observation surveys every 6 years. Licensee will conduct Recreation Monitoring once every 6 years which will include evaluation of resource impacts from developed and dispersed use; the Forest Service shall be involved in the evaluation of resource impacts. Licensee shall summarize the most current regional and statewide trends in recreation based on available surveys and reports. Licensee shall draft the Recreation Monitoring and Survey Report, that incorporates data from the information listed above, traffic counters, other resource monitoring results (if any), law enforcement input, emergency services (including fire) input, accident reports, Project Patrol reports, occupancy rates and other applicable information. The Report shall summarize monitoring results in relation to established triggers and address any changes in trends since previous reports (or initially from relicensing studies). Licensee shall, every 6 years (coinciding with FERC's recreation Form 80), consult with the resource agencies and interested parties to review this report and propose appropriate management actions. This review shall be based on findings in the Recreation Monitoring and Survey Report. The review shall address, at a minimum, the following factors: • Changes in use type, volume, season, group size, duration of stay, other use pattern and trends. • Public safety issues• Condition of project facilities, roads, trails parking areas, directional/informational and interpretive signing. • Kinds, quality, quantity, and range of recreational opportunities. • Preferences in recreation activities. • Health and safety. • User and resource conflicts. • Any mandated updated guidelines, such as ADA and FSORAG. • Kinds and sizes of recreational vehicles. *(continued on next page)*	NID did not adopt this proposal. The agencies have provided insufficient detail for NID to perform an in depth analysis of the proposal, or for NID to estimate the cost associated with implementing the proposal. While the agencies provided detail related to some specific measures for this proposal, it is not clear what the full scope of the survey and monitoring methodology would include. However, NID updated the recreation monitoring plan contained in the Recreation Facilities Plans in the FLA to address most of the items the agencies have identified in this measure. While NID proposes to monitor the amounts, types, and impacts of recreation use and public safety, at minimum, every 6years through observation surveys and available information sources, NID feels the type of user information that would need to be collected through user surveys (e.g., group size, types of user conflicts, duration of stay, and activity preferences) does not change significantly over a 6-year period. Therefore, NID proposes to conduct the user survey every 12 years, which is typical for most hydroelectric projects.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
(continued from previous page) • Occupancy and capacity information. • New or modified management actions (increased patrols, additional sanitation facilities, closure orders, etc.) proposed to address concerns identified in report. • A 6-year schedule for maintenance, rehabilitation, reconstruction and new construction. Because the standard life of recreation facilities ranges from 20 to 30 years, it is anticipated that during the life of the license, all facilities including those that are currently new will need to be redesigned and reconstructed to standards applicable at that time. The Report shall comply with FERC's regulations and shall be provided to the resource agencies for review and comment prior to being filed with FERC. (p. 73-74).	
Plan Revision (Drum-Spaulding and Yuba-Bear Recreation Plans): Over the term of the Project Licenses, unforeseen recreation needs, changes in visitor preferences and attitudes, and new recreation technologies may occur. The frequency with which the Plan is revised or updated shall depend on significant changes to existing conditions, monitoring results, and management responses made over time. The frequency of Plan updates shall be based on consultation, review of recreation use and facilities condition reports, and through other appropriate sources. Agreed upon changes to this Plan will be incorporated into a revised document or an amendment to this document, and after approval by the resource agencies, the revised plan will be submitted to FERC for approval. Factors that may trigger a revision include but are not limited to: • Revisions and updates to FS, BLM, or other applicable management plans. • Substantial changes (>25 percent change) of Recreation Visits in any activity recreationists of the Project participate in, as revealed in the National Visitor Use Monitoring (NVUM) of the Tahoe National Forest (using the 2010 surveys as a base), similar survey conducted by FS/BLM or documented in the NID's periodic observation and recreation survey. • Documentation of substantial changes in demographic use patterns, visitor needs, recreation preferences, types or patterns of use or other social factors affecting recreation facilities within the Project area. • Changes in road maintenance standards or similar physical factors affecting the use of the recreation facilities within the Project area. • Reaching occupancy (or other) triggers where new, but previously unanticipated, facilities will be required. • Catastrophic natural events, such as major forest fires or natural disasters, and significant effects of social disorder. • New federal or state policies, regulations, and laws (including Wilderness designation of land within or near the Project) that significantly affect recreation resources in the Project area. (p. 74-75).	NID adopted this proposal with some modifications. NID revised the Section 5 (Plan Revision) of the Recreation Facilities Plans to address some of these items. As written, the plan may need to be updated "if significant changes in recreation use or resources create the need"; and, that "A need may arise from recreation monitoring results, from day-to-day operation and maintenance of the Project, or, from other unanticipated events that may arise during the license period." In the Recreation Facilities Plans, the following sentence has been added: "Examples of such events that may trigger a need to update the plan include unforeseen recreation needs, changes in visitor preferences and attitudes, new recreation technologies, significant changes in the amount and types of recreation uses, or revisions and updates to Forest Service, BLM, or other applicable management plans." Section 5 also currently states that "Any updates to the Plan would be prepared in consultation with Forest Service and appropriate agencies and stakeholders, as appropriate." The Recreation Facilities Plan also indicates that any updates or revisions to the plans that are on or affect lands administered by the Forest or BLM will be approved by these federal land management agencies prior to sending to FERC for approval.
Campsite Closures (Drum-Spaulding and Yuba-Bear Recreation Plans): Various NID and resource agency proposals include closing dispersed campsites to overnight camping or limiting camping to designated sites. In order to implement this on National Forest System lands, a forest order must be passed, which is subject to prior environmental analysis pursuant to NEPA. The resource agencies believe that the most efficient way to complete this analysis is by including it in the FERC environmental document. The FS can then use this document to issue the order. Additional coordination will be needed with the county sheriff to implement the closures on private and NID owned land. (p. 75).	NID adopted this proposal with modification. NID added a sub-section to the Recreation Facilities Plan (in Section 3) that limits camping to designated campsites within the FERC Project Boundary as a policy. NID will work the Forest Service to develop a consistent policy on Forest Service lands within the FERC Project Boundary. NID will pursue a county ordinance to limit camping to designated sites on NIDs land.
In addition to the actions listed below (unless otherwise agreed to) all Project and Project-related recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance. (p. 75).	NID adopted this proposal with modification in the Recreation Facilities Plan (Section 3.3). The proposal was modified as follows: "All existing Project recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance unless the facilities are in good condition and do not warrant replacement."

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
All new, rehabilitated, and reconstructed recreation facilities located on National Forest System lands will meet FS national and regional direction, regulations, design and other applicable standards in place at the time of design, such as (but not limited to): Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG); FS direction included in manuals (FSM), handbooks (FSH) and stated in official correspondence; EM-7100-15, and other applicable direction. All new, rehabilitated and reconstructed recreation facilities located on BLM lands will meet BLM regulations, design and other applicable standards in place at the time of design and construction. (p. 76).	NID has adopted the proposal and provided language to address this item in Section 3.2 of the Recreation Facilities Plans for facilities on NFS land.
All newly constructed and reconstructed campgrounds on National Forest System lands shall contain a minimum of the following constructed features unless specifically excluded in this Plan (or subsequently agreed to the contrary): • Roads and spurs with barriers to prevent off road travel. • Tables. • Fire rings. • Animal resistant food lockers. • Bulletin boards. • Entrance sign. • Facilities for garbage collection. • Toilets. • Site markers. • Gate and entrance station. (p. 76).	NID adopted this proposal with modification. NID will provide all the listed features at new or reconstructed Project recreation campgrounds with Development Scale II or higher on NFS land unless NID and Forest Service agree otherwise. Furthermore, NIDs do not propose to include an entrance station at each new or reconstructed feature. Rather, NID proposes installing self-pay fee tubes, at a minimum, at each new or reconstructed campground and NID will discuss the need for an entrance station at on a case-by-case basis. NID added language in the Recreation Facilities Plans to state the types of facilities and features that each type of new or reconstructed Project recreation facility shall include, at a minimum, unless otherwise agreed to by NID and Forest Service. NID does not propose to include most of these facilities/features at designated primitive campsites at Project reservoirs. These sites will, at a minimum, consist of a steel fire ring; and may or may not consist of additional facilities or features. NID will address additional features at designated primitive campsites on a case-by-case basis.
Additionally, Development Scale 3 and above (and when specified in Development Scale 2 campgrounds) will also include graded tent pads, graded and surfaced spurs and roads and graded access routes (per FSORAG). Unless agreed to the contrary, all campgrounds with potable water will include a camp host site with septic (or a holding tank), solar (or other) power and water. If there are constructed features that are addressed here, but not mentioned at a specific facility, this section should prevail. (p. 76).	NID adopted this proposal with modification, however only at Project campgrounds on NFS land and for the proposal related to grading tents, grading/surfacing spurs and road, and access routes. NID addresses the need for campsite hosts at Project campgrounds on a case-by-case basis; and believes this depends on the proximity to other campgrounds with provided hosts and host sites. Where campgrounds are clustered together, one host/host site may cover multiple campgrounds. At Project campgrounds on NID land, NID addressed these items on a facility-by-facility basis.
All campgrounds, picnic areas or other recreation sites being constructed or reconstructed under the FERC relicensing on public land must fully comply with the applicable section of the ABAAS and the FSORAG and other applicable accessibility guidelines. (p. 76).	NID has adopted the proposal and provided language to address this item in Section 3.2 of the Recreation Facilities Plans for facilities on NFS land.
All new and reconstructed Project recreation facilities located on NID's or other private lands will be designed to meet applicable Americans with Disability Act (ADA) and Architectural Barrier Act (ABA) Accessibility Standards (ABAAS) and other standards as currently written at the time of project design. Design facets of facilities on NID and other private land shall be to a standard not less than those applied to surrounding public lands. (p. 76).	NID adopted part of this proposal for Project recreation facilities on public land. NID will meet all applicable accessibility guidelines for public land (ABAAS and FSORAG). However, the agencies proposed that NID also construct/reconstruct facilities on private land to a standard no less than what is on the public land. NID did not adopt this part of the proposal and will construct/reconstruct facilities on private land to the current accessible standards for private land (ADAAG). NID has revised Section 3.2 of the Recreation Facilities Plan to reflect these requirements on federal versus NID/private lands.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 1 year of license issuance, provide signs addressing applicable lake surface regulations at all recreation sites that are located on project lakes and in compliance with land management agency management plans. (p. 77).	NID did not adopt this measure as it does not provide adequate detail for NID to understand what specific types of information are required on such signage. However, NID does have a measure in the Recreation Facilities Plan (Section 3.3) that addresses the provision of applicable signs for reservoir surface regulations, including county speed limits, direction of travel, horsepower/craft restrictions, and any other county specific regulations for a Project reservoir. Per NID's Recreation Facilities Plan, NID will provide this signage within 2 years of FERC approval of the Recreation Facility Plan.
Within 2 years of license issuance, install metal animal proof food storage lockers large enough to hold a large cooler at all overnight campsites at all walk-in campgrounds. Adjacent to the locker, provide a clear, level, compacted ground space (aka clear floor space) meeting dimensions and cross slopes specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers" (or current requirements). (p. 77).	NID did not adopt this proposal as stated. Rather, NID, in Section 3 of the Recreation Facility Plan, proposed animal-resistant food storage lockers on a facility-by-facility basis. However, in general, NID proposed metal animal resistant food lockers at walk-in campgrounds, but not at Project reservoirs where primitive campsites with just fire rings exist since the level and type of use at these sites does not warrant food lockers. At these facilities on NFS land, NID will meet the applicable FSORAG requirements.
Within 5 years of license issuance (unless specified sooner at a specific site), replace all existing plastic food storage lockers with metal animal proof food storage lockers lockers [sic] large enough to hold a large cooler and install new metal animal proof food storage lockers at all remaining (Development Scale 2 and above) campgrounds where food storage lockers are missing (regardless of land ownership), with the exception Milton Lake. Adjacent to the locker, provide a clear, level, compacted ground space meeting dimensions and cross slopes specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers" (or current requirements). At this time, these lockers need not be installed in remote, primitive campsites (which consist of a fire ring only.) (p. 77).	NID adopted part of this proposal. Specifically, NID proposed replacing plastic food storage lockers at Jackson Meadows Reservoir facilities in the Recreation Facilities Plan and will meet the FSORAG requirements on NFS land. Regarding installing metal food lockers at all remaining campgrounds where they are missing, NID addressed installation of food lockers on a facility-by-facility basis in the Recreation Facilities Plan.
Within 5 years of license issuance, provide as-builts drawing of all project facilities. As-builts should reflect current dimensions and layouts, including underground utilities. As alteration, improvement, new construction or expansion occurs, provide updated as-builts. As-built drawings should be provided in hard copy and an electronic format (".dwg" format). (p. 77).	NID adopted this proposal with modification. NID will provide as-built drawings for altered, improved, new construction, or expanded facilities of Project recreation facilities on NFS lands when they are submitted to FERC following construction/rehabilitation of the facility.
Within 5 years of license issuance, install animal proof trash receptacles, and provide corresponding garbage service, at all developed sites where a toilet building has been provided except Jackson Point Boat-in Campground, Milton, Meadow Shoreline Campground, Fordyce, Sterling, Jackson Meadows Administrative Site & Jackson Meadows Vista point. (Garbage collection will not be required at these "excepted" sites. The NID shall post Pack in/Pack out signs at these "excepted" facilities). Provide a clear, level, compacted ground space meeting dimensions and cross slope for these trash receptacles as specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers." (p. 77).	NID did not adopt the proposal. Rather, NID addressed animal-resistant trash receptacles on a facility-by-facility basis in their Recreation Facilities Plan in Section 3.
Within 5 years of license issuance, at each Project recreation site, provide an information display with a map and information illustrating the recreational opportunities in the area as well as emergency contact information, proper food storage and other salient information. Develop all displays in consultation with the applicable resource agency. Review and, as needed, update recreation information signs on a 6 year cycle. Replace signs as needed. (p. 77).	NID updated Section 3 of the Recreation Facilities Plan, on a site-by-site basis, to indicate where Project area recreation maps, emergency contact information, proper food storage information, leave no trace type of information, and other information will be provided on existing or proposed information boards. This information will be developed within two years of FERC approval of the Project Recreation Facility Plan. NID will send the proposed information to the appropriate resource agency for review and comment prior to installation for facilities on NFS or BLM land. Significant proposed changes to this information on NFS or BLM lands will be discussed at the annual coordination meeting and any changes of this information on NFS lands will require prior Forest Approval.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
The NID will be responsible for funding the actual capital costs of the below listed measures. All improvements on National Forest System or BLM lands shall become the property of the FS or BLM upon completion, final inspection, and acceptance by FS. (p. 78).	NID did not adopt this proposal. All Project facilities constructed by NID will remain the property of NID following construction.
Within 6 months following any and all completed construction and reconstruction work, the NID shall provide FS with updated "as-built" drawings of all sites located on National Forest System or BLM lands or managed by FS or BLM. (p. 78).	NID adopted this proposal with modification. NID will provide "as-built" drawings for altered, improved, new construction, or expanded facilities of Project recreation facilities on NFS lands when they are submitted to FERC following construction/reconstruction of the facility.
NID Recreation Plan: Address the following, at a minimum, related to the Recreation Plans (if full plans cannot be developed in time for the FLAs). • Develop a Recreation Plan for Jackson Meadow to determine where new group and family campgrounds should be located (addressed in current Exhibit R) and future implementation. • Develop a Basin-wide Recreation Plan for Bowman/Faucherie to determine where to concentrate overnight camping in locations with a toilet and additional group camping with future implementation. • Install animal resistant food lockers at all overnight sites except Milton and replace plastic ones at Jackson Meadow. • Meet Department of Boating and Waterway (DBOW) standards in reconstruction of Woodcamp Boat Launch. • Include a dumpstation with a leach field (or other options to make it cost-effective to operate) at Jackson Meadow. • Provide a safe crossing of the spillway or alternate route at Sawmill (this is addressed in current Exhibit R). • Provide trail from Faucherie to French Lakes and in Jackson Meadow area (this is addressed in current Exhibit R). • Include improvements at Jackson Point Campground (this is addressed in current Exhibit R). • Address Jackson Meadow Administrative Site. (p. 3).	NID did not adopt this proposal. NID will address each of these items in the detailed proposals provided in the agencies' comment letter.
Furthermore, the resource agencies believe the following facilities should be included in the recreation plan: • Woodcamp Interpretive trail (since the only reason the trail exists is to serve the recreationist at Jackson Meadows). • Jackson Creek Campground. Although this campground predated the project and is currently not a project facility, the current use of this campground is clearly tied to the surrounding project reservoirs. (p. 58).	NID did not adopt this proposal since both sites are outside the FERC Project Boundary.
Section 3.1.2 Operation Maintenance Activities: The standards should be consistent with the cleaning and policing requirements in "Cleaning Recreation Sites," USDA Forest Service, San Dimas Technology and Development center, August 1995 (SDTC 9523-1206) and meet Recreation Sites National Quality Standards February 5, 2002. (p. 60).	NID adopted the proposal to include the specific maintenance standards for the Project recreation facilities located on NFS lands at Jackson Meadows, Milton, Bowman, Sawmill and Faucherie lakes. NID included additional language and references to these documents in Section 3.1 of the Recreation Facilities Plan. .
Section 3.3, Scheduling Major Recreation Facility Rehabilitation: Although the resource agencies agree that facilities should be replaced near the end of their useful life, experience has shown that developing a schedule of out-year replacement is advisable since most facilities have a useful life of 20-30 years. As a general rule, the license facilities do not meet current standard and by replacing each individual constructed feature when it reaches its useful life, there is never the opportunity to address the facility as a whole to assure the facility effectively serves the current and projected future users and meets current accessibility and other standards. (For instance, the spurs and turning radius of the campgrounds designed in the 1960s do not serve the needs of the larger vehicles which use the facilities today.) If a particular constructed feature (a toilet, for instance) is not in need of reconstruction when the rest of the facility is being reconstructed, the NID and appropriate resource agency can jointly agree to delay the reconstruction of that specific feature. (p. 64).	NID adopted this proposal with modification. NID added language to Section 3.3 that indicates that at the time a facility is reconstructed, NID and Forest Service will discuss the potential to re-design a facility on NFS land; and that NID will re-design the facility (on NFS land), if NID and Forest Service jointly agree that a re-design is warranted.
The Woodcamp Boat Launch should meet the standards established in the California Department of Boating and Waterway's (DBOW) "Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities" (March 1991), which would mean replacing the Woodcamp boat launch with a 2-lane launch. (p. 65).	NID adopted the proposal and will install a 2-lane launch ramp if the site conditions allow for a 2-lane launching ramp per the Department of Boating and Waterways (DBAW) guidelines.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Section 3.4.1.3, Sawmill Lake: The resource agencies agree with the concept of limiting camping to designated campsites only and the need for construction of a campground with toilet facilities at Sawmill Lake. Based on the current occupancy rates of Faucherie Group Camp and the available developable land at Sawmill Lake, a group campground should also be constructed at this lake. The developable land in this area spans NID and National Forest System lands. (p. 65-66).	NID did not adopt this proposal. NID believes developing a group campground at Sawmill Lake is not compatible with the desire to continue to provide a semi-primitive setting that is unique for the Project, which is predominantly a developed recreation setting at other reservoirs, particularly Jackson Meadows and Rollins reservoirs.
The resource agencies support the NID's desire to minimize shoreline impacts; however, we have strong concerns that managing this site as a walk-in campground will not be effective. Based on FS's experience managing users in the area (and the need to routinely re-barricade areas that had been previously closed), it is likely that barriers in a walk-in campground would be breached by users trying get vehicles closer to the campsite. Therefore, the resource agencies recommend that the campground be designed as a drive-in campground, with the campsites located away from the lake to protect the lakeshore with a trail to the lakeshore. The parking spurs should be well barricaded. The NID has proposed to use logs, boulders, and wooden posts as vehicle barriers, but due to the number of users who have vehicles with winches, barriers should consist of large, partially buried boulders to minimize the number of breached barriers. (p. 66).	NID addressed the agencies' detailed proposal for Sawmill Family Campground provided later in their comment letter and this table.
The resource agencies recommend allowing user created boat-in sites on the south side of Sawmill Lake to remain if there is not resource issues associated with them. (p. 66).	NID did not adopt this proposal since NID proposed to limit camping to designated campsites only within the FERC Project boundary in response to agencies proposal. At this time, NID does not propose any exceptions to this policy.
The NID's proposal to designate 8 areas (14 dispersed campsites) on the north shore of Bowman on NID and National Forest System land and limit camping along the north shore of Bowman Lake only to these sites would be acceptable if a toilet, food storage lockers, and appropriate vehicle control were to be provided at each of these campsite clusters to address resource and sanitation needs. (p. 67).	NID adopted the proposal for a food storage locker at each of the 14 designated campsites. NID did not adopt the toilet and vehicle barriers at each campsite cluster as the terrain along the north shore of Bowman Lake is not suitable for installing toilet buildings and the campsite clusters already have natural barriers that limit the number of vehicles at most sites. NID will post signage at each site as pack-it-in/pack-it-out and that a restroom facility is available at Bowman Lake Campground.
Section 4.1.1.1, Facility Indicators and Standards: In the resource agency proposed measures, the resource agencies have recommended improvements based on current use and growth projections. The use of triggers in the existing Exhibit R was not adequate to trigger the need for additional group campground facilities. Therefore, instead of including triggers, the resource agencies have instead recommended construction of additional facilities based on a set schedule, which considered existing and projected use as well as a 20-30 year life span for typical outdoor recreation facilities. This approach will keep the new construction "on the radar screen" of both NID and the resource agencies. However, NID and the resource agencies jointly may make adjustments to this schedule when mutually agreed to. By specifying these future developments on a set schedule, the resource agencies will be better able to plan for and track these actions. (p. 67).	NID did not adopt this proposal. Triggers are defined in the Recreation Facilities Plan to identify when new facilities may be needed and planned for. NID will construct additional recreation facilities based on a sustained demonstrated need through the detailed monitoring program in the Recreation Facilities Plan; and does not want to build facilities or types of facilities unless the facilities are in demand.
The resource agencies propose the following triggers for Family Campground at fee sites: On four non-holiday Saturdays between June 15 and August 16, least 80 percent of the individual developed campground campsites (excluding boat-in campsites and host sites) are occupied at a project reservoir in 2 of 6 years (during the Form 80 monitoring period). For Jackson Meadows, this will be an aggregate of all family campgrounds except Jackson Point. (p. 67).	NID did not adopt this proposal. NID did not adopt the proposed family campground trigger. NID believes based on previous research, that there needs to be a sustained demonstrated need for additional campsites, before considering constructing additional campsites at a Project lake. Two out of six years is not enough of a sustained pattern of need. NID's triggers including, the type of season, trigger level, and years the trigger is met in the Recreation Facilities Plan are adequate to identify the potential need for future development or management.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
The resource agencies propose the following triggers for Group Campground: On four non-holiday Saturdays between June 15 and August 16, there is at least 80 percent occupancy of all the public group campsites at a project reservoir (in the case of Jackson Meadows) or in a recreation area (in the case of the Bowman/Faucherie corridor) in 2 of 6 years (during the Form 80 monitoring period). (p. 67-68).	NID did not adopt this proposal. NID did not adopt the proposed family campground trigger. NID believes based on previous research, that there needs to be a sustained demonstrated need for additional campsites, before considering constructing additional campsites at a Project lake. Two out of six years is not enough of a sustained pattern of need. NID's triggers including, the type of season, trigger level, and years the trigger is met in the Recreation Facilities Plan are adequate to identify the potential need for future development or management.
The resource agencies propose a similar trigger to that described above for Trigger 2 at facilities where daily occupancy information is not collected including at boat-in campgrounds. (p. 68).	NID adopted this proposal with modification. NID's "Trigger 2" in the Recreation Facilities Plan is intended to be used for facilities where daily occupancy is not collected daily by host management (where host management is not onsite), which includes boat-in campgrounds. NID has provided clarifying language in Section 4.1 and 4.2 to make this clear.
Method and Trigger 2. The resource agencies and NIDs are not in agreement. If Trigger 1 is hit, the NID needs to continue to monitor these sites annually. Monitoring for 3 consecutive years and then stopping if trigger is not hit in a total of 4 consecutive years does not account for anomalous years, for example when there is a fire, drought, high gas prices, or other anomalies. (p. 68).	NID adopted this proposal with modification. NID's proposed triggers for "Trigger 2" does allow for an anomalous year within the 3-year monitoring period after "Trigger 1" has been met since the Plan states that the occupancy "Trigger 2" would need to be met in 2 of the 3 monitoring years after "Trigger 1" had been met. Thus, one of the three years could be anomalous for some reason, and the trigger would still be met overall.
Table 4.1-2: For perceived crowding, the resource agencies recommend 51 percent be used as the standard for crowding since the facility is approaching capacity. This will provide a more sensitive indication if crowding is becoming an issue. This sensitivity is especially important since surveys are only done periodically. (p. 68).	NID did not adopt this proposal. The < 65% trigger is the trigger proposed for NID's Pit 345 Project; and is supported by outdoor recreation research in normative behavior. Specifically, Dr. Bo Shelby, who is one of the foremost experts in this area, and developed the crowding scale and conducted the meta-analysis; which ultimately contributed to 5 crowding categories listed in the monitoring section (Section 4).
Section 4.2.3, Recreation Questionnaire Survey: The resource agencies recommend that recreation surveys be completed at 6-year intervals. It is widely recognized that substantial changes in recreation use, activities, motivations, and other related items can happen in a short span of time. These trends are important to recognize and track so that adjustments in management strategies can be made in order to prevent the degradation of either resource conditions or recreation experiences (including public safety). The change over time of visitor attitudes, preferences, use patterns, experience, and capacity may require modifications to the management of recreation within the Project area. This is especially important at the beginning of the license in order to understand visitor's attitudes towards substantial changes in the management proposed in the Bowman corridor. (p. 69).	NID did not adopt this proposal. NID believes that 12-year interval is adequate to identify significant changes in preferences, use and activities, particularly since very little has changed on the Project since the revised Exhibit R in the late 1990s.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Construction and Reconstruction (Yuba-Bear Recreation Plan only): The following existing and proposed sites, within the boundary of the Tahoe National Forest (on National Forest System and NID land) or on BLM lands are considered project sites. The FERC boundary should be adjusted to include new facilities when the planning for these project facilities is approved by FERC and prior to when facilities are constructed. FS Facilities • Aspen Group Campground • Aspen Picnic Area (including access road) • Pass Creek Campground • Pass Creek Overflow • Pass Creek Boat Ramp (including the access road from road 07 (Fiberboard Road) to the boat ramp) • East Meadows Campground (including access road 70-80 from the Pass Creek Loop road to East Meadows Campground) • Findley Campground • Firtop Campground • Woodcamp Campground • Woodcamp Picnic Area • Woodcamp Boat Ramp (including access road from road 956 to the recreation sites) • Woodcamp Interpretive Trail • Silvertip Group Campground • Jackson Point Boat-in Campground • Jackson Vista Point • Jackson Sanitary Dump Station • Jackson Meadows Administrative Site • New Group and Family Campgrounds at Jackson Meadows (proposed—location to be determined through a recreation basin plan) • Jackson Meadow Showers (proposed) • Trails to Jackson Meadows dam overlook (proposed) • Trail from Woodcamp complex to English Dam (proposed) • Trail connecting Woodcamp interpretive trail to the campgrounds (proposed) • Milton Lake—(Development Scale 2) • Bowman Lake Campground—(Development Scale 2) • Bowman Lake Informal Boat Launch • The following list of sites may be amended based on a Bowman area recreation basin plan ► Bowman Lake Group Campground (proposed) ► Bowman Lake Peninsula Day Use (proposed—currently dispersed sites) ► Sawmill Lake Family Campground (proposed) ► Sawmill Lake Group Campground (proposed) ► Sawmill Informal Boat Launch ► Canyon Creek Day Use (proposed—currently dispersed sites) • Trail from Sawmill Lake to Grouse Ridge Trail and trailhead (proposed to provide a safe crossing of Sawmill spillway) *(continued on next page)*	NID did not adopt this proposal. NID's Recreation Facilities Plan includes all Project recreation facilities - both existing and proposed by NID.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
(continued from previous page) • Canyon Creek Campground (including proposed expansion) • Faucherie Lake Group Campground, Boat Launch and Day Use area • Trail from Faucherie to French Lake and trailhead (proposed) • Jackson Creek Campground (if not included in a settlement agreement per meeting on 7/21/10) • Dispersed campsites surrounding project lakes and in the Canyon Creek corridor from Faucherie to Bowman. BLM Facilities • Dutch Flat Afterbay – Day Use facilities • Chicago Park Power House – Day Use facilities" (p. 78-79).	

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Jackson Meadows Area: The current Yuba-Bear Exhibit R (2000) stated "The NID will consult with the Tahoe National Forest and develop a recreation use/demand study and based on that study, develop campground expansion proposals for new facilities on the basis of demonstrated need, consistent with the carrying capacity of the area and within feasible expansion areas." Since this plan was ordered under the existing license and based on the work done in Technical Memorandum 8-2, we anticipate this plan should be submitted prior to issuance of the new license with implementation to start soon before or after the license issuance. However, if this plan is not submitted within the current license, within 1 year of issuance of the license: Provide a development plan for facility expansion. This plan should aim to provide the following capacity (to the degree topographically feasible).• Up to 100 PAOT group sites (accessible by paved road) in 25 PAOT units.• Up to 57 Development Scale 4, family campsites (accessible along a paved road). Based on the demand (and lack of available space) for large RV spurs, a limited number of these sites may be the non-traditional camping opportunities such as those currently provided at the Pass Creek Overflow.• Two central shower facilities (one on each side of the lake).• An RV dump station, with a leach field, on the east side of the lake (or other appropriate solution to provide a dump station that is cost efficient for the operating party to operate).• Twenty-one additional parking spaces at Pass Creek Boat Ramp at high water.The NID shall be responsible for the implementation of this plan. Although there may be additional suitable land not addressed below, areas that have potentially suitable land include:• NID land T.19N., R.13E., Sec 17 -- additional group sites. This may involve relocating the RV sanitary dump station.• Minor expansion on National Forest System land surrounding East Meadows Campground—potential family campground expansion• National Forest System land north of Woodcamp Picnic area and east of Findley Campground—potential family campground• National Forest System land on the peninsula where Jackson Point Boat in Campground is located (ideally providing at least .1 mile separation between the boat in campground and the new drive-in campground.) This would require access across private land. (If this public access is acquired, the road surface for the road accessing campsites in this area is negotiable.)• National Forest System land T.19N., R.13E., Sec 28, if lake access could be provided over a puncheon or other walking surface. (The land lines in this area need to be reviewed in more detail.) Due to the slopes, this site may be best suited for tent camping• National Forest System land southwest of the Woodcamp Complex—this land may be best suited for RV "overflow" type camping, similar to what is currently provided at the Pass Creek Overflow.• A limited area behind site #7 at Firtop. Acquire by any means necessary, but not including by condemnation, fee title land or an easement to provide public access to the Jackson Point peninsula in order to allow additional recreational development of that land, if NID and public lands with legal access are insufficient to meet the development needs. If this access cannot be obtained, the resource agencies may require additional boat-in campsites be constructed on this peninsula in the future (when demand exists). If public access cannot be obtained, acquire access to Jackson Point for administrative purposes (including construction, toilet pumping and fire suppression.)Whenever additional recreation facilities are provided, the water and septic systems shall be reengineered, reconstructed, and resized to accommodate the additional demand. Generally, in family campgrounds, the majority of the toilets should be flush toilets unless it is infeasible to provide sufficient septic or water to accommodate this.This recreation management plan is to be approved by the applicable resource agencies, including the FS at a minimum. The NID shall be responsible for the development of sites and/or implementation of measures identified in this plan after approval of the plan. Within 2 years of license issuance, construct the group campground facilities to accommodate at least 50 PAOT. NOTE: The triggers for group campgrounds set in the Yuba-Bear Exhibit R (2000) appear to have been met; therefore, the resource agencies believe that construction of these facilities should be completed prior to the issuance of the new license.Within 5 years of license issuance, construct 25-30 additional family campsites. Include a host site in each new family campground. The host site should include water, septic, and solar power. Include a double unit vault toilet in each new campground (to allow for continued operation if the water system fails). *(continued on next page)*	NID did not adopt this proposal. NID believes the current occupancy data is not adequate to determine if a need for such development at Jackson Meadows exists at this time. To date, NID has only been provided with weekend occupancy data for July, August, and September in 2009 from the TNF's concessionaire. NID needs the June weekend occupancy data in order to calculate the non-holiday weekend occupancy during the Memorial Day to Labor season; and compare the calculated non-holiday weekend occupancy. In addition, NID needs to see a sustained demonstrated need for these developments over multiple years (as outlined in NID's Recreation Facilities Plan monitoring section) before determining if, where, and whether additional facility development is warranted at Jackson Meadows Reservoir. NID does not believe the existing occupancy data supports the need to develop additional family and/or group campgrounds at Jackson Meadows Reservoir until non-holiday weekend occupancy data is available for the full peak season (Memorial Day - Labor Day holiday weekends) over at least a three-year period (to be consistent with the monitoring program in the Recreation Facilities Plan).

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
(continued from previous page) Within 15 years of license issuance, provide two central shower facilities, one each in the vicinity of the Woodcamp and Pass Creek complexes. (The shower on the eastside may be collocated with the dump station).Upon meeting occupancy triggers, construct the remaining family & group campsites. (p. 79-81).	
To the degree possible when a campground is being rehabilitated, provide additional trailer and vehicle parking in all (drive-in) family campgrounds. (p. 81).	NID did not adopt this proposal. NID proposes to maintain the existing footprint of the existing recreation facilities. If the monitoring program as outlined in the Recreation Facilities Plan identifies a future need for additional parking, then NID would address the issue at that time.
Within 2 years of license issuance, conduct sanitary surveys of all septic tanks and disposal fields [at Jackson Meadows Reservoir]. Locating, potholing, and excavating will be required. Depending on the results of this investigation, additional work will be specified which may include improvements, or complete redesign and installation of new systems at some point in the license. When this survey is completed on a septic system, inspection tubes shall be installed in the disposal field, risers shall be installed on the septic tanks and paddle markers shall be installed identifying the underground utility locations. (p. 81).	NID did not adopt this proposal. NID will address septic system repair and replacement as the need arises based on the identification of site-specific septic issues through routine maintenance of the facilities.
Aspen Group Campground: Within 2 years of license issuance: • Re-contour Spring Unit to address flooding issue that occurs • Regrade cooking and eating areas • Improve barriers to prevent off road use. • Mark handicapped parking. (p. 81).	NID did not adopt this proposal. NID will address these issues at the Spring Unit within 10 years of license issuance concurrent with the rehabilitation of the entire group campground as outlined NID's Recreation Facilities Plan.
Within 10 years of license issuance [at Aspen Group Campground], redesign and reconstruct the campground to meet the current requirement of the Americans with Disabilities Act (ADA) or the standard of the time. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Reconstruct and widen road. The road should be a paved road, designed with sufficient subgrade to withstand the expected loads. Road geometry and widths will be specified at the time of the design. Expand parking areas especially in Spring Unit. • Replace unit markers and information boards • Regrade tent pads • Replace all non-accessible tables with accessible tables and bring the remaining 2 fire pits up to accessibility standards in this unit. Provide accessible trail between cooking and eating area, parking lot, restroom, camping area and fire ring. Provide a clear, level compacted ground surface with flattened area around tables, hydrants & grills to provide for accessibility (p. 81-82).	NID has adopted the proposal with modification. NID will rehabilitate the road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1; and NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.
Aspen Picnic Area: Within 2 years of license issuance: • Construct a non-motorized trail from Aspen Group campground through Aspen Picnic Area to the lakeshore. To the degree possible this should be an accessible (Class IV) trail. • Replace the 4 unit toilet near the beach with 2 unit accessible vault toilet. • Designate accessible parking. • Meet FSORAG at a minimum of 2 sites. Provide for accessible tables and pedestal grills at these sites. At a minimum, provide a clear, level compacted ground surface with flattened area picnic area around tables, hydrants & grills to meet FSORAG. Provide Outdoor Recreation Access Route (ORAR) between accessible sites, constructed features, toilet and parking area. (p. 82).	NID adopted the proposal with modification. NID will complete this work concurrent with the wholesale rehabilitation of the picnic area as scheduled in NID's Recreation Facilities Plan. In addition, NID will construct a non-motorized, native surface trail from Aspen Group Campground to Aspen Picnic Area to accessible standards as practical for a native surface trail; and will clearly define the existing trail from the picnic area to the lakeshore, but not to accessible standards due to the steep slope. Finally, NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 10 years of license issuance [at Aspen Picnic Area], redesign and reconstruct picnic area to meet the current FS design standards, FSORAG and requirements of the ADA or other applicable standards at the time of design. Explore opportunities to allow recreationists to drive down and drop off equipment closer to the lakeshore before parking in the existing campground. The following includes, but is not necessarily limited to, the specific elements of this reconstruction.• Address accessibility. Evaluate opportunity to provide accessibility at all picnic sites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between accessible sites, constructed features, toilet and parking area.• Where feasible, regrade picnic units to 600-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide a clear, level compacted ground surface around tables & grills to meet FSORAG.• Replace remaining tables so that there are a total of eight accessible, cement picnic tables.• Replace fire devices with pedestal grills for a total of eight picnic sites.• Remove remaining tables and stoves.• Replace signs.• Replace barriers.• Reconstruct road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths will be specified at the time of the design (p. 82).	NID adopted all the recommended proposals, except reconstructing the entrance/circulation road and allowing vehicles to access the lakeshore. NID will re-surface the entrance/circulation road per the standards and schedule outlined in the Recreation Facilities Plan in Section 3.2.1. And, NID provides public the opportunity to access the shoreline with vehicles at the Pass Creek Boat Launch.
Pass Creek Campground: Within 5 years of license issuance: • Replace two flush toilet buildings with fully accessible flush toilets. • To the degree feasible, provide additional trailer and vehicle parking. (p. 82-83).	NID adopted the proposal with modification. NID will replace the 2 existing flush toilet buildings with at least fully accessible vault toilet buildings, and would consider replacing the units with like flush toilets if the ongoing water system evaluation determines the water supply will be reliable in the long-term. However, if the water supply is not reliable, NID proposes to replace all flush toilets with vault toilets.
Within 15 years of license issuance [at Pass Creek Campground], redesign and reconstruct the campground to meet the current FS design standards, FSORAG, and requirements of the ADA or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs. • Where feasible regrade camp units to 1,200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers, hydrants and grills to meet FSORAG. • Replace bulletin boards and signs. • Lengthen and widen spurs. • Replace barriers & unit markers. • Replace fire rings & picnic tables. • Reconstruct entrance station & signs. • Construct trash bin pads with paved approaches from the roadway. • Provide asphalt treatment of roads and spurs (as specified in the Pavement Management System). • Replace gate. • Provide a host site that includes water, septic (or holding tank), and solar (or other) power • Provide additional trailer and vehicle parking. • Replace or refurbish vault toilets as needed. (p. 83).	NID has adopted the proposal, except NID will maintain the existing camp unit compacted surface but upgrade appropriate camp units to accessible standards during the rehabilitation scheduled in the Recreation Facilities Plan. In addition, NID did not adopt the road management proposal as NID will rehabilitate the road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1. Finally, NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Pass Creek Boat Ramp: Within 1 year of license issuance: • Replace wheels on floating dock (if not accomplished sooner). • Provide asphalt treatment (as specified in the Pavement Management System) on the high water launch (referred to as ramp A on the NID's condition surveys). • Replace wooden barriers with boulders. • Provide more prominent signing regarding submerged stumps and rocks. • Construct and maintain an accessible trail between the shoreline below Aspen Picnic Area and the boat ramp (this will involve reconstructing the existing trail and bridge). (p. 83).	NID adopted this proposal with modification. NID will complete all the work tasks per the schedule in the Recreation Facilities Plan, except constructing the accessible shoreline trail; and reconstructing the roads. NID will maintain the existing non-accessible trail; however, the survey data did not identify any demand for an accessible trail and the high cost to construct an accessible trail is not in-line with the demand nor the practicality of it. NID will rehabilitate the roads to the standards outlined in the Recreation Facilities Plan in Section 3.2.1, and not according to the proposed Pavement Management System, which lacks adequate detail for NID to evaluate in comparison to NID's proposal.
Within 5 years of license issuance [at Pass Creek Boat Ramp]: • Provide 21 additional boat parking sites. Most spaces should be for vehicles with trailers; however, some spaces can be single spaces (to accommodate parking trailers without vehicles and vehicles without trailers). Ideally, this will be accomplished by expanding the parking to the west and northwest of the Pass Creek overflow. However, due to limited land base, it may be necessary to convert the overflow area from camping spaces to boat parking. If this is needed, replace the overflow camping spaces (suitable for larger RV's) elsewhere within the project on a paved road. Provide this overflow camping in an area that provides some scenic qualities, if possible.• If the overflow site is converted to boat ramp parking, provide picnic tables (replacing the remaining wood tables) and fire rings, around the edge of the overflow area so that overflow camping can be provided at this site when the lake levels drop. Provide removable unit markers. The number of overflow sites will be determined during the site design. (p. 83-84).	NID adopted this proposal with modification. NID will evaluate the options for providing an additional 20 boat parking spaces (majority vehicle and trailer spaces) to include at least the following options: 1) expansion at the overflow camping area; and 2) converting the overflow camping area and relocating RV overflow campsites elsewhere at Jackson Meadows Reservoir. Within 5 years of license issuance, NID will complete the option chosen for providing additional boat parking spaces.
Within 15 years of license issuance [at Pass Creek Boat Ramp]: • Reconstruct boat to California Boating and Waterways standards; replace toilet and other facilities as needed. • Extend ramp (or provide an alternate ramp) to provide for lake access until September 30 in a critically dry year. • Provide for accessibility (p. 84).	NID adopted this proposal with modification. NID will reconstruct the main boat ramp to CDBAW standards, install an accessible boat dock, and replace the toilet building within 15 years of license issuance; however, NID will not extend the main boat ramp for use through Sept. 30 in Critically Dry water year types since the existing ramp is usable under Licensee's Proposed Project operations, at a minimum, for the entire peak recreation season from Memorial Day through Labor Day in all water year types, except Critically Dry water years. And, in Wet, Above Normal, and Below Normal water years, the boat ramp is usable beyond Labor Day to September 15. NID does not believe that a usable standard for the boat ramp should include Critically Dry years since such water years are highly anomalous and would require substantial boat launch construction costs for rare situations.
Pass Creek Overflow (Henness Pass Campground): Within 5 years (regardless of whether or not the site is converted to boat ramp parking): • Construct new 1 unit vault accessible toilet. • Replace visitor signs. • Address accessibility. • Replace gate and barriers as needed. • Provide asphalt treatment (as specified in the Pavement Management System). If the area is not converted to boat ramp parking, restripe overflow (parallel parking) sites to provide for two adjacent parking spaces (rather than three) and replace existing wooden tables and fire rings. (p. 84).	NID adopted this proposal with modification. NID will complete this rehabilitation, except installing a new 1-unit vault toilet and providing asphalt treatment per the Pavement Management System. NID believes the existing vault toilet at the boat ramp (approx. 350 ft. away) is adequate to meet the needs of the overflow camping area; and the road will be rehabilitated per the standards outlined in the Recreation Facilities Plan in Section 3.2.1. Finally, NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
East Meadows Campground: Within 1 year of license issuance (if not done under existing license), replace spur retaining walls as needed (these are currently getting undermined). • Replace two entrance signs (one in campground and one on the 07 road). • To the degree feasible, provide additional trailer and vehicle parking. • Construct and maintain a non-motorized trail from the campground to the river. • Install a 2-unit accessible vault toilet. (This is not a replacement toilet. It is an additional toilet for periods when the campground is open but water system is not available, making the flush toilet buildings un-usable). (p. 84).	NID adopted most of the proposals in this proposal, except installing an additional 2-unit vault restroom. NID will replace the existing toilet buildings with at least fully accessible vault toilet buildings, and would consider replacing the units with like flush toilets if the ongoing water system evaluation determines the water supply will be reliable in the long-term. However, if the water supply is not reliable, NID proposes to replace all flush toilets with vault toilets. NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.
Within 10 years of license issuance [at East Meadow Campground]: • Redesign and reconstruct the campground to meet the current FS design standards, FSORAG and requirements of the ADA or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction:• Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs.• Where feasible, re-grade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers, hydrants and grills to meet FSORAG.• Replace bulletin boards and signs.• Lengthen and widen spurs.• Replace barriers and unit markers.• Replace fire rings and picnic tables.• Reconstruct entrance station.• Construct trash bin pads with paved approaches from the roadway.• Replace gate.• Replace three (wooden) flush toilets• To the degree feasible, provide additional campsites. This may include some tent only and/or walk-in campsites to the south, north & west of the campground.• Provide additional trailer and vehicle parking.• Reconstruct road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths will be specified at the time of the design.• Provide asphalt treatment of spurs (as specified in the Pavement Management System).• Provide a host site that includes water, septic (or holding tank), and solar (or other) power. (p. 84-85).	NID adopted most of the proposals, except providing additional campsites and reconstructing the road. NID does not believe providing additional campsites is warranted at this time; however, if triggers in the Recreation Facilities Plan are met in the future, then NID will evaluate the type, location and scope of additional camping opportunities. And, NID will re-surface the road and the facility as a whole to the standards and schedule in the Recreation Facilities Plan in Section 3.2.1., but not reconstruct the road and sub-grade.
Findley Campground: Within 2 years of license issuance: • Repair road damage sufficiently to last until reconstruction. • Replace water source. • Replace flush toilet • Replace spur retaining walls as needed. (p. 85).	NID adopted all of the proposals related to repairing the road damage and spur retaining walls within 3 years of license issuance and approval of the Plan. However, NID did not adopt the replacement of the toilet and water source.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 10 years of license issuance [at Findley Campground], redesign and reconstruct the campground to meet the current FS design standards, FSORAG and requirements of the ADA or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs. • Where feasible, regrade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers, hydrants and grills to meet FSORAG. • Replace bulletin boards and signs. • Lengthen and widen spurs. • Replace wood barriers and unit markers. • Replace fire rings and picnic tables. • Reconstruct entrance station and signs. • Construct trash bin pads with paved approaches from the roadway. • To the degree feasible, provide additional trailer and vehicle parking • Reconstruct road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths will be specified at the time of the design. • Provide asphalt treatment of spurs (as specified in the Pavement Management System) • If feasible, construct and maintain a non-motorized trail connecting the campground with the Woodcamp Interpretive trail. • Provide a host site which includes water, septic (or holding tank), and solar (or other) power. • Add a single unit vault toilet. (p. 85-86).	NID adopted all of the proposals except: 1) reconstructing the road; 2) providing additional campsites; 3) constructing a trail to connect to Woodcamp Interpretive Trail; 4) providing a host site; 5) installing a new, 1-unit vault toilet; and 6) regarding/sizing camp units. Instead: 1) NID will resurface the road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1., but not reconstruct the road and sub-grade. ; 2) NID does not believe providing additional campsites is warranted at this time, particularly considering the occupancy data is incomplete/inconclusive without weekend occupancy data. However, if triggers in the Recreation Facilities Plan are met in the future, then NID will evaluate the type, location and scope of additional camping opportunities; 3) NID does not believe the cost of constructing a connecting trail to the very low use non-Project Woodcamp Interpretive Trail is reasonable. While constructing the trail may potentially increase the use of the non-Project Woodcamp Interpretive Trail to some degree, NID believes a high cost connecting trail is not reasonable simply to increase the use of the existing Woodcamp Interpretive Trail; 4) NID believes the host site at Woodcamp Campground is adequate to meet the needs at Findley Campground as well as Fir Top and Silvertip Group campgrounds (48 sites total) - one host is used for East Meadow Campground which has 46 sites total; 5) NID does not believe an additional vault toilet is reasonable for the reasons stated in NID's response at East Meadow Campground; and 6) NID will maintain the existing camp unit compacted surface but upgrade the appropriate number of campsites to accessible standards including clear/level surface when the facility is rehabilitated per the schedule and guidelines in the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Firtop Campground: Within 5 years of license issuance, redesign and reconstruct the campground to meet the current FS design standards, FSORAG, and requirements of the ADA or other applicable standards at the time of design The following includes, but is not necessarily limited to, the specific elements of this reconstruction.• Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs.• Where feasible regrade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floorspace around tables, food storage lockers, hydrants and grills to meet FSORAG. • Replace bulletin boards and signs.• Lengthen and widen spurs. Where feasible, provide pull through spurs to provide longer spurs.• Replace wood barriers and unit markers• Replace fire rings and picnic tables• Reconstruct entrance station and signs• Construct trash bin pads with paved approaches from the roadway.• Provide additional trailer and vehicle parking• Provide asphalt treatment of spurs (as specified in the Pavement Management System).• Reconstruct road including Woodcamp complex access road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths will be specified at the time of the design.• Replace toilet with new accessible flush toilet and paved access route from the road to the toilet entrances.• If feasible, construct and maintain a non-motorized trail connecting the campground with the Woodcamp Interpretive Trail.• Provide a host site which includes water, septic (or holding tank), and solar (or other) power.• Add a single unit vault toilet. (p. 86-87).	NID adopted all of the proposals except: 1) reconstructing the road; 2) providing additional campsites; 3) constructing a trail to connect to Woodcamp Interpretive Trail; 4) providing a host site; 5) installing a new, 1-unit vault toilet; and 6) regrade/size camp unit compacted space. Instead: 1) NID will resurface the road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1, but not reconstruct the road and sub-grade. 2) NID does not believe providing additional campsites is warranted at this time, particularly considering the occupancy data is incomplete/inconclusive without weekend occupancy data. However, if triggers in the Recreation Facilities Plan are met in the future, then NID will evaluate the type, location and scope of additional camping opportunities; 3) NID believes a high cost connecting trail is not reasonable simply to increase the use of the existing Woodcamp Interpretive Trail; 4) NID believes the host site at Woodcamp Campground is adequate to meet the needs at Findley Campground as well as Fir Top and Silvertip Group campgrounds (48 sites total) - one host is used for East Meadow Campground which has 46 sites total; 5) NID does not believe an additional vault toilet is reasonable for the reasons stated in NID's response at East Meadow Campground; and 6) NID will maintain the existing camp unit compacted surface but upgrade the appropriate number of campsites to accessible standards including clear/level surface when the facility is rehabilitated per the schedule and guidelines in the Recreation Facilities Plan.
Woodcamp Campground: Within 3 years of license issuance: • Replace one toilet with new double unit accessible vault toilet and pave access route to the toilet entrance. • Replace entrance sign. (p. 87).	NID has adopted the proposals to replace the entrance sign, but believes the newly installed 2-unit vault toilet meets the needs of the 20 site campground. Thus, the older, wooden toilet building will be removed near the end of its useful life (no later than10 years after license issuance when the majority of the campground rehabilitation will occur).

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 10 years of license issuance [at Woodcamp Campground], redesign and reconstruct the campground to meet the current FS design standards, FSORAG and requirements of the ADA or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs. • Where feasible, regrade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers, hydrants and grills to meet FSORAG. • Replace bulletin boards and signs. • Lengthen and widen spurs. Where feasible, provide pull through spurs to provide longer spurs • Replace wood barriers and unit markers. • Replace fire rings and picnic tables. • Reconstruct entrance station. • Construct trash bin pads with paved approaches from the roadway. • Provide additional trailer and vehicle parking • Reconstruct road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. The road surface shall be paved. Road geometry and widths will be specified at the time of the design. • Provide asphalt treatment of spurs (as specified in the Pavement Management System). • Replace gate. • If feasible, construct and maintain a non-motorized trail connecting the campground with the Woodcamp Interpretive Trail. • Provide a host site which includes water, septic (or holding tank), and solar (or other) power. (p. 87).	NID adopted all of the proposals with the exception of 1) constructing a connector trail to the Woodcamp Interpretive Trail as explained in previous responses to the same request; 2) reconstructing/treating the road as NID will resurface the road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1; 3) replacing the entrance station since an entrance station does not exist at this facility; and 4) NID will maintain the existing camp unit compacted surface but upgrade the appropriate number of campsites to accessible standards including clear/level surface when the facility is rehabilitated per the schedule and guidelines in the Recreation Facilities Plan.
Woodcamp Picnic Area: Within 5 years of license issuance, redesign and reconstruct the picnic ground to meet the current FS design standards, FSORAG and requirements of the ADA or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction.• Address accessibility. Evaluate opportunity to provide accessibility at all picnic sites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between accessible sites, constructed features, toilet and parking area.• Where feasible, regrade picnic units to 600-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide a clear, level compacted ground surface around tables, hydrants & grills to meet FSORAG.• Replace six picnic tables with accessible tables.• Provide 6 accessible pedestal grills.• Replace one 4-unit toilet (by the beach) with a 2-unit vault toilet.• Provide signed accessible parking spaces.• Reconstruct road. The road shall be a paved road, designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths will be specified at the time of the design.• Replace visitor info board and signs.• In conjunction with the FS, determine feasibility of providing a one-way road to the lower toilet with parking for up to 4 vehicles and signing stating that parking is available for accessible parking (2 spaces) and loading and unloading only (2 spaces). The purpose of this would be to facilitate the use of the beach. If this determined not to be advisable, build accessible to path to beach from parking areas, if feasible.• Address the opportunity to provide pull thru RV overflow paved parking sites similar to the existing Pass Creek Overflow. (p. 87-88).	NID adopted all the proposals with the exception of the proposals related to reconstructing the road and developing a road or accessible path to the beach access. NID will resurface the existing road to the standards outlined in the Recreation Facilities Plan in Section 3.2.1. NID believes it is impractical and not cost-effective to retrofit the picnic area for accessibility due to the steep slope from the parking area to the beach/picnic area and the steep slope of the beach area as the water recedes throughout the recreation season. In addition, NID will include the parking area as a potential option for expanding RV overflow camping opportunities in relation to the proposal to provide additional boat parking spaces at Pass Creek Boat Ramp and/or Pass Creek Overflow Campground.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Woodcamp Boat Ramp: Within 5 years (if not completed in the current license), reconstruct boat ramp to California Department of Boating and Waterways and current accessibility standards to provide a 2-lane ramp with an accessible courtesy dock and sidewalk. Ramp shall provide for launching in the typical (25-year average) low water pool on September 30. The following includes, but is not necessarily limited to, additional elements of this reconstruction: • Pave and stripe parking area; provide & designate accessible parking. • Replace one 4-unit toilet with an accessible 2-unit vault toilet. • Provide ORAR between parking and toilets. • Provide prominent signing regarding submerged stumps and rocks. • Provide informational sign that meets FS standards. • Reconstruct the trail and footbridge between picnic area and boat ramp. If feasible, provide for accessibility on this trail. Provide appropriate signing on trail. (p. 88).	NID will complete all the work task proposals identified with the exception of reconstructing the existing shoreline trail to accessible standards; and reconstructing the roads. NID will maintain the existing non-accessible trail; however, the survey data did not identify any demand for an accessible trail and the high cost to construct an accessible trail is not congruent with the demand nor the practicality in this location. NID will rehabilitate the roads to the standards outlined in the Recreation Facilities Plan in Section 3.2.1, and not according to the proposed Pavement Management System, which lacks adequate detail for NID to evaluate in comparison to NID's proposal.
Silvertip Group Campground: Within 5 years of license issuance: • Replace remaining tables, including serving tables. • Replace unit marker. • Replace 2 information signs. • To the degree feasible, provide accessible routes in both group sites (between cooking and eating areas, restrooms, tent camping areas, parking and group fire ring areas). Address opportunities to provide an accessible route to Lakeside unit from the parking area, if feasible. • Design and construct accessible trail from Cove campsite to the shoreline, if feasible. • Regrade tent pad areas. Provide for a minimum of 1 accessible tent pad in each group area. • Regrade group cooking and eating areas. • Reconstruct interior campground roads and parking area; designate/sign one van accessible parking space per unit. Provide 10 additional paved vehicle parking. (p. 88-89).	NID adopted this proposal with modification. NID adopted all the proposals, except constructing accessible trails from the parking area to the Cove site and then to the shoreline. The slope and terrain are not practical for constructing accessible routes without lengthy and expensive trail construction along the steep slopes including switchbacks requiring accessible turnarounds. NID will replace the existing facilities and group features with accessible models per the rehabilitation schedule in the Recreation Facilities Plan. Also, NID will rehabilitate the roads to the standards outlined in the Recreation Facilities Plan in Section 3.2.1, and not according to the proposed Pavement Management System, which lacks adequate detail for NID to evaluate in comparison to NID's proposal.
Jackson Point Boat-In Campground: The current Yuba Bear Exhibit R (2000) included "Remove concrete stoves and provide fire rings and picnic tables at new sites on Jackson Point to promote more efficient use. Jointly evaluate sanitation facility needs at Jackson Point and determine future strategy within three years." Because most of this has not been accomplished, the USFS believes that some of the work listed below will be completed during the existing license. Most notably, the waste disposal of the existing toilets needs to be addressed immediately. However, if facility replacements are not completed during the current license, within 3 years of license issuance, redesign and reconstruct the campground to meet the current FS design standards. Relocate sites that are currently not being used. Remove unused facilities.• Replace 2 toilets with toilet facilities that are acceptable to the Forest Service and Sierra County Sanitarian. NID shall be responsible for the logistics associated with waste disposal.• Replace fire rings and tables.• Regrade tent pads.• Replace signs.• Install unit markers.• Install bulletin board.• Install metal animal proof food storage lockers.• Regrade camp units to 900-square-foot level compacted surface, with maximum 3 percent cross slope where feasible. At a minimum, provide graded tent pad and clear floor space around tables, food locker, and grills.• Address opportunities to provide for accessibility, where feasible. (p. 89).	NID adopted all the recommendations with the exception of the timing and provision of accessibility. Since the site is boat-in access only with a very steep shoreline to access the campsites, NID does not believe it is necessary to replace the existing site amenities with accessible models. NID will rehabilitate the facility per the schedule and guidelines in Section 3 of the Recreation Facilities Plan.
Jackson Vista Point: Within 5 years of license issuance, gravel the parking area (p. 89).	NID has adopted the recommendation without modification.
Jackson Sanitary Dump Station: Within 1 year of license issuance, construct a dump station with a leach field in the vicinity of the eastern portion of the reservoir. This could be on National Forest System land or NID land. Potential locations may include land near the 07 road in T.19N, R.13.E, Section 16 or 22 (near the intersection of the 88 road). Provide potable water with RV filling station. If feasible, design with sufficient space so that, if a decontamination station is needed in the future, it can be collocated with this facility (unless this potential need for a decontamination station is addressed elsewhere). (p. 89-90).	NID did not adopt this proposal. Instead, the NID proposes to decommission this facility since it is not cost-effective, and the existing system design does not handle the limited demand. Furthermore, the town of Truckee (34 miles away) provides dump station that can meet the needs without the need for NID to construct a new dump station.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Woodcamp Interpretive Trail: Provide trail maintenance annually. Work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, performing spring and fall drainage maintenance (including installing new drainage structures as needed), bridge maintenance and loose rock removal. On a five year cycle, trail maintenance will also include brush cutting; embedded rock and root removal; slough and berm removal; and (if appropriate) turnpike, retaining wall and switchback maintenance. Reconstruction needs (including bridge reconstruction) will be addressed on an "as needed" basis. Within 5 years of license issuance: • Install a more prominent trailhead sign at start of trail. • In consultation with FS develop, install and maintain interpretive signs (to replace the existing brochures). • Improve parking area as needed. (p. 90).	NID did not adopt this proposal because this facility is not a Project facility, and is located outside the FERC Project Boundary.
Trails from Woodcamp to English Dam and Above Vista Point: Within 5 years of license issuance, obtain a trail easement from the private land owner. Construct and maintain a new (Class III) non-motorized trail from the vicinity of Woodcamp Complex to English Dam with interpretation of English Dam site. Construct as much of this trail as possible near the shoreline, (although topography will dictate the location.) If feasible, connect this trail to the Woodcamp Interpretive Trail. If it is not feasible to connect with the Woodcamp Trail, provide trailhead facilities. (p. 90).	NID did not adopt this proposal. The proposed trail would be located outside of the FERC Project Boundary and therefore is not related to the Project. However, NID would discuss this proposal outside of the Project license.
Within 15 years of license issuance, obtain a trail easement from the private land owner. Construct and maintain a (Class III) non-motorized trail from the Vista Point and Aspen Group Campground to a lake overlook point above the quarry. (p. 90).	NID did not adopt this proposal. The proposed trail would be located outside of the FERC Project Boundary and therefore is not related to the Project. However, NID would discuss this proposal outside of the Project license.
Provide annual maintenance of these trails. The work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of construction and maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, bridge maintenance (if appropriate), performing spring and fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; loose rock and root removal; slough and berm removal; and turnpike, retaining wall, switchback maintenance and other work needed based on trail design. (p. 90-91).	NID does not propose constructing the agencies proposed trails that occur outside the FERC Project Boundary. Therefore as such, they do not propose to maintain these trails.
Milton Lake: Note: the FS would like to meet with the NID in the field in 2011 to review the NID and FS proposals. Within 3 years of license issuance: • Install barriers to limit location of parking and driving. Identify six dispersed campsites and provide parking for two cars at each. • Limit shoreline access to one single-lane car-top boat launch with barriers to allow direct vehicle access to the shoreline for boat launching purposes only, prevent driving along shoreline. • Replace signs. • Construct accessible pathway to toilet from a nearby parking spot. • Address accessibility as required in Development Scale 2 campgrounds. • Each year, at the Annual Coordination Meeting, address if there is a need for food lockers. If animal problems arise, install animal resistant food lockers at each campsite the following year. (p. 91).	NID has adopted the proposal without modification. In addition, NID would be willing to meet with the Forest Service in the field to review improvements proposed by NID in the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Implementation of the camping closure should be within 5 years [at Bowman/Faucherie Area]. By this time, through construction of additional facilities, the developed overnight camping capacity should be sufficient to accommodate the mid-summer non-holiday weekend camping use projected for the following 10 years. In addition to construction, implementation should include: • Working jointly with FS and county sheriff to limit camping (on National Forest System and NID lands) to developed campgrounds or designated sites only. This will involve a forest order on National Forest System land. The closure should encompass all land within 1,500 feet of roads from Bowman Dam on the west, Jackson Creek Campground on the east, and Faucherie Dam on the south. The corridor may need to be widened or narrowed in a few areas (such as the south side of Sawmill Lake) to meet the intent of allowing boat-in camping on the non-vehicle accessible side of these lakes but limiting camping to designated sites where there is vehicle access. • Closure, removal, and restoration of all dispersed campsites in this corridor that are not converted to designated camping or day use sites. Provide appropriate signage and maintain these closures throughout the license period. Barricade these sites. Where ever feasible, barricade in a way that provides day-use parking adjacent to the road if a site is likely to be used for day use. (p. 92-93).	NID adopted this proposal with modification. NID supports the Forest Service recommendation to limit camping to developed campgrounds and designated campsites along the recommended corridor. However, NID is not responsible for camping closures, removal of sites, and/or restoration of sites outside the FERC Project Boundary.
Within 5 years of license issuance [at Bowman Lake], establish gravel parking areas with barriers and information kiosk at the inflow of the reservoir and near the dam and Graniteville Road junction. (p. 92).	NID adopted the proposal except for the proposal to establish a gravel parking area near the dam at the Graniteville Road junction. NID will still install an information kiosk that identifies the recreation opportunities and regulations at Bowman Lake, which NID believes is valuable and practical at this location. NID initially proposed to establish this gravel parking area in the Recreation Facilities Plan in the DLA. However, after further evaluation of the proposed site, NID determined the proposed parking area is impractical. The proposed parking area does not provide the public with reasonable and safe access to the Project reservoir shoreline due to very steep terrain and large rock outcrops. Aside from this location at the road junction, suitable land does not exist to develop a parking area that would provide reasonable and safe access to the shoreline. Rather the existing roadside parking is the best available parking option until the Bowman Lake Road and McMurray Lake Road junction, where an informal parking area already exists.
Within 10 years of license issuance [at Bowman/Faucherie Lake Area]: • Provide a potable water system at one of the campgrounds in the Bowman/ Faucherie/Canyon Creek/Jackson Creek/Sawmill area. Provide signing at the other campgrounds as to where potable water can be obtained. As part of the distribution system for the potable water provide additional hydrant(s), signs and parking for a filling station for campers from other campgrounds.• Construct a host campsite that includes water, septic (or holding tank), and power (i.e. solar panels) at the campground where this potable water is provided. (p. 93).	NID did not adopt this proposal. NID believes providing a water system at Bowman, Sawmill or Faucherie lakes is not compatible with the desire to continue to provide a semi-primitive setting that is unique for the Project, which is predominantly a developed recreation setting at other reservoirs, particularly Jackson Meadows and Rollins reservoirs.
Bowman Lake Informal Boat Ramp (west end of Bowman near dam): Within 5 years of license issuance: • Regrade to create slight outslope to facilitate water drainage. Create "T" turnaround, near but above the high-water line, to meet appropriate standards at time of design (currently 20 feet wide by 40 feet long is recommended). • Sign as a "Car-top/Hand Launch" opportunity (no trailers). • Install barriers on the south side of the access road to prevent vehicles from accidentally slipping off the road and into Bowman Lake. (p. 93).	NID did not adopt this proposal. NID believes the existing informal boat ramp is adequate to meet the demand (less than 4 observed watercraft on average per weekend, and a maximum of 10 observed-at-one-time during 2009 season).

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Bowman Lake Campground: Within 5 years of license issuance, reconstruct and expand Bowman Campground as a Development Scale 2 campground. Base the size of the campground on the amount of available land and projected demand. • Replace existing toilet. • Install animal resistant food storage lockers. • Replace signing, entrance station, and fire rings. • Identify parking spurs sufficiently to prevent indiscriminate driving, and control vehicle access through the use of barriers. • Tables. • Self-service fee collection (if NID desires to recoup some of the operational costs). Opportunities to expand Bowman Campground that should be explored include: • Establish two walk-in campsites just west of the existing designated sites (across an ephemeral drainage). • Develop and designate other dispersed sites on the northeast shoreline of the lake, east of the Milton Bowman Canal [Milton-Bowman Tunnel outlet]. Strategically place toilet to accommodate future potential group camp. • Expand camping on developable lands west of the current campground by constructing approximately 20 sites on NFS land (depending on land development capability) in the Tree Camp area. There appears to be capacity for approximately 10 sites south of the road and 10 sites north of the road. This area already has several metal fire rings in place south of the county road. • These new sites should be at the same development scale and contain the same amenities as the rest of Bowman campground. Provide additional toilets to serve these sites. (p. 93-94).	NID adopted all recommendations except the expansion. The occupancy is low at the campground and NID will rehabilitate the existing facilities.
Bowman Lake Group Campground: When triggers at Faucherie, Canyon Creek, and Sawmill Group Campgrounds indicate the need, create a 25 PAOT group campground on the north side of the county road, just east of the Milton-Jackson Canal. Install animal resistant food storage lockers, tables, signing, and group fire ring. Identify parking area sufficiently to prevent indiscriminate driving, and control vehicle access through the use of barriers. Delineate the extent of the site. Install a toilet if the Bowman Campground toilet cannot logically be shared with this site. (p. 94).	NID did not adopt this proposal. While NID believes that a group campground may be warranted at Bowman Lake or elsewhere along the Bowman/Sawmill/Faucherie lakes corridor, NID does not believe the location, size and details of such a new campground should be determined until the need arises. As such, NID would examine such new development when triggers are met for this area.
Bowman Lake Peninsula Dispersed Sites: Within 10 years of license issuance, if determined appropriate in the basin-wide plan, convert the dispersed sites located approximately one-quarter mile west of Bowman Campground to day use picnic sites. This would include designating and controlling parking with barriers to minimize erosion potential, replacing fire rings with pedestal grills, installing picnic tables, installing appropriate signage and creating walking paths to the sites. If picnic sites are determined to be not desired at this location, close and rehabilitate these campsites within 5 years. (p. 94).	NID did not adopt this proposal. NID does not believe a designated day use/picnic area is warranted, particularly since visitors surveyed did not indicate a preference for day use facilities. NID will provide visitors with day use access to the reservoir at the proposed designated parking area at Jackson Creek inflow.
Sawmill Family Campground: Within 5 years of license issuance, build drive-in family campground on NID and/or National Forest System land. The facility shall meet FS design standards, FSORAG and requirements of the Americans with Disabilities Act (ADA) or other current standards at the time of the design. Campsites should be located at least 100 feet from the lake. Provide toilets with a minimum of one toilet seat per 35 PAOT and spaced no farther than 300-500 feet from any campsite (consistent with standards at the time of design), self service fee collection (if NID desires to recoup some of the operational costs), animal resistant food storage, tent pad, gate, graded living area, informational kiosk, site markers, graveled road and parking spurs (barricaded with boulders), tables and fire rings. Provide garbage collection. The capacity of the campground should be based on available land and demand. FS estimates that there is room for 15-20 campsites (some sites being on the north side of the dam access road). (p. 94).	NID did not adopt this proposal, NID believes developing a family campground at Sawmill is not compatible with the desire to continue to provide a semi-primitive setting that is unique for the Project, which is predominantly a developed recreation setting at other reservoirs, particularly Jackson Meadows and Rollins reservoirs.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 5 years of license issuance [at Sawmill Lake], grant FS (through donation) a right of way on the Grouse Ridge Trail and other public system trails on NID land. As additional trails (specified in this Plan) are constructed, donate a right of way for these trails. (p. 95).	NID did not adopt this proposal. However, NID would be willing to discuss this request outside of the Project license.
Sawmill Trail and Trailhead: Within 5 years of license issuance:• Construct a safe crossing of the Sawmill Lake spillway or effectively close the spillway to recreation traffic and construct a non-motorized trail around the south side of the lake, connecting to the trail to Grouse Ridge Trail between Sawmill Lake and Rock Lake. Reconstruct the trail from Sawmill Lake to Rock Lake. (If the spillway is effectively closed, a portion of the existing Grouse Ridge trail can be abandoned.)• Provide trailhead facilities including a single vault toilet, parking for up to ten cars (with room for expansion, if feasible), trailhead signing, 3 picnic tables, 3 pedestal grills, information kiosk, and barriers. (Depending on the location of this trailhead, it may be feasible to utilize one of the campground toilets if it is located within 500' of the trailhead. If this is the case, provide signing from the trailhead to the toilet.) Construct a (Class III) nonmotorized trail connecting the family and group campgrounds on Sawmill Lake to the newly constructed trail.• Provide maintenance on this trail annually. Work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, performing spring and fall drainage maintenance (including installing new drainage structures as needed) bridge maintenance and loose rock removal. On a five year cycle, trail maintenance will also include brush cutting; embedded rock and root removal; slough and berm removal; and (if appropriate) turnpike, retaining wall and switchback maintenance. Reconstruction needs (including bridge reconstruction) will be addressed on an "as needed" basis. (p. 95).	NID did not adopt this proposal. A crossing at Sawmill Lake spillway is not a safe option to access the Grouse Ridge Trail on the south side of the lake. NID does not believe there is sufficient demand to warrant developing a trail or trailhead at Sawmill Lake that connects to the Grouse Ridge trails.
Faucherie Group Campground: Within 5 years of license issuance: • Replace the toilets at Faucherie Group Campground and Day Use area. • Replace tables. (p. 96).	NID has adopted the proposal.
Within 5 years of license issuance [at Faucherie Lake]: • Provide effective vehicle barriers between the Faucherie spillway and dam to prevent vehicle access into the non-motorized area, if monitoring indicated breaching by OHVs. (p. 96).	NID has adopted the proposal.
Within 10 years of license issuance [at Faucherie Lake Group Campground], redesign and reconstruct the group campground to meet the current design and accessibility standards and requirements. The following includes, but is not necessarily limited to, the specific elements of this reconstruction: • Replace fire pits as needed. • Regrade group cooking eating and living areas with accessible paths between areas and constructed features; designate/sign van accessible parking space. • Regrade tent pad areas. • Expand parking to accommodate 5 vehicles for each group site (total of 10 vehicles). • Address opportunities to provide vegetative screening between the 2 group units or move units farther apart to improve privacy, if feasible. (p. 96).	NID adopted the proposal with modification. NID adopted all of the recommendations, except those to expand the parking areas and provide vegetative screening or further separation of the 2 group units since the group campground footprint lacks the substrate to add vegetative screening (loose rock and sand on granite) and moving outward from the existing locations is not feasible due to the surrounding terrain (granite outcrops and steep shoreline). However, during the rehabilitation work, NID will make every attempt to screen the site amenities between the group sites given the existing vegetation and natural terrain. Regarding parking expansion, the day use area provides ample overflow parking for the group campground; and space is already limited directly at the group campground.
Within 10 years of license issuance [at Faucherie Lake]: • Gravel campground/day use area roads and parking areas (NID may choose to grind the existing pavement in the loop and use as gravel). Provide parking signage and an information kiosk about the Grouse Lakes non-motorized area at the Faucherie day use/boat ramp area. Include information about fire, sanitation and safety; and interpretive information about the natural resources (including protection of resources, such as prevention of the spread of amphibian chytrid fungus). (p. 96).	NID has adopted the proposal without modification. In addition, NID will post educational materials at the information board related to reducing the spread of amphibian chytrid fungus as provided by CDFG and/or Forest Service.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Within 2 years of license issuance [at Faucherie Lake]: • Re-grade and resurface boat ramp with a surface that will withstand wave action. • Enlarge the current "T" turn around area just above the high water line to meet appropriate standards at time of design. (Currently 20' wide by 40' long is recommended). (p. 96).	NID adopted this proposal with modification. NID has adopted the recommendation to re-grade the boat ramp surface, but resurfacing the ramp to withstand wave action would likely entail paving the ramp, which is not consistent with the level and type of use.
French Lake: Within 5 years of license issuance: • Grade the existing parking area & install barriers to keep OHVs from accessing lake. • Install and maintain trailhead sign. (p. 96).	NID did not adopt this proposal for two reasons. First, the parking area/trailhead is located outside the FERC Project Boundary. Second, the trail/road does not receive enough use to warrant site developments.
Within 10 years of license issuance [at French Lake], construct a hiking trail from the day use area at Faucherie Lake (or nearby area) to French Lake. If the trailhead is not co-located with other facilities, provide associated trailhead facilities (including parking with barriers, toilet, and bulletin board) (p. 97).	NID did not adopt this proposal because the trail is located outside the FERC Project Boundary.
Canyon Creek Area: Some of the proposals and schedules associated with campground construction and expansion along Canyon Creek may be subject to modification based on the results of the basin-wide plan. Within 5 years of license issuance, if determined appropriate in the basin-wide plan, convert the two dispersed campsites just upstream of the road crossing of Canyon Creek below Faucherie (Canyon Creek Cluster#2) to two picnic sites with tables and pedestal grills. Create two parking spots near the road and block vehicle access down to the stream's edge. If picnic sites are determined to be not desired at this location, close and rehabilitate these campsites. (p. 97).	NID did not adopt these proposals because the dispersed sites referenced are outside the FERC Project Boundary on Canyon Creek.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Canyon Creek Campground: Within 5 years of license issuance, redesign and reconstruct the campground to meet the current FS design standards, FSORAG, and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Convert the seldom used sites on the westside of campground (sites west of the entrance with little to no shade) to a group campground (minimum 25 PAOT). During construction, take extra precautions to protect all vegetation. Provide for adequate separation between the individual family sites and the new group site. Provide appropriate group campground facilities including serving and eating tables, group campfire ring, tent pads, and graded cooking area. • Provide an information/interpretive display about the recreation opportunities and nonmotorized aspect of the Grouse Lakes area. Include information about fire, sanitation and safety; and interpretive information about the natural resources (including protection of resources, such as prevention of the spread of amphibian chytrid fungus). • Address the opportunity to provide shade structures. • Replace two existing toilets with new accessible vault toilets. Provide paved turnout in front of each toilet, and paved access route to the toilet entrances. • Install animal resistant food lockers. • Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs. • Where feasible re-grade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers and grills and other constructed features to meet FSORAG. • Replace bulletin boards and signs. • Replace barriers and unit markers. • Replace fire rings and picnic tables. • Reconstruct entrance station and signs. Install a self-service pay station if the NID wishes to recoup some of the operating costs. • Construct trash bin pads with paved approaches from the roadway. • Provide animal resistant trash receptacles and corresponding garbage service. • Widen and lengthen spurs. • Provide road surface treatment of all interior campground roads & spurs as prescribed by the Pavement Management System. Provide a paved parking turnout adjacent to the entrance station. • Expand Canyon Campground immediately to the east by creating 10-15 new campsites between the road and Canyon Creek, within a mature stand of trees. Campsites should be located at least 100 feet from the creek. Facilities provided for in the expansion should be similar to those in the existing campground (with the addition of animal resistant food lockers and trash receptacles.) Convert the existing dispersed camping sites downstream of the triple culverts (Canyon Creek Clusters #1) to developed campsites as part of the expansion. • Install accessible toilet for this new portion of the developed campground. Provide a toilet within 350 feet of each campsite and a minimum of one toilet per 35 PAOT. • Remove and restore all remaining dispersed sites along Canyon Creek that are not incorporated into the expansion of Canyon Creek Campground. (p. 97-98).	NID adopted all the recommendations, except the following: 1) conversion of west side to group campground; 2) constructing trash bin pads; 3) widening/lengthening spurs; 4) expansion of the campground to the east; 5) removal/restoration of dispersed campsites along Canyon Creek; 6) reconstructing the road (Pavement Management System); and 7) regarding/sizing camp unit compacted surface. First, NID does not believe the level of use requires expansion. Second, NID shall provide animal resistant trash cans, which is sufficient for the size of the campground and existing use (similar to what is provided at Faucherie Group Campground). Third, NID believes the existing spurs are adequate for high clearance/4WD vehicles that typically use the campground. Widening and lengthening the spurs is not necessary since the campground is not intended for RVs or larger vehicles as the access roads to the campground require high clearance/4WD vehicles. Fourth, NID believes the existing campground provides an adequate number of campsites for the level of use and does not believe expansion is warranted at this time. In addition, the dispersed campsites are outside the FERC Project Boundary. Fifth, the dispersed campsites along Canyon Creek are outside the FERC Project Boundary. Sixth, NID will rehabilitate the roads to the standards outlined in the Recreation Facilities Plan in Section 3.2.1, and not according to the proposed Pavement Management System, which lacks adequate detail for NID to evaluate in comparison to NID's proposal. In addition, NID will post educational materials at the 1-panel information board related to reducing the spread of amphibian chytrid fungus as provided by CDFG and/or FS. NID will maintain the existing camp unit compacted surface but upgrade the appropriate number of campsites to accessible standards including clear/level surface when the facility is rehabilitated per the schedule and guidelines in the Recreation Facilities Plan.

