Lower Cascade Canal and Upper Grass Valley Canal Long Term Canopy Cover and Pond Study Report- Monitoring Year 4

Banner Cascade Pipeline Project

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Sign-off Sheet

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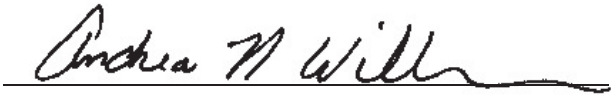
Technically Reviewed by 
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Abbreviations

CEQA	California Environmental Quality Act
CFS	Cubic Feet per Second
CRLF	California red-legged frog
DBH	Diameter at Breast Height
DEIR	Draft Environmental Impact Report
ESA	Endangered Species Act
FEIR	Final Environmental Impact Report
GPS	Global Positioning System
GIS	Geographic Information Systems
Impact Assessment Workplan	The Lower Cascade Canal and Upper Grass Valley Canal-Canal Canopy and Wetland Impact Assessment Workplan
LCC	Lower Cascade Canal
MM	Mitigation Measure
MMRP	Mitigation Monitoring and Reporting Program
NID	Nevada Irrigation District
NRCS	National Resources Conservation Service
NWI	National Wetlands Inventory
Project	Banner Cascade Pipeline Project
Pond Study	The Seep Wetland, Pond, and Associated Potential Endangered Species Act Species Habitat Study
PVC	Polyvinyl Chloride
Report	Lower Cascade Canal and Upper Grass Valley Canal Long Term Canopy Cover and Pond Study Report- Monitoring Year 4
UGVC	Upper Grass Valley Canal
USFWS	U.S. Fish and Wildlife Service
WTP	Wastewater Treatment Plant

1.0 INTRODUCTION

The Nevada Irrigation District (NID) constructed the Banner Cascade Pipeline as part of the Banner Cascade Pipeline Project (Project) to ensure reliable water delivery to the areas of Nevada County, California. Specifically, the Banner Cascade Pipeline serves as the primary means of conveying raw water to Grass Valley, Nevada City, and the Loma Rica and Elizabeth George Wastewater Treatment Plants (WTP). The Banner Cascade Pipeline has replaced both the Lower Cascade Canal (LCC) and the Upper Grass Valley Canal (UGVC), which had reached capacity and no longer met the needs of the area. NID has kept both the LCC and UGVC canals in service, as historical, cultural, scenic, and recreational amenities; however, flows have been reduced.

Due to canal flow reductions in the LCC and UGVC, NID has identified and addressed potential impacts that could result from these flow reductions in the Project's California Environmental Quality Act (CEQA) Draft Environmental Impact Report (DEIR) (NID 2004). These include the potential reduction in canopy cover due to reduced flows and seepage that support the growth of riparian, or wet-adapted riparian-type species (e.g., emergent, hydrophytic, mesic, etc.). The impact analysis found that the possible stress from the flow reductions could also lead to increased susceptibility to disease, parasitism, and possibly death of plants, including special-status plant species. This, in turn, could result in the loss of trees and associated shade canopy, reductions in seepage flows to ponds, and the reduction of habitat for common and special-status wildlife species (NID 2004). As such, the Final Environmental Impact Report (FEIR) deemed it necessary to study the potential for reduced flow to affect canal area vegetation (NID 2006). To facilitate environmental compliance with the Project CEQA Mitigation Monitoring and Reporting Program (MMRP) Mitigation Measures (MM) *3.8-1: Prepare and Implement Long-Term Monitoring Program* and MM *3.8-2: Prepare and Implement a MMRP to Determine Impacts to Adjacent Seeps and Ponds*, NID developed the LCC and UGVC Canal Canopy and Wetland Impact Assessment Workplan (Impact Assessment Workplan) (NID 2012).

This Impact Assessment Workplan identifies two specific monitoring studies- (1) the Canopy Cover Study, comprised of both the Tree Health Assessment and Canopy Cover Assessment; and (2) the Seep Wetland, Pond, and Associated Potential Endangered Species Act (ESA) Species Habitat Study (Pond Study). A summary of the Impact Assessment Workplans can be referenced in the Ten-Year Canopy Study Monitoring Plan (**Appendix B**), and the Ten-Year Pond Study Monitoring Plan (**Appendix C**). This Year 4 Monitoring Report (Report) fulfills the requirements for Year 4 of the monitoring and reporting requirements for both studies.

2.0 METHODS

Methods for the Canopy Cover Study and the Pond Study were developed as part of the MMRP Impact Assessment Workplan (NID 2012), in coordination with specialist from Save Our Historic Canals. The methods assess the potential flow reduction impacts through spatial and temporal comparisons. The qualitative and quantitative approach for monitoring and documenting changes along the LCC and the UGVC as compared to the control site, the DS Canal, are summarized below.

The DS Canal was selected as a control (i.e., reference) site due to its parallel proximity to the LCC and UGVC and its unaltered operational flows relative to the LCC flow reductions. NID's flows in the LCC were reduced in 2014 with the simultaneous installation of check dams to keep water levels higher. The LCC flows have remained approximately 5 cubic feet per second (cfs) since that time. Flows in the UGVC were reduced in 2014 and have remained approximately 0.3 to 0.5 cfs. In contrast, the DS Canal flows have continued at rates approximately 60-65 cfs per normal operations during the summer (April-October) and 3 to 5 cfs during winter months (October-April) (pers. com. Sue Sindt, NID 2018).

Table 2-1 Summary of Methods and Parameters for the Canopy Cover Study and the Pond Study

Study Type	Study Duration (years)	Data Collection Frequency	Total Study Sites			Study Site Description(s)
			LCC	UGVC	DS Canal[1]	
Canopy Cover Study Tree Health Assessment	10	Every 2 years (Years 0, 2, 4, 6, 8, 10)[4]	4	1	1	Approximately 20 X 10 meters
Canopy Cover Study Canopy Cover Assessment	10	Every 4 years [2] (Years 0, 4, 8, +10) [4]	350	50	50	1 densiometer reading for approximately every 100 feet of Reach
Seep Wetland, Pond, & Associated Potential ESA Species Habitat Study Pond Study	10	Every 4 years [2] (Years 0, 4, 8, +10) [4]	2	0 [3]	1	Dependent on pond locations & accessibility

[1] DS Canal is not part of the Project and thus acts as a monitoring control-site

[2] Data Collection Frequency was updated in the table to reflect future adaptive management recommendations

[3] No ponds were observed along UGVC

[4] Year 0- 2013 Year 2- 2015 Year 4- 2017 Year 6- 2019 Year 8- 2021 Year 10- 2023

2.1 CANOPY COVER STUDY METHODS

Two studies were conducted as part of the overall Canopy Cover Study including the (1) Tree Health Assessment; and (2) Canopy Cover Assessment (NID 2006).

2.1.1 Tree Health Assessment

A total of six representative Tree Health Assessment study sites were selected (**Appendix A**- Figure A.1 Project and Study Location Overview). The six Tree Health Assessment sites are comprised of (1) four study sites along the LCC, (2) one study site along the UGVC[1], and (3) one control-site (i.e., reference-site) along the DS Canal. Representative sites were specifically selected based on vegetation type, areas suspected of maximum leakage (i.e., unlined stretches of the canal), and other associated flora that has the greatest potential to be adversely impacted by reductions in canal leakage. Each study site is approximately 20 meters in length, centered within riparian vegetation, and includes individual trees on both the downslope (i.e., approximately 75 percent of the site trees) and upslope (i.e., approximately 25 percent of the site trees) of the canal. Each study site is one meter from the downslope side of the canal and one meter from the upslope side of the canal.

The Tree Health Assessment is comprised of the following parameters:

- Evaluations will be conducted of progressive changes in flora patterns over time, along the impacted LCC and UGVC canal areas and the comparable un-impacted DS Canal control-site;
- Data collection will occur within each of the appropriate study years in the late summer (i.e., typically August through September), when the trees are most water stressed, but prior to leaf shedding (i.e., abscission); and
- Surveys will be completed by a qualified botanist or biologist.

Assessment data for monitoring Year 4 was collected on September 7, 8, 12, 15, 2017 by a qualified Stantec Botanist and Biologist at the six study site locations (**Appendix A**- Figure A.1 Project and Study Location Overview). At each of the six study sites, previously tagged trees were evaluated for tree health. To capture tree health, visual inspections of tagged trees at the six study sites were made using the criteria listed below (Table 2-2) to determine overall tree health. Data was documented with a Trimble Series 6000 GeoXH Global Positioning System (GPS).

[1] Due to limited suitable study sites only one site was established along the UGVC.

Table 2-2 Tree Health Assessment Data Collection Criteria

Assessment Type	Assessment Description	Assessment Score
Canopy Cover	Canopy cover die-back by a percentage based on density and presence of foliage at the crown of the tree.	**1- None:** no canopy present, 0% **2- Sparse:** most canopy absent, 0-25% **3- Partial:** canopy 25-50% **4- Medium:** canopy 50-75% **5- Full:** canopy 75-100%
Bark Health	Bark health is assessed through the absence/ sluffing of bark on the bole and limbs of the tree.	**1- Dead:** 100% sluffing off, extensive damage **2- Poor:** decaying or dead; 75-100% bark absent from bole and limbs of tree; abundant root rot; extensive insect damage; overall discoloration and bark shape irregularities; abundant surface growth **3- Fair:** 50-75% bark absence; some root rot and insect damage; discoloration and bark shape irregularities; bark sluffing **4- Good:** 25-50% bark absence; some root or heart rot present; bark only missing from tree limbs **5- Excellent:** 0-25% bark absence. Present bark generally intact and of high vigor
Leaf Color	Leaf color is assessed based on abnormal colorations that are not typical for the species or season, uniform throughout all present foliage, etc.	**1- Normal:** no abnormalities present, color normal **0- Abnormal:** abnormal color present (e.g., spotting, insect tracks, necrotic tips, etc.)
New Growth Presence	"New growth" is any new vascular growth including leaf buds, basal sprouts, epicormic stems, and saplings.	**0- Present** **1- Not present**
Surface Growth Presence	Surface growth on the trunk and stems includes lichen, moss, and all other normal terrestrial algal plants (i.e., non-vascular plants, bryophytes).	**0- Present** **1- Not present**
Disease	Disease includes fungal/mold presence and other pathogens, tubers, cankers, structural decay (e.g., basal decay, irregular growth pattern of tree), root and heart rot, etc.	**0- Present** **1- Not present**
Parasites	Parasites can include, but are not limited to, the presence of mistletoe, red pustules, etc.	**0- Present** **1- Not present**
Insect Infestation	Signs of insects include burrowing/bore holes; frass, larvae or larva galleries, or insect presence; leaf notching; epicormics stems, galls, etc.	**0- Present** **1- Not present**

Assessment Type	Assessment Description	Assessment Score
Overall Tree Health	Overall tree health was assessed through leaf/ foliage health and other associated physical leaf characteristics, the amount of canopy foliage present, stem, and bark health (e.g., decay), abnormal tree shape, and/or increased presence of disease, parasites, and insect infestations. Normal seasonal variations were considered in overall health scoring.	**1- Dead Overall** **2- Poor Overall**: partial-full discoloration; severe insect damage; disease presence; tissue damage **3- Fair Overall**: partial discoloration; some insect damage, heart rot **4- Good Overall**: some discoloration **5- Excellent Overall**: no physical abnormalities

2.1.2 Canopy Cover Assessment

A Canopy Cover Assessment (via Densiometer Analysis) was conducted as part of the Canopy Cover Study. Canopy data is collected in conjunction with the Tree Health Assessment data (i.e., within the same Ten-Year monitoring period) every four years- Years 0, 4, 8, and 10 (NID 2012). Like the tree health data collection period, canopy data collection occurs within each of the appropriate study years in the late summer (i.e., typically August through September).[2]

The Canopy Cover Assessment Reaches were established along the same canal portions as the Tree Health Assessment sites. However, the Canopy Cover Assessment Reaches do not directly correlate to the Tree Health Assessment study sites, but rather extend along the canal and comprise a study Reach. Canopy cover data was collected along each Reach of (1) approximately seven miles of the LCC, (2) 0.5 mile of the UGVC, and (3) along one mile of the DS Canal as a control. (**Appendix A**- Figure A.1 Project and Study Location Overview).

Canopy data for monitoring Year 4 was collected on September 9, 15, 18, and 22, 2017 by a qualified Stantec Botanist and Biologist. Observations were made using a densiometer and methods described in the Riparian Monitoring Procedures Section of the Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment (SWRCB 2012), and the canopy cover monitoring protocols referenced in the Project Impact Assessment Workplan (Burres 2010; Ode 2007; NID 2012). Specifically, the densiometer method uses the Strickler modification (17-point) of a convex spherical densiometer to correct for overestimation of canopy density (thickness and consistency of plant foliage) that occurs with unmodified readings (Strickler 1959). Observations were made facing upstream, downstream, facing the right bank, and facing the left bank (i.e., north, south, east, and west). Each observation location was documented with a Trimble Series 6000 GeoXH GPS. During Year 4 monitoring, the Canopy Cover Assessments on the LCC (i.e., seven-mile Reach) had less observation points from the previous monitoring Year 0 (i.e., baseline 2013) due to the standardization of observation intervals (i.e., 79 less densiometer observation points).

[2] The Canopy Cover Assessment interval specification in the Workplan outlines five year intervals for Canopy Cover Assessments however this is contradicted with a specification to occur every two to four years (i.e. 0 4 6 10). Considering on-going environmental conditions within the timeframe of tree health and canopy studies (e g. drought) to be complimentary to the Tree Health Assessments and to increase study time and efficiency it has been recommended and adopted as an adaptive management strategy to update the Canopy Cover Assessments to occur every four years with one final assessment to conclude the study on year ten (i e. 0 4 8 10).

2.2 POND STUDY METHODS

2.2.1 Pond Study

The objective of the Pond Study is to assesses whether reductions in canal flows and associated leakage in ponds located adjacent to the LCC and the UGVC will potentially result in negative impacts to sensitive habitats and species, specifically the special-status California red-legged frog (CRLF) (NID 2012). The Pond Study was conducted in conjunction with the Canopy Cover Study, every four years- Years 0, 4, 8, and 10 (NID 2012). Like the tree health and canopy cover data collection period, pond data collection occurs within each of the appropriate study years in the late summer (i.e., typically August through September).[3]

The Pond Study sites include two sites along the LCC (i.e., Pond 1 and Pond 2), and one control-site along the DS Canal (i.e., Pond 3) (**Appendix A**- Figure A.1 Project and Study Location Overview). No ponds were identified along the UGVC, and therefore no pond study sites are located along the UGVC.[4]

As part of the Pond Study, wildlife and habitat suitability assessments were conducted on September 5, 2017 by qualified Stantec Biologists. At each of the three Pond Study sites, the following data was collected and assessed:

- Delineation of inundated area/ soil saturation;
- Hydrology pattern(s);
- Range of water depths;
- Soil type(s);
- Vegetation observed and overarching vegetation community type;
- Wildlife species observed;
- CRLF habitat assessment; and
- Site photos.

[3] Like the Canopy Cover Assessment it is also recommended as an adaptive management strategy to update the Pond Study to occur every four years with one final assessment to conclude the study on year ten (Years 0 4 8 10).

[4] Ponds and/or seep wetlands that are located within 50 meters of the downslope side of the canals were targeted for pond study site locations. Sites were also targeted based on property access. Due to the lack of ponds/seep wetlands and access along the LCC UGVC and DS Canal fewer than five seep wetlands/ ponded areas were identified as was originally targeted by the Workplan (NID 2012).

3.0 RESULTS

Tree and Canopy Health Assessment and Pond Study data for Year 4 (2017) monitoring was collected in September 2017. Data for each study location was post-processed using Geographic Information Systems (GIS) ESRI ArcView 10.4.1 technologies. Geographical data and associated attribute information were compiled into a central database using Microsoft Excel. The following section outlines specific results and findings for all studies.

3.1 CANOPY COVER STUDY: TREE HEALTH ASSESSMENT RESULTS

Year 4 (2017) Tree Health Assessment data were collected on September 7, 8, 12, and 15, 2017. The results of the overall Tree Health Assessment are summarized in this section. Table 3-1 includes a comparison of the 2017 results relative to prior monitoring events (i.e., Year 0- 2013, and Year 2- 2015). **Appendix A**- A.2.1-A.2.6 includes maps depicting the 2017 results. **Appendix D** includes the complete list of botanical species observed during monitoring.

3.1.1 Tree Health Assessment Results Summary

3.1.1.1 LCC Tree Health Assessment Results

LCC SITE 1

During Year 4 monitoring, 22 riparian trees were surveyed at Site 1 on the LCC; including bigleaf maple (*Acer macrophylum*), Pacific dogwood (*Cornus nuttallii*), and white alder (*Alnus rhombifolia*). Pacific dogwood is the dominant riparian tree species. Various upland tree species are also present at Site 1, including Douglas-fir (*Pseudotsuga menziesii*), hazelnut (*Corylus cornuta*), incense cedar (*Calocedrus decurrens*), and Pacific madrone (*Arbutus menziesii*); however, they were not surveyed due to their upland status. The Diameter at Breast Height (DBH) for the surveyed trees ranged from 1.2 to 25.3 inches. The overall health of trees at Site 1 is fair, with foliage discoloration present, insect damage to the leaves and tree bark (e.g., burrowing, frass, epicormic sprouting, and general insect presence), and potential disease and surface growth presence on the trunks and/or foliage. Bark health for the trees surveyed is fair, with some bark/root rot, and other irregularities. General site conditions yield excessive down woody debris in the understory on both up and downslope portions of Site 1.

LCC SITE 2

During Year 4 monitoring, 21 riparian trees were surveyed at Site 2 on the LCC. Tree species surveyed include bigleaf maple, gray alder (*Alnus incana*), Oregon ash (*Fraxinus latifolia*), and Pacific dogwood. Pacific dogwood is the dominant riparian tree species. Various upland tree species are also present at Site 2, including black oak (*Quercus kelloggii*), hazelnut, and incense cedar; however, they were not surveyed due to their upland status. The DBH for the surveyed trees ranged from 1.2 to 14.7 inches. Overall health of trees at Site 2 is fair, with some foliage

discoloration, surface growth presence on the trunk and/or foliage (e.g., specifically lichen and mosses due to excessive shading at this site), and fair bark health. Disease was observed on the surveyed trees, including some fungal presence (e.g., maple rust/lead spotting), structural decay, and other pathogen indicators. Insect infestation and/or damage was also observed present on all trees within Site 2; however no parasitic presence was observed. General site conditions yield excessive encroachment by non-native and invasive understory species (e.g., Himalayan blackberry [*Rubus armeniacus*]).