Table 6.6.3-1. (continued)

Specific Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**NID's Reply**
Jackson Creek Campground: Within 10 years of license issuance, redesign and reconstruct the campground to meet the current FS design standards, FSORAG and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. The following includes, but is not necessarily limited to, the specific elements of this reconstruction. • Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs. • Where feasible regrade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope, where feasible. At a minimum, provide graded tent pad and clear floor space around tables, food storage lockers and grills to meet FSORAG. • Replace toilets with new accessible vault toilet. Provide paved turnout in front of each toilet, and paved access route to the toilet entrances. • Replace bulletin boards and signs. • Replace wood barriers and unit markers. • Replace fire rings and picnic tables. • Reconstruct entrance station and signs. Install a self-service pay station if the NID wishes to recoup some of the operating costs. • Construct trash bin pads with paved approaches from the roadway. • Install animal resistant food storage lockers. • Provide animal resistant trash receptacles and corresponding garbage service. • Widen and lengthen spurs. • Pave all interior campground roads and spurs. Include a paved parking turnout adjacent to the entrance station. (p. 98-99).	NID did not adopt this proposal because the campground is not a Project facility and is located outside the FERC Project Boundary.
Dutch Flat Afterbay: Within 5 years of license issuance provide the following day use facilities on BLM lands: • Five picnic sites with accessible tables.• Clear, compacted, level surface round each picnic table that meets BLM design standards.• Toilet facility.• Information kiosk.• Maps and brochure.• Bear-proof trash containers.• Gravel and outline parking area. (p. 99).	NID adopted this proposal, except installing a toilet facility and bear-proof trash containers since neither of these facilities are consistent with the low level of use at the Afterbay.
Chicago Park Powerhouse: Within 5 years of license issuance, provide the following day use facilities on BLM lands: • Delineated parking area. • Information kiosk. • Maps and brochure. • Toilet facility. (p. 99).	NID did not adopt this proposal and believes constructing recreation facilities at this location is impractical for three key reasons. First, NID has public safety concerns at the location of the proposed facilities since the river reach is operated as a peaking reach whereby flows fluctuate significantly throughout the day, especially during the summer season; and NID does not want to encourage recreation use at this location with the peaking nature of the reach and shoreline safety concerns. Second, the access road (Chicago Park Powerhouse Road) is a private road that NID has an easement solely to operate and maintain the Project facilities (Chicago Park Forebay and Powerhouse). The public does not have an easement for access along this road. Furthermore, the private landowners may decide to gate the road, which would not allow any further access to the Chicago Park Powerhouse area. Third, NID may pursue a permitted gravel operation (as it has in the past) at the location of the proposed facilities.

6.6.3.2 Drum-Spaulding Project

6.6.3.2.1 PG&E's Proposed Measures

As described above, PG&E's Proposed Project includes four measures specifically related to the protection and enhancement of recreational resources:

- Proposed Measure DS-GEN1: Annual Consultation with Forest Service, BLM and BOR
- Proposed Measure DS-AQR3: Fish Stocking in Lake Spaulding
- Proposed Measure DS-RR1: Implement Recreation Facilities Plan (includes recreation improvements and use monitoring program)
- Proposed Measure DS-RR2: Provide Recreation Flow Information
- Proposed Measure DS-LU2: Implement Fire Prevention and Response Plan on Federal Land[6]

Each of these measures and the related rationale is provided in full in Attachment E7.

6.6.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that fully provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope, purpose and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as required by the regulations and FERC PM&E Guidance. However, some commenters made requests or proposals that provided PG&E with enough information that PG&E could address at least components of the request. In addition, because the resource agencies made numerous recreation requests, which while not rising to the level of proposed measures were nevertheless specific, PG&E sought to capture each of those proposals in Table 6.6.3.2-1 below. PG&E has made its best effort to address each of the more specific recreation proposals and, when not adopted, provide reasoning, including study results, on why the proposal was not adopted, adopted with modification, or adopted in part.

[6] Section 8 of the Fire Prevention and Response Plan, filed in Appendix E8 of this FLA, addresses recreation resources.

General Recreation Proposals by Agencies and Other Relicensing Participants

Minimum Instream Flows

In its February 1, 2011 letter, Foothills Water Network (FWN) proposed minimum instream flows on four reaches for recreation purposes:

> The PG&E FLA flow measures should include minimum instream flows that enhance the angling experience in the Bear Valley, which is a popular fishing site. (p. 57).
>
> The FLA's minimum instream flows should take into account the interest in wilderness angling on this reach [Bear River below Drum Afterbay]. (p. 58).
>
> PG&E's FLA should include minimum instream flows that enhance recreational fishing on Auburn Ravine. (p. 64).
>
> PG&E's FLA minimum instream flows in these reaches [Rock Creek and Dry Creek] should take into account interest in recreational angling. (p. 65).

PG&E did not adopt these proposals because the FWN did not provide flow levels with adequate specificity for PG&E to be able to assess the environmental consequences or the costs of the recommendation.

Real-Time Flow Information and Warning Signs

FWN also made requests regarding providing real-time flow information and flow fluctuation warning signs on certain reaches:

> Provide online real-time flow information to facilitate recreational angling on this reach [NF of the NFAR] (p. 61)
>
> FLAs should include a condition that online gauge information will be 15-minute data. The condition should also say that both instantaneous and historical data should also be posted online. The online real-time gauge information should be made available to CDEC for posting also. (p. 69)
>
> The PG&E FLA should include real-time online flow information should be provided for Bear Valley. The PG&E FLA should also include installation of staff gages and flow warning signs at the sections of the Bear Valley where anglers fish to provide warning and information as to sudden and high flow fluctuations. (p. 70)

PG&E did not adopt the proposal for the North Fork of the North Fork American River. An upstream gage would not reflect heavy natural flow accretions along the river reach in the spring; and summertime flows have minimal variation.

PG&E did not adopt the proposal related to providing 15-minute online flow information. The request does not provide adequate detail to evaluate, particularly regarding what specific locations PG&E should provide real-time flow information. However, PG&E currently provides real-time flow information to Dreamflows for the following gages: South Fork Yuba River at Cisco, South Fork Yuba River at Langs Crossing, Bear River at Highway 20, Bear River below Drum Afterbay, Fordyce Creek below Lake Fordyce. PG&E will investigate whether CDEC can accommodate PG&E's real-time flow data; and USGS provides public information on historical data for all of the listed gages.
Regarding the Bear River at Bear Valley, PG&E currently provides real-time flow information for the Bear River at Bear Valley (YB-198 gage) on Dreamflows. PG&E will install additional flow warning signs along the Bear River in the Bear Valley, but will not install staff gages.

<u>Weekly Forecasting of Flow Information</u>
FWN also made requests regarding providing weekly forecasting of flow information:

> The Network requests that the Licensees' FLA's include a condition for weekly forecasting of flows on below Milton diversion, Bowman Reservoir, Spaulding Reservoir, Drum Afterbay, Dutch Flat Afterbay, and Rollins Reservoir to facilitate angler, boater, and trail crossing recreational use. It is our understanding that the Licensees provide predicted flows as submitted to the Cal ISO every week throughout the year. We understand that the electricity market is in constant flux, and can change the Licensees' operations. We suggest Licensees include a caveat with its weekly flow predictions that flows may not meet the predictions and can change without notice, but that Licensees will make a good faith effort to post changes to the flow predictions to the website as they become known. This weekly service will provide information for anglers about when flows will rise, thereby ameliorating the safety issues involved in wading and angling activities (i.e., prevent anglers from becoming stranded on one or the other side of the river because of rising water). Forecasting will also notify anglers of prime angling opportunities. The weekly forecasting will also aid trail crossers in planning their equestrian rides and trail runs so they time their crossings when the flow is appropriate. The forecasting will allow boaters to plan to take advantage of the flows provided to the Confluence and Mammoth Bar Runs a week in advance. (p. 69-70)

PG&E did not adopt this proposal. PG&E does not provide the Cal ISO with predicted flows as stated by FWN. As noted by FWN, weekly flow forecasts can change unpredictably based on weather conditions, power demand and water availability. Any prediction would be constantly in flux. In addition, the "Confluence" and "Mammoth Bar" runs are not related to the Project, but rather part of PCWA's Middle Fork American River Project license.

<u>River Fluctuation Signage</u>
FWN also made a request for the development of signs regarding fluctuating flows:

> We recommend that licensees work with the California Dept of Parks and Recreation to develop signs to inform the general public about fluctuating water levels and the potential

> danger and that the licensees' FLA include a condition that they will provide the appropriate signage. (p. 70).

PG&E did not adopt this proposal. The FWN proposal does not provide enough detail to fully assess specifically what and where PG&E should provide the proposed signage. PG&E's internal procedures are to notify appropriate downstream entities on the South Yuba River for unusual water releases from Lake Spaulding. This includes notifying the South Yuba River State Park (CDPR), Washington Store, Pine Aire Campground, Nevada County Sheriff (24-hour dispatch), River Rest Resort, and the Town of Washington fire chief.

Bear River Trail Parkway Facilities and Access

FWN also made requests regarding the Bear River Trail Parkway:

> The PG&E and NID FLA's should include measures to support and invest in the Bear River Trail Parkway (p. 71); and
>
> The PG&E and NID FLA's should include measures for the following proposed access, facilities, and trail related to their properties on the Bear River Trail Parkway [includes a table with general trail segments, access and uses] (p. 72-75).

PG&E did not adopt these proposals. There does not appear to be a nexus between the Project and the proposed Bear River Trail, which is located on non Project lands (i.e. outside the FERC Project Boundary) that are not affected by the operations and maintenance of the Drum-Spaulding Project.[7]

Recreation Facilities Plan Content

In their joint letter, the agencies made the following recommendations related to the content of a Recreation Facilities Plan (as applied to PG&E):

> Address the following, at a minimum, related to the Recreation Plans (if full plans cannot be developed in time for the FLAs).
>
> Drum-Spaulding and Yuba-Bear Recreation Plans
>
> - Place toilets in most areas where camping is encouraged.
> - Limit or concentrate camping to developed sites (with toilets) in various areas.
> - Collect garbage at additional sites.
> - Recognize that rather than replacing constructed features in kind when they reach the end of their useful life, there is a need to address redesign to meet FSORAG and assure the site and features are in the optimum location.

[7] FWN made another infrastructure improvement recommendation stating, "PG&E's FLA should include installation of a vehicle bridge over Fordyce River where the Sierra Trek Jeep Jamboree. [sic]" FWN did not explain the nexus between this request and PG&E's Project. The annual Sierra Trek Jeep Jamboree is a Forest Service permitted event outside of the Project boundary using established OHV roads supported by the Forest Service's Travel Management Plan. As a result, PG&E has not adopted this proposal and has not discussed it further.

- Include a schedule for reconstruction.
- Address silvicultural treatment, view enhancement, and fuels reduction in and around developed sites.
- Patrol project area and clean dispersed sites.
- Improve signing to and from lakes and interpretive/ informational signing.
- Include various smaller heavy maintenance/minor reconstruction projects. Examples are rebuilding retaining at Jackson Meadow and providing accessible access at Fuller Angler access. (p. 3).

PG&E has incorporated most of these general proposals, as appropriate, in the updated Recreation Facilities Plan contained in the FLA. This includes providing restrooms at certain camping areas where needed; limiting camping to developed sites; adopting FSORAG regulations on NFS lands and considering potentially more appropriate locations at the time recreation facilities are reconstructed or replaced; providing a schedule for re-construction; providing an additional accessible fishing station; and providing appropriate patrol of Project recreation use areas. In addition, PG&E takes into consideration view enhancement during the design of new or re-constructed recreation sites.

In regard to silviculture treatment and fuels reduction, PG&E's current practice is to drop hazard trees in the beginning of the season and to cut the trees into firewood lengths. The firewood is left on-site for the campers to use. In addition, vegetation is generally maintained within these recreation sites, so fuel loading is typically not an issue.

<u>Information and Education Plan</u>
In their joint letter dated January 28, 2011, the Forest Service, BLM, NPS and CDFG (agencies) recommended that Licensees develop an Information and Education Plan:

> Information and Education Plan (Drum-Spaulding and Yuba-Bear Recreation Plans): Within 2 years of license issuance, develop an information plan which includes maps, information, brochures, signs, websites etc. to provide information to enhance the project recreation opportunities and protect and interpret the area natural and cultural resources. Include educational material aimed at reducing the spread of aquatic invasive species (including amphibian chytrid fungus) and preventing animal habituation. An implementation schedule shall be part of this plan, with all actions implemented within 5 years of the license issuance. (p. 74).

Although a very low percentage of all Project visitors (<5 percent) rated educational/interpretive panels at Project recreation areas as unacceptable, the final license application nevertheless includes most of the agency proposals. This includes proposals for: resource protection signs; maps showing other recreation opportunities in the Project area and of campground layouts; boating regulation signs; educational material aimed at reducing the spread of aquatic invasive species (including amphibian chytrid fungus and Quagga/Zebra mussels) and preventing animal habituation; and, an additional interpretive panel. These proposals are detailed on a site by site basis in the update Recreation Facility Plan. In addition, PG&E notes the Project's Sierra Discovery Trail already contains 16 educational/interpretive panels on Project area's natural resources, river system, and hydroelectric development.

Project Patrol

The agencies recommended twice in their joint letter that PG&E implement a Project patrol for the Project recreation facilities and sites:

> The resource agency proposed measures require the Licensee to develop of [sic] plan for project patrol, which needs to address subjects including obtaining user compliance with regulations and patrol of dispersed sites around the project, as well as developed sites. (p. 134).
>
> **Project Patrol (Drum-Spaulding and Yuba-Bear Recreation Plans)**
>
> Within 2 years of license issuance, develop and implement a Project Patrol component for Project and Project-affected National Forest System and BLM lands. At the Annual Coordination Meeting, the Licensee shall coordinate with the resource agencies and interested parties to review information from the prior season and plan any adjustments for the next recreation season. This component shall outline duties of a seasonal Project Patrol to implement, at a minimum, the following:
>
> - Monitor and seek compliance with safety, camping closures, fire clearance, and other measures.
> - Monitor and seek compliance with regulations associated with camping, parking, food storage, whitewater boating, and other use.
> - Whitewater boating program management including patrolling, permitting, monitoring, and educating the public.
> - Install and maintain signs; adjust as seasonally needed.
> - Disperse information to the public including appropriate OHV and firearm use, campfire safety, leave no trace, and other messages to reduce resource impacts and inter-user conflicts.
> - Patrol dispersed public use areas within 1/4 mile of all Project and Project-affected waterways.
> - Monitor and report vandalism of facilities, cultural sites or other resource damage.
> - Report illegal activities and cooperate with law enforcement agencies, as needed.
> - Remove trash and clean fire rings from dispersed campsites and other areas of concentrated public use within 1/4 mile of all Project and Project-affected waterways.
> - Maintain fuels clearance within 100 feet of all dispersed campsites (including Project provided steel fire rings and user created fire rings) surrounding Project lakes.

- Remove visitor created fire rings in areas where camping is limited to designated sites.
- Perform other duties that provide for the safety of the public and protection of Project-affected resources.
- Maintain a log of activities, key resource issues and public concerns to summarize in an annual report provided at least 30 days prior to the annual coordination meeting. (p. 71).

The Recreation Facilities Plan has been updated to include a new caretaker at Sterling Lake. This caretaker will be responsible for patrolling Lake Fordyce and Sterling Lake, with a focus on regulation compliance to minimize impacts to sensitive resources. Among other things, the Project's operation and maintenance practices, the Project Recreation Facilities Plan, new proposed resource protection signage, and the two existing MOUs (signed in 2005) between the TNF's Yuba River Ranger District and the Sierraville Ranger District and PG&E (Attachment 2 to the Recreation Facilities Plan, filed with this FLA at Appendix E8 of Exhibit E) and the related Annual Operating Plans (a requirement of the MOU)[8] for Project facilities located on NFS lands, most of the agencies concerns/proposals are addressed. The proposed Project's 11 recreation caretakers are located throughout the Project Area at areas where recreation use occurs most frequently and they are required to visit and maintain the less frequented recreation use areas. Most of the agencies requests are performed by these caretakers.

In particular, as stated in both 2010 Annual Operating Plans with the TNF (Attachment 3 to the Recreation Facilities Plan, filed with this FLA at Appendix E8 of Exhibit E), the caretakers are responsible for the below items that are generally equivalent to the agency identified items. These items are also caretaker requirements for Project recreation facilities located on PG&E lands:

- Compliance with camping closures and maintain appropriate fire clearances around all designated fire rings.
- Compliance with safety regulations associated with camping at developed sites.
- Install and maintain Project recreation signs. Post signs for site specific hazards (bees, rattlesnakes, bears, etc.) for public safety.
- Perform security/patrol duties for areas within the FERC project boundary and report any violations of federal, state and local laws, ordinances and regulations to the appropriate law enforcement authorities.
- Remove trash and clean fire rings from dispersed campsites and other areas of concentrated public use on all Project reservoirs.
- Remove visitor created fire rings in areas where camping is limited to designated sites.
- Maintaining a record of all enforcement contacts made with the public.

[8] The MOU is effective until April 30, 2013, but may be extended or amended by the Parties.

The Recreation Facility Plan contains proposals to provide resource protection signs on recreation site information boards to address items such as appropriate OHV and firearm use, campfire safety, and reducing resource impacts (i.e. leave no trace) and inter-user conflicts.
The below agency proposal were not included in the updated Recreation Facilities Plan, because they are proposals for non-Project related use outside of the FERC Project boundary.

- Patrol dispersed public use areas within 1/4 mile of Project-affected waterways.
- Removing trash and clean fire rings from dispersed campsites and other areas of concentrated public use within 1/4 mile of all Project-affected waterways.

Additionally, the below proposals are not included in the updated Recreation Facilities Plan because they are too vague to determine what is being proposed or to determine if they should fall under the prevue of the FERC license.

- Whitewater boating program management including patrolling, permitting, monitoring, and educating the public.
- Perform other duties that provide for the safety of the public and protection of Project-affected resources.

Forest Service and BLM Approvals

The agencies proposed in their joint letter that PG&E seek Forest Service and BLM approval regarding recreation-related items, as follows:

> The licensee will be responsible for the following items requiring FS or BLM approval: survey; design; contract preparation and administration; environmental analysis (including any required additional site specific resource studies) and documentation (including any permits) necessary for construction of proposed facilities; and preparation of "as-built" drawings. The licensee will be responsible for funding the actual capital costs of the below-listed measures. Timelines specified are within a given number of years following plan approval. (p. 77-78).

The Recreation Facilities Plans (Section 3) describes the planning, consultation, and approval process that is conducted prior to construction or re-construction of Project recreation facilities. This includes Forest Service approval of the above items on NFS land (excluding PG&E contracts for construction and as-built drawings) but not BLM approval, because no Project recreation facilities are located on BLM lands.

The Recreation Facilities Plan also makes clear that PG&E is responsible for funding all the Project recreation proposals. For Project recreation facilities located on NFS lands, it is PG&E's expectation that the Forest Service as the primary land manager, promoter of recreation use, and benefactor of recreation publicity, will, in the collaborative spirit, pursue co-funding opportunities when available.

Policy to Limit Camping to Designated Campsites

In their joint letter the agencies recommended the following regarding camping in designated campsites:

> A forest order prohibiting camping outside of the designated sites would be required on National Forest System lands in order to enforce the proposed signing that limits camping to established primitive campsites. The forest order is subject to environmental analysis pursuant to NEPA. [sic] The resource agencies believe that the most efficient way to complete [sic] this analysis is by including it in the FERC environmental document. The FS can then use this document to issue the order. Additional coordination will be needed with the county sheriff to implement the closures on private and licensee owned land. (p. 125).

PG&E, in Section 3 of the Recreation Facilities Plan, adopted this proposal to limit camping to designated campsites within the FERC Project Boundary as a policy. The section further states that PG&E will work with the Forest Service to develop a consistent policy on NFS lands and to implement a Forest Order prohibiting camping outside of designated areas within the FERC Project boundary on NFS lands. PG&E will also pursue county ordinances (Nevada and Placer counties) to limit camping to designated sites on PG&E land within the FERC Project Boundary.

Specific Proposals Related to Recreation Facilities and PG&E's Recreation Facilities Plan

The agencies, in their joint letter, proposed that PG&E add or modify numerous recreation facilities and provided specific proposals for PG&E's Recreation Facilities Plan (e.g., monitoring, operation and maintenance, rehabilitation standards, plan review and consultation). Given the long list of recommendations, PG&E has collated the requests and its replies to the requests in Table 6.6.3-2 below.

PG&E will implement the recreation measures proposed in the Recreation Facilities Plan after FERC has issued the Project license and approved the Recreation Facilities Plan. Therefore, the proposed implementation times set forth in the Recreation Facilities Plan are different than the agencies proposed implementation schedule, which is based only the date that FERC issues the Project license.

Table 6.6.3-2. PG&E's replies to proposals to add or modify recreation facilities and other elements of PG&E's Recreation Facilities Plan by the agencies for the Drum-Spaulding Project.

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
PG&E Recreation Plan: Address the following, at a minimum, related to the Recreation Plans (if full plans cannot be developed in time for the FLAs). • Include (at a bare minimum) toilets in the following locations: o An additional single vault toilet at Carr Campground. o Toilets at Meadow Shoreline Campground and Fordyce. o Replace toilet at Kelly Lake. • Include a drive-in campground at Rucker Lake. • Expand Fuller Boat Launch. • Include trails in the Lindsey and Fuller/Rucker area. (p. 3-4).	PG&E has adopted the proposal in part. The Recreation Facility Plan includes expansion of the Fuller Lake boat launch parking area and an additional toilet at Carr Lake Walk-In Campground, Meadow Lake Shoreline Campground, and Fordyce Lake. Detailed responses to the agencies' proposals are provided below.
Operations and Maintenance (Drum-Spaulding and Yuba-Bear Recreation Plans): • Follow the cleaning and policing requirements in "Cleaning Recreation Sites," USDA Forest Service, San Dimas Technology and Development Center, August 1995 (SDTC 9523-1206), and meet FS Recreation Site National Quality Standards February 5, 2002 (or the current FS standards if these change). Determine frequencies of servicing based on these standards. Ashes are to be removed from fire rings and grills, cooled and extinguished and disposed of at a county landfill. • Ashes are not to be disposed of onsite and ashes which have been previously disposed of onsite (including those disposed of onsite by users) shall be properly disposed of as described above. • At the beginning of each recreation season, and as needed throughout the season, replace, reset, improve, and reinstall barriers within and adjacent to all project recreation sites; along the roads surrounding Project lakes, and along Project roads and trails where there is uncontrolled vehicle use. • Annually place tables on a level surface and bring the legs up to the surrounding ground level, prior to Memorial Day (or within 2 weeks of facility opening if not before Memorial Day.) Maintain grading following establishment of tent pads, clear floor space, graded living areas, Outdoor Recreation Access routes (ORARs), and other areas. • Hardware on toilet doors shall be maintained in a functioning condition. Toilet doors shall be capable of locking and open and close smoothly without sticking. • Remove trash from toilet vaults when pumped. • Remove trash from (road accessed) dispersed sites on a weekly basis between Memorial Day and Labor Day and twice monthly after Labor Day, until the facilities are closed for the winter. (p. 71-72).	PG&E adopted the following proposal in the Recreation Facilities Plan: • For Project recreation facilities on NFS land, incorporate appropriate standards and policing for cleaning recreation sites contained in the Forest Service's "Cleaning Recreation Sites," (USDA Forest Service, August 1995) and the Recreation Sites National Quality Standards (February 2002), or current guidelines if updated. PG&E proposes that the level of detail contained in the other elements of the agencies proposal be included the annual operating plan with the Forest Service. This is consistent with the agencies proposal that the Recreation Facilities Plan provide the overall direction for the more detailed MOU and the annual operating plan.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Annual Coordination Meeting (Drum-Spaulding and Yuba-Bear Recreation Plans): • Each year during the term of the licenses, Licensee will arrange to meet with interested resource agencies (FS and BLM at a minimum) for an Annual Coordination Meeting to discuss the measures needed to ensure public safety, and protection and utilization of the recreation facilities listed in of this Plan. The date of the meeting will be mutually agreed to by Licensee and the resource agencies but in general will be held within the first 90 days of each calendar year. A detailed agenda will be provided to the resource agencies when the meeting date is proposed to assure that the appropriate parties are present. • During the annual meeting with resource agencies, Licensee will review the status of recreation projects from the previous year. This will include rehabilitation of existing recreation facilities, the establishment of new recreation facilities, and any other recreation measures or programs that were implemented. The resource agencies will provide Licensee with any available recreational use data from the previous year for the facilities listed in this Plan. • At the coordination meetings, Licensee will provide the resource agencies with a summary list of the recreation facilities scheduled for rehabilitation and any other Plan measures or programs to be implemented. Work on recreation facilities scheduled for the forthcoming years will be presented to the resource agencies for review and will include logistical and coordination planning, and an implementation schedule. The Licensee and the resource agencies will identify any coordination needs in regards to other resource agency projects being implemented in the area. Permitting requirements and other key resources that will need to be protected from potential impacts associated with the implementation of the scheduled recreation projects will be addressed. • The Licensee will review with the resource agencies the long-term planning and implementation schedule for the rehabilitation and heavy maintenance of existing recreation facilities, and development of the new capital improvements proposed in this Plan. • The Licensee and the resource agencies may consider potential adjustments in specific actions or schedules, if appropriate. The resource agencies will be asked to approve any revisions to the schedule, and the revised schedule will be submitted to the FERC. Within 60 days following such consultation, the Licensee shall file with the FERC evidence of the meeting, which summarizes any comments made by the resource agencies, and any agreements or Plan revisions that were reached by Licensee and the resource agencies. • The Annual Coordination Meeting is a minimum requirement; it is anticipated that meetings will occur throughout each year as needed to implement the Recreation Plans." (p. 72-73).	PG&E incorporated additional language (in Section 5.1 in the Recreation Facilities Plan) to address these proposals.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Recreation Survey and Monitoring (Drum-Spaulding and Yuba-Bear Recreation Plans) NOTE: The monitoring program shall incorporate the salient details of the licensee's proposal for monitoring presented in the licensee's draft Recreation Plan, amended to include the resource agency comments. Implement Recreation Survey and Monitoring program on a 6-year interval concurrent with FERC's Recreation Form 80. This is in addition to Form 80. A Recreation Survey and Monitoring Report shall be prepared following the monitoring. A copy of the Report shall be provided to the resource agencies and filed with FERC after resource agency approval. The resource agencies may, based upon review of the information, require revisions to the recreation conditions. The Survey and Monitoring program shall address the following: • At facilities where fees are required or passes are issued, licensee shall annually collect use data that includes use numbers by location, dates, occupancy, and party size (if collected). Where a host is not on site it should be anticipated that the fee collection will be inconsistent; and thus licensee shall, provide 4- annual Saturday counts between June 15 and Aug. 16 at these sites. Annual data will be included in the 6-year Report. • Licensee shall conduct a Recreational Survey once every 6 years (concurrent with FERC's Recreation Form 80) starting from license issuance. Survey methods and questions shall be reviewed and approved by the resource agencies in advance. The Recreation Survey shall be focused to address the key issues at the time. Survey information shall be reviewed by all interested parties. • Licensee shall conduct observation surveys every 6 years. • Licensee will conduct Recreation Monitoring once every 6 years which will include evaluation of resource impacts from developed and dispersed use; the FS shall be involved in the evaluation of resource impacts. • Licensee shall summarize the most current regional and statewide trends in recreation based on available surveys and reports. Licensee shall draft the Recreation Monitoring and Survey Report, that incorporates data from the information listed above, traffic counters, other resource monitoring results (if any), law enforcement input, emergency services (including fire) input, accident reports, Project Patrol reports, occupancy rates and other applicable information. The Report shall summarize monitoring results in relation to established triggers and address any changes in trends since previous reports (or initially from relicensing studies). Licensee shall, every 6 years (coinciding with FERC's recreation Form 80), consult with the resource agencies and interested parties to review this report and propose appropriate management actions. This review shall be based on findings in the Recreation Monitoring and Survey Report. The review shall address, at a minimum, the following factors: • Changes in use type, volume, season, group size, duration of stay, other use pattern and trends. • Public safety issues • Condition of project facilities, roads, trails parking areas, directional/informational and interpretive signing. • Kinds, quality, quantity, and range of recreational opportunities. • Preferences in recreation activities. • Health and safety. • User and resource conflicts. • Any mandated updated guidelines, such as ADA and FSORAG. • Kinds and sizes of recreational vehicles. • Occupancy and capacity information. *(Continued on the next page)*	The following elements of the agency proposals are included in the recreation monitoring section (Section 4.0) of PG&E's Recreation Facilities Plan: • At campgrounds where fees are collected daily, Licensee will annually collect daily occupancy information. Use numbers (i.e. number of visitors) are generally estimated from average party sizes as determined by the relicensing or future recreation monitoring surveys. • At campgrounds where fees are not collected daily, the Recreation Facilities Plan was updated to conduct occupancy counts on at least 4 Saturdays between June 15 and August 16. • As required by FERC Form 80 requirements, day use facilities and primitive campsites will be collected every six years. If results suggest recreation facilities are approaching capacity, then annual surveys will be conducted. Licensee does not feel there is need to collected annual data at non-fee sites, if these sites are well below capacity. • Type of RVs (which is reflective of size) and occupancy and capacity information will be collected and reported every six years. As noted above, though, campground occupancy information will be collected annually • Changes in the volume and season of recreation use and changes in the types and trends of recreation use. The following agency items are proposed in the operation and maintenance section of the Recreation Facilities Plan (Section 3.4) and/or proposed to be discussed at the annual agency consultation meeting. • Annually, the condition of Project facilities, roads, trails, parking areas, and directional, informational and interpretive signage will be evaluated. • On NFS lands, the Forest Service will be invited to field condition evaluations, which includes resource impacts and facility conditions. • For Project facilities located on NFS lands, planned rehabilitation of existing recreation facilities and construction of new recreation facilities will be presented and discussed during annual agency consultation meetings. • Any new/modified management actions (changes in patrols, additional sanitation measures, closure orders, etc.) will be presented during annual agency consultation meeting. In addition, the below items can be presented and discussed during annual agency consultation meetings. • Accident information reported to FERC and Cal Boating accident information for Project Reservoirs • Any known mandated update in ADA and FSORAG. • Law enforcement, emergency service, and fire incidents. *(Continued on the next page)*

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
(Continued from previous page) • New or modified management actions (increased patrols, additional sanitation facilities, closure orders, etc.) proposed to address concerns identified in report. • A 6-year schedule for maintenance, rehabilitation, reconstruction and new construction. Because the standard life of recreation facilities ranges from 20 to 30 years, it is anticipated that during the life of the license, all facilities including those that are currently new will need to be redesigned and reconstructed to standards applicable at that time. The Report shall comply with FERC's regulations and shall be provided to the resource agencies for review and comment prior to being filed with FERC. (p. 73-74).	*(Continued from previous page)* The Recreation Facilities Plan does not include recreation user surveys (i.e. questionnaires) every six years as proposed by the agencies. The type of user information collected through user surveys (such as group size, types of user conflicts, duration of stay, and activity preferences) typically does not change significantly over a six-year period. The Recreation Facilities Plan proposes a user survey every 12 years, which is typical for most of PG&E's hydroelectric projects. The every 12 year report will also contain current regional and statewide trends in recreation based on available surveys and reports. As suggested by the agencies, the monitoring reports will incorporate information listed above. The reports will also summarize monitoring results in relation to established triggers and address any changes in trends since previous reports. Because traffic counts are not proposed as part of recreation monitoring, this recommendation is not included in the Recreation Facilities Plan.
Plan Revision (Drum-Spaulding and Yuba-Bear Recreation Plans): Over the term of the Project Licenses, unforeseen recreation needs, changes in visitor preferences and attitudes, and new recreation technologies may occur. The frequency with which the Plan is revised or updated shall depend on significant changes to existing conditions, monitoring results, and management responses made over time. The frequency of Plan updates shall be based on consultation, review of recreation use and facilities condition reports, and through other appropriate sources. Agreed upon changes to this Plan will be incorporated into a revised document or an amendment to this document, and after approval by the resource agencies, the revised plan will be submitted to FERC for approval. Factors that may trigger a revision include but are not limited to: • Revisions and updates to FS, BLM, or other applicable management plans. • Substantial changes (>25 percent change) of Recreation Visits in any activity recreationists of the Project participate in, as revealed in the National Visitor Use Monitoring (NVUM) of the Tahoe National Forest (using the 2010 surveys as a base), similar survey conducted by FS/BLM or documented in the Licensee's periodic observation and recreation survey. • Documentation of substantial changes in demographic use patterns, visitor needs, recreation preferences, types or patterns of use or other social factors affecting recreation facilities within the Project area. • Changes in road maintenance standards or similar physical factors affecting the use of the recreation facilities within the Project area. • Reaching occupancy (or other) triggers where new, but previously unanticipated, facilities will be required. • Catastrophic natural events, such as major forest fires or natural disasters, and significant effects of social disorder. • New federal or state policies, regulations, and laws (including Wilderness designation of land within or near the Project) that significantly affect recreation resources in the Project area. (p. 74-75).	Section 5 of the Recreation Facilities Plans reflects many of these concepts
Campsite Closures (Drum-Spaulding and Yuba-Bear Recreation Plans): Various Licensee and resource agency proposals include closing dispersed campsites to overnight camping or limiting camping to designated sites. In order to implement this on National Forest System lands, a forest order must be passed, which is subject to prior environmental analysis pursuant to NEPA. The resource agencies believe that the most efficient way to complete this analysis is by including it in the FERC environmental document. The FS can then use this document to issue the order. Additional coordination will be needed with the county sheriff to implement the closures on private and Licensee owned land. (p. 75).	PG&E adopted this proposal with modification. Section 3 of the Recreation Facilities Plan was updated to indicate that PG&E will limit camping to designated campsites within the FERC Project Boundary as a policy; work with the Forest Service to develop a consistent policy on Forest Service lands within the FERC Project Boundary; and pursue county ordinances to limit camping to designated sites on PG&Es land.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
In addition to the actions listed below (unless otherwise agreed to) all Project and Project-related recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance. (p. 75).	PG&Es adopted the proposal with modification. Section 3.3.1 of the Recreation Facilities Plan now proposes that all existing Project recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance unless the facilities are in good condition and do not warrant replacement.
All new, rehabilitated, and reconstructed recreation facilities located on National Forest System lands will meet FS national and regional direction, regulations, design and other applicable standards in place at the time of design, such as (but not limited to): Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG); FS direction included in manuals (FSM), handbooks (FSH) and stated in official correspondence; EM-7100-15, and other applicable direction. All new, rehabilitated and reconstructed recreation facilities located on BLM lands will meet BLM regulations, design and other applicable standards in place at the time of design and construction. (p. 76).	PG&E has adopted the proposal for facilities on NFS land (see Section 3.2 of the Recreation Facilities Plan). Because the Recreation Facilities Plan contains no proposals for Project recreation facilities on BLM lands, the BLM portion of the proposal was not adopted.
All newly constructed and reconstructed campgrounds on National Forest System lands shall contain a minimum of the following constructed features unless specifically excluded in this Plan (or subsequently agreed to the contrary): • Roads and spurs with barriers to prevent off road travel. • Tables. • Fire rings. • Animal resistant food lockers. • Bulletin boards. • Entrance sign. • Facilities for garbage collection. • Toilets. • Site markers. • Gate and entrance station. (p. 76).	PG&E adopted this proposal with modification. Section 3.3.2.5 of Recreation Facilities Plan now indicates that most of the listed features will be included in new or reconstructed Project campgrounds with Development Scale II or higher on NFS land, unless PG&E and Forest Service agree otherwise. Facilities for garbage collection, gates, and entrance stations are not included as standard items, but are included on a case-by-case basis. Self-pay fee tubes, though, are, at a minimum, included at new or reconstructed campgrounds. Primitive campsites will include, at a minimum, a fire ring and resource protection information and will generally include an animal resistant food storage locker. Additional features, such as an information board, are included on a case-by-case basis.
Additionally, Development Scale 3 and above (and when specified in Development Scale 2 campgrounds) will also include graded tent pads, graded and surfaced spurs and roads and graded access routes (per FSORAG). Unless agreed to the contrary, all campgrounds with potable water will include a camp host site with septic (or a holding tank), solar (or other) power and water. If there are constructed features that are addressed here, but not mentioned at a specific facility, this section should prevail. (p. 76).	PG&E adopted this proposal with modification for NFS lands. In particular, the Recreation Facilities Plan indicates that (as a matter of policy) at new or reconstructed Project recreation campgrounds on NFS land, PG&E will include graded tent pads, graded and surfaced spurs and roads, as well as graded access routes per applicable accessible guidelines (FSORAG). The Recreation Facility Plan, though, indicates (as a matter of policy), PG&E will provide host sites at Project campgrounds on a case-by-case basis. The inclusion of a host site depends on the level of use, remoteness, proximity to other facilities with a host site, and the level of campground facility development.
All campgrounds, picnic areas or other recreation sites being constructed or reconstructed under the FERC relicensing on public land must fully comply with the applicable section of the ABAAS and the FSORAG and other applicable accessibility guidelines. (p. 76).	PG&E adopted the proposal for facilities on NFS land (see Section 3.2 of the Recreation Facilities Plan).
All new and reconstructed Project recreation facilities located on Licensee's or other private lands will be designed to meet applicable Americans with Disability Act (ADA) and Architectural Barrier Act (ABA) Accessibility Standards (ABAAS) and other standards as currently written at the time of project design. Design facets of facilities on Licensee and other private land shall be to a standard not less than those applied to surrounding public lands. (p. 76).	PG&E adopted this proposal with modification. The Recreation Facility Plan indicates that PG&E will use the current version of ADAAG at the time Project recreation facilities are designed. The other elements of the agencies' proposals were not adopted because they are not applicable to PG&E and other private lands.
Within 1 year of license issuance, provide signs addressing applicable lake surface regulations at all recreation sites that are located on project lakes and in compliance with land management agency management plans. (p. 77).	This proposal was adopted with modification. PG&E will provide this signage as applicable (primarily with regard to signage directed at boaters) but within 2 years of license issuance and FERC approval of the Recreation Facilities Plan.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Within 2 years of license issuance, install metal animal proof food storage lockers large enough to hold a large cooler at all overnight campsites at all walk-in campgrounds. Adjacent to the locker, provide a clear, level, compacted ground space (aka clear floor space) meeting dimensions and cross slopes specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers" (or current requirements). (p. 77).	PG&E adopted this proposal with modification. Animal resistant food lockers that can hold a larger cooler (i.e., 30 cubic feet) are proposed at all Project walk-in and drive-in developed campgrounds. In addition, the Recreation Facility Plan indicates that at developed campground facilities on NFS land, PG&E will meet the applicable FSORAG requirements, which include the space adjacent to food lockers.
Within 5 years of license issuance (unless specified sooner at a specific site), replace all existing plastic food storage lockers with metal animal proof food storage lockers lockers [sic] large enough to hold a large cooler and install new metal animal proof food storage lockers at all remaining (Development Scale 2 and above) campgrounds where food storage lockers are missing (regardless of land ownership), with the exception Milton Lake. Adjacent to the locker, provide a clear, level, compacted ground space meeting dimensions and cross slopes specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers" (or current requirements). At this time, these lockers need not be installed in remote, primitive campsites (which consist of a fire ring only.) (p. 77).	PG&E adopted with modification. The Recreation Facilities Plan includes proposals that provide animal resistant food lockers at all remaining development level 2 campgrounds where the food lockers are missing (PG&E and NFS lands). There are no plastic food lockers at PG&E Project campsites. In addition, as noted above, on NFS lands, FORSAG requirements will be met for the space adjacent to the food lockers.
Within 5 years of license issuance, provide as-builts drawing of all project facilities. As-builts should reflect current dimensions and layouts, including underground utilities. As alteration, improvement, new construction or expansion occurs, provide updated as-builts. As-built drawings should be provided in hard copy and an electronic format (".dwg" format). (p. 77).	PG&E adopted this proposal in part. The Recreation Facilities Plan was updated to indicate that PG&E will provide as-built drawings to FERC and the Forest Service for altered, improved, new construction, or expanded Project recreation facilities on NFS lands following construction/rehabilitation of the facility. (See Section 3.2.1).
Within 5 years of license issuance, install animal proof trash receptacles, and provide corresponding garbage service, at all developed sites where a toilet building has been provided except Jackson Point Boat-in Campground, Milton, Meadow Shoreline Campground, Fordyce, Sterling, Jackson Meadows Administrative Site & Jackson Meadows Vista point. (Garbage collection will not be required at these "excepted" sites. The Licensee shall post Pack in/Pack out signs at these "excepted" facilities). Provide a clear, level, compacted ground space meeting dimensions and cross slope for these trash receptacles as specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers.' (p. 77).	PG&E adopted the proposal in part. PG&E is providing animal-resistant lockers at developed campgrounds and most primitive camping areas; posting Pack-in/Pack out signs at sites where garbage service is not provided; and, on NFS lands, providing FSORAG-compliant spaces adjacent to trash receptacles.
Within 5 years of license issuance, at each Project recreation site, provide an information display with a map and information illustrating the recreational opportunities in the area as well as emergency contact information, proper food storage and other salient information. Develop all displays in consultation with the applicable resource agency. Review and, as needed, update recreation information signs on a 6 year cycle. Replace signs as needed. (p. 77).	PG&E updated Section 3 of the Recreation Facilities Plan, on a site-by-site basis, to indicate where Project recreation maps, emergency contact information, proper food storage information, leave no trace, and other information will be provided on existing or proposed information boards. For signs proposed on NFS land, PG&E will use Forest Service sign guidelines and PG&E will provide draft sign information to the Forest Service for review and approval prior to installation. During the license period, significant proposed changes to signs on NFS lands will be discussed at the annual consultation meeting, and will require prior Forest Service approval.
The Licensee will be responsible for funding the actual capital costs of the below listed measures. All improvements on National Forest System or BLM lands shall become the property of the FS or BLM upon completion, final inspection, and acceptance by FS. (p. 78).	PG&E did not adopt this proposal. All recreation improvements funded and constructed or reconstructed by PG&E will remain PG&E's asset.
Within 6 months following any and all completed construction and reconstruction work, the Licensee shall provide FS with updated "as-built" drawings of all sites located on National Forest System or BLM lands or managed by FS or BLM. (p. 78).	PG&E adopted this proposal with modification. PG&E will provide to the Forest Service "as-built" drawings for altered, improved, newly constructed, or expanded Project recreation facilities on NFS lands. Copies of the as-built drawings will be provided to the Forest Service when the drawings are submitted to FERC following construction/ reconstruction of the facility (See Section 3 of the Recreation Facility Plan).

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
All campgrounds, picnic areas or other recreation sites being constructed or reconstructed on public land under the FERC relicensing must fully comply with the applicable section of the ABAAS and the FSORAG. (p. 124).	PG&E has adopted the proposal for NFS lands (see Section 3.2 of the Recreation Facilities Plan).
Regardless of landownership, there is a need for toilets at all areas where concentrated camping occurs or is encouraged (e.g. Fordyce, Meadow Shoreline) and established day use areas (e.g. Kelly Lake). The only exceptions to this on National Forest System lands are the lakes within Grouse Lakes (Middle & Upper Lindsey, Culbertson and Lower and Upper Rock) and White Rock Lake. The relatively low use and remote nature of these sites does not warrant toilet facilities at this time. In general, toilets should be located no more than 350 feet from the designated campsites, however in Semi-Primitive Motorized areas, toilets can be located up to 500 feet from campsites. (p. 125).	The Recreation Facilities Plan includes new restrooms at areas where concentrated camping occurs (i.e. Fordyce Lake, Carr Lake, and Meadow Lake Shoreline) and at day use areas were the amount of recreation use warrants a restroom. However, as documented in the relicensing studies, the minimal recreation use at Kelly Lake does not warrant a restroom.
Road signs need to lead the public to and back from the recreation areas. This comment applies to all proposals to improve road signing and may not be repeated at each lake. (p. 127).	Section 3 of the Recreation Facilities Plan includes signage, as appropriate, to and from Project recreation facilities.
Section 3.1.1.1, White Rock: The road should be graded through the primitive sites. There is an area of rough road beyond the first campsite. We would like to review the plans for the White Rock area in summer of 2011. (p. 127).	PG&E adopted with modification. The section of road proposed for grading is located on PG&E lands. Based on 2010 field trips, PG&E did not observe rough road sections past the first designated primitive campsite, so this portion of the proposal was not included in the updated Recreation Facilities Plan.
Section 3.1.2.3, Fordyce Lake: The resource agencies support the Licensee's proposal to install primitive campsites. However, we believe that a toilet is needed and that the number of sites should be dictated by demand and available land base. As the dispersed sites on National Forest System land below the high water mark are closed, there will be more demand on the sites on PG&E land. Furthermore, the Drum-Spaulding Project proposed measures on page E7-26 state that as many as 11 and 18 sites were observed on holidays and weekends indicating that 6 sites may not be sufficient to meet future needs. (p. 128).	PG&E adopted this proposal. The Recreation Facilities Plan was updated to include a compositing style toilet and up to 10 primitive campsites (instead of just 6 campsites).
The August version of the Plan proposed a caretaker at Fordyce Lake, and the November version proposed a management presence. The resource agencies support the need for a greater management presence and believe a caretaker is the preferred method of providing a management presence at this lake. Housing the host at Fordyce Lake will provide better resource protection than housing the host at Sterling Lake or elsewhere in the project. This host should be available to patrol Sterling and Fordyce Lakes; however, there are more impacts from overnight use at Fordyce Lake, necessitating greater host presence. (p. 128).	PG&E did not adopt this proposal. The Recreation Facility Plan includes a host site in the vicinity of Lake Sterling recreation site; because Lake Sterling is a more suitable place for a host site than Lake Fordyce. This host will provide a management presence for Fordyce Lake and Lake Sterling.
The licensee proposes to recondition the existing walk-in campground. However, based on the low overnight camping use, low fee compliance, and high day use at this site (which is not reflected in the Technical Memorandum, but has been observed in the field over the years by FS managers), the public would be better served by converting the campground to a small picnic site with expanded parking area, a formal trail from the parking area to the picnic sites, restroom, new tables and fire pedestals. (p. 128).	PG&E did not adopt this proposal because the existing Project recreation facilities and opportunities are meeting the recreation demand for the reservoir. Based on PG&E's visitor and use study in 2009, only 20 percent of the visitors surveyed at Lake Sterling were day use visitors and their primary activity was OHV use, hiking/walking, relaxing, and sightseeing – not picnicking. Lake Sterling provides adequate opportunities for these types of day use activities, which do not require picnic facilities. Nearly 80 percent of visitors surveyed found the existing facilities acceptable at Lake Sterling. PG&E's 2009 study revealed that Project picnic areas are rarely utilized as the highest seasonal and weekend occupancy was 14 percent (Halsey Forebay Picnic Area) at the six developed picnic areas.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
The licensee proposes to develop three primitive campsites on the PG&E land along the east shoreline of Sterling Lake. Due to topography, PG&E land provides a far superior site for overnight camping than does National Forest System land. Developable land is limited around the small project lakes (such as Sterling, Carr, and Lindsey Lakes). As previously mentioned, the resource agencies do not support encouraging concentrated camping without providing a toilet. We recommend that a toilet, barriers, food storage lockers, and site markers be included in addition to the fire rings and information boards proposed by PG&E. Since camping on the east side of the lake will replace the displaced camping on the west side of the lake, the access road to these sites should be improved. (p. 128).	A developed public campground with an established access road, restrooms, barriers, and site markers is currently provided at Sterling Lake. In addition, the Recreation Facilities Plan proposes to provide animal-resistant food lockers at each of those campsites. Relicensing studies indicate that users found this campground to be acceptable, but did identify a need for a beach area or a car top boat launch. The shoreline at the campground currently provides adequate opportunities for visitors to launch non-motorized watercraft and access the water for swimming without any facility development. Lake Sterling is a relatively small lake with only 105 water surface acres. Currently, the 6-unit Lake Sterling Walk-In Campground (30 PAOT) and the Boy Scouts of America Camp Winton (300 PAOT) are located along the shoreline. Adding a third developed recreation facility (10 to 15 unit campground or 60 to 75 PAOT), as proposed by the agencies, would likely exceed the reservoir's carrying capacity and is not consistent with its' semi-primitive setting. PG&E's proposal to provide fire rings at three existing user-created sites allows existing use to occur safely, without encouraging additional use.
Spaulding Lake Campground appears to be somewhat under-utilized based on the occupancy data. Therefore, the following recommendations are made with an eye toward increasing the occupancy of these facilities (thereby reducing the demand on neighboring National Forest System land): • Construct showers since there was a high desire (64 percent) for showers at this site • Since the campground has tight road geometry, which prevents the use by vehicles larger than 24 feet, assess if there are any opportunities to improve the geometry for larger vehicles prior to the proposed repaving. • Since the campground is located away from the lake, which reduces the attractiveness of this facility, assess opportunities to build a trail from the campground to the lake. (p. 129).	PG&E did not adopt this proposal. These facilities are located on PG&E land, and the topography severely limits the location, size and type of campground that can be provided. The existing campground is located in the only practical space and maximizes the available space. In regard to the trail, because the current road will provide more convenient and quicker access to the lake than the agencies' proposed trail, the trail will likely receive minimal use. Also, rocky terrain is not ideal for constructing a trail. With regard to a shower, PG&E is proposing a shower at the nearby Lake Valley Reservoir, which could be used by Drum-Spaulding campers.
Therefore, the resource agencies recommend that the licensee address whether there are desirable opportunities to provide a boat-in campground (with a feature to tie boats off to) at Lake Spaulding. This campground could be located on licensee or National Forest System land. (p. 129).	The agencies' request did not provide details on the location, extent, and types of facilities that such a facility would offer, except for a tie-off feature for boats. PG&E was not able to evaluate the impacts, scope, and cost of this general suggestion. However, PG&E proposed three boat-in campsites on PG&E land along the north shoreline, each with a steel fire ring and animal resistant food locker. PG&E chose this location because of the existing dispersed campsites that showed recurrent use during a 2010 shoreline evaluation. PG&E does not propose any tie-off facilities for boats as the steep, rocky shoreline and reservoir level fluctuation throughout the summer season are not amenable to such a facility.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Rucker Lake: The resource agencies believe that the walk-in campground should be converted to a drive-in campground of 20-25 units. (p. 129).	PG&E did not adopt this proposal. The agencies have not identified a demonstrated need for a drive-in campground, especially considering that 100% of campground users found the existing walk-in facilities acceptable and roughly 67% of campers had no preference for vehicle spurs. In addition, in the 1990s, the Forest Serviced and PG&E agreed on a walk-in campground, because the area adjacent to the shoreline was too wet and marshy in the spring and early summer for a drive-in campground. Away from the shoreline, steeper terrain limits development opportunity.
Section 3.1.3.5, Blue Lake: Human waste is frequently evident along the trail around the lake. The resource agencies are concerned about concentrated designated camping where toilets are lacking. Signage should be placed at each of the dispersed camping site clusters that educate recreationists on proper backcountry human waste disposal techniques. (p. 129-130).	PG&E has adopted the proposal in part and will include the proposed signage at the Blue Lake parking area. Such signage should be sufficient (as it is the parking area used by hikers and campers) and providing additional signage at the campsites would unnecessarily distract from the recreation experience.
Section 3.5.1.2, Carr Lake: The resource agencies agree with installation of food lockers, picnic tables, resource protection posters, and a toilet located to serve both campers and trailhead users. An additional single stall toilet is needed to serve the remaining sites. (p. 130).	PG&E adopted these proposals.
Section 3.1.6.1, Kelly Lake: The toilet should be replaced when the existing toilets are removed. A single vault toilet should be sufficient. (p. 130).	PG&E did not adopt this proposal. The facilities at Kelly Lake are on PG&E land. PG&E proposes removing the pit toilets and not providing new toilets at the picnic area due to very low use (less than 2 people on a weekend and short length of stay of 1.4 hours) at the site. The cost of replacing and maintaining the toilets is not justified given such a low level of use.
There is a need to improve the signing to the lake for the general public, since the presence of the gated entrance is confusing and significantly reduces use of this scenic lake. (p. 130).	The Recreation Facilities Plan includes directional signage to Kelly Lake before and after the Snowflower Resort (private) gate and PG&E will approach the resort owner regarding PG&E being allowed to provide directional signage to Kelly Lake at their gate.
Group camping is one of the most constrained resources within the NID/PG&E project areas. The phenomenon of group camping has changed over the years to attract more frequent groups of RVers who tend to utilize the parking lot as a living space much more than the traditional campsite living space. The resource agencies, therefore, recommend increasing the parking area of the upper unit to provide additional RV clustered parking. (p. 130).	PG&E did not adopt this proposal as the visitor surveys did not indicate a need for additional vehicle parking. In fact, all of the visitors surveyed in 2009 found the existing parking areas acceptable. RV camping opportunities within a parking area, though, are provided at Lake Spaulding. In addition, in order to meet group camping demand in the Project Area, PG&E is proposing a new Project group campground at Lake Valley Reservoir.
Section 3.3, Maintenance and Replacement: In the resource agency proposed measures, there is a schedule of out-year reconstruction, since most facilities have a useful life of 20-30 years. This schedule includes redesign of facilities at the time of reconstruction to assure the facility effectively serves the current and projected future users, current accessibility, and other standards. As a general rule, the license facilities do not meet current standards, and by replacing each individual constructed feature when it reaches its useful life, there is never the opportunity to address the facility as a whole. For example, spurs and turning radius of the campgrounds designed in the 1960s do not serve the needs of the larger vehicles that use the facilities today. If a particular constructed feature (a toilet, for instance) is not in need of reconstruction when the rest of the facility is being reconstructed, the Licensee and appropriate resource agency can jointly agree to delay the reconstruction of that specific feature. The narrative should include boat ramps. (p. 131).	PG&E adopted this proposal with modification. PG&E added language to Section 3.3.1 as follows: "Overall, unless otherwise agreed to by PG&E and Forest Service or stated in the Plan, all existing Project recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance and FERC approval of the Plan unless facilities are in good condition and do not warrant replacement."

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
The licensee should develop a Pavement Management System for all paved roads within project recreation site and access roads that primarily serve these recreation sites. Striping of paved surfaces may be needed more often than surface treatments. Vehicle barriers should be repaired as needed throughout the season. (p. 132).	Primary Project Roads are addressed within PG&E's Transportation Plan, not the Recreation Facilities Plan. However, the Recreation Facilities Plan addresses (including annual assessment) various road surfaces, including the condition of pavement, vehicle barriers, and pavement striping within recreation facilities, and identifies specific maintenance measures for those items.
Section 3.4.1: The Licensee is responsible for operating and maintaining all improvements made as part of this Plan (unless otherwise noted). A reconstruction schedule is needed beyond the 3-5 year timeframe provided in the current Plan. Since the design life of most facilities is 20-30 years, the resource agencies would expect all sites to be fully reconstructed within 20 years of the license issuance. The resource agency proposed measures include a proposed schedule for reconstruction of facilities on National Forest System lands. (p. 132).	PG&E adopted this proposal with modification. PG&E added Table 3.3-1, which provides a schedule for facility replacement beyond the 3 to 5 year time frame. This schedule varies, though, from the agency schedule for reconstruction of Project recreation facilities located on NFS lands.
The resource agencies propose the following alternate trigger for Family Campgrounds: On four non-holiday Saturdays, between June 15 and August 16, at least 80 percent of the individual developed campsites (excluding boat-in campsites) are occupied at a project reservoir in 2 of 6 years during the Form 80 monitoring period. (p. 135).	PG&E did not adopt the proposed family campground trigger. There should be sustained demonstrated need for additional campsites before such campsites are constructed; two out of six years is not enough of a sustained pattern to demonstrate need. In addition, PG&E is unaware of any agency facility trigger that is as stringent as the one proposed by the agencies.
During the every 6-year observation surveys, at non-fee sites, include all users within 200 feet of the lake's edge (regardless if they are located in a designated site or not) and include campers along Lindsey Creek within ¾ miles downstream of Lindsey Lake. (p. 135).	PG&E adopted the proposal in part. Section 4.2.2 (Recreation Observation Survey) has been updated to indicate that recreation use within 200 feet from the Project reservoir shoreline (and outside of recreation facilities where use information is already being collected) will be collected during observation surveys. PG&E did not adopt the proposal to survey the users downstream of Lindsey Lake on Lindsey Creek because it is outside of the FERC Project Boundary.
The resource agencies propose the following alternate trigger for Group Campgrounds: On four non-holiday Saturdays between June 15 and August 16, least 80 percent of all of the public group campsites are occupied at all of the project reservoirs except Meadow Knolls, in 2 of 6 years (during the Form 80 monitoring period). (p. 135).	PG&E did not adopt the proposed group campground trigger. There should be a sustained, demonstrated need for additional campsites before such campsites are constructed; two out of six years is not enough of a sustained pattern to demonstrate need.
The resource agencies propose a similar trigger (as described above) for Trigger #2 at facilities where daily occupancy information is not collected. (p. 135).	PG&E did not adopt the proposed trigger for the same reasons identified immediately above.
Method and Trigger 2. If trigger 1 is hit, the Licensee needs to continue to monitor these sites annually. Monitoring for 3 consecutive years and then stopping if trigger is not hit in a total of 4 consecutive years does not account for anomalous years—years when there are fire, drought, high gas prices etc. (p. 135).	PG&E adopted this proposal. PG&E will monitor the sites that meet Trigger 1 for five additional consecutive years.
Table 4.1-2: For perceived crowding the resource agencies recommend that 51 percent be used as the standard for crowding since this is approaching capacity. (p. 136).	PG&E did not adopt this proposal. The < 65% trigger is the trigger supported by outdoor recreation research regarding normative behavior, particularly research by Shelby and Heberlein (1986, 1989).
Section 4.2.2: The resource agencies recommend observation surveys be focused from mid-June to mid-August since this is the most heavily used period. Due to fee-non-compliance, observation surveys should include all recreation facilities including those where fees are normally charged. Based on fee collection data provided by the Licensee, there appears to be a high degree of fee non-compliance. (p. 136).	PG&E adopted this proposal. PG&E's proposal includes monitoring during the entire summer from Memorial to Labor Day Weekends, which includes the agencies proposed period. The Recreation Facilities Plan has been updated to include observation counts of actual occupied campsites on Saturdays when a host visits the campground to clean the facilities and to collect fee envelopes. This will occur at 4 campgrounds. At the other 7campgrounds, the host will count occupied campsites and collects fees daily.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
The resource agencies recommend that recreation surveys be completed on 6-year intervals. It is widely recognized that substantial changes in recreation use, activities, motivations, and other related items can happen in a short span of time. These trends are important to recognize and track so that adjustments in management strategies can be made in order to prevent the degradation of either resource conditions or recreation experiences. The change over time of visitor attitudes, preferences, use patterns, experience, and capacity may require modifications to the management of recreation within the Project area. (p. 137).	PG&E did not adopt this proposal and believes that 12-year interval is adequate to identify significant changes in user preferences and activities as reported on user surveys because there are typical few changes over a 6-year period. This is based on PG&E's experience on the Drum-Spaulding Project and PG&E's other hydroelectric projects. PG&E will note that resource impacts and campground occupancies information are proposed to be collected annually and day use facility occupancy and observed shoreline and boating activity information is proposed to be collected every six years. In addition, PG&E provides annual tallies of campground users comments from the back of fee envelopes, which should also identify any significant changes.
Section 4.3, Monitoring Report: On public land, the Licensee shall consult directly with the appropriate resource agency and gain concurrence for any proposed changes to the project facilities or management recommendations that are proposed based on monitoring results. The monitoring report should be in addition to Form 80. (p. 137).	PG&E adopted this proposal.
Add a requirement for an Annual Coordination Meeting and Rehabilitation Report as addressed in the resource agency proposed measures. (p. 138).	PG&E adopted this proposal with modification. Section 5 of the Recreation Facilities Plan has been updated to indicate that PG&E will provide a status of recreation facility rehabilitation on NFS land from the previous calendar year and for the upcoming calendar year during the Project's annual consultation meeting with agencies.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Construction and Reconstruction (Drum-Spaulding Recreation Plan only): The following existing and proposed sites, within the boundary of the Tahoe National Forest (on NFS and Licensee land) or on BLM land, are considered project sites. The FERC boundary should be adjusted to include new facilities when the planning for these project facilities is approved by FERC and prior to when facilities are constructed. FS Facilities • Carr Feeley Trailhead • Carr Lake Campground (Development Scale 2) • Lower Lindsey Campground (Development Scale 2) • Lower Lindsey Trailhead • Lodgepole Campgound [sic] • Lake Valley Group Campground (proposed) • Silvertip Boat Launch • Lake Valley Family Campground (proposed) • Kelly Lake Picnic Area • Fuller Lake Boat Launch • Fuller Lake Angler Access • Trail between Fuller, Rucker and Blue Lakes and associated trailhead facilities (proposed) • Rucker Lake Campground (including the access road & proposed expansion) • Fordyce Lake Campground (proposed) • Sterling Lake Campground (proposed Licensee land) • Sterling Lake Day Use (conversion from existing overnight facility) • Sterling Lake Trail (proposed) • Meadow Lake Campground • Meadow Lake Shoreline Campground (Development Scale 2) • Meadow Knolls Group Campground • Meadow Lake Informal Boat Launch • Peak Lake Trailhead & Trail (proposed) • Kidd Lake Group Campground • Spaulding Campground and Boat Launch • Bear Valley Campground • Sierra Discovery Trail • Golden Quartz (if used as a rafting put in/take out) • Langs Crossing • Trail between Lower Lindsey and Upper Rock Lakes (proposed) • Designated dispersed campsites surrounding project lakes BLM Facilities • Edwards Crossing put in/ take-out trail, day use facility AND • Purdons Crossing put in/ take-out area, day use facility (p. 138-139).	PG&E adopted this proposal with modification. The Recreation Facilities Plan includes a proposal to update the FERC Project Boundary to include all the recreation facilities proposed in the Recreation Facilities Plan, if needed. The update of the Project Boundary, if needed, is proposed to occur after facility construction to ensure the boundary encompasses the as built recreation facility.
Within 1 year of license issuance, change the Drum-Spaulding signing within and adjacent to recreation sites on public land with signing that discloses the fact that the facilities are located on NFS or BLM land. (p. 139).	PG&E adopted this proposal with modification. PG&E will complete this work within 2 years of FERC issuing the new license and approving the Recreation Facilities Plan, but only at facilities located on (not adjacent to) NFS land.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Carr-Feeley Trailhead: Within 10 years of license issuance: • Add 3 picnic sites with accessible tables and pedestal grill. • Provide for a clear, compacted, and level surface around each table and grill to meet FSORAG. The picnic sites may be located on the west side of the parking area providing a view. • If desired by the Licensee and approved by the resource agencies, construct a self-service fee tube and fee information bulletin board for the trailhead. FS will analyze if a fee should be charged to redistribute use. If fees are charged, address the opportunity to provide a host site at this trailhead to increase fee compliance. • Install and replace wood barriers around the parking area with rock barriers. • Construct interpretive display. In the information/interpretive display includes information about the recreation opportunities and non-motorized aspect of the Grouse Lakes area. Include information about fire, sanitation and safety; and interpretive information about the natural resources (including protection of resources, such as prevention of the spread of amphibian chytrid fungus). • Grade and gravel entrance road and parking area • Increase size of the parking area. Depending on the size, this may require improving the parking for vehicles along road 17-6 and prohibiting vehicle parking along road below provided parking. If fees are charged for trailhead parking, include notification that a fee is charged for parking along the road as well as the parking area. The parking design capacity will be determined by FS at a future date. (p. 139-140).	PG&E adopted with modification. PG&E adopted this proposal as it applies to the gravel parking lot. The other proposals are improvements to accommodate non-Project hikers who park in the trailhead and hike into non-Project areas within the Grouse Lakes Area. The relicensing studies found that only 10% of the recreationists who parked at the trailhead visited the Project reservoirs (Carr or Feeley lakes); and that 90% hiked the trail system into the Grouse Lakes Area, where no Project reservoirs or facilities exist. In addition, PG&E does not propose to install additional rock barriers around the parking area because the existing barriers and terrain sufficiently restrict vehicles. PG&E also did not propose picnic sites at the trailhead, as relicensing studies did not show a sufficient visitor demand for picnic sites (only 22% preferred picnic sites).
Carr Lake Campground: Within 5 years of license issuance, redesign and reconstruct the campground as a Development Scale 2 walk-in campground (with tables). The design should meet the current FS design standards, FSORAG (for a Development Scale 2 campground), and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. Address opportunities to relocate campsites (especially sites 6-8, and potentially 9-11) to more durable and logical locations. Explore the opportunity to relocate campsites 6-11 sites on the ridge near the dam, and providing parking and vehicle turn around for these sites beyond the southern gate in the trailhead parking lot. The size of the campground to be constructed should be based on projected July weekend demand for the next 20 years. The campground design, however, should address the maximum capacity of this campground based on topography (even if projected demand does not justify the maximum build out at the time.) The following includes, but is not necessarily limited to, the specific elements of this reconstruction: • Install a new 2-unit accessible vault toilet near the entrance of the campground. Provide signing at the trailhead and within the campground indicating the location of the toilet.• Replace existing toilet with new single unit accessible vault toilet (location to be determined based on location of relocated campsites). Toilets should be placed no more than 350-500 feet from any campsite (consistent with standards at the time of design).Remove old toilets.• Grade tent pads. Provide a clear, level compacted surface around constructed features (e.g. tables, fire rings, food storage lockers) as required by FSORAG.• Establish a path between campsites and toilet. Construct trails from campsites to lake and parking area. Close excess informal trails.• Install unit markers.• Install accessible tables and animal resistant food lockers at each campsite.• Replace fire rings.• Replace existing signs with a three-panel sign. Provide appropriate signing that meets FS standards. In the information/interpretive display include information about the recreation opportunities and non-motorized aspect of the Grouse Lakes area, information about fire, sanitation and safety; and interpretive information about the natural resources. • Provide an animal resistant trash receptacles and corresponding garbage service at the trailhead to serve the campground and the trailhead. (p. 140).	PG&E adopted with modification. PG&E adopted the majority of the suggestions, but did not adopt: 1) installing a 3-panel information board (PG&E , though, will provide appropriate signing to USFS standards and included fire, sanitation, safety, and spread of amphibian chytrid fungus information at the existing 1-panel board); 2) installing an interpretive display because the interpretive information is related to non-Project resources in the Grouse Lakes Area; 3) providing trash receptacle and trash service to serve both trail and campers (since camping use is low and PG&E intends to maintain the pack-it-in/pack-it-out policy; and trash for trail users is a non-Project use, and 4) expanding the campground (or at least not until it reaches its monitoring trigger).

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Lower Lindsey Campground: Within 2 years of license issuance: • Improve and define parking spurs--removing protrusions, lengthening, widening, and leveling. • Gravel road and spurs; delineate spurs with barriers. • Install new and replace existing barriers along road and spurs to reduce the opportunity for off road vehicle use. • Replace entrance sign with a three panel sign. Include, in the information/interpretive display, information about the recreation opportunities and non-motorized aspect of the Grouse Lakes area, fire, sanitation and safety and interpretation of the natural and cultural resources of this area. Include information about protection of resources, such as prevention of the spread of amphibian chytrid fungus. • Determine if there is a better location (outside the campground) for the boat ramp. If so, move boat ramp to that location and close existing ramp. Resurface boat ramp with a surface that will withstand wave action and provide turnaround. (p. 140-141).	PG&E adopted most of these proposals with little modification. The proposals that PG&E did not adopt include: providing information about the larger, non-Project Grouse Lakes Area (although PG&E proposes a map of the recreation opportunities in the area.) and 2) providing a 3-panel information board (instead PG&E proposes to replace the existing 1-panel information board). PG&E also proposes to implement these improvements within 5 years of license issuance and FERC approval of the Recreation Facilities Plan.
Within 15 years of license issuance, redesign and reconstruct the campground [Lower Lindsey Lake Campground] as a Development Scale 2 campground (with tables) to meet the current FS design standards, FSORAG (for a Development Scale 2 campground) and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. Expand campground to the degree topographically feasible. Address opportunities to locate campsites to more desirable locations. The following includes, but is not necessarily limited to, the specific elements of this reconstruction: • Replace toilet if needed. If toilet is not in need of replacement, retrofit toilet to provide lighting (solar tube/skylight), assisted venting (with solar panel powered fans) and an accessible path to entrance. • Grade tent pads and provide clear, level compacted floor space around constructed features (table, grill, food storage) to meet FSORAG. • Replace tables and fire rings. • Provide appropriate signing that meets FS standards. • Replace unit markers. • Re-gravel road and spurs and barrier as needed. (p. 141).	PG&E adopted all these proposals, except PG&E did not adopt the expansion of the campground because, in the 1990s, PG&E and the Forest Service jointly developed a campground design that utilized all the available suitable land.
Based on current high-season weekend occupancy (100 percent on July 2009 weekends), it is anticipated there will be a need for additional camping in the Lindsey Lake area within the license term. If triggers indicate a need for additional camping at Carr or Lindsey Lakes, these campgrounds should be expanded to the degree feasible. However, the opportunity to expand the campgrounds at these lakes is severely topographically limited. Upon expanding these campgrounds, if triggers indicate a continued need, the Licensee shall construct a Development Scale 3 campground with a non-motorized trail connecting this campground with the Lindsey area trail system. The campground should be located within a mile of Lindsey or Carr Lakes and preferably would offer views of the lakes or other scenic features or be located near a creek or other body of water. Potential locations include downstream of Lindsey Lake (where dispersed sites are currently located) and on National Forest System land in T.18N. R.12E., Sec 20. Other sites may be available in the vicinity. The size of the campground design should be based on available land base and projected demand. To the degree topographically feasible, the design should be capable of expansion if future demand indicates a need. If the Licensee and FS concur that suitable sites do not exist in the vicinity, the Licensee shall look for opportunities to provide a campground at another small, high elevation project lake (e.g. Peak Lake) with similar access. (p. 140-142).	PG&E did not adopt this proposal. Expansion or other management action should not occur until a campground has reached its capacity trigger. The capacity trigger in the Recreation Facilities Plan will determine when expansion or management action is needed. In addition, once PG&E has provided recreation facilities to meet the development potential or carrying capacity of a Project reservoir, it has appropriately met its recreation facility obligation for the Project reservoir. Campgrounds away from lakes have low utilization and are not cost-effective. Meadow Knoll Group Campground is a good example of a campground located away from a reservoir and that receives very low utilization.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Lower Lindsey Trailhead: Within 5 years of license issuance, build and maintain a single tract non-motorized trail from the Lower Lindsey Trailhead to Lower Rock Lake. Provide a trail connection from the upper end of the campground to this new trail in as short a distance as is feasible. An approximate location of this proposed trail (which is in need of ground-truthing) will take off from the Lower Lindsey trailhead on National Forest System land, head south across the creek, continue east across National Forest System land PG&E land, skirting the south sides of Lower and Middle Lindsey Lakes. If construction on the east side of Culbertson Lake is feasible and cost effective, the trail would skirt the south side of Upper Lindsey and the east side of Culbertson. However, due the steep topography, if construction east of Culbertson is not feasible, the trail could be routed either between Upper and Middle Lindsey or between Upper Lindsey and Culbertson Lakes. From this point the trail would continue north on PG&E land across the private land (preferably on a new right of way, but utilizing the existing road if the private landowner declined to grant an additional right of way). The trail would continue north to join the existing Lindsey Lake trail where it turns into a single track. (p. 142).	PG&E did not adopt this proposal. The existing non-motorized hiking opportunities on the road behind the locked gate provide adequate hiking opportunities and links to single track hiking trails in the Grouse Ridge area. In addition, two other existing single-track trails are available in the area via Grouse Ridge and Loney Meadow trailheads, which provide access to the Grouse Lakes Area. The need for developing another single track trail in the area has not been established. The agencies state hiking in the Lower Lindsey Lake area is less desirable due to the lack of a single track trail; however, a key difference between the two areas is that Lower Lindsey Lake area does not have the same unique, scenic quality as the non-Project lakes beyond Carr and Feeley lakes including Island Lake, Long Lake, and Round Lake. The hiking access via Carr-Feeley Trailhead provides quick access (less than 1 mi.) to unique, panoramic views above the tree line with surrounding granite peaks. In comparison, the Lower Lindsey Lake area is predominantly forested and lacks panoramic views except near the north end of Culbertson Lake and Upper Rock Lake (roughly 2 mi. into the hike). In addition, the existing Loney Meadow Trailhead provides a single-track trail opportunity near the Lindsey Lakes area through unique meadow habitat and beyond, yet this trail receives very low use as well. Thus, PG&E believes constructing another single track trail in hopes of attracting users away from the Carr Lake Trailhead trails will not be successful. Rather, PG&E believes that Forest Service enhancements or complimentary information to its existing Grouse Lake Map at Carr Lake Trailhead can better identify and promote the other trail options within the Forest Service's Grouse Lakes Management Area and will be a more effective measure to achieve their goal.
At Lower Lindsey Trailhead, within 5 years: • Install a new site identification sign and provide signage notifying trail users that the campground is for camping only. • Construct an information/interpretive display with information about the recreation opportunities and non-motorized aspect of the Grouse Lakes area. Include information about fire, sanitation and safety and interpretation about the natural and cultural resources of this area. • Install signing at Carr-Feeley trailhead and along the access road between the trailheads "advertising" the Lindsey Lake Trail. (p. 142).	PG&E adopted many of these proposals. PG&E, though, did not adopt the proposal for interpretive signs about the Grouse Lakes Area and providing information about the larger Grouse Lakes Area nor signs directing Carr-Feeley Trailhead users to the Lower Lindsey Lake Trailhead. These measures fall under the responsibilities of the Forest Service management of the Carr-Feeley Trailhead users and their management of the Forest Service's Grouse Lakes Management area.
At Lower Lindsey Trailhead: Within 10 years: • Construct a single unit vault toilet. • Gravel and barrier the extent of the parking area. (p. 142).	PG&E adopted this proposal with modification. PG&E will gravel and barrier the parking area; however, PG&E does not believe use levels warrant installing a vault toilet. The nearby 2-unit toilet is available at Lower Lindsey Lake, which visitors hike by to access the trail.
Middle Lindsey, Culbertson, Upper and Lower Rock Lakes: Perform or fund trail maintenance (including maintaining directional signing) between these lakes and from these lakes to Lower Lindsey Trailhead. Work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, performing fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; embedded rock and root removal; slough and berm removal; and turnpike, retaining wall and switchback maintenance if applicable. (p. 142).	PG&E did not adopt the agencies' proposal for a single track trail, which these proposals reference. PG&E will, however, maintain the existing gated trail/road that provides access to several Project reservoirs. The maintenance of this trail/road is covered in the Project's Transportation Management Plan for Primary Project Roads.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Within 5 years of license issuance, grant FS (through donation) a right of way on the following trails: • Blue Lake Trail • Lindsey Lake Trail • Spaulding Lake Trail • Committee Trail (near Fordyce Lake) • Other system trails on Licensee land where a public right of way is lacking. • As additional trails (specified in this Plan) are constructed, donate a right of way for these trails. (p. 143).	PG&E did not adopt this proposal. These are all non-Project trails located outside the FERC Project Boundary. With certain exceptions, it is PG&E's policy, however, to allow public access to PG&E's lands; if these lands are donated as part of the Land Conservation Commitment, public access will continue to be preserved.
Lake Valley: Within 5 year of license issuance: • Decommission, rip, and revegetate hardened sites along the FS Road 19 on the north and east side of the reservoir. Maintain barriers. • Remove culvert that has washed out on the southeast side of the reservoir at a road crossing. • Implement the Licensee's proposal included in the Draft Recreation Facilities Plan November 2010, Section 3.1.6.2. (p. 143).	PG&E adopted this proposal with modification. PG&E will implement the improvements proposed in the Recreation Facilities Plan at Lake Valley Reservoir. PG&E added a measure to the Recreation Facilities Plan that limits camping to designated campsites within the FERC Project Boundary as a policy. The dispersed sites on PG&E lands along Forest Service Road 19 have already begun to naturally re-vegetate since closing the sites to the public last year, so no further work will be done. The culvert appears to be outside the FERC Project Boundary and PG&E will therefore address the issue outside of the license.
Kelly Lake: Within 5 years of license issuance: • Remove the two single unit pit toilets and replace with a single unit vault toilet. • Improve directional signing to Kelly Lake both outside of Snowflower gate, at gate and from gate to lake. • Replace the vehicle barriers and remaining picnic tables. (p. 143).	PG&E adopted this proposal in part. The facilities at Kelly Lake are on PG&E land. In the Recreation Facilities Plan, PG&E proposed to replace, as appropriate, the vehicle barriers around the parking area; install additional directional signage before and after the Snowflower Resort (private); and approach Snowflower Resort about providing signage at their gate. PG&E also proposes to reduce the total number of picnic tables to three and to remove the existing pit toilets due to very low use (less than 2 people on a weekend and short length of stay of 1.4 hours) at the site. This very low use is not sufficient to warrant a toilet or more than three picnic tables.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Fuller Boat Launch: Within 5 years of license issuance, upgrade and reconstruct the facility. Increase vehicle and trailer parking capacity. Meet current accessibility goals and standards. Meet USFS, DBOW and /or other approved beach launch design standards. The work shall include, but is not necessarily limited to, the following specific elements: • Increase parking. One potential opportunity includes providing parallel parking along the dirt road south of the boat ramp, with turnaround at the end. • Lengthen trailer parking to 40 feet and improve vehicle approach to these parking spaces. This may require closing some of the upper picnic sites in order to change the road alignment and allow for this expansion. • Move fee tube and fee information sign to a visible location. Currently it is not very visible when cars are parked in front of it. • Resurface and repaint parking lot. • Provide a fish cleaning station with potable water. • Provide an area to back up directly behind the boat launch to facilitate trailer launching. • Construct an accessible fishing pier with a paved accessible path to the pier (south of the existing boat ramp). • Provide accessible parking spaces adjacent to pier and adjacent to restrooms. • Correct the grade of currently marked accessible parking space (if this space continues to be used as an accessible spot). • Pave road from Bowman Road to Fuller. • Provide a courtesy dock. • Replace all grills, fire rings and tables with accessible features. Provide clear level floor space around each constructed feature. Provide an ORAR to and between constructed features. • Install animal-resistant trash receptacles with corresponding garbage service. (p. 143-144).	PG&E adopted most of the proposal, except: 1) the fish cleaning station is not proposed due to water quality concerns associated with operation of these stations; 2) providing a back up area at the boat ramp because the existing boat ramp already includes a "T" shaped area to back into the ramp; and 3) paving the road from Bowman Road to the facility because it is a general access road on private lands, used by private residents and the private sportsman club.
Fuller Angler Access: Within 3 years of license issuance: • Repair accessibility issues at the entrance of the existing toilet. Provide and sign an accessible parking space and accessible path to the restroom. • Regrade and gravel the existing parking area. • Install resource protection posters at the bulletin board. (p. 144).	PG&E adopted most of the proposal, except providing an accessible parking space because it is not appropriate due to site terrain/slope. PG&E, though, does provide an accessible parking space, restroom, and picnic unit at the nearby Fuller Lake Day Use and Boat Launch facility.
At Fuller Angler Access: Within 10 years of license issuance: • Provide a non-motorized accessible interpretive trail around the south and east shores of Fuller lake (Class IV or V). Include fisherman access to shoreline as an aspect of the trail. Construct a non-motorized (Class III) trail connection from this trail to the Pioneer Trail, Rucker Lake Campground, & Spaulding Lake Campground. Locate trail on NFS and Licensee land. Provide trail signage. Provide annual maintenance of these trails. The work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of construction and maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, bridge maintenance (if appropriate), performing spring and fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; loose rock and root removal; slough and berm removal; and turnpike, retaining wall, switchback maintenance and other work needed based on trail design. • Provide trailhead facilities with vault toilet, trailhead signs, barriers, and surfaced parking in the general vicinity of Fuller Lake. Connect this trail to the trailhead. (p. 144).	PG&E did not adopt this proposal. Trail opportunities already exist starting below Fuller Lake Dam extending for 10+ miles along Lake Spaulding and Fordyce Creek. More importantly, the angler access parking area is already at capacity (110% on weekends) and the site lacks adequate land/space to develop additional parking that would be required to deal with additional trail users. In addition, the proposal requests PG&E build connector trails to non-Project trails, which do not have a nexus to the Project.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Rucker Lake: Within 1 year of license issuance: • Pursue a forest order to prohibit camping outside of developed campgrounds within one-quarter mile of Rucker and Fuller Lakes. The forest order is subject to environmental analysis pursuant to NEPA. • Install and maintain a heavy duty cement vandal-resistant sign at the road intersection with Bowman Road. This sign should indicate the presence of a tent campground; however, the name of the campground need not be included on the sign. Install and maintain directional signs to the campground from Bowman Road and back to Bowman Road. (p. 144-145).	PG&E adopted this proposal. PG&E added a proposal to the Recreation Facilities Plan that limits camping to designated campsites within the FERC Project Boundary as a policy. PG&E will work the Forest Service to develop a consistent policy on Forest Service lands within the FERC Project Boundary. Regarding the sign at Bowman Road, due to regular vandalism and removal of this sign, PG&E will install a heavy duty sign (non-concrete), but if the sign is vandalized and/or removed 3 times in a 6-year period, PG&E will no longer replace the sign
Within 3 years of license issuance [at Rucker Lake]: • Replace existing table, fire rings, and site markers. Provide these facilities at each campsite. • Install resource protection posters on the bulletin board(s). • Clearly define a trail to the walk-in campsites. • Provide 3 additional campsites. • Replace existing lockers with 30 cubic feet storage lockers. (p. 145).	PG&E adopted this proposal with modification. PG&E adopted all recommendations, and will provide up to 3 additional campsites if suitable lands can be identified.
Within 10 years of license issuance[at Rucker Lake], redesign and reconstruct as a Development Scale 3 drive-in (vehicle accessible) campground to meet the current FS design standards, FSORAG, and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. The capacity is estimated at 20-25 units. Due to topography, this facility will probably be designed primarily for tents, but should provide for longer spurs when topography allows. The road system, spurs, and toilets shall be placed at least 100' from the lakeshore. Whenever reasonable, the camp unit living space shall also be placed at least 100' from the lakeshore. The following includes, but is not necessarily limited to, the specific elements of this reconstruction.• Provide potable water. The hydrants shall meet FSORAG and ABAAS standards. Provide a level and compacted surface on the sides and in front of each faucet unit.• Provide additional toilets as needed (based on the size of the campground).• Provide paved turnout in front of each toilet, and access route to the toilet entrances.• Address accessibility. Provide ORAR between camp units, constructed features, spurs and toilets.• Grade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope where feasible. At a minimum, provide clear level, compacted floor space around all constructed features as required by accessibility standards.• Install tables and new accessible fire rings at each campsite• Install additional animal proof food storage lockers at each campsite and provide a clear, level, compacted ground space meeting size and slope specified in the FSORAG requirements for "Trash, Recycling and other Essential Containers". • Provide appropriate signing that meets FS standards.• Construct trash bin pads with paved approaches from the roadway. Install animal resistant trash receptacle and provide corresponding trash service.• Provide parking spurs that meet FSORAG.• Pave the all interior campground roads and spurs. Include a paved parking turnout adjacent to the entrance station.• Install a fee station at entrance.• Install barriers along road and spurs.• Grade tent pad areas.• Install unit markers.• As needed, work with adjacent private land owner to install signs indicating the presence of private land and prohibiting trespass. Provide signing at end of campground indicating the presence of the existing organization camp.• Install a gate at the campground entrance.• Improve (including rerouting as necessary) access road from Bowman Road. Maintain road as a maintenance-level 3 (graded, graveled) road.• Provide a graveled beach boat launch with turn around.• Provide a host site which includes water, septic (or holding tank), and solar (or other) power• Provide trailhead facilities including a trailhead signs, directional signs, barricades and a graveled parking area in the vicinity of the current Rucker Lake campground parking. Construct non-motorized trail to connect with the proposed Fuller Lake Trail. (p. 145-146).	PG&E did not adopt this proposal. PG&E has concerns related to the suitability of the lands along the site's shoreline, which are often very wet and marshy in the spring and early summer and may not be conducive to a 20-25 site drive-in campground. The 2009 relicensing study does not show a demonstrated need for such development (roughly 67% of the visitors had no preference for vehicle parking spurs for the campground; and 100% of visitors found the existing campground acceptable. If future monitoring identifies a need to address the existing facilities at Rucker Lake, then PG&E will address potential management actions and/or development. The current relicensing studies results provide the best information on existing conditions and users preferences, (not information from the 1990s as presented in the agencies rationale information on page 155). When reconnaissance was performed by PG&E and the Forest Service for the new campground as part of the implementation of the Revised Recreation Plan, it was agreed that a walk-in campground would be developed because the area was too wet and marshy for a drive-in campground.
Blue Lake: Within 5 years of license issuance: • Barricade road to support existing gate. Maintain barriers. • Install resource protection information on the information board and install additional bulletin board(s) at each campsite clusters addressing resource protection including proper human waste disposal. (p. 146).	PG&E adopted most of the proposal, with the exception of providing additional bulletin boards at the hike-in campsites. PG&E is providing the resource protection signage/messages at the parking area bulletin board where visitors must park to hike to the campsites.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Within 15 years of license issuance: • Connect the Fuller Lake Trail system with the Blue Lake Trail. Provide annual maintenance of these trails. The work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of construction and maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, bridge maintenance (if appropriate), performing spring and fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; loose rock and root removal; slough and berm removal; and turnpike, retaining wall, switchback maintenance and other work needed based on trail design. • Construct a trailhead (consisting of signs, bulletin board and parking with barriers) to serve the users of this trail. (p. 146).	PG&E did not adopt this proposal. As previously stated, PG&E does not propose to construct a trail at Fuller Lake from the angler access due to parking capacity concerns; and because the Blue Lake Trail is a non-Project trail. Also, the proposed connector trail from Fuller to Blue Lake is across PG&E lands outside the FERC Project Boundary and not on public lands.
Fordyce Lake: Within 2 years of license issuance, pursue a Nevada County ordinance and forest order that prohibits motorized vehicle use below the high water mark of Fordyce Lake. (p. 146).	PG&E has adopted this proposal and will pursue county ordinances with Nevada and Placer counties.
Within 3 years of license issuance [at Fordyce Lake]: • Install and maintain barriers and signing on the southern arm of the lake to close off uncontrolled OHV use that occurs when the lake level drops. • Improve and maintain signage to and from the lake. • Develop primitive campsites including a fire ring, animal resistant food locker, facility identification sign, information board (with resource protection information, regulations and OHV information etc.), barriers and a centrally located toilet. The size of the campground should be determined by the available area and the demand, with the opportunity to expand if demand justifies. Consider road condition in the toilet design. • Provide a management presence in the form of a camp host. • Dismantle and remove dispersed rock fire rings and makeshift toilets. This needs to be an ongoing action item. • Limit camping to designated sites only. (p. 146-147).	PG&E adopted all proposals except: 1) installing and maintaining barriers along the southern arm. Barriers are not an effective management tool along more than a mile of road/shoreline; 2) PG&E will provide a host at Lake Sterling (not at Fordyce Lake) to provide on-site management to address uncontrolled OHV use along the shoreline. The Recreation Facilities Plan was updated to include the agencies' proposal to dismantle and disperse rock fire rings and remove user-created site structures. (See Section 3.4.5 of the Recreation Facilities Plan.)

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Sterling Lake: Within 10 years of license issuance:• Install a railing on the dam for hiker safety.• Construct and maintain a non-motorized trail (Class III) around the lake and install signing to respect the organizational camp. Provide annual maintenance of these trails. The work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of construction and maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, bridge maintenance (if appropriate), performing spring and fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; loose rock and root removal; slough and berm removal; and turnpike, retaining wall, switchback maintenance and other work needed based on trail design.• Improve and maintain signage to and from the lake.• Convert existing campground to a day use area.• Replace toilet with new double unit accessible vault toilet.• Install 5 accessible tables and pedestal grills. Provide for a clear and level surface around each table and grill to meet FSORAG.• Expand existing parking lot to accommodate 15-20 vehicles.• Construct path from parking lot to day use sites and toilet.• Install rock barriers to prevent off road travel.• Where appropriate, move picnic sites away from the lake to minimize impacts to the shoreline.• Improve the signage on the current information board. Provide appropriate signing that meets FS standards and addresses resource protection, and regulations.• To replace lost overnight capacity (from conversions of the existing Sterling Campground to a day use area) and meet future demand for camping on small lakes within the project area, provide a designated camping area or campground with appropriate resource protection on the east side of lake (on PG&E land). To provide for this resource protection, at a minimum, control vehicle use and provide toilet, fire rings, information board, and animal resistant food storage lockers. The number of sites provided be based on available base and projected demand and should at least replace those six sites that were converted to day use on the west side of the lake. Monitor the use of these sites to determine the need for additional sites and amenities. There is sufficient land available for 10-15 units.• Upgrade access road (85-2-2-3) so that it is passable for high clearance 2WD vehicles.• Create a beach area with a Car-Top/Hand Launch boat access on the lake's edge. (p. 147-148).	PG&E adopted the proposal in part. PG&E proposes to: 1) install the railing; 2) install signage to and from the reservoir; 3) improve signage at the existing information board; 4) replace the restroom with a 2-unit vault restroom; and 5) install accessible food lockers, tables and pedestal grills. PG&E must confirm with Division of Safety of Dams (DSOD) to verify whether installing a handrail would impact the probable maximum flood calculations as the railing can collect debris under extreme high water scenarios creating a dam safety integrity situation. If DSOD confirms the installation is allowed, then PG&E will install the railing. Regarding the remaining proposals, nearly 80 percent of visitors surveyed in 2009 found the existing facilities acceptable at Lake Sterling. As a result, PG&E did not adopt the proposal to convert the existing campground to a picnic area because the existing Project recreation facilities and opportunities are meeting the recreation demand for the reservoir. The agencies, on page 157 of their letter, provide rationale that current Forest Service direction requires campsites be located at least 100 feet from a reservoir; however, site terrain often results in campsites being located within 100 feet of the reservoir (such as Rucker Lake, Lower Lindsey Lake, and Meadow Lake). In addition, PG&E has concerns that providing a new 10-15 site campground, which could result in overcrowding at this small reservoir. Similarly, this level of development is not consistent with the lake's semi-primitive ROS management class. In regard to the proposed boat launch, the low-standard road access makes developing a car-top launch impractical and unwarranted considering car-top watercraft (canoes, kayaks, and fishing tubes) can already be launched from the existing walk-in campground on the west side of the reservoir. PG&E, also, does not propose to expand the parking area because 2009 study data did not show any capacity concerns. Regarding rock barriers at the walk-in campground parking area, the existing barriers appear to be adequate to keep vehicles from accessing the shoreline as the shoreline shows little evidence of regular vehicle use. In addition, in the future, with a new camp host site, there will be management presence at the lake. A beach area is not suitable at this lake as cold water temperatures and cooler air temperatures are prevalent throughout much of the peak season. Finally, PG&E did not adopt the proposal to construct a new trail around Lake Sterling. An existing trail system is already available from the dam leading to the non-Project "Mossy Lakes" area and to the east shoreline along the north shoreline outside the FERC Project boundary.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Meadow Lake: Prohibit camping along the shore of Meadow Lake except within developed sites or dispersed areas accessed only by boat. This will need to be addressed through a forest order that is subject to environmental analysis pursuant to NEPA. The FS requests that the analysis of camping closures be included in the relicensing NEPA document to facilitate these closures. Additional coordination will be needed with the county sheriff to implement the closures on private and Licensee owned land. (p. 148).	PG&E adopted this proposal with modification. PG&E added a measure to the Plan that limits camping to designated campsites within the FERC Project Boundary as a policy. PG&E will work the Forest Service to develop a consistent policy on Forest Service lands within the FERC Project Boundary. PG&E does not propose to allow exceptions to the designated camping policy for boat-in camping.
Within 5 years of license issuance [at Meadow Lake]: • Provide interpretation of the cultural resources of this area in all three campgrounds. The interpretation is to be developed jointly with the FS. • Grade and gravel both boat ramps. • Define, gravel and barricade parking areas above high water and provide turn-arounds. • Install information sign indicating the area is for day use parking only. • Install signage on boat ramps and at the campgrounds prohibiting OHV use below water level. (p. 148).	PG&E adopted the proposal with modification. The boat ramps at Meadow Lake are adequate for the level and type of boating use that occurs. In addition, PG&E's proposed picnic area and parking will include a defined, gravel area with barriers. PG&E will also provide a defined turnaround area at the proposed day use/parking area near the existing informal boat ramp. PG&E also felt one strategically located panel (not three panels) should be sufficient to provide information about the reservoirs' historic past and proposes that this panel be located at the new day use area.
Meadow Shoreline Campground: Within 5 years of license issuance, redesign and reconstruct the campground as a Development Scale 2 campground (with tables). The design should be primarily for tent camping and meet the current FS design standards, FSORAG, and requirements of the Americans with Disabilities Act (ADA) or other applicable standards at the time of design. The following, include but are not necessarily limited to, the specific elements of this reconstruction: • Relocate campsites, as needed, to more desirable/ durable locations. Close campsite # 10 to overnight camping. • Install 2 to 3 single unit vault toilets. The new toilets are to be placed so as to optimize travel to toilets. Remove all campsites that are not within 500 feet of a toilet. • Effectively barricade all closed campsites; maintain and enforce the closures. Replace the capacity of all removed campsites with additional campsites in Meadow Campground (or elsewhere within the Shoreline campground, if appropriate). • To the degree possible with the existing road alignment, move vehicle parking spurs, and camping living space at least 100 feet away from the lakeshore. Delineate all parking spurs, barricading the spurs and the road to prevent vehicle access into campsites and off-road travel. • Address dust reduction along the county road through the campground. • Replace all tables and fire rings with accessible features. Provide a clear, level compacted surface adjacent to all constructed features in compliance with FSORAG. • Provide appropriate signing that meets FS and other applicable agency standards, including signage about resource protection and location of nearest water and trash collection. • Replace entrance station. • Address accessibility as required in Development Scale 2 campgrounds. (p. 148-149).	PG&E adopted this proposal with modification. In the Recreation Facilities Plan, as part of the initial implementation proposals, PG&E proposes a single vault restroom, which should be sufficient for 9 shoreline campsites. When the campground is proposed to be reconstructed, PG&E proposes replacing existing facilities with new FSORAG-compliant facilities and to relocate/reinforce vehicle barriers to improve vehicle management at each campsite, and replace the information board. PG&E did not adopt the proposal to close (other than campsite #10) or relocate campsites because the sites were initially located by PG&E and Forest Service in the best available locations. PG&E also did not adopt the proposal to address dust reduction along the county road that parallels the campground (the road does not go through the campground) because the 2009 user survey results did not indicate this was an issue at the campground (92% of visitors rated the county road as acceptable).

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Meadow Campground: Within 5 years of license issuance, redesign as a Development Scale 3 campground, establishing the desirable, logical road and campsite location within approximately the existing footprint. (The existing campground contains a rather confusing maze of roads.) Reconstruction is not required at this time but the design will assist in minimizing future costs. In the design, provide for additional campsites to accommodate any that are closed in the Shoreline Campground. • Engineer and construct a potable water system. The hydrants shall meet accessibility standards. Provide a level and compacted surface on the sides and in front of each faucet unit to meet FSORAG. • Provide garbage collection (sufficient to handle garbage produced at Meadow Knolls, and Meadow Shoreline Campground as well as Meadow Campground). • Improve entrance station and signs. • Delineate roads and spurs with barriers, meeting current design standards. Regrade & gravel road and spurs. • Provide signing at neighboring campgrounds indicating the locating of nearest water and garbage service. (p. 149).	PG&E adopted this proposal with modification. PG&E did not adopt the proposal to redesign the campground as a Development Scale 3 campground. PG&E believes the existing Development Scale 2 is appropriate for this campground considering the reservoirs remoteness, the rough condition of the access road to the lake, and the high user satisfaction with the existing campground facilities (87% of visitors who offered an opinion rated the camping facilities as acceptable). Regarding garbage, PG&E did not adopt garbage facilities; because such service would be extremely costly given the lakes remoteness and difficult access road. Furthermore, the presence of an on-site host provides enforcement and management to maintain pack-it-in, pack-it-out conditions at the campgrounds. PG&E will provide potable water at the campground within 15 years of license issuance and FERC's approval of the Recreation Facilities Plan. PG&E will also provide signs at the other campgrounds to indicate that water is available at Meadow Lake Campground. In addition, PG&E will improve the entrance station and signs as proposed within 5 years of license issuance and FERC's approval of the Recreation Facilities Plan.
Within 15 years of license issuance [at Meadow Lake Campground], reconstruct as a Development Scale 3 campground (to implement redesign). Meet the current FS design standards, FSORAG and requirements of the Americans with Disabilities Act (ADA). Address expansion if triggers indicate this need. The following includes, but is not necessarily limited to, the specific elements of this reconstruction:• Address accessibility. Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. Provide ORAR between constructed features, campsites, toilets and spurs.• Where feasible regrade camp units to 1200-square-foot level compacted surface, with maximum 3 percent cross slope. At a minimum, provide graded tent pads and clear floor space around tables, food storage lockers, hydrants and grills to meet FSORAG.• Replace bulletin boards and signs, assuring signing meets FS standards and ADA requirements.• Replace barriers and unit markers.• Replace fire rings and picnic tables.• Gravel parking turnout adjacent to the entrance station.• Construct trash bin pads with graveled approaches from the roadway.• Resurface roads and spurs.• Replace gate as needed.• Replace toilets if needed.• Provide graded, surfaced turnout in front of each toilet, and access route to the toilet entrances. (p. 149-150).	PG&E adopted this proposal with modification. Within 15 years of FERC's issuance of the new license and approval of the Recreation Facilities Plan, PG&E proposes to rehabilitate the campground, maintaining the Development Level 2 campground, and meeting current accessibility requirements. In addition, potable water would be provided at the campground.
Meadow Knolls: Within 20 years of license issuance, reconstruct the group campground to meet current standards including but not limited to: • Install a potable water system. • Reconstruct all constructed features. • Clean up down logs and slash. • Bring roads and spurs up to standard. Barrier and gravel road. • Provide garbage service. • Construct a multiple-use trail to the lakeshore. (p. 150).	PG&E adopted this proposal with modification. PG&E will rehabilitate the existing facility and site features as outlined in the Recreation Facilities Plan. In addition, PG&E proposes to provide potable water at the nearby Meadow Lake Campground, and will install signage at the group campground indicating that the water is available nearby. PG&E did not adopt the proposal to install a water system, provide garbage service, construct a trail, or upgrade roads. This campground experiences very low use (25% occupancy on peak season weekend) and does not warrant additional development and facility services.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Upper and Lower Peak Lakes: Within 5 years of license issuance: • Construct non-motorized trail from trailhead to the lake at an acceptable grade. Rehabilitate the existing trail. • Construct a single vault toilet at the trailhead. • Replace trailhead bulletin boards and provide signage that meets FS standards including information on leave no trace camping and proper food storage. Within 10 years of license issuance, construct a new non-motorized trail around the Lower Peak. Within 20 years of license issuance, address the demand a campground on Licensee land on west shore of lake or National Forest System land on south shore of lake if a mid-license review indicates the unmet demand for camping facilities at small lakes within the project area. (p. 150).	PG&E did not adopt these proposals. Most of these recommendations are related to non-Project hiking associated with the non-Project Palisades Creek Trailhead, and not associated with the Project reservoirs. The Palisades Creek Trailhead provides access to a non-Project trail to non-Project lakes and the North Fork of the American River outside the FERC Project Boundary. Regarding the Lower Peak trail proposal, recreation use at Lower Peak Lake is very low and none of the Lower Peak Lake visitors identified a preference for trails around the shoreline. In addition, the maximum use recorded on weekends was four recreationists total; and such low use also does not warrant a toilet facility. Lower Peak Lake visitors also have easy hiking access to the Palisades Creek Trailhead via the dirt road between Lower Peak Lake and Upper Peak Lake. PG&E will evaluate the future demand for a campground when, and if, such demand is evident as determined by PG&E's monitoring program in the Recreation Facilities Plan. At present, the demand for such a campground does not exist.
Kidd Lake: Within 5 years of license issuance: • Construct a non-motorized trail from the group campground to Peak Lake, if feasible, • If the USA acquires the land in the northwest corner of the lake, construct a parking area, toilet, signage and boat launch. Design of the boat launch (to be determined at the time) will be appropriate for the size, types of use and 15 mph speed limit of the lake. (This may be a beach, hand or car top launch.) If the USA has not acquired this parcel by this time, but acquires it in the future, construct these features within 5 years of this acquisition. • Implement the Licensee's proposal included in the Draft Recreation Facilities Plan November 2010, Section 3.1.5.1. • Explore opportunities to increase the parking area of the upper group campground unit to provide additional RV parking. (p. 150-151).	PG&E did not adopt this proposal. The 2009 study data did not indicate that visitors preferred additional trails along the shoreline (nearly 70% did not prefer or had no opinion); and, public access is already provided to Upper and Lower Peak lakes via the dirt access roads. Also, PG&E did not propose facilities on the potential that the Forest Service may acquire private land at Kidd Lake at some future date. PG&E did not adopt the group campground parking expansion proposal because the 2009 study data did not indicate a need for increased parking for RVs (100% of visitors found the existing parking acceptable). PG&E, though, is proposing to provide additional group camping opportunities at Lake Valley Reservoir.
White Rock: Within 5 years of license issuance: • Grade road along north shoreline to all of the campsites and provide for appropriate drainage as needed. Maintain road in a graded condition. • Install information board with information about leave no trace camping, proper waste disposal prevention of the spread of amphibian chytrid fungus and proper food storage. • Close campsite below dam, which is located on a sensitive resource site. Implement and maintain the closure in such a way as to prevent damage to this sensitive resource. (p. 151).	PG&E adopted this proposal with modification. PG&E proposes to grade the rough areas of the road, which is up to the first few campsites. PG&E notes that the access to the lake requires 4WD and that the rough section of this road is entirely on PG&E lands. In addition, PG&E will post educational materials at the 1-panel information board related to leave-no-trace, proper waste disposal, and reducing the spread of amphibian chytrid fungus.
Langs Crossing: Within 5 years of license issuance: • Provide a garbage collection, a single unit vault toilet, gravel parking. • Construct a 3 unit picnic site with tables and pedestal grills. • If this is used as a boating put-in, construct appropriate river access. (p. 151).	PG&E did not adopt this proposal. This site is located outside the FERC Project Boundary. The recreational use at this river reach site is non-Project use and is use that would exist regardless of the Project.
Golden Quartz (if used as a boating access point): • Construct raft put-in/take-out access on the South Yuba River. • Work with Nevada County to have the bridge over Canyon Creek replaced to provide access to the site for heavy equipment to provide toilet pumping and other site maintenance work. The current bridge has a 3 ton weight limit. • Replace the existing toilet. (p. 151).	PG&E did not adopt this proposal. This site is located outside the FERC Project Boundary. The recreational use at this river reach site is non-Project use and is recreation use that would exist regardless of the Project.

Table 6.6.3-2. (continued)

Proposal (Includes the Text of Proposal and Comment Letter Page Reference)	**PG&E's Reply**
Edwards Crossing: Within 5 years of license issuance, construct raft put-in/take-out access on the South Yuba River that includes the following: • Boating flow information. • River maps. • Information kiosk. • Replace restroom facility. • Bear-proof trash containers. (p. 151).	PG&E did not adopt this proposal. This site is located outside the FERC Project Boundary. The recreational use at this river reach site is non-Project use and is recreation use that would exist regardless of the Project.
Purdon Crossing: Within 2 years of license issuance, construct raft put-in/take-out access on the South Yuba River that includes the following: • Boating flow information. • River maps. • Information kiosk. • Restroom facility. • Bear-proof trash containers. • Gravel and repair road. (p. 152).	PG&E did not adopt this proposal. This site is located outside the FERC Project Boundary. The recreational use at this river reach site is non-Project use and is recreation use that would exist regardless of the Project.

6.6.4 Unavoidable Adverse Impacts

6.6.4.1 Yuba-Bear Hydroelectric Project

NID's proposed Yuba-Bear Hydroelectric Project would not create any significant, unavoidable adverse effects. The Project provides extensive recreational facilities including developed campgrounds, day use areas, boat launches, and facility access and circulation roads at six Project reservoirs. All of the facilities and features provide a beneficial effect not an adverse effect by providing the public with opportunities to recreate along the shoreline and on the Project reservoirs in varying natural settings, and recreation settings from highly developed experiences to more remote, primitive experiences. Construction of new facilities and rehabilitation of the existing recreation facilities has short-term adverse impacts (noise, ground disturbance including vegetation and erosion, and water quality); however, Licensee has proposed appropriate resource protection measures and plans to minimize the short-term impacts from construction activities. Regarding whitewater boating opportunities, the Project provides numerous opportunistic boating opportunities on several Project-affected river reaches where NID has the ability to control the flow. These opportunities primarily occur during the spring months, but also into the summer months on the lower elevation reaches on the Bear River below Rollins Reservoir; and in September on the high elevation reaches of Canyon Creek via NID's proposed supplemental whitewater boating flows on Canyon Creek. Thus, the Project further provides beneficial uses along the Project-affected stream reaches for whitewater boating throughout the summer recreation season, which would typically only exist during the spring months under unimpaired conditions.

6.6.4.2 Drum-Spaulding Project

Operating and maintaining the Drum-Spaulding Project consistent with PG&E's proposed measures would not create any significant and unavoidable adverse effects to recreational resources. The Project provides developed recreational opportunities including campgrounds, day use areas, and boat launches; as well as undeveloped access to reservoirs and impoundments ranging in elevation from 8,500 ft. to nearly 1,400 ft. The developed facilities and features provide a beneficial effect, not an adverse effect, by providing the public with opportunities to recreate along the shoreline and on the Project reservoirs in varying natural settings and recreation settings from highly developed experiences to more remote, primitive experiences. Construction of new facilities and rehabilitation of the existing recreation facilities has short-term adverse impacts (noise, ground disturbance including vegetation and erosion, and water quality); however, PG&E has proposed appropriate resource protection measures in its Recreation Facilities Plan, and plans to minimize the short-term impacts from construction activities. Regarding whitewater boating opportunities, there are numerous boating opportunities that occur on several Project-affected river reaches. These opportunities primarily occur during the spring months, but also occur in summer months in some instances; under unimpaired conditions, those opportunities would typically only exist in the spring months.

6.7 Land Use

The discussion of land use is broken into five sections. First, and immediately below, is a list summarizing the status of the study Licensees conducted regarding land use. Second, the affected environment is discussed in Section 6.7.1. Third, the environmental effects of each of the projects are located in Section 6.7.2; Fourth, proposed measures are listed in Section 6.7.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, Section 6.7.4 notes that the proposed projects do not result in any unavoidable adverse impacts.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on land use, Licensees developed and conducted the study listed in Table 6.7-1.

Table 6.7-1. Land Use studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress[1]	Study Complete	Date Study is Scheduled to be Complete
2.9.1	Roads and Trails[2]	9-1	7/23/10	--	10/31/11

[1] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, the Roads and Trails study listed in Table 6.1-1 is in progress. The status of the study is described below.

- Roads and Trails Study (Study 2.9.1). Licensees posted a technical memorandum to the Relicensing Website on July 23, 2010. Subsequently, PG&E identified four roads, which had not been surveyed under Study 2.9.1 that need to be surveyed. PG&E intends to survey these roads (to complete Study 2.9.1) and file with FERC a final technical memorandum by October 31, 2011.

The interim technical memorandum for the Roads and Trails Study is filed with this FLA in Appendix E12. The technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; lists of variances to the FERC-approved study; attachments to the technical memorandum; and references.

6.7.1 Affected Environment

This section describes existing land use conditions, and is divided into the following eight areas: 1) land ownership; 2) land use; 3) land management; 4) Licensees' shoreline buffer zone and shoreline permitting policies; 5) fire risk and protection; 6) Project-related Forest Service Special Use Permit (SUP) and easements; 7) law enforcement; and 8) access to the projects.

6.7.1.1 Land Ownership

The proposed projects are each located in Nevada and Placer counties, California, with portions of the projects on public land administered by the U.S. Department of Interior, Bureau of Reclamation (BOR), the Bureau of Land Management (BLM), and the Forest Service (FS). Portions of the Yuba-Bear Hydroelectric Project are also located in Sierra County, California.

Within the upper elevations of these counties (i.e., above El. 3,000 ft), major landholders include the Forest Service, timber companies (e.g., Sierra Pacific Industries, or SPI), PG&E and NID. Lands around mid-elevation along the Bear River are primarily owned by BLM, whereas lands in the lower elevations are generally privately owned (with some small BOR holdings) and are near urban areas.

Table 6.7.1-1 summarizes land ownership within the existing and proposed Yuba-Bear Hydroelectric Project FERC Project Boundaries.

Table 6.7.1-1. Summary of land ownership within the existing and proposed Yuba-Bear Hydroelectric FERC Project Boundary by Project Development.[1]

Development	Forest Service (ac)	BLM (ac)	NID (ac)	Other Private (ac)	Total	
					(ac)	Percent
EXISTING FERC PROJECT BOUNDARY						
Bowman	1,283.8	--	2,348.9	142.3	3,775.0	60%
Dutch Flat	221.3	14.0	46.9	136.2	418.4	7%
Chicago Park	0.1	54.1	38.4	73.2	165.8	3%
Rollins	--	140.4	1,618.4	61.2	1,820.0	29%
Bowman-Spaulding Transmission Line	35.6	--	3.7	34.1	73.4	1%
Total	**1,540.8**	**208.5**	**4,056.3**	**447.0**	**6,252.6**	**100%**
Percent	**25%**	**3%**	**65%**	**7%**	**100%**	**--**
PROPOSED FERC PROJECT BOUNDARY						
Bowman	1,247.1	--	2,313.9	112.8	3,673.8	60%
Dutch Flat	205.1	13.9	53.1	89.4	361.5	6%
Chicago Park	--	77.0	48.1	70.3	195.4	3%
Rollins	--	140.2	1,690.6	7.3	1,838.1	30%
Bowman-Spaulding Transmission Line	28.2	--	1.9	28.2	58.3	1%
Total	**1,502.6**	**231.1**	**4,107.6**	**308.0**	**6,127.2**	**100%**
Percent	**24%**	**4%**	**67%**	**5%**	**100%**	**--**
DIFFERENCE BETWEEN EXISTING AND PROPOSED FERC PROJECT BOUNDARIES						
Difference	**-60.4**	**22.6**	**51.4**	**-139.0**	**-125.4**	**-2.00%**

[1] The Bowman-Spaulding Transmission Line, part of the Bowman Development, is shown separately because it is a linear facility.

Tables 6.7.1-2 and 6.7.1-3 provide Drum-Spaulding Project land ownership within the existing and proposed FERC Project Boundaries, respectively.

Table 6.7.1-2. Summary of land ownership within the existing Drum-Spaulding Project Boundary.

Owner	Totals	
	Acres	% of Total
Forest Service	978.3 acres	18%
Bureau of Land Management	10.6 acres	<1%
Bureau of Reclamation	5.1 acres	<1%
Licensee	3,443.9 acres	63%
State	20.4 acres	<1%
Other Patented Non-Federal	1,061.9 acres	19%
Total Federal Lands[1]	**994.0 acres**	**18%**
Total Non-Federal Lands	**4,526.2 acres**	**82%**

Table 6.7.1-3. Summary of land ownership within the Proposed Drum-Spaulding Project Boundary.

Owner	Totals	
	Acres	% of Total
Forest Service	1,128.8 acres	21%
Bureau of Land Management	5.6 acres	<1%
Bureau of Reclamation	5.3 acres	<1%
Licensee	3,410.1 acres	65%
State	20.1 acres	<1%
Other Patented Non-Federal	683.1 acres	13%
Total Federal Lands[1]	**1,139.7 acres**	**22%**
Total Non-Federal Lands	**4,113.3 acres**	**78%**

[1] The above federal lands include patented lands that have been reconveyed to the federal government. Exhibit G contains a complete breakdown of all land ownership in the FERC Project Boundary.

6.7.1.2 Land Use

6.7.1.2.1 Nevada County

Land use within Nevada County is varied and classified for either public or private use. Private land use accounts for about 68 percent of the 623,828 acres (978 square miles) within the county (Table 6.7.1-3). Forestlands are the most abundant classification of lands within the county, at approximately 172,800 acres (270 square miles). The second largest classification is Rural lands at approximately 153,600 acres (240 square miles).

Table 6.7.1-3. Distribution of public and private land in Nevada County.[1]

Public Agency or Private Ownership	Number of Parcels	Average Acreage of Parcels	Total Acreage per Agency	Public Agency Lands as a % of County
Army Corps of Engineers	8	121.3	970.0	0.2
Bureau of Land Management	138	128.9	17,793.7	2.9
Military	3	44.2	84.6	<0.1
Tahoe National Forest	140	1,224.8	171,469.8	27.5
Toiyabe National Forest	10	258.7	2,587.1	0.4
California Department of Fish and Game	16	263.4	4,214.7	0.7
California Department of Parks and Recreation	7	419.7	2,937.9	0.5

Table 6.7.1-3. (continued)

Public Agency or Private Ownership	Number of Parcels	Average Acreage of Parcels	Total Acreage per Agency	Public Agency Lands as a % of County
Other State Lands of California	7	120	845.3	0.1
Private Lands[2]	155	2,728.5	422,924.9	67.8
Total	**484**	**NA**	**623,828.0**	**100.0**

1 Source: Teale GIS Solutions Group 1997.
2 Private Lands include land owned by NID and PG&E.

Federally-owned land in Nevada County is not subject to county jurisdiction. Private land use is managed by the county in accordance with the 1996 Nevada County General Plan and County zoning ordinances. The plan provides 26 land use categories, seven of which are germane to the projects. Table 6.7.1-4 summarizes the seven county zoning ordinance land use categories that apply in the vicinity of the projects.

Table 6.7.1-4. Nevada County Zoning Ordinance Land Use Categories in the vicinity of the projects.[1]

Land Use Categories	Description
AG – General Agriculture	Area for farming, ranching, agricultural support facilities and services. Consistent with agricultural-oriented General Plan land use descriptions.
OS – Open Space	Provides for areas of open space protected from development.
FR – Forest	Provides for the protection, production and management of timber including support uses and temporary buildings and low intensity recreation.
RA – Residential Agriculture	Low-density single-family dwellings that keep with the rural character of the area.
P – Public	Areas occupied by Federal, State or local agencies.
REC – Recreation	Include a wide range of active and passive recreation uses and support services. More intense activities should be close to a major highway or main arterial.
TPZ – Timberland Production Zone	Provides for forest resource management and the continued use of timberlands for timber production. Other uses are acceptable as long as they do not detract from timber management.

1 Source: County of Nevada 1996.

6.7.1.2.2 Placer County

Land use in Placer County is varied and classified for either public or private use. Private land use within Placer County accounts for 59 percent of the 909,894 acres (1,422 square miles) within the county (Table 6.7.1-5).

Table 6.7.1-5. Distribution of public and private land in Placer County.[1]

Public Agency or Private Ownership	Number of Parcels	Average Acreage of Parcels	Total Acreage per Agency	Public Agency Lands as a % of County
Bureau of Land Management	92	260.0	23,916.1	2.6
Bureau of Reclamation	17	1,150.7	19,562.5	2.1
Military	3	229.3	688.0	0.1
El Dorado National Forest	43	1,190.2	51,178.9	5.6
Lake Tahoe Basin Management Unit	7	4,544.0	31,808.2	3.5
Tahoe National Forest	80	2,993.7	239,496.9	26.3
City and County Lands	1	7.3	7.3	<0.1
Private[2]	195	2,769.0	539,954.0	59.3
California Department of Fish and Game	5	60.8	304.0	<0.1

Table 6.7.1-5. (continued)

Public Agency or Private Ownership	Number of Parcels	Average Acreage of Parcels	Total Acreage per Agency	Public Agency Lands as a % of County
California Department of Parks and Recreation	7	366.2	2,563.3	0.3
Other State Lands of California	7	59.3	414.9	<0.1
Total	**457**	**NA**	**909,894.1**	**100.0**

1 Source: Teale GIS Solutions Group 1997.
2 Private includes land owned by NID and PG&E.

Federally-owned land in Placer County is not subject to county jurisdiction. Private land use is managed by the county in accordance with the 1994 Placer County General Plan and County zoning ordinances. The plan provides 14 land use categories, four of which are pertinent to the projects. Agriculture/Timberland – 80-acre minimum lot size land use classification is the most abundant classification within Placer County at approximately 651,520 acres (1,018 square miles). The Placer County zoning ordinance land use categories that apply to the vicinity of the projects are described in Table 6.7.1-6.

Table 6.7.1-6. Placer County Zoning Ordinance Land Use Categories in the vicinity of the projects.[1]

Land Use Categories	Description
FOR – Forestry	Primary land use will be the growing and harvesting of timber and timber products.
TPZ – Timberland Production Zone	Responsible forest resource management and continued use of lands for timber products and compatible uses.
RES – Resort	Areas with significant natural facilities and commercial recreation potential, with good access to highways.
RF – Residential Forest	Rural residential living in forested, mountainous or foothill areas.

1 Source: County of Placer 1994.

6.7.1.2.3 Sierra County

Land use in Sierra County is varied and classified for either public or private use. Federal public land use accounts for 70 percent of the 615,040 acres (961 square miles) within the county (Table 6.7.1-7).

Table 6.7.1-7. Distribution of public and private land in Sierra County.[1]

Public Agency or Private Ownership	Number of Parcels	Average Acreage of Parcels	Total Acreage per Agency	Public Agency Lands as a % of County
Bureau of Land Management	18	287.4	5,173.3	0.8
Plumas National Forest	2	20,756.6	41,513.2	6.7
Tahoe National Forest	84	4,206.6	353,356.5	57.4
Toiyabe National Forest	20	1,379.1	27,582.2	4.5
California Department of Fish and Game	251	705.7	177,132.8	28.8
California Department of Parks and Recreation	10	1,044.3	10,443.2	1.7
Other State Lands of California	1	1.1	1.1	<0.1
Private[2]	1	3.2	3.2	<0.1
Total	**387**	**NA**	**615,205.5**	**100.0**

1 Source: Teale GIS Solutions Group 1997.
2 Private includes land owned by NID.

Sierra County manages private land use (public lands are not subject to county jurisdiction) in accordance with the Sierra County General Plan and the County zoning ordinance. County land use zoning categories in the vicinity of the projects are described in Table 6.7.1-8.

Table 6.7.1-8. Sierra County Zoning Ordinance Land Use Categories in the vicinity of the projects.[1]

Land Use Categories	Description
GF – General Forest	Growing and harvesting of forest products, grazing of livestock, single-family residence and accessory buildings.
FR – Forest Recreation	Provide low intensity recreational opportunity that also maintains natural environment.
TPZ – Timberland Preserve Zone	Implement the Forest Taxation Reform Act (1976) and the California Timberland Productivity Act (1982).

[1] Source: County of Sierra 1996.

6.7.1.2.4 National Forest System Land

The TNF, which is managed by the Forest Service, was initially established in 1891 as a 136,335-acre area within the Sierra Reserve established by President Benjamin Harrison. With the addition of the Yuba Forest Reserve in 1904 and the Tahoe Forest Reserve in 1905, the TNF encompasses 800,000 acres (1,250 square miles) within Sierra, Nevada and Placer counties.

Many of the areas within or proximate to the TNF were settled by Europeans after gold was discovered in Coloma, which is located south of the TNF. Hydraulic mining began in 1852 near Nevada City at the North Bloomfield Mine using a canvas hose to move water in "diggings." By the late 1860s, hydraulic mining operations washed away hillsides to reach gold in the gravel of ancient riverbeds. These mines required large amounts of water that was stored in lakes and reservoirs high in the Sierra, many of which are part of hydroelectric and water supply projects today.

The Forest Service manages TNF in accordance with the Tahoe National Forest Land and Resource Management Plan (LRMP 1990), as amended by the Sierra Nevada Forest Plan Amendment Record of Decision (June 2004) for old forest ecosystems, aquatic, riparian, and meadow ecosystems, fire and fuels management, lower westside hardwood ecosystems and noxious weed management. The LRMP as amended, sets two levels of management direction: one is Forest-wide and the other is Area-specific. With respect to Forest-wide management, direction comes from Forest-wide Goals, Objectives and Standards and Guidelines. Area-specific direction is set forth in the Management Direction for 106 areas and includes Management Area Emphasis, Standards and Guidelines and Practices.

Forest-specific management areas in the vicinity of the Yuba-Bear Hydroelectric Project include Henness, Milton-Jackson, Pinoli, Bowman, South Yuba, Grouse, Fuller and Chalk. Forest-specific management areas in the vicinity of the Drum-Spaulding Project include Henness, Meadow Lake, Grouse, South Yuba, Meadow, Twenty, Mears, Red, Loch Leven, Yuba Gap, Blue Castle, Chalk, Emigrant, Monumental, Fordyce and Fuller.

Roads on the TNF are managed under the Forest Service Motorized Travel Management EIS and Record of Decision (2010). The plan designates roads, trails, and areas that are open to motor vehicle use on NFS lands. The plan also prohibits the use of motor vehicles off designated roads, trails, and areas, as well as use of motor vehicles on roads and trails and in areas that is not consistent with the designations. Roads in the FERC Project Boundary on both the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project that are on NFS lands are subject to the provisions of this plan.

6.7.1.2.5 Public Land Administered by BLM

Approximately 231 acres of the Yuba-Bear Hydroelectric Project are located on public land administered by BLM. The Drum-Spaulding Project contains 5.6 acres on BLM administered lands near Deer Creek Powerhouse. The BLM manages the land as part of Sierra Resource Management Area. The Sierra Resource Management Area encompasses approximately 230,000 acres within Alpine, Amador, Calaveras, Colusa, El Dorado, Mariposa, Merced, Nevada, Placer, Sacramento, San Joaquin Stanislaus, Sutter, Tuolumne, and Yuba counties (BLM 2008). BLM manages these Resource Areas in accordance with the Sierra Resource Management Plans (SRMPs). Draft SRMPs and accompanying Environmental Impact Statements (EIS) were issued by BLM for public review in 2006 and the final RMPs and EISs were released in May 2007.

The SRMP was developed to address changes and increases in consumptive uses or resources (such as minerals) and the need for BLM to coordinate resource protection protocols between Nevada and California agencies. Four alternatives were considered in the SRMP evaluation: No Action (Alternative A); Emphasis on Environmental Protection (B); Emphasis on Recreation and Consumptive Uses (C); and Balance of Environmental Protection with Recreation and Consumptive Uses (D). The management plan recommended Alternative D as the preferred alternative to the Secretary of Interior. In Placer County, the SRMP proposed an Area of Critical Environmental Concern (ACEC) proximate to the Yuba-Bear Hydroelectric Project. No other ACECs are near the projects.

6.7.1.2.6 Public Land Administered by BOR

A portion of the Drum-Spaulding Project (5.3 acres) is located on public land administered by BOR. These lands are situated in the American River Division of the Central Valley Project, which provides water for irrigation, municipal and industrial use, hydroelectric power, and recreation. Flood control is provided through a system of dams, canals, and powerplants. The division consists of the Folsom and Sly Park Units, both authorized in 1949, and the Auburn-Folsom South Unit, authorized in 1965.

The BOR manages this Division in accordance with a Resource Management Plan (RMP) that conforms to requirements specified in the Reclamation Act of 1902, Reclamation Project Act of 1939 and the, Federal Water Project Recreation Act of 1992, as integrated with other applicable federal laws, including the Federal Land Management Policy Act of 1976.

The Newcastle Powerhouse is located on federal land managed by the BOR on the northernmost portion of Folsom Reservoir. BOR's multipurpose Folsom Dam Project was built by the United States Army Corps of Engineers (USACE) and is operated by BOR. Although the projects primary function is flood control, Folsom Dam stores water for irrigation and domestic use and for electrical power generation. BOR has delegated management of the majority of Folsom Dam Project lands to the California Natural Resources Agency, State Parks, as the Folsom Lake State Recreation Area and Folsom Powerhouse State Historic Park.

6.7.1.3 Land Management

Land management directions by Project and development are summarized below. For each project, the summary contains information regarding standards and guidelines for NFS land, BLM and BOR, if applicable, as well as land use designations for each county in which the project development occurs. In general, these standards and guidelines provide means for the Forest Service, BLM and BOR to mitigate adverse impacts to ensure that their management goals are met for resources such as recreation, fish and wildlife habitat, minerals, soil, timber, plants, pests, facilities, air quality, cultural resources, wilderness, water, and riparian areas. Standards and guidelines are implemented by the Forest Service at the Forest level on NFS land, and a management area level. Standards and guidelines implemented at the Forest level apply to all resources throughout the Forest. Management area standards and guidelines are applied to the Forest Service land areas designated by the Forest Service within the TNF and in many cases provide management direction to the Forest within each management area. With respect to county land designations, the county "designates" lands within its boundaries to be utilized in ways that are consistent with the resources found in that area.

6.7.1.3.1 Yuba-Bear Hydroelectric Project

Bowman Development

The Bowman Development consists of seven reservoirs and one powerhouse. These facilities are situated within or adjacent to the TNF. Table 6.7.1-9 summarizes the TNF management areas standards and guidelines as they apply to the Bowman Development.

Table 6.7.1-9. TNF management areas standards and guidelines that apply to the Bowman Development.

Bowman Development Facilities	TNF Management Area	TNF Management Area Standards and Guidelines
Bowman Lake	Bowman (TNF LRMP 1990,as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.240)	1) ROS – Semi-primitive 2) VQO – Retention for foreground as viewed from Bowman reservoir, Weaver Lake and Graniteville Road. Partial retention within the developed sites (developed sites will meet the retention VQO when viewed as middle ground from traveled routes. Partial retention for the remainder of area 3) TMP – Forest wide standards and guidelines apply. If new timber access roads are developed, they will be closed after use to reduce maintenance costs 4) OHV – Designated routes only. Open to over-the-snow 5) All forest wide standards and guidelines apply

Table 6.7.1-9. (continued)

Bowman Development Facilities	TNF Management Area	TNF Management Area Standards and Guidelines
Bowman Lake (continued)	Pinoli (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.192)	1) ROS – Roaded natural except semi-primitive along MYR 2) VQO – Modification except partial retention for foreground areas as viewed along Graniteville and Faucherie Roads and in middle ground areas as viewed from MA's 39 and 41 3) TMP – closed roads into Macklin Creek watershed and MYR. For remaining area forest wide standards and guidelines apply 4) OHV – Macklin Creek Drainage and Austin Meadows are closed. Designated routes only from Pinoli Peak and Pyramid Peak on the west to the eastern boundary of the Management Area, open to over-the-snow. Seasonal closure in the deer holding area when deer are suing the area. The western third of the area is open 5) All Forest wide standards and guidelines apply 6) Specific Standards and Guidelines – Private land acquisition in Macklin Creek area for management of Lahontan cutthroat.
	Grouse (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.248)	1) ROS – Semi-primitive non-motorized 2) VQO – Retention 3) TMP – Roads closed to motor vehicles except Rock Lake Rd, which is open to landowners. Eagle Lakes, Fordyce Creek trail in the southeast, and roads to Faucherie (north) end Grouse Ridge Campground (southwest) will remain open. Trail development shall consider equestrian and hiker systems separately. 4) OHV – Closed, open to over-the-snow vehicles 5) All forest wide standards and guidelines apply
	South Yuba (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.254)	1) ROS – Roaded natural except semi-primitive motorized along the MYR, part of SYR and Canyon Creek from Holbrook Flat to Windy Point Cliff 2) VQO – Retention for foreground seen from Bowman Road 3) TMP – Forest wide standards and guidelines apply. Bowman Rd from Windy Point is not maintained for low clearance vehicles. Bowman Rd will not be improved beyond its current standard north of Windy Point. Nevada County's Graniteville Rd is included in the Forest Highway System 4) OHV – Semi-primitive along the SYR and Canyon Creek are designated routes only. Open over-the-snow travel 5) All forest wide standards and guidelines apply
Jackson Lake	Milton-Jackson (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.182)	1) ROS – Roaded natural 2) VQO – Retention in foreground, partial retention within developed sits (however, retention VQO when viewed as middle ground from travel routes and other occupancy sites. Partial retention in remainder of area 3) TMP – Forest wide standards and guidelines apply 4) OHV Restrictions – Restricted to designated routes only: over the snow vehicle travel open 5) All forest wide Standards and Guidelines apply
Sawmill Lake	Grouse	See above
Faucherie Lake	Grouse	See above
French Lake	Grouse	See above
Milton-Bowman Diversion Tunnel	Henness (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.149)	1) ROS - Roaded Natural 2) VQO - Modification except partial retention for all foreground as viewed from the Fiberboard Road, from HWY 89 to Jackson Meadow Reservoir 3) TMP - Seasonal closure and permanent closure to protect road surface and key wildlife areas 4) OHV Restrictions – Designated summer routes, over the snow is open 5) All forest wide Standards and Guidelines apply
	Pinoli	See above
	Bowman	See above
Jackson Meadows Reservoir	Milton-Jackson	See above
Milton Reservoir	Milton-Jackson	See above

The Bowman Development is primarily within Nevada County with a small portion of the development residing in Sierra County (Jackson Meadows Reservoir and Milton Reservoir are both bisected by Nevada and Sierra County line). Table 6.7.1-10 provides a summary to the

Nevada County and Sierra County General Plan Land Use Designations that apply to specific portions of the Bowman Development.

Table 6.7.1-10. Nevada County and Sierra County General Plan Land Use Designations that apply to the Bowman Development.

Bowman Development Facilities	Nevada County Land Use Designations[1]	Sierra County Land Use Designations[2]
Bowman	Open Space-Water Area for reservoir, Forest 160 for lands surrounding Reservoir	N/A[3]
Jackson Lake	Open Space-Water Area for reservoir, Forest 160 for lands surrounding Reservoir	N/A
Sawmill Lake	Open Space-Water Area for reservoir, Forest 160 for lands surrounding Reservoir	N/A
Faucherie Lake	Open Space-Water Area for reservoir, Forest 160 for lands surrounding Reservoir	N/A
French Lake	Forest 160 for lands surrounding Reservoir	N/A
Milton-Bowman Diversion Tunnel	Forest 160 for lands surrounding Reservoir	N/A
Jackson Meadows Reservoir	Open Space-Water Area for reservoir, Forest 160 for lands surrounding Reservoir	Sierra county has no land use designation identified along the Jackson Meadows Shoreline. Adjacent to the shoreline Lands are classified as a Rural Land available for Timber Production
Milton Reservoir	Forest 160 for lands surrounding Reservoir	Sierra county has no land use designation identified along the Milton Reservoir Shoreline.

[1] Source: County of Nevada 2007.
[2] Source: County of Sierra 2007.
[3] N/A = Not Applicable

Dutch Flat Development

The Dutch Flat Development consists of one reservoir, one powerhouse, and two diversion dams. These facilities are situated within or adjacent to NFS land. Table 6.7.1-11 summarizes the TNF management areas standards and guidelines as they apply to the Dutch Flat Development.

Table 6.7.1-11. TNF Management Areas Standards and Guidelines that apply to the Dutch Flat Development.

Dutch Flat Development Facilities	TNF Management Area	TNF Standards and Guidelines
Texas Creek Diversion Dam	South Yuba	See Bowman Development
Fall Creek Diversion Dam	South Yuba	See Bowman Development
Bowman-Spaulding Conduit	South Yuba	See Bowman Development
	Fuller (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.295,296)	1) ROS – Rural 2) VQO – Retention if foreground as viewed from reservoir. Partial retention within the developed sites. The sites will, however, meet the retention VQO when viewed as middle ground from travel routes and the lakes. Partial retention for remainder of area 3) TMP – Forest wide standards and guidelines apply 4) OHV – Designated routes only, open to over-the-snow travel 5) All forest wide standards and guidelines apply
Dutch Flat No. 2 Flume	Chalk (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.354)	1) ROS – Roaded natural 2) VQO – Partial retention in middle ground viewed from I-80 and Highway 20, Modification for the remainder of the area. Maximum modification will be allowed on a case-by-case basis in areas that have a modified or maximum modification initial VQO and have herein been assigned the modification VQO 3) TMP – Forest wide standards and guidelines 4) OHV – Open except restricted in Burlington Ridge area end Greenhorn Road, November 1 to May 1 (deer dependent) 5) All forest wide standard and guidelines apply

The Dutch Flat Development is primarily within Nevada County, with Dutch Flat Afterbay bisected by Nevada and Placer counties. Table 6.7.1-12 provides a summary to the Nevada County and Placer County General Plan Land Use Designations that apply to the Dutch Flat Development.

Table 6.7.1-12. Nevada County and Placer County General Plan Land Use Designations that apply to the Dutch Flat Development.

Dutch Flat Development Facilities	Nevada County Land Use Designations[1]	Placer County Land Use Designations[2]
Bowman-Spaulding Conduit	Forest 160	N/A[3]
Texas Creek Diversion Dam	Forest 160	N/A
Fall Creek Diversion Dam	Forest 160	N/A
Dutch Flat No. 2 Forebay	Forest 160 for lands surrounding Forebay	N/A
Dutch Flat Afterbay (includes Dutch Flat No. 2 Powerhouse, and Switchyard)	Forest 160 for lands surrounding the upper portions of Dutch Flat Afterbay including the Dutch Flat No. 2 Powerhouse. Forest 40 for lands surrounding Dutch Flat Afterbay Dam	Agriculture/Timberland 40 acre (compatible with Forest Residential Zoning)

[1] Source: County of Nevada 2007.
[2] Source: County of Placer 2007.
[3] N/A = Not Applicable

Chicago Park Development

The Chicago Park Development is located on federal lands managed by BLM and on private lands in Nevada County. Chicago Park Conduit, Forebay and Powerhouse are situated within BLM-managed lands. The BLM manages these lands in accordance with the SRMP with specific emphasis on establishing a balance between environmental protection with recreation and consumptive uses.

The Chicago Park Conduit from its origin at the Bear River to just east of Chicago Park Forebay is situated on lands designated by the Nevada County General Plan as Forest 40 (County of Nevada 1996). The remaining section of the conduit from just east of Chicago Park Forebay to its terminus at the Forebay as well as Chicago Park Forebay and Powerhouse are situated on lands designated by the Nevada County General Plan as Open Space (County of Nevada 1996).

Rollins Development

The Rollins Development consists of one reservoirs and one powerhouse. These facilities are primarily situated within both Placer County and Nevada counties managed lands. With respect to Nevada County, Rollins Reservoir is classified as Open Space water (County of Nevada 1996). Nevada County has designated lands adjacent to Rollins Reservoir as: 1) Bear River arm of Rollins Reservoir is designated as Open Space and Forest – 40; 2) Greenhorn Creek arm of Rollins Reservoir is surrounded by lands designated as Rural-20, Rural-5, Estate lands, and Recreation; 3) lands abutting Rollins Reservoir from the dam upstream towards Greenhorn Creek arm of the reservoir are designated as Rural-5 (County of Nevada 1996). For the area of Rollins Reservoir that falls within Placer County, (i.e., the Southern shoreline from inflow at Bear River to the Rollins Dam), Placer County has applied the following land use designations: 1) Rollins

Reservoir itself is designated as Water Influence; 2) Agriculture/Timberland – 40 Acre, Ranchette 2.5 – 20 Acre, Special Study Corridor, and Park.

Portions the Bear River arm and Greenhorn arm of Rollins Reservoir are situated on public land administered by BLM. The BLM manages these lands in accordance with the SRMP with specific emphasis establishing a balance between environmental protection with recreation and consumptive uses.

6.7.1.3.2 Drum-Spaulding Project

Spaulding No. 3 Development

The Spaulding No. 3 Development consists of 11 reservoirs and one powerhouse. These facilities are situated within or adjacent to NFS land. Table 6.7.1-13 summarizes the TNF management areas Standards and Guidelines as they apply to the Spaulding No. 3 Development.

Table 6.7.1-13. Tahoe National Forest Management Areas Standards and Guidelines (as amended 2004) for Spaulding No. 3 Development Facilities.

Spaulding No. 3 Development Facilities	Tahoe National Forest Management Area	Tahoe National Forest Management Area Standards and Guidelines
Upper Rock Lake Dam and Reservoir	Grouse (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.248) Grouse (See Upper Rock Dam and Reservoir)	1) ROS – Semi-primitive non-motorized 2) VQO – Retention 3) TMP – Roads closed to motor vehicles except Rock Lake Rd, which is open to landowners. Eagle Lakes, Fordyce Creek trail in the southeast, and roads to Faucherie (north) end Grouse Ridge Campground (southwest) will remain open. Trail development shall consider equestrian and hiker systems separately. 4) OHV – Closed, open to over-the-snow vehicles 5) All forest wide standards and guidelines apply
Lower Rock Lake Dam and Reservoir		
Culbertson Lake Dam and Reservoir		
Upper Lindsey Lake Dam and Reservoir		
Middle Lindsey Lake Dam and Reservoir		
Lower Lindsey Lake Dam and Reservoir[1]		
Feeley Lake Dam and Reservoir		
Carr Lake Dam and Reservoir	South Yuba (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.254)	1) ROS – Roaded natural except semi-primitive motorized along the MYR, part of SYR and Canyon Creek from Holbrook Flat to Windy Point Cliff 2) VQO – Retention for foreground seen from Bowman Road 3) TMP – Forest wide standards and guidelines apply. Bowman Rd from Windy Point is not maintained for low clearance vehicles. Bowman Rd will not be improved beyond its current standard north of Windy Point. Nevada County's Graniteville Rd is included in the Forest Highway System 4) OHV – Semi-primitive along the SYR and Canyon Creek are designated routes only. Open over-the-snow travel 5) All forest wide standards and guidelines apply
Blue Lake Dam and Reservoir		
Spaulding No. 3 Powerhouse		
Rucker Lake Dam and Reservoir[2]	Fuller (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004 pp. V.295, 296.)	1) ROS – Rural 2) VQO – Retention if foreground as viewed from reservoir. Partial retention within the developed sites. The sites will, however, meet the retention VQO when viewed as middle ground from travel routes and the lakes. Partial retention for remainder of area 3) TMP – Forest wide standards and guidelines apply 4) OHV – Designated routes only, open to over-the-snow travel 5) All forest wide standards and guidelines apply
Fuller Lake Dam and Reservoir[3]		

1 Lower Lindsey Lake Dam is situated in the South Yuba Management Area.
2 Rucker Reservoir Dam is situated in the South Yuba Management Area.
3 The southern edge of Fuller Lake extends into the South Yuba Management Area.

The Spaulding No. 3 Development is located within Nevada County. Table 6.7.1-14 provides a summary of the Nevada County General Plan Land Use Designations within and adjacent to the Spaulding No. 3 Development.

Table 6.7.1-14. Nevada County General Plan Land Use Designations for Spaulding No. 3 Development.

Spaulding No. 3 Development Facilities	Nevada County Land Use Designations[1]
Upper Rock Lake Dam and Reservoir	Forest - 160
Lower Rock Lake Dam and Reservoir	Forest – 160
Culbertson Lake Dam and Reservoir	Forest – 160
Upper Lindsey Lake Dam and Reservoir	Forest – 160
Middle Lindsey Lake Dam and Reservoir	Forest – 160
Lower Lindsey Lake Dam and Reservoir	Forest – 160
Feeley Lake Dam and Reservoir	Forest – 160
Carr Lake Dam and Reservoir	Forest - 160
Blue Lake Dam and Reservoir	Forest - 160
Spaulding No. 3 Powerhouse	Forest - 160
Rucker Lake Dam and Reservoir	Reservoir itself designated as Open Space – Water, land surrounding reservoir Designated as Forest - 160
Fuller Lake Dam and Reservoir	Reservoir itself designated as Open Space – Water, land surrounding reservoir Designated as Forest - 160

1 Source: County of Nevada 2007.

The South Yuba River Comprehensive Management Plan (2005) provides guidelines for public lands on a 29-mile stretch of the South Yuba River, beginning at Lake Spaulding. The plan deals with environmental, cultural, recreation and other resources. Most of the FERC Project Boundary around Lake Spaulding falls into the management area; however, only a small section of Lake Spaulding, near Spaulding No. 3 Powerhouse, is on public lands (NFS) and is subject to the plan's directives.

The South Yuba River from Spaulding Dam to Englebright Reservoir has been designated as a State wild and scenic river under the California Wild & Scenic Rivers Act and an Eligible and Suitable Federal Wild and Scenic River for scenic, historic, and recreational "Outstandingly Remarkable" scenic, historic, and recreational values (USFS and BLM 1999). There are a wide variety of high quality scenic values throughout this 41.1-mile segment. The river is characterized by moderate to steep canyon walls, cascades, waterfalls, large smooth sculpted granite boulders, with deep pools. Historic values along the river include the wood-covered Bridgeport Bridge (constructed in1862 and recognized as the longest single span wood-covered bridge in the west), which is on the National Register of Historic Places, the Virginia Turnpike (1853-1901), Bridgeport Townsite (1849-1940's), Excelsior Mining Ditch (1855-1961), Miner's tunnel (circa 1872), Purdon Crossing Bridge (1895), Edwards Crossing Bridge (1904), and Highway 49 Bridge (1921). Recreational activities include swimming, water play, sunbathing, gold panning, suction dredging, fishing, picnicking, hiking, mountain biking, and nature appreciation an a range of settings, from high use public swimming areas to special, remote, and secluded areas (USFS and BLM 1999). These "Outstandingly Remarkable" values were defined long after the development of the Project. The Proposed Project will have no effect on historic values. The Proposed Project should have a marginally beneficial effect on scenic and recreational values due to the enhanced flow to the South Yuba River.

Spaulding No. 1 and No. 2 Development

The Spaulding No. 1 and No. 2 Development is comprised of eight reservoirs and two powerhouses. These facilities are situated within, or adjacent to, TNF administered lands. Table 6.7.1-15 summarizes the TNF management areas Standards and Guidelines as they apply to the Spaulding No. 1 and No. 2 Development.

Table 6.7.1-15. Tahoe National Forest Management Areas Standards and Guidelines (as amended 2004) for Spaulding No. 1 and No. 2 Development Facilities.

Spaulding No. 1 and No. 2 Development Facilities	Tahoe National Forest Management Area	Tahoe National Forest Standards and Guidelines
White Rock Lake Dam and Reservoir	Castle (TNF LRMP, 1990,as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.262)	1) ROS – Semi-primitive motorized. 2) VQO – Retention for the foreground and middle ground as viewed from I-80, Castle Valley Round Valley, all trails and other concentrated use areas. Partial retention in any remaining background areas. 3) TMP – Forest wide Standards and Guidelines apply to open portions. 4) OHV – the PCT is closed. Designated routes only, summer open over-the-snow, except Castle Valley and round Valley areas, where travel will be restricted to designated routes only. 5) All Forest wide Standards and Guidelines apply.
Meadow Lake Dam and Reservoir	Meadow (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.266)	1) ROS – Roaded natural. 2) VQO – Partial retention with the developed sites, and meet the partial retention VQO when viewed as middle ground from travel routes and other occupancy sites. Partial retention for remainder of area. 3) TMP – Forest wide Standards and Guidelines apply. 4) OHV – Restricted motor vehicles on designated routes only, open to over-the-snow travel 5) All Forest wide Standards and Guidelines apply.
Lake Sterling Dam and Reservoir	Fordyce (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.275)	1) ROS – Semi-primitive motorized. 2) VQO – Retention for foreground as viewed from Fordyce Lake. Partial retention within the developed sites. The sites will however, meet the retention VQO when viewed as middle ground from travel routes and lake surface. Partial retention for remainder of area. 3) TMP – Forest wide Standards and Guidelines apply. If new local timber access roads are developed, they will be closed after use. 4) OHV – Designated routes only in summer. Open to over-the-snow travel in winter. 5) All Forest wide Standard and Guidelines apply.
Fordyce Lake Dam and Reservoir[1]		
Kidd Lake Dam and Reservoir	Lock Leven (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.402)	1) ROS – Roaded natural. 2) VQO – Partial Retention in Sections 6, 12 and 18). Retention throughout the rest of the MA. 3) TMP – Forest wide Standards and Guidelines apply. 4) OHV – Designated routes only. Over-the-snow travel. 5) All forest wide Standards and Guidelines apply.
Upper Peak Lake Dam and Reservoir		
Lower Peak Lake Dam and Reservoir		

Table 6.7.1-15. (continued)

Spaulding No. 1 and No. 2 Development Facilities	Tahoe National Forest Management Area	Tahoe National Forest Standards and Guidelines
Lake Spaulding Dams and Reservoir	Red (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.279), and the South Yuba (western shore of the Reservoir, including the dam)	1) ROS – Semi-primitive motorized except roaded natural in western half of section 18, T17N, R13E. 2) VQO – Partial retention in Section 13. Retention for remainder of the area. 3) TMP – Forest wide Standards and Guidelines apply. If new local timber access roads are developed, they will generally be closed to maintain the existing primitive access. 4) OHV – Open. Select OHV routes will be provided for the "Adopt a Trail" program. 5) All Forest wide Standards and Guidelines apply.
Spaulding Powerhouse No. 1		
Spaulding Powerhouse No. 2	South Yuba	See Spaulding No. 1 Development for the Standards and Guidelines for the South Yuba Management Area.