LCC SITE 3

During Year 4 monitoring, 20 riparian trees were surveyed at Site 3 on the LCC. Tree species surveyed include bigleaf maple, gray alder, and Pacific dogwood. Bigleaf maple is the dominant riparian tree species. Various upland tree species are also present at Site 3, including Douglas-fir and incense cedar; however, they were not surveyed due to their upland status. The DBH for the surveyed trees ranged from 1.1 to 12.3 inches. Overall health of trees at Site 3 is fair. Trees surveyed exhibit some foliage discoloration, insect damage to the leaves and tree bark, and potential disease presence. Surface growth is present on trunks and/or foliage, specifically biological growths such as moss and lichen. Bark health for the trees surveyed is fair, as some trees exhibit decay, and or general bark abnormalities. Disease was observed on surveyed trees, and insect infestations were abundant (i.e., observed on all surveyed trees). No parasitic presence was observed. General site conditions yield excessive encroachment by non-native and invasive understory species and vining up the tree trunks (e.g., English ivy [*Hedera helix*]).

LCC SITE 4

During Year 4 monitoring, 19 riparian trees were surveyed at Site 4 on the LCC. Tree species surveyed include bigleaf maple, gray alder, and Oregon ash. Bigleaf maple is the dominant riparian tree species. Various upland tree species are also present at Site 4, including black oak, Douglas-fir, incense cedar, and tanoak (*Notholithocarpus densiflorus*); however, they were not surveyed due to their upland status. The DBH for the surveyed trees ranged from 1.3 to 9.5 inches. Overall health of trees at Site 4 is fair, with half of trees assessed exhibiting abnormal leaf coloration. Surface growth is also present on approximately half of the surveyed trees, specifically biological growth such as moss. Bark health for the trees surveyed is fair; disease observations were minimal (i.e., concentrated on the foliage), and insect infestation and/ or damage was noted on all assessed trees. No parasitic presence was observed. General site conditions yield encroachment by hazelnut, thimbleberry (*Rubus parviflorus*), poison oak (*Toxicodendron diversilobum*), and various fern species.

3.1.1.2 UGVC Tree Health Assessment Results

During Year 4 monitoring, seven riparian trees were surveyed at Site 5 on the UGVC. Tree species surveyed include bigleaf maple, Pacific dogwood, and white alder. White alder is the dominant riparian trees species. Various upland tree species are also present at Site 5, including black oak and incense cedar; however, they were not surveyed due to their upland status. The DBH for the

surveyed trees ranged from 0.5 to 6.0 inches. Overall health of trees at Site 5 is fair, with abundant foliage discoloration, no surface growth presence was observed, and bark health for the trees surveyed is good (score of 2 to 3). No parasitic, insect presence/damage, or disease presence was observed. General site conditions yield some mechanical damage to trees due to proximity to the road, and new growth of various riparian tree species saplings within the site.

3.1.1.3 DS Canal (Control-Site) Canopy Results

During Year 4 monitoring, 17 riparian trees were surveyed at Site 6 (control-site) on the DS Canal. Tree species surveyed include bigleaf maple, gray alder, and Pacific dogwood. Pacific dogwood is the dominant riparian tree species. Various upland tree species are also present at Site 6, including Douglas-fir, incense cedar, and Ponderosa pine (*Pinus ponderosa*); however, they were not surveyed due to their upland status. The DBH for the surveyed trees ranges from 1.8 to 17.8 inches. Overall health of trees at Site 6 is fair. Trees surveyed exhibit minimal foliage discoloration, insect damage and infestation on all trees, and potential disease presence on half of the trees. Surface growth was observed (e.g., biological growths such as moss and other fungal matter), and bark health for the trees surveyed is fair. No parasitic presence was observed. General site conditions yield abundant down woody debris, and vining plant encroachment on tree trunks primarily by honeysuckle (*Lonicera hispidula*). In addition, all tree tags were removed from trees within the downslope portion of Site 6 by an unknown party. As such, the trees were re-tagged this year during the Tree Health Assessment survey.

Table 3-1 Canopy Cover Study: Tree Health Assessment Results Summary

	Site 1 LCC			Site 2 LCC			Site 3 LCC			Site 4 LCC			Site 5 UGVC			Site 6 DS Canal (control-site)		
	2013	2015	2017	2013	2015	2017	2013	2015	2017	2013	2015	2017	2013	2015	2017	2013	2015	2017
Survey Date	9/12	10/7	**9/12**	9/11	10/6	**9/8**		10/8	**9/8**	9/11	10/6	**9/12**		10/7	**9/7**	9/10	10/7	**9/15**
Total Trees Surveyed	24	23	**22**	20	22	**21**	21	19	**20**	18	20	**19**	8	8	**7**	22	23	**17**
Total Living Stems	24	22	**20**	20	21	**20**	21	19	**20**	18	20	**19**	8	7	**6**	22	20	**14**
Dominant Species	CORNUT	CORNUT	**CORNUT**	CORNUT	CORNUT	**CORNUT**	ACEMAC	ACEMAC	**ACEMAC**	ACEMAC	ACEMAC	**ACEMAC**	ALNRHO	ALNRHO	**ALNRHO**	CORNUT	CORNUT	**CORNUT**
DBH (min. inches)	1.0	1.1	**1.2**	1.0	1.0	**1.2**	1.0	1.0	**1.1**	1.0	1.0	**1.3**	2.0	2.0	**0.5**	1.0	1.0	**1.8**
DBH (max. inches)	9.0	9.3	**25.3**	12.5	13.0	**14.7**	21.0	24.0	**12.3**	7.0	7.7	**9.5**	10.0	10.0	**6.0**	10.0	11.2	**17.8**
Tree Foliage Cover[1]	2.5	3.0	**3.0**	2.6	3.0	**3.0**	2.5	2.9	**3.0**	2.9	3.4	**3.0**	2.3	3.1	**4.0**	2.3	2.9	**4.0**
Bark Health[1]	2.6	3.0	**3.0**	2.5	3.0	**3.0**	2.2	2.8	**3.0**	3.0	3.2	**3.0**	2.0	2.8	**4.0**	2.4	2.8	**3.0**
Abnormal Leaf Color (%)	90.5	13.0	**35.0**	70.0	45.5	**45.0**	81.0	26.3	**60.0**	100	15.0	**57.9**	100	37.5	**83.3**	95.5	34.8	**7.1**
New Growth Presence (%)	100	39.1	**60.0**	95.2	40.9	**20.0**	100	57.9	**20.0**	100	45.0	**21.0**	100	62.5	**0**	86.4	39.1	**42.9**
Surface Growth Presence (%)	76.2	82.6	**85.0**	65.0	77.2	**95.0**	85.7	72.7	**80.0**	11.1	40.0	**47.4**	87.5	0	**0**	13.6	52.2	**57.1**
Disease Presence (%)	4.8	4.3	**15.0**	14.3	40.9	**65.0**	0	31.5	**10.0**	0	20.0	**5.3**	12.5	25.0	**0**	0	17.4	**64.0**
Parasite Presence (%)	0	0	**5.0**	0	9.0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
Insect Presence (%)	9.5	78.3	**95.0**	0	50.0	**100**	5.6	52.6	**100**	5.6	60.0	**100**	37.5	0	**0**	68.2	56.5	**100**
Overall Tree Health[1]	4.1	3.0	**2.9**	3.9	3.9	**3.0**	3.7	3.3	**3.2**	4.6	4.2	**3.4**	3.1	3.8	**3.7**	3.5	3.1	**3.1**

Note: Metric totals were completed using on live stems per site (i.e. dead stems were not included in final calculations)

[1] Average of all individual tree foliage cover values not total canopy cover as assessed in the canopy cover study

Dominant Species = ACEMAC- bigleaf maple CORNUT- Pacific dogwood ALNRHO- white alder

Canopy Cover = 1- None (0%) 2- Sparse (0-25%) 3- Partial (25-50%) 4- Medium (50-75%) 5- Full (75-100%)

Bark Health = 1- Dead (100%) 2- Poor (75-100%) 3- Fair (50-75%) 4- Good (25-50%) 5- Excellent (0-25%)

Overall Tree Health= 1- Dead 2- Poor 3- Fair 4- Good 5- Excellent

3.2 CANOPY COVER STUDY: CANOPY COVER ASSESSMENT RESULTS

Year 4 (2017) Canopy Cover Assessment data was collected on September 9, 15, 18, and 22 2017 for each assessment Reach. Data collection and canopy density percentages were calculated based on methods and formulas for calculating the 17-point methods results described in the Use of the Densiometer to Estimate Density of Forest Canopy on Permanent Sample Plots (Strickler 1959). The following results average and summarize the overall canopy cover data densiometer readings collected on each canal Reach during Year 4 (2017) monitoring. Baseline monitoring results (Year 0, 2013) have also been provided. A compiled data summary of Canopy Cover Assessment metrics has been provided below in Table 3-2. Results can also be referenced in **Appendix A**- A.3 Canopy Cover Assessment Results Map.

3.2.1 Canopy Cover Assessment Results Summary

3.2.1.1 LCC Canopy Cover Assessment Results

An approximate seven-mile Reach of the LCC was sampled for Canopy Cover Assessment in Year 4 monitoring. A total of 272 canopy cover densiometer observation points were identified and collected. The LCC canopy cover ranges from a minimum density of zero to a maximum density of 99.5 percent. The average density of canopy cover along the LCC Reach was 76.3 percent, therefore yielding medium to full canopy cover.

3.2.1.2 UGVC Canopy Cover Assessment Results

An approximate half-mile Reach of the UGVC was sampled for Canopy Cover Assessment in Year 4 monitoring. A total of 27 canopy cover densiometer observation points were identified and collected. The UGVC canopy cover ranges from a minimum density of 47 to a maximum density of 96.5 percent. The average density of canopy cover along the LCC Reach was 78.2 percent, therefore yielding nearly full canopy cover.

3.2.1.3 DS Canal (Control-Site) Canopy Cover Assessment Results

An approximate one-mile Reach of the DS Canal was sampled as a control for Canopy Cover Assessment in Year 4 monitoring. A total of 85 canopy cover densiometer observation points were identified and collected. The DS Canal canopy cover ranges from a minimum density of 33.5 to a maximum density of 92 percent. The average density of canopy cover along the DS Canal Reach was 71 percent, therefore yielding medium canopy cover.

Table 3-2 Canopy Cover Study: Canopy Cover Assessment Results Summary

	LCC		UGVC		DS Canal (control-site)	
	2013	2017	2013	2017	2013	2017
Survey Date(s)	9/19; 9/30	**9/19; 9/22**	9/10	**9/22**	9/10	**9/15; 9/22**
Study Reach Length (miles)	7.0	**7.0**	0.5	**0.5**	1.0	**1.0**
Total Observation Points[1]	351	**272**	24	**27**	48	**85**
Minimum Density Canopy Cover (%)	33.5	**0**	71.0	**47.0**	57.5	**33.5**
Maximum Density Canopy Cover (%)	100.0	**99.5**	100.0	**96.5**	96.5	**92.0**
Average Density Canopy Cover (%)	83.2	**76.3**	89.4	**78.2**	78.8	**71.0**

[1] Variation in the total number of observation points along each canal Reach for the Canopy Cover Assessment is due to the interval distance for each set of observations. Baseline Year 0 (2013) observation interval for LCC and DS Canal (control-site) was averaged at approximately 50 to 65 feet for each densiometer reading along the canal Reach. UGVC was averaged at 100 feet for each densiometer reading along the canal. To be consistent with baseline and create a standard Year 4 (2017) averaged all observations intervals for LCC UGVC and DS Canal (control-site) to 100 feet for each set of densiometer readings.

3.3 POND STUDY RESULTS

Year 4 (2017) Pond Study data was collected on September 5, 2017 for all sites on LCC and DS Canal (control-site) (i.e., Ponds 1, 2, and 3). As stated in the Methods section of this Report, no Pond Study data was collected on UGVC because no ponds were identified on this canal. During monitoring, the area of inundation and soil saturation, approximate water depth, apparent hydrology patterns, soil type(s), botanical and wildlife species present, vegetation community type(s), and special-status species habitat were documented. During Year 4 (2017) monitoring, data collected serves as the first comparison to baseline conditions at the Pond Study sites. Table 3-3 summarizes Pond Study results for metrics collected during monitoring Year 0 and Year 4 (i.e., 2013 and 2017). **Appendix A**- A.4-A.5 includes maps of LCC Ponds 1 and 2 and the DS Canal (control- site) Pond.

3.3.1 Pond Study Results Summary

3.3.1.1 LCC Pond Study Results

POND 1

Pond 1 on the LCC is surrounded by upland forest, and bound by a perennial wetland (i.e., pond). The Pond 1 banks include incense cedar as the dominant overstory species, and Himalayan blackberry, as well as various other non-native and ornamental species from a nearby residence, are dominant within the understory. Limited vegetation overhangs the pond, and emergent vegetation is minimal. Downed woody debris is present on the north side of Pond 1, and its south slope is steep and devoid of understory, due to increased erosion evident along the banks of Pond 1. The present habitat during Year 4 (2017) monitoring appears to be intact

and healthy, and able to support both native plant populations and wildlife species. A complete list of observed vegetation and wildlife species at Pond 1 has been provided in **Appendix D**.

Pond 1 is separated from Pond 2 by a dirt access road and feeds into it via a culvert approximately six inches in diameter. This outflow culvert was replaced in early August 2017 due to rust, debris blockage, and subsequent seasonal overflows by the pond. The relatively consistent supply of water in Pond 1 allows for its perennial state despite fluctuating water levels throughout the year (NID 2013).

Specifically, Pond 1 is supplied with purchased water from April 15 through October 15 from the LCC. Water is fed via a culvert approximately four inches in diameter, but is also fed by observed seepage from the LCC in two locations (1) northwest of the pond immediately adjacent to the LCC culvert and (2) southwest of the pond, following a swale downslope of the LCC. The northwest seepage is aboveground and causes significant amounts of erosion and sedimentation. The land manager indicated that the southwest seepage from the LCC is sub-surface most of the year, but experiences above-ground flow during heavy winter rains. The land manager additionally indicated that both seepage inputs were highly variable based upon NID flow controls. Pond 1 annually overflows and flushes out.

POND 2

Pond 2 on the LCC is surrounded by upland forest, and bound by a perennial wetland (i.e., pond). The Pond 2 banks include incense cedar as the dominant overstory species, and Himalayan blackberry, as well as various other non-native and ornamental species from a nearby residence, are dominant within the understory. While limited vegetation overhangs the pond, emergent vegetation is present at Pond 2, (e.g., cattails [*Typha* sp.]). The emergent vegetation near the rim of Pond 2 appears to be dehydrated; however, at the time of monitoring the land manager indicated this condition was unique to this season. The land manager indicated that fish entrapment occurred throughout the year until the annual overflow in winter, when fish were flushed out of Pond 2 into upland habitat and non-water areas. The present habitat during Year 4 (2017) monitoring appears to be intact and healthy, and able to support both native plant populations and wildlife species. A complete list of observed vegetation and wildlife species at Pond 2 has been provided in **Appendix D**.

Pond 2 is located adjacent to and downslope of Pond 1 along the LCC and is surrounded by dirt access roads on all sides. Pond 1 is supplied with purchased water from April 15 through October 15 from the LCC, and feeds Pond 2 via a culvert approximately six inches in diameter. Potential seepage from the NID canal located upslope and to the northeast may also supply Pond 2 with water. The land manager indicated that the landowner has been utilizing Pond 2 for irrigation via a one-inch polyvinyl chloride (PVC) pipe since 2014. Usage of Pond 2 water for irrigation is intermittent, minor, and has negligible effects on the water level. Additionally, the land manager indicated that water levels vary widely over the course of the year due to debris blockages to the inflow culvert and overflows caused by winter precipitation events. Both the inflow culvert (i.e., connecting Pond 1 and Pond 2) and the outflow culvert (i.e., draining Pond 2) were

replaced in early August 2017 due to rust, debris blockage, and subsequent seasonal overflows from each pond. The relatively consistent supply of water in Pond 2 allows for its perennial state despite fluctuating water levels throughout the year (NID 2013).

3.3.1.2 DS Canal (Control-Site) Pond Study Results

POND 3

Pond 3 on the DS Canal is the control-site for the Pond Study. Pond 3 is in upland forest habitat; however freshwater emergent vegetation is present. Pond 3 supports emergent wetland species, specifically dense cattail species thickets. There is minimal overhanging vegetation. A complete list of observed vegetation and wildlife species at Pond 3 has been provided in **Appendix D**.

There is a water service agreement on the parcel that Pond 3 is located that purchases water through the irrigation season (i.e., April 15 through October 15) from DS Canal. No water is purchased through the winter months; however, the water service could potentially leak water due to residual canal flows and increased annual precipitation. The water purchased from the DS Canal is first stored in a source pond upslope of Pond 3, then feeds through a culvert and/or overflows directly into Pond 3, which is otherwise confined by the surrounding topography. Pond 3 was observed to contain more water than typical for this time of year. Pond 3 likely experiences annual flushing during annual rains, as evidenced by the large spill area draining to a pond downslope.

3.3.1.3 Pond Study- Special-Status Species Results

All sites within the Pond Study on the LCC and the DS Canal (control-site) were assessed for sensitive and/or special-status species and their associated habitat, specifically for the CRLF. Depending on the presence of sensitive species and habitat, ponds may be removed from future monitoring (NID 2012); however, all Pond Study sites were found to have marginal potential suitable CRLF habitat. Rationale for marginal suitable habitat at each pond site is as follows:

- Pond 1- limited emergent and overhanging vegetation, poor water quality, inconsistent water levels, annual flushing, and supports a population of bullfrogs and/or other CRLF predatory species;
- Pond 2- emergent vegetation present, limited overhanging vegetation, inconsistent water levels and annual flushing, and supports populations of multiple large predatory species, including trout, bullfrogs, and red-eared sliders; and
- Pond 3- minimal emergent vegetation present, poor water quality, inconsistent water levels, annual flushing, and supports a population of bullfrogs and/or other CRLF predatory species.

No CRLF were observed at any of the Pond Study locations.

Table 3-3 Pond Study Results Summary

Observation	Pond 1 LCC		Pond 2 LCC		Pond 3 DS Canal (control-site)	
	2013	2017	2013	2017	2013	2017
Survey Date	11/6	**9/5**	11/6	**9/5**	11/6	**9/5**
Approximate Pond Size/ Inundation Area (sq. feet)[1]	2,010	**2,355**	3,090	**5,028**	4,870[2]	**2,730**
Approximate Visual Pond Depth (feet)	4	**6**	4	**5**	4	**8**
Perennial or Ephemeral Site[3]	Perennial	**Perennial**	Perennial	**Perennial**	Perennial	**Perennial**
NWI Classification[4]	PUBFh	**PUBFh**	PUBFh	**PUBFh**	PUBk	**PUBk**
Soil Map Unit[4]	AfB	**AfB**	AfB	**AfB**	AfD	**AfD**
Presence of Over-Hanging Vegetation	Yes	**Limited**	Yes	**Limited**	Yes	**Limited**
Presence of Emergent Vegetation	Yes	**Minimal**	Yes	**Yes**	Yes	**Yes**
Site in Current and/or Historic CRLF Range[5]	Yes	**Yes**	Yes	**Yes**	Yes	**Yes**
Known Records of CRLF within One Mile[6]	No	**No**	No	**No**	No	**No**

[1] Note: 'Approximate Pond Size/Inundation Area (sq. feet)' was completed via visual estimation during Year 0 (2013 Baseline). In Year 4 (2014) estimation of pond size was (re)calculated from GIS via the mapped boundary collected during the field surveys to improve assessment accuracy over time.