[1] The southwestern arm of Fordyce Lake and Dam are situated within the Red Management Area.

The Spaulding No. 1 and 2 Development is located within Nevada and Placer Counties. Table 6.7.1-16 provides a summary of the Nevada and Placer County General Plan Land Use Designations within and adjacent to the Spaulding No. 1 and 2 Development.

Table 6.7.1-16. Nevada and Placer County General Plan Land Use Designations for Spaulding No. 1 and No. 2 Development Facilities.

Spaulding No. 1 and 2 Development Facilities	Nevada County Land Use Designations[1]	Placer County Land Use Designations[2]
White Rock Lake Dam and Reservoir	Forest – 160	N/A[3]
Meadow Lake Dam and Reservoir	Forest – 160, Two plots of land immediately west of the Meadow Reservoir are designated as Forest - 40	N/A
Lake Sterling Dam and Reservoir	Forest – 160	N/A
Fordyce Lake Dam and Reservoir	Reservoir itself designated as Open Space – Water, land surrounding reservoir Designated as Forest - 160	N/A
Kidd Lake Dam and Reservoir	--	Water Influence for Kidd Reservoir, Agriculture/Timberland 80 Acre Minimum
Upper Peak Lake Dam and Reservoir	--	Water Influence for Kidd Reservoir, Agriculture/Timberland 80 Acre Minimum
Lower Peak Lake Dam and Reservoir	--	Water Influence for Kidd Reservoir, Agriculture/Timberland 80 Acre Minimum
Lake Spaulding Dams and Reservoir	Reservoir itself designated as Open Space – Water, land surrounding reservoir Designated as Forest - 160	N/A
Spaulding Powerhouse No. 1	Forest – 160	N/A
Spaulding Powerhouse No. 2	Forest – 160	N/A

[1] Source: County of Nevada, 2007.
[2] Source: County of Placer, 2007.
[3] N/A = Not Applicable

The South Yuba River Comprehensive Management Plan (2005) provides guidelines for public lands on a 29-mile stretch of the South Yuba River, beginning at Lake Spaulding. The plan deals with environmental, cultural, recreation and other resources. Most of the FERC Project Boundary around Lake Spaulding falls into the management area; however, only a small section of Lake Spaulding, near Spaulding No. 3 Powerhouse, is on public lands (NFS) and is subject to the plan's directives.

As noted above, the South Yuba River has been designated as a State Wild and Scenic River under the California Wild & Scenic Rivers Act and an Eligible and Suitable Federal Wild and Scenic River for scenic, historic, and recreational "Outstandingly Remarkable" scenic, historic, and recreational values (USFS and BLM 1999). Recreational activities include swimming, water play, sunbathing, gold panning, suction dredging, fishing, picnicking, hiking, mountain biking, and nature appreciation in a range of settings, from high use public swimming areas to special, remote, and secluded areas (USFS and BLM 1999). These "Outstandingly Remarkable" values were defined long after the development of the Project. The Proposed Project will have no effect on historic values. The Proposed Project should have a marginally beneficial effect on scenic and recreational values due to the enhanced flow to the South Yuba River.

Deer Creek Development

The Deer Creek Development consists of one reservoir, one powerhouse and one canal. These facilities are situated within, or adjacent to, TNF administered lands. Table 6.7.1-17 summarizes the TNF management areas Standards and Guidelines as they apply to the Deer Creek Development.

Table 6.7.1-17. Tahoe National Forest Management Areas Standards and Guidelines (as amended 2004) for Deer Creek Development Facilities.

<table>
<tr><th>Deer Creek Development Facilities</th><th>Tahoe National Forest Management Area</th><th>Tahoe National Forest Standards and Guidelines</th></tr>
<tr><td>Deer Creek Forebay Dam and Reservoir</td><td rowspan="3">Chalk (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.354)</td><td rowspan="3">1) ROS – Roaded natural
2) VQO – Partial retention in middle ground viewed from I-80 and Highway 20, Modification for the remainder of the area. Maximum modification will be allowed on a case-by-case basis in areas that have a modified or maximum modification initial VQO and have herein been assigned the modification VQO
3) TMP – Forest wide standards and guidelines
4) OHV – Open except restricted in Burlington Ridge area end Greenhorn Road, November 1 to May 1 (deer dependent)
5) All Forest wide standard and guidelines apply</td></tr>
<tr><td>Deer Creek Powerhouse</td></tr>
<tr><td>South Yuba and Chalk Bluff Canals</td></tr>
</table>

The Deer Creek Development is located within Nevada County. Table 6.7.1-18 provides a summary of the Nevada County General Plan Land Use Designations within, and adjacent to, the Deer Creek Development.

Table 6.7.1-18. Nevada County General Plan Land Use Designations for Deer Creek Development Facilities.

Deer Creek Development Facilities	Nevada County Land Use Designations[1]
Deer Creek Forebay Dam and Reservoir	Forest – 160
Deer Creek Powerhouse	Forest – 160
South Yuba Canal	Forest – 160

[1] Source: County of Nevada 2007.

Alta Development

The Alta Development is located entirely within Placer County. No TNF administered lands are in, or adjacent to, the development. Table 6.7.1-19 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Alta Development.

Table 6.7.1-19. Placer County General Plan Land Use Designations for Alta Development Facilities.

Alta Development Facilities	Placer County Land Use Designations[1]
Towle Canal	Rural Residential – 5 Acre Minimum and Agriculture/Timberland 40 – Acre Minimum
Alta Forebay Dam and Reservoir	Agriculture/Timberland – 10 Acre Minimum
Alta Powerhouse	Rural Residential - 5 Acre Minimum

[1] Source: County of Placer 2007.

Drum No. 1 and No. 2 Development

The Drum No. 1 and No. 2 Development consists of three reservoirs, two powerhouses and two canals. These facilities are situated within, or adjacent to, TNF administered lands. Table 6.7.1-20 summarizes the TNF management areas Standards and Guidelines as they apply to the Drum No. 1 and No. 2 Development.

Table 6.7.1-20. Tahoe National Forest Management Areas Standards and Guidelines (as amended 2004) for Drum No. 1 and No. 2 Development Facilities.

Drum No. 1 and No. 2 Development Facilities	Tahoe National Forest Management Area	Tahoe National Forest Standards and Guidelines
Kelly Lake Dam and Reservoir Lake Valley Dam and Reservoir	Mears (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.361)	1) ROS – Roaded natural 2) VQO – Modification except for foreground of system trail, the primary roads accessing the trailheads, the railroad and middle ground of I-80 3) TMP – Forest wide Standards and Guidelines apply 4) OHV – Designated routes only. Open to over-the-snow travel 5) All Forest wide Standards and Guidelines apply
Lake Valley Canal	Mears	
	Yuba Gap (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.357)	1) ROS – Rural 2) VQO – Retention 3) TMP - All Forest wide Standards and Guidelines apply 4) OHV – Open 5) All Forest wide Standards and Guidelines apply
	Emigrant (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.345)	1) ROS – Rural 2) VQO – Partial retention (significant modifications are required for many established structures that do not currently comply with this VQO 3) TMP - All Forest wide Standards and Guidelines apply 4) OHV – Designated routes only in vicinity of Cisco Grove and Big Bend. Remainder of MA open 5) All Forest wide Standards and Guidelines apply
	Red (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.279)	See Lake Spaulding Dam and Reservoir

Table 6.7.1-20. (continued)

Drum No. 1 and No. 2 Development Facilities	Tahoe National Forest Management Area	Tahoe National Forest Standards and Guidelines
Drum Canal	Red (TNF LRMP, 1990. pp. V.279 as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004)	See Lake Spaulding Dam and Reservoir
	Yuba Gap (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.357)	See Lake Valley Canal
	Blue (TNF LRMP, 1990, as amended by the Sierra Nevada Forest Plan Amendment Record of Decision, June 2004. pp. V.409)	1) ROS – Adjacent to I-80, rural. Other areas roaded natural 2) VQO – Partial retention in northern most parcels and in foreground as viewed from I-80 and the railroad. Modification for remainder of area. 3) TMP - All Forest wide Standards and Guidelines apply 4) OHV – Open 5) All Forest wide Standards and Guidelines apply

The Drum No. 1 and No. 2 Development is located entirely within Placer County. Table 6.7.1-21 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Drum No. 1 and No. 2 Development.

Table 6.7.1-21. Placer County General Plan Land Use Designations for Drum Development Facilities.

Drum No. 1 and No. 2 Development Facilities	Placer County Land Use Designations[1]
Kelly Lake Dam and Reservoir	Water Influence for reservoir, Agriculture/Timberland – 80 Acre Minimum
Lake Valley Dam and Reservoir	Water Influence for reservoir, Agriculture/Timberland – 80 Acre Minimum
Lake Valley Canal	Agriculture/Timberland – 80 Acre Minimum and Open Space
Drum Canal	Agriculture/Timber land– 80 Acre Minimum and Open Space
Drum Forebay Dam and Reservoir	Water Influence for reservoir, Agriculture/Timberland – 80 Acre Minimum
Drum Powerhouse No. 1	Agriculture/Timberland – 80 Acre Minimum and Open Space
Drum Powerhouse No. 2	Agriculture/Timberland – 80 Acre Minimum and Open Space

[1] Source: County of Placer 2007.

Dutch Flat No. 1 Development

The Dutch Flat No. 1 Development is located entirely within Placer County. The development contains one reservoir, dam and powerhouse. No TNF administered lands are in or adjacent to the development. Table 6.7.1-22 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Dutch Flat No. 1 Development.

Table 6.7.1-22. Placer County General Plan Land Use Designations for Dutch Flat No. 1 Development Facilities.

Dutch Flat No. 1 Development Facilities	Placer County Land Use Designations[1]
Drum Afterbay Dam and Reservoir	Agriculture/Timberland – 40 Acre Minimum
Dutch Flat Powerhouse No. 1	Agriculture/Timberland – 40 Acre Minimum

[1] Source: County of Placer 2007.

Halsey Development

The Halsey Development is located entirely within Placer County. The development contains one reservoir, dam and powerhouse. No TNF administered lands are in or adjacent to the Development. Table 6.7.1-23 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Halsey Development.

Table 6.7.1-23. Placer County General Plan Land Use Designations for Halsey Development Facilities.

Halsey Development Facilities	Placer County Land Use Designations[1]
Bear River Canal	Special Study Corridor, Park, Ranchette 2.5 – 20 Acre Minimum, Rural Estate 1.1 – 4.5 Acre Minimum, Rural Estate 2.3 -4.6 Acre Minimum, Rural Low Density Residential 0.4 – 2.3 Acre Minimum,
Halsey Forebay Dam and Reservoir	Open Space
Halsey Powerhouse	Open Space

[1] Source: County of Placer 2007.

Wise Development

The Wise Development is located entirely within Placer County. The development contains three reservoirs and three dams, two canals and one powerhouse. No TNF administered lands are in, or adjacent to, the Development. Table 6.7.1-24 provides a summary of the Placer County General Plan Land Use Designations within, and adjacent to, the Wise Development.

Table 6.7.1-24. Placer County General Plan Land Use Designations for Wise Development Facilities.

Wise Development Facilities	Placer County Land Use Designations[1]
Halsey Afterbay Dam and Reservoir	Open Space
Upper Wise Canal	Rural Residential 2.3 – 4.6 Acre Minimum, Rural Estate 4.6 – 10 Acre Minimum, Low Density Residential 1-2 Dwellings per Acre, Industrial, Open space, High Density Residential 10 – 15 Dwellings per Acre, Commercial, Rural Low Density Residential 0.9 – 2.3 Acre Minimum
Rock Creek Dam and Reservoir	Open Space
Lower Wise Canal	Rural Residential 2.3 – 4.6 Acre Minimum
Wise Forebay Dam and Reservoir	Rural Low Density Residential 0.9 – 2.3 Acre Minimum
Wise Powerhouse	Low Density Residential 1-2 Dwellings per Acre

[1] Source: County of Placer 2007.

Wise No. 2 Development

The Wise No. 2 Development is located entirely within Placer County. The development contains one powerhouse. No TNF administered lands are in, or adjacent to, the Development. Table 6.7.1-25 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Wise No. 2 Development.

Table 6.7.1-25. Placer County General Plan Land Use Designations for Wise No. 2 Development Facility.

Wise No. 2 Development Facilities	Placer County Land Use Designations[1]
Wise No. 2 Powerhouse	Low Density Residential 1-2 Dwellings per Acre

[1] Source: County of Placer 2007.

Newcastle Development

The Newcastle Development is located entirely within Placer County. The development contains one canal and one powerhouse. The BOR manages lands proximate to the Newcastle Powerhouse. There are no TNF administered lands in, or adjacent to, the Development. Table 6.7.1-26 provides a summary of the Placer County General Plan Land Use Designations within and adjacent to the Newcastle Development.

Table 6.7.1-26. Placer County General Plan Land Use Designations for Newcastle Development Facilities.

Newcastle Development Facilities	Placer County Land Use Designations[1]
South Canal	Rural Estate 4.6 – 10 Acre Minimum, Rural Residential 2.3 – 4.6 Acre Minimum, Commercial, Business Park/Industrial 10,000 Sq. Ft – 5 Acre Minimum, Rural Residential 1 – 10 Acre Minimum, Rural Estate 4.6 – 20 Acre Minimum
Newcastle Powerhouse	Open Space

[1] Source: County of Placer 2007.

6.7.1.4 Licensees' Shoreline Buffer Zone and Shoreline Permitting Policies

Currently, none of the Yuba-Bear Hydroelectric Project reservoirs have private residences that abut the shoreline. Drum-Spaulding Project reservoirs that have shoreline private residences/ownerships include Kidd, Fuller, Rucker, Culbertson, and Rock Creek lakes.

NID and PG&E do not have formal shoreline buffer zone policies for their respective Project reservoirs. Licensee-owned and privately owned lands on each Project's reservoir shorelines are managed in accordance with the applicable county general plan. Federal and state-owned lands along each Project's reservoir shorelines are managed in accordance with the applicable federal or state land management plan.

Similarly, Licensees do not have formal written shoreline policies for permitting shoreline facilities on the projects' reservoirs, other than to allow such development when it is consistent with Licensees' operational requirements, public safety, and the projects' recreation and other resource management plans, and is compliant with all federal, State of California and local regulations.

6.7.1.5 Fire Risk and Protection

The Forest Service maintains a list of wildfires that have occurred on NFS land within the TNF, and a general description of each wildfire. From June 2000 through August 2009, excluding the

15 lightning-caused fires that burned a total of 6.7 acres, there have been 37 reported fire ignitions recorded within a 1-mile buffer of the Yuba-Bear Hydroelectric Project, on a total of 19.0 acres (Tables 6.7.1-27). Twenty-seven of the 37 ignitions were related to campfires, and none of the wildfires were related to NID's Yuba-Bear Hydroelectric Project's O&M.

Table 6.7.1-27. Wildfires in the Yuba-Bear Hydroelectric Project Vicinity.

Fire Name	Fire Date	Cause[1]	Reported Acres
Lang	6/7/00	Miscellaneous	0.1
English	6/27/00	Lightning	0.1
Bowman	7/3/00	Lightning	0.2
Five	8/10/00	Campfire	1.0
Snowflower	8/15/00	Campfire	5.0
Sawmill	10/25/00	Campfire	0.1
Blue	5/5/01	Campfire	0.2
Generic	6/2/01	Smoking	0.1
Spaulding	6/25/01	Campfire	0.2
Bowman	8/20/01	Equipment Use	0.1
Toll House	9/3/01	Campfire	0.1
Black Oak	9/6/01	Equipment Use	1.0
Lang	6/29/02	Campfire	0.2
Celina	7/21/02	Lightning	0.1
Sawmill	9/9/02	Campfire	0.1
Fiberboard	9/20/02	Miscellaneous	0.5
Jackson	9/23/02	Campfire	0.1
Granite	11/18/02	Debris Burning	0.1
Spill	7/27/03	Lightning	0.1
Sawmill	8/10/03	Campfire	0.1
Ahart	8/22/03	Lightning	0.3
Red	8/24/03	Lightning	0.1
Jordan	9/3/03	Lightning	0.2
Bald 1	9/3/03	Lightning	0.1
East	9/3/03	Lightning	0.1
Zion	9/4/03	Lightning	0.1
Pinoli Peak	6/8/04	Lightning	0.1
Milton	6/9/04	Lightning	0.1
Lizzy	7/11/04	Campfire	0.2
Bowman	8/5/04	Campfire	0.1
Canyon	8/7/04	Campfire	0.1
Trailer	8/20/04	Campfire	0.1
Lake 1	9/8/04	Equipment Use	0.1
Sawmill	8/9/05	Campfire	0.3
Painted	12/3/05	Lightning	0.1
Bowrock	6/17/06	Campfire	0.1
A-1	6/26/06	Lightning	3.0
Rucker	7/19/06	Smoking	0.1
Faucherie	8/25/06	Campfire	0.1
Sawmill	9/3/06	Campfire	0.1
Bowman	6/3/07	Campfire	0
Bear	7/26/07	Campfire	1.0
Lang	8/19/07	Campfire	0
Jackson	8/27/07	Campfire	0
Fuller	9/9/07	Campfire	0
Haystack	11/2/07	Campfire	0
Clear	6/21/08	Lightning	2.0

Table 6.7.1-27. (continued)

Fire Name	Fire Date	Cause[1]	Reported Acres
Woodcamp	7/16/08	Campfire	0.1
Creek	8/3/08	Miscellaneous	7.0
Carr	9/28/08	Miscellaneous	0.3
Bowman	7/4/09	Campfire	0.2
Emerald	8/9/09	Campfire	0.1
Total			**25.7**

[1] Miscellaneous fires include those that are still under investigation.

Based on the Forest Service's list, from June 2000 through August 2009, 70 wildfires that burned a total of 84.1 acres have been recorded within a 1-mile buffer of the Drum-Spaulding Project (Tables 6.7.1-28). Campfires were the common cause of wildfires, and none of the wildfires were related to the Drum-Spaulding Project's O&M.

Table 6.7.1-28. Wildfires in the Drum-Spaulding Project Vicinity.

Fire Name	Fire Date	Cause[1]	Reported Acres
Lodgepole	6/03/2000	Campfire	0.1
Lang	6/07/2000	Miscellaneous	0.1
Bowman	7/03/2000	Lightning	0.2
20/80	7/17/2000	Equipment Use	0.1
Loney	7/24/2000	Campfire	0.1
Pierce	9/17/2000	Campfire	0.1
Steephollow	5/1/2001	Debris Burning	24.0
Blue	05/05/2001	Campfire	0.2
Spaulding	06/25/2001	Campfire	0.2
Chalk	07/04/2001	Miscellaneous	0.1
Log	8/5/2001	Miscellaneous	0.1
Black Oak	09/06/2001	Equipment Use	1.0
Crystal	5/23/2002	Debris Burning	0.1
Lang	06/29/2002	Campfire	0.2
Fordyce	7/2/2002	Miscellaneous	0.1
Cisco	8/31/2002	Equipment Use	0.1
Lindsey	9/1/2002	Campfire	0.1
Blue	9/8/2002	Campfire	0.5
Burlington	10/28/2002	Arson	0.2
Indian	10/28/2002	Miscellaneous	7.1
Rock	07/13/2003	Miscellaneous	0.1
Bowman	08/11/2003	Campfire	0.2
Valley	08/17/2003	Campfire	0.1
Red	08/24/2003	Lightning	0.1
Jordan	09/03/2003	Lightning	0.2
Canal	09/03/2003	Lightning	0.1
Valley Lake	09/03/2003	Lightning	0.1
Zion	09/04/2003	Lightning	0.1
Fordyce 2	10/14/2003	Campfire	0.2
Lindsey	10/29/2003	Campfire	3.0
Meadow	6/9/2004	Lightning	0.1
Brady	6/30/2004	Lighting	0.1
Spalding	6/30/2004	Lightning	0.3
Canyon	08/07/2004	Campfire	0.1
Lake	8/9/2004	Miscellaneous	0.1

Table 6.7.1-28. (continued)

Fire Name	Fire Date	Cause[1]	Reported Acres
Fordyce	8/15/2004	Miscellaneous	0.1
Trailer	08/20/2004	Campfire	0.1
Lowell	11/21/2004	Debris Burning	17.0
Fordyce	7/24/2005	Miscellaneous	0.1
Magonigal	08/15/2005	Lightning	0.1
Trail	6/25/2006	Lightning	0.1
Rucker	7/19/2006	Smoking	0.1
Silver	8/9/2006	Smoking	0.1
Omega	10/3/2006	Arson	0.5
Quaker	2/5/2007	Debris Burning	3.0
Deer	4/5/2007	Miscellaneous	1.0
Bowman	6/3/2007	Campfire	0
White	7/10/2007	Lightning	0
Bear	7/26/2007	Campfire	1.0
Lang	8/19/2007	Campfire	0
Fuller	9/9/2007	Campfire	0
Lindsey	9/9/2007	Campfire	17.0
Bluff	2/15/2008	Debris Burning	0.2
Skillman	6/21/2008	Lightning	0.5
Quaker	6/21/2008	Lightning	1.0
Meadow	7/13/2008	Lightning	0.1
Snowflower	07/13/2008	Debris Burning	0.3
Blue	8/1/2008	Campfire	0.1
Lake	8/15/2008	Smoking	0.1
Long	8/16/2007	Lightning	0.1
Island	8/20/2008	Miscellaneous	0.3
Silver	8/30/2008	Miscellaneous	0.1
Sterling	10/16/2008	Campfire	0.1
Cascade	5/27/2009	Lightning	0.1
Crooked	7/12/2009	Lightning	0.5
Gap	8/1/2009	Arson	0.1
Emerald	8/9/2009	Campfire	0.1
Sterling	8/21/2009	Campfire	0.1
Burlington	8/29/2009	Equipment Use	0.25
Turning	9/12/2009	Lightning	0.25
Total			**84.1**

[1] Miscellaneous fires include those that are still under investigation.

In addition, and not recorded in the Forest Service's database, in August 2001, the Gap Fire at Yuba Gap destroyed two short sections of the Drum-Spaulding Project Lake Valley Canal flume, which PG&E re-built. The fire was started by a campfire in the Monumental Ridge area southeast of Emigrant Gap on Forest Service lands. The fire consumed approximately 2,500 acres of which 640 acres were on PG&E's lands. Approximately 5 acres of the fire damaged lands were within the FERC Project Boundary along a Project road and the Lake Valley Canal Flume.

Licensees' crews are not trained in forest fire suppression and are not required to fight fires, but instead notify appropriate emergency response agencies in the event of such an emergency. In addition, Licensees adhere to local, State and federal rules and regulations regarding work on the projects. Licensees' crew vehicles and contractor vehicles are required to have a shovel, 5-gallon back pump and chemical fire extinguisher at all times while in the field to facilitate Licensees' emergency response preparedness. If such work includes burning debris, Licensees obtain necessary permits and approvals, which may require Licensees to have specialized equipment on site and restrict burning to specific times of the year and day.

6.7.1.6 Project-Related Forest Service Special Use Permits and Easements

NID holds two active, Forest Service special use permits (SUP) related to O&M of the Yuba-Bear Hydroelectric Project. Both permits were issued in 1985 in relation to the expansion of the Bowman Development. Executed by the Forest Supervisor on May 14, 1985, the first SUP is for construction, operation and maintenance of the Bowman Powerhouse, penstock and switchyard on NFS land. The second SUP, executed by the Forest Supervisor on June 10, 1985, is for construction, operation and maintenance of the Bowman-Spaulding Transmission Line on NFS land.

NID held a Road Use Permit (#17-55-03-95) for the purpose of operating and maintaining the Project. The permit included Forest Service roads 7, 18, 18-12, 18-14, 18-21, 41-20-10, 85, 85-2, 85-2-1, 85-2-1-1, and 122-80. The permit expired in December 2000. NID does not hold any active, Project-related easements or right-of-way grants from the BLM for use of BLM managed federal lands. The SUP that has expired is not necessary for future Project O&M activities.

NID does not hold any other permits or easements from federal or State agencies for use of lands related to Project O&M.

PG&E holds 8 SUPs from the Forest Service for activities related to Project O&M. Four SUPs are for managing the recreation facilities on Forest Service lands; three are related to road maintenance and one addresses stream gages. Once the new license is issued, one of the road maintenance SUPs will be eliminated because portions will be covered under the FERC Project boundary. The remaining General Access Roads will be incorporated into the amended Road Maintenance Agreement with the Forest Service.

6.7.1.7 Law Enforcement

NID does not have formal agreements with local law enforcement agencies for law enforcement on Project lands, nor have the agencies suggested such an agreement since the Project has been in operation.

PG&E has a formal relationship with the Placer County Sheriff's office. This relationship allows the Placer County Sheriff to enforce civil and criminal codes on PG&E property without PG&E being present. PG&E provides the Sheriff with an authorization letter, which is effective for a 6-month period and resubmitted semi-annually. PG&E also has had communication with Nevada County and the Forest Service to allow its law enforcement agents the right to access and enforcement on PG&E property.

6.7.1.8 Project Access

Licensees obtain vehicular access to each Project's facilities over federal, State of California, county and private roads. Licensees' use of these roads consists of light and heavy vehicles at varying frequencies.

In 2008, 2009 and 2010, Licensees conducted inventories of Primary Project Roads and Trails for each Project; the inventories included about 75 miles of roads encompassing 115 individual road segments and 0.8 miles of trail. The main goals of the study were to: 1) assess environmental damage that may result from the interaction between road features, rainfall runoff, erosion, and sediment delivery; 2) provide information for the possible development of a transportation system management plan for Primary Project Roads; and 3) determine whether the roads on NFS land met the maintenance-level objectives established by the Forest Service. Licensees performed a field inventory of specific attributes along each segment of road or trail, including road dimensions and locations of water crossings and road drainage features, gates and signs, hazard trees, and erosion features.

Within the inventoried segments, hundreds of discrete features were identified, including 245 water crossings and other drainage features (e.g., low-water fords). Systematic analysis of attribute data, including condition, maintenance requirements, and erosion potential was used to establish a ranking process applicable to both discrete features and entire road segments. Each road segment was ranked as “good”, “moderate”, or “poor”.

The Transportation Management Plan for Primary Project Roads (Appendix E8) is intended to provide guidance for the rehabilitation and maintenance of Primary Project Roads on all lands within the Project. Primary Project Roads are non-general use roads used primarily for the Project and are located within the FERC Project Boundary (and therefore will be under FERC's jurisdiction for the Proposed Project). General Access Roads are general use roads that are outside the FERC Project Boundary. If a General Access Road is located on Forest Service lands, such roads are included in a Road Maintenance Agreement (RMA) between PG&E and Forest Service. The RMA is not jurisdictional to the FERC license and is intended to remain as a separate agreement between PG&E and Forest Service that generally addresses shared responsibilities and funding. The RMA is presently being amended by the Forest Service and PG&E and is consistent with the Primary Project Road list and related technical memo, filed with Licensee's FLA. Licensee has consulted with the Forest Service to determine which roads are Primary Project Roads and which roads are General Access Roads.

Table 6.7.1-29 provides details on the Primary Project Roads for the Yuba-Bear Hydroelectric Project. Table 6.7.1-30 provides information regarding the Drum-Spaulding Project's Primary Project Roads

Table 6.7.1-29. Yuba-Bear Hydroelectric Project Primary Project roads shown by road ID, length, width, surface treatment, and overall condition.

Road Name	Road ID[1]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Bowman-Spaulding Berm Rd	YBBSC_001	NID	0.00	0.265	0.265	8	Gravel/asphalt/ Native rock	Poor	Erosion	Medium
		Private	0.265	0.942	0.677					
Texas Creek Diversion Access Rd.	YBBSC_003	NID	0.00	0.358	0.358	10	Gravel	Good	None	N/A[2]
Box Car Section Rd.	YBBSC_004	Forest Service	0.00	0.384	0.384	10	Gravel	Poor	Road failure	High
		Private	0.384	1.077	0.693					
		Forest Service	1.077	1.325	0.248					
Bowman-Spaulding Berm Rd	YBBSC_006	Forest Service	0.00	0.440	0.440	10	Gravel/Native soil	Good	None	N/A
		PG&E	0.44	0.915	0.475					
		Forest Service	0.915	1.510	0.595					
		PG&E	1.510	1.903	0.393					
		Forest Service	1.903	2.451	0.548					
		Private	2.451	2.690	0.239					
		PG&E	2.690	3.508	0.818					
Bowman Powerhouse Access Rd.	YBBPH_001	NID	0.00	0.360	0.36	16	Gravel	Good	None	N/A
Chicago Park Forebay Rd.	YBCPF_001	BLM	0.00	1.638	1.638	13	Gravel/rock	Poor	--	High
		Private	1.638	1.745	0.107					
Chicago Park Forebay Rd.[3]	YBCPF_002	BLM	0.00	0.574	0.574	14	Gravel/rock	Poor	--	High
Chicago Park Forebay Rd.	YBCPF_003	BLM	0.00	0.083	0.083	17	Native rock	Good	None	N/A
		Private	0.083	0.180	0.097					
Chicago Park Powerhouse Access Rd.	YBCPH_001	NID	0.00	0.008	0.008	12	Paved	Good	None	N/A
		BLM	0.008	0.159	0.151					
French Lake Rd.	YBFL_001	Private	0.00	0.377	0.377	12	Native rock	Poor	Erosion	Medium
		Forest Service	0.377	1.867	1.49					
		NID	1.867	2.092	0.225					
Rollins Dam Spillway Access Rd.	YBRDS_001	NID	0.00	0.934	0.934	20	Native soil	Poor	None	N/A
Connroy Pl.	YBRMS_001	NID	0.00	0.062	0.062	12	Gravel	Good	None	N/A
Rollins Powerhouse Access Rd.	YBRPA_001	NID	0.00	0.133	0.133	14	Paved	Good	None	N/A

Table 6.7.1-29. (continued)

Road Name	Road ID[1]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Low Level Outlet Access Rd.	YBJMO_001	Forest Service	0.00	0.153	0.153	12	Gravel	Good	None	N/A
Pipeline Outlet Access Rd.	YBMBP_001	Forest Service	0.00	0.354	0.354	11	Native rock/soil	Poor	Runoff	Medium
		NID	0.354	0.558	0.204					
		Forest Service	0.558	0.978	0.420					
Wilson Creek Diversion Rd.	YBWCD_001	Forest Service	0.00	0.185	0.185	10	Native Soil	Poor	Erosion	High
Bowman Dam Access Rd.	YBBND_001	Forest Service	0.00	0.336	0.336	11-12	Native rock/Gravel	Poor	Runoff	Medium
Bunkhouse Rd.	YBBNK_001	Forest Service	0.00	0.11	0.11	12	Gravel	Good	None	N/A
Dutch Flat No. 2 Conduit Intake Access Rd.	YBDFI_001	Forest Service	0.00	0.348	0.348	12	Native rock	Poor	Erosion	High
		PG&E	0.348	0.383	0.035					
"B" Alarm Rd.	YBBAL_001	PG&E	0.000	0.784	0.784	12	Native soil	Poor	Erosion	High
		Forest Service	0.784	1.484	0.70	11	Native rock/gravel			
Stump Canyon Intake Access Rd.	YBSCS_001	PG&E	0.00	0.211	0.211	12	Native rock	Poor	Erosion	High
		Forest Service	0.211	0.426	0.215					
		PG&E	0.426	0.823	0.397					
Stump Canyon Siphon Low Level Valve Access Rd.	YBSCS_002	PG&E	0.00	0.156	0.156	11	Native rock	Poor	Erosion	High
Stump Canyon Outlet Access Rd.	YBSCS_003	NID	0.00	0.081	0.081	15	Gravel	Good	None	N/A
		Forest Service	0.081	0.447	0.366					
		NID	0.447	0.566	0.119					
		Forest Service	0.566	0.691	.125					
Canal Access Rd.	YBZION_001	PG&E	0.00	0.322	0.322	14	Gravel	Good	None	N/A

[1] Road ID pertains to the road segment designation in Licensees' Roads and Trails Technical Memorandum (9-1) in Appendix E12 of this Exhibit E and in NID's Road Management Plan in Exhibit E4 of this Exhibit E.
[2] N/A = Not applicable
[3] YBCPF_002 is proposed to be decommissioned by Licensee; see Transportation Management Plan in Appendix E4 of this FLA.

Table 6.7.1-30. Drum-Spaulding Project Primary Project Roads shown by road ID, length, width, surface treatment, and overall condition.

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment[3]	Overall Road Condition[4]	Identified Problems[5]	Overall Erosion Risk[6,7]
Carr-Lindsey Rd.	DS001	Modified	Forest Service	0.00	0.30	0.30	15	Native rock/gravel	Good	None	N/A
			PG&E	0.30	1.36	1.06					
			Private	1.36	1.80	0.45					
			Forest Service	1.80	1.88	0.08					
			Private	1.88	1.91	0.02					
			Forest Service	1.91	2.67	0.76					
			PG&E	2.67	2.75	0.08					
Upper Lindsey Lake Rd	DS002	Modified	PG&E	0.00	0.46	0.46	13	Native rock	Good	Several hazard trees	N/A
Lower Peak Rd.	DS004	Modified	PG&E	0.00	0.12	0.12	12	Native rock	Good-Poor	Erosion/several hazard trees	High
			Forest Service	0.12	0.38	0.26					
Langs Crossing Spillway Rd.	DS005	Modified	Private	0.00	0.49	0.49	20	Native rock	Good-Poor	Erosion	Medium
			PG&E	0.49	0.62	0.12					
Drum Canal/YB-28 Access Rd.	DS006	Modified	PG&E	0.00	0.56	0.56	10	Gravel/rock	Good	None	N/A
Chicken Ladder Rd.	DS007	Modified	Private	0.00	0.003	0.003	13	Gravel/rock	Good	None	N/A
			PG&E	0.003	0.58	0.58					
			Private	0.58	0.81	0.23					
			PG&E	0.81	1.29	0.48					
Burnt Point Rd.	DS007-1	Modified	PG&E	0.00	0.06	0.06	10	Native soil	Good	None	N/A
Drum Canal Access Rd.	DS007-3	Modified	PG&E	0.00	0.30	0.30	9	Native rock/gravel	Good	None	N/A
Drum Canal/ US Highway 20	DS008	Existing	PG&E	0.00	0.28	0.28	9	Gravel	Good	None	N/A
			Private	0.28	0.39	0.10					
			PG&E	0.39	0.53	0.14					
Lake Valley Diversion Dam Rd.	DS009	Existing	Private	0.00	0.72	0.72	11	Native rock	Good	Several hazard trees	N/A
Drum Canal Rd.	DS010	Existing	PG&E	0.00	0.88	0.88	13	Gravel	Good	None	N/A
			Forest Service	0.88	1.09	0.21					
			PG&E	1.09	3.31	2.22					
			Private	3.31	3.40	0.09					
			PG&E	3.40	4.00	0.60					

Table 6.7.1-30. (continued)

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Drum Canal Access Rd.	DS011	Modified	PG&E	0.00	1.72	1.72	12	Gravel/native	Good-Poor	Erosion	Medium
Camp 2 Rd.	DS013	Existing	PG&E	0.00	0.79	0.79	13	Paved/gravel	Good-Poor	Erosion	Low
			Forest Service	0.79	1.13	0.33					
			PG&E	1.13	1.17	0.04					
PG&E Access Rd.	DS014	Existing	PG&E	0.00	0.47	0.47	11	Native rock	Good	Brushed in	N/A
Drum Canal Rd.	DS015	Existing	PG&E	0.00	1.67	1.67	12	Native rock/soil	Good-Poor	Erosion	High
Old Highway 40											
Pittman Spill Channel North Rd.	DS017	Modified	PG&E	0.00	0.44	0.44	12	Native rock	Good-Poor	Erosion/landslide	High
			Private	0.44	0.51	0.07					
			PG&E	0.51	1.87	1.36					
Pittman Spill Channel South Rd.	DS018	Modified	PG&E	0.00	1.47	1.47	12	Native rock	Good-Poor	Erosion/landslide	High
Drum Canal Rd.	DS020	Existing	PG&E	0.00	0.81	0.81	16	Gravel/rock	Good	Erosion	Low
Drum Forebay Rd.											
Drum #3 Penstock Access Rd.	DS021	Modified	PG&E	0.00	0.24	0.824	11	Native rock	Poor	Erosion	High
Wheel House Rd.	DS022	Modified	PG&E	0	0.52	0.52	12	Native rock	Good	None	N/A
Access Rd.	DS023	Modified	PG&E	0.00	0.48	0.48	10	Native soil	Good	Erosion/landslide	Low
Downstream end of Little Tunnel Rd.	DS026	Existing	Private	0.00	0.12	0.12	12	Native rock/gravel/ native soil	Poor	Erosion/landslide	High
			Forest Service	0.12	1.00	0.88					
Telephone House Rd.	DS027	Existing	Private	0	0.73	0.73	12	Native soil	Poor	Erosion	High
South Yuba Canal Access Rd.	DS028	Modified	Private	0	0.69	0.69	14	Native rock	Good	None	N/A
Canal Rd.	DS029	Existing	Forest Service	0.00	0.34	0.34	12	Native rock	Good	None	N/A
Downstream Steephollow 1 Rd.	DS030	Existing	Forest Service	0.00	0.14	0.14	11	Native rock	Poor	Erosion	High
			Private	0.14	0.18	0.04					
			Forest Service	0.18	1.35	1.16					
East Excelsior Point Rd.	DS031	Modified	Forest Service	0.00	0.34	0.34	18	Native rock	Good	None	N/A
			Private	0.34	0.59	0.26					
		Existing	Forest Service	0.59	0.83	0.23					
			Private	0.83	0.92	0.10					
			Forest Service	0.92	1.33	0.41					

Table 6.7.1-30. (continued)

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Growers Rd.	DS032	Existing	Forest Service	0.00	0.22	0.22	12	Native soil	Good	Several hazard trees	N/A
Chalk Bluff Spur Rd.	DS035	Existing	Forest service	0.00	0.79	0.79	12	Native soil/rock	Poor	Erosion/landslide	Medium
Big Tunnel Spring Rd.	DS036	Existing	Forest Service	0.00	0.37	0.37	12	Native soil	Good	None	N/A
Deer Creek Spur Rd.	DS037	Existing	Forest Service	0.00	0.39	0.39	12	Native soil	Good	None	N/A
Deer Creek Spur Rd.	DS038	Existing	Forest Service	0.00	0.49	0.49	12	Native soil	Good	None	N/A
South Yuba Canal Access Rd	DS039	Modified	Forest Service	0.00	0.79	0.79	12	Native rock	Good	None	N/A
Drum PH Rd.	DS041	Existing	Forest Service	0.00	0.27	0.7	14	Paved	Poor	Erosion/landslide/blind spots	High
			Private	0.27	0.49	0.22					
			Forest Service	0.49	0.74	0.25					
			Private	0.74	0.76	0.01					
			Forest Service	0.76	1.28	0.52					
			PG&E	1.28	2.66	1.39					
			Private	2.66	2.69	0.03					
			Forest Service	2.69	3.70	1.00					
			PG&E	3.70	3.78	0.09					
			Forest Service	3.78	3.90	0.11					
			PG&E	3.90	4.36	0.46					
Dutch Flat Surge Tank Rd.	DS042	Modified	PG&E	0.00	0.16	0.16	12	Native rock	Good	None	N/A
			Private	0.16	0.39	0.23					
			Forest Service	0.39	0.43	0.04					
			Private	0.43	0.50	0.07					
			PG&E	0.50	0.60	0.10					
Simpson Spill Access Rd.	DS045	Existing	Private	0.00	2.01	2.01	12	Native/gravel	Good	Erosion	Low
Downstream end of Meadow Gate Rd.	DS046	Existing	Private	0.00	1.43	1.43	12	Gravel/paved	Good	Erosion	Low

Table 6.7.1-30. (continued)

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Wise Tunnels 7, 8, & 9 Access Rd.	DS047	Existing	PG&E	0.00	0.96	0.96	12	Gravel/rock	Good	Shotgun culverts	N/A
			Private	0.96	1.02	0.06					
Fiddler Green Flume Access Rd.	DS048	Existing	PG&E	0.00	0.21	0.21	12	Gravel/native rock	Good	Erosion/ brushed in	Medium
			Private	0.21	0.32	0.11					
			PG&E	0.32	0.33	0.01					
Rock Creek Rd.	DS051	Existing	PG&E	0.00	0.25	0.25	17	Paved/gravel	Good	Erosion/ brushed In	Low
			Private	0.25	0.26	0.02					
Rock Creek Arch Dam Rd.	DS051-1	Existing	PG&E	0.00	0.26	0.26	12	Native rock	Good	None	N/A
Newcastle PH Rd.	DS052	Existing	Private	0.00	0.01	0.01	15	Asphalt/gravel	Good	None	N/A
			PG&E	0.01	0.25	0.25					
			BOR	0.25	0.64	0.38					
Deer Creek Spur Rd.	DS053	Existing	BLM	0.00	0.07	0.07	10	Native rock	Good	Erosion/several hazard trees	Low
			PG&E	0.07	0.28	0.21					
Feeley Lake Rd.	DS054	Modified	Forest Service	0.00	0.27	0.27	15	Native rock	Good	None	N/A
	DS055	Existing	Forest Service	0.00	0.05	0.05	30	Gravel	Good	None	N/A
Lake Spaulding Rd.	DS056	Existing	Private	0.00	0.23	0.23	14	Paved	Good	Erosion/ brushed in	Low
			PG&E	0.23	1.05	0.82					
Drum Forebay Rd.	DS057	Existing	PG&E	0.00	0.12	0.12	12	Native rock	Good	None	N/A
	DS058			0.00	0.18	0.18	15	Gravel	Good	None	N/A
Drum Butterfly Valve House Rd.	DS059	Modified	PG&E	0.00	0.09	0.09	12	Gravel	Good	None	N/A
Boot Rd.	DS060	Modified	Forest Service	0.00	1.17	1.17	13	Gravel/rock	Poor	Erosion/ landslide	Medium
Downstream of Boot Rd.	DS060-2	Existing	Forest Service	0.00	0.26	0.26	12	Native rock/soil	Good	None	N/A
Downstream of Boot Rd.	DS060-3			0.00	0.02	0.02		Native rock			
Steephollow 2 Rd.	DS060-4			0.00	0.04	0.04					
13 Mile Spill Rd.	DS060-5			0.00	0.47	0.47		Gravel/native rock			
13 Mile Spill Rd.	DS060-6			0.00	0.03	0.03		Gravel			
Spaulding No. 3 Header Box Rd.	DS062	Modified	PG&E	0.00	0.45	0.45	10	Native rock/soil	Good	None	N/A

Table 6.7.1-30. (continued)

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Alta PH Rd.	DS063	Existing	PG&E	0.00	0.20	0.20	14	Asphalt/ Gravel	Good	None	N/A
			Private	0.20	0.21	0.01					
Canal Rd.	DS064	Existing	Forest Service	0.00	0.36	0.36	12	Native soil	Good	None	N/A
Upper Access to YB-34 Rd.	DS067	Modified	Forest Service	0	0.01	0.01	11	Native soil	Good	None	N/A
			PG&E	0.01	0.70	0.69					
Boardman Diversion Dam Rd.	DS069	Existing	Forest Service	0.00	0.11	0.11	13	Native rock	Good	None	N/A
Little Tunnel Rd.	DS071	Existing	Forest Service	0.00	0.18	0.18	11	Native soil	Good	None	N/A
Spillway Access Rd.	DS074	Modified	Forest Service	0.00	0.17	0.17	11	Native rock	Poor	Erosion	Low
Chalk Bluff Spur Rd.	DS075	Existing	Forest Service	0.00	0.26	0.26	11	Native soil	Poor	Erosion	Low
Deer Creek Rd.	DS076	Existing	PG&E	0.00	0.12	0.12	13	Native soil	Good	None	N/A
			BLM	0.12	0.32	0.20					
Bear River Canal Access Rd.	DS077	Existing	Private	0.00	0.19	0.19	11	Gravel	Good	None	N/A
Krause Flume Access Rd.	DS078	Existing	Private	0.00	0.28	0.28	10	Native soil	Good	None	N/A
Bowman Yard Rd.	DS080	Existing	PG&E	0.00	0.27	0.27	9	Native soil	Good	None	N/A
	DS081	Existing	PG&E	0.00	0.04	0.04	15	Gravel	Good	None	N/A
			Private	0.04	0.05	0.01					
			PG&E	0.05	0.08	0.03					
Downstream End of Little Tunnel Rd.	DS082	Existing	Forest Service	0.00	0.71	0.71	11	Unknown	Unknown	Unknown	Unknown
Downstream End of Little Tunnel Spur Rd.	DS082-1	Existing	Forest Service	0.00	0.10	0.10	11	Unknown	Unknown	Unknown	Unknown
South Yuba Canal Access Rd.	DS083	Modified	Forest Service	0.00	0.06	0.06	11	Unknown	Unknown	Unknown	Unknown
			PG&E	0.06	0.07	0.01					

Table 6.7.1-30. (continued)

Common Road Name	Road ID[1]	Existing/ Modified[2]	Land Ownership	Mile Marker-Start	Mile Marker-End	Total Length (mi)	Average Road Width (ft)	Road Surface Treatment	Overall Road Condition	Identified Problems	Overall Erosion Risk
Bear Valley Spill Rd.-SYC Access	DS084	Modified	Forest Service	0.00	0.02	0.02	11	Unknown	Unknown	None	N/A
			PG&E	0.02	0.03	0.01					
			Forest Service	0.03	0.04	0.01					

[1] Road ID pertains to the road segment designation in Licensees' Roads and Trails Technical Memorandum (9-1) n Appendix E12 of this Exhibit E and in PG&E's Transportation Management Plan for Primary Project Roads in Exhibit E8 of this Exhibit E.
[2] Modified – the FERC Project Boundary was amended to include portions (or the whole) of roads denoted as modified. These roads are part of the Proposed Project.
[3,4,5,6] Unknown road conditions denote roads that have not been surveyed yet. These roads will be surveyed in spring/summer 2011.
[7] N/A = Not applicable

Table 6.7.1-31. Drum-Spaulding Project's General Access Roads (general use roads, not within the FERC Project Boundary and not in FERC's jurisdiction) on National Forest System land and which will be addressed in a Road Maintenance Agreement (RMA) between PG&E and the Forest Service.

Road Name	Access Requirement	Segment Beginning Termini	Segment Ending Termini	Quad Name	RMA Length (Miles)	RMA Maintenance Level
Road 18 Bowman Lake	Access to Grouse Lakes area (Bear Valley Section)	Highway 20	South Yuba Canal	Blue Canyon	1.01	5
Road 18 Bowman Lake	Access to Grouse Lakes area (up to Rucker Lake turnoff)	South Yuba Canal	Forest Road 18-6	Blue Canyon	3.78	5
Road 18 Bowman Lake	Access to Grouse Lakes area (up to Lindsey Lake turnoff)	Forest Road 18-6	Forest Road 18-19	Blue Canyon Graniteville	5.73	4
Road 17 (4C)	Access to Lindsey Lake (to Lindsey Lake Trailhead)	Forest Road 17-8	Gate at Lindsey Lake	Graniteville	0.36	3
Road 17-8 (4B)		Forest Road 18-19	Forest Road 17		0.34	2
Road 18-19 (4A)		Forest Road 18	Forest Road 17-8		0.31	2
Road 17	Access road connecting the roads to Lindsey and Carr Lake (aka Lower Feeley Lake)	Forest Road 17-6	Forest Road 17-8	Graniteville	1.36	3
Carr-Lindsey Road Road 17	Access to Carr Lake (aka Lower Feeley Lake)	Forest Road 18	Forest Road 17-6	Graniteville	2.09	3
Carr-Lindsey Road 17-6	Access to Carr Lake (aka LowerFeeley Lake)	Forest Road 17	Gate at Carr Lake	Graniteville	0.73	3
Forest Road 18-6, Blue Lake	Access to Blue Lake	Forest Road 18	West Line Section 8	Blue Canyon	1.16	3
Forest Road 20-17, Excelsior Point	Access to So. Yuba Canal	Highway 20	Forest Road 20-17-5	Blue Canyon	2.84	2
Forest Road 32, Chalk Bluff	Access to So. Yuba Canal	Highway 20	Forest Road 32-7	Washington	0.85	2
Forest Road 32-7, Deer Creek Road	Access to Deer Creek Forebay	Forest Road 32	Deer Creek Forebay	Washington	4.36	2
Forest Road 86-70, White Rock	Access to White Rock Lake	Forest Road 86	White Rock Lake	Webber Peak	5.04	2
Sterling , Forest Road 85-2	Access to Sterling Lake	Forest Road 85	Sterling Lake	Cisco Grove/ Soda Sprgs	1.13	2
Texas Hill Mears, Forest Road 19	Access to Silvertip DUA	County Route 9100	Silvertip DUA entrance	Cisco Grove	0.35	3
Fordyce Road, Forest Road 85-2-1	Access to Fordyce	Forest Road 85-2	Property Line, Fordyce	Cisco Grove	1.36	2
Rattlesnake Road, Forest Road 85	Access to Fordyce	County Route 9140	Forest Road 85-2	Cisco Grove	5.22	2

NID proposes to amend the FERC Project Boundary to include the following 12 existing Primary Project access road segments:

- A 1.6-mile-long segment of French Lake Dam Road (Forest Service Road 843-20), located partially on private land and partially on NFS land
- A 0.1-mile-long segment of the Milton Pipeline Access Road, located entirely on NFS land
- Cumulatively a 0.1-mile-long set of segments of the Wilson Creek Diversion Access Road, located entirely on NFS land
- The 0.1-mile-long Bunkhouse Road, located entirely on NFS land
- The 0.4-mile-long Texas Creek Diversion Access Road, located entirely on NID land
- A <0.1-mile-long segment of the Bowman-Spaulding Canal Berm Road (near the Rucker Creek Diversion), located entirely on PG&E land
- A 0.1-mile-long segment of the Bowman-Spaulding Canal Access Road (just below PG&E's Fuller Lake Dam), located entirely on PG&E land
- The 0.8-mile-long Stump Canyon Siphon Intake Access Road, located partially on NFS land and partially on PG&E land
- The 0.2-mile-long Stump Canyon Siphon Low Level Valve Access Road, located entirely on PG&E land
- A 1.3-mile-long segment of the "B" Alarm Road, located partially on NFS land and partially on PG&E land
- Cumulatively a 1.4-mile-long set of segments of the Chicago Park Forebay Road partially located on public land administered by BLM and partially located on private land
- The 0.2-mile-long Chicago Park Powerhouse Access Road, located entirely on BLM land

All of the above road segments are used almost exclusively by NID to access Project facilities and are included in NID's proposed Transportation Management Plan, which can be found in Appendix E4 of Exhibit E.

All trails on the Drum-Spaulding Project and Yuba-Bear Hydroelectric Project were ranked as being in 'good' condition. No adverse impacts were reported.

6.7.2 Environmental Effects

6.7.2.1 Yuba-Bear Hydroelectric Project

This section includes a description of the anticipated effects of NID's proposed Project, which includes NID's proposed PM&E measures (Appendix E3) on land use. The section is divided into the following areas: 1) effects on land use; 2) effects on fires; and 3) effects on roads.

6.7.2.1.1 Effects on Land Use

NID's proposed Project does not include any new facilities or significant changes in operations other than the addition of the Rollins Upgrade and some new recreation facilities. Most of the existing Project facilities have been in place for well over 50 years. The Rollins Upgrade would occur entirely within the existing FERC Project Boundary and on NID-owned land, and would be located adjacent to the existing powerhouse. The addition of the upgrade would have a less than significant effect on land use since the area affected is already dedicated to a power facility and not on federal land. Similarly, the addition of the recreation facilities would have a less than significant effect on land use since the facilities are within or adjacent to existing recreation facilities (i.e., no change in land use).

Maintenance of proposed Project facilities on federal land would have a less then significant effect. Most of the existing Project facilities on federal land have been in place for at least 50 years and some for over 100 years, and NID's studies did not identify any land use impacts related to existing facilities. NID does not propose significant changes to existing Project facilities or how they are maintained and operated. Also, NID's proposed Project includes a measure that would provide Licensee consult with the Forest Service and BLM annually. The measure would: 1) assure that NID's planned activities are efficiently coordinated to the extent possible with the Forest Service and BLM activities; 2) make the Forest Service and BLM aware of NID's planned O&M activities on NFS land and on public land administered by BLM; and 3) make NID aware of all pertinent Forest Service and BLM orders, rules and policies that might affect the planned activities. NID would meet with the Forest Service, BLM and other agencies in the first quarter of each year to discuss NID's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate since NID normally develops an annual maintenance plan early in each calendar year. NID would file documentation of the meeting with FERC, including recommendations by the Forest Service and BLM, if requested by FERC. The measure does not imply that NID may not proceed with planned Project O&M activities until NID has reviewed the planned O&M activity with the Forest Service and BLM, or relieve NID from obtaining all necessary approvals and permits for the planned maintenance work.

6.7.2.1.2 Effects on Fires

Over the past 10 years, NID's existing Project has not had a significant effect on fire occurrence (Table 6.7.1-27). NID does not propose significant changes to the facilities or how they are maintained and operated, so the Proposed Project would not increase the risk of Project-related fires. Nevertheless, NID's proposed Project includes a Fire Prevention and Response Plan for federal land within the FERC Project Boundary. The plan, when implemented, would: 1) assure NID minimizes within reason the risk of wildfires caused by Project O&M on federal land; 2) advise the Forest Service, BLM and other interested parties of roads, helispots, and fire fighting equipment within the FERC Project Boundary; 3) provide a mechanism for reporting of wildfires to the Forest Service of BLM, as appropriate, and other fire-fighting agencies; and 4) provide for cooperation between NID and Forest Service and BLM, as appropriate, for investigating fires that may be related to Project O&M. The plan would be updated as necessary and provided to the Forest Service, BLM and the appropriate fire response agencies. The plan does not imply that NID is responsible for patrolling for wildfires, fighting fires, or responding to fires in any manner. NID's staff has not received the specialized training necessary for such activities. Nor does inclusion of this measure imply NID is *a priori* responsible for the costs of fighting or restoration of a wildfire in the vicinity of the Project. Such a determination will be made by the appropriate parties on a case-by-case basis based on the evidence at hand.

6.7.2.1.3 Effects on Roads

Use of roads for Project purposes has a potential to affect the road facilities themselves (e.g., road surfaces and culverts), and associated resource areas such as erosion. NID's proposed Project does not include any new roads or changes in how the roads are used. Some of the existing roads used to access the Project facilities for O&M are on NFS land and land administered by BLM, and a few of these were rated as in poor condition during NID's Roads and Trails Study (Table 6.7.12-29). NID's proposed Project includes a Transportation Management Plan related to maintenance of Primary Project Roads and Trails. Implementation of the Transportation Management Plan will assure that all Primary Project Roads and Trails are maintained to current standards, thereby minimizing the potential for adverse affects due to roads and road use, such as erosion.

6.7.2.2 PG&E's Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on land use. In some instances, it is concluded that the existing Project does not adversely affect land use, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific land use resource, PG&E has proposed a measure to be included in its Proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed three PM&E measures that are relevant to this resource area, which are listed in Section 6.7.3.2.1 below. The complete text of each measure and the accompanying rationale is presented in Appendix E7 of this FLA.

The section is divided into the following areas: 1) effects on land use; 2) effects on fires; and 3) effects on roads.

6.7.2.2.1 Effects on Land Use

PG&E's Proposed Project does not include any new facilities, with the exception of some new recreation facilities, which are further discussed in PG&E's Recreation Facilities Plan, filed with this FLA in Appendix E8. The addition of the facilities would have a less than significant effect on land use because the new facilities will be within or adjacent to existing recreation areas (i.e. no change in land use).

Maintenance of Project facilities on federal land would have a less then significant effect. Most of the existing Project facilities on federal land have been in place for at least 50 years and some for over 100 years, and PG&E's studies did not identify any land use impacts related to existing facilities. PG&E does not propose significant changes to existing Project facilities, including related O&M. PG&E's Proposed Project includes a measure that would provide that PG&E consult as applicable, with the Forest Service, BLM and BOR annually. The measure would: 1) assure that PG&E's planned activities are efficiently coordinated to the extent possible with the Forest Service, BLM and BOR activities; 2) make the Forest Service, BLM and BOR aware of PG&E's planned O&M activities on NFS land and on public land administered by BLM and BOR; and 3) make PG&E aware of all pertinent Forest Service, BLM and BOR orders, rules and policies that might affect PG&E's planned activities. PG&E would meet with the Forest Service, BLM, BOR and other agencies in the first quarter of each year to discuss PG&E's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate because PG&E normally develops an annual maintenance plan early in each calendar year.

6.7.2.1.2 Effects on Fires

Over the past 10 years, PG&E's existing Project has not had a significant effect on fire occurrence (Table 6.7.1-28). PG&E does not propose significant changes to the facilities including related O&M, so the Project would not increase the risk of Project-related fires. Nevertheless, PG&E proposes a Fire Prevention and Response Plan on Federal Land. The plan, when implemented, would: provide a mechanism for prevention and reporting of wildfires to the Forest Service, BLM and BOR, as appropriate, and other fire-fighting agencies; and provides for the cooperation between PG&E and Forest Service, BLM and BOR, as appropriate, for investigating fires that may be related to Project O&M and recreation. The plan would be updated as necessary and provided to the Forest Service, BLM, BOR, and the appropriate fire response agencies. The plan does not imply that PG&E is responsible for patrolling for wildfires, fighting fires, or responding to fires in any manner. PG&E's staff has not received the specialized training necessary for such activities. Nor does inclusion of this measure imply PG&E is responsible for the costs of fighting or restoration of a wildfire in the vicinity of the Project.

6.7.2.1.3 Effects on Roads

Use of roads for Project purposes has a potential to affect the road facilities themselves (e.g., road surfaces and culverts), and associated resource areas such as erosion. Some of the existing roads used to access the Project facilities for O&M are on NFS land and to a limited extent, land administered by BLM and BOR. A few of the roads on NFS land were rated in poor condition during PG&E's Roads and Trails Study (Table 6.7.12-30). PG&E's Proposed Project includes a Transportation Management Plan for Primary Project Roads. Implementation of the Transportation Management Plan for Primary Project Roads will, among other things, enable Primary Project Roads to be maintained and rehabilitated to improve access and resource protection.

6.7.3 Proposed Measures

6.7.3.1 Yuba-Bear Hydroelectric Project

6.7.3.1.1 NID's Proposed Measures

NID has included in its proposed Project the following three measures related to land use:

- Proposed Measure YB-GEN1: Annual Consultation
- Proposed Measure YB-LU1: Implement Fire Prevention and Response Plan on Federal Land
- Proposed Measure YB-LU2: Implement Transportation Management Plan

Refer to Appendix E3 for the full text of each measure. Management plans are included in Appendix E4.

6.7.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Include a Fire Prevention and Response Plan

The Forest Service, BLM, NPS and CDFG recommended in their joint letter:

> Section 6.7.3.2.1: The Licensee should prepare a FPRP on Federal Land… (p. 43)
>
> …the plan needs to address conduct of work associated with operation and maintenance of both of the project's facilities on National Forest System lands by the licensee and their contractors... (pp. 42 - 43)
>
> The licensee shall provide current contact information to the resource agencies, including contact information for the Emergency Action Plan, Fire Plan, and other appropriate plans. (p. 52)

Licensee has developed a Fire Prevention and Response Plan on Federal Lands for the Project (Proposed Measure YB-LU1) and incorporated the agencies' recommendations. The plan is included in Appendix E4.

Include a Transportation Management Plan

The Forest Service, BLM, NPS and CDFG recommended in their joint letter:

> The Transportation Management Plan…should include the specific restoration plans and remedies…for each road to mitigate adverse effects and specific plans to maintain…to standards…instead of a reference to

general maintenance… should be developed earlier than 2 years after license issuance… [and] needs to address:

- Operation, maintenance, and repairs of project roads that are causing adverse affects
- Maintenance and repairs of roads in project recreation facilities
- Maintenance agreement for general access over public lands to project facilities…

The…plan should include an element for sign inspection and replacement…as required by the MUTCD. (p. 45 - 46)

Include the following language in the Transportation Management Plan and reference it in the recreation management plan:

- Develop a Pavement Management System for all paved roads within project recreation sites and access roads that primarily serve project recreation sites. Conduct condition inventory of pavement and road conditions in all recreation sites and access roads. This inventory shall be conducted by someone trained in the Pavement Management System…Licensee shall provide resource agencies with a Pavement Condition Index…and the planned schedule of maintenance…
- Annual review of recreation facilities should include a qualified engineer to assess…
- Within the TNF, install and maintain prominent road signing…guiding the recreating public to the facility…road signing to will be to current MUTCD standards. Signs will be designed and installed in coordination with the appropriate road management agency and the Forest Service… (p. 46)

The following should be included in the NID Transportation Management Plan… Faucherie Road and the road across Jackson Meadows Dam should be Project roads… (p. 46)

Within 2 years of license issuance, enter into an agreement with appropriate parties, including Nevada and Sierra Counties, and Forest Service, to address design standards, maintenance, and public access on the following roads:

- Bowman Road past Lindsey Lake turn-off, FS 18
- Graniteville road from Jackson Meadow Dam to the Bowman Road, County Route 843
- Henness Pass Road from Jackson Meadows to Milton Impoundment, County Route 301. (p. 47)

> Work with the appropriate road agencies and authorities to pave the Nevada County road 956, from the end of the pavement of County Road 956 to Jackson Meadows Admin site so that the road provides, and is maintained in a smooth, dust-free driving surface to the Woodcamp recreation facilities. Provide pull outs along the way with barriers and a non- motorized trail to lakeshore in at least two locations along this stretch of road, to the degree feasible. (p. 47)

NID has developed a Transportation Management Plan for the Project (Proposed Measured YB-LU2), which addresses operation, maintenance, and repairs of Primary Project roads that are causing adverse affects. The plan includes site-specific discussions for repairing/restoring those roads currently rated as 'poor.' All discussion of roads on recreation sites, including signage, paving and annual review, is included solely in Licensee's Recreation Facilities Plan. All discussion of non-Primary Project roads will be addressed in a Road Maintenance Agreement being developed between NID and the Forest Service. The Transportation Management and Recreations Facilities plans are included in Appendix E4.

Conduct Inventory of Illegal OHV Trails

The Forest Service, BLM, NPS and CDFG recommended in their joint letter:

> Within 2 years of license issuance, conduct a Roads and Trails inventory of all feeder trails illegally built by OHV activity coming off the project trails and roads on to BLM land… Trails built along the pipelines…need…barriers put in place to discourage further use from OHV activity. (p. 47)

BLM has provided insufficient detail for NID to perform in depth analysis of the recommended study, or for NID to estimate the cost associated with implementation.

NID has not included in its proposed Project a study to prepare an inventory of OHV illegal feeder trails on BLM managed land for three reasons. First, studies conducted in 2008-2010 on the Project did not incidentally report any illegal OHV trails. Second, NID does not believe that there is a causal nexus between Primary Project roads and trails and illegal primitive OHV roads on BLM land. Third, NID believes policing illegal use of BLM land is the responsibility of BLM, not NID.

6.7.3.2 Drum-Spaulding Project

6.7.3.2.1 PG&E's Proposed Measures

PG&E has included in its Proposed Project three measures related to land use:

- Proposed Measure DS-GEN1: Annual Consultation with the Forest Service, BLM and BOR

- Proposed Measure DS-LU1: Implement Transportation Management Plan for Primary Project Roads
- Proposed Measure DS-LU2: Implement Fire Prevention and Response Plan on Federal Land

Refer to Appendix E7 for the full text of the measure and a rationale for each measure. Management plans are filed in Appendix E8 of this FLA.

6.7.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as required by the regulations. However, some commenters made requests or proposals that provided PG&E with enough information that PG&E could address at least components of the request (including whether the proposal was consistent with study results). Below PG&E has made its best effort to capture each of these proposals (and PG&E's response to each proposal) that relate to this resource area.

Include a Fire Prevention and Response Plan

The resource agencies in their January 28, 2011 joint letter recommended:

> Section 6.7.3.2.1: The licensee should prepare a FPRP on Federal Land . . . . (p. 43).
>
> [T]he plan . . . needs to address conduct of work associated with operation and maintenance of both of the project's [sic] facilities on National Forest System lands by the licensee and their contractors. (p. 42).
>
> The licensee shall provide current contact information to the resource agencies, including contact information for the . . . Fire Plan, and other appropriate plans. (p.119).

Licensee has developed a Fire Prevention and Response Plan on Federal Land for the Project, the implementation of which is addressed in Proposed Measure DS-LU2. The plan is filed with this FLA in Appendix E8.

Include a Transportation Management Plan

The resource agencies also recommended in their joint letter:

> The Transportation Management Plan and Monitoring Plan should include the specific restoration plans and remedies that need to be implemented for each road to mitigate adverse effects and specific plan [sic] to maintain it to standards instead of a simple reference to general maintenance. (p. 45).
>
> Transportation Management Plan should be developed earlier than 2 years after license issuance. The Transportation Management Plan needs to address:
>
> - Operation, maintenance, and repairs of project roads that are causing adverse affects.
> - Maintenance and repairs of roads in project recreation facilities.
> - Maintenance agreement for general access over public lands to project facilities. (p. 46).
>
> The transportation system management plan should include an element for the sign inspection and replacement plan as required by the MUTCD. (p. 46).
>
> Additionally, include the following language in the Transportation Management Plan and reference it in the recreation management plan:
>
> - Develop a Pavement Management System for all paved roads within project recreation sites and access roads which primarily serve these recreation sites. Conduct condition inventory of pavement and road conditions in all recreation sites and access roads. This inventory shall be conducted by someone trained in the Pavement Management System . . . . [L]icensee shall provide the resource agencies with a Pavement Condition Index . . . and the planned schedule of maintenance . . . .
> - Annual review of recreation facilities should include a qualified engineer to assess the need for resurfacing of gravel roads and grading native surface roads.
> - Within the Tahoe National Forest, install and maintain prominent road signing (where these do not currently exist) guiding the recreating public to the facility and back to the main road from all project lakes. The following lakes are not subject to this requirement: Jackson Lake, French Lake and the lakes within the Grouse Lakes Non-Motorized area. The road signing will be to current MUTCD (Manual on Uniform Traffic Control Devices) standards. Signs will be designed and installed in coordination with the appropriate road management

> agency and the FS, to assure that signs are included in the FS road sign inventory. (p. 46).
>
> Within 2 years of license issuance, enter into an agreement with appropriate parties, including Nevada, Placer, and Sierra Counties, and FS, to address design standards, maintenance, and public access on the following roads:
>
> - Fuller Lake, FS 18-03
> - Meadow Lake Road, FS 86
> - Meadow Lake Road (from the intersection with the 86 road to Meadow Lake Campground) County Route 843
> - Kidd Lake to Peak Lake, County Route 9146 (p. 47).
>
> Section 3.8.1: The Transportation Management Plan should reference a requirement for the licensee entering into a road use and maintenance agreement with FS whereby the licensee has shared road maintenance responsibilities on general access roads commensurate with their share [sic] traffic using project facilities. In addition to taking appropriate measures to rehabilitate erosion, all the other unacceptable environmental damages caused by project roads should be addressed. (p. 47).

PG&E has developed a Transportation Management Plan for Primary Project Roads for the Proposed Project (Proposed Measure DS-LU1), which addresses operation, maintenance, and repairs of Primary Project Roads that are causing adverse affects. The plan includes site-specific discussions for repairing/restoring those roads currently rated as 'poor.' All discussion of roads within recreation sites, including signage, paving and annual review, is included in Licensee's Recreation Facilities Plan. As discussed further in Exhibit E, Appendix E7, General Access Roads on NFS lands will be addressed in a Road Maintenance Agreement being amended between PG&E and the Forest Service. The Transportation Management Plan for Primary Project Roads and Recreations Facilities Plan are filed with this FLA in Appendix E8.

Conduct Inventory of Illegal OHV Trails

In their joint letter, the resource agencies recommended:

> Within 2 years of license issuance, conduct a Roads and Trails inventory of all feeder trails illegally built by OHV activity coming off project trails and roads onto BLM land. Install barriers to prevent further resource damage. Trails built along the pipelines and ditches also need to be rehabilitated and barriers need to be put in place to discourage further use from OHV activity. (p. 47).

The joint agency letter has provided insufficient detail for PG&E to perform in depth analysis of this recommendation, or for PG&E to estimate the cost associated with the request.

PG&E has not included, in its Proposed Project, a study to prepare an inventory of OHV illegal feeder trails on BLM managed land. Studies conducted in 2008-2010 on the Project did not incidentally report any illegal OHV trails. Additionally, there is no information that has been developed or presented that demonstrates a causal nexus between Primary Project Roads and trails and illegal OHV roads on BLM land. Policing the potential illegal use of BLM land is the responsibility of BLM. However, unauthorized access to agency property from Primary Project Roads will be discussed at the annual consultation meeting.

6.7.4 Unavoidable Adverse Impacts

6.7.4.1 Yuba-Bear Hydroelectric Project

The proposed Project would have both short- and long-term minor impacts on land use resources. Project facilities will continue to be a long-term, committed land use. Their initial construction represented a major, short-term impact to land use resources, but as most of the facilities have been in place for over 50 years, their impact is now relatively minor. The proposed Rollins Upgrade will have a minor, short-term effect in respect to construction and a minor, long-term effect in respect to land use.[1] The existing Rollins Powerhouse occupies the area directly adjacent to the location for the proposed Rollins Upgrade, so land in the area is already utilized for a Project powerhouse. Therefore, the proposed Rollins Upgrade does not represent a land use change for the area. Additionally, the Rollins Upgrade would occur entirely within the existing FERC Project Boundary and on NID-owned land. Construction activities would be short in duration and occur in areas previously disturbed.

Project O&M activities and associated road use will continue to have a long-term, minor affect on fire risk. In the past 10 years, no Project O&M or road use activities have caused a fire. Additionally, NID has developed a Fire Prevention and Response Plan for federal land within the FERC Project Boundary, which, when implemented, will further reduce the potential of Project O&M to cause fires.

Use of roads for Project purposes will continue to have a minor, short-term affect on the road facilities themselves (e.g., road surfaces and culverts), and associated resource areas. Only a small proportion of the roads within the TNF and general area are Primary Project roads, so their impact, compared to the impact of the roads system as a whole, is relatively insignificant. However, NID has developed a Transportation Management Plan which details road maintenance and rehabilitation for Primary Project roads and trails to further reduce their adverse impacts.

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[1] See Section 6.4.2.1.16 of Terrestrial Resources for a detailed description on the effects of the proposed Rollins Upgrade and new recreation facilities.

6.7.4.2 Drum-Spaulding Project

As described above for the proposed Yuba-Hydroelectric Project, PG&E's Proposed Drum-Spaulding Project would have both short- and long-term minor impacts on land use resources. Project facilities will continue to be a long-term, committed land use. Their initial construction represented a major, short-term impact to land use resources, but as most of the facilities have been in place for over 50 years, their impact is now relatively minor. With the exception of recreation facilities discussed above, PG&E has not proposed any new Project facilities, so no new areas of land will be impacted by the Project.

Project O&M activities and associated road use will continue to have a long-term, minor affect on fire risk. In the past ten years, no Project O&M or road use activities have caused a fire. Additionally, PG&E has developed a Fire Prevention and Response Plan on Federal Land within the FERC Project Boundary, which, when implemented, will further reduce the potential of Project O&M to cause fires.

Use of roads for Project purposes will continue to have a minor, short-term affect on the road facilities themselves (e.g., road surfaces and culverts), and associated resource areas. Only a small proportion of the roads within the TNF and general area are Primary Project Roads, so their impact, compared to the impact of the roads system as a whole, is relatively insignificant. However, PG&E has developed a Transportation Management Plan for Primary Project Roads which details road maintenance and rehabilitation for Primary Project Roads to further reduce their adverse impacts.

6.8 Cultural Resources

The discussion of cultural resources is broken into four sections. First, and immediately below, is a list and status of the studies Licensees conducted regarding cultural resources. Second, the affected environment is discussed in Section 6.8.1. Third, the environmental effects of the projects are located in Section 6.8.2. Fourth, proposed measures are listed in Section 6.8.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, unavoidable adverse effects, if any, are addressed in Section 6.8.4.

Where existing, relevant, and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on cultural resources, Licensees developed and conducted the studies listed in Table 6.8-1.

Table 6.8-1. Cultural resources and tribal studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	**Study Name**	**Tech Memo Number**	**Study in Progress[2]**	**Study Complete**	**Date Study is Scheduled to be Complete**
2.12.1	Historic Properties – Drum-Spaulding Project	12-1a	1/25/11	--	10/31/11
	Historic Properties – Yuba-Bear Hydroelectric Project	12-1c	9/16/10	--	10/31/11
2.13.1	Native American Traditional Cultural Properties – Drum-Spaulding Project	13-1a	3/29/10	--	10/31/11
	Native American Traditional Cultural Properties – Yuba-Bear Hydroelectric Project	13-1c	11/29/10	--	10/31/11

[1] Because there was no overlap between the two projects in the performance of these studies, Licensees prepared separate technical memorandum for each Project: Technical Memoranda 12-1a and 13-1a address the Historic Properties Study and Native American Traditional Cultural Properties Study, respectively, for the Drum-Spaulding Project. Technical Memoranda 12-1c and 13-1c address the Historic Properties Study and Native American Traditional Cultural Properties Study, respectively, for the Yuba-Bear Hydroelectric Project.

[2] Although in some instances Licensees may have posted a technical memorandum to their Relicensing Website earlier than the date listed in this column, the date in the column reflects the date that the most recent version of the document was posted to the Relicensing Website.

At the time this FLA is filed with FERC, the two studies listed in Table 6.8-1 are in progress; the most recent version of the interim technical memorandum that has been posted to the Relicensing Website for each study is being filed with this FLA in Appendix E12. Each technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; and lists of variances to the FERC-approved study; attachments to the technical memorandum; and references.

The status of each study, including expected completion, is described below.

- <u>Historic Properties (Study 2.12.1) for the Drum-Spaulding Project</u>. PG&E has completed all tasks in the FERC-approved study with the exception of: 1) completing studies on new areas added to the FERC projects boundaries, including Project roads, totaling 23.41 acres; and 2) revising the technical memorandum. Licensees expect to complete the study and file the technical memorandum by October 31, 2011.

- Historic Properties (Study 2.12.1) for the Yuba-Bear Project. NID has completed all tasks in the FERC-approved study with the exception of: 1) completing studies on new areas added to the FERC Project's boundaries, including Project roads, for which the total acreage is being determined; and 2) revising the technical memorandum. NID expects to complete the study and file the technical memorandum by October 31, 2011.
- Native American Traditional Cultural Properties (Study 2.13.1) for the Drum-Spaulding Project. PG&E has not completed all tasks in the FERC-approved study because the documentation and evaluation of one potential TCP, discovered in late 2010/early 2011, is currently in progress. Additionally, PG&E will need to: 1) complete studies on new areas added to the FERC Project's boundaries, including Project roads, totaling 23.41 acres; and 2) revise the technical memorandum. PG&E expects to complete the study and file the technical memorandum October 31, 2011.
- Native American Traditional Cultural Properties (Study 2.13.1) for the Yuba-Bear Hydroelectric Project. NID has completed all tasks in the FERC-approved study with the exception of: 1) completing studies on new areas added to the FERC projects boundaries, including Project roads, for which the total acreage is being determined; and 2) revising the technical memorandum. NID expects to complete the study and file the technical memorandum by October 31, 2011.

6.8.1 Affected Environment

This section describes existing cultural resources, and is divided into the following six areas: 1) regulatory context, including Section 106 consultation; 2) Area of Potential Effects (APE); 3) cultural history overview; 4) prehistoric and historic archeological resources; 5) Traditional Cultural Properties (TCP); and 6) historic buildings and structures.

6.8.1.1 Regulatory Context, including Section 106 Consultation

Section 106 of the National Historic Preservation Act (NHPA) of 1996, as amended, requires FERC to evaluate potential effects on properties listed or eligible for listing in the National Register of Historic Places (NRHP) prior to an undertaking. Pursuant to 36 CFR 800.16, an undertaking is defined as a, project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including . . . those requiring a Federal permit, license or approval. In this case, the undertaking is the proposed issuance of new licenses for the projects. Potential effects that may be associated with this undertaking include any project-related effects associated with the day-to-day operation and maintenance of the projects after issuance of a new license.

Historic properties are cultural resources listed or eligible for listing in the NRHP. Historic properties represent objects, structures, traditional places, or archeological sites that can be either Native American or Euro-American in origin. In most cases, cultural resources less than 50 years old are not considered eligible for the NRHP. Cultural resources also must retain integrity (i.e., the ability to convey their significance) to qualify for listing in the NRHP. For example, dilapidated structures or heavily disturbed archeological sites may not retain enough integrity to relay information relative to the context in which the resource is considered to be important and, therefore, eligible for listing on the NRHP.

Section 106 also requires that the Commission seek concurrence from the State Historic Preservation Officer (SHPO) on any determinations of NRHP eligibility and findings of effect to historic properties, and allow the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on any finding of adverse effects. If Native American properties have been identified, Section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties (i.e., TCPs).

On May 22, 2008, FERC designated NID and PG&E as FERC's non-federal representatives for purposes of consultation under Section 106 and the implementing regulations found at 36 Code of Federal Regulations Section 800.2(c)(4) for their respective relicensings. Consultation has included: 1) obtaining SHPO's concurrence on the APEs (see below); 2) submitting archaeological site and isolate records and location maps to the United States Department of Agriculture, Forest Service (Forest Service) and the United States Department of Interior, Bureau of Land Management (BLM) and; 3) submitting the archaeological site and isolate records and location maps to the North Central Information Center for review and assignment of agency and state cultural resource numbers.

In addition, consultation has included more than 33 meetings between Licensees, tribes, and agencies. These meetings focused on: development of study proposals; Section 106 training for the tribes; collaboration meetings on the projects' APE; the Historic Properties Management Plans (HPMP), and NRHP Evaluation Plans; field visits to archaeological sites; and quarterly Section 106 meetings to discuss any other topics participants wished to address. These meetings were attended by designated representatives from eight tribes, an additional five individual tribal members, and representatives from the Forest Service, BLM, FERC, and the National Park Service. (NID 2010c, d and PG&E 2010c, d.)

As part of this consultation, information was solicited from the tribes and agencies during the meetings to identify locations outside the APEs where Project operation and maintenance (O&M) may affect cultural resources or other tribal interests and, thus, warrant additional survey and potential expansion of the APEs. Areas identified were examined simultaneously with study plan fieldwork.

6.8.1.2 Area of Potential Effects

Pursuant to Section 106, the Commission must take into account whether any historic property could be affected by a proposed new license within a project's APE. The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." *See* 36 CFR

800.16(d). In this case, the APEs for the Yuba-Bear Hydroelectric and Drum-Spaulding projects include all lands within the respective FERC Project boundaries. In addition, for both projects, the APE also includes areas outside the FERC Project boundary where PG&E's and NID's activities (e.g., O&M, recreational developments, or other enhancements) have the potential to affect historic properties. These additional areas incorporate a 100-foot radius surrounding communication towers (e.g., Signal Peak tower for the Drum-Spaulding Project and Quartz Hill tower for the Yuba-Bear Hydroelectric Project) and 200 feet above the high waterline around Project lakes and reservoirs, or the FERC boundary, whichever is greater.

For the Yuba-Bear Hydroelectric Project, SHPO concurred with the defined APE in a letter dated July 22, 2009, and with a minor expansion to the APE to accommodate two new Project access roads in a letter dated January 21, 2010. NID will consult with the SHPO to obtain concurrence on the new acres of land to be added to the FERC Project Boundary and expects to receive SHPO concurrence by October 2011.

For the Drum-Spaulding Project, SHPO concurred with the defined APE in a letter dated July 22, 2009, with the exception of a 200-foot buffer above the high waterline. PG&E will consult with the SHPO to obtain concurrence on the 200-foot buffer around Project reservoirs and the 23.41 acres of land that were newly added to the FERC Project Boundary in late 2010. In addition, consistent with the status of the various studies discussed above, PG&E also intends to submit to SHPO: a revised APE (approximately end of April 2011); a Built Environmental Report (in which PG&E will formally evaluate all historic hydroelectric features of the Project) (approximately end of April 2011); an archaeological inventory and evaluation (mid-May 2011); and a revised HPMP (including an evaluation plan for all sites in the Project) (mid-May 2011). SHPO is independent and will ultimately control its timeline for conducting its review and determination on these items; however, PG&E is hopeful that SHPO concurrence will be received by October 2011.

6.8.1.3 Cultural History Overview

Most early archaeological work in the Northern Sierra Nevada, with the exception of the Lake Tahoe area, was conducted at the lower to middle elevations along the major rivers draining the western Sierran slope, including: the North Yuba, Middle Yuba, and South Yuba rivers; the Bear River; and the North and Middle Fork of the American River. Other rivers and numerous tributaries feed these rivers, depositing water into various bodies on both sides of the Sierran crest (Markley and Henton 1985).

Beginning more than 50 years ago, Robert Heizer and Albert Elsasser (1953) defined two sequential archaeological cultures, termed the Martis and Kings Beach complexes, from investigations in the Lake Tahoe area. Comparisons with dated assemblages in the Central Valley, Great Basin, and other nearby locations suggested that the Martis Complex, purportedly identified by a reliance on basalt toolstone, dates from between 2,000 B.C. to A.D. 500. The Kings Beach complex, defined by Heizer and Elsasser for the strong presence of flaked obsidian and chert tools (Moratto 2004:294-295), represents the ethnographic Washoe and their ancestors after circa (ca.) post A.D. 1,000 (Heizer and Elsasser 1953; Hull 2007; Moratto 1984, 2004).

Various other investigations were completed in the Lake Tahoe region (cf. Arnold 1957; Elsasser 1960; Payen and Boloyan 1961; Payen and Olsen 1969) that further explored and defined the Lake Tahoe cultural sequences. However, it was the work of W. A. Davis and R. Elston (Moratto 2004:295) that resulted in revisions to the archaeological sequences. Their work identified cultural components both predating the Martis Complex and indicating a transitional period between the Martis and Kings Beach sequences that demonstrated prehistoric human occupation of the region for a period extending about 7,000 years (Elston 1971).

Two pre-Martis periods have been identified. The earliest is the Tahoe Reach Phase followed by four phases of the Spooner period. The Tahoe Reach Phase and the Spooner period are associated with occupation during the Altithermal climatic period. The Tahoe Reach Phase is defined by buried archaeological deposits and the presence of Parman projectile points and nondiagnostic artifacts dating to 8,130 +/- 130 years before present. The Spooner I period (5,150 to 2,970 B.C.) is followed by the Spooner II period (1,100 B.C. to A.D. 60), the Spooner III period (A.D. 60 to A.D. 1385), and the Spooner IV period (A.D. 1385 to the historic era). The Spooner II period is marked by milling equipment and Elko, Rose Spring, and Martis projectile point styles, which continue through the Spooner III period with the addition of cobble manos, drills, and Eastgate, Cottonwood, and Desert Side-notched projectile points. The Spooner IV period is represented in materials associated with a winter village associated with the protohistoric Washoe (Moratto 2004:297).

Evidence from previous investigations (cf. Crew 1970; Ritter [ed.] 1970; etc.) suggests that occupation of the northern Sierra Nevada foothills and upper slopes included sporadic seasonal visits by Pre-Archaic people whose major settlements were focused on the lush lakeshore and streamside environments found farther east of Lake Tahoe, around the pluvial lakes of the Great Basin, or farther west in the Sacramento and San Joaquin valleys. Middle Holocene occupation in the Project Vicinity is represented by the Tahoe Reach and Spooner phases. Components dating between 5000 and 3000 B.C. are relatively rare, and little is known about prehistoric lifeways during this interval. However, flat slab millingstones, loaf-shaped manos, and large foliate and corner-notched projectiles are the elements that have been associated with these assemblages.

From A.D. 1250 to 1500, land use seems to have returned to a more densely settled residential pattern. Large sites were occupied throughout the year, supported by intensification of acorn and piñon nut processing. At lower elevations on the western slope, the Sweetwater and Shasta complexes are contemporaneous with Kings Beach occupation of the high Sierra and Lake Tahoe region and Augustine Pattern of the Sacramento/San Joaquin Delta region, but also feature a distinctive riverine adaptation with roots extending back to Middle Archaic times. The bow and arrow replaced the atlatl and dart as the preferred hunting tool, and a more complex social organization developed. Occupational specialization, secret societies, and elaborate burial practices including cremation of high-status individuals were common. Arrow points and small triangular and parallel-sided bifaces, bedrock mortars, stone hullers, and a variety of small expedient flake tools mark late-prehistoric assemblages. Trade networks and other mechanisms provided for the movement of local goods over long distances in exchange for exotic products. In the Project vicinity, cultural ties with north-central and northwestern California are evident.

Although contact with Europeans began with mid-sixteenth century coastal explorations by Spaniards, the effect of European presence did not become evident until arrival of Spanish missionaries in 1769. That year initiated a period—extending into the early nineteenth century—during which missionaries implemented a process to aggregate and colonize the Native inhabitants through the institutions of missions, presidios, and pueblos, greatly affecting the demography, social life, and culture of the area's indigenous peoples.

With Mexico's independence from Spain in 1821, the missions were gradually secularized as "ranchos" dependent on Native inhabitants for labor required for farming and ranching. The United States' war with Mexico in the middle of 1840s resulted in the cession of California in 1848. That same year, discovery of gold initiated Euro-American migration into the region on an enormous scale. There soon emerged a need for food, shelter and the infrastructure that accompanies thousands of people in a developing area. Immigrants from Europe, Asia, and elsewhere followed the miners to the gold fields to grow crops, raise cattle, harvest timber, and build towns. Roads were built over the Sierra Nevada, often following trails used by Native populations for millennia.

By 1850, the lower portions of drainages supported the largest populations in the state. Miners, agriculturalists, loggers and merchants all settled in the area. The Yuba, Bear, and American drainages intersect a number of historic period mining districts, in which an elaborate network of ditches and flumes were built, beginning in the mid-nineteenth century to provide power for miners. As the call for hydraulic power increased, so did the size of the ditches, at first providing water for placer mining and later to the expanding agriculture of the region. Grazing emerged as one of the biggest industries in the area and surrounding vicinity, even as the gold rush began to decline. The many unsettled areas of the Sierra Nevada and foothills drew cattlemen, soon followed by sheepherders, including a significant number of Basques. In the 1890s logging, which had begun in the area in the mid-nineteenth century, became a major extractive activity in the county by the American River Land and Lumber Company and successor companies until the Great Depression.

Of the many cultural groupings occupying various ecological niches in the Sierra Nevada and foothills, those most usually associated with the area of the projects are the Maidu, Nisenan (Southern Maidu), and Washoe. Travelers and explorers in the early nineteenth century would have encountered these people living within their traditional territories. The Nisenan occupied the Sierra foothills below about 3,000 ft in the vicinity of the American, Bear, Consumnes, and Feather rivers. The Washoe lived in the vicinity of the Lake Tahoe, east of the Sierran crest, but traveled extensively to the west. However, traditional ways of life were deeply disrupted by the disease, wars with military expeditions, enslavement, and relocation that attended Euro-American occupation of the region in the nineteenth century. Nisenan, Maidu, and Washoe communities were displaced from their lands by miners, ranchers and others seeking to extract resources from the region.

By the late nineteenth century, the "Rancheria" emerged as a Euro-American solution to problems of displaced Native peoples in California. The rancherias were lands purchased by Congressional authorization for displaced and homeless Native Americans of various tribal groups. Although the U.S. government terminated 30 rancherias under the California Rancheria Act of 1958, court decisions forced the government to recognize the "tribes, bands, communities and groups" of 17 rancherias and restore those rancherias to their previous status. Among these were the Shingle Springs and Auburn Rancherias, whose residents include Nisenan, and other Maidu.

During the first decade of the twentieth century, the Forest Reserves were placed under the management of the federal Department of Agriculture. By 1906, the TNF had been created, under the direct supervision of Madison B. Elliot. During the early years, Elliott recruited rangers, mapped the new forest territories, and implemented land management plans and other forest programs. The concept of multiple use management was introduced under his stewardship. Power development, balanced handling of timber sales, and mineral exploration were the key developments from 1906 to the 1940s and through to today (Jackson et al. 1982).

6.8.1.3.1 History of the Yuba-Bear Hydroelectric Project

Development of the Yuba-Bear Hydroelectric Project stems back to the early 1900s when community leaders sought to acquire new water rights and acquisitioned abandoned mining features (i.e., reservoirs, canals, etc.) from the California Gold Rush to form a public water system (NID 2007). A group of southeastern Nevada County farmers and orchardists, who formed the Irrigation Club in 1915, filed a water rights application on the Upper Canyon Creek, beyond Bowman Lake (Jackson et al. 1982). On August 5, 1921, voters elected to form a new water district, which was approved by the Nevada County Supervisors. NID was officially established on August 15, 1921, and began supplying local farms with irrigation water shortly thereafter. In 1962, voters supported a $65 million bond issue to construct the Yuba-Bear Hydroelectric Project, which was built between 1963 and 1966. This resulted in new power generation capabilities and new reservoirs and canal systems, and also created an additional 145,000 acre-feet of water storage for district residents.

The abandoned mining features used to form the water system initially belonged to numerous mining ditch companies that, beginning in the 1850s, were involved in the evolution of the core water delivery system. However, today's Yuba-Bear Hydroelectric Project system as a whole reflects a design conceived, surveyed, and engineered by NID in the 1910s, constructed in the 1920s, and then completely redesigned in the 1960s (PAR 2009). Throughout the past 150 years, dams and other water control and conveyance features have been significantly updated as economic and technological considerations have allowed. The Yuba system of the Yuba-Bear Hydroelectric Project uses diversions along tributary creeks and regulatory reservoirs combined with conveyance features, such as tunnels, flumes, and ditches. Perhaps its most noted feature is the Bowman House, built by NID as part of California's State Emergency Relief Administration during the Great Depression of the 1930s.

A history of NID's Yuba-Bear Hydroelectric System is provided in PAR Environmental's evaluation report for this historic system (PAR 2009), and is summarized below.

Water Resources

Mining ditch companies began forming by the early 1850s to transport water by ditch from higher elevations to mining districts. The high mountain lakes, drainages and canyons of the Yuba-Bear Hydroelectric Project area created numerous water resources that could be dammed and diverted into ditches leading west.

The Blue Tent Ditch Company and North Bloomfield Ditch Company were two of the largest in the region and were largely used for hydraulic mining (Rohe 1985:18-29). Others in the immediate Yuba-Bear Hydroelectric Project area included the Milton Company Ditch and the Sierra Nevada Lake Company-Truckee (or English) Ditch, both of which derived their water from English Reservoir. This reservoir was created by the English (or Rudyard) Dam built in 1858. This 400-foot-long dry-laid stone and timber facing structure, located at the headwaters of the Middle Yuba River, was the largest dam in the state as late as 1868. This dam broke in 1883, sending a surge of 650 million cubic feet of water and debris down the Middle Yuba River and curtailing hydraulic mining at Milton Company's French Corral operations until the reservoir could be restored (Baumgart 2006).

French Lake Dam was constructed in 1859 on the headwaters of Canyon Creek. The Eureka Lake Ditch Company took water from its reservoir at Lake Faucherie beginning in 1858. This company built the Eureka Lake Ditch and two high flumes -- the National Flume and the Magenta Flume -- both used for hydraulic mining. By 1875, the Eureka Lake Ditch Company had absorbed numerous smaller companies and had 300 miles of main canal and lateral ditches running 65 miles from Faucherie to North San Juan. The North Bloomfield Ditch Company took its water from a timber dam reservoir constructed in 1868-1870 at Bowman Ranch (old Bowman Station). After this dam burned, it was rebuilt in 1872 as a dressed granite dam (Jackson et al. 1982:34, 79, 81; Pagenhart 1969:113).

Around 1917, investors in Nevada County organized the Nevada Irrigation District (NID) to create a reliable water source for their district using the water rights from the Yuba-Bear Hydroelectric Project area. They took advantage of the topography of the Project area that had been noticed as early as 1867 when one historian noted, "In the district there are about twenty artificial or natural lakes, and the number could be increased almost indefinitely at a trifling expense. All that is required to form a reservoir is the cost and labor of erecting a stone dam across some valley or ravine." (Tilford 1867:n.p.).

Origins of NID: An Overview

NID was formed by forward-thinking local farmers who recognized that the mining water system created during the 1800s could provide them with an ample supply of year-round irrigation water. The first founders met in 1917 and decided that if they did not secure the water rights to those mountain sources, someone else would and they would be paying them for their supplies. The San Juan Ridge area was dependant on water from the Bowman System on Canyon Creek for continuing irrigation service. At that time, farmers in the area were buying some water from the South Yuba Canal system owned by PG&E and knew the company was a growing concern (California, State of 1921).

The farmers organized the Nevada County Farm Bureau Irrigation Committee to investigate the possibilities and conducted a survey of the watersheds of the South and Middle Yuba Rivers, along with a variety of tributaries in 1918. Soon thereafter, the committee filed a claim for water rights with the State of California. After gathering the signatures of 797 persons in favor of forming the irrigation district, they presented their petitions to the Nevada County Board of Supervisors on March 15, 1921. When an election to form the district came before the voters, they approved it 638 to 168 and, on August 15, 1921, the NID was officially formed (The Union 1981: 2A, 23).

The original board of directors included Willis Green, William G. Ullrich, M. B. Church, Guy Robinson, and Theodore Schwartz. Their first meeting was held in the Farm Adviser's office in the Bret Harte Hotel in historic Grass Valley. These men were able to raise $7.25 million through a bond to purchase the needed storage and transmission facilities for their system. They negotiated for years with owners of old mining and water companies to secure the water and other rights they needed to ensure a future water supply and future development of the region. They also developed an agreement, formalized in 1924, to sell water from their new system for power generation to PG&E (The Union 1981: 2B, 23).

Designing the NID System – 1920s

In 1922, Fred Tibbetts became the chief engineer of the system and remained associated as a consultant for the NID for the rest of his career. Tibbetts looked closely at the system and gave them a clear assessment of the potential. Tibbetts found that most of the 1800s mining water system had fallen into disrepair after the discontinuance of hydraulic mining some decades before (Tibbetts 1922:73).

In 1927, NID bought parts of the South Yuba Canal system, as well as those of the Northern Water and Power Company, North Bloomfield Water and Power Company, the Empire Mine Company, the Excelsior Water and Power Company, the New Blue Point Mine's Tarr Ditch and water rights to the Jackson Meadows, Bowman and Canyon Creek areas. In fact, their most important purchase was of Bowman Lake, which became the storage core of their system. As negotiations continued, major construction began at Bowman Lake as NID's contractor, the Bechtel Corporation, tore down the 1876 stone Bowman Lake Dam and began creating a modern replacement. At the same time, NID hired the Jasper Stacy Company, which built the Bowman-Spaulding conduit. Both features were completed in 1926 (NID 1926; The Union 1981: 2A-2B).

The main water supplies for NID's system were from the headwaters of the Middle and South Yuba Rivers. NID's system, as conceived in the 1920s by Fred Tibbetts, started with Milton Diversion Dam, which diverts high mountain water through a 4.1-mile-long tunnel to Bowman Lake. Bowman is located on Canyon Creek, which is a tributary to the South Yuba River. Canyon Creek also includes other smaller reservoirs, including French Lake. The discharge from Bowman Lake is conveyed by the ten-mile-long Bowman-Spaulding Conduit to Jordan

Creek, about 1.5 miles above Lake Spaulding, and is then passed to PG&E's Spaulding powerhouses. NID's main source of revenue came from supplying PG&E with water from the conduit between July 1 and March 31 each season, allowing them to operate their powerhouses after the summer snow packs of their own drainages had begun to dry up (The Union 1981:23).

With the completion of Bowman Dam and the Bowman-Spaulding conduit, water sales could begin. The NID service area in 1927 encompassed 202,000 acres. Seeing the potential for their benefit, Placer County landowners asked to join, adding another 66,500 acres to the district (The Union 1981: 2A).

Depression-Era Operations

During the Depression in the 1930s, NID received state assistance for some of its construction projects. NID's General Manager, William Durbrow, recognized that their state of finances did not allow them to do any work not considered absolutely necessary. The district was in the process of refinancing in 1931, but that would not fill all of their costs. They were receiving some funds from leasing Faucherie Lake to the Grass Valley Sporting Club, a fishing and hunting club in Grass Valley, and club members also agreed to do some of the dam maintenance at the site (California, State of 1932).

The most historically notable project was the construction of a dam tender's house at Bowman Lake. The original Bowman House, which possibly predated the 1920s construction period, was destroyed in a fire. It was essential that NID construct a new house, not only for the use of the dam tender, but also for employees who needed shelter while conducting work in the mountain division of the system. Additionally, the Bowman House had become a popular summer retreat for employees, their guests and, more importantly, VIP guests (Morrow 2008).

This major project needed to be completed at a time when the district was trying to cut its expenses, conducting only essential repairs. Subsequently, NID decided to apply to California's State Emergency Relief Administration (SERA) for funding. If SERA determined the project was worthwhile, money was given to the applicant for them to spend on their own contractors (Starr 1997). Plans for the new Bowman House were drawn up by NID engineer, A. H. Kramm, under the guidance of Charles T. Law, NID's assistant engineer, and submitted to SERA with an application for funding. The application was approved and the Bowman House was rebuilt in the 1930s.

The Bowman House has become a key element of the Yuba-Bear system. Today it remains the residence of the dam tender, who rents it as a regular tenant. A log at the house lists many of the guests, both local and international, who have enjoyed a stay in this beautiful mountain lake retreat (Morrow 2008).

Ongoing Maintenance

After the initial construction of the NID's system in the 1920s, the district continued to maintain their facilities in conjunction with the State of California's Division of Water Resources. The state inspectors visited the dams each year for public safety purposes and then required repair work. That work varied from the installation of measuring weirs to measure leakage to actual dam reconstruction. The earliest dams required the most work. In 1932, for instance, French Lake Dam (an early 1850s rock dam) was showing its age. Its outlet works were completely rebuilt that year and, in 1937 its timber elements were replaced with masonry. In 1948 the dam itself was reconstructed. While the core remained, the downstream side was replaced with new rock fill and the upstream side was replaced with rock and gunite (NID 1949). In 1953, a bunkhouse and office were added at the Bowman House site.

Development of the Yuba-Bear System

By the 1960s, NID water use had increased 50 percent in Nevada County and 100 percent in Placer County. The value of hydroelectric use had also grown. NID's engineers began drawing up plans to enlarge their existing facilities and develop more water and power resources. They again went before the voters for approval of a bond to construct the new system. Again the voters approved, this time with a 97 percent "yes" vote (The Union 1981:23).

In the early 1960s, NID began construction of its $65 million Yuba-Bear Project in cooperation with PG&E. Their contract provided security for the project's financial backing as well. PG&E agreed to pay NID $3,029,000 annually for 45 years for the added power and energy. With this completed, the Federal Energy Regulatory Commission issued a license to NID for the Yuba Bear Development. This four-year project doubled the water storage capacity of the district to 280,280-acre feet at no cost to the district water users. The first phase included two new hydroelectric power plants and construction of the 66,000 acre Rollins Reservoir (PG&E 1963; The Union 1981: 23).

NID hired Ebasco Services Incorporated of New York to design the system and manage the construction effort. The new development included work up and down the entire length of the old 1920s system. At Jackson Meadows, a new dam was constructed, which remains in place today. Another new dam was built at Faucherie Lake, replacing the earlier 1850s era dam. The other dams in the high mountains were also renovated. A major alteration was the replacement of the Milton-Bowman Conduit. The old wood stave conduit constructed in 1928 was replaced with steel-reinforced concrete pipe. The original Milton-Bowman Tunnel was also significantly altered. It was enlarged and repaired in numerous locations and old transitional connections replaced with modern elements. The Fall Creek and Texas Creek diversions were also rebuilt, with older elements abandoned in place. The only original elements were the concrete gates date-stamped "NEVADA IRRIGATION DISTRICT 1926" (PG&E 1963; The Union 1981:23).

The company built a new powerhouse at Dutch Flat; the Dutch Flat No. 2 (since PG&E already had a Dutch Flat No. 1). Part of this work included building the Dutch Flat Afterbay Dam to store water exiting the No. 2 Powerhouse before it enters the Bear River. Its release could then be controlled to another new plant, the Chicago Park Power Plant below it. Another new dam, the Rollins Dam, was constructed on the Bear River, which created a 66,000-acre reservoir. Work was also done on NID's Scotts Flat Dam, which is strictly used for irrigation, not power (PG&E 1963; The Union 1981:23).

The 1980s: Rollins and Bowman Powerhouse

In the 1980s, the Yuba Bear system entered a second phase with the construction of the $8.5 million power plant at Rollins Lake, with other work planned at Chicago Park (The Union 1981: 2A). A powerhouse was also added at Bowman Reservoir, along with a new transmission line.

With these changes in place, the Yuba-Bear Project was complete. Over the last 20 years, work has entailed routine maintenance. Some features of the system, such as a modern employee bunk house near Bowman Lake, have been removed. Today, NID continues to be a vital and essential utility for the people of Nevada County, supplying water to an ever-increasing population of primarily residential customers.

6.8.1.3.2 History of the Drum-Spaulding Project

The Drum-Spaulding Project was the first major hydroelectric Project for PG&E. The Project utilized the water resources of the old South Yuba Water Company. Engineers Frank G. Baum and James H. Wise laid the plans for the system in 1905 after surveying the new acquisition. Seven years later crews of men, machines and horses went to work. Their vision became a reality within a decade and continues today as a major component of PG&E's hydroelectric power system (Coleman 1952:257).

By 1910, the South Yuba system consisted of 22 storage reservoirs, 458 miles of canals, and five small power plants (Alta, Deer Creek, Rome [on the South Yuba River in Nevada City], Auburn, and Newcastle). There were two different sources for this water. One was the Towle system that diverted water from the North Fork of the North Fork American River and ran it through 20 miles of conduits to its junction with the Boardman Ditch at the head of the Alta pipeline. It also included Lake Valley Reservoir. The other source took water from the South Yuba River at Lake Spaulding (Downing 1917:2-10).

The Boardman Canal and the Towle Ditch could not be sustained through snow melt, thus both drew on storage during the summer months, indicating that any increase in the amount of water supply must be made by developing additional storage above these canals or by adding diversions from other streams. Fordyce Lake, already a natural water storage basin located above these water conveyances, was the obvious and easiest choice to increase in size, with the construction of a new dam at Spaulding to follow soon after (White & Co. 1910:2-43).

From 1909 to 1913, PG&E made major improvements to Fordyce Dam, a dam started in the 1870s for mining water storage. Fordyce Lake was the largest storage reservoir on the system and its improvement was critical to the future development of the Drum-Spaulding Project (PG&E 1924:1; Van Norden 1923:213).

On July 24, 1912, PG&E started construction of a major power and irrigation development that formed the heart of the Drum-Spaulding Project hydroelectric system. Plans consisted of building a complete power installation with seven powerhouses, including dams, canals and penstocks with associated equipment and transmission lines, using water from the Yuba and Bear

River watersheds. Power from the proposed seven powerhouses would be conveyed to Oakland, Berkeley, Alameda, San Rafael, Santa Rosa, Vallejo, Petaluma, Suisun, Cement, Woodland, Sacramento, Davis, Dixon, Cordelia, and Sausalito and, by underwater cable via Lime Point, into San Francisco (Wise 1912:79).

Work to improve the dams and canals continued. Spaulding Dam was raised to its current height in 1916, a major effort that required a large construction camp, roads, narrow gauge construction railroads and major concrete works, including bunkers for storing sand and gravel and batch plants for mixing concrete. Some materials were quarried on site, while others were brought in by train from elsewhere.

Lake Spaulding received water from three watersheds to the north: the Texas, Fall, and Jordan creek watersheds. These creeks were impounded by miners between 1850 and 1870 to create 11 reservoirs: Upper and Lower Rock lakes, Culbertson Lake, Upper, Middle and Lower Lindsey lakes, Upper and Lower Feeley lakes, Blue Lake, Rucker Lake, and Fuller Lake. Their storage was diverted into three canals (Texas Creek, Fall Creek, and Fuller Lake) that led to Spaulding. The lakes had been acquired by the South Yuba Water and Mining Company and consolidated into one system to form the storage reservoirs for that company's Main South Yuba Canal. The system dams and conduits were in very poor shape in 1919 when numerous system improvements were begun (Steele 1919). More work on the dams occurred in the 1920s as state regulators required all dams in the state to be evaluated and upgraded. All of these high mountain storage dams were reworked between 1922 and 1925, with crews living in camps nearby. The canals were also expanded in the 1930s to bring increased flow to the powerhouses downstream (Hunt 1922:1-2, 4).

In 1922, PG&E's engineering department surveyed the South Yuba-Bear River system to seek opportunities for increasing output. Their study included Lake Van Norden, Kidd Lake, Upper and Lower Peak (Cascade) lakes, and two abandoned reservoirs, Hole-in-the-Ground and Chubb Lake (Hunt 1922). Their first target, though, was at Fordyce.

One way to increase power generation was to increase water storage, and Fordyce Dam was chosen as the place to do this. In 1923, they set about raising the dam 47 feet, creating a 47,000-acre-foot reservoir. Improvements were also made to the water transmission facilities between Lake Fordyce and Auburn, including the Drum and Bear River canals. Plans were also started that year to improve Drum Powerhouse with the addition of a second penstock. Another storage reservoir was also added half a mile below the Drum plant to regulate water during its peak operations, when more water flowed through the system than was required or desired downstream (*Pacific Service Magazine* 1923).

In order to bring the heavy loads of "modern" equipment (such as caterpillars and trucks) into the dam site, the company built a curving road with a maximum grade of 12 percent. This allowed for much easier access from the highway and the Southern Pacific Railroad (SPRR) at Cisco to the construction area than in previous efforts. The first task was clearing the roadway of timber, then building a heavy timber bridge over the South Yuba River. As the road reached the midpoint, heavy excavation of hard granite was necessary on the north side of Fordyce, accomplished using air compressor rigs and drills. The road was completed in three months, giving the crews time to bring in supplies and establish a camp before winter set in (Myrtle 1924:367-368).

The camp at Fordyce was soon occupied by several hundred men, a warehouse, machine shop, blacksmith shop and other construction buildings, including a cement storehouse where as many as 15,000 sacks of cement were stored at any given time, a mixing plant and a rock crushing plant. The equipment that was moved in included a 70-ton steam shovel, two 30-ton cranes, two 25-ton dinky locomotives and 12 rail-cars weighing 15 tons each. Some items were so large they had to be dismantled to be trucked in (Myrtle 1924:368).

PG&E also built offices and buildings on the main highway about one-half mile from the lake. This camp included a mess hall, cooking house, recreation hall, eight bunk houses and a number of tents and platforms. A large house was also built to accommodate four large compressors. Power to the entire operation came from a substation one-quarter mile away, connected by a transmission line tapping the 60,000-volt line from Spaulding to Summit (*Pacific Service Magazine* 1927:21).

Beginning in 1909, camps were constructed at various places along the Drum-Spaulding Project canals, nearly extending the distance from Auburn to Lake Spaulding, with the largest camp located at the Drum Forebay and the Spaulding Dam locations (Wise 1912:82). Additional camps were occupied by canal, lake, and dam tenders, like Evan Magnuson, a Norwegian immigrant who had watched over Spaulding beginning in 1894 (Myrtle 1912:91-92). When projects were completed, some camps were converted to permanent use, such as Camp Spaulding. Ditch tender camps and other facilities, like warming huts, have largely been phased out as transportation and remote operational equipment have improved.

The NID Agreement

In 1924, PG&E and NID executed a cooperative agreement in which NID would deliver water to PG&E from its reservoirs in exchange for funding to construct improved storage and a conduit to interlink their system with PG&E's. Construction was underway by 1927. NID's two most important improvements were the enlargement of Bowman Reservoir and its dams, and a plan for constructing the Bowman-Spaulding Conduit. This conduit included a four-mile-long tunnel from the newly reconstructed Milton and Jackson reservoirs to Bowman Reservoir, and from there through another three miles of tunnel and nine miles of canal to the upper end of Lake Spaulding. Where the water entered the lake, a new powerhouse was planned (*Pacific Service Magazine* 1927:342-347).

Another element was the construction of a conduit from Lake Valley Reservoir to the Drum Canal. Before this, water from Lake Valley was diverted downstream of the reservoir and carried into the old Towle Canal to join the Boardman Canal at the head of the Alta Powerhouse penstock (Downing 1924; Myrtle 1928:176).

Dam Rehabilitation Project of 1931

In 1928, St. Francis Dam in southern California failed, resulting in the deaths of more than 600 people. For the previous 20 years, California had experienced a surge of dam building, largely due to the development of hydroelectric energy and the growing domestic and irrigation demands of the state's population. After the failure of the dam, the State of California became concerned about the lack of real supervision over the safety of dams. Owners of existing dams, including PG&E, were required to file applications with the state for approval of all structures no later than February 1930 (Markwart 1931:68-71).

PG&E examined all their high mountain lakes in the Drum-Spaulding Project and made a series of improvements to the old dams, some of which dated to the 1850s. In total, 17 system dams were raised between six inches and four feet and their spillways, gates and outlet trunks repaired, improved or replaced.

Canal and Ditch Improvements in the 1930s

In 1931, PG&E replaced large flumes on the South Canal near Newcastle with concrete flumes, one of which (Appleton Flume) spanned Auburn-Folsom Road and became a local landmark. By 1936, there was extensive leakage on the Drum, Main South Yuba and Chalk Bluff canals. Additionally, the 1,950 flume boxes on the Drum Canal were rapidly deteriorating and were being replaced at a rate of nearly 200 boxes per year (PG&E 1936). This type of work has continued to the present, especially repairs and efforts to prevent leakage and speed the flow of water.

Dutch Flat Powerhouse Construction, 1941-1943

The Dutch Flat Powerhouse was constructed between 1941 and 1943. The main facility includes the powerhouse and switchyard, as well as a penstock, tunnel, tunnel intake and a forebay (also known as the Drum Afterbay). Dutch Flat Powerhouse has one generating unit with a 22-megawatt capacity (Camp Dresser & McKee 1997:3-1).

Work in the 1950s

Most work during this period included maintenance and replacement of aging systems. For instance, the tramway between Spaulding No. 1 and No. 2 was replaced in 1952. The old structure had deteriorated to a point beyond repair. During the heavy snows of winter, 150 feet of the tramway was destroyed. PG&E replaced it and added a signal system as well (PG&E 1952). Another strong storm in December 1955 caused major flooding throughout the system. As a result, the Bear River Canal Head Dam was significantly damaged and had to be repaired. In January 1956, more flood damage occurred at Dutch Flat Powerhouse, eroding away the bank below the operators' camp and washing away the bridge to the powerhouse itself (PG&E 1956).
In 1961, PG&E automated Spaulding 1 and 2 powerhouses. As a result, the company no longer needed most of its ditch and operator's housing and many of the camps were dismantled (PG&E 1961).

PG&E's Connection with NID's Yuba Bear System

By the 1960s, NID's water use had increased 50 percent in Nevada County and 100 percent in Placer County. The value of hydroelectric use had also grown. NID's engineers began drawing up plans to enlarge their existing facilities and develop more water and power resources. They went before the voters for approval of a bond to construct the new system. The voters approved, with a 97 percent "yes" vote (The Union 1981:23).

In the early 1960s, NID began construction of its $65 million Yuba-Bear Hydroelectric Project in cooperation with PG&E. Their contract provided security for the Project's financial backing as well. PG&E agreed to pay NID $3,029,000 annually for 45 years for the added power and energy. With this completed, the Federal Energy Regulatory Commission (FERC) issued a license to NID for the Yuba-Bear Development. This project doubled the water storage capacity of NID to 250,280-acre feet at no cost to the district water users. The first phase included two new hydroelectric power plants and construction of the 66,000-acre Rollins Reservoir (PG&E 1963; The Union 1981:23).

Drum No. 2 Construction, 1962-1965

NID's new Yuba-Bear Hydroelectric Project meant PG&E would be able to acquire more water to run through powerhouses of the Drum-Spaulding system. In 1962, PG&E approved construction of a second powerhouse at Drum (known as Drum No. 2) to utilize that increased generation capacity. This $9 million job included building a new tramway along the penstock, the powerhouse, a new penstock, enlarging Drum Canal and Drum Forebay and installing the additional equipment necessary to tie its energy into Drum No. 1.

Other work in the 1960s included the reconstruction of the Drum Afterbay Dam. In 1967, PG&E decided to replace the then 42-year-old afterbay dam on the Bear River. The existing structure had deteriorated to the point where the structure no longer met safety standards. A new concrete arch dam, about 100 feet high, was constructed roughly 60 feet downstream of the old structure (PG&E 1967).

1980s to 1990s

In 1986, the Drum-Spaulding system was completed in its present form with the construction of the Newcastle Powerhouse on Folsom Lake. This modern powerhouse took water that previously spilled into the American River (which became Folsom Lake in 1952) and converted its energy to electricity.

Following the completion of Newcastle, PG&E's work on the system during the ensuing 24 years has primarily entailed upgrading equipment and repairing system features. Significant repairs have occasionally been undertaken in response to severe weather events. For example, a storm in February 1986 caused significant damage to canals throughout the Drum-Spaulding system (PG&E 1986).

In December 1996, a warm storm with heavy warm rainfall caused snow melt to flood northern California streams. At Blue Canyon, 30 inches of rain fell in a 36-hour period. The raised water levels caused a good deal of damage to system features and required extensive repair (PG&E 1997b).

Today the economy of the region surrounding the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project is increasingly reliant on recreation and tourism as timber and mineral resources are depleted and protected through government policy. During the 1920s, improved roads, railroad access, and increasing automobile traffic led to far greater summer visitation to the mountainous region around the projects. Camp Robert L. Cole at Lake Sterling within the Drum-Spaulding Project APE, for instance, was established in 1955 by the Boy Scouts of America as the Glacial Trails Camp, also known as the Butte Area Camp. Today the camp is known as Camp Robert L. Cole. It consists of tent pads and a series of small modern buildings constructed in the late 1950s to 1970s (Goddard 2010).

Campgrounds were established by private and religious organizations around many of the projects' reservoirs. The Girl Scouts of Northern California established Deer Lake Campground in the 1970s, which also included sites at Kidd Lake. Today this camp is used largely by scouts from the San Francisco Bay area (Pook 2010). PG&E, NID and the U. S. Forest Service also established campgrounds beginning in the 1960s.

6.8.1.4 Prehistoric and Historic Archeological Resources

Archaeological surveys in and around the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project began in the 1940s, with increasing frequency after passage of the NHPA in the mid-1960s. Many of the surveys have been conducted by the Forest Service or its consultants in association with various logging and other projects, particularly from the 1970s to 1990s.

Licensees conducted archaeological surveys between 2008 and 2010. The surveys of the APEs combined verification of data from the earlier surveys and systematic field investigations of locations previously but inadequately surveyed, or those not previously surveyed. These surveys did not include the land above the project tunnels because there are not Project operations on the surface at these locations. The results of these surveys by Project are described below.

6.8.1.4.1 Yuba-Bear Hydroelectric Project

NID identified a total of 105 archaeological resources, 88 sites and 17 isolated artifacts, in the Yuba-Bear Hydroelectric Project APE. Six of the 88 sites contain both Native American and historic-era components, nine sites were exclusive to Native American use, and 72 sites contained historic-era deposits and/or features. Eighteen of the sites were on National Forest System (NFS) land, in whole or in part, and four were on public land administered by BLM (NID 2010d).

As part of its study, NID identified and assessed potential Project effects on all 88 archaeological sites encountered within the APE, and developed a NRHP Evaluation Plan, in collaboration with tribes, Forest Service, and BLM, that identified: 1) NRHP eligibility for sites that can be evaluated based on collected field data (56 sites, one of which has been evaluated in the NRHP evaluation report for the Project hydroelectric system [Baker 2010]); 2) sites requiring additional investigations to determine NRHP eligibility (15 sites); 3) sites that have been previously evaluated (one site); 4) one site that was not relocated during the relicensing study, and 5) sites experiencing no Project effects (15 sites) and which will be managed as if eligible to the NRHP through avoidance by Project O&M (Table 6.8.1-1). Isolated artifacts do not in and of themselves provide enough data relevant to understanding past events and are not, therefore, considered for listing on the NRHP.

Table 6.8.1-1. Yuba-Bear Hydroelectric Project NRHP site evaluation summary.

Site Type	Sites Evaluated at Inventory Stage (No.)	Sites to be Evaluated: Further Research/ Investigations Required (No.)	Sites Previously Evaluated: No Evaluation Required (No.)	Sites With No Project Effects: No Evaluation Required[1] (No.)	Site Not Relocated, Does Not Need to be Addressed with Regards to the NRHP (No.)
Prehistoric	0	5	0	4	0
Historic	55	7	1	10	1
Prehistoric/Historic	1	3	0	1	0
Total	**56**	**15**	**1**	**15**	**1**

[1] Unevaluated (and eligible) sites will be managed as if eligible for listing on the NRHP through avoidance and routine monitoring.

6.8.1.4.2 Drum-Spaulding Project

To date, PG&E has identified 223 archaeological sites within the Drum-Spaulding Project APE. Forty-four of these represent Native American use, 168 sites contain historic-era deposits and features, and 11 represent both prehistoric and historic-eras occupation. As part of its study, PG&E identified and assessed potential Project effects on all 223 archaeological sites encountered within the APE to date, and developed a NRHP Evaluation Plan, in collaboration with tribes and the Forest Service. The NRHP Evaluation Plan is included as Appendix E of the draft Historic Properties Management Plan discussed below in Section 6.8.2.2. In all, 47 sites were recorded entirely or partially on lands managed by TNF, two sites were documented entirely or partially on Bureau of Reclamation (BOR) lands, and one site was recorded on BLM land. The plan calls for 158 sites to be evaluated for eligibility to the NRHP; the remaining 65 sites would not be evaluated. Of the 158 sites to be evaluated, 127 can be evaluated based on data already collected during the fieldwork survey or have already been evaluated, while the other 31 will require further fieldwork (i.e., excavation) to enable determinations of eligibility. Of the 65 sites for which evaluation is not planned, PG&E will implement measures to avoid Project effects for seven, three are on private land not owned by PG&E and cannot be treated, and 55 are being completely avoided by Project O&M activities. All 65 and are assumed eligible for management purposes (Table 6.8.1-2).

Table 6.8.1-2. Drum-Spaulding Project NRHP site evaluation summary.

Site Type	Sites Evaluated at Inventory Stage (No.)	Sites to be Evaluated: Further Research/ Investigations Required (No.)	Sites With No Project Effects: No Evaluation Required[1] (No.)
Prehistoric	11	13	20
Historic	112	16	41
Prehistoric/ Historic	4	2	4
Total	**127**	**31**	**65**

[1] Unevaluated (and eligible) sites will be managed as if eligible for listing on the NRHP through avoidance and routine monitoring.

6.8.1.5 Traditional Cultural Properties

From 2006 to 2011, Licensees conducted a study to identify TCPs. The study included contact with the California Native American Heritage Commission (NAHC) for a list of tribes and individuals who might have an interest in the projects, outreach to both recognized and non-recognized tribes and tribal members, and contacting those individuals and organizations. Licensees also requested that the NAHC review its Sacred Lands File for any potential resources in the vicinity of the projects. Licensees have held more than 33 joint meetings with tribes and agencies, and Licensees' ethnographer has conducted interviews with approximately 30 individuals. To date, no cultural resources meeting the definition for TCPs or NRHP eligibility criteria have been identified within the Yuba-Bear Hydroelectric Project APE. However, the study did document the tribes' strong sense of association with the area and the continued importance to them of gathering plants for instrumental, medicinal, ceremonial, and food uses. Late 2010 to early 2011, one potential TCP was identified in the Drum-Spaulding Project APE and the Licensee's ethnographer is working with tribes to properly document this resource and evaluate its potential for inclusion on the NRHP.

6.8.1.6 Historic Buildings and Structures

6.8.1.6.1 Yuba-Bear Hydroelectric Project

In 2008, NID completed its study of the Yuba-Bear Hydroelectric Project's built environment, which included documentation and NRHP evaluation of the Project system (e.g., powerhouses, dams, switchyards, and conduits). Twenty-six primary Project features and numerous system sub-features were documented. The evaluation identified the system as ineligible for listing on the NRHP as a historic district because the features of the system, as a whole, do not convey a unified sense of time and place, nor do they convey architectural interconnectedness. Table 6.8.1-3 lists the 26 primary system features and provides their dates of construction with brief descriptions of their individual eligibility recommendations and justifications. Two buildings within the Project, the Bowman House and the French Lake ditch tender's house, were evaluated as individually eligible for listing on the NRHP (Baker 2010).

Table 6.8.1-3. Yuba-Bear Hydroelectric Project System Features/Facilities and NRHP Eligibility.

Facility Type	Project Facility (date of construction, modification dates)	NRHP Eligibility
BOWMAN DEVELOPMENT		
Dams	Jackson Meadows Dam (1965)	Modern, not eligible
	Milton Dams (1926, 1964, 1992)	Insufficient integrity, not eligible
	French Dam (1858, 1929, 1933, 1945, 1948)	Insufficient integrity, not eligible
	Sawmill Dam (1910, enlarged 1930, 1938)	Insufficient integrity, not eligible
	Faucherie Dam (1966)	Modern, not eligible
	Jackson Lake Dam (1926, 1942, 1945, 1948)	Insufficient integrity, not eligible
	Bowman Dams (1926, modified 1960s, 1980s)	Insufficient integrity, not eligible
	Bowman Road (1925)	Not eligible
Powerhouses	Bowman (1980s)	Modern, not eligible
Water Conveyance	Milton-Bowman Tunnel (1926, enlarged 1964)	Lacks sufficient integrity, not eligible
Tertiary Elements	Bowman House (1935)	Eligible under Criterion C, local level, 1935 (period of significance)
	Bowman Office and Garage (1998)	Modern, not eligible
	French Lake Control House (1858)	Eligible under Criterion A (Nevada Co. hydraulic mining history) and C (architecture), local level (Period of Significance)
Transmission Line	Bowman-Spaulding Transmission Line (1980s)	Modern, not eligible
DUTCH FLAT DEVELOPMENT		
Dams	Texas Creek Diversion Dam (1920s, 1960s)	Lacks significant integrity, not eligible
	Fall Creek Diversion Dam (1920s, 1960s)	Lacks significant integrity, not eligible
	Rucker Creek Diversion (1920s, 1960s)	Lacks significant integrity, not eligible
	Trap Creek Diversion (1920s, 1960s)	Lacks significant integrity, not eligible
	Dutch Flat Forebay Dam (1966)	Modern, not eligible
Powerhouses	Dutch Flat II (1966)	Modern, not eligible
Water Conveyances	Bowman-Spaulding Conduit (1926, largely rebuilt 1964); includes Fall Creek Diversion Flume and Clear Creek, Trap Creek and Rucker Creek non-gated diversions	Lacks significant integrity, not eligible
CHICAGO PARK DEVELOPMENT		
Dams	Dutch Flat Afterbay Dam (1966)	Modern, not eligible
Powerhouses	Chicago Park (1966)	Modern, not eligible
Water Conveyance	Chicago Park Conduit (1966)	Modern, not eligible
ROLLINS DEVELOPMENT		
Dams	Rollins Dam (1966)	Modern, not eligible
Powerhouses	Rollins (1980)	Modern, not eligible

NID further documented two architectural features at the Millsite Marguerite Construction Quartz Mine #43 site (P-29-937), four architectural features at a residential complex at Jackson Lake, and four architectural residential features and ancillary buildings at Rollins Reservoir. The NRHP evaluation of the Project system and its individual features was submitted to the SHPO on August 19, 2010 for a 30-day review and comment period. SHPO concurred with NID's findings in a letter dated November 16, 2010.

6.8.1.6.2 Drum-Spaulding Project

In 2010, PG&E completed its study of the Drum-Spaulding Project's built environment, which included documentation and NRHP evaluation of the Project system (e.g., powerhouses, dams, switchyards, and conduits). The architectural survey of the Drum-Spaulding Project APE was conducted at various times between September 2009 and February 2010. A total of 113 built environment resources were identified during these surveys. The vast majority, 85 in all, are associated with the generation of electricity and include dams, powerhouses, canals, switchyards, work and residential camps, tramways and other features related to the historic development and operation of the Project.

In addition to the hydroelectric-related resources, 28 buildings, structures, and features were identified that are over 50 years of age and represent a variety of non-hydroelectric historic activities. Thematically, these resources are related to recreation (cabins, organizational camps, clubs and lodges), transportation development (trails, roads, bridges), ranching (corrals, barns, sheds), non-Project water conveyance systems, settlement (part of the townsite of Dutch Flat), and other themes (a garage/shed and grave plot).

The Project system can logically be divided into hydroelectric historic districts that reflect different construction efforts and time periods for the purposes of NRHP evaluation. These historic districts include the Deer Creek Powerhouse Historic District, the Alta Powerhouse Historic District, the Dutch Flat Powerhouse Historic District, and the Drum-Spaulding Historic District. The grouping of elements within a district is based on the construction efforts that created them. For example, in 1908 the South Yuba and Chalk Bluff Canals were improved in order to provide power generation potential, which was realized through the construction and operation of the Deer Creek Powerhouse. These features functioned as a unit, standing alone from other hydroelectric development that occurred later in time. Thus, these three features comprise the Deer Creek Powerhouse Historic District. The Drum-Spaulding Hydroelectric Historic District is the only district of the four identified that appears eligible for inclusion in the NRHP.

In addition, some elements within the smaller historic districts appear individually eligible for inclusion in the NRHP. All other features of the Drum-Spaulding Project system either lack historic significance or integrity that might qualify them individually for listing in the NRHP. However, several of these are evaluated as contributing elements to the various historic districts that PG&E has evaluated as eligible for inclusion in the NRHP.

All of the 113 built environment resources, their construction dates, and NRHP evaluations are summarized below. The Project system features are organized by historic district and the non-hydroelectric built environment resources follow.

Alta Powerhouse Historic District

The Alta Powerhouse Historic District includes Towle Diversion, Towle Canal Diversion Dam, Towle Canal, Alta Forebay, and Alta Powerhouse, all portions of the Alta Development (Table 6.8.1-4). The Alta district was constructed in 1902 by the Central California Electric Company, a subsidiary of the South Yuba Water Company. The Alta Powerhouse Historic District is representative of pioneering hydroelectric development in the Sierra Nevada and California (Criterion A), and also represents the early design and construction methods for plant facilities at the turn of the nineteenth century (Criterion C). However, it has greatly diminished historic integrity, and therefore does not appear to qualify for inclusion in the NRHP.

Table 6.8.1-4. Alta Powerhouse Historic District Elements.

Feature	Date Constructed	Modified	Ineligible Individually and/or as Contributing Elements[1]	Individually Eligible (Criteria)	Eligible as a Contributing Element
Towle Intake and Canal	1866	1921, 1959	X	--	--
Towle Diversion Dam	1866	1921	X	--	--
Alta Forebay dam	1864	1902	X	--	--
Alta Penstock	1902	1955	X	--	--
Alta Powerhouse	1902	2007	--	X (A)[2]	--

[1] X = Yes, facility meets NRHP eligibility status indicated in column heading.
[2] (A) = Facility meets significance Criterion A of the NRHP.
-- = Not Applicable

In contrast, the Alta Powerhouse, one of the elements of the Alta Powerhouse Historic District, is the oldest powerhouse operated by PG&E in California. The Powerhouse was determined eligible by the California State Historic Preservation Officer in 2007 at a local level under Criteria A and C with a period of significance dating to its construction in 1902 (Baker and Millet 2007). In 2007 PG&E prepared a HABS/HAER report without large format photography, which was accepted and filed with the California Office of Historic Preservation (Baker 2007). HABS/HAER recordation of the powerhouse and header pipe served as mitigation for replacement of the underground header pipe leading into the powerhouse, capturing elements of the powerhouse that qualified it for listing under Criterion C. Subsequently, though no longer eligible under Criterion C, the powerhouse retains its eligibility status under Criterion A, for its representation of pioneering hydroelectric development in the Sierra Nevada of California. The other district components have compromised integrity or are new additions to the system and are not individually eligible.

Deer Creek Powerhouse Historic District

The Deer Creek Powerhouse Historic District is composed of the South Yuba Canal, Big Tunnel, Bear Valley Camp, Chalk Bluff Canal and the Deer Creek Powerhouse, all components of the Deer Creek Development (Table 6.8.1-5). This district is composed of features purchased by PG&E from the South Yuba Water Company in 1905 and others constructed by PG&E in the following years. The Deer Creek Powerhouse Historic District appears to meet Criterion A for its role in early PG&E company development. However, modifications to the two major features of the district (the South Yuba and Chalk Bluff canals) have compromised the integrity of the district. Therefore, this district does not qualify for inclusion in the NRHP.

Table 6.8.1-5. Deer Creek Powerhouse Historic District Elements.

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as Contributing Elements[1]	Individually Eligible (Criteria)	Eligible as a Contributing Element
South Yuba Canal	1858	1878, 1926-1999	Determined in 2004	--	--
Bear Valley Work Camp	1913	--	X	--	--

Table 6.8.1-5. (continued)

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as Contributing Elements[1]	Individually Eligible (Criteria)	Eligible as a Contributing Element
Chalk Bluff Canal	1858	1878, 1993	X	--	--
Big Tunnel	1893	1908	X	--	--
Deer Creek Forebay/Dam	1907	--	X	--	--
Deer Creek Penstock/intake	1908	--	X	--	--
Deer Creek Powerhouse	1908	--	--	X (A)[2]	--

[1] X = Yes, facility meets NRHP eligibility status indicated in column heading.
[2] (A) = Facility meets significance Criterion A of the NRHP.
-- = Not Applicable

Individually, the South Yuba Canal has been previously determined ineligible for inclusion in the NRHP (Baker et al. 2004) with SHPO concurrence. However, the Deer Creek Powerhouse, while not of outstanding architectural or engineering design, appears to meet Criterion A as an example of early PG&E hydroelectric development efforts. It is individually eligible at a state level with a period of significance of 1908, its date of construction.

Drum Spaulding Hydroelectric Historic District

The Drum-Spaulding Hydroelectric Historic District is composed of elements from six PG&E developments: Spaulding No. 1 and No. 2, Spaulding No. 3, Drum No. 1 and No. 2, Halsey, Wise, and Wise No. 2. Components of the district include 7 reservoirs, four major water conduits, 5 powerhouses with associated switchyards, and associated facilities and structures, including residential and maintenance-related facilities (Table 6.8.1-6).

Table 6.8.1-6. Drum-Spaulding Hydroelectric Historic District Elements.

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as a Contributing Element[1]	Individually Eligible (Criteria)[2]	Eligible as a Contributing Element
Fordyce Dam	1874, 1881	1913, 1924, 1936	Determined in 1999	--	X
Fordyce Dam Access Road	1860	1911	--	--	X
Fordyce Dam Tender's House	1955	--	X	--	
Lake Valley Dam/Lake Valley Auxiliary Dam	1889, 1911	1928	--	--	X
Kelly Lake Dam	1887	1928	--	--	X
Lake Valley Canal Diversion Dam	1928	--	--	--	X
Lake Valley (Crossover) Canal	1928	1937, 1941, 1979	--	--	X
Spaulding Dam 1	1912	1913, 1916, 1919, 1939, 1977	--	X (A, C)	X
Spaulding Dam 2	1916	1919, 1939, 1975	--	--	X
Spaulding Dam 3	1913	1916, 1919	--	--	X
Spaulding Powerhouse 1	1917	1928	--	X (C)	X
Spaulding Powerhouse 2	1920	1928, 1933	--	--	X
Spaulding 2 Penstock	1920	1928	--	--	X
Spaulding Powerhouse 3	1928	--	--	--	X

Table 6.8.1-6. (continued)

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as a Contributing Element[1]	Individually Eligible (Criteria)[2]	Eligible as a Contributing Element
Spaulding 3 Penstock	1928	--	--	--	X
Spaulding Incline Railway/Tram	1917	1920, 1924, 1955	--	X (C)	X
Spaulding Snowsheds/Stairs	1917	1920	--	X (C)	X
Spaulding Dam Access Road	1913	1920	--	--	X
Spaulding Dam Maintenance Camp	1913-1928	--	--	X (C)	X
Camp Spaulding (Residential)	1913-1928	1970s	--	X (A, C)	X
Spaulding Dam Tender's House	1915	1953	X	--	--
Drum Canal	1912	1917, 1928, 1965	X	--	--
Drum Forebay	1913	1965	X	--	--
Drum Penstock 1 and 2 / valve and wheel houses	1913	1922	--	X (C)	X
Drum Penstock 3	1965	--	X	--	--
Drum 1 Powerhouse	1913	--	--	X (A, C)	X
Drum 2 Powerhouse	1965	--	X	--	--
Drum Residential Camp	1913	1959	X	--	--
Drum Water Tower	1913	--	--	--	X
Drum Access Road	1925	1997	X	--	--
Halsey Forebay Dam 1/2	1916	1923, 1955	Determined in 1999	--	--
Bear River Canal	1852	1925, 1931	--	--	X
Bear River Diversion Dam	1909	1926, 1931	--	--	X
Halsey Penstock	1913-1916	--	--	--	X
Halsey Powerhouse Compound	1913-1916	--	--	X (A, C)	X
Halsey Afterbay Dam	1916	--	--	X (C)	X
Rock Creek Multi-Arch Dam	1916	1998	X	--	--
Rock Creek Intake	1916	1960s	X	--	--
Wise Forebay Dam	1916	--	--	--	X
Wise Penstocks	1916	1933, 1978, 1986	X	--	--
Upper Wise Canal	1913	1931	--	--	X
Lower Wise Canal	1913	1931	--	--	X
Wise Powerhouse 1 Compound	1917	--	--	X (A, C)	X
Wise Powerhouse 2	1986	--	X	--	--
South Canal	1917	1920, 1931	--	X (C)	X
Halbom Concrete Flume	1931	--	--	X (C)	X
Appleton Concrete Flume	1931	--	--	X (C)	X
Newcastle Powerhouse Intake/ Penstock	1986	--	X	--	--
Newcastle Powerhouse	1986	--	X	--	--
Switchyards	1913-1928	Many	X	--	--
Weirs, gauges, gauge houses, spill gates	1913-1928	Many	X	--	--

[1] X = Yes, facility meets NRHP eligibility status indicated in column heading.
[2] (A or C) = Facility meets significance Criterion A and/or Criterion C of the NRHP.
-- = Not Applicable

The district is an intact example of a high-head, impulse-wheel, high-voltage electric generation system and, as such, appears eligible at the state level under Criterion A. As the first major hydroelectric project undertaken by PG&E, this project was pivotal in the development of large-scale hydroelectric energy generation in California. The district also appears to meet Criterion C as an example of cutting-edge construction technology in the hydroelectric field during its period of significance. The system was planned by Frank Baum, a consulting engineer in San Francisco, and James Wise, both significant contributors to the development of hydroelectric systems and important for their engineering achievements. The district, therefore, appears eligible at a state level under Criteria A and C with a period of significance from 1912, when construction began, to 1931, when all major elements of the system were in place.

Individually-eligible components of the district include the main Spaulding Dam (the largest gravity type dam constructed up to that time), Drum, Halsey and Wise powerhouses (all designed by noted architect Ivan Frickstad and built between 1913-1916), Spaulding Powerhouse 1 (built in 1917 into an alcove blasted from existing granite cliffs), the incline railway, snowsheds and stairs that access Spaulding 1, the Spaulding Dam Maintenance Camp and Camp Spaulding, Drum Penstocks 1 and 2 with associated valve and wheel houses, the Halsey Afterbay Dam, and the South Canal with its two associated concrete flumes.

In addition to individually eligible components, the district also has 35 components that are ineligible individually, but are eligible as contributing elements to the district. Other elements that are both ineligible individually and as contributing elements include the Fordyce Tender's house, Drum Canal, Drum Forebay, Spaulding's Tender's House, Drum Powerhouse 2 and Penstock 3, Drum Residential Camp, Drum Access Road, Wise Penstock and Powerhouse 2, and Newcastle Penstock and Powerhouse; all of which were built or extensively modified after 1953 and, therefore, do not reflect the district's period of significance or the Baum and Wise design of the district.

The Rock Creek Multi-Arch Dam, also part of the district, was determined eligible for inclusion on the NRHP in 1999 (Baker 1999a) with SHPO concurrence. However, the dam was mitigated through HAER documentation prior to proposed modifications to the structure by PG&E in 1998 (Baker 1999b). SHPO concurred that the dam had been successfully mitigated and that the modifications would result in the dam's ineligibility for the NRHP. The dam has since been modified and therefore is no longer individually eligible for inclusion on the NRHP or as a contributing element to the district.

Dutch Flat Hydroelectric Historic District

The Dutch Flat Hydroelectric Historic District, comprised of the Dutch Flat No. 1 Development, includes Drum Afterbay, Dutch Flat Tunnel and Penstock and Dutch Flat No. 1 Powerhouse, constructed in 1941-1943 (Table 6.8.1-7). The Dutch Flat Powerhouse Historic District is a later addition to the Project. It does not meet any of the four NRHP criteria as it does not represent unique or exceptional architectural or engineering characteristics, does not contain potential substantive information that would contribute to local, state, or national history, and is not associated with an important historic event or person. The elements of the district also fail to meet the eligibility criteria, and are therefore ineligible individually as well.

Table 6.8.1-7. Dutch Flat Hydroelectric Historic District Elements.

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as a Contributing Element[1]	Individually Eligible (Criteria)	Eligible as a Contributing Element
Drum Afterbay	1928	1967	X	--	--
Dutch Flat No. 1 Intake	1943	--	X	--	--
Dutch Flat No. 1 Penstocks	1943	--	X	--	--
Dutch Flat Tunnel	1943	--	X	--	--
Dutch Flat No. 1 Powerhouse	1943	--	X	--	--

[1] X = Yes, facility meets NRHP eligibility status indicated in column heading.
-- = Not Applicable

Other Features of the Drum-Spaulding Project System

There are numerous small gauging stations, valves and weirs on the Project that measure and moderate downstream flows. These are minor and unremarkable structures that are nearly all modern. Their function is not essential to the operation of the system and nearly all were added to the system after its completion and do not represent original design and engineering concepts. As such, these features do not appear eligible for inclusion in the NRHP.

The Drum-Spaulding Project system also includes 17 small, high elevation dams that are used to store water for release into Fordyce and Spaulding lakes (Table 6.8.1-8). These dams are part of the Spaulding No. 1 and No. 2 and Spaulding No. 3 developments. In general, the dams have their origins in the gold rush-era quest to store, convey and use water for mining. However, they have been raised, rebuilt and modified many times through the years and have no outstanding characteristics that make them unique. While they store water for the overall system, they are not outstanding engineering components and no longer reflect their early historical importance to the California Gold Rush era. They do not appear collectively or individually eligible for inclusion in the NRHP.

Table 6.8.1-8. High elevation dams.

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as a Contributing Element[1]	Individually Eligible (Criteria)[2]	Eligible as a Contributing Element
White Rock Dam	1855	1922, 1931	X	--	--
Meadow Lake Dam	1864	1921, 1931, 1963, 1966, 1986	X	--	--
Sterling Lake Dam	1858	1922, 1929, 1979	X	--	--
Upper Peak Lake Dam	1850	1931, 1954, 1964	X	--	--
Lower Peak Lake Dam	1860	1923, 1932	X	--	--
Kidd Lake Dam	855	1922, 1931, 1945, 1962, 1972	X	--	--
Upper Rock Lake Dam	1855	1931	X	--	--
Lower Rock Lake Dam	1921	1931	X	--	--

Table 6.8.1-8. (continued)

Feature	Date Constructed	Date Modified	Ineligible Individually and/or as a Contributing Element[1]	Individually Eligible (Criteria)	Eligible as a Contributing Element
Culbertson Lake Dam	1852	1921, 1931	X	--	--
Upper Lindsey Lake Dam	1870	1931	X	--	--
Middle Lindsey Lake Dam	1920	1931	X	--	--
Lower Lindsey Lake Dam	1921	1932, 1972	X	--	--
Carr Lake Dam	1870	1932, 1931, 1972	X	--	--
Feeley Lake Dam	1870	1921, 1931, 1972	X	--	--
Blue Lake Dam	1856	1931, 1990	X	--	--
Rucker Lake Dam	1856	1922, 1931, 1972	X	--	--
Fuller Lake Dam	1856	1922, 1930, 1964, 1966, 1976, 1987	X	--	--

1 X = Yes, facility meets NRHP eligibility status indicated in column heading;
-- = Not Applicable

Non-Hydroelectric Built Environment Resources

The cultural resources surveys conducted for the relicensing identified 28 built environment resources that were not associated with the development or operation of the hydroelectric system. These resources included non-Project water conveyance systems, roads, trails, bridges, ranch-related buildings (corrals, barns, sheds), recreational facilities (camps, homes, private clubs), settlement-related buildings and structures (commercial and residential buildings and a monument), and other resources (a shed/garage and grave plot). The majority of these resources have no historical or architectural/engineering importance, or have been significantly altered and do not meet NRHP eligibility criteria due to their compromised integrity. Four of the resources appear to meet NRHP eligibility criteria and retain adequate integrity. One qualifies for the California Register of Historical Resources, but is not considered eligible for inclusion in the NRHP. Three require further research to assess importance. These 28 non-hydroelectric built environment resources are summarized in Table 6.8.1-9.

Table 6.8.1-9. Summary of Non-Hydroelectric Built Environment Resources within the Drum-Spaulding Project APE.

Name	Type	Date of Construction/ Modification	Number	Ineligible Individually and/or as a Contributing Element[1]	Potentially Eligible (Criteria)[2]	Eligible (Criteria)[2, 3]
Sterling Lake Trail	Trail	ca. 1954	05-15-53-943 STL-MRM-A1	X	--	--
Rock Lake Trail	Trail	ca. 1860s			X (A)	--
Bowman Road (abandoned)	Road	1856	05-17-53-950 FUL-MRM-A4	X	--	--
Spaulding Lake Trail	Trail	ca. 1930s	SPL-MRM-A26	X	--	--
Dog Bar Road	Road	1920s	BRC-MRM-A10	X	--	--
Bear River Bridge	Roll-up metal bridge	1950s	DMCR-MRM-A1	X	--	--
Bear River Bridge	Concrete arch bridge	1924	BRC-MRM-A1	--	--	X (C)
Campground Road Bridge	Concrete bridge	ca. 1930	BRCS-MRM-A9	X	--	--

Table 6.8.1-9. (continued)

Name	Type	Date of Construction/ Modification	Number	Ineligible Individually and/or as a Contributing Element[1]	Potentially Eligible (Criteria)[2]	Eligible (Criteria)[2, 3]
Robert L. Cole Boy Scout Camp	Organizational Camp	ca. 1954	P-29-2662-H/ CA-NEV-1662 05-17-53-865	X	--	--
Deer Lake Girl Scout Camp Historic Core	Organizational Camp	1928-1930, 1970s	KID-MLM-A1	--	--	X (C)
Camp Winthers	Organizational Camp	1957	PKU-MLM-A1	X	--	--
Culbertson Houses	Vacation Home	1920s, 2009	CUL-MLM-A2	X	--	--
Grass Valley Rod and Gun Club	Recreational Club	1942-1955	FUl-MLM-A1	X	--	--
Dear Fly Lodge	Recreational Club	1930s	FUL-MRM-A2	X	--	--
Bear Valley Barn	Barn	ca. 1900	BRC-MRM-A12	--	X (C)	--
Bear Valley Corral	Corral	1905-1990s	P-29-2249-H	X	--	--
Shed	Shed	1940s-1950s	BRCR-MRM-A16	X	--	--
Residence with barns/corral	Ranch	1940s	NCP-MRM-A1	X	--	--
Bowman Feeder Canal	Non-Project Canal	1910s	BRC-MRM-A14	X	--	--
Lower Boardman Canal	Non-Project Canal	1880, 1924	P-31-796 CA-PLA-670	X	--	--
Bowman Canal	Non-Project canal	1916	HSF-MRM-A11	X	--	--
Fiddler's Green Canal	Non-Project canal	1880s, 1920s, 1970s	P-31-1110 CA-PLA-952H	X	--	--
Dutch Flat Coal House	Commercial building	1930s	DFPR-CB-3	--	--	X
Diggins Hill Road Residence	Residential building	1930s-1940s	DFPR-CB-3	X	--	--
Dutch Flat Historic Monument	Monument	1950	DFPR-CB-1	--	X	--
Dutch Flat Post Office	Commercial building	1890-1898	DFPR-CB-2	--	--	X
Garage/shed	Garage/shed	1940s – 1950s	SYCAR-MRM-A1	X	--	--
Porter's Grave	Two-grave plot	ca. 1880		X (NRHP)	--	X (CEQA)

1 X = Yes, facility meets NRHP eligibility status indicated in column heading.
2 (A or C) = Facility meets significance Criterion A and/or Criterion C of the NRHP;
3 (CEQA) = Site is eligible as a historical resource under the California Environmental Quality Act but not under the NRHP.
-- = Not Applicable;

6.8.2 Environmental Effects

6.8.2.1 Yuba-Bear Hydroelectric Project

Continued Project operation and enhancements and new construction could affect cultural resources listed in or eligible for inclusion in the NRHP. NID's proposed Project includes a proposal to implement a Historic Properties Management Plan (HPMP).

The purpose of NID's HPMP is to prescribe specific actions and processes to manage historic properties within the Project APE. It is intended to serve as a guide for Licensee's operating personnel when performing necessary O&M activities and to prescribe site treatments designed to address ongoing and future effects to Historic Properties. The HPMP also describes a process of consultation with appropriate state and federal agencies, as well as with Native Americans who may have interests in historic properties within the APE. Licensee requirements detailed in the HPMP include: management measures; training for all O&M staff; routine monitoring of known cultural resources and, periodic review and revision of the HPMP.

NID provided a draft of the HPMP to the Forest Service, BLM and tribes for a 30-day review and comment period on September 8, 2010, and met with tribes and agencies on October 6, 2010 to discuss any questions regarding the HPMP. Written comments were received from the BLM, Forest Service, and April Moore, a Nisenan/Maidu tribal member (October 27, 2010), and United Auburn Indian Community (UAIC) between October 1 and 12, 2010. NID addressed the written comments in the HPMP. The revised draft HPMP was again provided to tribes and agencies with the DLA, which was filed with FERC on November 3, 2010 for a 90-day review. Comments on the HPMP were received from the Washoe Tribe of Nevada and California (December 29, 2010), the FERC (January 31, 2011), and resource agencies (January 28, 2011). NID has addressed the written comments in the HPMP.

Implementation of the HPMP would assure that the effects of NID's proposed Project on cultural resources would be taken into account and the appropriate management measures emplaced prior to imposing any O&M activities on cultural resources. NID anticipates that FERC would execute a Programmatic Agreement (PA) with SHPO and ACHP (should they choose to participate), to implement the final Yuba-Bear Hydroelectric Project HPMP within 1 year of license issuance, as a condition of any license for the Project. NID, the Tribes, the Forest Service, and BLM would be invited to participate in the PA as consulting parties.

6.8.2.2 Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on cultural resources. In some instances, it is concluded that the existing Project does not adversely affect cultural resources, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific cultural resource, PG&E has proposed a measure to be included in its proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed one PM&E measure that is relevant to this resource area, which is listed in Section 6.8.3.2.1 below. The complete text of the measure and the accompanying rationale is presented in Appendix E7 of this FLA.