[2] Note: 'Approximate Pond Size/Inundation Area (sq. feet)' for DS Canal (control-site) Year 0 (2013) was calculated to include an area within the OHWM that did not contain standing water/inundation. The area of inundation for Year 0 (2013) was 3 885 sq. ft.

[3] All ponds contain water year-round but likely experience fluctuating water levels due to changes in seepage amounts from the LCC and DS Canal as well as flushing during annual rains.

[4] **National Wetlands Inventory (NWI) Classifications** (USFWS 2017)

PUBFh = Palustrine (P) Unconsolidated Bottom (UB) Semi-permanently Flooded (F) Dike/Impounded (h)

PUBk = Palustrine (P) Unconsolidated Bottom (UB) Artificially Flooded (k)

[5] **NRCS Soil Classification** (USDA 2017)

AfB = Aiken Loam two to nine percent slopes well-drained

AfD = Aiken Loam 15 to 30 percent slopes well-drained

[6] USFWS 2005

4.0 FINDINGS

The following section provides a comparative analysis between each monitoring year to-date. Specifically, LCC and the UGVC tree health, canopy, and pond data were compared with the DS Canal control-site data, as well as against previous monitoring data (i.e., Year 0- 2013, and Year 2- 2015), where applicable. In addition, biological communities and habitat associated with the study sites and canals were generally evaluated for potential presence/absence of special status species. Lastly, data for all studies was interpreted against the backdrop of NID's LCC and UGVC flow rates, reduced rates, and California's defined water years (i.e., October to April).

NID's flows in the LCC were reduced in 2014 with the simultaneous installation of check dams to keep water levels higher. The LCC flows have remained approximately 5 cfs since that time. Flows in the UGVC were reduced in 2014 and have remained approximately 0.3 to 0.5 cfs. In contrast, the DS Canal flows have continued at rates approximately 60 to 65 cfs per normal operations during the summer and 3 to 5 cfs during winter months. (pers. com. Sue Sindt, NID 2018).

The water years have fluctuated during the study, with 2014 – 2016 considered severe drought (DWR 2017a) and the 2016/2017 water year providing above average rainfall. Table 4-1 summarizes the total precipitation (in inches and as a percentage of average rainfall) for the area over the study years (DWR 2017b).

Table 4-1 California Water Year Precipitation Reports (2013-2017)

	Water Year Totals (Oct – Sept)	2013	2014	2015	2016	2017
Nevada City, CA (2781 ft elev.)	Precipitation (in.)	56.75	37.55	37.12	62.75	103.77
	Percent of average	106%	70%	70%	118%	194%
Grass Valley, CA (2400 ft elev.)	Precipitation (in.)	47.19	33.85	32.10	55.65	95.9
	Percent of average	88%	63%	60%	104%	179%

4.1 LCC FINDINGS

TREE HEALTH ASSESSMENT

Notable findings for the Tree Health Assessment on the LCC (i.e., Sites 1, 2, 3, and 4) relative to the DS Canal during Year 4 monitoring include the following:

- Some trees were eliminated from study due to land owner removal.
- The dominant tree species assessed remain consistent with previous monitoring years.

- There was an increase in the average maximum value of tree DBH measurements, potentially due to the increase of new growth and growth trends for the region, specifically on multi-stem trees, for LCC Sites 1, 2, and 4.

- The average individual tree foliage for all sites on the LCC was relatively equivalent to the previous monitoring Year 0 and Year 2 (i.e., 2013 and 2015). This typical average foliage was *partial,* meaning 25 to 50 percent foliage present in the upper canopy of the tree. The tree foliage estimate and year to year trend in individual tree foliage was similar on the DS Canal and the LCC, likely due to natural seasonal abscission of foliage.

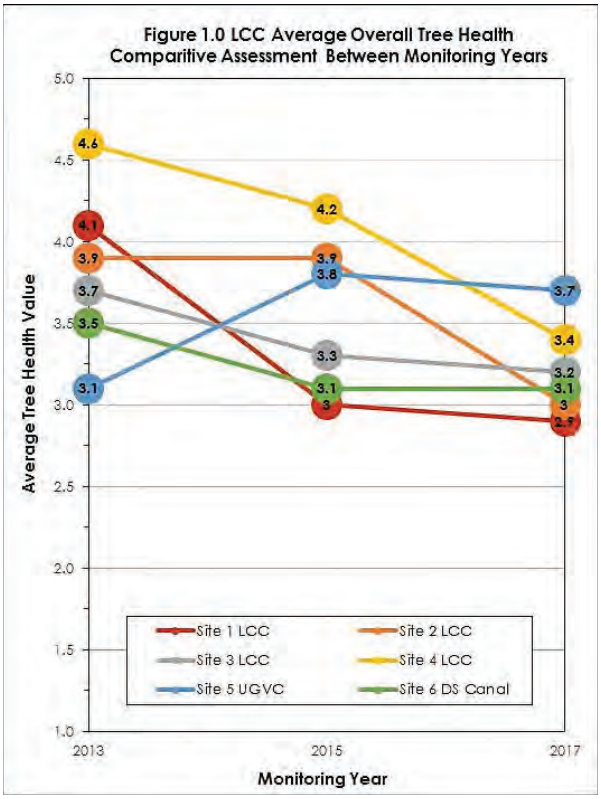
- The average bark health for all sites on the LCC also was similar to the previous monitoring Year 0 and Year 2 (i.e., 2013 and 2015). The average bark health for all sites was fair, meaning 50 to 75 percent of the bark was absent, exhibited some root rot, insect damage, sluffing, and discolorations. This finding was similar on the DS Canal and thus likely due to drought or other natural processes.

- Leaf discoloration during fall is a natural process. There was an increase in leaf discoloration/abnormal leaf color from the previous monitoring Year 2 (i.e., 2015), but less discoloration noted from Year 0 (i.e., 2013) for all the sites. Some sites with abundant big leaf maple trees exhibited minimal leaf spots and rusting, but overall leaf discoloration was on trend with seasonal abscission and similar to the DS Canal control-site.

- New growth is any new vascular growth including leaf budding, basal sprouts, epicormic sprouting, stems or new sapling at the base of the tree evident from the previous spring. The LCC Site 1 exhibited an increase from previous monitoring years (by an approximate average of 40 percent), while new growth at the remaining LCC sites (i.e., Site 2, 3, and 4) yielded a decrease in new growth (by an approximate average of 52 percent). By comparison, new growth on the DS Canal dropped between monitoring Years 0 and 2, then remained relatively static. There was variability between sites relative to new growth and thus difficult to discern a pattern.

- Surface growth is any biological growths such as moss, lichen, terrestrial algal plants, etc., and they are typically not beneficial to the tree; not considered positive tree health. Surface growth remained on trend with previous monitoring Year 0 and Year 2 (i.e., 2013 and 2015), demonstrating an average of 76 percent surface growth presence at all sites. In contrast, the DS Canal trees exhibited an increase in surface growth.

- Disease is often an indicator of stress and is often observable as structural decay and irregular growth patterns. At LCC Sites 1 and 2 there was an increase by an average of approximately 18 percent in overall disease presence from Year 2 (i.e., 2015). At LCC Site 3 and 4 there was a decrease by an average of approximately 18 percent in overall disease presence from Year 2 (i.e., 2015), while the DS Canal exhibited an increase in potential pathogens of over 40%.



- Insect infestation is also an indicator of stress and poor tree health. There has been an overall upward trend of insect infestation and/or damage to assessment trees at all sites over the last three monitoring years, including at the DS Canal control-site. This pattern in the increase in insect outbreaks has been captured in forest patterns across the State, and are influenced by temperature, climate, and other environmental conditions. Specifically, shifts in temperatures that directly influence insects, as well as reduced host tree resistance caused by changes in precipitation are contributing to forest insect population growth (Liebhold et. al. 2011).

- Parasite presence was noted at LCC Site 1. All other sites (i.e., Sites 2, 3, 4) either saw a decrease in parasite presences and/or continued to have not notable observations, including the reference DS Canal site.

Overall tree health was calculated using all metric variables listed above. All LCC sites (i.e., 1, 2, 3, and 4) yielded an overall decline in average tree health from previous monitoring Year 0 and Year 2 (i.e., 2013 and 2015) (Figure 1.0). This tree health decline was also true of the DS Canal control-site. The two Tree Health Assessment monitoring metrics predominantly contributing to the overall decline in overall tree health are the increase in insect infestations (documented statewide) and observations of leaf discoloration and other foliage abnormalities.

CANOPY COVER ASSESSMENT

From Year 0 to Year 4, average canopy cover density marginally decreased by approximately seven percent on the LCC and six percent on the DS Canal control site. The fact that there is no

difference between sites indicates that the minor decline is potentially due to seasonal climate conditions and natural abscission variation from year-to-year.

POND STUDY

During Year 4 monitoring, the Pond Study on the LCC (i.e., Ponds 1 and 2) yielded very little change from the previous monitoring Year 0 (i.e., baseline 2013). The most notable variation observed during Year 4 of the Pond Study was the overall increase in pond size/area of inundation (i.e., wetted perimeter- Pond 1 had an increase of 345 sq. ft.; Pond 2 had an increase of 1938 sq. ft.). This subsequently influenced the overall visual approximation of pond depth by two feet. It has been noted that the Pond levels at both Ponds 1 and 2 are controlled by NID, as fluctuating canal flows are the primary input. Conversations with the land manager have also indicated that Ponds 1 and 2 are generally used for on-site irrigation; however, in the last year, irrigation has been minimal due to increased natural precipitation in the region. Therefore, it can be deduced that variation in the inundated area of the LCC Pond 1 and 2, as well as visual estimations of pond depth, are likely influenced by both factors.

4.2 UGVC FINDINGS

TREE HEALTH ASSESSMENT

Notable findings for the Tree Health Assessment on the UGVC (i.e., Site 5) relative to the DS Canal are as follows:

- The dominant tree species assessed remain consistent with previous monitoring years.
- There was a decrease in both the minimum and maximum value of tree DBH measurements; with a 25 percent decrease in minimum DBH and a 60 percent decrease in maximum value of tree DBH, potentially due to succession and an increase in new growth.
- The average individual tree foliage cover at UGVC Site 5 was medium, meaning 50 to 75 percent foliage present in each tree. The trend is an overall increase from the sparse (i.e., zero to 25 percent presence) canopy cover previously noted in monitoring Year 0 (i.e., 2013) and from partial (i.e., 25 to 50 percent presence) foliage cover in Year 2 (i.e., 2015). One potential factor influencing this increase in foliage is the annual precipitation increase and the absence of drought conditions during Year 4. The tree foliage cover was equally robust at the UGVC site and the DS Canal control-site, indicating likely limited effects from flow reductions in the UGVC.
- The average bark health was good, meaning 25 to 50 percent of bark was absent or unhealthy relative to the given tree species. This is an improvement from monitoring Year 0 and 2 (i.e., 2013 and 2015) where bark health averaged poor, likely due to insect damage observation on the tree trunk and limbs. The Year 4 bark healthy along the UGVC was also considered healthier than the DS Canal control-site.

- There was an increase in leaf discoloration/abnormal leaf color from the previous monitoring Year 2 (i.e., 2015), but less discoloration noted from Year 0 (i.e., 2013). Overall leaf discoloration was on trend with seasonal abscission and comparable to the DS Canal control-site.

- No new growth (e.g., leaf budding, basal sprouts, epicormic sprouting, stems, new sapling, etc.) was observed during Year 4 monitoring at UGVC Site 5. This is a substantial decrease from both previous monitoring years and is notably due to the adjacent road maintenance activities and clearing of new tree growth, unrelated to the canal flow reductions.

- No new surface growth was observed on trees at UGVC Site 5. Surface growth remains on trend or equivalent to previous monitoring Year 2 (i.e., 2015); with a significant reduction from baseline Year 0 (i.e., 2013). In general, the surface growth, generally considered detrimental to tree health, is much less on the UGVC than the DS Canal control site.

- UGVC Site 5 exhibited a decrease in average tree disease observations, by approximately 25 percent from Year 2 (i.e., 2015). Furthermore, no disease presence was noted during Year 4 monitoring at UGVC Site 5. In general, structural decay and irregular growth patterns that are indicators of pathogen or disease were absent from the site in Year 4.

- There was no increase in insect infestations and/or damage to assessment trees at UGVC Site 5 between monitoring Year 2 and 4 (i.e., 2015 and 2017). This is a significant decrease from baseline Year 0 (i.e., 2013), where there was an average of 37.5 percent insect infestations and/or damage observed at UGVC Site 5. This variability is potentially due to shifts in temperatures that directly influence insects, as well as reduced host tree resistance caused by changes in precipitation that are contributing to forest insect population growth (Liebhold et. al. 2011).

- No parasites were noted during Year 4 monitoring at UGVC Site 5, as well as previous monitoring Year 0 and 2 (i.e., 2013 and 2015).

Overall tree health was calculated using all metric variables listed above. UGVC Site 5 was considered fair in Year 2 and 4 (i.e., 2015) (Figure 1.0). From the baseline Year 0 (i.e., 2013), the overall tree health at the UGVC Site 5 has increased marginally (i.e., by 0.6 score points). Tree health is noted as being consistently fair, potentially due to partial discoloration of foliage present, some insect damage and presence, and/or rot of the tree bark and inner cambium. However, it is important to note, although marginal, this is the only site in the Tree Health Assessments that had an improvement in overall tree health. Even with flow reductions, the tree health remains consistent and higher than the DS Canal control-site.

CANOPY COVER ASSESSMENT

During Year 4 monitoring, the Canopy Cover Assessments on the UGVC (i.e., half-mile Reach) had more observation points from the previous monitoring baseline Year 0 (i.e., 2013) due to the standardization of observation intervals (i.e., 3 more densiometer observation points). From Year 0 to Year 4 (i.e., 2013 to 2017), average canopy cover density for the UGVC decreased by approximately 11 percent, which is on par with the decrease in cover at the DS Canal control site. This minor decrease is potentially due to seasonal climate conditions and natural abscission variation from year-to-year.

POND STUDY

No ponds were identified along the UGVC. Therefore, no Pond Study sites are present along the UGVC; thus, a Pond Study was not conducted on the UGVC.

5.0 DISCUSSION

The purpose of the Monitoring Study is to evaluate and make interpretations based on the observed changes in spatial, compositional, and temporal land cover and the shifts in management and climate fluctuations derived during the ten-year study. Each of the different studies conducted during this year of monitoring revealed unique representations of the coupled larger ecosystem. In response, vegetation and the surrounding ecosystems were also impacted differently depending not only on the lowering of flows in the canal, but also on multifaceted management efforts of landowners and climate fluctuations.

One of the overarching factors influencing all monitoring assessment and study metrics is the fluctuation and variability in the weather in the region. During monitoring Year 0 and Year 2 (i.e., 2013 and 2015), the region experienced several years of drought and decreased annual precipitation. However, this past season (prior to Year 4 monitoring), the region experienced an end to drought conditions, and had an increased precipitation which likely led to increases in the native growth of riparian forests and an increase in the overall density of the vegetation.

As discussed in the previous monitoring reports, riparian forests are a complex ecological system that are located at the land-water margin. These vegetation communities support dynamic levels of biodiversity and further exhibit high rates of nutrient cycling and ecological function. As a result, riparian plant species are generally more vulnerable to overarching climatic and water-induced stress (e.g., drought, reduction in groundwater seepage) during the growing season. Therefore, shifts in the timing of inundation can increase the mortality rates of such species. Decreased water availability often results in a reduction of riparian vegetation, as less flood-tolerant upland species extend further into the riparian forest community.

Furthermore, rising temperatures and aridity may negatively impact tree growth in the region. Annual precipitation variation in conjunction with drought stress, has been shown to directly influence tree size and competition with varied plant communities. It is hypothesized that if

climatic variability continues in the region, growth of some tree species specific to Sierra Nevada Coniferous Forest systems may drastically decrease, as well as experience range shift and overall forest composition (Aubry-Kientz et. al. 2017).

Due to these conditions becoming more prevalent, it is possible that the riparian vegetation in the monitoring locations will decline in both health and overall composition. However, despite the occurrence of the expected responses from multifaceted management efforts of landowners (as the trees occur on or adjacent to varying landowners' property) and climate fluctuations such as drought, riparian ecosystems have the ability to maintain basic resilience. This is consistent with Year 4 monitoring results as the native forest composition continues to exist at the DS Canal control-site and the LCC and UGVC sites throughout the study period despite the shifts in flow regimes, private property owner land management, and fluctuations in climate. There are many variables that may be unrelated to the canal flow rates, such as an increase in the average maximum tree size (as measured by DBH) at three of the Sites as well as at the control-site. This also illustrates that over time, the forest is maturing and the trees are becoming larger, which is unrelated to the reduced flow in the canal. At some sites, the trees becoming larger has led to reduced understory (due to shading out the understory), however, at some sites, there has been an increase in both tree size and understory vegetation. Since there is not a clear trend between the control site and the LCC and UGVC sites, the increase in understory, primarily of non-natives, could be due to the fact that the non-native vegetation was able to adapt better to the drought conditions that persisted for years.

Overall, the tree health and canopy cover studies have showed results of an ever-changing riparian forest that is continuously responding to the various management efforts and climate fluctuations. Thus far, through Year 4 of Monitoring, the results have not indicated significant diebacks due to the lowering of canal flows in the LCC and UGVC relative to the DS Canal; however, the study will continue for another six years when final conclusions can be made.

6.0 CONCLUSIONS

The DS Canal was used as a control-site (i.e., reference-site) for all monitoring components (i.e., Tree Health and Canopy Assessments, and the Pond Study); as water levels in the DS Canal were not decreased or part of the Project.

For the Tree Health Assessment, the DS Canal Site 6 yielded metric conclusions on trend and comparable to the trees assessed at the LCC and UGVC sites. The outlying difference in metrics was the DS Canal has less leaf discoloration or other foliage abnormalities than the LCC and UGVC sites. It is notable that the DS Canal control site has been influenced by land management activities, and has subsequently had many of the tags removed from monitoring trees by unknown parties. Due to human disturbance of the DS Canal Site 6 Tree Health Assessment monitoring control, as well as other environmental fluctuations (discussed below),

various Tree Health Assessment metrics will continue to be monitored to better estimate the drivers and conclusions for variance.

For the Canopy Cover Assessment, the DS Canal control site yielded a comparable trend regarding the average canopy cover. Therefore, no significant variation between LCC and UGVC monitoring reaches and the DS Canal control-site reach are noted for the Canopy Cover Assessment.

For the Pond Study, the DS Canal control site yielded a comparable trend for all survey metrics, excluding the approximate pond inundation metric. The DS Canal control-site was the only site that saw a decrease in inundation, with an increase in pond depth due to the location of inundation. No other significant variation between the ponds on the LCC and the DS Canal control-site pond are noted for the Pond Study.

7.0 NEXT STEPS

This Report provides Year 4 monitoring results for the NID LCC and UGVC Long Term Canopy Cover Study and Pond Study. This Report also includes the Ten-Year Canopy Cover Monitoring Plan (**Appendix B**), and the Ten-Year Pond Study Monitoring Plan (**Appendix C**); both compliance components for the two canal-flow reduction MMs included in the Project FEIR (NID 2006). Moving forward, and in accordance with the Impact Assessment Workplan for the Project, additional data will be collected (1) every two years for the Tree Health Assessment portion of the Canopy Cover Study (i.e., 2019, 2021, 2023), (2) every four years plus the last monitoring year for the Canopy Cover Assessment portion of the Canopy Cover Study (i.e., 2021, 2023), and (3) every four years plus the last monitoring year for the Pond Study (i.e., 2021, 2023). Therefore, three remaining surveys will be conducted in years 2019, 2021, and 2023. Data collection will occur during each study year in the late summer or early fall (i.e. August through September) when the trees are most water stressed, and coincide with previous monitoring dates. Surveys will be completed by a qualified biologist and/or botanist (NID 2012). Lastly, in addition to field surveys, reporting will be completed for subsequent monitoring years; including comparative considerations and assessment recommendations, as needed. These may include, but are not limited to, natural variation assessments, cumulative and sequential impacts evaluation, relevant considerations of threshold and latent effects, abiotic and biotic conditions (e.g., climatic variability, drought, plant, and pest invasive species increases, site aspect, etc.), and relative assessment of potential flow reductions. Upon the completion of field surveys and monitoring reporting in 2023, FEIR requirements to study the potential for reduced flow affected canal area vegetation, canopy cover, and associated seep wetlands/ponds shall be met.

8.0 REFERENCES

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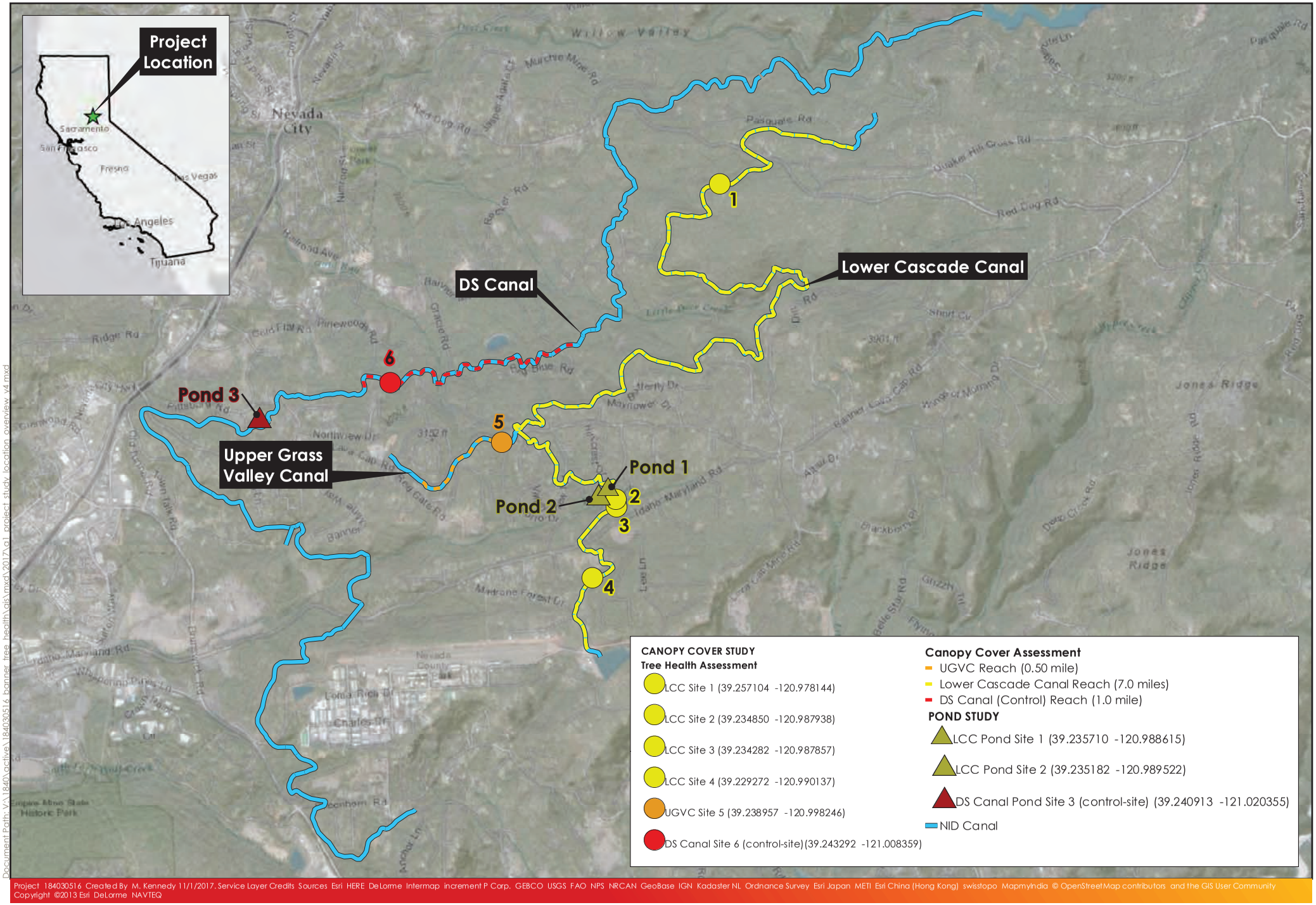
APPENDICES

Appendix A PROJECT MAPS

A.1 PROJECT AND STUDY LOCATION OVERVIEW MAP



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Nevada

Appendix A.1
Project and Study Location Overview
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

A.2 TREE HEALTH ASSESSMENT RESULTS MAPS

Downslope

Upslope

Lower Cascade Canal

3200

3240

3280

186 187 183 183 185 182 181 176 180 178 177 175 210 189 174 194 195 192 191 190 193

Tree Species
- big leaf maple (Acer macrophylum)
- gray alder (Alnus incana)
- Pacfic dogwood (Cornus nuttallii)

Overall Tree Health Score
- 1- Dead
- 2- Poor
- 3- Fair
- 4- Good
- 5- Excellent

Project 184030516 Sources Created By M. Kennedy 11/2/2017. Service Layer Credits Sources Esri HERE DeLorme Intermap increment P Corp. GEBCO USGS FAO NPS NRCAN GeoBase IGN Kadaster NL Ordnance Survey Esri Japan METI Esri China (Hong Kong) swisstopo MapmyIndia © OpenStreetMap contributors and the GIS User Community
Sources Esri DeLorme USGS NPS

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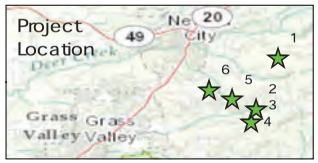
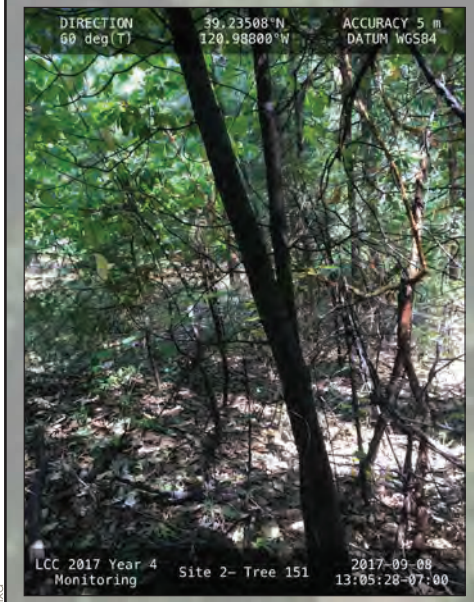


Appendix A.21
LCC Site 1- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project



Downslope

Upslope

Lower Cascade Canal

3200

151
148
147
149
150
209
208
137
146
145
143
144
139
136
213
212
205
138
211
141
140

Tree Species
- big leaf maple (Acer macrophylum)
- gray alder (Alnus incana)
- Oregon ash (Fraxinus latifolia)
- Pacific dogwood (Cornus nuttallii)

Overall Tree Health Score
- 1- Dead
- 2- Poor
- 3- Fair
- 4- Good
- 5- Excellent

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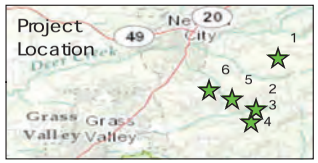

Appendix A.2.2
LCC Site 2- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

Downslope

Upslope

Lower Cascade Canal

3200

157 158 214 155 159 160 152 168 164 163 162 172 167 154 169 165 166 171 153

Tree Species
- big leaf maple (Acer macrophylum)
- gray alder (Alnus incana)
- Pacific dogwood (Cornus nuttallii)

Overall Tree Health Score
- 1- Dead
- 2- Poor
- 3- Fair
- 4- Good
- 5- Excellent

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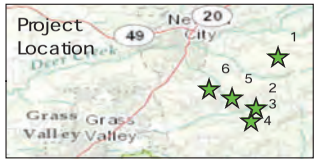

Appendix A.2.3
LCC Site 3- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

Downslope

Upslope

Lower Cascade Canal

3160

203 109 110 118 113 116 117 120 119 115 123 114 202 215 201 199 197 198 196

Tree Species
- bigleaf maple (Acer macrophylum)
- gray alder (Alnus incana)
- Oregon ash (Fraxinus latifolia)
- tanoak (Notholithocarpus densiflorus)

Overall Tree Health Score
- 1- Dead
- 2- Poor
- 3- Fair
- 4- Good
- 5- Excellent

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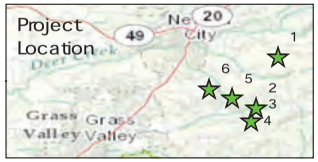

Appendix A.2.4
LCC Site 4- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

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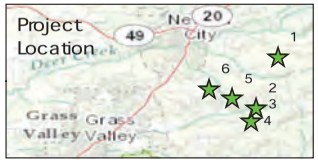
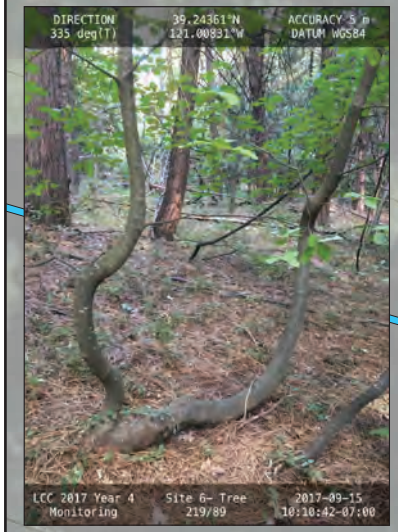


Appendix A.25
UGVC Site 5- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project



Downslope

Upslope

223
220
75
78
219
217
218
225
221
216
224
222
93
92
94
95
96

2820
2840
2860
2880
2900

DSCanal

Tree Species
- bigleaf maple (Acer macrophylum)
- gray alder (Alnus incana)
- Pacific dogwood (Cornus nuttallii)

Overall Tree Health Score
- 1- Dead
- 2- Poor
- 3- Fair
- 4- Good
- 5- Excellent

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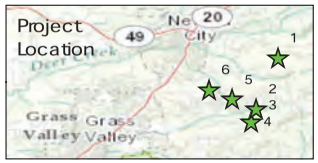
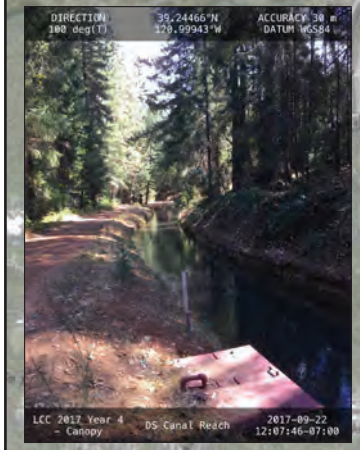


Appendix A.26
DS Canal Site 6 (Control)- Tree Health Assessment Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

A.3 CANOPY COVER ASSESSMENT RESULTS MAP



DS Canal

Lower Cascade Canal

Upper Grass Valley Canal

	LCC		UGVC		DS Canal (control-site)	
	2013	2017	2013	2017	2013	2017
Survey Date(s)	9/19 9/30	9/19; 9/22	9/10/2017	9/22/2017	9/10/2017	9/15; 9/22
Study Reach Length (miles)	7	7	0.5	0.5	1	1
Total Observation Points	351	272	24	27	48	85
Minimum Density Canopy Cover (%)	33.5	0	71	47	57.5	33.5
Maximum Density Canopy Cover (%)	100	99.5	100	96.5	96.5	92
Average Density Canopy Cover (%)	83.2	76.3	89.4	78.2	78.8	71

NID Canal
Canopy Cover Assessment Locations
- LCC
- UGVC
- DS Canal (Control-Site)

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Project 184030516 Created By: M. Kennedy 11/13/2017. Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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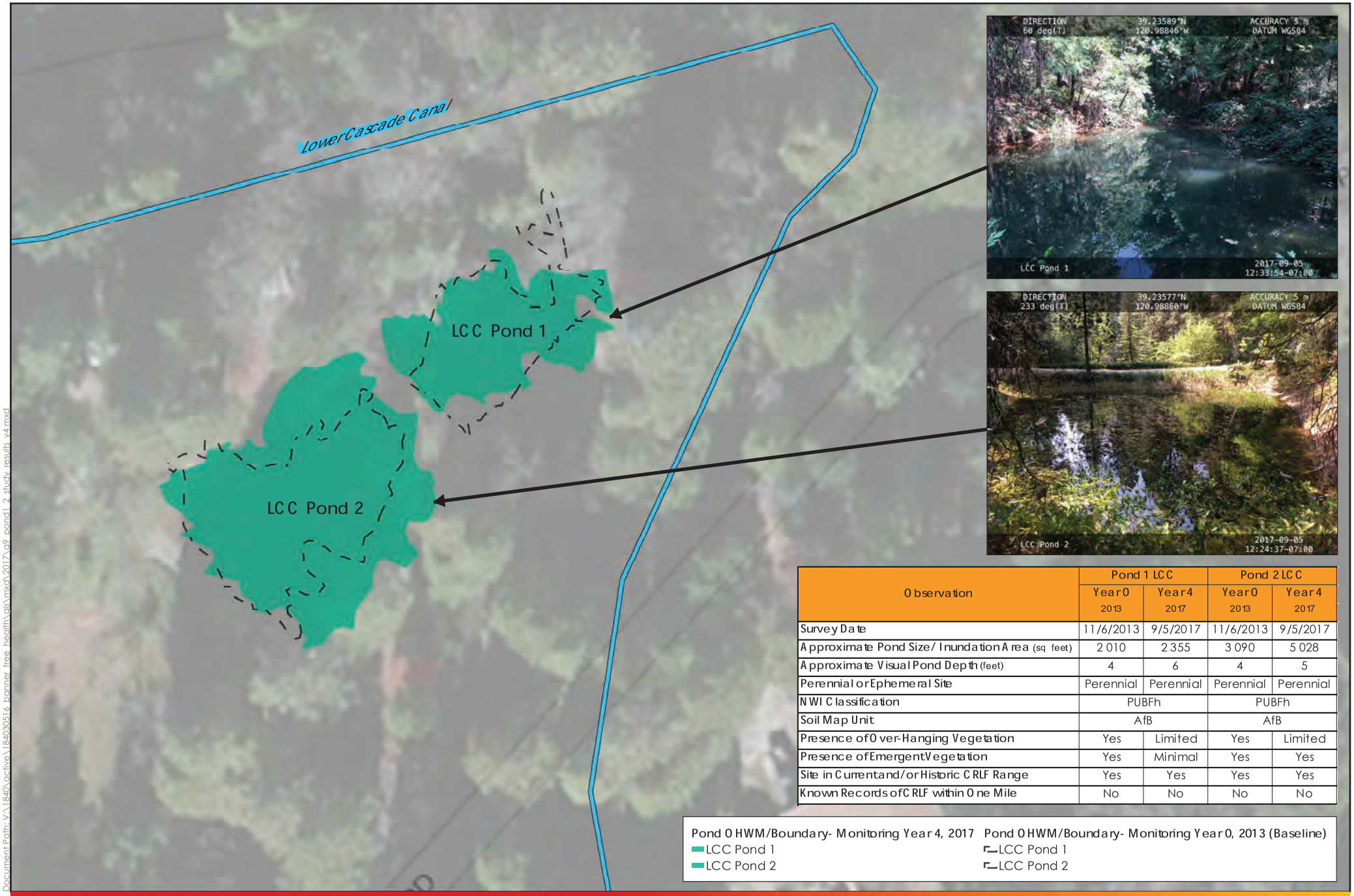
Project Location

Nevada

Appendix A.3
Canopy Cover Assessment Results
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

A.4 LCC PONDS 1 AND 2- POND STUDY RESULTS MAP



Observation	Pond 1 LCC		Pond 2 LCC	
	Year 0 2013	Year 4 2017	Year 0 2013	Year 4 2017
Survey Date	11/6/2013	9/5/2017	11/6/2013	9/5/2017
Approximate Pond Size/ Inundation Area (sq feet)	2 010	2 355	3 090	5 028
Approximate Visual Pond Depth (feet)	4	6	4	5
Perennial or Ephemeral Site	Perennial	Perennial	Perennial	Perennial
NWI Classification	PUBFh		PUBFh	
Soil Map Unit	AfB		AfB	
Presence of Over-Hanging Vegetation	Yes	Limited	Yes	Limited
Presence of Emergent Vegetation	Yes	Minimal	Yes	Yes
Site in Current and/or Historic CRLF Range	Yes	Yes	Yes	Yes
Known Records of CRLF within One Mile	No	No	No	No

Pond OHWM/Boundary- Monitoring Year 4, 2017
- LCC Pond 1
- LCC Pond 2

Pond OHWM/Boundary- Monitoring Year 0, 2013 (Baseline)
- LCC Pond 1
- LCC Pond 2

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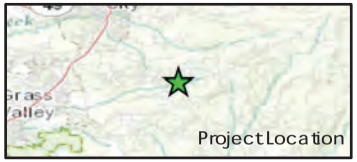

Appendix A.4
LCC Ponds 1 and 2- Pond Study Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

A.5 DS CANAL (CONTROL-SITE) POND 3- POND STUDY RESULTS MAP

Observation	Pond 3 DS Canal (control-site)	
	Year 0 2013	Year 4 2017
Survey Date	11/6/2013	9/5/2017
Approximate Pond Size / Inundation Area (sq feet)	4 870	2 730
Approximate Visual Pond Depth (feet)	4	8
Perennial or Ephemeral Site	Perennial	Perennial
NWI Classification	PUBk	
Soil Map Unit	AfD	
Presence of Over-Hanging Vegetation	Yes	Limited
Presence of Emergent Vegetation	Yes	Yes
Site in Current and/or Historic CRLF Range	Yes	Yes
Known Records of CRLF within One Mile	No	No

Pond OHMV Boundary- Monitoring Year 4 (2017) — DS Canal Pond 3 (Control-Site)
Pond OHMV Boundary- Monitoring Year 0, 2013 (Baseline) — DS Canal Pond 3 (Control-Site)

DS Canal Pond 3 (Control-Site)

DS Canal

PITTSBURG MINE RD

PITTSBURG RD

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Appendix A.5
DS Canal Pond 3 (Control-Site) - Pond Study Results Map
Long Term Canopy Cover Study and Pond Study, Monitoring Year 4

Nevada Irrigation District, Banner Cascade Project

Appendix B TEN-YEAR CANOPY COVER STUDY MONITORING PLAN

PURPOSE

The purpose of the Ten-Year Canopy Cover Study Monitoring Plan is to summarize and detail requirements for the future monitoring efforts for the Canopy Cover Study, and to comply with Mitigation Measure 3.8-1 defined in the Final EIR for the Lower Cascade Canal- Banner/Cascade Pipeline Project (NID 2006). The Canopy Cover Study is comprised of the Tree Health Assessment Study and the Canopy Cover Assessment for the Lower Cascade Canal, and Upper Grass Valley Canal, and DS Canal (control-site). This Ten-Year Canopy Cover Study Monitoring Plan is specific to a study timeline and data collection methods which are detailed below.