Continued operation of the Drum-Spaulding Project could affect cultural resources listed in or eligible for inclusion in the NRHP. PG&E's relicensing studies found 223 cultural sites, some of which are eligible for inclusion in the NRHP and others that have not yet been evaluated, but may also be eligible. PG&E's relicensing studies also determined that some Project facilities are eligible for inclusion in the NRHP. Continued Project O&M and associated Project recreation has a potential to affect these sites due to ground disturbing activities (e.g., erosion, trampling and blading).

The purpose of PG&E's proposed HPMP is to prescribe specific actions and processes to manage historic properties within the Project APE. It is intended to serve as a guide for the Licensee's operating personnel when performing necessary operation and maintenance (O&M) activities and to prescribe site treatments designed to address ongoing and future effects to Historic Properties. The HPMP also describes a process of consultation with appropriate state and federal agencies, as well as with Native Americans who may have interests in historic properties within the APE. Licensee requirements detailed in the HPMP include: appointment of an HPMP Coordinator; training for all O&M staff; routine monitoring of known cultural resources; and, periodic review and revision of the HPMP as necessary.

A first draft of the HPMP was provided to the Forest Service, BLM, and tribes for a 30-day review and comment period on August 31, 2010. PG&E met with tribes and agencies on October 6, 2010, to discuss any questions regarding the HPMP. Written comments for the Drum-Spaulding Project HPMP were received from the UAIC in a letter dated October 8, 2010 and from the Forest Service in a letter dated October 12, 2010. The written comments were addressed in the HPMP. The revised draft HPMP was again provided to tribes and agencies with the DLA, which was filed with FERC on November 3, 2010 for a 90-day review. Comments on the HPMP were received in letters from April Moore, Nisenan tribal member (October 27, 2010), the FERC (January 31, 2011), and resource agencies (January 28, 2011). PG&E has addressed the written comments in the HPMP.

Implementation of the plan would assure that the effects of the proposed Project on cultural resources would be taken into account and the appropriate management measures emplaced prior to imposing any O&M activities on cultural resources. PG&E anticipates that FERC would execute a PA with SHPO and ACHP (should they choose to participate), to implement the final Drum-Spaulding Project HPMP within 1 year of license issuance, as a condition of licensure for the Project. PG&E, the Tribes, Forest Service and BLM would be invited to participate in the PA as consulting parties.

6.8.3 Proposed Measures

6.8.3.1 Yuba-Bear Hydroelectric Project

6.8.3.1.1 <u>NID's Proposed Measures</u>

As described above, NID's proposed Project includes one measure specifically related to the protection of cultural resources:

- Proposed Measure YB-CR1: Implement HPMP

See Appendix E3 for the full text of this proposed measure. The Yuba-Bear Hydroelectric Project HPMP is Privileged and included in Volume IV of NID's Yuba-Bear Hydroelectric Project FLA.

6.8.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Disposition of Human Remains

The Forest Service, BLM, NPS and CDFG recommended in their joint letter that:

> Section 4.3.7.2[of the HPMP]: Please revise the third paragraph to indicate that the BLM will be included in the negotiation with respect to the disposition of human remains from BLM-administered land. (p. 57)

NID agrees with this request and has included in the HPMP that BLM will be included in the negotiation process related to human remains found on public land administered by BLM.

6.8.3.2 Drum-Spaulding Project

6.8.3.2.1 PG&E's Proposed Measures

As described above, PG&E's proposed Project includes one measure specifically related to the protection of cultural resources:

- Proposed Measure DS-CR1: Implement HPMP

See Appendix E7 for the text and rationale of this proposed measure. The Drum-Spaulding Project HPMP is Privileged and included in Volume IV of PG&E's Drum-Spaulding Project FLA.

6.8.3.2.2 Specific Proposals and Studies Recommended by Agencies or Other Relicensing Participants

There were no proposals or studies recommended by agencies or other Relicensing Participants related to Cultural Resources for PG&E's Drum-Spaulding Project.

6.8.4 Unavoidable Adverse Effects

6.8.4.1 Yuba-Bear Hydroelectric Project

To determine whether the existing Project and NID's proposed Project have the potential to impose, unavoidable adverse effects on historic properties, NID developed in consultation with tribes, the Forest Service, and BLM the NRHP Evaluation Plan discussed above in Section 6.8.1.4.1, and included in Appendix F of the HPMP (Volume IV of the FLA). The purpose of the plan is to identify cultural resources documented during relicensing studies that are currently, or will potentially be, affected by the proposed Project. Based on this plan, NID recommends that 56 cultural resources be evaluated at the inventory level based on collected field data and archival research; 15 sites be evaluated for listing on the NRHP using additional field investigation and archival research; and that 15 sites not be evaluated for NRHP because they are not expected to be affected by the proposed Project. Additionally, one site has been previously evaluated for the NRHP and one other site was not relocated, therefore the NRHP eligibility of these sites need not be addressed or readdressed. The NRHP Evaluation Plan was included in the HPMP that was provided to the SHPO, tribes, Forest Service, and BLM on September 8, 2010, for review and comment. Written comments on NID's HPMP, including the Evaluation Plan, are addressed in the HPMP.

6.8.4.2 Drum-Spaulding Project

To determine whether Project-related O&M is imposing, or has the potential to impose unavoidable adverse effects on historic properties, PG&E developed the NRHP Evaluation Plan included in Appendix F of the HPMP (Volume IV of the FLA), and discussed above in Section 6.8.1.4.2, in consultation with tribes, TNF, and BLM. Based on this plan, PG&E recommends that: 127 sites can be evaluated at the inventory level based on collected field data and archival research or have already been evaluated; 31 additional sites were identified that are experiencing Project effects and require additional archival and/or field work to be evaluated for listing on the NRHP; 65 sites will not be evaluated, of these PG&E will implement avoidance measures for seven, three are on private property and cannot be treated, and 55 sites are not affected by Project O&M. All 65 unevaluated sites will be managed as if eligible and, therefore, do not require NRHP evaluations at this time. The first draft of the HPMP containing the NRHP Evaluation Plan was submitted to the SHPO, tribes, forest service, and BLM on August 31, 2010, for review and comment. A second draft was provided with the DLA, which was filed with FERC on November 3, 2010. Written comments on PG&E's HPMP, including the Evaluation Plan, are addressed in the HPMP.

6.9 Aesthetic Resources

The discussion of aesthetic resources is broken into four sections. First, and immediately below, is a list and status of the study Licensees conducted regarding aesthetic resources. Second, the affected environment is discussed in Section 6.9.1. Third, the environmental effects of each project are located in Section 6.9.2. Fourth, proposed measures are listed in Section 6.9.3. For the Yuba-Bear Hydroelectric Project, detailed text for each measure is included in Appendix E3. For the Drum-Spaulding Project, each measure is set forth in Appendix E7 with the accompanying rationale. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.9.4.

Where existing, relevant and reasonably available information from Licensees' PADs was not sufficient to determine the potential effects of the projects on aesthetic resources, Licensees developed and conducted the study listed in Table 6.9-1.

Table 6.9-1. Aesthetic resource studies conducted by Licensees.

FERC-Approved Study			Study Status		
Study Number	Study Name	Tech Memo Number	Study in Progress[1]	Study Complete	Date Study is Scheduled to be Complete
2.10.1	Visual Quality	10-1	--	3/5/10	--

The technical memorandum for the Visual Quality study listed in Table 6.9-1 is included in Appendix E12. The technical memorandum includes an executive summary; a description of study goals and objectives; methods and results; a discussion of study results; a description of study-specific consultation and collaboration undertaken by Licensees; variances to the FERC-approved study; attachments to the technical memorandum; and references.

6.9.1 Affected Environment

This section is divided into two subsections: 1) regulatory context; and 2) existing visual conditions.

6.9.1.1 Regulatory Context

The proposed projects are located in Nevada and Placer counties, California, with portions of each Project on private land, NFS land and public land administered by BLM. A portion of the Yuba-Bear Hydroelectric Project is also located in Sierra County, California, and a portion of the Drum-Spaulding Project is also located on public land administered by BOR.

6.9.1.1.1 NFS Land

On NFS land, the TNF Land and Resource Management Plan (LRMP) established Visual Quality Objectives (VQOs) under Forest Standards and Guidelines and Management Area direction that require land management activities meet a specific VQO on various areas of NFS land. The VQOs are displayed on a map provided in the LRMP identified as the Recreation Element, Visual Quality Objective Map dated 1989. The VQOs are defined under the TNF LRMP Standards and Guidelines (LRMP 1990). For the projects, the pertinent VQOs are "Retention," "Partial Retention" and "Modification." The Retention VQO allows management activities that are not visually evident. The Partial Retention VQO allows management activities that remain visually subordinate to the characteristic landscape. The Modification VQO allows management that may visually dominate the original characteristic landscape, but activities alter vegetative and land form must borrow from naturally established form, line, color, or texture and at such a scale that the visual characteristics are those of natural occurrences within the surrounding area or character type. The VQO's and their definitions are primarily focused on forest land management activities, but they also apply to existing facilities and proposed facilities.

6.9.1.1.2 Public Land Administered by BLM

On public land administered by BLM, the Sierra Resource Management Plan (SRMP) establishes Visual Resource Classes (VRC) under Section 2.10 (Visual Resources) that require land management activities meet a specific VRC on various areas of public land administered by BLM. The VRCs are defined in BLM Handbook H 8410-1, Visual Resource Inventory, 1976. For the projects, the pertinent VRC Objective is III, which provides direction that management activities partially retain existing character. There is further direction under Section 2.10 that states: "Design surface-disturbing projects to meet VRM objectives; and mitigate or prohibit surface disturbing actions that do not meet VRM objectives" (SRMP 2008). VRM objective III applies to existing facilities and proposed facilities, and activities on public land administered by BLM.

6.9.1.1.3 Public Land Administered by BOR

On public land administered by BOR, the Resource Management Plan (RMP) directs management that conforms to requirements specified in the Reclamation Act of 1902, Reclamation Project Act of 1939, Federal Water Project Reclamation Act of 1992, as integrated with other applicable federal laws, including the Federal Land Management Policy Act of 1976. The Drum-Spaulding Project lands administered by BOR are in association with the Newcastle Powerhouse, which is located at the upstream end of Folsom Reservoir approximately 25 miles from Sacramento. The multipurpose Folsom Dam Project was built by the USACE and is operated by BOR. Although its primary function is flood control, Folsom Dam stores water for irrigation and domestic use and for electrical power generation. In addition, the surface waters are managed by the California Natural Resources Agency, State Parks as the Folsom Lake State Recreation Area and managed for recreation values. BOR does not have a formal or informal system for evaluating scenic values.

6.9.1.1.4 Private Land

Licensees used a simplified visual quality assessment system for facilities located on private land, including land owned by NID or PG&E. In addition, Licensees used the Forest Service VMS on private lands within the TNF boundary to simplify the assessment results in an otherwise very complex land-ownership pattern. Outside of the Forest Service boundary, Licensees also incorporated the visual direction contained in the General Plans for Sierra, Nevada, and Placer counties. In general, all three county general plans have broad goals to maintain or enhance the visual quality of the lands within the county. Most emphasis is placed on protecting views from scenic highways and other important highways that are specifically named. Most of these highways are not near or do not have views of Project facilities, with the exception of Highway 174, which provides a fleeting view of Rollins Dam, and Interstate 80, which has views of Spaulding Dam and Lake Spaulding.

6.9.1.2 Existing Visual Conditions

The facilities and features of both projects are located in the northern Sierra Nevada and Sierra Nevada foothills, which generally provide a wooded, natural, scenic backdrop. The Project reservoirs provide an additional scenic asset to the landscape. The public takes advantage of these assets by hiking, fishing, boating, camping, and picnicking on or nearby these reservoirs. Overall the dams, powerhouses, canals, penstocks and other Project facilities blend into the landscape. Visual contrast due to light or uniform color, and introduction of lines and geometric shapes begins to be apparent for the larger dams and powerhouses at around distances of 2 miles or more. In foreground, and particularly immediate foreground, the industrial character of some dams, trash racks, penstocks, and powerhouses becomes apparent. The reservoirs with boating activities typically have floating safety booms, which provide safety to the boating public. In most cases, the public enjoying the reservoirs can choose to use areas away from the dams and associated facilities if desired. Some of the public choose to walk on and over dams, or to boat near dams. The main exceptions to the above characterization of the landscape setting as "natural" are the two reservoirs, three powerhouses and several miles of canal located in the vicinity of the City of Auburn where the setting varies from rural to residential, to commercial.

To better characterize the existing visual setting, in 2009, Licensees conducted a visual quality assessment of each Project's facilities (NID and PG&E 2010aa). On NFS land and public land administered by BLM, Licensees used those agencies' visual assessment protocols. On private land, the assessments were performed using a modification of the agencies' protocols. Field assessments were conducted primarily by vehicle and on foot. Digital photographs were taken from all Key Observation Points (KOP), which are critical viewpoints where the public can view reservoirs and facilities. Information recorded in the field included Existing Visual Condition (EVC), which is a formal evaluation of how well a facility blends with the surrounding landscape. Based on the EVC ratings, Licensees determined if Project facilities are in compliance with visual direction from both the TNF LRMP and BLM SRMP, both of which were developed after the projects were constructed and operating for many years.
Twenty-three Yuba-Bear Hydroelectric Project facilities were assessed. All of the facilities met the Forest Service or BLM land management visual direction from background and most from

middleground. At around 2 miles, the larger dams started to show contrast with the surrounding landscape. This was most notable with Jackson Meadows and Rollins dams. At a distance of 2 miles, Sawmill Lake Dam and Dutch Flat No. 2 Conduit met land management visual direction. Jackson Lake Dam met the land management visual direction because it is rarely viewed by the public. Bowman-Spaulding Conduit and Bowman-Spaulding Transmission Line generally are not seen and met land management visual direction with a few exceptions. The rest of the Yuba-Bear Hydroelectric Project reservoir dams and associated facilities did not meet land management visual direction in foreground or immediate foreground.

Fifty-two Drum-Spaulding Project facilities were assessed. There are no Drum-Spaulding Project facilities located on or viewed from BLM lands with the exception of Dutch Flat No. 1 Penstock, which can be seen from the north side of Dutch Flat Afterbay. All of the facilities met the TNF's LRMP's visual direction from background and most from middleground with the exception of penstocks discussed below. As with the Yuba-Bear Hydroelectric Project, at a viewing distance of about 2 miles, larger dams started to show contrast with the surrounding landscape. This was the case for Lake Spaulding and Lake Valley dams. All of the smaller reservoirs had better EVC ratings, particularly in the Grouse Lakes area, but still did not meet the LRMP's visual direction in foreground or immediate foreground. The linear facilities, such as transmission lines and canals, generally were not seen and met land management visual direction in all but a few immediate foreground situations. One exception to this observation was penstocks. Four Drum-Spaulding Project penstocks on private land are painted silver and are in strong contrast to the surrounding landscape. These penstocks do not fall under the Forest Service's or BLM's current land management visual direction. The canals in the lower part of the Project, primarily on private land, were rarely seen with the exception of public road crossings. These canals received relatively low EVC ratings, but the public drives past them at speeds where the existence of the canal is unlikely to register to the passengers in the vehicle.

Of the 12 Drum-Spaulding Project powerhouses, only one is on public land, and that is the Newcastle Powerhouse on land administered by BOR. As noted above, BOR does not have a formal or informal system for evaluating scenic values; however, Licensee notes that the powerhouse does present visual contrast in foreground views, primarily from an equestrian trail and, to a minor degree, from Folsom Lake. Of the remaining 11 powerhouses, six are viewed by the public and five of these are of traditional architecture that are quite visible due to their traditional light yellow buff color, however, these facilities also contribute to the landscape from a historical perspective. The five traditional architecture powerhouses are the Drum No. 1, Dutch Flat No. 1, Spaulding No. 3, Halsey, and Wise. The remaining modern powerhouse is the Wise No. 2 Powerhouse, which is located immediately adjacent to the Wise Powerhouse.

6.9.2 Environmental Effects

6.9.2.1 Yuba-Bear Hydroelectric Project

As described above, under existing conditions some of the existing Yuba-Bear Hydroelectric Project facilities on NFS land and public land administered by BLM do not meet the Forest Service's or BLM's visual management objectives in foreground or immediate foreground.

NID's proposed Project includes four measures related to aesthetic resources. Each measure is discussed below, including how the measure would protect or enhance visual resources. Implementation of these measures would assure that the effects of the proposed Project on aesthetic resources would be less than significant.

The first measure, Annual Consultation, would: 1) assure that NID's planned activities are efficiently coordinated to the extent possible with the Forest Service and BLM activities, including those related to visual quality; 2) make the Forest Service and BLM aware of NID's planned O&M activities on NFS land and on public land administered by BLM; and 3) make NID aware of all pertinent Forest Service and BLM orders, rules and policies that might affect the planned activities. NID would meet with the Forest Service, BLM and other agencies in the first quarter of each year to discuss NID's planned mitigation measures and Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate since NID normally develops an annual maintenance plan early in each calendar year. NID would file documentation of the meeting with FERC, including recommendations by the Forest Service and BLM, if requested by FERC. The measure does not imply that NID may not proceed with planned Project O&M activities until NID has reviewed the planned O&M activity with the Forest Service and BLM, or relieve NID from obtaining all necessary approvals and permits for the planned maintenance work.

The second measure pertains to new ground disturbing activities. If during the term of the new license, NID proposes ground disturbing activities not addressed by the relicensing NEPA process, such activities have the potential to adversely affect special-status species and other resources on NFS lands and public lands administered by BLM. This measure would assure that reasonable PM&E measures are developed to address the potential effects of the new ground disturbing activities. Specifically, prior to performing the new ground disturbing activity, NID would consult with the Forest Service or BLM, as appropriate, to: 1) discuss potential effects; 2) determine if additional information is needed to assess effects; 3) gather additional information, if needed; and 4) upon Forest Service's receipt or BLM's request, as appropriate, enter into an agreement to fund a reasonable portion of Forest Service's staff or BLM's staff, as appropriate, to perform staff activities related to the proposed ground disturbing activity. This measure provides for the timely review of new ground disturbing activities.

The third measure, Consultation Regarding New Facilities, also pertains to activities not addressed in FERC's NEPA review. If, during the term of the new license, NID proposes new Project facilities that were not addressed in FERC's NEPA process, prior to construction NID would develop a visual resource protection plan to address potential visual impacts if visual impacts are identified.

The fourth measure, Implement Visual Resource Management Plan On Federal Land, would implement visual mitigation measures needed to reduce the visual contrast of facilities on NFS lands and lands administered by BLM and provides a schedule when mitigation measures would be implemented. The plan would also provide direction on how to address visual impacts from modifications to the Project that are located on NFS land or public land administered by BLM and that are not covered under the FERC license.

6.9.2.2 PG&E's Drum-Spaulding Project

This section summarizes effects of the existing Drum-Spaulding Project on aesthetic resources. In some instances, it is concluded that the existing project does not adversely affect aesthetic resources, and therefore no PM&E measure is proposed. If it is concluded that the existing Project does or may adversely affect a specific aesthetic resource, PG&E has proposed a measure to be included in its proposed Project that would avoid or mitigate the adverse effect. PG&E has proposed two PM&E measures that are relevant to this resource area, which are listed in Section 6.9.3.2.1 below. The complete text of each measure and the accompanying rationale is presented in Appendix E7 of this FLA.

Like the Yuba-Bear Hydroelectric Project, some existing Drum-Spaulding Project facilities on NFS land and public land administered by BLM do not meet the current Forest Service's or BLM's visual management objectives for foreground or immediate foreground. There is also visual contrast associated with Newcastle Powerhouse, which is partially located on lands administered by BOR.

PG&E's proposed Project includes two measures related to aesthetic resources. Each measure is discussed below, including how the measure would protect or enhance visual resources. Implementation of the measures would assure that the effects of the proposed Project on aesthetic resources would be less than significant.

The first measure, Annual Consultation, would: 1) assure that PG&E's planned activities are efficiently coordinated to the extent possible with the Forest Service, BLM and BOR activities; 2) make the Forest Service, BLM and BOR aware of PG&E's planned O&M activities on NFS land and on public land administered by BLM and BOR; and 3) make PG&E aware of all pertinent Forest Service, BLM and BOR orders, rules and policies that might affect the planned activities. PG&E would meet with the Forest Service, BLM, BOR and other agencies in the first quarter of each year to discuss PG&E's planned Project O&M activities for that calendar year to the extent they are known. An annual meeting early in the year is appropriate because PG&E normally schedules annual maintenance early in each calendar year. The measure does not imply that PG&E may not proceed with planned Project O&M activities until PG&E has reviewed the planned O&M activity with the Forest Service, BLM and BOR. The measure also does not relieve PG&E from obtaining all necessary approvals and permits for the planned maintenance work.

The second measure, Implement Visual Resource Management Plan On Federal Land, would implement visual mitigation measures needed to reduce the visual contrast of facilities on NFS lands and lands administered by BLM and BOR, and provides a schedule for when mitigation measures would be implemented. The plan would also provide direction on how to address visual impacts from modifications to the Project that are located on NFS land or public land administered by BLM or BOR, and that are not covered under the FERC license.

6.9.3 Proposed Measures

6.9.3.1 Yuba-Bear Hydroelectric Project

6.9.3.1.1 NID's Proposed Measures

NID's proposed Project includes four measures related to the protection of aesthetic resources:

- Proposed Measure YB-GEN1: Annual Consultation
- Proposed Measure YB-GEN4: Consultation Regarding New Ground Disturbing Activities
- Proposed Measure YB-GEN5: Consultation Regarding New Facilities
- Proposed Measure YB-AER1: Implement Visual Resource Management Plan On Federal Land

Refer to Appendix E3 for the full text of this proposed measure.

6.9.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Visual Resource Management Plan

In their joint letter, the Forest Service, BLM, NPS and CDFG recommended the following measure:

> The resource agencies propose (In Section 6.9.3.1.2 of Yuba-Bear and Section 6.9.3.2.2 of Drum-Spaulding) that a Visual Resource Management Plan be completed and included in the FLAs. The purpose of the VRMP is to address the existing Project facilities and features, and any new construction or maintenance of facilities that have the potential to affect the visual resources on public lands. The VRMP shall provide a site-specific mitigation and implementation schedule to bring the Project facilities affecting visual resources on public lands in compliance with the visual resource standards and guidelines.
>
> The resource agencies participated in many field visits and discussions with the licensees' visual quality consultant as to how best address visual quality concerns related to the projects. The resource agencies would like the licensee to include the consultant's information and any recommendations in the VRMP.
>
> The VRMPs should address the following:
>
> - Paint penstocks to make them blend with the surrounding landscapes.

- Paint buildings to make them blend with the surrounding landscapes.
- Thin trees or vegetate areas with native plant species to achieve long-term visual screening of project facilities.
- Develop landscape rehabilitation plans for affected areas, such as staging areas, for the projects.
- Address ongoing project activities that affect visual quality, such as (but not limited to) clearings, spoils piles, transmission lines, and access roads.
- Consultation and approval for projects that affect visual quality.

Mitigation measures identified in the VRMP or for ongoing projects may include (but is not limited to):

- Surface treatments with FS/BLM-approved colors and natural appearing materials that will be in harmony with the surrounding landscape.
- Use of non-specular conductors for the transmission lines.
- Use of native plant species to screen facilities from view.
- Reshaping and re-vegetating disturbed areas to blend with surrounding visual characteristics.
- Locating transmission facilities to minimize visual impacts.

The VRMP should include, at a minimum:

- A description of planned modifications to the existing visual environment.
- Appropriate PM&E measures that will be implemented related to the modifications.
- A schedule for implementation of appropriate measures.
- A record of consultation with the FS/BLM regarding the modification and appropriate visual measures.
- A process for consultation on future projects.

For Project area modifications that may result in changes to the visual environment, the process by which a visual resource protection plan would be developed is as follows (this process assumes a plan/design for any potential modification has already been developed):

- Notify the FS/BLM of planned facility modifications and identify any potential impacts to the existing visual environment of the Project area.
- If determined by the FS/BLM that a visual resource protection plan is requires, develop a draft visual resource protection plan that identifies

the actions that will be taken to protect, enhance, and/or mitigate the visual resources impacted by the planned modification.

- Provide a draft visual resource protection plan to the FS/BLM for review.
- Revise and finalize the visual resource protection plan, based on FS/BLM review comments.
- Submit final visual resource protection plan to the FS/BLM for approval.

(pp. 54 – 56)

In addition, at page 123 of their letter, the agencies comment on the Drum-Spaulding Project and recommend some visual quality measures, which are actually Yuba-Bear Hydroelectric Project facilities. These measures included:

- Paint penstocks or tint concrete/canal surfaces to make them blend with the surrounding landscapes. Example locations of these facilities are …the Dutch Flat No. 2 Conduit.
- Paint buildings to make them blend with the surrounding landscapes. Reducing color contrast would improve visual quality at the following spillways and gage locations: Jackson Meadows, Bowman, Milton Reservoirs…
- Thin trees or vegetated areas with native plant species to achieve long-term visual screening of project facilities. Also, vegetative treatments could be planed to eliminate obtrusive edges and patterns along powerlines, canal and conduit routes. Example locations of these type of facilities are the Chicago Park conduit as viewed from Lowell Hill Road and the powerline clearings visible from Bowman Road.

(p. 123)

While the agencies have provided some detail, much of their recommendation is general in nature. Therefore, NID cannot perform an in depth analysis of the recommended measure, or estimate the cost associated with implementing the measure.

Nevertheless, NID has adopted, with modification, the agencies recommendation, and included a Visual Resource Management Plan on Federal Land (VRMP) in its proposed Project. The VRMP identifies measures needed to reduce the visual contrast of facilities on NFS lands and lands administered by BLM, provides a schedule for implementing the measures, provides a process for developing specific visual quality mitigation measures should NID propose any modifications to the Project or activities on NFS land or public land administered by BLM that are not covered under the FERC license, and provides a process for modifying the VRMP.

NID has not included in its VRMP some of the specific measures recommended by the agencies (e.g., painting gage buildings and thinning trees) because such measures were not identified as needed or as reasonable alternatives by NID's visual consultant during Licensees' Visual Quality Study. For instance, while options such as planting vegetative screens, removing a structure, building a solid fence for visual screening or changing the surface texture were considered to reduce visual effects on federal land, these were only included in the VRMP if NID concluded the measure was reasonable. In many cases, they were not. For instance, dam structures often have high visual contrast and do not meet visual objectives, but the engineering and safety requirements from FERC and DSOD strictly limit what can be done to a dam. In other cases, painting a structure will not reduce contrast substantially because the structure is too smooth and geometric in shape to blend with the surrounding landscape regardless of painting. In other cases, the color may work for summer conditions but contrast with the white snow of winter. Also, a reservoir surface level gage building, such as at Jackson Meadows Reservoir, Bowman Lake and Milton Diversion Dam, which are specifically mentioned by the agencies, might be painted a dark green color to better blend with the surrounding landscape. However, these structures house temperature-sensitive equipment that can not function with high heat, and insulating or otherwise cooling the inside of the structure is impractical. Painting the structure a dark color would significantly increase the temperature inside the structure. Therefore, such a measure would not be appropriate.

Nor has NID included in its VRMP the agencies' recommendations regarding developing landscape plans or plans to reduce visual quality impacts related to spoil or other areas because, again, these were not identified as appropriate mitigation during the Visual Quality Study. Rather, NID's VRMP provides that measures will be developed on a case-by-case basis specific to the proposed activity and at the time NID proposes a modification to the Project. These activity-specific measures would be reviewed with the Forest Service and BLM, as appropriate. NID believes this approach (i.e., not listing general potential measures, but providing that specific measures will be developed based on the proposed activity) will provide adequate protection to the resource. In addition, the agencies have provided no evidence to support that including in a plan general measures that might be applied would provide any additional resource protection than stating in the plan that activity-specific measures would be developed in consultation with the agencies when an activity is proposed.

6.9.3.2 Drum-Spaulding Project

6.9.3.2.1 PG&E's Proposed Measures

PG&E's proposed Project includes two proposed measure related to the protection of aesthetic resources:

- Proposed Measure DS-GEN1: Annual Consultation
- Proposed Measure DS-AER1: Implement Visual Resources Management Plan On Federal Land

Refer to Appendix E7 for the full text and rationale for each of these proposed measures.

6.9.3.2.2 Specific Proposals and Studies Recommended by Agencies or Other Relicensing Participants

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA). PG&E is therefore unable to thoroughly assess the scope, purpose and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as required by the regulations and FERC PM&E Guidance. However, in their joint letter the agencies made one request regarding that had enough information that PG&E could address at least components of the request. Below PG&E has made its best effort to capture this proposal and has also provided a response.

Visual Resource Management Plan

In their joint letter, the Forest Service, BLM, NPS and CDFG made the following recommendations:

> The resource agencies propose (In Section 6.9.3.1.2 of Yuba-Bear and Section 6.9.3.2.2 of Drum-Spaulding) that a Visual Resource Management Plan be completed and included in the FLAs. The purpose of the VRMP is to address the existing Project facilities and features, and any new construction or maintenance of facilities that have the potential to affect the visual resources on public lands. The VRMP shall provide a site-specific mitigation and implementation schedule to bring the Project facilities affecting visual resources on public lands in compliance with the visual resource standards and guidelines.
>
> The resource agencies participated in many field visits and discussions with the licensees' visual quality consultant as to how best address visual quality concerns related to the projects. The resource agencies would like the licensees to include the consultant's information and any recommendations in the VRMP.
>
> The VRMPs should address the following:
>
> - Paint penstocks or tint concrete/canal surfaces to make them blend with the surrounding landscapes. Example locations of these facilities are Drum and Dutch Flat No. 1 penstocks; and the Dutch Flat No. 2 Conduit.

- Paint buildings to make them blend with the surrounding landscapes. Reducing color contrast would improve visual quality at the following spillways and gage locations: Jackson Meadows, Bowman, Milton Reservoirs; and Upper Rock, Feeley, Blue, Rucker, Fuller and Fordyce Lakes.
- Thin trees or vegetated areas with native plant species to achieve long-term visual screening of project facilities. Also, vegetative treatments could be planed to eliminate obtrusive edges and patterns along powerlines, canal and conduit routes. Example locations of these type of facilities are the Chicago Park conduit as viewed from Lowell Hill Road and the powerline clearings visible from Bowman Road.
- Develop landscape rehabilitation plans for affected areas, such as staging areas, for the projects.
- Address ongoing project activities that affect visual quality, such as (but not limited to) clearings, spoils piles, transmission lines, and access roads.
- Consultation and approval for projects that affect visual quality.

Mitigation measures identified in the VRMP or for ongoing projects may include (but is not limited to):

- Surface treatments with FS/BLM-approved colors and natural appearing materials that will be in harmony with the surrounding landscape.
- Use of non-specular conductors for the transmission lines.
- Use of native plant species to screen facilities from view.
- Reshaping and re-vegetating disturbed areas to blend with surrounding visual characteristics.
- Locating transmission facilities to minimize visual impacts.

The VRMP should include, at a minimum:

- A description of planned modifications to the existing visual environment.
- Appropriate PM&E measures that will be implemented related to the modifications.
- A schedule for implementation of appropriate measures.
- A record of consultation with the FS/BLM regarding the modification and appropriate visual measures.
- A process for consultation on future projects.

For Project area modifications that may result in changes to the visual environment, the process by which a visual resource protection plan would be developed is as follows (this process assumes a plan/design for any potential modification has already been developed):

- Notify the FS/BLM of planned facility modifications and identify any potential impacts to the existing visual environment of the Project area.
- If determined by the FS/BLM that a visual resource protection plan is requires, develop a draft visual resource protection plan that identifies the actions that will be taken to protect, enhance, and/or mitigate the visual resources impacted by the planned modification.
- Provide a draft visual resource protection plan to the FS/BLM for review.
- Revise and finalize the visual resource protection plan, based on FS/BLM review comments.
- Submit final visual resource protection plan to the FS/BLM for approval.

(pp. 122 - 124)

While the agencies have provided some detail, much of their recommendation is general in nature and some of the facilities in their proposal are not Drum-Spaulding Project facilities (e.g., Dutch Flat No. 2 Conduit; gage buildings at Jackson Meadows Dam, Milton Diversion Dam and Bowman Dam; and the Chicago Park Conduit). In addition, the agencies have not provided a schedule or cost estimate for their recommendation. Therefore, PG&E cannot perform an in depth analysis of the recommendation as specifically drafted, or estimate the associated cost.

Nevertheless, PG&E has adopted, with modification, the agencies suggestion, and included a Visual Resources Management Plan On Federal Land in its proposed Project. The plan identifies measures needed to reduce the visual contrast of Drum-Spaulding Project facilities on NFS lands and lands administered by BLM and BOR, provides a schedule for implementing the measures, provides a process for developing specific visual quality mitigation measures should PG&E propose any modifications to the Project or activities that are not covered under the FERC license on NFS land or public land administered by BLM or BOR that are not covered under the FERC license, and provides a process for modifying the plan.

PG&E has not included in its plan some of the specific recommendations of the agencies (e.g., painting gage buildings and thinning trees) because such measures were not identified as needed or as reasonable alternatives during Licensees' Visual Quality Study. For instance, the study considered options such as planting vegetative screens, removing a structure, building a solid fence for visual screening or changing the surface texture. However, these are only included in the plan if PG&E concluded the measure was reasonable; in many cases, those options were not. For instance, dam structures often have high visual contrast and do not meet visual objectives, but the engineering and safety requirements from FERC and DSOD strictly limit what can be done to a dam. In other cases, painting a structure will not reduce contrast substantially because the structure is too smooth and geometric in shape to blend with the surrounding landscape regardless of painting. In other cases, the color may work for summer conditions but contrast with the white snow of winter. Therefore, such a measure would not be appropriate.

Nor has PG&E included in its plan the agencies' recommendations regarding developing landscape plans or plans to reduce visual quality impacts related to spoil piles or other areas because, again, these were not identified as appropriate mitigation during the Visual Quality Study. Rather, PG&E's plan provides that measures will be developed on a case-by-case basis specific to the proposed activity and at the time PG&E proposes a modification to the Project. These activity-specific measures would be reviewed with the Forest Service, BLM and BOR, as appropriate. PG&E believes this approach (i.e., not listing general potential measures, but providing that specific measures will be developed based on the proposed activity) will provide adequate protection to the resource.

6.9.4 Unavoidable Adverse Impacts

6.9.4.1 Yuba-Bear Hydroelectric Project

Licensees' Visual Quality Study documented that some Yuba-Bear Hydroelectric Project facilities do not meet Forest Service or BLM management plan direction for visual quality. However these inconsistencies between the Project and the plans occur primarily in foreground views from Project reservoirs or from close roads and trails. These inconsistencies are considered minor to the localized nature of the impacts and the nature of the inconsistencies. In addition, the inconsistencies are considered minor because the public using the areas are generally accustomed to these features and understand the function and purpose of such facilities, which are found throughout the Sierra Nevada. Also, the facilities pre-date the land management plans and, in many cases, provide historic value to the landscape. Implementation of the VRMP will mitigate some of the visual impacts in the years ahead.

6.9.4.2 Drum-Spaulding Project

Licensees' Visual Quality Study documented that some Drum-Spaulding Project facilities do not meet Forest Service or BLM management plan direction for visual quality (BOR does not have management plan directions for visual quality). However, these inconsistencies between the Project and the plans occur primarily in foreground views from the Project's reservoirs or from close roads and trails. These inconsistencies are considered minor due to: 1) the localized nature of the impacts; 2) the minor nature of the inconsistencies; and 3) because the public using the areas are generally accustomed to these features and understand the function and purpose of such facilities, which are found throughout the Sierra Nevada. Also, the facilities pre-date the land management plans and in many cases provide historic value to the landscape. Implementation of PG&E's proposed Visual Resources Management Plan will mitigate some of the visual impacts in the years ahead.

6.10 Socio-economic Resources

The discussion of socio-economic resources is broken into four sections. First, the affected environment is discussed in Section 6.10.1. Second, the environmental effects of each Project are described in Section 6.10.2. Third, proposed measures for each Project are listed in Section 6.10.3. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.10.4.

Existing, relevant and reasonably available information is sufficient to determine the potential effects of the projects on socio-economic resources. Accordingly, FERC's Study Determination, as amended, did not require that Licensees perform any studies related to socioeconomics.

6.10.1 Affected Environment

This section is divided into three sections. The first section describes existing socio-economic conditions in Nevada and Placer counties, California, the counties in which both projects are located. The section also describes socio-economic conditions in Sierra County, California, in which portions of the Yuba-Bear Hydroelectric Project are located. The second section is a brief description of socio-economic conditions related to the Tahoe National Forest (TNF). The last section describes socio-economic considerations for each Project.

6.10.1.1 County Socio-economic Conditions

6.10.1.1.1 Nevada County

Census data available from the U.S. Census Bureau and the California Department of Finance (CDOF) indicate that the Nevada County population in 2000, 2005 and 2010 were 92,033 (94.1 people per square mile), 99,236 (101.4) and 98,680 (100.9), respectively. Although there has been a modest decline in population in the past five years, the CDOF forecasted that by the year 2015, Nevada County's population will reach close to 123,203 residents (126.0 people per square mile).

The county is relatively rural, with the majority of the population residing in the greater Nevada City area and adjoining Grass Valley area. Nevada City is the county seat and, since 1851, has been incorporated on four separate occasions for various reasons (www.nevadacityca.gov/history) with the most recent incorporation occurring in 1878. The nearest major population center outside the county is Sacramento, located about 40 miles to the south and west.

Most people in Nevada County are between the ages of 18 and 65. This is similar to the age distribution in the rest of the State of California.

When compared to the State of California, Nevada County is relatively homogeneous with respect to ethnic diversity. The county is predominantly White with persons of Hispanic or Latino origin making up the second largest group.

Nevada County ranks 15th out of the 51 counties in California for income, with a per capita income of $24,007 and a median household income of $45,864, based on the 2000 U.S. census. Approximately 90 percent of Nevada County's population is educated through high school with 26 percent of the population having obtained a Bachelor's degree or higher, placing Nevada County above the State average for both categories.

Initially, all of Nevada County's settlements and their economies were based on the discovery of gold in the middle 1800s. Today, Nevada County has a diverse economic base and labor force that includes construction, mining, manufacturing, transportation, utilities, trade, finance, insurance, real estate services, and government. According to the California Employment Development Department (EDD), the annual average unemployment rate in Nevada County was 3.6 percent during 2000 and 4.8 percent in 2005 (EDD 2005), which was lower than the State of California's average of 4.3 percent during 2000 and 5.4 percent in 2005.

In 2005, the largest employment sectors in Nevada County were: 1) Construction; 2) Retail Trade; 3) Finance, Insurance and Real Estate; and 4) Education and Healthcare Services. Construction had the greatest earnings for the county (Bureau of Economic Analysis 2005).

6.10.1.1.2 Placer County

Interim census data available from the U.S. Census Bureau and the CDOF indicate that the Placer County population in 2000, 2005 and 2010 were 248,399 (174.7 people per square mile), 313,133 (220.3) and 347,102 (244.1), respectively. CDOF forecasts that by the year 2015, Placer County's population will reach close to 418,819 residents (294.5 people per square mile).

Placer County is relatively rural, with the majority of the county population residing in the greater Roseville and Auburn areas. Incorporated in 1851, Auburn is the county seat. Besides Auburn, Placer County contains five other incorporated cities: 1) Colfax; 2) Lincoln; 3) Roseville; 4) Rocklin; and 5) Loomis. The nearest major population center outside the county is Sacramento, located about 32 miles to the south and west.

Most people in Placer County are between the ages of 18 and 65; a similar age distribution to the rest of the State of California.

Like Nevada County, Placer County is predominantly White with persons of Hispanic or Latino origin making up the second largest group.

With respect to income, Placer County ranks 7th out of the 51 counties in California for income, with a per capita income of $27,963 and a median household income of $57,535, based on the 2000 U.S. census.

About 91 percent of Placer County's population has a high school education, with 30 percent of the population having obtained a Bachelor's degree or higher, placing Placer County above the State average for both categories.

Like Nevada County, Placer County's settlements and their economies were initially based on the discovery of gold in the middle 1800's. Today, Placer County has a diverse economic base and labor force that includes construction, mining, manufacturing, transportation, utilities, trade, finance, insurance, real estate services, and government. According to the California EDD, the annual average unemployment rate was 3.6 percent in Placer County during 2000 and 4.3 percent in 2005 (EDD 2005), which is less than the State of California's average of 4.3 percent during 2000 and 5.4 percent in 2005.

In 2005, the following sectors were the largest employers in Placer County: 1) Construction; 2) Retail Trade; 3) Finance, Insurance and Real Estate; and 4) Education and Healthcare Services. The construction industry had the greatest earnings for Placer County (Bureau of Economic Analysis 2005).

6.10.1.1.3 Sierra County

The 2000 U.S census indicated the population of Sierra County was 3,555 people, with a population density of 3.7 persons per square mile. Population growth within Sierra County has been extremely low, and since 2000 has been dominated by migration out of the county. Interim census data available from the U.S. Census Bureau and the CDOF indicate that the Sierra County population in 2005 and 2010 were 3,489 (3.6 people per square mile) and 3,303 (3.4 people per square mile), respectively. Although there has been a modest decline in population in the past 5 years, the DOF forecasts that by the year 2015, Sierra County's population will reach close to 3,589 residents (3.7 people per square mile).

Sierra County is rural. Downieville is the county seat of Sierra County, and Loyalton is the only other incorporated city within county. The nearest major population center outside the county is Sacramento, located about 60 miles to the south and west.

Most people in Sierra County are between the ages of 18 and 65, similar to the age distribution in the rest of the state, and the county is relatively homogeneous with respect to ethnic diversity. The county is predominantly White with persons of Hispanic or Latino origin making up the second largest group.

Approximately 85 percent of the county population has a high school education, with 17 percent having obtained a Bachelor's degree or higher.

Sierra County ranks 32th out of the 51 counties in California for income with a per capita income of $18,815 and a median household income of $35,827, based on the 2000 U.S. census.

Initially, all of Sierra County's settlements and the county's economy were based on the discovery of gold in the middle 1800's. Today, the county has a small yet diverse economic base and labor force that includes construction, mining, manufacturing, transportation, utilities, trade, finance, insurance, real estate services, and government. In 2005, government and Public Administration was the largest employment sector in Sierra County and provided the greatest earnings (Bureau of Economic Analysis 2005). According to the California EDD, the annual average unemployment rate was 4.9 percent for Sierra County during 2000 and 8.5 percent in 2005 (EDD 2005), which is slightly higher than the State of California's average of 4.3 percent during 2000 and 5.4 percent in 2005.

6.10.1.2 Tahoe National Forest

The TNF is managed by the Forest Service and is the 95th largest by area of the 155 national forests in the United States. The TNF was initially established in 1891 as a 136,335-acre area within the Sierra Reserve formed by President Benjamin Harrison. With the addition of the Yuba Forest Reserve in 1904 and the Tahoe Forest Reserve in 1905, the TNF encompasses 831,000 acres (1,250 square miles) of public land interspersed with 373,000 acres of private land in a checkerboard ownership pattern.

The TNF has an annual budget of approximately 20 million dollars, and has around 300 employees. The TNF manages public lands within the TNF boundary under a policy of multiple uses which includes timber, mining grazing, water, and recreation. The timber program provides jobs through timber sales that accomplish forest thinning, fuels reduction, and salvage operations for insect, disease, and fire impacted stands. The mining program, through permits, manages many small gold dredging operations and some hard rock mines. In addition, mineral material sales by the Forest Service include landscaping rock and aggregate for road maintenance and construction. The grazing program authorizes livestock grazing for local ranchers. The TNF manages water on the west side of the Sierra Nevada through four FERC approved projects including the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project. In addition, on the eastside of the Forest, BOR manages several reservoirs. The TNF provides recreation opportunities for the public through 160 Developed Recreation sites, 1,300 miles of motorized and non-motorized trails, numerous lakes and reservoirs, and permits for six ski areas.

6.10.1.3 Project-Specific Information

6.10.1.3.1 Yuba-Bear Hydroelectric Project

The Yuba-Bear Hydroelectric Project is primarily a water supply project that provides safe and affordable water to portions of Nevada County, Placer County and Yuba County. The Project is also a source of clean, renewable electricity for California. In addition, the Project provides recreation and associated recreation income for the local area.

NID is located in Grass Valley, California, and has about 168 employees. Approximately 16 employees work directly on the Project on a day-to-day basis, with headquarters near the Project near Colfax, California. The Project office includes administrative offices, warehouses, and machine shop facilities. The employees that work directly on the Project are dispatched from the Project's Headquarters in Colfax to the Project each day.

NID pays approximately $617,607 each year to federal, State, and local governments for Project-related services. Table 6.10.1-1 provides a list of these annual fees.

Table 6.10.1-1. Federal, State, and local agencies NID pays annually for Project-related services.

Agency	Description	Approximate Annual Payment
Federal Energy Regulatory Commission	Use of Federal Land	$205,190
Federal Energy Regulatory Commission	Administration	$124,698
United States Geological Survey	Stream Gage Data Auditing	$47,120
California Division of Safety of Dams	Dam Safety	$148,399
California State Water Resources Control Board	Water Rights	$27,200
United States Department of Agriculture, Forest Service	Operation & Maintenance of Recreation Sites Collection Agreement	$65,000
	Total	**$617,607**

6.10.1.3.2 Drum-Spaulding Project

Approximately 65 PG&E staff or contractors are headquartered near the Project and are responsible for maintaining and operating the Project and other PG&E projects in the area.

In 2009, PG&E paid Project-related income taxes of approximately $2,183,018 (federal) and $358,639 (State of California).

6.10.2 Environmental Effects

6.10.2.1 Yuba-Bear Hydroelectric Project

NID's proposed Project would have a less than significant effect on socio-economic conditions. The proposed Project would be operated in substantially the same manner in which the Project has been historically operated, and would preserve water supply, which is critical for the socio-economic health of the region. The Project employs about 16 people who reside in the Project area, and provide economic benefits (e.g., taxes, services, etc.) to the area. For instance, construction of the Rollins Upgrade and replacement of recreation facilities would result in some construction-related jobs, however, the labor force required would be very small (i.e., probably less than 20 people) and would only be needed for a short time. The demand for county, Forest Service and BLM services related to the proposed Project is not unusual for facilities of this size, has been ongoing for over 45 years, and NID pays fees to the federal government for use of public lands.

6.10.2.2 Drum-Spaulding Project

PG&E's proposed Project would have a less than significant effect on socio-economic conditions in Nevada and Placer counties and in the TNF. The proposed Project would be operated in substantially the same manner in which the Project has been historically operated. As a result, the Project would continue to employee people in the surrounding area and continue to preserve water supply (although the proposed Project includes the increased water supply demand over the term of the new license as projected by NID and PCWA). The proposed construction of recreation facilities would result in some construction-related jobs, however, the labor force required would be very small (i.e., probably less than 20 people) and would only be needed for a short time. As noted above, the demand for county, Forest Service, BLM and BOR services related to the Project is not unusual for facilities of this size, has been ongoing for over 45 years, and PG&E pays fees to the federal government for use of public lands and taxes for federal, state and local services.

6.10.3 Proposed Measures

6.10.3.1 Yuba-Bear Hydroelectric Project

6.10.3.1.1 NID's Proposed Measures

Because the proposed Project would have a less than significant, if not a beneficial effect, on socio-economic resources, NID does not propose any measures related to socio-economic resources.

6.10.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

Eight comments letters were filed on NID's Yuba-Bear Hydroelectric Project DLA. None of the comment letters include specific recommended measures or studies related to socio-economic resources.[1]

6.10.3.2 Drum-Spaulding Project

6.10.3.2.1 PG&E's Proposed Measures

Because the proposed Project would have a less than significant, if not a beneficial effect, PG&E does not propose any measures related to socio-economic resources.

6.10.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

None of the comment letters filed on PGE's Drum Spaulding Project DLA included specific recommended measures or studies related to socio-economic resources.[2]

[1] Some of the comment letters identified impacts to water supply as a concern, but the commenter did not recommend a specific measure. NID addresses potential effects on water supply in Section 6.2, Water Resources, and Section 7, NID's Economic Analysis for the Yuba-Bear Hydroelectric Project, of this Exhibit E.

[2] Some of the comment letters identified impacts to water supply as a concern, but the commenter did not recommend a specific measure. PG&E addresses potential effects on water supply in Section 6.2, Water Resources, and Section 8, PG&E's Economic Analysis for the Drum-Spaulding Project, of this Exhibit E.

6.10.4 Unavoidable Adverse Impacts

6.10.4.1 Yuba-Bear Hydroelectric Project

Increasing minimum flows, especially in Dry Water Years in the Middle Yuba River downstream of Milton Diversion Dam and in Canyon Creek downstream of the Bowman-Spaulding Diversion, will have an adverse effect on water supply because: 1) under existing conditions, water supply deficiencies already occur; and 2) water released at these locations is not available to meet local water supply. These effects are considered short-term in that they only occur in Critically Dry and Dry water years, and they are relatively minor in magnitude. However, the deficiencies will be greater in the future as consumptive water demand increases.

Continued operation and maintenance of the Project, including Project-related recreation, would require some commitment of local law enforcement resources. While there have been few if any Project-related wildfires, should a fire occur, local fire response services would be needed. These impacts are considered short-term because they are only needed in cases of emergencies. Also, when compared to the overall economic benefit of the Project in terms of employment and tourism and fees Licensee pays to federal, state and local agencies, these impacts are minor.

6.10.4.2 Drum-Spaulding Project

Continued operation and maintenance of the Project, including Project-related recreation, would require some commitment of local law enforcement resources. While there have been few if any Project-related wildfires, should a fire occur, local fire response services would be needed. These impacts are considered short-term because they are only needed in cases of emergencies. Also, when compared to the overall economic benefit of the Project in terms of employment, tourism and fees Licensee pays to federal, state and local agencies, these impacts are minor.

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6.11 Air Quality

The discussion of air quality is broken into four sections. First, the affected environment is discussed in Section 6.11.1. Second, the environmental effects of each Project are described in Section 6.11.2. Third, proposed measures for each Project are listed in Section 6.11.3. Finally, unavoidable adverse impacts are addressed in Section 6.11.4.

Existing, relevant and reasonably available information is sufficient to determine the potential effects of the projects on air quality. FERC's Study Determination, as amended, did not require Licensees perform any studies related to air quality.

6.11.1 Affected Environment

This section describes existing air resources conditions in two general areas: 1) regulatory context; and 2) existing air quality conditions.

6.11.1.1 Regulatory Context

The California Air Resources Board (CARB), as part of the California Environmental Protection Agency (Cal/EPA), is responsible for protecting public health and the environment from the harmful effects of air pollution. Pollutants associated with air emissions, such as ozone (O_3), particulate matter, and nitrogen dioxide (NO_2), are associated with respiratory illness. Carbon monoxide (CO), another air pollutant, can be absorbed through the lungs into the bloodstream and reduce the ability of blood to carry oxygen. Sources of air emissions include commercial facility operations, fugitive dust, on-road vehicles and trucks, aircraft, boats, trains, and natural sources such as biogenic and geogenic hydrocarbons and wildfires.

The topography and meteorology of the western slope of the Sierras are the important factors in the environmental effects of air quality emissions in the vicinity of the projects. Dispersion of high pollutant concentrations in downwind areas is hindered by the mountainous topography. Frequent inversions, in which warm air overlays cool air, trap pollutants close to the ground. In summer, long days, stagnant air, and high temperatures facilitate photochemical production of ozone from precursor air pollutants such as volatile organic compounds (VOC) and nitrogen oxides (NO_x). Regional transport of these precursors from the Sacramento Valley and the San Francisco Bay area result in high ozone concentrations.

To reduce harmful exposure to air pollutants, the federal Clean Air Act (CAA) requires the United States EPA (EPA) to set outdoor air quality standards for the nation with the option for states to adopt additional or more protective standards if needed. CARB has adopted ambient (outdoor) air quality standards (AAQS) that are more protective than federal standards and has implemented standards for some pollutants not addressed by federal standards. An AAQS establishes the concentration above which the pollutant is known to cause adverse health effects to sensitive groups within the greater population, such as children and the elderly. The goal is for localized Project effects not to cause or contribute to an exceedance of the standards. Criteria pollutants for which AAQS have been established include ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. California and federal AAQS for criteria pollutants are presented in Table 6.11.1-1.

Table 6.11.1-1. California and federal ambient air quality standards.

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (O_3)	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	--	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 μg/m^3)		0.075 ppm (147 μg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		--		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	15.0 μg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	--	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		--	--	--
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)	Gas Phase Chemiluminescence	0.053 ppm (100 μg/m^3)	Same as Primary Standard	Gas Phase Chemiluminecence
	1 Hour	0.18 ppm (339 μg/m^3)		0.100 ppm (see footnote 8)		
Sulfer Dioxide (SO_2)	Annual Arithmetic Mean	--	Ultraviolet Fluorescence	0.030 ppm (80 μg/m^3) (see footnote 9)	--	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 (105 μg/m^3)		0.14 ppm (365 μg/m^3)	--	
	3 Hour	--		--	0.5 ppm (1,300 μg/m^3)	
	1 Hour	0.25 (665 μg/m^3)		75 ppb (see footnote 9)	--	--
Lead[10]	30 Day Average	1.5 μg/m^3	Atomic Absorption	---	--	--
	Calendar Quarter	--		1.5 μg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	--		0.15 μg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer - visibility of 10 miles or more (0.07 - 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 μg/m^3	Ion Chromatography			

Table 6.11.1-1. (continued)

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Hydrogen Sulfide	1 Hour	0.03 ppm ($42\ \mu g/m^3$)	Ultraviolet Fluorescence	No Federal Standards		
Vinyl Chloride[10]	24 Hour	0.01 ppm ($26\ \mu g/m^3$)	Gas Chromatography			

1 California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour),nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2 National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than 1. For PM2.5, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. National ambient air quality standards are listed in the Code of Federal Regulations, Title 40, Part 50.

3 Concentration expressed first in units in which the standard was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 Any equivalent procedure that can be shown to the satisfaction of the CARB to give equivalent results at or near the level of the air quality standard may be used.

5 National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6 National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7 Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8 To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

9 On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at this time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075ppm.

10 The CARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11 National lead standard, rolling 3-month average: final rule signed October 15, 2008.

Both the California and federal governments use ambient air monitoring data to classify areas according to their attainment status with respect to criteria pollutants. These designations are used to identify areas with air quality problems and help determine whether Project emissions would be considered significant under NEPA and the California Environmental Quality Act (CEQA) assessments. The three basic designation categories are:

- Attainment—ambient air quality is not in violation of the established standard for the specific criteria pollutant.
- Non-attainment—ambient air quality violates the established standard for the specific criteria pollutant.
- Unclassified—there is currently insufficient data for determining attainment or non-attainment.

In addition to the above designations, California includes a subcategory of the non-attainment designation:

- Non-attainment-transitional—given to non-attainment areas that are making progress and nearing attainment.

6.11.1.2 Existing Air Quality

To manage air quality problems, California is divided into 15 air basins, each of which is associated with an Air Quality Management District. The projects are within the Northern Sierra Air Quality Management District (i.e., Nevada and Sierra counties) and the Placer County Air Pollution Control District (i.e., Placer County). Table 6.11.1-2 shows the current federal and State attainment status for each pollutant in each county.

Table 6.11.1-2. Attainment status for air quality pollutants in Nevada, Sierra, and Placer counties.[1]

Pollutant	State Attainment Status			National Attainment Status		
	Nevada	Sierra	Placer	Nevada	Sierra	Placer
Ozone (1 hr)[2]	Attainment	Unclassified	Non-Attainment	--	--	--
Ozone (8 hr)	Non-Attainment[3]	Unclassified	Non-Attainment	Non-Attainment[3]	Attainment	Non-Attainment[4]
Carbon Monoxide	Unclassified	Unclassified	Unclassified	Attainment	Attainment	Non-Attainment / Unclassified[5]
Nitrogen Dioxide	Attainment	Attainment	Attainment	Unclassified / Attainment[6]	Unclassified / Attainment[6]	Unclassified / Attainment[6]
Fine Particulate Matter (PM2.5)	Unclassified	Unclassified	Unclassified	Unclassified	Unclassified	Non-Attainment / Unclassified[7]
Respirable Particulate Matter (PM10)	Non-Attainment	Non-Attainment	Non-Attainment	Unclassified	Unclassified	Unclassified
Sulfur Dioxide	Attainment	Attainment	Attainment	Unclassified	Unclassified	Unclassified
Lead	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
Sulfates	Attainment	Attainment	Attainment	No Federal Standards		
Hydrogen Sulfide	Unclassified	Unclassified	Unclassified			
Visibility Reducing Particles	Unclassified	Unclassified	Unclassified			

Sources: California Air Resources Board and Environmental Protection Agency Green Book

1 Each of the counties is in a different air basin. Specifically, Nevada County is in the Nevada air basin, Sierra County is in the Mountain Counties air basin, and Placer County is split between the Sacramento Metro and Lake Tahoe North Shore air basins. Classifications are considered under both counties and air basins; therefore, the classifications may differ significantly between counties.

2 The federal 1-hour ozone rule was vacated on June 15, 2005.

3 Only Western Nevada County is non-attainment for the 8-hr standard.

4 Only the western portion of Placer County (i.e., the portion in the Sacramento Metro basin) is classified as non-attainment.

5 The part of Placer County in the Sacramento Metro basin is classified as non-attainment. The part of Placer County in the Lake Tahoe North Shore basin is unclassified, but is considered as non-attainment. This portion was previously classified as non-attainment, but there is insufficient data to determine whether it is meeting the carbon monoxide standard.

6 A distinction is not made between unclassified and attainment for federal NO_2 standards.

7 The part of Placer County in the Sacramento Metro basin is classified as non-attainment. The part of Placer County in the Lake Tahoe North Shore basin is unclassified.

6.11.2 Environmental Effects

6.11.2.1 Yuba-Bear Hydroelectric Project

The proposed Project would have a less-than-significant adverse effect on air quality. The existing Project is situated within geographic areas that are currently designated as non-attainment for 8-hour and 1-hour ozone, and non-attainment for PM10. Operations of the proposed Project would not result in a net increase of any criteria pollutant. The proposed Project includes the addition of the Rollins Upgrade and various recreation facilities. These are very minor, short-term construction projects, and NID will consult with local air quality agencies to obtain all necessary permits and approvals prior to initiating construction.

Greenhouse gas (GHG) emissions associated with development of hydroelectric systems has been a topic of study by the International Hydropower Association since 2006. A Working Group established to initiate such studies published in April 2008, "*Scoping Paper Assessment of Greenhouse Gas Status of Freshwater Reservoirs*" in which it was observed that reservoirs that were 5 years or less in age emitted higher levels of GHG, principally methane, than reservoirs 10 years and older. Although there is a wide range of variables associated with reservoir conditions, the GHG emissions from reservoirs the older reservoir emissions were comparable to natural lakes. This observation was verified in a study performed by Alain et al. for the Hydro-Quebec Eastman 1 Project.

With regard to NID's proposed Project, the reservoirs have been in existence for well over 30 years. Therefore, environmental effects associated with GHG emissions are less than significant.

6.11.2.2 Drum-Spaulding Project

The Project is situated within geographic areas that are currently designated as non-attainment for 8-hour and 1-hour ozone, and non-attainment for PM10. Although the proposed Project includes the replacement or addition of various recreation facilities, which entails minor, short-term construction efforts (for which PG&E will obtain all necessary permits and approvals prior to initiating such construction), the operations of the proposed Project will not result in a net increase of any criteria pollutant.

With regard to PG&E's Proposed Project, the reservoirs have been in existence for well over 30 years and environmental effects associated with GHG emissions are less than significant.

6.11.3 Proposed Measures

6.11.3.1 Yuba-Bear Hydroelectric Project

6.11.3.1.1 <u>NID's Proposed Measures</u>

NID's proposed Project would have a less than significant, if not a beneficial effect, on air quality. Therefore, NID does not propose any measures related to air resources.

6.11.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

No agency or other Relicensing Participant has filed with FERC any recommended measures or studies related to air quality for the Yuba-Bear Hydroelectric Project.

6.11.3.2 Drum-Spaulding Project

6.11.3.2.1 PG&E's Proposed Measures

Because the Proposed Project would have a less than significant, if not a beneficial effect, on air quality, PG&E does not propose any measures related to air resources.

6.11.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

No agency or other Relicensing Participant has filed with FERC any recommended measures or studies related to air quality for the Drum-Spaulding Project.

6.11.4 Unavoidable Adverse Impacts

6.11.4.1 Yuba-Bear Hydroelectric Project

Construction of NID's proposed new Rollins Powerhouse and recreation facilities may result in short-term, site-specific adverse effects on air quality. However, since NID will obtain all necessary agency permits and approvals for the work, and given the remote location of the facilities, brief period of work and type of construction activity, the effects on air quality are expected to be minor. NID's proposed Yuba-Bear Hydroelectric Project would not create any other short-term or any long-term adverse impacts related to air quality.

6.11.4.2 Drum-Spaulding Project

Restoration of PG&E's recreation facilities may result in short-term, site-specific adverse effects on air quality. However, because PG&E will obtain all necessary agency permits and approvals for the work, and given the remote location of the facilities, brief period of work and type of construction activity, the effects on air quality are expected to be minor. PG&E's proposed Drum-Spaulding Project would not create any other short-term or any long-term adverse impacts related to air quality.

6.12 Noise

The discussion of noise is broken into four sections. First, the affected environment is discussed in Section 6.12.1. Second, the environmental effects of each Project are addressed in Section 6.12.2. Third, proposed measures for each Project are listed in Section 6.12.3. Finally, unavoidable adverse impacts, if any, are addressed in Section 6.12.4.

Existing, relevant and reasonably available information is sufficient to determine the potential effects of the projects on noise. FERC's Study Determination, as amended, did not require Licensees perform any studies related to noise.

6.12.1 Affected Environment

This section describes the existing regulatory context related to noise.

6.12.1.1 Regulatory Context

Noise is defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. The magnitude of noise is described by its sound pressure. Because the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to a common reference level, the decibel. Sound pressures described in decibels are called sound pressure levels.

Sound levels, measured using an "A-weighted decibel scale", are expressed as decibels (dBA). Throughout this analysis, all noise levels are expressed in dBA. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- the amount and nature of the intruding noise;
- the relationship between the background noise and the intruding noise; and
- the type of activity occurring where the noise is heard.

In considering the first of these factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some people more than others. In addition, people react differently (including whether such noise is viewed as uncomfortable or offensive) to various patterns of noise. With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (i.e., background noise). The blowing of a car horn at night when background noise levels are approximately 45 dBA generally would be more objectionable than the blowing of a car horn in the afternoon when background noises might be 55 dBA.

The third factor is related to the interference of noise with activities of individuals. In a 60-dBA environment, normal work activities requiring high levels of concentration may be interrupted by loud noises, while activities requiring manual effort may not be interrupted to the same degree.

Time-averaged descriptors are utilized to provide a better assessment of time-varying sound levels. The three most common noise descriptors used in community noise surveys are the equivalent sound level (Leq), percentile distributions of sound levels (L%), and the day-night average sound level (Ldn). The Leq is an energy-averaged sound level that includes both steady background sounds and transient short-term sounds. The Leq is equivalent in energy to the fluctuating sound level over the measurement period. The Leq is commonly used to describe traffic noise levels, which tend to be characterized by fluctuating sound levels.

The L% indicates the sound level exceeded for a percentage of the measurement period. For example, the L90 is the sound level exceeded for 90 percent of the measurement period and is commonly used to represent background sound levels. The L10 is the sound level exceeded for 10 percent of the measurement period and represents the peak sound levels present in the environment.

The Ldn is another descriptor used to evaluate community noise levels. The Ldn is a 24-hour average sound level, which includes a 10 dBA penalty added to nighttime sound levels (10:00 PM to 7:00 AM) because people tend to be more sensitive to noise during the nighttime. The Ldn sound level is commonly used to describe aircraft and train noise levels.

For the state of California, noise intensity is also discussed in terms of Community Noise Equivalent Level, which presents a weighted average noise level that increases the relative significance of evening and nighttime noise. The Community Noise Equivalent Level descriptor is used to evaluate community noise levels, which includes a 5 and 10 dBA penalty added to evening (7:00 PM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM) sound levels, respectively, in consideration of people's increased sensitivity to noise during the evening and nighttime periods.

County noise standards are generally established based on land use and zoning designations. This is done to ensure that acceptable noise levels are consistent with community development goals and policies. As such, there can be variability between various counties' standards, as is the case with Nevada, Placer and Sierra counties due to their individual development patterns. However, among these counties there are similarities in allowable noise levels near sensitive receptors, which are generally areas such as rural(R), residential (Res), and institutional (e.g., schools and hospitals). Table 6.12.1-1 summarizes the Nevada, Placer and Sierra county noise standards.

Table 6.12.1-1. Nevada, Placer and Sierra county noise standards.

On-site Sound Level Descriptor	Day (7 AM – 7 PM)	Evening (7 PM - 10 PM)	Night (10 PM – 7 AM)	Day (7 AM - 10 PM)	Night (10 PM - 7 AM)
Nevada County[1]	--	-	--	--	--
Hourly Leq (dBA)	55(R/Res)	50 (R/Res)	40(R)/45(Res)	--	--
Maximum	75(R/Res0	65(R/Res)	55(R)/60(Res)	--	--
Placer County[2]	--	--	--	--	--
Hourly Leq (dBA)	--	--	--	55	45
Maximum	--	--	--	70	65
Sierra County[3]	--	--	--	--	--

Table 6.12.1-1. (continued)

On-site Sound Level Descriptor	Day (7 AM – 7 PM)	Evening (7 PM - 10 PM)	Night (10 PM – 7 AM)	Day (7 AM - 10 PM)	Night (10 PM - 7 AM)
Hourly Leq (dBA)	--	--	--	50	50
Maximum	--	--	--	60	60

[1] Nevada County General Plan 2012, (Nevada County 1996).
[2] Placer County Zoning Ordinance, (Placer County 2010).
[3] Sierra County General Plan 2012 (Sierra County 1996).

Nevada County has Leq and Lmax noise standards of 70 Leq and 90Lmaz for recreational uses between 7 AM and 7 PM, and noise standards of 65 Leq and 75 Lmax between 7 PM and 7 AM.

6.12.2 Environmental Effects

6.12.2.1 Yuba-Bear Hydroelectric Project

NID’s Proposed Project would have a less than significant effect on noise. The vast majority of the Project is located in remote areas. The Project powerhouses except for Rollins Powerhouse, which are the only sources of ongoing Project noise which occurs at very low levels, are in very remote areas – no residences or commercial properties are near the powerhouses. A residence occurs within about 1,000 feet downstream of Rollins Powerhouse on the left bank. NID is unaware of any complaints from the homeowner. The proposed Project includes the addition of the Rollins Upgrade and various recreation facilities. These are very minor, short-term construction projects, and NID will consult with local agencies to obtain all necessary permits and approvals prior to initiating construction.

6.12.2.2 Drum-Spaulding Project

PG&E’s Proposed Project would have a less than significant effect on noise. The vast majority of the Project is located in remote areas. Generally, noise from the Project powerhouses, which are the only main sources of ongoing Project noise, occur at very low levels and are in relatively remote areas; no residences or commercial properties are near the powerhouses.

6.12.3 Proposed Measures

6.12.3.1 Yuba-Bear Hydroelectric Project

6.12.3.1.1 <u>NID’s Proposed Measures</u>

Because the proposed Project would have a less than significant effect on noise, NID does not propose any measures related to noise.

6.12.3.1.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

No agency or other Relicensing Participant has filed with FERC any recommended measures or studies related to noise for the Yuba-Bear Hydroelectric Project.

6.12.3.2 Drum-Spaulding Project

6.12.3.2.1 PG&E's Proposed Measures

Because the proposed Project would have a less than significant on noise, PG&E does not propose any measures related to noise.

6.12.3.2.2 Proposals and Studies Recommended by Agencies or Other Relicensing Participants

No agency or other Relicensing Participant has filed with FERC any recommended measures or new studies related to noise for the Drum-Spaulding Project.

6.12.4 Unavoidable Adverse Impacts

6.12.4.1 Yuba-Bear Hydroelectric Project

Construction of NID's proposed new Rollins Powerhouse and recreation facilities will result in short-term increases in noise levels. However, the impacts given the remote location of the facilities, brief period of work and type of activity will be minor. In addition, when working on NFS land, NID will adhere to all applicable Limited Operating Procedures (LOP). NID's proposed Yuba-Bear Hydroelectric Project would not create any other short-term or any long-term adverse impacts related to noise.

6.12.4.2 Drum-Spaulding Project

Construction related to the restoration of PG&E's recreation facilities will result in short-term increases in noise levels. However, the impacts are expected to be minor given the remote location of the facilities, brief period of work and type of activity. PG&E will adhere to all applicable LOPs. PG&E's proposed Drum-Spaulding Project would not create any other short-term or any long-term adverse impacts related to noise.

SECTION 7
NID'S ECONOMIC ANALYSIS
YUBA-BEAR HYDROELECTRIC PROJECT

As discussed throughout this exhibit, although this is a joint Exhibit E between NID and PG&E, the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project are two separate projects, with distinct ownership and distinct FERC licenses. As a result, each Project has unique and separate economics. PG&E's economic analysis of the Drum-Spaulding Project is included in Section 8 of this Exhibit E. NID's economic analysis of its proposed Yuba-Bear Hydroelectric Project is provided below.

7.1 Proposed Yuba-Bear Hydroelectric Project

7.1.1 Approach and Assumptions

Under its approach to evaluating the economics of hydropower projects as articulated in Mead Corporation, Publishing Paper Division (72 FERC §61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of a project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. For the economic analysis of NID's proposed Yuba-Bear Hydroelectric Project, assumptions, values, and sources are shown in Table 7.1.1-1.

Table 7.1.1-1. Assumptions for economic analysis of NID's proposed Yuba-Bear Hydroelectric Project.

Assumption	Value	Source of Information
Base Year for Costs And Benefits	2010	--
RPS-eligible On-Peak Power Value (Mills/Kwh)	11.39	25-year 2013 MPR (CPUC)
RPS-eligible Off-Peak Power Value (Mills/Kwh)	10.63	25-year 2013 MPR (CPUC)
Non-RPS-eligible On-Peak Power Value (Mills/Kwh)	4.66	2009 Average SRACs (CPUC)
Non-RPS-eligible Off-Peak Power Value (Mills/Kwh)	4.35	2009 Average SRACs (CPUC)
Period of Analysis	Water Years 1976 through 2008	--

To estimate generation under Licensee's proposed Project as described in the application for new license, as well as under various alternatives including the No Action Alternative, Licensee developed a computerized model of the combined Licensee's Yuba-Bear Hydroelectric Project and Pacific Gas and Electric Company's (PG&E) Drum-Spaulding Project using HEC-ResSim, an application developed by the United States Army Corps of Engineers. The model simulates the operation of the two projects utilizing a synthetic inflow hydrology and operating rules developed by the Licensee and PG&E. Hydroelectric power generation is calculated for each powerhouse on a daily basis, and is stored in a database for extraction following a model run. See Exhibit E, Section 6.2 (Water Resources) for a detailed description of the Projects' Operations Model.

7.1.2 Project Costs Under Existing License (No Action Alternative)

The total annualized current costs for the Yuba-Bear Hydroelectric Project No-Action Alternative is $7,794,000 (Table 7.1.2-1).

Table 7.1.2-1. Summary of current annual costs and future costs for NID's Yuba-Bear Hydroelectric Project under the No Action Alternative.

Item	Annual Cost 2010 U.S. Dollars
Capital Cost including Cost of Capital[1]	$1,000,000
Local, State and Federal Taxes and Fees[2]	$500,000
Annual Depreciation Expense[3]	$2,500,000
Operation and Maintenance Expenses[4]	$2,487,000
Transmission Costs[5]	$300,000
Operating Reserve[6]	$600,000
Power Purchase Contract Management[7]	$40,000
Cost to Prepare Application for a New License[8]	$367,000
Subtotal – No-Action Alternative Project Cost	**$7,794,000**

1 As described in Exhibit D, Section 5.1.
2 As described in Exhibit D, Section 5.2.
3 As described in Exhibit D, Section 5.3.
4 As described in Exhibit D, Section 5.4.
5 For continued Project O&M and delivery of Project power, Licensee must obtain transmission access. The special facilities charge for transmission line access and capacity is assumed to be a monthly tariff set at 1.14% of transmission line capital investment, including transmission line licensing costs. This is assumed to be $300,000 annually based on access over existing PG&E transmission lines.
6 In the first 5 years of the term of the new licensee, Licensee plans to build an operating reserve of $15,000,000. As expended, the reserve would be re-established. Assuming the reserve is depleted once during the new license term, the annualized cost of creating and replenishing the reserve once over the 30-year term of the new license, the reserve equals $600,000 annually.
7 Over the term of the new license, License plans to seek out and enter into power purchase contracts for the sale of Project power. Besides the costs of entering into the contracts, Licensee must also manage the new contracts. Cost for this task is assumed to be $40,000 annually.
8 As described in Section 5.5.

7.1.3 Project Costs Under NID's Proposed Project

7.1.3.1 Cost of New Generation Developments

As part of this application for a new license, Licensee proposes to construct the Rollins No. 2 Powerhouse, to be located adjacent to the existing Rollins Powerhouse below Rollins Dam on the Bear River. Based on a preliminary design and feasibility study, Licensee estimates that construction of the Rollins No. 2 Powerhouse would cost roughly $24.9 million (2010 dollars). Annual operations and maintenance costs are projected to be $200,000 per year. This results in an annualized cost of $954,000 per year, assuming a 30 year license term.

Licensee does not propose to add to the Project any previously constructed, unlicensed water power structures or facilities.

Table 7.1.3-1. Summary of NID's proposed Rollins No. 2 Powerhouse capital costs under the Proposed Action.

Cost by Federal Accounting Code (2010 Dollars)	Mid-Point Estimates
330 – Lands and Land Acquisition Rights	$0
331 – Structures and Improvements	$**4,535,273**
332 – Reservoirs, Dams & Waterways	$**1,374,086**
333 – Waterwheels, Turbines & Generators	$4,261,702
334 – Accessory Electrical Equipment	$**1,129,842**
335 – Miscellaneous Power Plant Equipment	$**85,453**
336 – Roads and Recreation Facilities	$50,000
350-359 – Transmission & Substation Facilities	$862,127
397 – Communication and Control Equipment	$171,951
Sub-Total without Construction Management and Contingency	**$13,991,828**
Contingency, Construction Management and Owner's Misc. Costs	$7,994,172
Total	**$21,986,000**

Table 7.1.3-2. Summary of NID's proposed Rollins No. 2 Powerhouse annual costs under the Proposed Action, using current cost method.