STUDY TIMELINE

- Tree Health Assessments – Assessment data will be collected over a period of ten years, at an interval of every two years, for a total of six surveys (i.e., 2013-2023; Years 0, 2, 4, 6, 8, 10). Surveys shall be conducted in the late summer (i.e., August to September/ October).

- Canopy Cover Assessments – Canopy cover data will be collected every four years, with one final assessment to conclude the study on Monitoring Year 10 (i.e., Years 0, 4, 8, and 10). Surveys shall be conducted in the late summer (i.e., August to September) and concurrent with the Tree Health Assessments.

Table- Summary of Canopy Cover Studies and Monitoring Timeline Requirements

Canopy Cover Study	Monitoring Year & Requirement					
	2013- Year 0	2015- Year 2	2017- Year 4	2019- Year 6	2021- Year 8	2023- Year 10
Tree Health Assessment	X	X	X	X	X	X
Canopy Cover Assessment	X		X		X	X

X- Indicates a study year for monitoring to be completed

STUDY LOCATIONS

The study sites locations for the Tree Health Assessment, and Reach locations for the Canopy Cover Assessment are detailed below.

Tree Health Assessment

- Lower Cascade Canal
  - Site 1: Latitude 39.257104, Longitude -120.978144
  - Site 2: Latitude 39.234850, Longitude -120.987938
  - Site 3: Latitude 39.234282, Longitude -120.987857
  - Site 4: Latitude 39.229272, Longitude -120.990137
- Upper Grass Valley Canal
  - Site 5: Latitude 39.238957, Longitude -120.9982466
- DS Canal (control-site)
  - Site 6: Latitude 39.243292, Longitude -121.008359

Canopy Cover Assessment

Table- Summary of Canopy Cover Assessment Locations and Reach Lengths

Canal	Lower Cascade Canal	Upper Grass Valley Canal	DS Canal (control-site)
Canal Reach Length (miles)	7	0.5	1
Reach Start Coordinate (North)	39.259642872, -120.966559692	39.238985195, -120.998306278	39.245783455, -120.992624265
Reach End Coordinates (South)	39.225052309, -120.990948424	39.23597992, -121.005289880	39.243120641, -121.010794363

DATA COLLECTION

Tree Health Assessments

Data should be recorded and assessed considering the following factors (Zobrist 2011):

- Presence of foliage decline or evidence of crown fading;
- Color of foliage: out of season discoloration of foliage; and
- Evidence of disease, parasite, and/or insect damage.

To capture the data above, visual inspections of each tagged tree at each of the six Tree Health Assessment study sites should be made using the criteria listed in the table below. Each tree should be assigned a score for each category or criteria using the Project specific

datasheets associated with this Monitoring Plan.[1] Data shall be documented with a Trimble Series 6000 GeoXH GPS, and post-processed in GIS.

Table- Tree Health Assessment Data Criteria

Assessment Type	Assessment Description	Assessment Score
Canopy Cover	Canopy cover die-back by a percentage based on density and presence of foliage at the crown of the tree.	**1- None:** no canopy present, 0% **2- Sparse:** most canopy absent, 0-25% **3- Partial:** canopy 25-50% **4- Medium:** canopy 50-75% **5- Full:** canopy 75-100%
Bark Health	Bark health is assessed through the absence/ sluffing of bark on the bole and limbs of the tree.	**1- Dead:** 100% sluffing off, extensive damage **2- Poor:** decaying or dead; 75-100% bark absent from bole and limbs of tree; abundant root rot; extensive insect damage; overall discoloration and bark shape irregularities; abundant surface growth **3- Fair:** 50-75% bark absence; some root rot and insect damage; discoloration and bark shape irregularities; bark sluffing **4- Good:** 25-50% bark absence; some root or heart rot present; bark only missing from tree limbs **5- Excellent:** 0-25% bark absence. Present bark generally intact and of high vigor
Leaf Color	Leaf color is assessed based on abnormal colorations that are not typical for the species or season, uniform throughout all present foliage, etc.	**1- Normal:** no abnormalities present, color normal **0- Abnormal:** abnormal color present (e.g., spotting, insect tracks, necrotic tips, etc.)
New Growth Presence	"New growth" is any new vascular growth including leaf buds, basal sprouts, epicormic stems, and saplings.	**0- Present** **1- Not present**
Surface Growth Presence	Surface growth on trunk and stems includes lichen, moss, and all other normal terrestrial algal plants (i.e., non-vascular plants, bryophytes).	**0- Present** **1- Not present**
Disease	Disease includes fungal/mold presence and other pathogens, tubers, cankers, structural decay (e.g., basal decay, irregular growth pattern of tree), root and heart rot, etc.	**0- Present** **1- Not present**
Parasites	Parasites can include, but are not limited to, the presence of mistletoe, red pustules, etc.	**0- Present** **1- Not present**
Insect Infestation	Signs of insects include burrowing/bore holes; frass, larvae or larva galleries, or insect presence; leaf notching; epicormics stems, galls, etc.	**0- Present** **1- Not present**

[1] The Tree Health Assessment data collection form was updated in 2015 Year 2 Monitoring to be consistent with study requisites and on-going monitoring efforts.

Assessment Type	Assessment Description	Assessment Score
Overall Tree Health	Overall tree health was assessed through leaf/ foliage health and other associated physical leaf characteristics, the amount of canopy foliage present, stem, and bark health (e.g., decay), abnormal tree shape, and/or increased presence of disease, parasites, and insect infestations. Normal seasonal variations were considered in overall health scoring.	**1- Dead Overall** **2- Poor Overall**: partial-full discoloration; severe insect damage; disease presence; tissue damage **3- Fair Overall**: partial discoloration; some insect damage, heart rot **4- Good Overall**: some discoloration **5- Excellent Overall**: no physical abnormalities

Canopy Cover Assessment

The Canopy Cover Assessment data will be collected along each canal study Reach using a densiometer following the methods described in The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment State Water Resources Control Board Standard Operating Procedure for Measuring Canopy Cover Using a Seventeen Point Spherical Convex Densiometer (Burres 2010; Ode 2007). Field data for each site will be collected on the datasheet within this Monitoring Plan as well as using a sub-meter Trimble GPS.[2] Post-processed will be completed using GIS. The analysis will average the overall canopy cover data collected based on densiometer readings along each canal Reach. Results will then be synthesized from the canopy cover data. Data collection and canopy density percentages will be calculated based on methods and formulas described in Use of the Densiometer to Estimate Density of Forest Canopy on Permanent Sample Plots (Strickler 1959).

STUDY REPORTING

Reporting shall be completed at the end of each monitoring year, and will be drafted to summarize the Canopy Cover Study findings (i.e., Tree Health and Canopy Assessment data and results) for that year. The data for the study year will also be discussed in conjunction with previous monitoring years and California's water year data and NID LCC and the UGVC flow data. Each report will include adaptive management recommendations, if necessary. NID is not required to adhere to any interim recommendations, but may want to take them into consideration when reducing or limiting flow that may have canopy impacts, should they be documented. On the last year of study (i.e., Year 10, 2023) a comprehensive final report will be compiled summarizing data collection methods, results, analysis as well as make findings and recommendations.

[2] The Canopy Cover Assessment data collection form was updated in 2017 Year 4 Monitoring to be consistent with study requisites and on-going monitoring efforts.

Appendix C TEN-YEAR POND STUDY MONITORING PLAN

PURPOSE

The purpose of the Ten-Year Pond Study Monitoring Plan is to summarize and detail requirements for the future monitoring efforts for the Pond Studies and to comply with Mitigation Measure 3.8-2 defined in the Final EIR for the Lower Cascade Canal- Banner/Cascade Pipeline Project (NID 2006). The Pond Study is comprised of study sites on the Lower Cascade Canal, and DS canal (control-site). There are no Pond Study sites located on the Upper Grass Valley Canal.[1] This Ten-Year Pond Study Monitoring Plan is specific to a study timeline and data collection methods which are detailed below.

STUDY TIMELINE

Pond data will be collected every four years, with one final assessment to conclude the study on Monitoring Year 10 (i.e., Years 0, 4, 8, and 10). Surveys shall be conducted in the late summer (i.e., August to September) and concurrent with the Canopy Cover Assessment portion of the Canopy Cover Study.

Table- Summary of the Pond Study and Monitoring Timeline Requirements

Pond Study (all sites)	Monitoring Year and Requirement					
	2013- Year 0	2015- Year 2	2017- Year 4	2019- Year 6	2021- Year 8	2023- Year 10
	X		X		X	X

X- Indicates a study year for monitoring to be completed

STUDY LOCATIONS

The study sites locations for the Pond Study are detailed below.

- Lower Cascade Canal
  - Pond 1: 39.235710, -120.988615
  - Pond 2: 39.235182, -120.989522
- DS Canal (control-site)
  - Pond 3: 39.240913, -121.020355

[1] No ponds were identified along the UGVC and therefore no Pond Study sites are located along the UGVC

DATA COLLECTION

As part of the Pond Study, wildlife and habitat suitability assessments will be conducted. At each of the three Pond Study sites, the following data will be collected and assessed:

- Delineation of inundated area/ soil saturation;
- Hydrology pattern(s);
- Range of water depths;
- Soil type(s);
- Vegetation observed and overarching vegetation community type;
- Wildlife species observed;
- CRLF habitat assessment; and
- Site photos.

Each pond assessment will include a GPS delineation, and information on hydrology, soils, and vegetation, in accordance with U.S. Army Corps of Engineers Guidelines for Wetland Delineations (Environmental Library 1987). Each Pond Study site should be assessed for the presence of potential California red legged frog (CRLF) habitat, and other associated special status species, based on the Revised Guidance on Site Assessments and Field Surveys for the CRLF (USFWS 2005). Pond Study data will be recorded on the Project specific datasheet associated with this Monitoring Plan.[2] Data shall also be documented with a Trimble Series 6000 GeoXH GPS, and post-processed in GIS

STUDY REPORTING

Reporting shall be completed at the end of each monitoring year, and will be drafted to summarize the Pond Study findings for that year. The data for the study year will also be discussed in conjunction with previous monitoring years and California's water year data and NID LCC and the UGVC flow data. Each report will include adaptive management recommendations, if necessary. NID is not required to adhere to any interim recommendations, but may want to take them into consideration when reducing or limiting flow that may have canopy impacts, should they be documented. On the last year of study (i.e., Year 10, 2023), a comprehensive final report will be compiled summarizing data collection methods, results, analysis as well as make findings and recommendations.

[2] The Pond Study data collection form was updated in 2017 Year 4 Monitoring to be consistent with study requisites and on-going monitoring efforts.

Appendix D OBSERVED SPECIES

Vegetation and wildlife species observed during Year 4 monitoring (2017) for the Tree Health Assessments and Pond Studies in September 2017, Nevada County, California. Species observed, or not observed, in previous monitoring years (i.e., 2013 and 2015) are also noted.

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
Plants												
annual dogtail species	*Cynosurus echinatus*	Annual grass	Non-native invasive								X	
apple species*	*Malus* sp.	Tree	Non-native									X
bigleaf maple	*Acer macrophyllum*	Tree	Native	X	X	X	X	X	X			
black oak	*Quercus kelloggii*	Tree	Native	X	X	X	X	X	X	X	X	X
Bamboo species*	*Phyllostachys* sp.	Vine/Shrub	Non-native							X		
California man-root	*Marah watsonii*	Perennial herb/Vine	Native								X	
canyon live oak	*Quercus chrysolepis*	Tree	Native	X	X				X			
common cattail	*Typha latifolia*	Perennial herb	Native						X	X		X
common ladyfern	*Athyrium filix-femina*	Fern	Native	X	X	X	X	X	X			
common wooly mullein	*Verbascum Thapsus*	Perennial herb	Non-native Invasive								X	
coyote brush	*Baccharis pilularis*	Shrub	Native	X					X			
cutleaf blackberry	*Rubus laciantus*	Shrub	Non-native	X	X	X	X	X	X	X	X	

Appendix D Observed Species
January 5, 2018

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
dandelion species**	*Agoseris* sp.	Perennial herb	Native									
dock species	*Rumex* spp.	Perennial herb	Non-native				X					X
Douglas-fir	*Pseudotsuga menziesii*	Tree	Native	X	X	X	X	X	X			
duckweed species*	*Lemna* sp.	Perennial herb	Native								X	
English ivy *	*Hedera helix*	Vine	Non-native invasive	X	X	X	X					
Fremont's cottonwood*	*Populus fremontii*	Tree	Native								X	
gray alder	*Alnus incana*	Tree	Native	X	X	X	X	X	X	X		
Hazelnut	*Corylus cornuta*	Tree	Native	X								
hedge nettle species	*Stachys* sp.	Perennial herb	Native	X								
henbit dead-nettle	*Lamium* amplexicaule	Annual herb	Non-native								X	
Himalayan blackberry	*Rubus armeniacus*	Shrub	Non-native invasive	X	X	X	X	X	X	X	X	X
incense cedar	*Calocedrus decurrens*	Tree	Native	X			X	X	X	X	X	X
interior live oak*	*Quercus wislizeni*	Tree	Native	X			X					
mountain grape	*Berberis aquifolium*	Shrub	Native	X	X							
mountain maple	*Acer glabrum*	Tree	Native								X	
mustard species*	*Brassica* sp.	Annual herb	Non-native invasive									X
narrowleaf cattail*	*Typha angustifolia*	Perennial herb	Non-native								X	

Appendix D Observed Species
January 5, 2018

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
narrowleaf plantain*	*Plantago lanceolata*	Perennial herb	Non-native invasive									X
Oregon ash	*Fraxinus latifolia*	Tree	Native				X					
Pacific dogwood	*Cornus nutallii*	Tree	Native	X	X	X		X	X		X	
Pacific madrone	*Arbutus menziesii*	Tree	Native	X	X	X	X	X	X	X	X	
pink honeysuckle	*Lonicera hispidula*	Vine	Native	X	X	X	X		X	X	X	
pea species*	*Lathyrus* sp.	Perennial herb	—							X		
periwinkle species*	*Vinca* sp.	Perennial herb	Non-native invasive								X	
poison hemlock	*Conium maculatum*	Perennial herb	Non-native invasive		X	X	X					
poison oak*	*Toxicodendron diversilobum*	Vine/Shrub	Native	X	X	X	X	X	X			
Ponderosa pine	*Pinus ponderosa*	Tree	Native	X	X	X	X	X	X		X	X
Queen Anne's lace, wild carrot*	*Daucus carota*	Perennial herb	Non-native									X
quillwort species	*Isoetes* sp.	Fern	Native	X	X		X		X			
rush species	*Juncus* spp.	Perennial grass	Native								X	X
Scotch broom*	*Cytisus scoparius*	Shrub	Non-native invasive							X		X
sedge species*	*Carex* sp.	Perennial herb	Non-native								X	
Solomon's seal species *	*Maianthemum* sp.	Perennial herb	Native							X		

Appendix D Observed Species
January 5, 2018

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
sorrel species	*Oxalis* sp.	Perennial herb	Non-native	X								
sugar pine*	*Pinus lambertiana*	Tree	Native	X	X	X	X	X	X			
sweet cicely species*	*Osmorhiza* sp.	Perennial herb	Native									X
sword fern*	*Polystichum munitum*	Fern	Native							X	X	
tanoak	*Notholithocarpus densiflorus*	Tree	Native	X			X					
thimbleberry*	*Rubus parviflorus*	Vine/Shrub	Native							X		
trail plant*	*Adenocaulon bicolor*	Perennial herb	Native	X	X		X	X				
tree of heaven*	*Ailanthus altissima*	Tree	Non-native invasive						X			
water parsnip**	*Berula erecta*	Perennial herb	Native									
western goldenrod*	*Euthamia occidentalis*	Perennial herb	Native	X					X			
western raspberry*	*Rubus leucodermis*	Shrub	Native	X		X	X					
white alder	*Alnus rhombifolia*	Tree	Native	X		X		X	X			
Wildlife												
American bullfrog*	*Lithobates catesbeianus*	Frog	Non-native invasive							X	X	X
Anna's hummingbird*	*Calypte anna*	Bird	Native									X
black phoebe*	*Sayornis nigricans*	Bird	Native								X	
brown creeper*	*Certhia americana*	Bird	Native								X	
brown trout species*	*Salmo trutta sp.*	Fish	Non-native								X	

Appendix D Observed Species
January 5, 2018

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
California scrub jay	*Aphelocoma californica*	Bird	Native	X			X		X			
California sister*	*Adelpha californica*	Insect	Native									
damselfly species*	Zygoptera sp.	Insect	—							X		
deer species	*Odocoileus* sp.	Mammal	Native								X	
dragonfly species*	Anisoptera sp.	Insect	—							X		
flame skimmer*	*Libellula saturata*	Insect	Native									X
hummingbird species*	*Calypte*, *Selasphorus* sp.	Bird	Native									
lesser goldfinch*	*Spinus psaltria*	Bird	Native								X	
mosquitofish*	*Gambusia affinis*	Fish	Native							X		
mountain chickadee	*Poecile gambeli*	Bird	Native						X			
northern flicker	*Colaptes auratus*	Bird	Native	X	X	X						
orange-crowned warbler*	*Oreothlypis celata*	Bird	Native							X		
owl species*	Strigidae sp.	Bird	Native								X	
Pacific tree frog	*Pseudacris regilla*	Frog	Native								X	
red-breasted nuthatch*	*Sitta canadensis*	Bird	Native							X	X	
red-eared slider*	*Trachemys scripta elegans*	Turtle	Non-native invasive								X	
red-tailed hawk*	*Buteo jamaicensis*	Bird	Native									X

Appendix D Observed Species
January 5, 2018

Common name	Scientific Name	Lifeform	Nativity	Observation Location								
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Pond 1	Pond 2	Pond 3
spotted towhee*	*Pipilo maculatus*	Bird	Native							X		
Steller's jay	*Cyanocitta stelleri*	Bird	Native		X					X		
western gray squirrel*	*Sciurus griseus*	Mammal	Native									X

Note: The Canopy Cover Assessment is not included in this observed species tables as data metrics are consistent with only densiometer data collection.
Tree Health Assessment Sites = Lower Cascade Canal (LCC) Sites 1 2 3 4 Upper Grass Valley Canal (UGVC) Site 5 DS Canal (control-site) Site 6 Pond 1 2 and 3
Pond Study = LCC Ponds 1 3 DS Canal (control-site) Pond 3

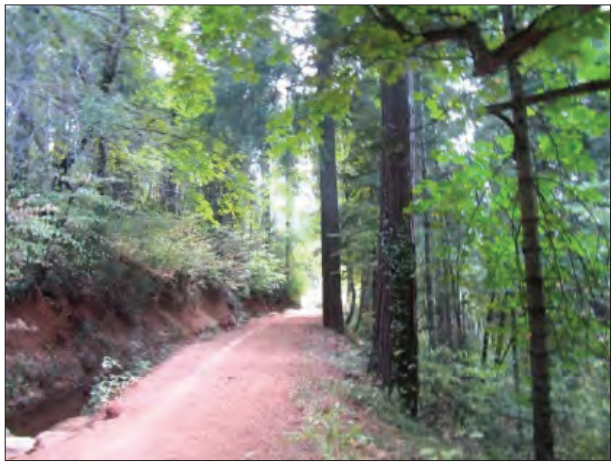
* = Notes species observed during Year 4 (2017) field surveys however not previously observed in monitoring Year 1 (2013) and/or monitoring Year 2 (2015)

** = Notes species observed in monitoring Year 1 (2013) and/or monitoring Year 2 (2015) however not observed during Year 4 (2017) monitoring

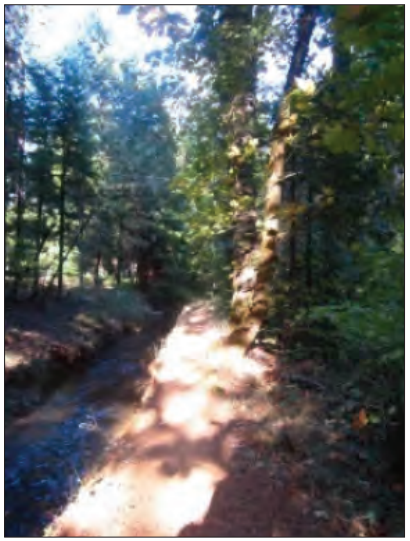
Appendix E PHOTO RECORD

The following Photo Record is documentation of the site conditions present during the Canopy Cover and the Pond Studies. This Photo Record provides a photographic comparison for all studies: (i.e., baseline monitoring [Year 0- 2013], and subsequent monitoring years [Year 2- 2015, and Year 4- 2017]. Additionally, general site conditions and other notable biological observations and findings, have also been provided.

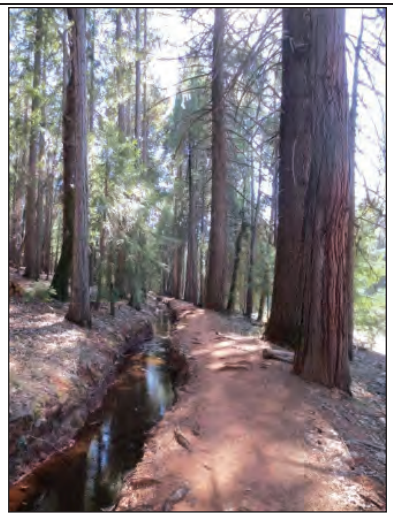
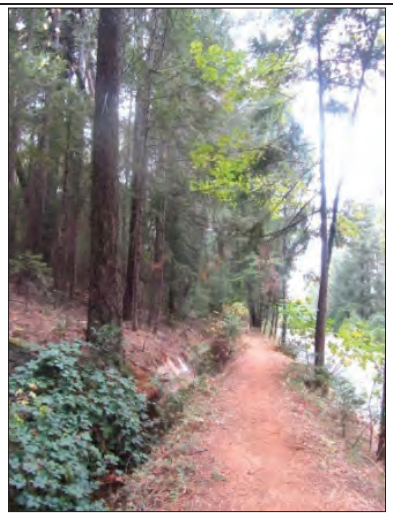
Canopy Cover Study: Tree Health Assessment (Baseline Year 0, 2013; Monitoring Year 2, 2015; and Monitoring Year 4, 2017)

		
LCC Site 1 (Year 0, 2013). East facing aspect	LCC Site 1 (Year 2, 2015). West facing aspect	LCC Site 1 (Year 4, 2017). Near upslope location

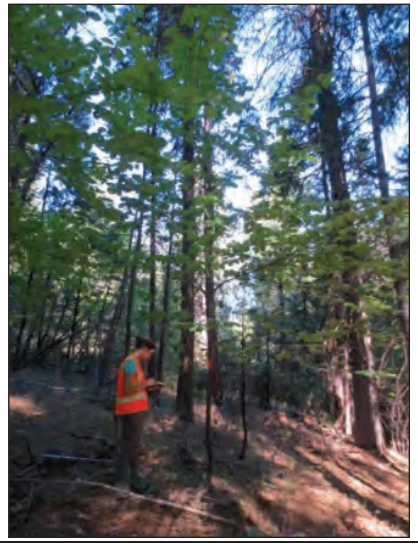
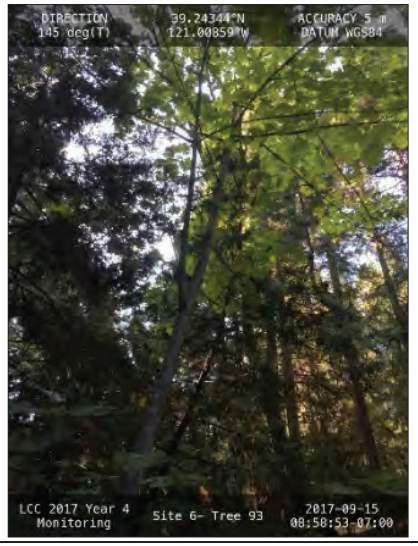
Appendix E Photo Record
January 5, 2018

		
LCC Site 2 (Year 0, 2013). Southwest aspect	LCC Site 2 (Year 2, 2015). East facing aspect	LCC Site 2 (Year 4, 2017). Downslope location
		
LCC Site 3 (Year 0, 2013). East facing aspect	LCC Site 3 (Year 2, 2015). West facing aspect	LCC Site 3 (Year 4, 2017). Downslope location

Appendix E Photo Record
January 5, 2018

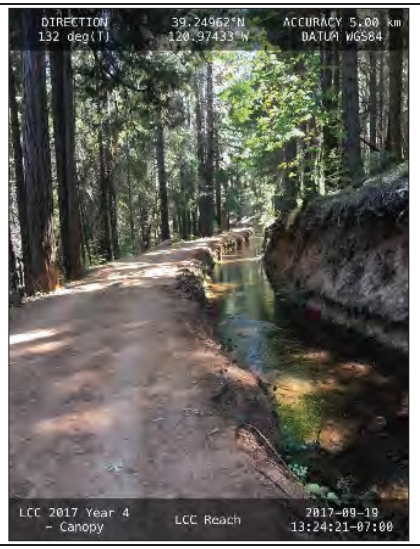
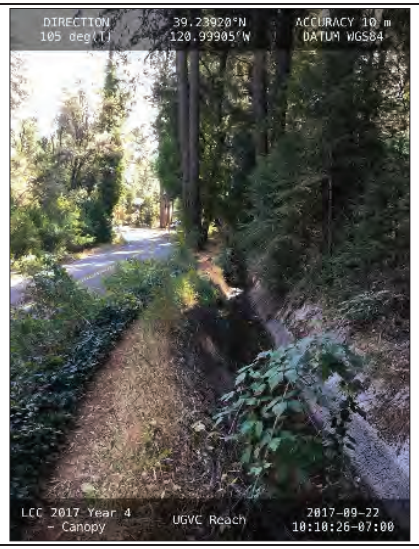
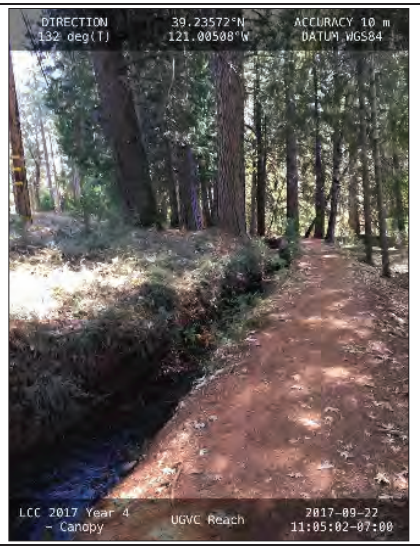
		
LCC Site 4 (Year 0, 2013). Southwest facing aspect	LCC Site 4 (Year 2, 2015). Northeast facing aspect	LCC Site 4 (Year 4, 2017). Downslope location
		
UGVC Site 5 (Year 0, 2013). West facing aspect	UGVC Site 5 (Year 2, 2015). West facing aspect	UGVC Site 5 (Year 4, 2017). Downslope location

Appendix E Photo Record
January 5, 2018

		
DS Canal Site 6 (control-site) (Year 0, 2013)	DS Canal Site 6 (control-site) (Year 2, 2015)	DS Canal Site 6 (control-site) (Year 4, 2017)

Appendix E Photo Record
January 5, 2018

Canopy Cover Study: Canopy Cover Assessment (Baseline Year 0, 2013; and Monitoring Year 4, 2017)

<table>
<tr><td>  </td><td> 
</td><td> 
</td></tr>
<tr><td>LCC Reach (Year 0, 2013). Southeast facing aspect</td><td>LCC Reach (Year 4, 2017)</td><td>LCC Reach (Year 4, 2017)</td></tr>
<tr><td>  </td><td> 
</td><td> 
</td></tr>
<tr><td>UGVC Reach (Year 0, 2013). Northwest facing aspect</td><td>UGVC Reach (Year 4, 2017)</td><td>UGVC Reach (Year 4, 2017)</td></tr>
</table>

Appendix E Photo Record
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	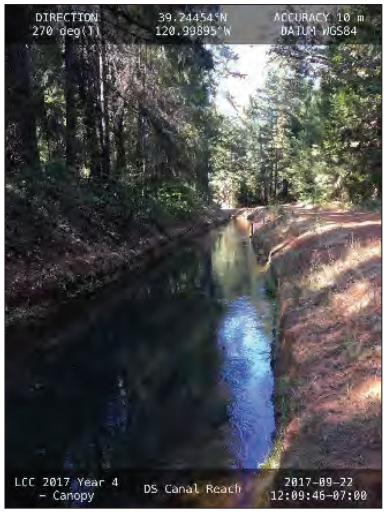	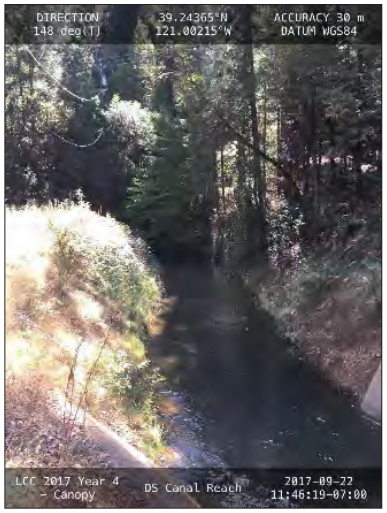
DS Canal Reach (control-reach) (Year 0, 2013). General west facing aspect	DS Canal Reach (control-reach) (Year 4, 2017)	DS Canal Reach (control-reach) (Year 4, 2017)

Pond Study (Baseline Year 0, 2013; and Monitoring Year 4, 2017)

		
LCC Pond 1 (Year 0, 2013). Located off lower Spring Road. Southwest facing aspect	LCC Pond 1 (Year 4, 2017). Sedimentation at upstream source	LCC Pond 1 (Year 4, 2017). Water source upstream
		
LCC Pond 2 (Year 0, 2013). Located off upper Spring Road. North facing aspect	LCC Pond 2 (Year 4, 2017)	LCC Pond 2 (Year 4, 2017). Culvert outlet to upland located to the left

Appendix E Photo Record
January 5, 2018

		
DS Canal Pond 3 (control-site) (Year 0, 2013). Located off Pittsburg Mine Road. Northeast facing aspect	DS Canal Pond 3 (control-site) (Year 4, 2017)	DS Canal Pond 3 (control-site) (Year 4, 2017). Upstream water source

Appendix E Photo Record
January 5, 2018

General Site Conditions / Notable Observations

<table>
<tr><td> 
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<tr><td>LCC Site 1. Downslope; downed debris, minimal understory</td><td>LCC Site 1. Upslope; thick duff as ground covering</td><td>LCC Site 1. Example assessment tree (#193)</td></tr>
<tr><td> 
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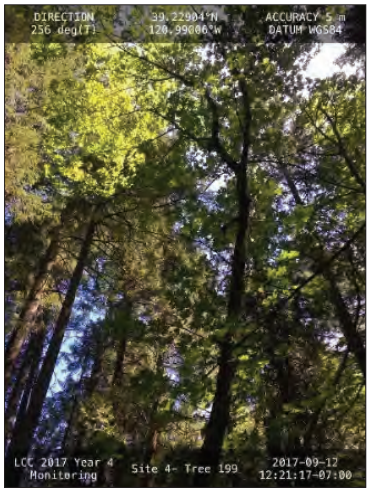
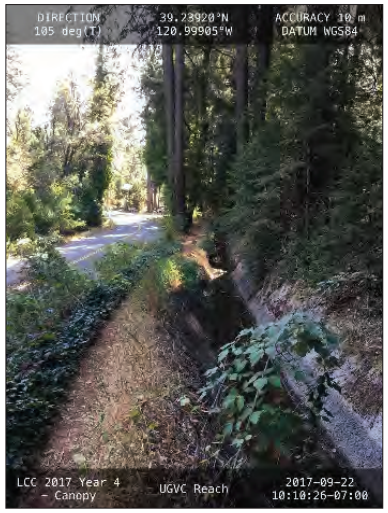
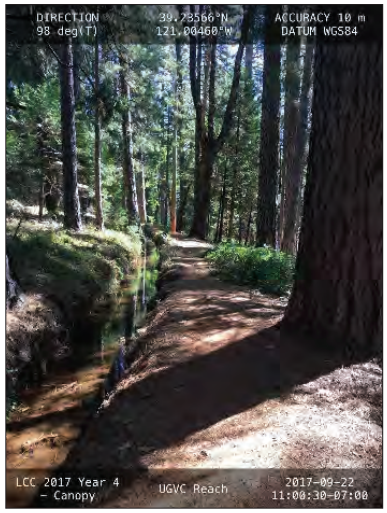
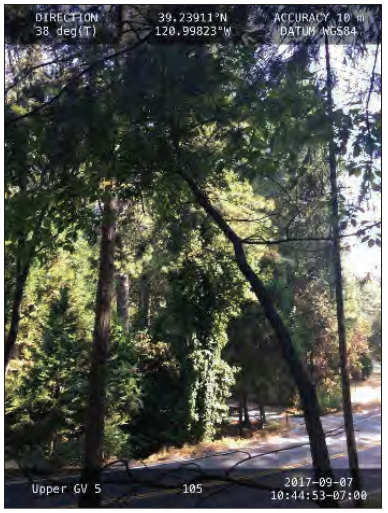
</td></tr>
<tr><td>LCC Site 2. Downslope; thick understory primarily comprised of Himalayan blackberry (Rubus armeniacus)</td><td>LCC Site 2. Downslope; thick understory and downed debris</td><td>LCC Site 2. Example assessment tree (#212)</td></tr>
</table>

Appendix E Photo Record
January 5, 2018

		
LCC Site 3. Numerous maple (*Acer macrophyllum*) saplings and encroaching English Ivy (*Hedera helix*) in the understory	LCC Site 3. Downslope; understory and downed woody debris throughout site	LCC Site 3. Example assessment tree (#214), with surface growth – moss species and pink honeysuckle (*Lonicera hispidula*)
		
LCC Site 4. Downslope; understory and dense ground covering of English Ivy (*Hedera Helix*)	LCC Site 4. Upslope; dense understory of maple saplings and poison oak (*Toxicodendron diversilobum*)	LCC Site 4. Exampled study tree exampled study tree (#199), showing a healthy, moderately full canopy (few bare branches)

		
UGVC Site 5. Downslope; adjacent to roadside	UGVC Site 5. Upslope; denser trees and understory on upslope (i.e., non-roadside location)	UGVC Site 5. Downslope, example of study tree (#105), roadside location
		
DS Canal Site 6 (control-site). Downslope; moderate understory with dense liter covering ground	DS Canal Site 6 (control-site). Upslope; dense understory of conifer saplings and poison oak (*Toxicodendron diversilobum*)	DS Canal Site 6 (control-site). Example study tree (#95), competition with adjacent trees for resources

Appendix E Photo Record
January 5, 2018

		
DS Canal Site 6 (control-site). Insect damaged big-leaf maple (*Acer Macrophyllum*) leaf	LCC Reach. Big-leaf maple (*Acer Macrophyllum*) with observable leaf rush and insect damage	LCC Site 4. Non-native invasive English Ivy (*Hedera helix*) example encroachment at study tree.