Cost in 2009 Dollars	Capital and One-Time Costs	Annual Cost Including Operation and Maintenance	Total Annualized Cost (Current Cost Method)
Rollins Powerhouse Upgrade Net Investment	$21,986,000	---	$733,000
Operations and Maintenance Costs	---	$175,000	$175,000
Miscellaneous Costs[1]	$633,000	$25,000	$46,000
Total	**$22,619,000**	**$200,000**	**$954,000**

[1] Includes Taxes, Fees, Additional Operating Reserve, Insurance, and Transmission Costs.

7.1.3.2 Cost of Environmental Measures

NID proposes numerous environmental measures for inclusion in the new licenses for the Yuba-Bear Hydroelectric Project. The measures would reduce the Yuba-Bear Hydroelectric Project generation, add significant capital costs, and increase annual cost to operate the Project.

7.1.3.2.1 Direct Cost of Environmental Measures

NID provided capital costs and annual costs for its proposed environmental measure in Exhibit D of its DLA. The costs are summarized in Table 7.1.3-3.

Table 7.1.3-3. Summary of annualized costs (2010 dollars) for environmental and recreation measures included in the proposed Yuba-Bear Hydroelectric Project with the Rollins Powerhouse Upgrade.

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Average Annual Costs ($1,000 per year)
	GENERAL			
GEN1	Annual Consultation with Forest Service and BLM	--	$15/year	$15/year
GEN2	Employee Training	--	$20/year	$20/year
GEN3	Annual Review of Special-Status Species Lists and Assessment of New Species on Federal Land	--	$16/year	$16/year

Table 7.1.3-3. (continued)

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Average Annual Costs ($1,000 per year)
GENERAL (continued)				
GEN4	Consultation Regarding New Ground Disturbing Activities on Federal Land	--	$5/year	$5/year
GEN5	Consultation Regarding New Facilities on Federal Land	--	$3/year	$3/year
GEN6	Development and Implementation of Coordinated Operations Plan for Yuba-Bear Hydroelectric Project and Drum-Spaulding Project	$60	--	$2/year
GEOLOGY AND SOILS				
G&S1	Development and Implementation of Rollins Upgrade Construction Erosion Control and Restoration Plan	$30	--	$1/year
G&S2	Development and Implementation of Recreation Facilities Construction Erosion Control and Restoration Plan	$90	--	$3/year
G&S3	Implement Clear and Trap Creeks Stabilization Plans[2]	$3,000	$25/year	$125/year
WATER RESOURCES				
WR1	Development and Implementation of Rollins Upgrade Construction Hazardous Material Spill Prevention, Control and Countermeasures Plan	$30	--	$1/year
WR2	Development and Implementation of Recreation Facilities Construction Hazardous Material Spill Prevention, Control and Countermeasures Plan	$30	--	$1/year
AQUATIC RESOURCES				
AQR1	Streamflows	$150	$40/year	$44/year
AQR2	Fish Stocking in Bowman Lake	--	$75/year	$75/year
AQR3	Jackson Meadows Reservoir Minimum Pool	--	--	--
AQR4	Milton Diversion Impoundment Normal Pool	$40	--	$1/year
AQR5	Rollins Reservoir Minimum Pool	--	--	--
AQR6	Faucherie Lake Minimum Pool	--	--	--
AQR7	Fish Stocking in Rollins Reservoir	--	$40/year	$40/year
TERRESTRIAL RESOURCES				
TR1	Implement Invasive Weeds Management Plan on Federal Land	$125	$30/year	$43/year
TR2	Implement Vegetation Management Plan on Federal Land	$125	$30/year	$43/year
TR3	Pesticide and Herbicide Use Restrictions on Federal Land	--	--	--
TR4	Consult When Replacing Canal Wildlife Escape Facilities	--	$1/year	$1/year
TR5	Monitor Animal Losses in Project Canals	--	$3/year	$3/year
TR6	Bat Management	--	$3/year	$3/year
RECREATIONAL RESOURCES				
RR1	Jackson Meadows Recreation Area	$625	$185/year	$200/year
	French Lake Recreation Area	--	$1/year	$1/year
	Bowman Lake Recreation Area	$134	$20/year	$24/year
	Dutch Flat Recreation Area	$7	$3/year	$3/year
	Rollins Reservoir Recreation Area	$730	$244/year	$263/year
RR2	Provide Recreation Flow Information	--	$4/year	$4/year
RR3	Provide Supplemental Flows in Canyon Creek Below French Dam for Whitewater Boating	--	$5/year	$5/year

Table 7.1.3-3. (continued)

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Average Annual Costs ($1,000 per year)
LAND USE				
LU1	Implement Transportation Plan on Federal Land[2]	$835	$90/year	$118/year
LU2	Fire Prevention and Response Plan on Federal Land[2]	$30	$2/year	$3/year
CULTURAL RESOURCES				
CR1	Implement Historic Properties Management Plan[3]	$1,650	$14/year	$69/year
AESTHETIC RESOURCES				
AER1	Implement Visual Resource Management Plan on Federal Land	--	$5/year	$5/year
	Total	**$7,625**	**$440/year**	**$694/Year**

7.1.3.2.2 Indirect Cost of Environmental Measures – Lost Opportunity Cost Related to Power Generation

Several proposed measures affect power generation from the Yuba-Bear Hydroelectric Project. Estimates were made of the effect of environmental, recreational and engineering measures as compared to the No Action Alternative by applying Licensees' Operations Model to simulate the system under both scenarios.

- Minimum stream flows, ramping rates and required reservoir levels presented in Section 6.3, Aquatic Resources.
- Recreational flows and levels presented in Section 6.7, Recreational Resources.

Based on this analysis, a increase of 12 GWh would result from flows needed for environmental and recreational flow requirements at the proposed Yuba-Bear Hydroelectric Project including the Rollins Powerhouse Upgrade as shown in Table 7.1.3-4. The increase includes 6 GWh of on-peak energy and 6 GWh of off-peak energy.

Table 7.1.3-4. Summary of energy and capacity effects of environmental, engineering and recreation measures on the No Action Alternative of the proposed Yuba-Bear Hydroelectric Project, including the proposed Rollins No. 2 Powerhouse.

Power Benefits Effects	No Action Alternative	Change to No Action Alternative with NID's Proposed Yuba-Bear Hydroelectric Project and Rollins Powerhouse Upgrade
Dependable Capacity (MW)	42.2	No Change
Total Annual Generation (GWh)	275	287 (+12)
Total Annual RPS Generation (GWh)	141	158 (+17)
On-Peak	86	96 (+10)
Off-Peak	55	62 (+7)
Total Annual Non-RPS Generation (GWh)	133	129 (-4)
On-Peak	90	89 (-1)
Off-Peak	43	40 (-3)

7.1.4 Project Costs Under Alternative Proposals

As explained more fully in Appendix E2 of this FLA, NID did not identify any fully developed PM&E measure or new study request in the seven (non-FERC) comment letters that were filed in response to NID's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on NID's DLA).

NID is therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as would otherwise be required by the regulations.

7.1.4.1 Cost of Resource Protection, Mitigation, and Enhancement Measures Recommended by Others That Are Not Adopted in Licensee's Proposal

With respect to comments filed on NID's DLA, three general areas of proposals provided enough information that NID could attempt to perform a gross approximation (i.e., ±40%) of potential costs. These general areas were: 1) the agencies' requests regarding certain recreation facilities; 2) the agencies' requests regarding stocking of fish in Bowman Lake and Rollins Reservoir; and 3) FWN's request related to instream flows. The estimated costs of these recommended measures are shown in Table 7.1.4-1.

- Recreation: A direct comparison between the costs of the recreation measures in Licensee's Proposed Project and those proposed by the agencies has not been attempted because in many cases scope of work cannot be compared and cost categories do not consist of the same elements. Both NID's and the agencies' proposals include one-time costs for new capital improvements and enhancements to the existing Project recreation facilities, as well as annual costs to rehabilitate the improvements/enhancements. However, NID's costs also include annual costs for rehabilitation of the existing recreation facilities, and the operation, maintenance, and monitoring of all Project recreation facilities (existing and proposed), which are not included in the agencies and FWN costs. While NID has limited ability to evaluate these proposals and develop cost estimates, NID has attempted to estimate certain facilities associated with the agencies' recreation proposal. That cost estimates of about $12.4 million (one-time) and $80,000 annually are likely well below the total cost of the agencies request. For instance, NID's estimate is only for facilities for which a reasonable level of detail was provided. NID's estimate does not include monitoring or trails, for which little detail was provided. These additional but uncertain elements likely represent substantial additional costs.

- Fish Stocking at Bowman Lake and Rollins Reservoir – Licensee has adopted a measure to fund a specific amount of fish stocking at Bowman Lake and Rollins Reservoir. However information is lacking to evaluate the scope, benefits and costs of supporting 100 percent of CDFG's annual management target or historical average stocking in these reservoirs

(Bowman Lake and Rollins Reservoir). Licensee's cost estimate for CDFG's proposal is therefore highly uncertain.

- Instream Flows – NID has performed an Operations Model run[1] to evaluate FWN's flow proposal with regard to reservoir water elevations, water supply deliveries, and power generation. Those results are addressed in this section only as they relate to impacts on the Project's energy output and replacement power costs. NID did not perform a feasibility assessment regarding potentially complex engineering and operations aspects of FWN's proposed water releases. Therefore, capital costs related to unknown facility modifications or improvements to dams, gates, valves, flow gages, and potential lost generation during construction and increased O&M costs to maintain any new facilities, which collectively could be extremely expensive, are not included in NID's estimate.

Table 7.1.4-1. NID's gross approximation (±40%) of costs in 2011 dollars related to the Agencies' proposals regarding recreation facilities and stocking fish in Bowman Lake and Rollins Reservoir, and replacement power costs related to FWN's Proposed Project.

Proposer	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)
AQUATIC RESOURCES					
Agencies	Alternative Recreation Proposals	$12,437	$80 /yr	$0	$495 /yr
Agencies	Fish Stocking in Bowman Lake and Rollins Reservoir	$0	$115 /yr	$0 /yr	$115 /yr
FWN	Instream Flows	$0	$0 /yr	$4,267 /yr	$4,267 /yr
Total average annual costs of measures recommended by others not adopted by Licensee				$4,267 /yr	$4,877 /yr

7.1.5 Comparison of No Action Alternative and Licensees' Proposed Project

Table 7.1.5-1 compares the power value, annual costs, and net benefits of the No Action Alternative with NID's proposed Yuba-Bear Hydroelectric Project with the Rollins Powerhouse Upgrade.

Table 7.1.5-1. Summary of annual net benefits of continued operation of the Yuba-Bear Hydroelectric Project with the Rollins Powerhouse Upgrade as proposed by NID as compared to the No Action Alternative.

Net Benefits	No Action Alternative	NID's Proposed Yuba-Bear Hydroelectric Project with Proposed Rollins No. 2 Powerhouse
CAPACITY (MW)		
Nameplate (@ 0.9 power factor)		
ANNUAL POWER VALUE		
Annual Generation - GWh	275	287
Energy Benefits	---	---
On-Peak Energy Value	$13,989,400	$15,081,800
Off-Peak Energy Value	$7,717,000	$8,330,600
Total 2010 U.S. Dollars	$21,706,400	$23,412,400
Average 2010 U.S. Dollars/MWh	79	82

[1] See Section 3.6 in this Exhibit E.

Table 7.1.5-1. (continued)

Net Benefits	No Action Alternative	NID's Proposed Yuba-Bear Hydroelectric Project with Proposed Rollins No. 2 Powerhouse
ANNUAL COST		
Total 2010 U.S. Dollars	$7,794,000	$9,442,000
Average 2010 U.S. Dollars/MWh	28	33
ANNUAL NET BENEFIT		
Annual Net Benefit	---	---
Total 2010 U.S. Dollars	$13,912,000	$13,970,000
Average 2010 U.S. Dollars/MWh	51	49

Table 7.5.-1 shows the change in peak, off-peak and total generation that would occur to the No Action Alternative if FERC issued a new license for NID's proposed Project. NID proposes increasing minimum instream flows below numerous dams and diversions to enhance aquatic resources. It is estimated that these measures will decrease average annual generation at the Project by 6 GWh per year at a cost of about $400,000 per year. It is estimated that on-peak generation will decrease by 3.5 GWh per year, at a cost of $250,000 per year, and that off-peak generation will decrease by 2.5 GWh per year, at a cost of $150,000 per year. Other PM&E measures included in NID's proposed Project are estimated to result in an additional cost of about $1 million per year.
It is estimated that the proposed Rollins No. 2 Powerhouse will increase average annual generation at the Project by 18 GWh per year, resulting in additional generation revenue of about $2,100,000. This results in a net increase in Project generation of 12 GWh per year, and a net increase in Project generation value of about $1,700,000.

7.1.6 Other Economic Considerations

7.1.6.1 Water Supply

Currently, NID delivers 166,300 ac-ft of water to serve 6,000 agricultural and 18,900 domestic customers, and provides raw water to the cities of Grass Valley and Nevada City and to a portion of city of Lincoln. NID serves a population of approximately 80,600 people and the irrigation customers have about 29,800 acres under production.

There are no alternative surface water supplies to the customers in NID's service area. Nor is groundwater pumping a reliable alternative. Recently, some of the wells relied on in the area have failed, and NID has expanding its service to provide water to those people.

Based on an extrapolation of NID's 2010 updated Raw Water Mater Plan which projects demand to 2032, NID's total deliveries are projected to be about 250,000 ac-ft by the year 2062. In 2008, 117,500 ac-ft of the total deliveries came from water stored[2] and diverted through the Yuba-Bear Hydroelectric Project facilities. As demand increases over time, a greater withdrawal from

[2] The reservoirs in the Yuba-Bear Hydroelectric Project make up 81 percent of NID's total storage.

storage will occur to help meet this need. It is estimated that 201,300 ac-ft of the total projected 2062 demand will need to come from the Yuba-Bear Hydroelectric Project.

A major concern to the region's water supply is carryover storage, which if reduced will decrease the probability that NID can make the full water deliveries demanded by the region if Critically Dry Water Years or consecutive Dry Water Years occur.

Minimum instream flow and reservoir minimum pool measures included in NID's proposed Project were developed to provide adequate protection, mitigation and enhancement to affected resources, while protecting NID's water supply reliability. This becomes particularly evident when reviewing NID's proposed Project measures in Dry and Critically Dry water years. Based on Licensees' Operations Model runs, the proposed Project will have an insignificant effect on NID's ability to make water deliveries in the future as compared to the No Action Alternative.

See Exhibit E, Section 3 for a discussion of predicted impacts to power generation and water deliveries due to projected future (2062) water deliveries.

7.1.6.2 Air Quality

The existing Yuba-Bear Hydroelectric Project is a source of clean power with no air quality emissions. As such, the Project offsets the need for power from alternative generating facility. In the Western Electricity Coordinating Council (WECC) Power Region where the Project is located, it is likely that such a facility would be a combined cycle natural gas-fired generating facility, which does affect air quality by emitting greenhouse gases (GHG), the most prominent of which is carbon dioxide (CO_2). The amount of GHG emissions that would result from such a natural gas-fired facility is specific to the region, the composition of the fuel burned, and the amount of power produced. Using the Oak Ridge Competitive Electricity Dispatch (ORCED) computer model, NID estimates the regional carbon intensity factor would be 155 metric tons of carbon per GWh. Therefore, NID's existing Project, with an estimated annual generation of 274 GWh offsets annually approximately 42,500 metric tons of carbon emissions.

NID's proposed Project, not including the proposed Rollins No. 2 Powerhouse, would result in a loss in power generation of 6 GWh annually. This reduction in generation equates to approximately 930 metric tons of carbon emissions assuming the lost generation was replaced by a combined cycle natural gas-fired generating facility.

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SECTION 8
PG&E'S ECONOMIC ANALYSIS – DRUM-SPAULDING PROJECT

Pacific Gas and Electric Company (PG&E or Licensee) is providing the following economic analysis pursuant to the requirements of 18 CFR § 5.18(b)(4)(E).

8.1 Annual Operations and Maintenance Costs

PG&E's costs for owning and operating the Drum-Spaulding Project are shown in Table 8.1-1. Project cost components include unrecovered past capital additions, relicensing transaction costs, future capital additions, normal O&M, FERC fees, taxes, and insurance.

Table 8.1-1. Average annual cost of the Drum-Spaulding Project using FERC's current cost method for the No-Action Alternative (with 14 percent FCR and estimated costs in 2011 dollars).

Item	Capital, One-Time, or Repeating ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)
Replacement power costs	--	--	-$52,429 /yr	--
Net book value	$73,600	--	--	$10,304 /yr
FERC license application	$37,957	--	--	$5,314 /yr
Normal operations and maintenance	--	$13,600 /yr	--	$13,600 /yr
Future annual capital additions	$7,015 /yr		--	$11,926 /yr
FERC fees	--	$601 /yr	--	$601 /yr
Total No-Action Alternative average annual costs		$14,201 /yr	-$52,429 /yr	$41,744 /yr
Cost of Project power, with 739.1 GWh per year average annual energy				$56 /MWh
Net No-Action Alternative average annual costs				-$10,685 /yr

8.2 Estimated Cost of PG&E's Proposed Resource Protection, Mitigation, and Enhancement Measures

The estimated costs of PG&E's proposed resource protection, mitigation and enhancement (PM&E) measures for the Licensee's Proposed Project are shown in Table 8.2-1.

Table 8.2-1. Average annual cost of the Drum-Spaulding Proposed Project using FERC's current cost method with Licensee-proposed measures (with 14 percent FCR and cost in 2011 dollars).

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)
GENERAL					
DS-GEN1	Annual Consultation with Forest Service, BLM and BOR	--	$30 /yr	--	$30 /yr
DS-GEN2	Annual Employee Training	--	$60 /yr	--	$60 /yr

Table 8.2-1. (continued)

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)
GENERAL					
DS-GEN3	Develop and Implement Coordinated Operations Plan for the Drum-Spaulding Project and the Yuba-Bear Hydroelectric Project	$60	$10 /yr	--	$18 /yr
AQUATIC RESOURCES					
DS-AQR1	Streamflows (Part 1: Minimum and Target Streamflows; Part 2: Water Year Type; Part 3: Consecutive Dry Water Years; Part 4: Ramping Rates; Part 5: Streamflow Measurement)	$1,306	$50 /yr	$809 /yr	$233 /yr
DS-AQR2	Fordyce Lake Minimum Pool	--	--	--	$0 /yr
DS-AQR3	Fish Stocking in Lake Spaulding	--	$15 /yr	--	$15 /yr
TERRESTRIAL RESOURCES					
DS-TR1	Develop and Implement Integrated Vegetation Management Plan	$300	$60 /yr	--	$102 /yr
DS-TR2	Monitor Animal Losses in Project Canals	--	$3 /yr	--	$3 /yr
DS-TR3	Bear River Canal Deer Assessment	$160	$15 /yr	--	$37 /yr
DS-TR4	Channel Morphology and Riparian Vegetation Assessment in Bear Valley	--	$10 /yr	--	$10 /yr
RECREATIONAL RESOURCES					
DS-RR1	Implement Recreation Facilities Plan[1]				
	White Rock Lake Primitive Campsites	$30	$20 /yr	--	$25 /yr
	Meadow Lake Campground	$156	$34 /yr	--	$55 /yr
	Meadow Lake Shoreline Campsites	$115	$24 /yr	--	$40 /yr
	Meadow Knoll Group Campground	$10	$29 /yr	--	$30 /yr
	Meadow Lake Picnic Area (proposed)	$45	$22 /yr	--	$28 /yr
	Lake Sterling Walk-In Campground	$150	$29 /yr	--	$50 /yr
	Lake Sterling Primitive Campsite	$4	$25 /yr	--	$26 /yr
	Lake Sterling Dam railing	$270	$1 /yr	--	$38 /yr
	Fordyce Lake Primitive Campground	$95	$23 /yr	--	$36 /yr
	Lake Spaulding Campground	$270	$53 /yr	--	$90 /yr
	Lake Spaulding Boat Launch	$246	$89 /yr	--	$123 /yr
	Lake Spaulding Boat-In Campsites	$2	$33 /yr	--	$33 /yr
	Bear Valley Group Campground	$31	$49 /yr	--	$53 /yr
	Sierra Discovery Trail	$75	$42 /yr	--	$52 /yr
	Fuller Lake Day Use and Boat Launch	$311	$40 /yr	--	$84 /yr
	Fuller Lake Angler Access	$13	$19 /yr	--	$21 /yr
	Rucker Lake Walk-In Campground	$38	$29 /yr	--	$35 /yr
	Blue Lake Primitive Campsites	$1	$10 /yr	--	$10 /yr
	Carr Lake Walk-In Campground	$158	$16 /yr	--	$38 /yr
	Carr-Feeley Trailhead	$1	$13 /yr	--	$13 /yr
	Lower Lindsey Lake Campground	$126	$21 /yr	--	$39 /yr
	Lower Lindsey Trailhead	$32	$13 /yr	--	$18 /yr
	M. Lindsey, Culbertson, Rock Lakes Primitive Walk-In Campsites	$1	$12 /yr	--	$13 /yr

Table 8.2-1. (continued)

Measure No.	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)
RECREATIONAL RESOURCES (continued)					
DS-RR1 (continued)	Implement Recreation Facilities Plan[1] (continued)				
	Kidd Lake Group Campground	$51	$68 /yr	--	$75 /yr
	Upper Peak Lake shoreline access	$0	$4 /yr	--	$4 /yr
	Lower Peak Lake Primitive Campsites	$6	$5 /yr	--	$5 /yr
	Kelly Lake Picnic Area	$16	$10 /yr	--	$12 /yr
	Lodgepole Campground	$98	$66 /yr	--	$80 /yr
	Silvertip Day Use and Boat Launch	$1,184	$46 /yr	--	$212 /yr
	Lake Valley Group Campground (proposed)	$127	$68 /yr	--	$86 /yr
	Lake Valley Campground (proposed)	$936	$28 /yr	--	$159 /yr
	Deer Creek Forebay Angler Access	$2	$4 /yr	--	$4 /yr
	Alta Forebay	$2	$1 /yr	--	$1 /yr
	Drum Forebay	$2	$4 /yr	--	$4 /yr
	Drum Afterbay	$0	$1 /yr	--	$1 /yr
	Halsey Afterbay	$0	$1 /yr	--	$1 /yr
	Wise Forebay Shoreline Parking Area	$28	$6 /yr	--	$10 /yr
	Halsey Forebay Picnic Area	$9	$78 /yr	--	$79 /yr
	Rock Creek Reservoir	$0	$6 /yr	--	$6 /yr
DS-RR2	Provide Recreation Flow Information	$0	$4 /yr	--	$4 /yr
LAND USE					
DS-LU1	Implement Transportation Management Plan for Primary Project Roads	$2,240	$380 /yr	--	$694 /yr
DS-LU2	Implement Fire Prevention and Response Plan on Federal Land	$0	$2 /yr	--	$2 /yr
CULTURAL RESOURCES					
DS-CR1	Implement Historic Properties Management Plan	$3,060	$54 /yr	--	$482 /yr
AESTHETIC RESOURCES					
DS-AER1	Implement Visual Resource Management Plan on Federal Land	--	$3 /yr	--	$3 /yr
Total Licensee - Proposed Project Costs		$11,767	$1,736 /yr	$809 /yr	$3,383 /yr
Total Licensee - Proposed Project Average Annual Costs					$45,128 /yr
Cost of Production with 726 GWh/year average annual energy					$62 / MWh
Net Licensee - Proposed Project Average Annual Costs					-$6,492 /yr

[1] Costs provided for individual recreation facilities include capital improvements, near-term rehabilitation, cyclic rehabilitation and other elements of the Recreation Facilities Plan for operations and monitoring.

8.3 Estimated Value of Developmental Resources

8.3.1 Power Generation

The alternative sources of power currently available to PG&E are increased purchases and new generation developments. The California Public Utilities Commission (CPUC) periodically publishes market price referents (MPRs) which are an estimation of the long-term market prices of electricity that are used in evaluating bid products received during Renewable Portfolio Standards (RPS) power solicitations. The MPRs represent “the levelized price at which the proxy power plant revenues exactly equal the expected proxy power plant costs on a net-present value basis” (e.g., CPUC Market Price Referent Staff Report 2005). As a reference, the CPUC’s estimated 25-year levelized 2013 MPR is 11.2 cents per kWh. As a proxy for the cost of power used in the FERC current-cost methodology, as applicable, PG&E used both (1) the CPUC-published average monthly Short-Run Avoided Costs (SRAC) of 4.74 cents per kWh and 4.41 cents per kWh for peak and off-peak prices, respectively, for non-RPS-eligible powerhouses, and (2) assumed peak and off-peak prices of 9.74 cents per kWh and 9.41 cents per kWh, respectively, for RPS-eligible powerhouses. Using FERC's current cost method (Refer to Exhibit D), the resulting developmental value of the Project based on the gross annual replacement power cost is $52.4 million per year for the No-Action Alternative and $51.6 million per year for Licensee's Proposed Project. The net annual benefits (negative average annual cost) of the Project under the No-Action Alternative and Licensee's Proposed Project are approximately $10.7 million and $6.5 million per year, respectively. The developmental resource value of PG&E's Proposed Project does not include new power generation facility development. Because Newcastle Powerhouse is the most downstream facility in PG&E's Drum-Spaulding Project, its economic viability (measured in both annual energy and dependable capacity) is particularly subject to upstream water availability.

8.3.2 Other Developmental Resources

Although there are other consumptive water resources (e.g., domestic, irrigation and municipal water supply) that utilize some Project facilities (e.g., canals and reservoirs), those resources are managed under water contracts outside of FERC jurisdiction. PG&E sells this water under three contracts, each of which is described below.

- <u>PCWA Zone 1</u> – This contract makes up to 100,400 ac-ft of water available to PCWA. Under the existing contract terms, this water is worth approximately $217,260 per year. This contract expires on May 1, 2013.
- <u>PCWA Zone 3</u> – This contract makes up to 25,000 ac-ft of water available to PCWA. Under current contract prices, the value of this water is approximately $300,000 per year. The contract price is escalated based on the change in PG&E's short-run avoided cost (SRAC) energy price as paid to qualified facilities under the Public Utility Regulatory Policies Act (PURPA). Escalation is not included in this analysis. This contract has no expiration date.
- <u>NID</u> – This consolidated contract makes up to 59,600 ac-ft of water available to NID. Under current contract prices, the value of this water is approximately $242,517 per year. This contract expires on July 1, 2013.

Refer to Section 3.3.4 of this Exhibit E for a detailed discussion regarding current and projected future water demand.

Under PG&E's Proposed Project, PG&E expects to negotiate replacement contracts for the NID contract and the PCWA Zone 1 contract. However, negotiations regarding the two contracts have not advanced sufficiently at the time of this FLA to a point where PG&E can estimate future value. The PCWA Zone 3 contract remains in force during the term of PG&E's next FERC license and the contract and its value is expected to remain unchanged.

The market value of water under the future contracts is difficult to assess. The existing contract prices were negotiated in the late 1960's and were not indexed for inflation. There is no readily available index of current "market" prices to estimate future water revenue. The only readily available market data for water transactions are temporary, 1-year transactions. These transactions are not directly comparable to PG&E's anticipated long-term contract transactions.

Another method to determine value is replacement cost. However, replacement cost is highly variable depending on water supply alternatives, such as groundwater availability, potential dam sites, and potential for water conservation. PG&E cannot reasonably assess potential replacement water supply alternatives or the related value for NID and PCWA.

8.4 Project Costs Under Alternative Proposals

As explained more fully in Appendix E6 of this FLA, PG&E did not identify any fully developed PM&E measure or new study request in the nine (non-FERC) comment letters that were filed in response to PG&E's DLA. Specifically, there were no PM&E measures or study requests that provided the level of information that is required by both the regulations and the related FERC PM&E Guidance (FERC reiterated its PM&E Guidance in its January 31, 2011 letter providing comments on PG&E's DLA).

PG&E is therefore unable to thoroughly assess the scope and potential benefit of each of those requests and cannot provide FERC with a reasonable cost estimate for each proposed measure as would otherwise be required by the regulations.

8.4.1 Cost of Resource Protection, Mitigation, and Enhancement Measures Recommended by Others That Are Not Adopted in Licensee's Proposal

With respect to comments filed on PG&E's DLA, three general areas of proposals provided enough information that PG&E could attempt to perform a gross approximation (i.e., ±40%) of potential costs. These general areas were: 1) the agencies'[1] requests regarding certain recreation facilities; 2) the agencies' requests regarding stocking of fish in Fuller Lake and Lake Spaulding; and 3) FWN's[2] request related to instream flows. The estimated costs of these recommended measures are shown in Table 8.4-1.

- Recreation: A direct comparison between the costs of the recreation measures in Licensee's Proposed Project and those proposed by the agencies has not been attempted because in many cases scope of work cannot be compared and cost categories do not consist of the same elements. Both PG&E's and the agencies' proposals include one-time costs for new capital improvements and enhancements to the existing Project recreation facilities, as well as

1 Comments filed at FERC on Drum-Spaulding's DLA by USDA Forest Service, USDI Bureau of Land Management, USDI National Park Service, and California State Department of Fish and Game in a letter dated January 28, 2011.

2 Comments filed at FERC on Drum-Spaulding's DLA by Foothills Water Network in a letter dated February 1, 2011, did not include a comprehensive instream flow measure. Licensee's continued collaboration with FWN resulted in an instream flow regime for simulation purposes to determine power generation results (598 GWh per year) as described in Exhibit E, Section 3.6.2.3, used in this economic analysis.

annual costs to rehabilitate the improvements/enhancements. However, PG&E's costs also include annual costs for rehabilitation of the existing recreation facilities, and the operation, maintenance, and monitoring of all Project recreation facilities (existing and proposed), which are not included in the agencies and FWN costs. While PG&E has limited ability to evaluate these proposals and develop cost estimates, PG&E has attempted to estimate certain facilities[3] associated with the agencies' recreation proposal. That cost estimate of about $9.3 million (one-time) and $105,000 annually are likely well below the total cost of the agencies request. For instance, PG&E's estimate is only for facilities for which a reasonable level of detail was provided. PG&E's estimate does not include monitoring or trails, for which little detail was provided. These additional but uncertain elements likely represent substantial additional costs.

- Fish Stocking at Fuller Lake – Licensee has adopted a measure to fund a specific amount of fish stocking at Lake Spaulding. However information is lacking to evaluate the scope, benefits and costs of supporting 100 percent of CDFG's annual management target or historical average stocking in these reservoirs (Lake Spaulding and Fuller Lake). Licensee's cost estimate for CDFG's proposal is therefore highly uncertain.

- Instream Flows – PG&E has performed an Operations Model run[4] to evaluate FWN's flow proposal with regard to reservoir water elevations, water supply deliveries, and power generation. Those results are addressed in this section only as they relate to impacts on the Project's energy output and replacement power costs. PG&E did not perform a feasibility assessment regarding potentially complex engineering and operations aspects of FWN's proposed water releases. Therefore, capital costs related to unknown facility modifications or improvements to dams, gates, valves, flow gages, and potential lost generation during construction and increased O&M costs to maintain any new facilities, which collectively could be extremely expensive, are not included in PG&E's estimate.

[3] The recreation proposals by the Forest Service, NPS, BLM and CDFG ranged from broad concepts to those proposals that did include some specific information (such as upgrading a level 2 campground to a level 3, increasing the number of campsites and providing ADA access). PG&E found that this level of specificity was provided for 23 of the 40 existing Drum-Spaulding Project recreation facilities and for two entirely new campgrounds (one at Lower Lindsey Lake and one at Rucker Lake). The existing facilities for which this level of detail was provided included White Rock Lake Primitive Campsites, Meadow Lake Campground, Meadow Lake Shoreline Campsites, Meadow Knoll Group Campground, Lake Sterling Walk-In Campground, Lake Sterling Primitive Campsites, Lake Sterling Trail Development, Fordyce Lake Primitive Campground, Lake Spaulding Campground, Lake Spaulding Boat-In Camping, Fuller Lake Day Use and Boat Launch, Fuller Lake Angler Access, Rucker Lake Walk-In Campground, Blue Lake Hike-In Campsites, Carr Lake Walk-In Campground, Carr-Feeley Trailhead, Lower Lindsey Lake Campground, Lower Lindsey Trailhead, Middle/Upper Lindsey, Culbertson, Rock Lakes, Kidd Lake Group Campground, Upper Peak Lake, Lower Peak Lake and Kelly Lake Picnic Area. For these proposals, PG&E made a good faith effort to estimate the cost of the agencies' proposals. However, PG&E must emphasize that its estimate must be considered a very rough cost (i.e., ±40%) based on, at best, conceptual level input. Also, PG&E emphasizes that this cost estimate may not include all elements proposed by the agencies (e.g., agencies may have proposed other additions for which PG&E could not develop even a rough estimate because the proposal was not sufficiently detailed).

[4] See Section 3.6.2.3 in this Exhibit E.

Table 8.4-1. PG&E's gross approximation (±40%) of costs in 2011 dollars related to the Agencies' proposals regarding recreation facilities and stocking fish in Fuller Lake, and replacement power costs related to FWN's Proposed Project.

Proposer	Measure	Capital, One-Time, or Repeating Cost ($1,000s or $1,000 per year)	Annual Expense ($1,000 per year)	Replacement Power Costs ($1,000 per year)	Average Annual Costs ($1,000 per year)[1]
AQUATIC RESOURCES					
Agencies	Alternative Recreation Proposals	$9,296	$105	$0	$1,407
Agencies	Fish Stocking in Fuller Lake	$0	$30 /yr	$0 /yr	$30 /yr
FWN	Instream Flows	$0	$0 /yr	$9,546 /yr	$0 /yr
Total average annual costs of measures recommended by others not adopted by Licensee				$9,546 /yr	$1,437 /yr

[1] Average annual costs do not include replacement power costs.

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SECTION 9
CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the Federal Power Act (FPA) requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving waterways affected by the project. On April 27, 1988, FERC issued Order No. 481-A revising Order No. 481, issued October 26, 1987, establishing that FERC will give FPA Section 10(a)(2)(A) comprehensive plan status to any federal or State plan that meet the following three criteria:

- It is a comprehensive study of one or more of the beneficial uses of a waterway or waterways;
- It specifies the standards, the data, and the methodology used to develop the plan; and
- It is filed with FERC.

A review of FERC's *Revised List of Comprehensive Plans* (http://www.ferc.gov/industries/hydropower/gen-info/licensing/ complan.pdf) shows that the Commission has listed, under Section 10(a), 61 comprehensive plans for the State of California. On October 6, 2008, in its revised SD2, FERC identified 20 comprehensive plans that it considered to be relevant to the projects. As required by 18 CFR § 5.18(b)(5)(ii)(F), this section provides an explanation of how and why each of the proposed projects would, would not, or should not comply with each of the 20 plans, or in some cases, directs the reader to the appropriate section of the FLA for an in depth discussion of compliance with the plan. To facilitate FERC's review, the plans are discussed below in the order presented by FERC in its revised SD2, and the full reference for each plan is provided. As of the time these FLAs are filed, relevant resource agencies have not made a formal determination regarding the consistency of each of the proposed projects with any qualifying comprehensive plans.

1. California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, California. 84 pp.

The California Advisory Committee on Salmon and Steelhead Trout was established by California legislation in 1983 to develop a strategy for the conservation and restoration of salmon and steelhead resources in California. To streamline its process, the committee divided California's steelhead and salmon resources into 11 groups. The report focuses mostly on the Central Valley. The committee recommended, among other things, that California should seek to double its steelhead and salmon populations, and recommended strategies to do so. Many of the recommendations were advanced and discussed in subsequent related publications described below.

The only location where PG&E has identified it may have an effect on salmon and steelhead is in Auburn Ravine. PG&E's analysis of this potential effect is addressed in Section 6.5 of this

Exhibit E. Given the conclusions reached in Section 6.5 that there are no salmon or steelhead present, this plan does not apply.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

2. California Department of Fish and Game. U.S. Fish and Wildlife Service. National Marine Fisheries Service. Bureau of Reclamation. 1988. Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River Basin. Sacramento, California. May 20, 1988. 10 pp.

This cooperative agreement was made by the BOR, USFWS, NMFS and CDFG. The purpose of the agreement was to implement actions that would improve the status of winter-run Chinook salmon in the Sacramento River basins.

The agreement identified eight measures that would be followed by the identified parties. The measures generally included: a revised gate operation schedule for Red Bluff Diversion Dam, implementing a thermal control at Shasta Reservoir, correcting pollution from Spring Creek, restoring habitat in the Redding, CA area, correcting salmon-related problems at the Anderson-Cottonwood Irrigation District Diversion Dam, restricting in-river harvest of winter-run salmon, developing a winter-run propagation program at Coleman Hatchery, modifying the Keswick fish trap to prevent mortality of winter-run Chinook, expanding studies on winter-run Chinook, and developing fish passage alternatives to raising the Red Bluff Diversion Dam gates. The management plan also identified other ongoing measures that each participating party was undertaking to benefit winter-run salmon.

There are no winter-run Chinook salmon in any location where the Drum-Spaulding Project may have an effect. Thus, there are not additional measures that PG&E can reasonably take to be consistent with this plan.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

3. California Department of Fish and Game. 1990. Central Valley salmon and steelhead restoration and enhancement plan. Sacramento, California. April 1990. 115 pp.

This plan was released by CDFG in April 1990. This plan is intended to outline CDFG's restoration and enhancement goals for salmon and steelhead resources of the Sacramento and San Joaquin river systems and to provide direction for various CDFG programs and activities. This plan is also intended to provide the understanding and persuasive arguments for the restoration and enhancement of the State's salmon and steelhead resources.

The only location where PG&E has identified it may have an effect on salmon and steelhead is in Auburn Ravine. PG&E's analysis of this potential effect is addressed in Section 6.5 of this Exhibit E. Given the conclusions reached in Section 6.5, and given that this plan does not specifically address Auburn Ravine this plan does not apply.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

4. California Department of Fish and Game. 1993. Restoring Central Valley streams: A plan for action. Sacramento, California. November 1993. 129 pp.

This plan was released by CDFG in November 1993. The goals of the plan, all targeted toward anadromous fish, are to restore and protect California's aquatic ecosystems that support fish and wildlife, to protect threatened and endangered species, and to incorporate the State legislature mandate and policy to double populations of anadromous fish in California. The plan encompasses only Central Valley waters accessible to anadromous fish, excluding the Sacramento-San Joaquin Delta.

The only location where PG&E has identified it may have an effect on salmon and steelhead is in Auburn Ravine. PG&E's analysis of this potential effect is addressed in Section 6.5 of this Exhibit E. Given the conclusions reached in Section 6.5 that there are no salmon or steelhead present, this plan does not apply.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

5. California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February 1996. 234 pp.

This plan was released by CDFG in February 1996. This plan focuses on restoration of native and naturally produced (wild) stocks because these stocks have the greatest value for maintaining genetic and biological diversity. Goals for steelhead restoration and management are: 1) increase natural production, as mandated by *The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988*, so that steelhead populations are self-sustaining and maintained in good condition; and 2) enhance angling opportunities and non-consumptive uses.

The only location where PG&E has identified it may have an effect on salmon and steelhead is in Auburn Ravine. PG&E's analysis of this potential effect is addressed in Section 6.5 of this Exhibit E. Given the conclusions reached in Section 6.5 that there are no salmon or steelhead present, this plan does not apply.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

6. California Department of Parks and Recreation. 1998. Public Opinions and Attitudes on Outdoor Recreation in California. Sacramento, California. March 1998.

California Department of Parks and Recreation's (CDPR) Public Opinions and Attitudes in Outdoor Recreation survey (POAOR), the most recent version of which is dated 2002, provides information used in the development of the CDPR's California Outdoor Recreation Plan (CORP). The POAOR identifies: 1) California's attitudes, opinions, and values with respect to outdoor recreation; and 2) demand for, and participation in, 42 selected outdoor recreation activities.

This document applies to recreation facilities owned and operated by the State or local parks and recreation agencies. Therefore, the plan has no direct application to the proposed projects other than general guidance.

7. California Department of Parks and Recreation. 1980. Recreation outlook in Planning District 3. Sacramento, California. June 1980. 82 pp.

Although this plan is included in FERC's revised SD2 as one that is relevant to the projects, Licensees were not able to obtain a copy of this plan from the Internet, FERC, CDPR or other sources. CDPR advised Licensees that the document is out-of-date and irrelevant due to the State's CORP documents that are revised every 4 years. CDPR stated that the State's CORP documents are the primary recreation planning documents.

8. California Department of Parks and Recreation. 1994. California Outdoor Recreation Plan. Sacramento, California. April 1994.

The objectives of CDPR's CORP, the most recent version of which is dated 2002, are to determine outdoor recreation issues (problems and opportunities) most critical in California, and to explore the most appropriate actions that State of California and local agencies, which manage State and local parks, could take to address those issues. The CORP also provides valuable information on the State's recreation policy, code of ethics, and statewide recreation demand, demographic, economic, political, and environmental conditions. The plan lists the following major issues: 1) improving resource stewardship; 2) serving a changing population; 3) responding to limited funding; 4) building strong leadership; 5) improving recreation opportunities through planning and research; 6) responding to the demand for trails; and 7) halting the loss of wetlands. The CORP applies to State and local parks and recreation agencies, and does not apply to federal and private-sector recreational providers.

Because neither the projects nor the related recreation facilities are State or local parks managed by State or local agencies, the CORP has no direct application to the proposed projects.

9. California Department of Water Resources. 1983. The California water plan: Projected use and available water supplies to 2010. Bulletin 160–83. Sacramento, California. December 1983. 268 pp.

The California Department of Water Resources (CDWR) first published the California Water Plan in 1957. The plan focused on the quantity and quality of water available to meet the State of California's water needs, and management actions that could be implemented to improve the State's water supply reliability. Since then, CDWR has updated the plan numerous times including in 1983 (the reference used in FERC's July 2010 List of Comprehensive Plans for the California Water Plan) and 1994 (the reference used in FERC's July 2010 List of Comprehensive Plans for the California Water Plan Update). The most recent update to the Water Plan was in December 2005.

The projects are located in what the Water Plan calls the "Sacramento River Hydrologic Region." The projects' reservoirs represent a portion of the water supply in the hydrologic region. The proposed projects comply with California Water Plan as updated.

10. California Department of Water Resources. 1994. California water plan update. Bulletin 160–93. Sacramento, California. October 1994. Two volumes and Executive Summary.

This document is an update to the California Water Plan discussed above. As stated above, the proposed projects comply with California Water Plan as updated.

11. California Department of Water Resources. 2000. Final programmatic environmental impact statement/environmental impact report for the CALFED Bay-Delta Program. Sacramento, California. July 2000. CD Rom, including associated plans.

The California Water Policy Council and the Federal Ecosystem Directorate united in June 1994 to form CALFED. In June 1995, CALFED established its Bay-Delta Program (Program) to develop a long-term, comprehensive solution to environmental issues in the Sacramento-San Joaquin Delta and San Francisco Bay. The Program is a cooperative, interagency effort involving 15 state and federal agencies with management and regulatory responsibilities in the San Francisco Bay-San Joaquin Delta Estuary (Bay-Delta).

The Program was divided into three phases. In Phase I, completed in September 1996, the Program identified the problems confronting the Bay-Delta, developed a mission statement, and developed guiding principles. Following scoping, public comment, and agency review, the Program identified three preliminary alternatives to be further analyzed in Phase II. The three Phase II preliminary alternatives each included Program elements for levee system integrity, water quality improvements, ecosystem restoration, water use efficiency, and three differing approaches to conveying water through the Bay-Delta.

In Phase II, completed in July 2000, the Program refined the preliminary alternatives, conducted a comprehensive programmatic environmental review, and developed implementation strategies.

The Program added greater detail to each of the Program elements and crafted frameworks for two Program elements: water transfers and watershed management. The Phase II report contains a general summary of the Program plans. More fundamentally, the report also describes the Program process, the fundamental Program concepts that have guided their development, and analyses that have contributed to Program development. Further, this report describes how this large, complex Program may be implemented, funded, and governed in the future. The following plans outline Program actions:

- Ecosystem Restoration Program (ERP) Plan (Volumes 1, 2, and 3)
- Water Quality Program Plan
- Water Use Efficiency Program Plan
- Water Transfer Program Plan
- Levee System Integrity Program Plan
- Watershed Program Plan

The goals of the Water Quality and Watershed programs under CALFED include improving overall water quality by reducing the loadings of many constituents of concern that enter Bay-Delta tributaries from point and non-point sources. Targeted constituents include heavy metals (such as mercury), pesticide residues, salts, selenium, pathogens, suspended sediments, adverse temperatures, and disinfection byproduct precursors (DBP) such as bromide and total organic carbon (TOC). The remaining Program plans include the:

- Implementation Plan
- Multi-species Conservation Strategy (MSCS)
- Comprehensive Monitoring, Assessment, and Research Program (CMARP)

In Phase III, completed in July 2000, the final programmatic Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) described the broad environmental consequences of proposed actions and enabled decisions to be made regarding Program direction and content. Information from the final programmatic EIS/EIR will be incorporated by reference into subsequent tiered environmental documents for specific projects in accordance with NEPA and CEQA guidelines.

The proposed projects’ reservoirs do not feed directly into the Bay-Delta. The flow into the Bay Delta is controlled by other parties downstream of each project. For example, releases from Jackson Meadows Reservoir on the Middle Yuba River flow through YCWA’s New Bullards Bar Reservoir or USACE’s Englebright Reservoir, or both. Therefore, the Program has no direct application to the proposed projects.

12. California State Water Resources Control Board. 1975. Water quality control plan report. Sacramento, California. Nine volumes.

This reference is to the first edition of the water quality control plans adopted by the SWRCB pursuant to the Clean Water Act. The nine plans, which apply to different areas of California, formally designate existing and potential beneficial uses and water quality objectives. The water quality control plan that is applicable to the Project Area is the Central Valley Regional Water Quality Control Board's (CVRWQCB) Water Quality Control Plan for the Sacramento River and San Joaquin river basins, which is referred to as the Basin Plan in this document. The SWRCB has updated the water quality control plans a number of times since 1995. The most recent version of the Sacramento River and San Joaquin River Basin Plan is 2007.

Section 6.2 (Water Resources) of this joint Exhibit E includes a detailed discussion regarding compliance of each proposed project with the Basin Plan.

13. The Resources Agency. 1983. Department of Parks and Recreation. Recreation needs in California. Sacramento, California. March 1983. 39 pp and appendices.

In response to the Roberti-Z'berg Urban Open Space and Recreation Program Act of 1976, the CDPR conducted a statewide recreational needs assessment. The report consisted of two major elements: 1) the Recreation Patterns Study that surveyed current participation and projected recreation demand; and 2) the Urban Recreation Case Studies that examined the leisure behavior and needs of seven underserved populations. The purpose of the needs analysis was to: 1) develop statewide recreation planning data; 2) analyze the recreation needs of California's urban residents; and 3) modify project selection criteria used in the administration of grants to local agencies under the Roberti-Z'berg Act.

In general, this report is a wide-ranging, programmatic document providing guidance for statewide planning. The urban-specific study has little relevance to the proposed projects, which are located in primarily remote and primitive areas. Therefore, the programmatic document has no direct application to the proposed projects.

14. The Resources Agency. 1989. Upper Sacramento River fisheries and riparian habitat management plan. Sacramento, California. January 1989.

The California Resource Agency is a state cabinet-level agency in the government of California that was appropriated funds through a bill (SB 1086) to develop a management plan for fisheries and riparian habitat resources of the Sacramento River. The purpose of the plan is to identify specific actions that will help restore the Sacramento River fishery and protect or restore riparian habitat. These identified actions provide a framework for regulating agencies to plan for future activities.

The product of the plan identified six conclusions. The conclusions generally: stated that the Sacramento River is important for anadromous fish; noted that winter- and spring-run salmon populations are at dangerously low levels and less than 5 percent of riparian habitat remains on the Sacramento River; suggested restoration measures in the plan will restore anadromous fisheries and benefit other resources; asserted that implementing the plan will require a significant commitment amongst state and federal regulators along with local funding; and, stated that responsibility for the implementation is expected to be 75 percent federal and 25 percent state responsibility.

The plan also provided four recommendations. These recommendations were: state and federal legislation is needed soon to take action; the State of California should seek funding through multiple propositions to share cost; identified implementation measures should be conformed to by indentified priorities; and, an Upper Sacramento River Advisory Council should be created with authority to implement the plan.

The overall implementation of the plan occurs outside of the area of the proposed projects and is not directly affected by the operation of the projects. Thus, the implementation actions have no specific relevance to operation or management of the proposed projects.

15. Forest Service. 1990. Tahoe National Forest Land And Resource Management Plan as amended by the Sierra Nevada Forest Plan Amendment Supplemental Environmental Impact Statement – Record of Decision (SEIS), June 2004. U.S. Department of Agriculture, Forest Service, Nevada City, California. 687 pp.

The Forest and Rangeland Renewable Resources Planning Act (FRRPA) requires that each National Forest prepare an initial forest plan that provides direction for the efficient use and protection of forest resources within their administrative boundaries. The Tahoe National Forest's LRMP was adopted in 1990. The LRMP sets two levels of management direction: one is Forest-wide and the other is Area-specific. With respect to Forest-wide management, direction comes from Forest-wide Goals, Objectives and Standards and Guidelines. Area-specific direction is set forth in the Management Direction for 106 areas and includes Management Area Emphasis, Standards and Guidelines, and Practices. The LRMP addresses resources throughout the Forest.

The LRMP is complex and applies to resource areas as diverse as water quality to visual resources. Refer to Section 6 of this joint Exhibit E for a discussion of potential effects of the proposed projects on resources of interest to the Forest Service. Of note, the Forest Service has been an active participant in the relicensings of the projects.

16. State Water Resources Control Board. 1999. Water quality control plans and policies adopted as part of the State comprehensive plan. April 1999.

This citation in FERC's List of Comprehensive Plans refers to an April 1999 submittal by the SWRCB to FERC of a listing of all SWRCB plans and policies. The transmittal referenced that all of the listed plans and policies are part of the "State Comprehensive Plan," even though it does not exist as a single plan.

As described above, the most pertinent SWRCB plan or policy that applies to each of the proposed projects is the Basin Plan, and each of the proposed projects' compliance with the Basin Plan is discussed in detail in Section 6.2 (Water Resources).

17. U.S. Fish and Wildlife Service, California Department of Fish and Game, California Waterfowl Association, and Ducks Unlimited. 1990. Central Valley habitat joint venture implementation plan: a component of the North American waterfowl management plan. February 1990.

The California Central Valley Habitat Joint Venture (CVHJV) is one of 12 current joint ventures charged with implementation of the North American Waterfowl Management Plan. The CVHJV was formally established by a working agreement signed in July 1988 and is guided by an Implementation Board comprised of representatives from the California Waterfowl Association, Defenders of Wildlife, Ducks Unlimited, National Audubon Society, Waterfowl Habitat Owners Alliance, and The Nature Conservancy. Technical assistance is provided to the Implementation Board by the USFWS, CDFG, California Department of Food and Agriculture, and other organizations and agencies.

The Central Valley of California is the most important wintering area for waterfowl in the Pacific Flyway, supporting 60 percent of the total population. Historically, the Central Valley contained more than 4 million acres of wetlands; however, only 291,555 acres remained in 1990 when the CVHJV was first implemented. The primary cause of this wetland loss was conversion to agriculture, flood control, and navigation projects, and urban expansion.

When completed, the CVHJV will: 1) protect 80,000 acres of existing wetlands through the fee acquisition or conservation easement; 2) restore 120,000 acres of former wetlands; 3) enhance 291,555 acres of existing wetlands; 4) enhance waterfowl habitat on 443,000 acres of private agricultural land; and 5) secure 402,450 acre-feet of water for existing State Wildlife Areas, National Wildlife Refuges, and the Grasslands Resource Conservation District. These habitat conservation efforts are intended to result in a fall flight of 1 million ducks and 4.7 million wintering ducks. The wintering birds will include 2.8 million pintails, a species whose wintering population is vitally dependent on the Central Valley.

The CVHJV is a regional approach to conservation and management of waterfowl populations in the Central Valley, but has no specific relevance to operation and management of either of the proposed projects.

18. U.S. Fish and Wildlife Service. 2001. Final restoration plan for the anadromous fish restoration program. Department of the Interior, Sacramento, California. January 9, 2001

This plan was released by USFWS as a revised draft on May 30, 1997 and adopted as final on January 9, 2001. This plan identifies restoration actions that may increase natural production of anadromous fish in the Central Valley of California. This plan is split up into watersheds within the Central Valley and restoration actions are identified for each watershed. It also lists the involved parties, tools, priority rating, and evaluation of each restoration action. The plan encompasses only Central Valley waters accessible to anadromous fish, including the Sacramento-San Joaquin Delta.

The only location where PG&E has identified it may have an effect on salmon and steelhead is in Auburn Ravine. PG&E's analysis of this potential effect is addressed in Section 6.5 of this Exhibit E. Given the conclusions reached in Section 6.5 that there are no salmon or steelhead present, this plan does not apply.

NID concluded that the plan does not apply to the Yuba-Bear Hydroelectric Project because the plan pertains specifically to anadromous fish, and anadromous fish do not occur in the geographic scope of the Yuba-Bear Hydroelectric Project, as defined by FERC in SD2.

19. National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, D.C. January 1982.

The Nationwide Rivers Inventory (NRI) is a listing by the NPS of more than 2,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values (ORVs) judged to be of more than local or regional significance. In addition to these eligibility criteria, river segments are divided into three classifications: Wild, Scenic, and Recreational river areas. Under a 1979 Presidential Directive and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments. Such adverse impacts could alter the river segment's eligibility for listing and/or alter their classification. Table 9.0-1 details the segments of river in area of the projects listed on the NRI.

Table 9.0-1. River Reach Segments related to Drum-Spaulding Project and Yuba-Bear Hydroelectric Project that are listed in the Nationwide Rivers Inventory.

Reach	Length (miles)	Year Listed/ Updated	Potential Classification	ORVs	Description
MIDDLE YUBA RIVER					
Milton Diversion Dam to confluence with Wolf Creek	17	1982/1993	Wild, Scenic, Recreational	Scenery, Fish	Box canyons are most significant features.
Confluence with Wolf Ck to Our House Dam	14	1982/1993	Wild, Scenic, Recreational	Scenery, Fish	Scenic, rocky stream channel cuts through numerous box canyons in a series of pools, falls and cascades; surrounded by dense conifer-hardwood forest; generally inaccessible; trophy brown trout and good rainbow trout stream.
SOUTH YUBA RIVER					
Lake Spaulding to Englebright Reservoir	39	1982		Scenery, Recreation, History	Boulder-strewn stream channel flows mostly through deep canyons hemmed in by sharp, steep ridges; area is precipitous and rugged in lower reaches; generally inaccessible by road except for valley area near Washington; outstanding trail system in lower reaches including one of a few wilderness handicap trails; popular recreation resource, historic remnants of gold mining activities border river.

Table 9.0-1. (continued)

Reach	Length (miles)	Year Listed/ Updated	Potential Classification	ORVs	Description
SOUTH YUBA RIVER (continued)					
Lake Spaulding to 0.5 mile below confluence with Fall Creek	6	1982/1993	Scenic, Recreational	Scenery, Recreation, History	Remnants of South Yuba Canal Company wooden flume. Evidence of historic mining activity.
0.5 mile below confluence with Fall Ck to confluence with Poorman Ck	8	1982/1993	Recreational	Scenery, Recreation, History	See initial comments for entire 39-mile segment.
Confluence with Poorman Creek to Forest Boundary, about 0.3 mile below confluence with New York Canyon	7	1982/1993	Scenic, Recreational	Scenery, Recreation, History	See initial comments for entire 39-mile segment.

Source: Nationwide Rivers Inventory. 2004. USDOI National Park Service (http://www.nps.gov/rtca/nri/states/ca.html).

Each of the proposed projects complies with the plan because the projects would not alter the current flows or character of the above river segments to the extent that the NPS's classifications of the river segments would change.

20. U.S. Fish and Wildlife Service. Undated. The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. Washington, D.C. undated

This is a 12-page policy that was signed by John F. Turner, then Director of the USFWS, on December 5, 1989. Its purpose is to unite all of the USFWS's recreational fisheries capabilities under a single policy to enhance the nation's recreational fisheries. Regional and Assistant directors are responsible for implementing the policy by incorporating its goals and strategies into planning and day-to-day management efforts. The USFWS carries out this policy relative to FERC-licensed hydroelectric projects through such federal laws as the Fish and Wildlife Coordination Act, the Clean Water Act, the ESA, NEPA Act, and the FPA, among others.

The proposed projects support recreational fishery in the projects' reservoirs and in streams below the projects' facilities. In addition, each of the proposed projects will comply with all federal and State laws.

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SECTION 10
CONSULTATION DOCUMENTATION

Pursuant to 18 CFR § 5.18(b)(5)(C)(ii)(G), in this section Licensees summarize the consultation process with federal and state agencies, Native American tribes and members of the public (collectively referred to with Licensees in this document as Relicensing Participants) that occurred in preparation of this environmental analysis for the projects. In addition, Appendix E1 includes a list containing the name and address of every federal, State of California, and local agency; tribe; non-governmental organization; and unaffiliated member of the public with which Licensees consulted during the relicensings.

10.1 NID's and PG&E's Coordination for Consultation

NID and PG&E coordinated and cooperated in the relicensings of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project.[1] The two projects are located at least in part in the Yuba River and Bear River basins. Portions of both projects are located on public land managed by the United States Department of Agriculture, Forest Service as part of the Tahoe National Forest (TNF) and by the United States Department of Interior (USDOI), Bureau of Land Management (BLM). In addition, the Drum-Spaulding Project is located in part on public land managed by the USDOI, Bureau of Reclamation (BOR) as part of the Folsom Dam Project. Both projects have licenses that expire on April 30, 2013. NID and PG&E have historically closely coordinated the operations of the Yuba-Bear Hydroelectric Project and the Drum-Spaulding Project. Also, both NID and PG&E used the Commission's Integrated Licensing Process (ILP) for relicensing their respective projects.

To facilitate consultation, Licensees have established and maintained relicensing websites that provide access to pertinent documents and information regarding the projects and the relicensings. The relicensing address for NID's Yuba-Bear Hydroelectric Project is www.nid-relicensing.com, and the website for PG&E's Drum-Spaulding Project is www.drumspauldingrelicensing.com. For efficiency purposes, all process information is placed on the www.nid-relicensing.com website.

10.2 Commission's Scoping

Under the Commission's regulations, issuing a licensing decision for any project first requires preparation of either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), in accordance with NEPA. The preparation of an EA or EIS is supported by a scoping process to ensure the identification and analysis of all pertinent issues.

[1] NID and PG&E included in this coordination the relicensing of PG&E's Rollins Transmission Line Project, FERC Project No. 2784. PG&E plans to file a separate Exhibit E for the Rollins Transmission Line Project. As a result, this section on Relicensing Consultation does not address PG&E's consultation regarding the Rollins Transmission Line Project relicensing.

On May 22, 2008, the Commission issued a notice of intent to prepare a multi-project EIS, and issued Scoping Document 1 (SD1) for the combined relicensings of the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project (and Rollins Transmission Line Project). SD1 provided Relicensing Participants with FERC's preliminary list of issues and alternatives to be addressed in a joint EIS and enabled Relicensing Participants to more effectively participate in and contribute to the scoping process.

The Commission conducted site visits for the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project on June 17, 18, and 19, 2008, and held two public scoping meetings for the projects in Auburn and Grass Valley, California, on June 24, 2008. The scoping meetings and site visits were announced in a local newspaper and the Federal Register. According to the sign-in sheets, 28 individuals (exclusive of Commission staff) attended the June 24 daytime scoping meeting and 41 individuals attended the June 24 evening scoping meeting. The meetings were recorded and the transcript posted by the Commission on its internet E-Library.

The Commission requested that written comments on SD1 and Licensees' PADs be provided to the Commission no later than August 11, 2008. In addition to the oral comments received during the scoping meetings and comments from Licensees, the Commission received 15 comment letters by the August 11, 2008, deadline and one comment letter after the deadline. In addition, Commission staff issued a letter to Licensees regarding conceptual plans that would implement environmental measures. The comment letters and the document to which they apply are shown in Table 10.2-1.

Table 10.2-1. List of comment letters filed on the Commission's SD1 and Licensees' PADs.

Commenting Entity	Date Filed	Document to Which Comments Applied		
		Commission's SD1	NID's Yuba-Bear Hydroelectric Project PAD	PG&E's Drum-Spaulding Project PAD
City of Roseville	July 30, 2008	X	--	X
FERC Staff	August 8, 2008	--	X	X
Foothill Water Network	August 10, 2008	--	X	X
Joint letter from US Department of Agriculture, Forest Service; US Department of Interior (USDOI), Bureau of Land Management; USDOI, National Parks Service (NPS); US Department of Commerce, National Oceanic and Atmospheric Administration, Marine Fisheries (NMFS); State Water Resources Control Board (SWRCB), and California Department of Fish and Game.	August 11, 2008	X	X	X
NMFS	August 11, 2008	X	X	X
SWRCB	August 11, 2008	X	X	X
Colfax-Todds Valley Consolidated Tribe	August 11, 2008	--	X	X
Placer County Water Agency	August 11, 2008	X	--	X
Social Alliance Network	August 11, 2008	--	X	X
American Rivers	August 11, 2008	--	X	X
Sackheim Consulting	August 11, 2008	--	X	X
Tyrone Gorre	August 11, 2008	--	X	X
Kelly Janes/Rorie Gotham	August 11, 2008	X	X	X
PG&E	August 11, 2008	X	--	--
NID	August 11, 2008	X	--	--

Table 10.2-1. (continued)

Commenting Entity	Date Filed	Document to Which Comments Applied		
		Commission's SD1	NID's Yuba-Bear Hydroelectric Project PAD	PG&E's Drum-Spaulding Project PAD
Gail Mackenroth	August 11, 2008	--	X	X
South Yuba River Citizens League	August 20, 2008	X	X	X
	Total	**9**	**13**	**15**

Based on the Commission's review of the NOIs, PADs and written comments, on September 25, 2008, the Commission issued Scoping Document 2 (SD2).

The Commission issued a revised SD2 on October 6, 2008. Three parties filed comments on revised SD2: California Salmon and Steelhead Alliance on November 8, 2008; Save Auburn Ravine Salmon and Steelhead on December 15, 2008; and NMFS on December 17, 2008. The Commission did not issue an additional scoping document.

10.3 Relicensing Studies

10.3.1 FERC's Determination on Revised Study Plan

Beginning in mid 2007, over 9 months prior to filing their NOIs and PADs, Licensees began to meet with other Relicensing Participants to familiarize them with the projects and operations; discuss process; identify issues; and, most importantly, to collaboratively develop study proposals. After over 150 meetings, Licensees filed their respective Revised Study Plans[2] with the Commission on January 23, 2009. The majority of the studies proposed by Licensees in their Revised Study Plans had reached a "can live with it" threshold by Licensees and other Relicensing Participants.[3]

On February 23, 2009, FERC issued a joint Study Plan Determination (FERC's Determination) for the projects. The Determination directed NID and PG&E to jointly perform 36 studies, and PG&E to perform one additional study (Study 2.3.13, Western Placer County Streams) unique to the Drum-Spaulding Project.

On March 16, 2009, the Forest Service and BLM jointly filed a Notice of Study Dispute with FERC and, pursuant to 18 CFR § 5.14, requested formal dispute resolution on five studies included in FERC's Determination. The issues connected to the five studies raised in the Forest Service's and BLM's joint Notice of Study Dispute were resolved among Licensees, the Forest Service and BLM without formal dispute resolution, and the resolution did not affect the studies in FERC's Determination (i.e., no studies were added or removed - there were only scope changes made to some studies).

[2] Licensees filed with FERC Proposed Study Plans on September 25, 2008.
[3] Licensee and other interested Relicensing Participants had stated they "can live with" each of the detailed study proposal consistent with the "can live with it" consensus process described in Section 2.3.6.8 of the each PAD.

Licensees each filed with FERC a Study Progress Report on September 16, 2009.

10.3.2 FERC's Determination on Initial Study Report

Licensees filed with FERC an Initial Study Report on March 17, 2010; held an Initial Study Report meeting on March 30, 2010; and filed with FERC an Initial Study Report meeting summary on April 14, 2010. Licensees proposed to modify six FERC-approved studies to include additional data gathering in 2010.

Nine letters regarding Licensees' Initial Study Report were filed with FERC. Table 10.3.2-1 lists the commenters, the date of their letter, and the Project or projects to which the comment letters applied.

Table 10.3.2-1. Comment letters filed with FERC regarding NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project.

Commenter	Date on Letter	To Which Project(s) Comment Letter Applied	
		NID's Yuba-Bear Hydroelectric Project	PG&E's Drum-Spaulding Project
California Fisheries and Water Unlimited	March 20, 2010	X	X[2]
Colfax-Todds Valley Consolidated Tribes	April 5, 2010	X	X
Colfax-Todds Valley Consolidated Tribes	April 29, 2010	X	X
SWRCB	May 11, 2010[1]	X	X
Tyrone Gorre	May 13, 2010	X	X
Tyrone Gorre	May 13, 2010	X[2]	X
Forest Service, BLM, NPS and the California Department of Fish & Game (CDFG)	May 13, 2010	X	X
FWN	May 14, 2010	X	X
Tyrone Gorre	May 14, 2010	X	X[2]
	Total	**9**	**9**

[1] The SWRCB's May 11, 2010, letter was posted by FERC again on May 17, 2010.
[2] Although the FERC docket does not indicate that this letter referenced the Drum-Spaulding Project, the subject of the letter lists the Drum-Spaulding Project.

The joint Forest Service, BLM, NPS and CDFG letter requested two study modifications that applied to both projects: a fish passage barrier study and a Western Pond Turtle (WPT) study. The letter also requested a modification to the Recreation Use and Visitor Surveys Study (Study 2.8.2b) that applied only to the Yuba-Bear Hydroelectric Project. The SWRCB concurred with the request submitted by the agencies. The FWN also requested a fish passage barrier study and requested a new Lower Auburn Ravine Instream Flow Study.

On July 23, 2010, the Commission issued a Determination that: approved the six study modifications requested by Licensees; directed Licensees to perform two new studies (WPT Basking, Study 2.3.14; and Fish Barriers, Study 2.3.16); directed Licensees to conduct entrainment monitoring at Fordyce Lake; ordered Licensees to modify a technical memorandum[4] (i.e., Special-Status Wildlife – CWHR); and required NID to consult with the Forest Service on the need for additional information under the Recreation Use and Visitor Surveys Study (Study 2.8.2).

On July 26, 2010, NID filed with FERC a study plan for a new study - 2010 Dutch Flat No. 2 Conduit Entrainment Netting (Study 2.3.15).

Licensees filed with FERC a Study Progress Report on September 17, 2010.

On October 8, 2010, NID filed with FERC a study plan for a new study - 2011 Dutch Flat No. 2 Conduit Entrainment Netting (Study 2.3.17).

10.3.3 Updated Study Report

Licensees each filed with FERC an Updated Study Report on March 17, 2011; held an Updated Study Report meeting on March 31, 2011; and intend to file with FERC an Updated Study Report meeting summary by April 15, 2011. Licensees did not propose any modification to FERC-approved studies or new studies in its Updated Study Report.

The current status of each FERC-approved study is described in the applicable resource sections in Section 6 of this Exhibit E, and in Licensees' Updated Study Reports. Table 10.3.3-1 describes the status of the 38 studies for the Drum-Spaulding Project and 39 studies for the Yuba-Bear Hydroelectric Project.[5]

Table 10.3.3-1. Status of studies as of filing of the Final License Applications.

Study No.	Study Description/ Technical Memorandum	Column A	Column B	Column C
		Study Complete (Date Licensees Posted Technical Memorandum to Relicensing Website)	Study in Progress with Some Data Reported (Date Licensees Posted Interim Technical Memorandum to Relicensing Website or Notation if data has been provided to Relicensing Participants)[1]	Licensees' Forecasted Date to Complete Remaining Studies (All Studies other than those listed in column A)[2]
GEOLOGY AND SOILS				
2.1.1	Channel Morphology	--	1/24/11	10/31/11
WATER RESOURCES				
2.2.1	Water Quality	2/10/10	--	--
2.2.2	Water Temperature Monitoring	8/26/10	--	--

4 Each of the current FERC-approved studies requires preparation of a report. Licensees refer to these reports as "technical memoranda" and have, or will, prepare a single technical memorandum for each study, with three exceptions. Licensees will prepare two technical memoranda for the Recreation Use and Visitor Surveys Study (one technical memorandum for the Yuba-Bear Hydroelectric Project and one for the Drum-Spaulding Project); two technical memoranda for the Historic Properties Study (one each for the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project); and two technical memoranda for the Native American TCP Study (one each for the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project). Therefore, 43 technical memoranda will be prepared. Technical memoranda are included in Appendix E12 to this Exhibit E.

5 Since 37 of the studies pertain to both projects, one to only the Drum-Spaulding Project and two to only the Yuba-Bear Hydroelectric Project, there are a total of 40 FERC-approved studies.

Table 10.3.3-1. (continued)

Study No.	Study Description/ Technical Memorandum	Column A Study Complete (Date Licensees Posted Technical Memorandum to Relicensing Website)	Column B Study in Progress with Some Data Reported (Date Licensees Posted Interim Technical Memorandum to Relicensing Website or Notation if data has been provided to Relicensing Participants)[1]	Column C Licensees' Forecasted Date to Complete Remaining Studies (All Studies other than those listed in column A)[2]
WATER RESOURCES (continued)				
2.2.3	Water Temperature Modeling	1/29/11	--	--
2.2.4	Hydrologic Alteration	1/27/11	--	--
2.2.5	Bioaccumulation	2/25/10	--	--
AQUATIC RESOURCES				
2.3.1	Stream Fish Populations	9/17/10	--	--
2.3.2	Instream Flow	--	9/22/10	10/31/11
2.3.3	None. HSC Study withdrawn by Licensees on 2/19/09; became part of Instream Flow Study and approved by FERC on 2/23/09.			
2.3.4	Fish Passage	4/15/10	--	--
2.3.5	Fish Entrainment[3]	--	2/20/10	10/31/11
2.3.6	Special-Status Amphibians – FYLF Surveys	10/21/10	--	--
2.3.7	Special-Status Amphibians – FYLF Habitat Modeling	2/1/11	--	--
2.3.8	Special-Status Amphibians – SNYLF	10/27/10	--	--
2.3.9	Special-Status Reptiles – WPT	4/21/10	--	--
2.3.10	Aquatic Macroinvertebrates	6/14/10	--	--
2.3.11	Special-Status Mollusks	7/12/10	--	--
2.3.12	Reservoir Fish Populations	7/14/10	--	--
2.3.13	Western Placer County Streams	--	8/5/10	10/31/11
2.3.14	Western Pond Turtle Basking[3]	9/15/10	--	--
2.3.15	2010 Dutch Flat No. 2 Conduit Entrainment Netting	10/27/10	--	--
2.3.16	Fish Barriers	--	4/1/11	10/31/11
2.3.17	2011 Dutch Flat No. 2 Conduit Entrainment Netting	--	This study does not begin until mid April 2011, so an interim tech memo and data have not been posted.	9/30/11
WILDLIFE RESOURCES				
2.4.1	Special-Status Wildlife – CWHR	--	9/8/10	10/31/11
2.4.2	Wildlife – Movement	--	9/17/10	10/31/11
2.4.3	Wildlife – Bats	8/5/10	--	--
BOTANICAL RESOURCES				
2.5.1	Special-Status Plants	--	5/16/10	10/31/11
RIPARIAN, WETLANDS AND LITTORAL HABITATS				
2.6.1	Riparian Habitat	--	10/21/10	10/31/11
2.6.2	Wetlands	7/23/10	--	--
THREATENED, ENDANGERED AND FULLY PROTECTED SPECIES				
2.7.1	ESA-Listed Amphibians – CRLF	7/9/10	--	--
2.7.2	ESA-Listed Wildlife – VELB	--	4/16/10	10/31/11
2.7.3	ESA-Listed Plants	--	2/15/10	10/31/11
2.7.4	CESA-Listed and Fully Protected Wildlife – CWHR	--	9/13/10	10/31/11
2.7.5	CESA-Listed and Fully Protected Wildlife – Bald Eagle	6/25/10	--	--
2.7.6	CESA-Listed Plants	--	12/24/09	10/31/11

Table 10.3.3-1. (continued)

Study No.	Study Description/ Technical Memorandum	Column A	Column B	Column C
		Study Complete (Date Licensees Posted Technical Memorandum to Relicensing Website)	Study in Progress with Some Data Reported (Date Licensees Posted Interim Technical Memorandum to Relicensing Website or Notation if data has been provided to Relicensing Participants)[1]	Licensees' Forecasted Date to Complete Remaining Studies (All Studies other than those listed in column A)[2]
RECREATION RESOURCES				
2.8.1	Recreation Flow	--	1/28/11	10/31/11
2.8.2a	Recreation Use and Visitor Surveys Drum-Spaulding Project	--	9/9/10	10/31/11
2.8.2b	Recreation Use and Visitor Surveys Yuba-Bear Hydroelectric Project	--	9/13/10	10/31/11
LAND USE				
2.9.1	Roads and Trails	--	7/23/10	10/31/11
AESTHETIC RESOURCES				
2.10.1	Visual Quality	3/21/10	--	--
SOCIO-ECONOMIC RESOURCES				
2.11	None			
CULTURAL RESOURCES				
2.12.1a	Historic Properties – Drum-Spaulding Project	--	1/25/11	10/31/11
2.12.1b	Historic Properties – Rollins Transmission Line Project	12/28/09	--	--
2.12.1c	Historic Properties – Yuba-Bear Hydroelectric Project	--	9/16/10	10/31/11
TRIBAL RESOURCES				
2.13.1a	Native American TCP – Drum-Spaulding Project	--	3/29/10	10/31/11
2.13.1b	Native American TCP – Rollins Transmission Line Project	9/14/10	--	--
2.13.1c	Native American TCP – Yuba-Bear Hydroelectric Project	--	11/29/10	10/31/11

[1] Although in some instances, Licensees may have posted data or a draft technical memorandum earlier than the date listed in Column B, this Column reflects the date that the current version of the document was posted to the Relicensing Website as of March 17, 2011.