Appendix F FIELD DATA COLLECTION FORMS

F.1 TREE HEALTH ASSESSMENT FIELD DATA COLLECTION FORMS

Baseline Arborist Survey Datasheet

Project LCC- 2017 Monitoring (Year 4) **Site** Site 1 TREE HEALTH ASSESSMENT

Client NID **Date** Sept 12, 2017

Weather 90°, humid, sunny **Observer(s)** M. OATS, E. CARNAHAN

Site Conditions steep downslope; lots of downed debris covering ground ~10% understory; 90% downed debris; steep on both upslope/downslope {STOD1, cutleaf blackberry, ferns, trail plant, LOHI}

Notes seepage exhibits marginal decline.

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH (inches)	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
185	down.	N/A	N/A	dead								0	Not viable; fallen down on ground
180	down	ALIN	N/A	2	2	0	1	0	1	1	0	7	fallen over, soon to be non viable; epicorm sprouting; roots pulled out of ground
181	down	ALIN	1.9	3	3	0	1	0	1	1	0	9	outshadowed by adj. ACMA dead tree leaning on it
183	down	CONU	3.5	2	3	0	0	0	1	1	0	7	some browning on leaves, leaves are wilted, leaning downslope
186	down	ACMA	9.8, 1.6, 5.2*	4	3	1	0	0	1	1	0	10	sparse upper half of canopy; insect damage; stems rusting on leaves; heavy
187	down	ALIN	1.3	3	3	0	1	1	1	1	0	10	sluffing of bark, very large tree outshadowed by adj. foliage
184	down	CONU	4.9	3	4	1	0	0	1	1	0	10	broken trunk- upper half absent; good foliage present on lower branches
178	down	ACMA	7.8, 6, 7.3, 5.2 dead	2	2	1	0	0	1	1	0	7	one stem dead, leaves browning, competing w/adj. Conu, woodpecker hole
175	down	CONU	2.4	3	4	1	0	0	1	1	0	10	leaning greatly downslope, white & brown spotting on leaves, outshadowed by foliage
176	down	CONU	1.8	2	4	1	0	0	1	1	0	9	leaning downslope, white/brown spotting on leaves; sparse upper canopy
177	down	CONU	—	dead									non-viable; upright, no foliage
210	down	CONU	1.2	2	2	1	0	0	0	1	0	6	leaning greatly downslope, white/brown spots on stems, leaves wilted
173	down	CONU	6.8, 2.3, 0.16	3	3	0	1	0	1	1	0	9	dead branch on main stem; spotting on bark, somewhat sparse upper canopy
174	down	CONU	1.9, 1.2	2	3	0	1	0	1	1	0	8	leans greatly sideslope/downslope, sparse upper canopy, some spotting on leaves
189	down	CONU	2.8	3	3	0	1	1	0	1	0	9	absent lower canopy, some white spotting on trunk, competing adjacent foliage
182	down	ACMA	7.5, 2.9, 1.2, 3.3	3	2	1	0	0	0	1	0	7	split stem, wet cavity, white on bark; wilt spotting on leaves

*8.5, 5.1, 5.4, 3.01, 7.2, 6.2, 6.3, 6.3, 4.7, 4.9, 9.05, 5.8, 7.5

Project ______________________ Site ____________ Date ________________ Tree Health Assessment Datasheet pg 2 of 2

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
195	upslope	ACMA	33,23,29,*	4	3	0	1	0	1	1	0	10	5 stems, canopy over canal, white spotting on bark, lichen running up trunk
193	upslope	CONU	1.9	4	3	0	0	0	0	1	0	8	white spotting on bark, leaves browning
194	upslope	CONU	5.7	4	3	0	0	0	0	1	0	8	white spotting on bark, leaves browning
191	upslope	CONU	4.75, 4.15	3	3	0	0	0	0	1	0	7	2 stems, lower canopy absent, competition [illegible] spotting on bark, lichen present, [illegible] fir
192	upslope	ACMA	2.3	3	3	0	0	1	1	1	0	9	canopy over canal, nearby insect damage, brown spotting on leaves, [illegible] white spots
190	upslope	CONU	5.7	3	2	1	0	0	1	1	0	8	canopy over canal, leaves browning, white spots on trunk, leaning downslope; overshadowed by fir & ACMA

*2.1

ASSESSMENT KEY

Canopy Cover	1- Sparse to full die-back (0-25%); 2- Partial (25-50%); 3- Medium (50-75%); 4- Full (75-100%)
Bark Health	1- Poor to No bark (75-100%); 2- Fair (50-75%); 3-Good (25-50%); 4- Excellent (0-25%)
New Growth	1- Present; 0- Not present
Leaf Color	1- Normal; 0- Abnormal
Surface Growth	1- Not Present; 0- Present
Disease	1- Not Present; 0- Present
Parasites	1- Not Present; 0- Present
Insects	1- Not Present; 0- Present
Overall Tree Health	1-3 Poor Health/Dead; 4-7 Fair Health; 7-10 Good Health; 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

ALIN	
CONU	
ACMA	

TODI
LOHI
RUAR
RULA
} understory dominants

Baseline Arborist Survey Datasheet

pg 1 of 2

Project LCC Year 4 Monitoring - tree health assessment **Site** Site 2 - tree health

Client NID **Date** 9/8/2017

Weather 75° / light breeze **Observer(s)** M. Oats E. Carnahan

Site Conditions very dense understory of RUAR & cutleaf blackberry; CONU as understory

Notes most trees located downslope of canal, some w/in dense blackberry
ACMA had maple rust & lichen on the bole/trunk potentially indicating older trees, w/ growth & spots on leaves could be indication of old spotted leaf from year past & caused necrosies; mature

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH (inches)	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
139	down	ACMA	2.8	4	3	1	0	0	0	1	0	9	spots on leaves - possible disease; [illegible] adjacent to conifer
140	downslope	ACMA	4.7	2	4	1	0	0	0	1	0	8	spot [illegible]; top third canopy [illegible] near base of trunk
141	downslope	CONU	1.9	4	4	1	0	1	1	1	0	12	[illegible] drainage; [illegible] LOH along trunk
136	downslope	ACMA	2.7	4	4	1	0	0	0	1	0	10	spots on leaves; [illegible] trunk; LOH
205	downslope	ACMA	10.2	4	3	1	0	0	0	1	0	9	spots on leaves [illegible]
138	downslope	ACMA	11.5 & 7.9	4	2	1	1	0	1	1	0	10	[illegible] dead at [illegible] of [illegible] where trunk is split
209	downslope	ACMA	12.1	4	3	1	1	0	1	1	0	11	leans greatly upslope; close to canal; competing with adjacent cedar
208	downslope	ACMA	11, 9.8	4	2	1	0	0	0	1	0	8	multistem; white spots on leaves; some root rot
211	downslope	ACMA	4.5	3	2	1	0	0	0	1	0	7	prev. 133/204; spots on leaves; some root rot; leans greatly downslope
143	downslope	ALIC	5	3	3	1	1	0	0	1	0	9	very dense understory; competing with blackberry, dogwood & other vines
144	downslope	ALIC	1	3	3	1	1	0	0	1	0	9	adjacent to drainage; top part of trunk absent (naturally split); competing w/ dense understory
145	— dead —												
212	downslope	CONU	3.8, 1.5, 1.7, 3.9	3	3	1	1	0	1	1	0	10	prev 135/207; multistem, 1 stem mech. removed; competing w/ adj. dogwood & blackberry
213	downslope	CONU	3.8	3	1	1	1	0	0	1	0	7	prev 132/206; multistem dbh avg.; fungal disease on stems; some stems dead; missing canopy
146	downslope	CONU	1.8, 1.4	4	4	1	1	0	1	1	0	12	two stem; competing with dense understory; lots of CA black[berry]
137	downslope	CONU	2.1, 1.7	4	3	1	1	0	0	1	0	10	multistem; 4?; stem has rot + fungal disease; competing w/ dense understory - cutleaf blackberry

no photo

Project _____ Site _____ Date _____ Tree Health Assessment Datasheet pg__of__

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes

ASSESSMENT KEY

Canopy Cover 1- Sparse to full die-back (0-25%); 2- Partial (25-50%) 3- Medium (50-75%); 4- Full (75-100%)
Bark Health 1- Poor to No bark (75-100%); 2- Fair (50-75%); 3-Good (25-50%), 4- Excellent (0-25%)
New Growth 1- Present; 0- Not present
Leaf Color 1- Normal; 0- Abnormal
Surface Growth 1- Not Present; 0- Present
Disease 1- Not Present; 0- Present
Parasites 1- Not Present; 0- Present
Insects 1- Not Present; 0- Present
Overall Tree Health 1-3 Poor Health/Dead, 4-7 Fair Health, 7-10 Good Health, 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

RULA	Rubus laciniatus (cutleaf blackberry)
RUUR	Rubus ursinus (CA blackberry)
RUAR	Rubus armeniacus (Himalayan blackberry)
ALIN	Alnus incana - gray alder
ALRH	Alnus rhombifolia - white alder
COSE	Cornus sericea - dogwood
ACMA	Acer macrophylla - bigleaf maple

trees

trail plant
English ivy - Hedera helix
honeysuckle - Lonicera hispidula

(SEE PAGE 1)

Baseline Arborist Survey Datasheet

Project _____ **Site** Site 2

Client _____ **Date** 9/8/17

Weather _____ **Observer(s)** _____

Site Conditions _____

Notes _____

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
151	upslope	CONU	3.2, 2.3	3	3	1	1	0	1	1	0	10	2 stem, competing w/ adjacent fir,
147	upslope	CONU	0.8, 1.6	3	2	0	0	0	1	1	0	7	2 stem, spots on stems & leaves LOHI growing up stem
148	upslope	CONU	1.6	2	2	0	0	0	0	1	0	5	dead branches; LOHI vining up on stems; spots on stems & leaves
149	upslope	CONU	1.2	2	2	0	0	0	0	1	0	5	spots on branches/stems; leaves some brown
150	upslope	CONU	1.3	3	2	0	0	0	0	1	0	6	competing w/ adj. fir; spots on stems + leaves; vining upslope

Baseline Arborist Survey Datasheet — tree health assessment

Project LCC Year 4 Monitoring (2017) - Site 3 = tree health assessment

Client Nevada Irrigation District (NID) **Date** September 8, 2017

Weather 75° / light breeze **Observer(s)** M. Oats, S. Carnahan

Site Conditions English Ivy present throughout understory; not dense understory veg

Notes ACMA - spots on leaves could be from previous spotted tree fungus led to necrosis of the leaves. English ivy present growing on boles/up trunks.

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
214	down	ACMA	6.5, 3.7	3	2	1	1	0	1	1	0	9	prev. 15φ; 18cm nearly dead; vining english ivy on dead stem
157	ds	ALIN	2	4	2	0	1	0	1	1	0	9	some english ivy vining up;
158	ds	ACMA	9.0	1	1	1	1	0	1	1	0	6	English ivy vining up whole trunk; upper canopy absent
155	ds	ACMA	9.6	4	3	1	1	0	1	1	0	11	lots of moss on trunk; canopy over trail; epicormic timber up the
152	ds	ACMA	7, 6.4, 7.8	4	2	1	1	0	0	1	0	9	3 stem; decay on trunk; canopy over trail
167	ds	ACMA	3.3	4	3	1	1	0	1	1	0	11	new stem growth from base; canopy over trail; some spots on trnk
165	ds	ACMA	4.8	4	2	0	1	0	1	1	0	9	side slope lean to ground; spots on trunk
162	ds	ACMA	9.7	2	1	0	0	0	1	1	0	5	upper canopy absent; lichen & moss heavy present on trunk
161	ds	ALIN	1.1	4	3	1	0	0	1	1	0	10	leaves are curled, trunk curved overshadowed by adjacent ACMA
160	ds	ACMA	9.3	4	2	1	1	0	1	1	0	10	bark sluffed off; English ivy on bole
159	ds	CONU	2.1	4	4	1	0	1	1	1	0	12	some spots on leaves; leaning downslope
163	ds	ACMA	5.8	1	1	1	0	0	0	1	0	4	upper canopy absent; large white patch on trunk; spots on leaves; heavily moss
164	ds	ACMA	4.5	3	2	1	0	0	1	1	0	8	side slope lean; competing w/ adjacent ACMAs & ALICs
166	ds	ACMA	6.4	4	2	1	1	0	1	1	0	10	upslope lean; canopy over trail, curved trunk
153	ds	ACMA	1.9, 2	4	3	1	0	0	1	1	0	10	tree growing around tag; 2 stems, main cut at snag; competing with adjacent ACMA
154	ds	ACMA	1.8	3	3	1	0	0	1	1	0	9	spots on trunk & leaves

*Note: Access to upslope side not accessible (fences, etc) so upslope sides (pg 2) were taken offset on GPS & visually assessed/observed w/ binoculars.

Project ____________ Site ____________ Date ____________ Tree Health Assessment Datasheet pg__of__

Baseline Data				Tree Health Assessment									Notes
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	

ASSESSMENT KEY

Canopy Cover	1- Sparse to full die-back (0-25%); 2- Partial (25-50%), 3- Medium (50-75%); 4- Full (75-100%)
Bark Health	1- Poor to No bark (75-100%); 2- Fair (50-75%), 3-Good (25-50%); 4- Excellent (0-25%)
New Growth	1- Present; 0- Not present
Leaf Color	1- Normal, 0- Abnormal
Surface Growth	1- Not Present 0- Present
Disease	1- Not Present, 0- Present
Parasites	1- Not Present; 0- Present
Insects	1- Not Present; 0- Present
Overall Tree Health	1-3 Poor Health/Dead; 4 7 Fair Health, 7-10 Good Health 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

ALIN - Alnus incana	
CONU - Cornus nuttallii	
ACMA - acer macrophylla	
English Ivy - Hedera helix	
honeysuckle - Lonicera hispidula	

(see page 1)

Baseline Arborist Survey Datasheet

Project _____ **Site** Site 3

Client _____ **Date** 9/8/17

Weather _____ **Observer(s)** _____

Site Conditions _____

Notes All upslope inaccessible; taken offset on downslope side of canal

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
168	upslope	CONU	3.5	3	3	0	0	0	1	1	0	8	offset 30' from pt taken; leans uphill not accurate
169	upslope	CONU	4.5	4	3	1	1	1	1	1	0	12	offset 30' from pt taken;
171	upslope	ACMA	4	4	4	1	1	1	1	1	0	13	offset 20' from pt taken; leans upslope; competing w/ adj. CONU
172	upslope	CONU	5	4	4	0	1	1	1	1	0	12	offset 30' - no tag guessing from location

Baseline Arborist Survey Datasheet

Project LCC- 2017 Monitoring (Year 4) Site Site 4 TREE HEALTH ASSESSMENT

Client NID Date Sept 12, 2017

Weather 85°, sunny Observer(s) M. OATS, E. Carnahan

Site Conditions ground covered in grass, ivy, fern, TODI, RUAR, cutleaf blackberry, NNAGs, etc.

Notes Not as much lichen & moss on trees at this STS as compared to other sites upslope side has cedar saplings w/ RUAR understory veg (no English ivy upslope)

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH (inches)	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
200	downsl	ACMA	1.5	4	2	1	1	1	1	1	0	11	bark is scratched, one limb broken off, lots of insect damage (prev 127)
201	down.	FRLA	2	4	3	1	1	1	1	1	0	12	caterpillar on bark; competing w/ oak, ACMA; potential rust on leaves (prev 121)
202	down	ALIN	1.75	4	2	0	1	1	1	1	0	10	a lot of bark peeling/stuff, LOHI vining up branches (prev 112)
203	down	ACMA	7.1	4	3	1	1	0	1	1	0	11	English ivy & LOHI vining up trunk (prev 111)
113	down	ACMA	1.6	4	4	1	0	1	1	1	0	12	lots of insect damage on leaves, leaves curling; shaded out by conifer canopy
114	down.	ACMA	1.85	2	3	1	0	1	1	1	0	9	leans downslope, top half of canopy absent, new growth to north/canal
123	down.	NODE	2.5	4	4	1	1	1	1	1	0	13	heavy insect damage & spotting on leaves, adj. cedar growing under canopy
116	down.	ACMA	1.6, 1.1	2	4	1	0	0	1	1	0	9	2 stems, canopy shaded out by adjacent conifers & ACMA, high insect damage on leaves
117	down	ALIN	1.3	2	2	0	1	1	1	1	0	8	English ivy growing up trunk, lower half of canopy absent; bark stuffing
115	down	ALIN	1.7	2	2	0	0	1	1	1	0	7	outshadowed by adj. tanoak, lower half of canopy absent; bark stuffing;
119	down.	ALIN	2.2	3	2	1	0	1	1	1	0	9	competing with adjacent ACMA; bark stuff, yellowing lower leaves; lower third canopy absent
118	down	NODE	3.4	4	3	1	1	0	1	1	0	11	English ivy growing up trunk; multistem tree, ACMA w/ 201
new 215	down	ACMA	2.4	4	3	1	1	1	1	1	0	12	(prev. 120? (NOW DAS) competing canopy over trail
109	down	ACMA	4.5	3	3	0	0	0	1	1	0	8	heavy insect damage; english ivy growing on trunk; canopy sparse on lower third
110	down	ACMA	2.4	4	4	1	0	0	1	1	0	11	heavy insect damage; English ivy on bark
198	upslope	ACMA	7.0	3	3	1	1	0	1	1	0	10	canopy sparse on some branches, heavy insect damage on leaves

(over)

Project ______________ Site ______________ Date ______________

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
199	upslope	ACMA	9.5	3	3	1	1	0	1	1	0	10	wire wrapped around trunk heavy insect damage on leaves
197	upslope	ACMA	4.3	3	2	1	1	0	1	1	0	9	moss on trunk, insect damage on leaves
196	upslope	ACMA	6.5	3	2	1	0	0	0	1	0	7	2 stem (one is dead, alive one was evaluated); leaves browning; possibly root rot

ASSESSMENT KEY

Canopy Cover	1- Sparse to full die-back (0-25%), 2- Partial (25-50%), 3- Medium (50-75%), 4- Full (75-100%)
Bark Health	1- Poor to No bark (75-100%), 2- Fair (50-75%) 3-Good (25-50%); 4- Excellent (0-25%)
New Growth	1- Present; 0- Not present
Leaf Color	1- Normal; 0- Abnormal
Surface Growth	1- Not Present; 0- Present
Disease	1- Not Present, 0- Present
Parasites	1- Not Present; 0- Present
Insects	1- Not Present; 0- Present
Overall Tree Health	1-3 Poor Health/Dead; 4-7 Fair Health; 7-10 Good Health; 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

one stem maple was in understory
[illegible] cover (english ivy) completely
covered [illegible]; other understory (20% cover)
more herbaceous cover [illegible]
[illegible])

FRLA - Fraxinus latifolia (OREGON ASH)
NODE - Notholithocarpus densiflorus (TANOAK)
ACMA - big leaf maple (Acer macrophyllum)
ALIN - [illegible] alder (Alnus incana)

Baseline Arborist Survey Datasheet

Project LCC-2017 Monitoring (year 4) **Site** VGVC #5 TREE HEALTH ASSESSMENT

Client NIO **Date** ~~OCTOBER~~ 2017

Weather Clear, Mild breeze, 72°F **Observer(s)** M. KENNEDY, M. OATS

Site Conditions All downslope Trees are roadside (2'-4').