[2] Licensees forecast completing the remaining studies by the date listed in Column C.

The Updated Study Report process will not be completed until after Licensees file their FLAs. Comments on each Licensee's Updated Study Report and Updated Study Report meeting summary may be filed with FERC by May 15, 2011, 30 days after Licensees file their meeting summaries. If no party disagrees with Licensee's proposals regarding studies, Licensees' proposal will be deemed final by May 15, 2011. If a party files a disagreement with Licensees' proposal, Relicensing Participants may file responses to the disagreement by June 15, 2011, and FERC will make a final determination by July 15, 2011.

10.4 Comments on Draft License Application

Licensees each filed with FERC a DLA on November 3, 2010. Ten comment letters regarding Licensees' DLAs were filed with FERC by the February 1, 2011 filing deadline. Table 10.4-1 lists the commenters, the date of their letter, and the Project or projects to which the comment letters applied.

Table 10.4-1. Comment letters filed with FERC regarding NID's Yuba-Bear Hydroelectric Project Draft License Application and PG&E's Drum-Spaulding Project Draft License Application.

Commenter	Date on Letter	To Which Project(s) Comment Letter Applied	
		NID's Yuba-Bear Hydroelectric Project	PG&E's Drum-Spaulding Project
Placer County Water Agency	January 27, 2011	X	--
Placer County Water Agency	January 27, 2011	--	X
Joint Letter from the Forest Service, Bureau of Land Management, National Parks Service and California Department of Fish and Game	January 28, 2011	X	X
Federal Energy Regulatory Commission	January 31, 2011	X	--
Federal Energy Regulatory Commission	January 31, 2011	--	X
Yuba County Water Agency	January 31, 2011	X	X
Foothills Water Network	February 1, 2011	X	X
National Marine Fisheries Service	February 1, 2011	X	--
National Marine Fisheries Service	February 1, 2011	--	X
State Water Resources Control Board	February 1, 2011	X	X
Town of Loomis	February 1, 2011	--	X
County of Placer	February 2, 2011	X	--
County of Placer	February 2, 2011	--	X
City of Roseville	February 2, 2011	--	X
	Total	**8**	**10**

In this FLA, each Licensee has addressed the various comment letters that were received on their respective DLA, consistent with the regulatory requirements of 18 CFR Section 5 and the related FERC guidance. For additional information regarding NID's and PG&E's responses to comments, see Appendix E-1 and E-6 of this Exhibit E, respectively.

SECTION 11

REFERENCES CITED

Adams, B.L., W.S. Zaugg, and L.R. McLain. 1975. Inhibition of Salt Water Survival and Na-K-ATPase Elevation in Steelhead Trout (Salmo gairdneri) by Moderate Water Temperatures. *Transactions of the American Fisheries Society*. 104:766-769.

Allen, M.F., and T. Tennant. 2000. Evaluation of Critical Habitat for the California Red-Legged Frog (*Rana aurora draytonii*). Center for Conservation Biology, University of California, Riverside. Available online: <http://escholarship.org/uc/item/7027275m>.

Alpers, C.N., and M.P. Hunerlach. 2000. Mercury Contamination from Historic Gold Mining in California. U.S. Geological Survey Fact Sheet FS-061-00. Available online: <http://ca.water.usgs.gov/mercury/fs06100.html>.

Alpers, C.N., M.P. Hunerlach, J.T. May, and R.L. Hothem. 2005. Geochemical Characterization of Water, Sediment, and Biota Affected by Mercury Contamination and Acidic Drainage from Historical Gold Mining, Greenhorn Creek, Nevada County, California, 1999-2001. U.S. Geological Survey Scientific Investigation Report 2004-5251. Available online: <http://pubs.usgs.gov/sir/2004/5251/>.

Anrdt, S.K., R.A. Cunjak, and T.J. Benfey. 2002. Effect of Summer Floods and Spatial-Temporal Scale on Growth and Feeding of Juvenile Atlantic Salmon in Two New Brunswick Streams. *Transactions of the American Fisheries Society*. 131:607-622.

Arnold, B.A. 1957. Archaeological Investigations on Federal Lands in Martis Valley, California. On file, North Central Information Center, California State University, Sacramento, California.

ATSDR. 1999. Agency for Toxic Substances and Disease Registry. Toxicological profile for mercury (update). Prepared by Research Triangle Institute under contract no. 205-93-0606. Public Health Service, U.S. Department of Health and Human Services.

Azimi-Gaylon, Shakoora. Senior Environmental Scientist. TMDL Program, Division of Water Quality, State Water Resources Control Board. Personal communication with Carin Loy, Senior Scientist with HDR|DTA. August 7, 2010.

Bacher, D. 2002. Fuller and Rucker Lakes, Two Completely Different High Sierra Fisheries. *The Fish Sniffer Online*. Available online: <http://www.fishsniffer.com/dbacher/090502ruck.html>. Last updated September 5, 2002.

Bailey, R. 2003a. Auburn Ravine Aquatic Habitat and Biological Literature Review and Resource Assessment. Bailey Environmental, Lincoln, Calironia.

_____. 2003b. Coon Creek Aquatic Habitat and Biological Literature Review and Resource Assessment. Bailey Environmental, Lincoln, CA. CD-Rom.

Bailey, R., and J.W. Buell, PhD. 2005. Anadromous Fish Screening and Passage Opportunities in Western Placer County and Southern Sutter County. Bailey Environmental and J.W. Buell and Associates.

Baker, C. 2007. Historic American Engineering Record: Alta Powerhouse, Placer County, California. PAR Environmental Services, Inc., Sacramento. On file, Pacific Gas and Electric Company, San Francisco, CA and California State Office of Historic Preservation, Sacramento, CA.

_____. 1999a. National Register of Historic Places Evaluation of Rock Creek Dam, Placer County, California. PAR Environmental Services, Inc., Sacramento. On file, Pacific Gas and Electric Company, San Francisco, CA and California State Office of Historic Preservation, Sacramento, CA.

_____. 1999b. Historic American Engineering Record, Rock Creek Dam (HAER No. CA-238). PAR Environmental Services, Inc., Sacramento. On file, Pacific Gas and Electric Company, San Francisco, CA and California State Office of Historic Preservation, Sacramento, CA.

_____, and M.R. Millett. 2007. Cultural Resources Inventory and National Register of Historic Places Evaluation of the Alta Powerhouse Header Pipe Replacement Project, Drum-Spaulding Hydroelectric System (FERC #2310), Placer County, California. PAR Environmental Services, Inc., Sacramento. On file, Pacific Gas and Electric Company, San Francisco, CA.

_____, Dougherty, and L. Compass. 2004. Cultural Resources Inventory and Evaluation, South Yuba Canal, Drum Spaulding Hydroelectric System (FERC 2310), Placer County, California. PAR Environmental Services, Inc. Sacramento, California.

_____. 2010. National Register of Historic Places Evaluation, Nevada Irrigation District's Yuba-Bear Hydroelectric Project, FERC No. 2266 Nevada, Sierra, and Placer Counties, California. PAR Environmental Services, Inc. Sacramento, California.

Baltz, D.M., B. Vondracek, L.R. Borwn, and P.B. Moyle. 1987. Influence of Temperature on Microhabitat Choice by Fishes in a California Stream. *Transactions of the American Fisheries Society*. 116:12-20.

Baumgart, D. 2006. The Dam Has Broke! *Nevada County Gold*. Available online: <http://www.ncgold.com/History/BecomingCA_Archive65.html>. Accessed February 2009.

Beak (Beak Consultants, Inc.). 1989. Yuba River Fishery Investigation, 1986-1988. Sacramento, California. Prepared for the California Department of Fish and Game.

Beedy, E.C. 2002. Nevada County Planning Department. Nevada County Natural Resources Report. Available online: <http://yubanet.com/nrr/summary.html>.

Behnke, R.J. 1992. Native Trout of Western North America. *American Fisheries Society Monograph 6*. Bethesda, Maryland.

Bell, M. C. 1986. Fisheries Handbook of Engineering Requirements and Biological Criteria. Contract #DACW57-80-M-0567. Fish Passage Development and Evaluation Program, United States Army Corps of Engineers, North Pacific Division. Portland, Oregon.

Benson, A.J. 2011. New Zealand mudsnail sightings distribution. Available online: <newzealandmudsnaildistribution.aspx>. Accessed March 28, 2011.

Black & Veatch Corporation (Black & Veatch). 2002. Sanitary Survey Update and Source Water Assessment for the Yuba and Bear River Watersheds. Placer County Water Agency and Nevada Irrigation District. In Association with Standish-Lee Consultants.

Bloom, N.S. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. Can. J. Fish. Aquat. Sci. 49(5):1010-1017.

Bombay, H.L., T.M. Ritter, and B.E. Valentine. 2000. A Willow Flycatcher Survey Protocol for California. USDA Forest Service. Vallejo, California.

Bovee, K.D. 1986. Development and Evaluation of Habitat Suitability Criteria for Use in the Instream Flow Incremental Methodology. USDI Fish and Wildlife Service Instream Flow Information Paper No. 21 FWS/OBS-86/7. Fort Collins, Colorado.

_____. 1982. A Guide to Stream Habitat Analysis Using the Instream Flow Incremental Methodology. USDI Fish and Wildlife Service Instream Flow Information Paper No. 12. FWS/OBS-82/26. Fort Collins, Colorado.

_____. 1978. Probability of Use Criteria for the Family Salmonidae. Fish and Wildlife Service, U.S. Department of the Interior Information Paper No. 4 FWS/OBS-78/07. Fort Collins, Colorado.

_____, B.L. Lamb, J.M. Bartholow, C.B. Stalnaker, J. Taylor, and J. Henriksen. 1998. Stream Habitat Analysis Using the Instream Flow Incremental Methodology. U.S. Geological Survey, Biological Resources Division Information and Technology Report USGS/BRD-1998-0004.

Bradford, D.F., F. Tabatabai, and D.M. Graber. 1993. Isolation of Remaining Populations of the Native Frog, *Rana muscosa*, by Introduced Fishes in Sequoia and Kings Canyon National Parks, California. *Conservation Biology*. 7:882-888.

CALFED. 2000a. CALFED Bay-Delta Program. Volume II: Ecosystem Restoration Program Plan American River Basin Ecological Management Zone. Available online: < http://www.dfg.ca.gov/ERP/reports_docs.asp>.

_____. 2000b. Final Programmatic Environmental Impact Statement/Environmental Impact Report. CALFED Bay-Delta Program. Sacramento, California. Prepared for U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Environmental Protection Agency, Natural Resources Conservation Service, U.S. Army Corps of Engineers, and California Resources Agency. Available online: <http://calwater.ca.gov/calfed/library/Archive_EIS.html>.

_____ and YCWA. 2005. Draft Implementation Plan for Lower Yuba River Anadromous Fish Habitat Restoration: Multi-Agency Plan to Direct Near-Term Implementation of Prioritized Restoration and Enhancement Actions and Studies to Achieve Long-Term Ecosystem and Watershed Management Goals. Prepared by Lower Yuba River Fisheries Technical Working Group. Funded by CALFED and Yuba County Water Agency.

California Academy of Sciences (CAS). 2007. Herpetology Records. Available online: <www.calacademy.org/research/herpetology/catalog/Index.asp>. Accessed April 20, 2007.

California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the Balance: 1988 annual report. Sausalito, California.

California Department of Boating and Waterways. 1991. Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities. Sacramento, California.

California Department of Fish and Game (CDFG). 2010a. Biogeographic Data Branch. California Natural Diversity Database (CNDDB). Version 3.1.0. Available online: <http://www.dfg.ca.gov/bdb/html/cnddb.html>. Accessed January 25, 2010.

_____. 2010b. Heritage and Wild Trout Program. Available online: <http://www.dfg.ca.gov/fish/Resources/WildTrout/WT_HeritageTProg.asp>. Accessed October 20, 2010.

_____. 2009a. 2002–2009 Stocking Records Query. Unpublished internal reports.

_____. 2009b. Biogeographic Data Branch. California Natural Diversity Database. RareFind 4 for Commercial Subscribers.

_____. 2009c. Biogeographic Data Branch. California Natural Diversity Database. State & Federally Listed Endangered & Threatened Animals of California. Accessed January 2009.

_____. 2009d. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities.

_____. 2009e. Life History Accounts and Range Maps. Biogeographic Data Branch. California Natural Diversity Database. Available online: <www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx>. Accessed October 30, 2009.

_____. 2008a. Summary of 2004 and 2005 Fish Community Surveys in Auburn Ravine and Coon Creek (Placer County). Memorandum - Fisheries Files.

_____. 2008b. Biogeographic Data Branch. California Natural Diversity Database. Version 3.1.0. Available online: <www.dfg.ca.gov/bdb/html/cnddb.html>. Accessed May 6, 2008. Last updated May 6, 2008.

_____. 2008c. California Interagency Wildlife Task Group. CWHR Version 8.2 personal computer program. Sacramento, California.

_____. 2007a. 2002–2007. Stocking Records Query. Unpublished internal reports.

_____. 2007b. California On-line Fishing Guide. Available online: <http://www.dfg.ca.gov/fishingpassport/guide.asp>.

_____. 2006. Biogeographic Data Branch. California Natural Diversity Database. State and Federally Listed Endangered and Threatened Animals of California.

_____. 2005. Unpublished data. CDFG file report. Rancho Cordova, California.

_____. 2000. Guidelines for Assessing the Effects of Proposed Project on Rare, Threatened, and Endangered Plants and Natural Communities.

_____. 1998. A Status Review of the Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage. Candidate Species Status Report 98(01). CDFG. Sacramento, California.

_____. 1996. Steelhead Restoration and Management Plan for California.

_____. 1993. Restoring Central Valley Streams: A Plan for Action. Sacramento, California.

_____. 1991. Lower Yuba River Fisheries Management Plan. The Resources Agency, CDFG, Stream Evaluation Report No. 91-1.

_____. 1990. Central Valley Salmon and Steelhead Restoration and Enhancement Plan. Sacramento, California.

_____. 1986. Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California. Prepared by W.M. Snider and E. Gerstung.

_____. 1974 and 1983. Rollins Reservoir Surveys. Unpublished internal reports.

_____. 1958-1980. Historical Stocking Records. Unpublished internal reports.

_____. 1930-1959. Historical Stocking Records. Unpublished internal reports.

_____, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Bureau of Reclamation (BOR). 1988. Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River Basin. Sacramento, California.

California Department of Food and Agriculture (CDFA). 2007. Pest Ratings of Noxious Weed Species and Noxious Weed Seed. Division of Plant Health and Pest Prevention Services.

California Department of Parks and Recreation (CDPR). 1998. Public Opinions and Attitudes on Outdoor Recreation in California. Sacramento, California.

_____. 1994. California Outdoor Recreation Plan. Sacramento, California.

_____. 1983. Recreation Needs in California. Sacramento, California.

_____. 1980. Recreation Outlook in Planning District 3. Sacramento, California.

California Department of Water Resources (CDWR) Northern District. 2007. Mercury Contamination in Fish from Northern California Lakes and Reservoirs. State of California, The Resources Agency. Available online: <http://www.waterboards.ca.gov/water_issues/programs/tmdl/records/region_1/2007/ref2665.pdf>.

_____. 2004a. Final Report, Evaluation of the Timing, Magnitude and Frequency of Water Temperatures and Their Effects on Chinook Salmon Egg and Alevin Survival. SP-F10, Task 2C. Oroville Facilities Relicensing FERC Project No. 2100.

_____. 2004b. SP-F10, Task 2B: Potential Effects of Facility Operations on Spawning Chinook Salmon, Draft. Oroville Facilities Relicensing, FERC Project No. 2100. California Department of Water Resources.

_____. 1998. California Water Plan Update. Bulletin 160-98. California Department of Water Resources. Sacramento, California.

_____. 1994. California Water Plan Update. Bulletin 160–93. Sacramento, California.

_____. 1983. The California Water Plan: Projected Use and Available Water Supplies to 2010. Bulletin 160–83. Sacramento, California.

_____ and the Bureau of Reclamation. 1999. Biological Assessment: Effects of the Central Valley Project and State Water Project Operations From October 1998 Through March 2000 on Steelhead and Spring-Run Chinook Salmon.

California Division of Mines and Geology. Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions. 1:750,000. California Geologic Data Map 6. Charles W. Jennings, compiler, 1994.

California Geological Society (CGS). 2005. Earthquake Shaking Potential Map for Portions of Eastern California and Western Nevada. CGS Map Sheet 56. NBMS Open File Report 05-2.

_____. 2003. Earthquake Shaking Potential for California. CSSC No. 03-02.

California Native Plant Society (CNPS). 2009. Inventory of Rare and Endangered Plants of California. Available online: <cnps.web.aplus.net/cgi-bin/inv/inventory.cgi>.

California Resources Agency. 2007. California Environmental Resources Evaluation System (CERES). California Wetlands Information System: Coastal Zone Management Act (CZMA). Available online: <http://ceres.ca.gov/wetlands/permitting/czma.html>.

_____. 1989. Upper Sacramento River Fisheries and Riparian Habitat Management Plan. Sacramento, California.

California, State of. 1932. Memorandum to Mr. Hauley: Dams of Nevada Irrigation District #61-0. Conference Notes by W. A. Perkins. On file, Division of Dam Safety, Sacramento, California.

_____. 1921. Correspondence between J.B. Brown, Assistant State Engineer, and W.F. McClure, State Engineer, on Formation of the Proposed Nevada Irrigation District. On file, Nevada Irrigation District Archives, Grass Valley, California.

Camp, Dresser, and McKee. 1997. Phase 1 Environmental Site Assessment, Deer Creek Hydroelectric Generating Facility, Quaker Hill Road, Nevada County, California. On file, PG&E Archives, San Bruno, California.

Campbell, R.F., and J.H. Neuner. 1985. Seasonal and Diurnal Shifts in Habitat Utilized by Resident Rainbow Trout (Salmo gairdneri) Observed in Western Washington Cascade Mountain Streams. In: *Symposium on Small Hydropower and Fisheries*. May 1-3, 1985. Denver, Colorado.

Castleberry, D.T., J.J. Cech, Jr., M.K. Saiki, and B.A. Martin. 1991. Growth, Condition, and Physiological Performance of Juvenile Salmonids From the Lower American River: February Through June, 1991.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2009. Clean Water Act Sections 305(b) and 303(d) Integrated Report for the Central Valley Region. Draft Final Staff Report. Available online: <www.swrcb.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/303d_list.shtml>.

_____. 1998. Water Quality Control Plan (Basin Plan) for the Sacramento River and the San Joaquin River Basins. Fourth Edition. California Regional Water Quality Control Board, Central Valley Region. Revised in September 2009 with Approved Amendments. Available online: <http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/>.

CH2M HILL. 1996. Auburn Stream Study: Fisheries Surveys, Continuous Water Quality Monitoring, and Habitat Inventories. CH2M Hill. Redding, California. Prepared for City of Auburn, Department of Public Works.

Cherry, D.S., K.L. Dickson, and J. Cairns Jr. 1977. Preferred, Avoided and Lethal Temperatures of Fish During Rising Temperature Conditions. *Journal of the Fisheries Research Board of Canada.* 34:239-246.

Childs, J.R., N.P. Snyder, and M.A. Hampton. 2003. Bathymetric and Geophysical Surveys of Englebright Lake, Yuba-Nevada Counties, Californa. U.S. Geologic Survey Open-File Report, 03-383.

Chow, V.T. (ed.). 1964. Handbook of Applied Hydrology: A Compendium of Water-resources Technology. McGraw Hill Book Company.

City of Lincoln. 1999. DEIR City of Lincoln Wastewater Treatment and Reclamation Facility.

City of Roseville. 2011. Comments of City of Roseville regarding Pacific Gas and Electric Company’s Drum-Spaulding (FERC Project # 2310) Hydroelectric Project Draft License Applications. February 1, 2011.

Coleman, C. 1952. P. G. & E. of California: The Centennial Story of Pacific Gas and Electric Company: 1852-1952. McGraw-Hill Book Company. New York, New York.

County of Nevada, California. 2007. Available online: <www.mynevadacounty.com>.

_____. 2004. Nevada County General Code, Chapter IX: Waterways and Watercraft. Nevada City, California.

_____. 1996. Nevada County General Plan. Nevada City, California. Available online: <http://new.mynevadacounty.com/planning/index.cfm?ccs=783>.

County of Placer, California. 2011a. Comments of Placer County Water Agency on PG&E's Draft License Application for the Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011b. Comments of Placer County Water Agency on Nevada Irrigation District's Draft License Application for the Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2007. Placer County GIS Planning. General Plan Land Use Designations 2007. Available online: <http://lis.placer.ca.gov/gis.asp?s=1000&h2=571>.

_____. 1994. Placer County General Plan. Auburn, California. Available online: <http://www.placer.ca.gov/Departments/CommunityDevelopment/Planning/CommPlans/PCGP.aspx>.

County of Sierra, California. 2007. Web-based GIS. Zoning and Land Use Layers. Available online: <http://sierracounty.calcad.com:8080/SierraCountyPublic/>.

_____. 1996. Countywide General Plan Document. Downieville, California.

Coutant, C.C. 1977. Compilation of Temperature Preference Data. *Journal of Fisheries Research Board of Canada*. 34:739-745.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Online. Available online: <http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm>. Accessed December 4, 1998.

Crew, H. 1970. Preliminary Report: 4-Pla-36. In: E.W. Ritter, editor. Archaeological Investigations in the Auburn Reservoir Area, Phase II-III. Department of Anthropology, University of California, Davis. Davis, CA. Prepared for the National Park Service, San Francisco. pp. 275-280

Currie, R.J., W.A. Bennett, and T.L. Beitinger. 1998. Critical Thermal Minima and Maxima of Three Freshwater Game-fish Species Acclimated to Constant Temperatures. *Environmental Biology of Fishes*. 51:187-200.

Curtis, J.A., L.E. Flint, C.N. Alpers, and S.M. Yarnell. 2005a. Conceptual Model of Sediment Processes in the Upper Yuba River Watershed, Sierra Nevada, CA. *Geomorphology*. 68:149-166.

_____, L.E. Flint, C.N. Alpers, S.A. Wright, and N.P. Snyder. 2005b. Use of Sediment Rating Curves and Optical Backscatter Data to Transport in the Upper Yuba River Watershed, California, 2001-03, U.S. Geological Survey Scientific Investigations Report 2005–5246.

_____, L.E. Flint, C.N. Alpers, and S.A. Wright. 2006. Evaluating Sediment Sources, Erosion, and Transport Processes in the Upper Yuba River Watershed. In: Joint 8th Federal Interagency Sedimentation Conference Extended Abstracts; 2006 Apr 2-6; Reno, Nevada.

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2009. Contaminants in Fish from California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Study. Sacramento, California. Prepared for the Surface Water Ambient Monitoring Program (SWAMP) of the California State Water Resources Control Board. Available online: <http://www.swrcb.ca.gov/water_issues/programs/swamp/lakes_study.shtml>.

Dickson, I.W., and R.H. Kramer. 1971. Factors Influencing Scope for Activity and Active Standard Metabolism of Rainbow Trout (*Salmo gairdneri*). *J. Fish. Res. Board Can*. 28(4):587-596.

Downing, P.M. 1924. More Efficient Utilization of Lake Valley Storage and Possible Development of Additional Water Resources. On file, PG&E Archives, San Bruno, California.

_____. 1917. Undeveloped Power Possibilities. Pacific Gas and Electric Company, April 20th. On file, PG&E Archives, San Bruno, California.

Drennan, J.E., R. Jackman, K.R. Marlow, and K.D. Wiseman. 2006. Climatic and Water Flow Triggers Associated with Breeding and Movement in a Foothill Yellow-legged Frog (*Rana boylii*) Population on the North Fork Feather River, California [abstract]. In: Declining Amphibian Task Force (DAPTF) California-Nevada Working Group Meeting; 2006 Jan 12-14; Humboldt State University, Arcata, CA. Available online: <http://www.canvamphibs.com/DAPTF2006/DAPTF2006AgendaFinalrev2.htm#Abstracts>.

Drost, C.A., and G.M. Fellers. 1996. Collapse of a Regional Frog Fauna in the Yosemite Area of the California Sierra Nevada, USA. *Conservation Biology*. 10:414-425.

Eaton, J.G., J.H. McCormick, B.E. Goodno, D.G. O'Brien, H.G. Stefany, M. Hondzo, and R.M. Scheller. 1994. A Field Information-based System for Estimating Fish Temperature Tolerances. *Fisheries*. 20(4):10-18.

ECORP Consulting, Inc. 2005. Draft Results of the 2004 (Year 1) Amphibian Monitoring Program for Foothill Yellow-legged Frog and Mountain Yellow-legged Frog. El Dorado

Hydroelectric Project (FERC Project No. 184). Placerville, California. Prepared for El Dorado Irrigation District.

Elasser, A.B. 1960. The Archaeology of the Sierra Nevada in California and Nevada. *University of California Archaeological Survey*. 51:1-93.

Elston, R.G. 1971. A Contribution to Washo Archaeology. *Nevada Archaeological Survey, Research Paper No. 2*. University of Nevada-Reno, Reno, Nevada.

Fowler, G., and R. Wagner. 1982. The Blue Canyon Deer Herd Management Plan. Placerville, California. Prepared for California Department of Fish and Game and United States Forest Service.

Garcia and Associates. 2001. Final Report: Benthic Macroinvertebrates Fordyce Creek Nevada County, California. San Anselmo, California. Prepared for Pacific Gas and Electric Company, San Ramon, CA.

Gast, T., M. Allen, and S. Riley. 2005. Middle and South Yuba Rainbow Trout (Onchorhynchus mykiss) Distribution and Abundance Dive Counts August 2004. Thomas R. Payne and Associates. Arcata, California. Included as Appendix G of CDWR 2006.

Geomatrix Consultants, Inc. (Geomatrix). 1997. Assessment of Sediment Sources in the Bear River Watershed above Drum Afterbay; Nevada and Placer Counties, California. Prepared for Pacific Gas & Electric Company, San Francisco, CA, Project No. 2074.34.

Gerstung, E.R. 1970-1975. Assistant Fishery Biologist, CDFG Lake Survey Progress Reports. Unpublished internal reports.

_____. 1965. Unpublished Data. CDFG file report. Rancho Cordova, California.

Goddard, Glenn. Director. Camping Program with Boy Scouts of America. Personal communication with Cindy Baker, PAR Environmental Services, Inc., Sacramento. 2010.

Hallock, R.J., W.F. Van Woert, and L. Shapovalov. 1961. An Evaluation of Stocking Hatchery-Reared Steelhead Rainbow Trout (Salmo Gairdnerii Gairdnerii) in the Sacramento River System. *Fish Bulletin.* 114.

Hayes, M.P., and M.R. Jennings. 1988. Habitat Correlates of Distribution of the California Red-legged Frog. (*Rana aurora draytonii*) and the Foothill Yellow-legged Frog (*Rana boylii*): Implications for Management. In: R.C. Szaro, K.E. Severson, and D.R. Patton, technical coordinators. Proceedings of the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America; 1988 July 19-21; Flagstaff, Arizona. pp. 144-158. United States Department of Agriculture, Forest Service, General Technical Report RM-166:1-458.

HDR|DTA. 2007. Aerial Video of Water Features, Streams, and Reaches for NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project. DVD.

Heizer, R.F., and A.B. Elsasser. 1953. Some Archaeological Sites and Cultures of the Central Sierra Nevada. *University of California Archaeological Survey*. 21:1-42.

Henwood Energy Services, Inc. 2002. Emergency Action Plan, Yuba-Bear River Project, FERC Project No. 2266 – CA, Vols 1 and 2. Prepared for Nevada Irrigation District.

Hiscox, John I. District Fishery Biologist. Region 2, California Department of Fish & Game. Personal Communication. May 14, 2007.

_____. 1986-1993. CDFG Lake Surveys. Unpublished internal reports. Sacramento, CA.

_____. 1981. CDFG Lake Surveys. Unpublished internal report.

Hoddle, M. 2010. University of California, Riverside, Center for Invasive Species Research. Didymo (or Rock Snot) *Didymosphenia geminate* (Bacilariophyceae: Cymbellales). Available online: <http://cisr.ucr.edu/didymo_rock_snot.html>.

Holland, D.C. 1991. A Synopsis of the Ecology and Status of the Western Pond Turtle (*Clemmys marmorata*) in 1991. Prepared for USFWS, National Ecology Research Center, San Simeon Field Station.

Hull, K.L. 2007. The Sierra Nevada: Archaeology in the Range of Light. In Jones, Terry L., and Kathryn A. Klar, editors. California Prehistory: Colonization, Culture, and Complexity. AltaMira Press. Lanham, MD. pp. 177-190.

Hunerlach, M.P., J.J. Rytuba, and C.N. Alpers. 1999. Mercury Contamination from Hydraulic Placer-gold Mining in the Dutch Flat Mining District, California. U.S. Geological Survey Water Resources Investigation Report 99-4018B:179-189.

Hunt, G. 1922. Study of the Storage Developments on South Yuba River and its Tributaries (Excluding Lake Spaulding), South Yuba System. Pacific Gas and Electric Company, internal document. On file, PG&E Archives, San Bruno, California.

Jackson, T.W., R. Hebert, and S. Wee. 1982. Tahoe National Forest: History of the Tahoe National Forest: 1840-1940. Tahoe National Forest Report No. 15.

James, L.A. 2004. Tailings Fans and Valley-spur Cutoffs Created by Hydraulic Mining. *Earth Surface Processes and Landforms*. 29(7):869-882.

_____. 2003. Glacial Erosion and Geomorphology in the Northwest Sierra Nevada, CA. *Geomorphology*. 55(1-4):283-303.

_____. 1991. Quartz concentration as an Index of sediment Mixing: Hydraulic Mine-tailings in the Sierra Nevada, California. *Geomorphology*. 4(2):125-144.

_____. 1988. Historical Transport and Storage of Hydraulic Mining Sediment in the Bear River, California. Ph.D. dissertation. University of Wisconsin - Madison. Madison, Wisconsin.

_____ and J.D. Davis. 1994. Glaciation and Hydraulic Gold-Mining Sediment in the Bear and South Yuba Rivers, California. Field Trip Guide, April 1-3, 1994, Association of American Geographers National Meeting, San Francisco.

Jennings, M.R., and M.P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Rancho Cordova, California. Prepared for the California Department of Fish and Game, Inland Fisheries Division.

Jones A.B., and D.G. Slotton. 1996. Mercury Effects, Sources, and Control Measures. Richmond, California. Prepared for the San Francisco Estuary Institute Regional Monitoring Program.

Jones & Stokes. 2006. Bear River Recovery Monitoring Project 3-Year Summary Report. Sacramento, California. Prepared for Pacific Gas and Electric Company.

_____. 1992. 1991 Fall Run Chinook Salmon Spawning Escapement in the Yuba River. (JSA 91-219). Sacramento, California. Prepared for Yuba County Water Agency.

Kilroy, C. 2004. A New Alien Diatom, Didymosphenia geminata (Lyngbye) Schmidt: its Biology, Distribution, Effects and Potential Risks for New Zealand Fresh Waters. Christchurch: National Institute of Water & Atmospheric Research Ltd. Report No. CHC2004-128. pp. 1-40.

Klasing, S., and R. Brodberg. 2008. Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. Pesticide and Environmental Toxicology Branch, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Available online: <www.oehha.org/fish/gtlsv/crnr062708.html>.

Knapp, R.A., P.S. Corn, and D.E. Schindler. 2001. The Introduction of Nonnative Fish into Wilderness Lakes: Good Intentions, Conflicting Mandates, and Unintended Consequences. *Ecosystems*. 4:275-278.

_____ and K.R. Matthews. 2000. Non-Native Fish Introductions and the Decline of the Mountain Yellow-Legged Frog from within Protected Areas. *Conservation Biology*. 14:428-438.

Kondolf, G.M. 2000. Assessing Salmonid Spawning Gravel Quality. *Transactions of the American Fisheries Society*. 129:262-281.

Kundargi, K.N., and J.C. Hanson. 2005. DRAFT Aquatic Resource Biodiversity Management Plan for the Canyon Creek Hydrologic Sub-Area. Prepared for the California Department of Fish and Game.

Kupferberg, S., A. Lind, J. Mount, and S. Yarnell. 2007. Aseasonal Pulsed Flow Effects on the Foothill Yellow-legged Frog (*Rana boylii*): Integration of Empirical, Experimental and Hydrodynamic Modeling Approaches. Davis, California. Prepared for the California Energy Commission Public Interest Energy Research Program.

Leopold, L.B. 1994. A View of the River. Harvard University Press, Cambridge, Massachusetts.

Lind, Amy. Wildlife Biologist and Herpetologist. Pacific SW Research Station, USDA Forest Service. Personal communication Februrary 2, 2008.

Lindley, S.T., R.S. Schick, A. Agrawal, M. Goslin, T. Pearson, E. Mora, J. Anderson, B. May, S. Greene, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J. Williams. 2006. Historical Population Structure of Central Valley Steelhead and its Alteration by Dams. *San Francisco Estuary and Watershed Science*. 4(1):Article 3.

_____, R.S. Schick, B.P. May, J.J.G.S. Anderson, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2004. Population Structure of Threatened and Endangered Chinook Salmon ESUs in California's Central Valley Basin. (NOAA-TM-NMFS-SWFSC-360.) National Oceanic and Atmospheric Administration (NOAA).

Lower Yuba River Accord River Management Team Planning Group (RMT). 2010. Lower Yuba River Water Temperature Objectives Technical Memorandum. Available online: <http://www.yubaaccordrmt.com/Studies%20%20Reports/LYR%20Water%20Temp%20Objectives%20Tech%20Memo.pdf>.

Ludington, S., B.C. Moring, R.J. Miller, K.S. Flynn, P.A. Stone, and D.R. Bedford, creators. 2005. Generalized Geologic Map of Bedrock Parent Material. OFR 2005-1305. Reston, Virginia. USGS.

Markley, R., and G. Henton. 1985. Tahoe National Forest Cultural Resources Overview, Part I: Prehistory. USDA TNF Report No. 20.

Markwart, A.H. 1931 January. State Supervision of Design and Construction of Dams in California. *Pacific Service Magazine.* On file, California Room, California State Library, Sacramento, California.

Marshack, J. 2008. A Compilation of Water Quality Goals. California Regional Water Quality Control Board, Central Valley Region. As amended through 2007. Available online: <http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_standards_limits/water_quality_goals/index.shtml>.

Matthews, K.R., and K.L. Pope. 1999. A Telemetric Study of the Movement Patterns and Habitat Use of *Rana muscosa*, Mountain Yellow-legged Frog, in the High Elevation Basin in the Kings Canyon National Park, California. *J. Herpetology*. 33:615-623.

May, J.T., R.L. Hothem, C.N. Alpers, and M.A. Law. 2000. Mercury Bioaccumulation in Fish in a Region Affected by Historic Gold Mining: The South Yuba River, Deer Creek, and Bear River Watersheds, California, 1999. (U.S. Geological Survey Open-File Report 00-367.) Sacramento, California. Available online: <http://ca.water.usgs.gov/archive/reports/ofr00367/ofr00367.pdf>. Accessed February 2007.

McCullough, D.A., S. Spalding, D. Sturdevant, and M. Hicks. 2001. Issue Paper 5: Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids. (EPA-910-D-01-005.) U.S. Environmental Protection Agency, Region 10. Seattle, Washington.

McEwan, D. 2001. Central Valley Steelhead. In R. Brown, editor. Contributions to the Biology of Central Valley Salmonids, California Department of Fish and Game, Bulletin 179(1). Salmonid Symposium; 1997 October 22-24; Bodega Bay, California.

Merwin, R.W. 1968. Gold Resources in the Tertiary Gravels of California. U.S. Bureau of Mines Technical Progress Report 3, Heavy Metals Program.

Meyer. 1986. Unpublished Data. CDFG file report. Rancho Cordova, California.

Monk, J., B.J. Walton, R. Olendorff and D. Carrier. 1988. California peregrine falcon implementation plan. Santa Cruz Predatory Bird Research Group. 44pp.

Moratto, M.J. 2004. California Archaeology. Reprinted. Coyote Press, Salinas, California. Originally published 1984, California Archaeology, Academic Press, San Francisco, California.

_____. 1984. California Archaeology. Academic Press, San Francisco, California.

Morrow, Bill. Hydroelectric Manager. Nevada Irrigation District. Personal Communication with HDR regarding hazard tree removal practices for Nevada Irrigation District. 2011.

_____. Hydro O&M Superintendent. Nevada Irrigation District. Conversation with Rick Jones, HDR|DTA. Spring, 2009.

_____. Hydro O&M Superintendent. Nevada Irrigation District. Personal communication with Cindy Baker, PAR Environmental Services, Inc., Sacramento.

Moyle, P.B. 2002. Inland Fishes of California. University of California Press, Berkeley and Los Angeles, California.

_____. 1973. Effect of Introduced Bullfrogs, *Rana catesbeiana*, on the Native Frogs of the San Joaquin Valley, California. *Copeia*. 1973:18-22.

_____, P.J. Randall, R. Nichols, R.M.Yoshiyama, and R.A. Knapp. 1997. Status of Fish and Fisheries. In: Erman, Don C. (editor) and SNEP Team. Status of the Sierra Nevada – The Sierra Nevada Ecosystem Project, Volume II, US Geological Survey Digital Data Series DDS-43. Chapter 33:953–973. CD-Rom.

Museum of Vertebrate Zoology (MVZ). 2007. Herpetological records for Yuba, Sierra, Nevada, and Placer Counties, California. University of California, Berkeley. Available online: <mvzarctos.berkeley.edu/SpecimenSearch.cfm>. Accessed May 14, 2007.

Myrick, C.A., and J.J. Cech. 2001. Temperature Effects on Chinook Salmon and Steelhead: A Review Focusing on California's Central Valley Populations. Bay-Delta Modeling Forum Technical Publication 01-1. Available online: <http://www.sfei.org>.

Myrtle, F. 1928 October. Enlarging Spaulding-Drum System---Co-operative Project at Completion. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

_____. 1924 May. Increased Storage for Our Spaulding-Drum System---Beginning Work on Lake Fordyce. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

_____. 1912 August. Nature Anticipates Man's Handiwork. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

National Marine Fisheries Service (NMFS). 2011. Response of NOAA's National Marine Fishereis Service regarding the Draft License application for the Drum-Spaulding Hydroelectric Project, FERC No. 2310. Letter from R. Wantuck to K. Bose February 1, 2011.

_____. 2009. Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead. Southwest Regional Office. Sacramento, California.

_____. 2007. Biological Opinion on the Operation of Englebright and Daguerre Point Dam on the Yuba River. California.

_____. 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register: Vol 70:52488-52627.

_____. 2004a. IN NMFS. 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register: Vol 70:52488-52627.

_____. 2004b. Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan. Prepared by National Marine Fisheries Service, Southwest Region.

_____. 2002. Biological Opinion on Interim Operations of the Central Valley Project and State Water Project Between April 1, 2002 and March 31, 2004, on Federally Listed Threatened Central Valley Spring-Run Chinook Salmon and Threatened Central Valley Steelhead in Accordance With Section 7 of the Endangered Species Act of 1973, As Amended. Long Beach: National Marine Fisheries Service, Southwest Region.

_____. 1997. Status Review Update for West Coast Steelhead from Washington, Idaho, Oregon, and California. Memorandum from the Biological Review Team to the National Marine Fisheries Service Northwest Regional Office. July 7, 1997.

_____. 1996. Factors For Steelhead Decline: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act.

_____. 1993. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Sacramento River winter-run Chinook salmon; Final Rule. Federal Register: Vol. 58:33212-33219.

National Park Service. 1982. The Nationwide Rivers Inventory. Department of the Interior. Washington, D.C. Available online: <http://www.nps.gov/ncrc/programs/rtca/nri/index.html>.

NatureServe. 2010. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version 7.1. Arlington, Virginia. Available online: <http://www.natureserve.org/explorer>.

Nevada Irrigation District (NID). 2010a. Technical Memorandum 3-15 – Dutch Flat No. 2 Conduit Entrainment Netting Sampling. Prepared for the Relicensing of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2010b. Technical Memorandum 8-2b – Recreation Use and Visitor Surveys Yuba-Bear Hydroelectric Project. Prepared for the Relicensing of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2010c. Technical Memorandum 12-1c – Historic Properties – Yuba-Bear Hydroelectric Project. Prepared for the Relicensing of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2010d. Technical Memorandum 13-1c – Native American Traditional Cultural Properties – Yuba-Bear Hydroelectric Project. Prepared for the Relicensing of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2009. November 2009 Irrigation Season Raw Water Demand Analysis Methodology Technical Memorandum for the Raw Water Master Plan Update Phase 2. Unpublished report.

_____. 2008. Relicensing Pre-Application Document (PAD), Yuba-Bear Hydroelectric Project. Prepared by HDR|DTA.

_____. 2007. History of Nevada Irrigation District. Available online: <www.nid.dst.ca.us/history.cfm>. Accessed November 2, 2007.

_____. 2006. 2005 Nevada Irrigation District Urban Water Management Plan. Prepared by Kennedy/Jenks Consultants. Rancho Cordova, California.

_____. 2005. Raw Water Master Plan Update. Phase I: Technical Analysis. Volume I Final Report. Prepared by Kleinschmidt, West Yost and Associates, and Robertson – Bryan, Inc.

_____. 1949. Correspondence between Forest Varney, NID Manager, and W. H. Holmes, Engineer of Dams, Department of Public Works, Sacramento.

_____. 1926. Bowman-Spaulding Conduit, Mountain Division Works, Contracts, Specifications Proposals. Nevada Irrigation District, Nevada County, California. On file, Nevada Irrigation District Archives, Grass Valley.

Nevada Irrigation District (NID) and Pacific Gas and Electric Company (PG&E). 2011a. Technical Memorandum 1-11 – Channel Morphology. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011b. Technical Memorandum 2-3 – Water Temperature Modeling. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011c. Technical Memorandum 2-4 – Hydrologic Alteration. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011d. Technical Memorandum 3-7 – Special-Status Amphibians – Foothill Yellow-Legged Frog Habitat Modeling. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011e. Technical Memorandum 8-1 – Recreation Flow. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010a. Technical Memorandum 2-1 – Water Quality. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010b. Technical Memorandum 2-2 – Water Temperature Monitoring. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010c. Technical Memorandum 2-5 – Bioaccumulation. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010d. Technical Memorandum 3-1 – Stream Fish Populations. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010e. Technical Memorandum 3-2 – Instream Flow. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010f. Technical Memorandum 3-4 – Fish Passage. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010g. Technical Memorandum 3-5 – Fish Entrainment. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010h. Technical Memorandum 3-6 – Special-Status Amphibians – Foothill Yellow-Legged Frog Surveys. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010i. Technical Memorandum 3-8 – Special-Status Amphibians – Sierra Nevada Yellow-Legged Frog. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010j. Technical Memorandum 3-9 – Special-Status Reptiles – Western Pond Turtle. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010k. Technical Memorandum 3-10 - Aquatic Macroinvertebrates. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010l. Technical Memorandum 3-11 – Special-Status Mollusks. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010m. Technical Memorandum 3-12 – Reservoir Fish Populations. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010n. Technical Memorandum 3-14 – Western Pond Turtle Basking. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010o. Technical Memorandum 4-1 – Special-Status Wildlife – California Wildlife Habitat Relationships. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E's Drum-Spaulding Project (FERC Project No. 2310), and PG&E's Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010p. Technical Memorandum 4-2 – Wildlife – Movement. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010q. Technical Memorandum 4-3 – Wildlife – Bats. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010r. Technical Memorandum 5-1 – Special-Status Plants. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E’s Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010s. Technical Memorandum 6-1 – Riparian Habitat. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E’s Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010t. Technical Memorandum 6-2 – Wetlands. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E’s Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010u. Technical Memorandum 7-1 – ESA-Listed Amphibians – California Red-Legged Frog. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E’s Drum-Spaulding Project (FERC Project No. 2310), and PG&E’s Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010v. Technical Memorandum 7-2 – ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E’s Drum-Spaulding Project (FERC Project No. 2310), and PG&E’s Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010w. Technical Memorandum 7-3 – ESA-Listed Plants. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E’s Drum-Spaulding Project (FERC Project No. 2310), and PG&E’s Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010x. Technical Memorandum 7-4 – CESA-Listed and Fully Protected Wildlife – California Wildlife Habitat Relationships. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E’s Drum-Spaulding Project (FERC Project No. 2310), and PG&E’s Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010y. Technical Memorandum 7-5 – CESA-Listed Wildlife – Bald Eagle. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266), PG&E’s Drum-Spaulding Project (FERC Project No. 2310), and PG&E’s Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2010z. Technical Memorandum 9-1 – Roads and Trails. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E’s Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010aa. Technical Memorandum 10-1 – Visual Quality. Prepared for the Relicensings of NID’s Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E’s Drum-Spaulding Project (FERC Project No. 2310).

_____. 2009. Technical Memorandum 7-6 – CESA-Listed Plants. Prepared for the Relicensings of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) and PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____ and Placer County Water Agency (NID & PCWA). 1996. Sanitary Survey for the Yuba and Bear River Watersheds. Final Draft.

Office of Environmental Health Hazard Assessment (OEHHA). 2009. Update of California Sport Fish Advisories. California Environmental Protection Agency. Available online: <http://www.oehha.ca.gov/fish/so_cal/index.html>.

Pacific Fishery Management Council (PFMC). 1999. Identification and Description of Essential Fish Habitat Adverse Impacts and Recommended Conservation Measures for Salmon. Amendment 14 to the Pacific coasts salmon plan. Pacific Fishery Management Council. Available online: <http://www.pcouncil.org/salmon/fishery-management-plan/adopted approved-amendments/amendment-14-to-the-pacific-coast-salmon-plan-1997/>.

Pacific Gas and Electric Company (PG&E). 2011. Technical Memorandum 12-1a – Historic Properties – Drum-Spaulding Project. Prepared for the Relicensing of PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010a. Technical Memorandum 3-13 – Western Placer County Streams. Prepared for the Relicensing of PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010b. Technical Memorandum 8-2a – Recreation Use and Visitor Surveys Drum-Spaulding Project. Prepared for the Relicensing of PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010c. Technical Memorandum 13-1a – Native American Traditional Cultural Properties – Drum-Spaulding Project. Prepared for the Relicensing of PG&E's Drum-Spaulding Project (FERC Project No. 2310).

_____. 2010d. Technical Memorandum 13-1b – Native American Traditional Cultural Properties – Rollins Transmission Line Project. Prepared for the Relicensing of PG&E's Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2009. Pacific Gas and Electric Company Quagga/Zebra Mussel Infestation Prevention Program. San Francisco, CA.

_____. 2009. Technical Memorandum 12-1b – Historic Properties – Rollins Transmission Line Project. Prepared for the Relicensing of PG&E's Rollins Transmission Line Project (FERC Project No. 2784).

_____. 2008a. Relicensing Pre-Application Document (PAD), Drum-Spaulding Project. Prepared by HDR|DTA.

_____. 2008b. Relicensing Pre-Application Document (PAD), Rollins Transmission Line Project. Prepared by HDR|DTA.

_____. 1997a. Three-year Texas-Fall Creek Minimum Flow Study Final Report & Recommendations re Drum-Spaulding Project No. 2310. Filed with FERC.

_____. 1997b. The Flood at Drum PH 1997. Pacific Gas and Electric Company. On file, PG&E Archives, San Bruno, California.

_____. 1986. February 1986 Storm Damage Assessment and Recovery, Drum Division, 2-24-86. On file, PG&E Archives, San Bruno, California.

_____. 1967. Remove from Capital Buildings #2061, 2062 and 2063. General Maintenance Order (GMO) 168021. On file, PG&E Archives, San Bruno, California.

_____. 1963. Consolidated Contract between Nevada Irrigation District and Pacific Gas and Electric Company, Dated July 12, 1963. On file, Nevada Irrigation District Archives, Grass Valley, CA.

_____. 1961. Conversion of Spaulding No. 1 and No. 2 Powerhouses to Unattended Semi-automatic Operation. On file, PG&E Archives, San Bruno, California.

_____. 1956. Photographs, Dutch Flat Power House Storm Damage on Little Bear River. On file, PG&E Archives, San Bruno, California.

_____. 1952. Reconstruction of Spaulding Tramway between Powerhouse #1 and #2. General Maintenance Order 12066. On file, PG&E Archives, San Bruno, California.

_____. 1924. Report on the Design of Dam for Lake Fordyce. Division of Civil Engineering, San Francisco. On file, PG&E Archives, San Bruno, California.

_____ and the United States Fish and Wildlife Service (USFWS). 2003. VELB Conservation Program.

Pacific Service Magazine. 1927, January. Nevada County Irrigation Project Helped Out by Our Spaulding-Drum System. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

_____. 1923. Fifty-three Years a Lake Tender- The Quaint Story of Ed Roening. *Pacific Service Magazine*. 15(2):56-58. On file, California State Library, California History Room, Sacramento.

Pagenhart, T.H. 1969. Water Use in the Yuba and Bear River Basins. Ph.D. dissertation. University of California,Berkeley. Berkeley, California. On file, Water Resources Collection Center, University of California, Berkeley.

Painter, R.E., L.H. Wixom, and S.N. Taylor. 1977. An Evaluation of Fish Populations and Fisheries in the Post-Oroville Project Feather River. California Department of Fish and Game. Prepared for the California Department of Water Resources. Federal Power Commission License No. 2100.

PAR Environmental, Inc. 2009. Draft: National Register of Historic Places Evaluation, Nevada Irrigation District's Yuba-Bear Hydroelectric System, FERC No. 2266, Nevada, Sierra, and Placer Counties, California. PAR Environmental Inc., Sacramento. Sacramento, California. Prepared for HDR|DTA Inc., Sacramento.

Payen, L.A., and D.S. Boloyan. 1961. Archaeological Excavations at Chilcoot Rockshelter. (CA-PLU-44.) California Department of Parks and Recreation. Plumas County, California. pp. 1-14.

Payen, L.A., and W.H. Olsen. 1969. Archaeological Investigations in Stampede Reservoir, Sierra County, California. (Unpublished survey report.) Prepared for the National Park Service.

Pfankuch, D.J. 1975. Stream Reach Inventory and Channel Stability Evaluation: A Watershed Management Procedure. (R1-75-002.) USDA Forest Service. Washington, D.C.

Placer County. 2002. Auburn Ravine/Coon Creek Ecosystem Restoration Plan, CRMP Draft, Chapter 8: Fisheries Resources. Available online: <http://www.placer.ca.gov/Departments/CommunityDevelopment/Planning/PlacerLegacy/WatershedPlanning/ARCCRestorPlan.aspx>.

Placer County Water Agency (PCWA). 2011a. Comments on PG&E's Draft License Application for the Drum-Spaulding Project (FERC Project No. 2310).

_____. 2011b. Comments on NID's Draft License Application for the Yuba-Bear Hydroelectric Project (FERC Project No. 2266).

_____. 2008. Draft Foothill Yellow-legged Frog (FYLF) Habitat Suitability Criteria (HSC). FYLF Draft HSC Summary. February 4, 2008 meeting handout.

_____. 2005. 2005 Urban Water Management Plan. Prepared by Brown and Caldwell. Rancho Cordova, California.

_____ and U.S. Bureau of Reclamation. 2002. American River Pump Station Final EIR/EIS. Prepared by Surface Water Resources Inc.

Pook, David. Project Director. Girl Scouts of Northern California. Personal communication with Cindy Baker, PAR Environmental Services, Inc. 2010.

Pope, K.L., and K.R. Matthews. 2001. Movement Ecology and Seasonal Distribution of Mountain Yellow-legged Frogs, *Rana muscosa*, in a High-elevation Sierra Nevada Basin. *Copeia*. 2001:787-793.

Powers, P.D., and J.F. Orsborn. 1985. Analysis of Barriers to Upstream Migration: An Investigation of the Physical and Biological Conditions Affecting Fish Passage Success at Culverts and Waterfalls. (DOE/BP-36523-1.) Bonneville Power Administration.

Prichard, D., C. Bridges, S. Leonard, R. Krapf, and W. Hagenbuck. 2003. Riparian Area Management: Process for Assessing Proper Functioning Condition for Lentic Riparian Wetland Areas. (Technical Reference 1737-11.) Bureau of Land Management. Denver, Colorado.

_____, J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. (Technical Reference 1737-15.) Bureau of Land Management. Denver, Colorado.

Rachowicz, L.J., R.A. Knapp, J.A.T. Morgan, M.J. Stice, V.T. Vredenburg, J.M. Parker, and C.J. Briggs. 2006. Emerging Infectious Disease as a Proximate Cause of Amphibian Mass Mortality. *Ecology*. 87:1671-1683.

Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. Habitat Suitability Information: Rainbow Trout. (FWS/OBS-82/10.60.) U.S. Fish Wildlife Service.

Randall, P.J. 1997. Distribution and Ecology of Fish and Frogs in Tributaries to the South Fork Yuba River. M.S. thesis. Shields Library Microcopy Collection LD781.D5j 1997 R368 MASTERS.

Rathbun, G.B., N.J. Scott, and T.G. Murphey. 2002. Terrestrial Habitat Use by Pacific Pond Turtles in a Mediterranean Climate. *The Southwestern Naturalist*. 47:225-235.

Reese, D.A. undated. Western Pond Turtle Survey Techniques.

_____ and H.H. Welsh. 1997. Use of Terrestrial Habitat by Western Pond Turtles, *Clemmys marmorata*: Implications for Management. In: New York Turtle and Tortoise Society. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles: An International Conference; New York, New York. pp. 352-357.

Rehn, A.C. 2009. Benthic Macroinvertebrates as Indicators of Biological Condition below Hydropower Dams on West Slope Sierra Nevada Streams, California, USA. *River Research and Applications*. 25:208-228.

Rich, A.A. 1987. Water Temperatures Which Optimize Growth and Survival of the Anadromous Fishery Resources of the Lower American River. Prepared for McDonough, Holland, and Allen.

Richard, J.B. 1968. Jr. Aquatic Biologist, CDFG. Lake Survey Reports. Internal memorandum.

Ritter, E.W., ed. 1970. Archaeological Investigations in the Auburn Reservoir Area, Phase II-III, San Francisco. Prepared for the National Park Service.

Rohe, R. 1985. Hydraulicking in the American West. *Montana: The Magazine of Western History*. 35(2).

Ruediger R., and J.Ward. 1996. Abundance and Function of Large Woody Debris in Central Sierra Nevada Streams. Fish Habitat Relationships Technical Bulletin No. 20.

Samford, Ted. Fishing guide and retired PG&E Water Systems Operator 1984 – 2003. Personal communication. April 2007.

Schaffer, C. 2005. The Definitive Guide to Fishing Northern California. Shafdog Publications.

Seaber, PR., F.P. Kapinos, and G.L. Knapp. 1987. Hydrologic Unit Maps. USGS Water Supply Paper 2294.

Seltenrich, C.P., and A.C. Pool. 2002. A Standardized Approach for Habitat Assessments and Visual Encounter Surveys for the Foothill Yellow-legged Frog (*Rana boylii*). Pacific Gas and Electric Company. San Ramon, California.

Shaffer, H.B., G.M. Fellers, S.R. Voss, J.C. Olive, and G.B. Pauly. 2004. Species Boundaries, Phylogeography and Conservation Genetics of the Red-legged Frog (*Rana aurora/draytonii*) Complex. *Molecular Ecology*. 13:2667-2677.

Shelby, B. and T.A. Heberlein. 1986. Carrying Capacity in Recreation Settings. Oregon State University Press. Corvallis, OR.

_____, J.J. Vaske, and T.A. Heberlein. 1989. Comparative analysis of crowding in multiple locations: Results from fifteen years of research. Journal of Leisure Research. 11: 269-291.

Slater, D.W. 1958. Upper Sacramento River Fisheries Conference Sixth Annual Meeting; 1958 April 17; Sacramento, California.

Snider, B., and R. Titus. 2000a. Timing, Composition, and Abundance of Juvenile Anadromous Salmonid Emigration in the Sacramento River Near Knights Landing October 1996 - September 1997. (Technical Report No. 00-04.) California Department of Fish and Game.

_____ and R.G. Titus. 2000b. Lower American River Emigration Survey: October 1996-September 1997. (Stream Evaluation Program Technical Report No. 00-2.) California Department of Fish and Game.

Spaulding, S.A., and Elwell, L. 2007. Increase in Nuisance Blooms and Geographic Expansion of the Freshwater Diatom *Didymosphenia geminate*. U.S. Geological Survey Open-File Report 2007-1425.

Stalnaker. 1993. IF 201 - Problem Analysis and Negotiating Solutions Using IFIM. U.S. Fish and Wildlife Service Instream Flow Training Manual. Course delivered May 10-14, 1993. Fort Collins, Colorado.

Starr Consulting & Palencia Consulting Engineers (Starr & Palencia). 2007. Yuba/Bear River Watershed Sanitary Survey. Second Update. Final Report. In Association with Talavera & Richardson and Archibal Consulting.

Starr, K. 1997. Endangered Dreams: The Great Depression in California. Oxford University Press, New York, New York.

State of California, Employment Development Department (EDD). 2005. Labor Market Information. <http://www.labormarketinfo.edd.ca.gov/>. Accessed August 2005.

State Water Resources Control Board (SWRCB). 2006. 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments. Central Valley Regional Water Quality Control Board. Available online: <http://www. swrcb.ca.gov/tmdl/303d_lists2006.html>. Last updated October 25, 2006.

_____. 2003. Revised Water Right Decision 1644 in the Matter of Fishery Resources and Water Right Issues of the Lower Yuba River.

_____. 1999. Water Quality Control Plans and Policies Adopted as part of the State Comprehensive Plan.

_____. 1986. Haypress-Milton Creeks Hydroelectric Project in Sierra County. Applications 27178 and 28104. Decision 1609.

_____. 1975. Water Quality Control Plan. Sacramento, California.

Steele, I.C. 1919, November. The Completion of Lake Spaulding Dam to the 275-Foot Level Above the Bed of the South Yuba River. *Pacific Service Magazine.* On file, California Room, California State Library, Sacramento.

Steffler, P., and Blackburn, J. 2002. River2D: Two-dimensional Depth Averaged Model of River Hydrodynamics and Fish Habitat: Introduction to Depth Averaged Modeling and User's Manual. University of Alberta, Edmonton, Alberta, Canada.

Studley, T.K., and S.D. Case. 1989. Fisheries Investigations in the North Fork of the North Fork American River below Lake Valley Reservoir. (026.11-87.4.) Pacific Gas and Electric Company, Technical and Ecological Services.

Tatarian, P., and G. Tatarian. 2010. Chytrid Infection of *Rana draytonii* in the Sierra Nevada, California, USA. *Herpetological Review*. 41:325-327.

Teale GIS Solutions Group. 1997.

Teater, Dan. Fish Biologist. American River Ranger District. Personal communication. 2007

Thompson, K. 1972. Determining Stream Flows for Fish Life. Presented at Pacific Northwest River Basins Commission Instream Flow Requirement Workshop. 1972 March.

Tibbetts, F. 1922. Report on Water Supply, Power Development, Irrigation Distribution. San Francisco, California. Prepared for Nevada Irrigation District. On file, Nevada Irrigation District Archives, Grass Valley, CA.

Tierney, Marylin. District Biologist. Tahoe National Forest, Camptonville, CA. Personal communications with Mike Whitter, HDR. July 14, 2009.

_____. 2006. Biological Evaluation – Birds, Mammals, Amphibians, Reptiles, Fish, Invertebrates – South Yuba Canal Project. Yuba River Ranger District. USFS Tahoe National Forest.

Tilford, H. 1867. Historical Sketch of Meadow Lakes Township. In: Bean, E.F., compiler. Bean’s 1867 History and Directory of Nevada County, California. On file, California History Room, California State Archives, Sacramento.

Town of Loomis. 2011. Town of Loomis, California Comments concerning the Pacific Gas and Electric Company’s Drum-Spaulding (FERC Project #2310) Hydroelectric Project Draft License Applications.

Trails.com. 2007. Northern California Fly-fishing – Northern California Fly Fish Waters. Available online: <http://www.trails.com/stateactivity.asp?area=13967>. Accessed May 29, 2007.

Tudor Engineering Company. 1981. Initial Environmental Study: Jackson Meadows and Bowman Power Plants. San Francisco, CA. Prepared for Nevada Irrigation District (NID).

Union, The. 1981. NID – 60 Years of Service. The Union, Grass Valley, July 24, 1981. On file, Nevada Irrigation District Archives, Grass Valley, CA.

United States Army Corps of Engineers – Hydrologic Engineering Center. 2005. HEC-ResSim webpage. Available online: <http://www.hec.usace.army.mil/software/hec-ressim/hecressim-hecressim.htm>.

_____. 2003. HEC-ResSim Version 3.0 - Users' Manual.

United States Congress. 1976. Magnuson-Stevens Fishery Conservation and Management Act of 1976. (16 U.S.C. 1801-1882.)

_____. 1973. Endangered Species Act (ESA) of 1973. (16 USC § 1531 *et seq.*)

_____. 1972. Coastal Zone Management Act (CZMA) of 1972. (16 U.S.C. 1451-1456.)

_____. 1970. Federal Water Pollution Control Act (Clean Water Act). (33 U.S.C. 1251 - 1376)

_____. 1968. Wild and Scenic Rivers Act of 1968. (16 USC §§ 1271 *et seq*.)

_____. 1966. National Historic Preservation Act (NHPA) of 1966. (16 USC § 470 *et seq*.)

United States Department of Agriculture, Forest Service (USFS). 2010. Motorized Travel Management Environmental Impact Statement and Record of Decision.

_____. 2005. National Inventory and Assessment – For Identifying Barriers To Aquatic Organism Passage At Road-Stream Crossings. U.S .Department Of Agriculture Forest Service National Technology and Development Program. San Dimas, California.

_____. 2004. Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement and Record of Decision. United States Department of Agriculture--Forest Service, Pacific Southwest Region. Available online: <http://www.fs.fed.us/r5/snfpa/>.

_____. 2002. South Yuba Watershed Assessment. USDA Forest Service. Tahoe National Forest. Nevada City Ranger District.

_____. 1990. Tahoe National Forest Land and Resource Management Plan, as amended 2004. USDA Forest Service, Pacific Southwest Region. San Francisco, California.

_____ and Bureau of Land Management. 1999. Westside Rivers Environmental Impact Statement and Record of Decision.

_____. 2009. Tahoe National Forest. USFS Corporate Geospatial Data. Nevada City, California.

_____. 2008. Sierra Resource Management Plan Record of Decision.

_____. 2007. Existing Vegetation Maps (or GIS Dataset metadata used to generate vegetation maps).

_____. 2006. Region 5 - Management Indicator Species (MIS) Accounts. 17 individual species accounts.

_____. 2001a. 1975-2001 Stream Surveys and Stream Condition Inventories for Streams and Creeks in the Tahoe National Forest. Unpublished internal reports.

_____. 2001b. Riparian Inventory - Gap Wildfire Area.

_____. 1998 to Present. Stream Survey Documents. Unpublished internal reports.

_____. Before 1998. Stream Survey Documents. Unpublished internal reports.

_____, Tahoe National Forest (TNF), United States Department of the Interior, Bureau of Land Management, California State Parks, and Nevada County. 2005. South Yuba River Comprehensive Management Plan-Final.

United States Department of Agriculture, Natural Resources Conservation Service (NRCS). 2009. The PLANTS Database. Available online: <http://plants.usda.gov>.

United States Department of Commerce, Bureau of Economic Analysis. 2005. Regional Economic Accounts: Placer County. Available online: <http://www.bea.doc.gov/bea/regional/reis>. Accessed May 2007.

United States Department of the Interior, Bureau of Land Management (BLM). 2008. Sierra Resource Management Plan and Record of Decision, USDOI Bureau of Land Management Folsom District, Folsom, California.

United States Environmental Protection Agency (EPA). 2003. Bacterial Water Quality Standards for Recreational Waters (Freshwater and Marine Waters). Office of Water Report No. EPA-823-R-03-008. Available online: <http://www.epa.gov/waterscience/beaches/local/sum2.html>.

_____. 2000. Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. (40 CFR 131.)

United States Fish and Wildlife Service (USFWS). 2010a. Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-Legged Frog; Final Rule. (Federal Register 75:12815.)

_____. 2010b. News Release: 1.6 Million Acres Designated as Critical Habitat for California Red-Legged Frog. Available online: <http://www.fws.gov/sacramento/ea/news_releases/2010_News_Releases/Critcal_Habitat_California_Red-Legged_Frog_2010.html>. Accessed January 2011.

_____. 2009. Sacramento Fish and Wildlife Office Species Account: Valley Elderberry Longhorn Beetle. Available online: <http://www.fws.gov/sacramento/es/animal_spp_acct/valley_elderberry_longhorn_beetl.htm>.

_____. 2007. National Bald Eagle Management Guidelines.

_____. 2006a. Sacramento Fish and Wildlife Office Species Account: Sacramento Orcutt Grass. Available online: <www.fws.gov/sacramento/es/plant_spp_accts/sacramento_orcutt_grass.htm>.

_____. 2006b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the California Red-Legged Frog, and Special Rule Exemption Associated With Final Listing for Existing Routine Ranching Activities; Final Rule. (Federal Register 71:19244-19346.)

_____. 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Region 1, U.S. Fish and Wildlife Service. Portland, Oregon.

_____. 2003. Endangered and Threatened Wildlife and Plants: 12-month Finding for a Petition to List the Sierra Nevada Distinct Population Segment of the Mountain Yellow-Legged Frog (*Rana muscosa*). Federal Register 68(11):2283-2303. 50 CFR Part 17.

_____. 2002a. Determination of Endangered Status for the Southern California Distinct Vertebrate Population Segment of the Mountain Yellow-Legged Frog (*Rana muscosa*). Federal Register 67:127:44382-44392.

_____. 2002b. Recovery Plan for Gabbro Soil Plants of the Central Nevada Foothills. Region 1, U.S. Fish and Wildlife Service. Portland, Oregon.

_____. 2002c. Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*). Region 1, U.S. Fish and Wildlife Service. Portland, Oregon.

_____. 2001a. Sacramento Fish and Wildlife Office Species Account: Hartweg's Golden Sunburst. Available online: <www.fws.gov/sacramento/es/plant_spp_accts/hartwegs_golden_sunburst.htm>.

_____. 2001b. Final Determination of Critical Habitat for the California Red-legged Frog. Federal Register 66(49):14626-14758.

_____. 1999. Valley Elderberry Longhorn Beetle Consultation with the U.S. Army Corps of Engineers. Sacramento, California. Appendix: Conservation guidelines for the valley elderberry longhorn beetle (PDF).

_____. 1997. Guidance on Site Assessment and Field Surveys for the California Red-legged Frogs.

_____. 1996. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the California Red-legged Frog. Federal Register 61(101):25813-25833.

_____. 1995. Working Paper on Restoration Needs: Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California. Volume 2. Prepared for the USFWS under the direction of the Anadromous Fish Restoration Program Core Group.

_____. 1987. National Wetland Inventory (NWI) Maps. U.S. Department of the Interior, USFWS, Region 1. Portland, Oregon.

_____. 1980. Listing the Valley Elderberry Longhorn Beetle as a Threatened Species with Critical Habitat. Federal Register 45:52803-52807.

_____. Undated. The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. Washington, D.C.

_____, California Department of Fish and Game (CDFG), California Waterfowl Association, and Ducks Unlimited. 1990. Central Valley Habitat Joint Venture Implementation Plan: A Component of the North American Waterfowl Management Plan.

United States Geological Survey (USGS). 2005. Water-Data Site Information for California. Available online: <http://waterdata.usgs. gov/ca/nwis/si>. Accessed October 25, 2005.

_____. 2002. Water Resources Data, California Water Year 2002, Volume 4. Northern Central Valley Basins and the Great Basin from Honey Lake Basin to the Oregon State Line.

United States of America Federal Power Commission (FPC). 1963a. Project No. 2266, Order Issuing License (Major).

_____. 1963b. Project No. 2310, Order Issuing License (Major).

Urie, S. 2003. Tahoe National Forest Noxious Weed Program. USFS Tahoe National Forest.

Van Norden, R. 1923, November. History of the Lake Fordyce Dam. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

Van Wagner, T. 1996. Selected Life History and Ecological Aspects of a Population of Foothill Yellow-legged Frogs (*Rana boylii*) from Clear Creek, Nevada City, California. M.S. Thesis. California State University, Chico. Chico, California.

Van Zuuk, K. 2006a. Biological Evaluation for Sensitive Plants and Fungi Crooked Lakes Trail Reroute Project Yuba River Ranger District Tahoe National Forest.

_____. 2006b. Watchlist Plant and Plant Community Report Crooked Lakes Trail Project Yuba River Ranger District Tahoe National Forest. November 28, 2006.

_____. 2006c. Weed Risk Assessment Crooked Lakes Trail Project. Yuba River Ranger District. USFS Tahoe National Forest.

_____. 2005a. Biological Evaluation for Sensitive Plants Brubaker Mine Site Restoration Project Yuba River Ranger District Tahoe National Forest.

_____. 2005b. Weed Risk Assessment Brubaker Mine Site Restoration Project. Yuba River Ranger District. USFS Tahoe National Forest.

_____. 2003a. Biological Evaluation for Sensitive Plants Blue Canyon Fuel Reduction Project Nevada City Ranger District Tahoe National Forest.

_____. 2003b. Watchlist Plant and Plant Community Report Blue Canyon Project Nevada City Ranger District Tahoe National Forest.

_____. 2003c. Weed Risk Assessment Blue Canyon Project. Nevada City Ranger District. USFS Tahoe National Forest.

_____. 2003d. Biological Evaluation – Birds, Mammals, Amphibians, Reptiles, Fish, Invertebrates – Blue Canyon Fuels Reduction Project. Nevada City Ranger District. USFS Tahoe National Forest.

Vogel, D.A. 2006. Assessment of Adult Anadromous Salmonid Migration Barriers and Holding Habitats in the Upper Yuba River – Appendix C to the Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Prepared for CH2M Hill as a part of the UYRSP.

_____ and K.R. Marine. 1991. Guide to Upper Sacramento River Chinook Salmon Life History. Prepared for the U.S. Bureau of Reclamation Central Valley Project.

Voight, H.N., and D.B. Gale. 1998. Distribution of Fish Species in Tributaries of the Lower Klamath River: An Interim Report, FY 1996. (Technical Report No. 3.) Yurok Tribal Fisheries Program, Habitat Assessment and Biological Monitoring Division. Klamath, California.

Vondracek, B., and D.R. Longanecker. 1993. Habitat Selection by Rainbow Trout *Oncorhynchus mykiss* in a California Stream: Implications for the Instream Flow Incremental Methodology. *Ecology of Freshwater Fish*. 2:173–186.

Vredenburg, V.T., R.A. Knapp, T.S. Tunstall, and C.J. Briggs. 2010. Dynamics of an Emerging Disease Drive Large-scale Amphibian Population Extinctions. *Proceedings of the National Academy of Sciences*. 107:9695-9700.

_____, R. Bingham, R. Knapp, J.A.T. Morgan, C. Moritz, and D. Wake. 2007. Concordant Molecular and Phenotypic Data Delineate New Taxonomy and Conservation Priorities for the Endangered Mountain Yellow-legged Frog. *Journal of Zoology*. 271:361-374.

Wagner, R., and J. Finn. 1985. The Downieville/Nevada City Deer Herd Management Plan. Prepared for California Department of Fish and Game and United States Forest Service.

Ward, Dave. Drum Generation Supervisor, Upper Drum. Pacific Gas and Electric Company, Power Generation Department. Personal communication with Rick Jones, HDR|DTA. Spring, 2009.

Wedemeyer, G.A., R.L. Saunders, and W.C. Clarke. 1980. Environmental Factors Affecting Smoltification and Early Marine Survival of Anadromous Salmonids. *Marine Fisheries Review*. 42:1-14.

White, J.G. & Company. 1910. Power Projects, Pacific Gas & Electric Co. J. G. White & Company, Incorporated, Engineers, Contractors, New York, Chicago, San Francisco. On file, PG&E Archives, San Bruno, Calfiornia.

White, J.L., and B. Harvey. 2007. Winter Feeding Success of Stream Trout under Different Streamflow and Turbidity Conditions. *Transactions of the American Fisheries Society*. 136:1187-1192.

Wise, J.H. 1912 August. The Newest and Greatest ‘Pacific Service’ Undertaking: The South Yuba and Bear River Hydro-Electric Development. *Pacific Service Magazine*. On file, California Room, California State Library, Sacramento.

Yoshiyama, R.M., E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California. In: Brown, R., editor. Contributions to the Biology of Central Valley Salmonids, California Fish and Game, Bulletin 179, Volume 1. Salmonid Symposium; 1997 October 22-24; Bodega Bay, California.

_____. 1996. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California. As cited in Sierra Nevada ecosystem project, Final Report to Congress, 111, Assessments, Commissioned Reports, and Background Information. Prepared by Fisher, F.W., et al.

Yuba County Water Agency (YCWA). 2005. Evaluation of the 2004 Yuba River Water Transfers, Draft. Prepared for Yuba County Water Agency by Surface Water Resources, Inc.

_____. 2000. Draft Environmental Evaluation Report - Yuba River Development Project (FERC No. 2246).

_____, DWR, and Reclamation. 2007. Draft Environmental Impact Report / Environmental Impact Statement for the Proposed Lower Yuba River Accord. Prepared by HDR|Surface Water Resources, Inc.

Zaugg, W.S., and H.H. Wagner. 1973. Gill ATPase Activity Related to Parr-Smolt Transformation and Migration in Steelhead Trout (Salmo gairdneri): Influence of Photoperiod and Temperature. *Comparative Biochemistry and Physiology*. 45B:955-965.

Zielinski, W.J., T.E. Kucera, and R.H. Barret. 1995. Current Distribution of the Fisher, *Martes pennanti*, in California. *California Fish and Game*. 81(3):104-12.

Zimmerman, C.E., G.W. Edwards, and K. Perry. 2008. Maternal Origin and Migratory History of Steelhead and Rainbow Trout Captured in Rivers of the Central Valley, California. *Trans. American Fisheries Society*. 138:2,280-291

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