Notes Various riparian saplings (eg. ACMA, ALRH) along canal w/in plot, however below DBH to be included in ASSESSMENT (check in year 6 DBH because these saplings may qualify. (Conversely)

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH (FEET)	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
104	DOWN	ACMA	n/a	—	—	—	—	—	—	—	—	1	DEAD/ABSENT - LOCATION TAKEN @ former location
105	UP	ALRH	0.55	4	4	1	1	0	1	1	0	12	lower canopy branches absent of foliage (due to understory location)
103	DOWN	ACMA	1.54'	3	4	1	0	0	1	1	0	10	EPICORMIC SPROUTS @ BASE COMPET. W/ ADJACENT ACMA, SAP.
101	DOWN	ALRH	1.58'	3	3	1	1	0	1	1	0	10	LIMBS - POSSIBLE ROADSIDE MAINT UPPER CANOPY ABSENT.
100	DOWN	ALRH	2.25'	3	4	1	1	0	1	1	0	11	ROADSIDE, POTH VINING UP TREE
99	DOWN	CONU	0.65'	4	4	1	1	0	1	1	0	12	VARIOUS SAPLINGS SPROUTING ADJACENT TO MAIN STEM. COMPETING W/ QUERCUS
98	DOWN	CONU	0.54'	4	4	1	1	0	1	1	0	12	COMPETING W/ ADJACENT QUERCUS VARIOUS SAPLINGS SPROUTING

Project LCC-2017 (Y4 Monitor) Site Veg VC #5 Date 07SEP2017 Tree Health Assessment Datasheet pg 2 of 2

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
Data Collection Checklist													Overall general species
• general site photos													composition is upland,
• individual tree photos													therefore reduction in upland
• Each tree gps'd & recorded on hard copy datasheet													seepage exhibits marginal
• Record general [illegible] conditions													decline & species decline to
• Record other [illegible]													date since Y1-2 more [illegible] cover (more rainfall)
• Notes on [illegible] weather conditions / canal seepage influence													
			Overstory saplings in understory; uplands include: PSME, QUKE, CEDAR,										
			20% understory; 80% downed wood/debris, leaf litter, & bare ground										
			canal depth – ≤ 1 foot (water), understory is dominated by upland										
ADDITIONAL NOTES			species such as LOHI, RUAR, ACMA, trail plant, gooseberry? fern, English ivy, sweet pea; poison oak										
			Tree tags on downslope/roadside & cannot be seen off of trail										
Within study area riparian sp present but not in initial baseline													
but w/in the overall site description													

Margin: NNAG madrone

ASSESSMENT KEY

Canopy Cover	1- Sparse to full die-back (0-25%); 2- Partial (25-50%); 3- Medium (50-75%); 4- Full (75-100%)
Bark Health	1- Poor to No bark (75-100%); 2- Fair (50-75%); 3-Good (25-50%); 4- Excellent (0-25%)
New Growth	1- Present; 0- Not present
Leaf Color	1- Normal; 0- Abnormal
Surface Growth	1- Not Present; 0- Present
Disease	1- Not Present; 0- Present
Parasites	1- Not Present; 0- Present
Insects	1- Not Present; 0- Present
Overall Tree Health	1-3 Poor Health/Dead; 4-7 Fair Health; 7-10 Good Health; 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

ACMA	
ALRH	
CONU	

Baseline Arborist Survey Datasheet

Project LCC - 2017 Monitoring (year 4) **Site** Site 6 - DS canal (control site)

Client NID **Date** 8 [illegible]

Weather 70°/clear **Observer(s)** A E C NATHAN

Site Conditions [illegible] dead (3 trees) HI ground (down slope) → and vining up trunks

Notes All dw [illegible] g [illegible] tree (E side) - as noted below and in data.

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH (inches)	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
92	upslope	ACMA	3.5	4	3	1	0	0	1	1	0	10	white spotting on leaves
93	upslope	ALIN	7.2	2	2	2	1	0	1	1	0	7	absent lower canopy, sparse woody competing lads, ACMA's
94	upslope	ACMA	11.5, 9.4, 8.2, 3.2	3	1	1	0	0	0	1	0	6	four stem, bare stuffing ht, possibly not rot, 2 stems dead, white spotting on leaves
96	upslope	A +	— dead	d	—	—	—	—	—	—	—		
95	upslope	ACMA	2.7, 0.6	3	2	1	0	0	0	1		7	2 stems, other dead stems, straight LOHI vining up trunk, white spotting on
82/210	down	CONU	2.4	3	2	1	0	0	0	1	0	7	prev. 82; LOHI vining up trunk, leaves [illegible]ng: spotting on trunk, stem leaves
90/217	down	CONU	2.35	4	3	1	0	1	0	1	0	10	prev 90; leaning downslope, white spots on leaves, some leaves,
91/218	down	CONU	1.5, 1.2	4	3	0	0	1	0	1	0	9	89; white on leaves & trunk, downslope lean, 2 stem, wilted
81/219	down	CONU	3.5, 2.3	4	3	0	0	0	0	1	0	8	prev 81; two stem; downslope lean; white spots on bark; some browning
76/200	down	CONU	2.2	4	4	1	0	1	1	1	0	12	prev 76; downslope lean; heavy on leaves, [illegible] understory adj. conifers
75	— dead												
85/221	down	CONU	1.95	4	3	0	0	0	1	1	0	9	prev 85; slight downslope lean, LOHI vining up trunk; spotting on trunk
86/222	down	CONU	6.4, 4.2	3	3	1	0	0	+	+	0	9	2 stem; large brown stem; moss on trunk; [illegible]
78/	— dead												
80/223	down	CONU	2.3	4	4	1	0	1	1	1	0	12	overshadowed by adj. conifers prev 80
79/224	down	CONU	1.8	3	3	0	0	1	0	1	0	8	prev 79, downslope lean, white spots on leaves & trunk overshadowed by adj. CONU

Project _____ Site _____ Date _____ Tree Health Assessment Datasheet pg 2 of 2

Baseline Data				Tree Health Assessment									
Tree Number	Tree Location	Species	DBH	Canopy Cover	Bark Health	New Growth	Leaf Color	Surface Growth	Disease	Parasites	Insects	Overall Health Score	Notes
95/225	Comm	CONU	2.3	4	3	0	0	1	0	1	0	9	

ASSESSMENT KEY

Canopy Cover	1- Sparse to full die-back (0-25%); 2- Partial (25-50%); 3- Medium (50-75%); 4- Full (75-100%)
Bark Health	1- Poor to No bark (75-100%); 2- Fair (50-75%); 3-Good (25-50%); 4- Excellent (0-25%)
New Growth	1- Present; 0- Not present
Leaf Color	1- Normal; 0- Abnormal
Surface Growth	1- Not Present; 0- Present
Disease	1- Not Present, 0- Present
Parasites	1- Not Present; 0- Present
Insects	1- Not Present; 0- Present
Overall Tree Health	1-3 Poor Health/Dead; 4-7 Fair Health, 7-10 Good Health; 11-14 Excellent Health

TREE SPECIES REFERENCE KEY

	FERN
	Trail plant
	TOPI
	LOTI
	Ingathering

F.2 CANOPY COVER ASSESSMENT FIELD DATA COLLECTION FORMS

Canopy Cover Study: Assessment via Densiometer updated 9/1/2018

Project: LCC - 2017 Monitoring (Year 4) Date: 2017

Client / Owner: NID Surveyors: TT E JM

Reach ID: LCC 1 (NORTH SECTION) Reach Length: Total LCC - 7.10 miles

Reach Location:

Reach Start Coordinates: 39.259104 2872, -120.9106559492 } Total Reach

Reach End Coordiantes: 39.22505 2309, -120.9909484 24 }

Notes: LCC1 - Red Dog Rd to Banner Lava Cap Rd. NORTH to South

IN GPS Data. N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
lcc1-1	324	8	157	3	68	11	258	4
lcc1-2	340	4	167	8	50	13	249	
lcc1-3	334	4	167	10	166	16	21	2
lcc1-4	340	9	1616	5	716	16	246	11
lcc1-5	324	8	167	16	163	4	241	13
lcc1-6	33	6	208	8	123	12	274	8
lcc1-7	350	14	209	15	173	16	285	
lcc1-8	344	9	165	15	75	11	244	15
lcc1-9	353	14	168	11	82	15	260	17
lcc1-10	336	8	161	16	53	13	234	
lcc1-11	19	5	200	8	118	17	259	14
lcc1-12	340	11	172	16	84	16	242	14
lcc1-13	356	9	113	4	35	13	211	14
lcc1-14	292	7	114	11	29	13	146	
lcc1-15	248	5	93	11	350	8	169	16
lcc1-16	33	7	89	16	351	12	163	15
lcc1-17	241	9	90	11	348	16	161	11
lcc1-18	260	5	34	16	0	12	178	
lcc1-19	256	5	83	11	357	12	175	7
lcc1-20	240	7	352	7	342	15	144	17
lcc1-21	271	11	109	11	11	14	85	13
lcc1-22	270	6	115	5	13	14	193	3
lcc1-23	255	9	79	4	350	13	176	3
lcc1-24	316	11	143	10	5	14	228	9
lcc1-25	285	6	139	6	145	13	220	8
lcc1-26	287	4	105	5	27	8	187	7
lcc1-27	307	11	126	10	36	14	215	11
lcc1-28	311	10	129	15	40	16	225	15
lcc1-29	302	15	118	9	29	15	212	16
lcc1-30	249	12	105	12	19	14	201	15
lcc1-31	281	7	87	2	355	10	185	12
lcc1-32	249	5	70	7	341	13	151	13
lcc1-33	253	5	49	14	315	15	140	15
lcc1-34	221	12	39	13	316	13	136	13
lcc1-35	253	12	53	7	342	15	142	5
lcc1-36	240	10	93	17	14	11	181	12
lcc1-37	262	10	74	7	0	15	170	3
lcc1-38	268	7	88	9	6	16	196	11

N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
ICCI-39	305	7	121	12	39	8	208	15
ICCI-40	274	12	93	7	19	14	201	16
ICCI-41	242	2	49	8	329	13	140	4
ICCI-42	196	7	16	5	288	7	106	14
ICCI-43	145	10	10	10	284	15	134	16
ICCI-44	224	11	30	3	294	12	120	15
ICCI-45	207	5	12	4	291	12	132	16
ICCI-46	201	10	32	10	300	14	111	15
ICCI-47	181	7	0	7	270	11	90	17
ICCI-48	248	12	58	9	341	15	153	10
ICCI-49	202	17	104	15	340	17	159	16
ICCI-50	259	14	81	14	352	13	181	17
ICCI-51	251	15	61	15	241	17	157	17
ICCI-52	359	16	164	9	75	16	259	16
ICCI-53	314	16	150	12	107	15	239	14
ICCI-54	263	10	33	7	0	19	178	9
ICCI-55	233	2	69	11	324	16	154	15
ICCI-56	33	16	278	14	131	17	310	15
ICCI-57	34	14	214	12	125	15	309	17
ICCI-58	165	14	243	11	118	14	238	10
ICCI-59	102	10	282	11	221	16	15	16
ICCI-60	112	7	310	12	210	15	256	13
ICCI-61	131	14	315	13	228	17	40	16
ICCI-62	87	8	269	10	183	16	4	5
ICCI-63	37	15	224	13	120	14	320	9
ICCI-64	42	2	283	12	176	15	327	16
ICCI-65	69	14	270	8	135	14	318	10
ICCI-66	5	12	180	15	102	19	290	19
ICCI-67	347	10	172	10	91	10	273	14
ICCI-68	19	8	202	9	110	16	297	11
ICCI-69	13	9	209	12	112	15	294	10
ICCI-70	12	9	192	8	164	13	293	6
ICCI-71	354	10	182	11	90	16	279	10
ICCI-72	353	14	156	16	108	19	254	17
ICCI-73	321	11	142	12	104	19	252	9
ICCI-74	105	11	255	12	102	12	250	12
ICCI-75	94	12	250	13	102	16	243	16
ICCI-76	48	13	222	12	147	10	320	11
ICCI-77	59	17	222	11	143	16	303	17
ICCI-78	58	11	209	15	128	11	323	16
ICCI-79	0	16	178	11	94	15	280	14
ICCI-80	332	10	144	14	63	15	240	15
ICCI-81	330	12	155	10	104	13	249	?
ICCI-82	336	14	163	12	80	16	255	10
ICCI-83	342	11	149	10	113	17	241	3
ICCI-84	18	0	151	13	73	16	208	3
ICCI-85	309	11	130	13	41	17	220	10
ICCI-86	318	10	140	7	53	15	288	9

Canopy Cover Study: Assessment via Densiometer

updated 9/1/2018

Project: LCC 2017 Monitoring (year 4)
Client / Owner: NID
Reach ID: LCC1 (NORTH SECTION)
Reach Location:
Reach Start Coordinates:
Reach End Coordiantes:
Notes: walking downstream

Date: SEPT 19, 2017
Surveyors: M. Oats, S Carrahan
Reach Length:

GPS: N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
LCC1-87	342	7	185	15	96	12	273	12
LCC1-88	143	13	319	7	242	13	60	7
LCC1-89	129	11	308	13	219	14	39	13
LCC1-90	80	16	256	14	168	17	345	17
LCC1-91	40	11	217	16	130	13	311	8
LCC1-92	135	10	308	17	217	11	39	16
LCC1-93	125	16	300	16	212	14	57	17
LCC1-94	155	15	333	14	240	16	58	13
LCC1-95	134	15	295	13	220	13	39	15
LCC1-96	112	13	286	15	205	12	11	15
LCC1-97	100	14	286	12	200	17	5	17
LCC1-98	94	10	274	9	190	15	1	16
LCC1-99	75	12	251	14	170	16	343	12?
LCC1-100	52	13	221	15	147	15	322	16
LCC1-101	3	11	184	8	110	9	284	5
LCC1-102	8	11	205	12	115	10	286	12
LCC1-103	22	12	219	10	132	17	306	14
LCC1-104	9	17	206	16	99	16	272	17
LCC1-105	344	16	164	5	69	16	342	16
LCC1-106	31	2	203	3	120	1	285	1
LCC1-107	287	16	107	17	13	16	263	17
LCC1-108	318	1	139	13	53	16	218	14
LCC1-109	335	14	147	13	49	17	230	15
LCC1-110	349	9	170	8	100	17	260	5
LCC1-111	51	17	222	16	134	15	337	17
LCC1-112	54	14	228	16	141	16	320	15
LCC1-113	81	13	243	17	179	17	1	17
LCC1-114	80	12	284	13	193	16	5	15
LCC1-115	88	16	272	16	174	17	12	17
LCC1-116	85	13	289	14	189	17	5	16
LCC1-117	83	15	283	16	184	17	2	17
LCC1-118	80	15	269	14	176	17	9	6
LCC1-119	71	11	259	12	161	17	343	13
LCC1-120	74	16	288	12	140	16	356	14
LCC1-121	59	13	335	8	245	17	61	14
LCC1-122	79	17	263	14	161	17	9	16
LCC1-123	73	8	268	12	169	16	19	12
LCC1-124	99	6	310	10	214	17	20	15

N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
ICCI-125	113	13	285	15	190	16	357	13
ICCI-126	113	13	287	15	193	11	7	15
ICCI-127	79	16	241	16	146	15	349	4
ICCI-128	241	12	183	13	94	15	297	16
ICCI-129	38	13	219	14	125	17	311	16
ICCI-130	25	10	210	15	107	13	306	2
ICCI-131	35	15	210	13	121	16	312	16
ICCI-132	36	15	204	14	108	15	278	11
ICCI-133	318	14	197	17	104	16	241	5
ICCI-134	288	13	89	16	104	15	262	10
ICCI-135	337	11	117	13	88	17	254	16
ICCI-136	324	15	111	9	85	17	254	16
ICCI-137	333	12	143	12	52	9	226	14
ICCI-138	278	12	84	15	347	7	236	7
ICCI-139	340	14	156	13	51	7	251	15
ICCI-140	73	14	241	15	161	16	331	8
ICCI-141	102	17	236	17	146	14	340	9
ICCI-142	74	17	234	17	143	17	0	14
ICCI-143	85	14	252	11	170	11	339	9
ICCI-144	12	15	164	11	159	15	331	11
ICCI-145	49	13	205	13	114	16	340	10
ICCI-146	22	15	244	15	159	12	329	15
ICCI-147	34	14	210	15	131	14	300	15
ICCI-148	333	16	150	17	53	16	281	16
ICCI-149	341	16	187	16	97	17	300	12
ICCI-150	40	16	220	17	120	14	300	17
ICCI-151	29	17	205	17	130	14	315	17
ICCI-152	41	16	224	17	141	15	330	10
ICCI-153	87	8	248	6	167	10	350	15
ICCI-154	83	7	259	15	174	15	353	12
ICCI-155	82	9	247	12	166	12	346	12
ICCI-156	101	13	231	9	147	11	326	9
ICCI-157	110	10	300	9	213	13	310	17
ICCI-158	97	11	298	7	184	15	17	17
ICCI-159	99	8	276	9	188	13	12	14
ICCI-160	50	16	252	16	163	16	335	17
ICCI-161	54	15	244	10	148	15	325	9
ICCI-162	107	12	254	16	162	17	338	11
ICCI-163	75	16	200	13	175	14	349	17
ICCI-164	57	14	250	10	160	15	339	16
ICCI-165	355	14	181	15	100	15	277	17
ICCI-166	323	12	150	13	59	11	248	16
ICCI-167	99	9	281	15	197	15	23	11
ICCI-168	108	12	289	15	205	16	35	13
ICCI-169	19	15	205	14	109	14	283	15
ICCI-170	309	11	144	12	101	13	230	16
ICCI-171	306	14	135	16	41	15	217	17

Canopy Cover Study: Assessment via Densiometer

updated 9/1/2018

Project: NID Canopy Study
Client / Owner: NID
Reach ID: LCC - 7.10 miles
Reach Location: segment 2 (south portion of LCC)
Reach Start Coordinates: south portion LCC → 39.239576, -120.996737
Reach End Coordiantes: " " " → 39.224111, -120.990331
Notes: We began at mid point LCC and went south to end of rea
Points were taken every 100 feet

Date: Sept 18, 2017
Surveyors: M Oats, E Carnahan
Reach Length: 7.10 miles (total)

NAD 83 UTM data: N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
LCC2-1	290	16	102	13	18	18	205	17
LCC2-2	299	12	177	16	31	16	201	16
LCC2-3	300	12	113	14	33	15	194	16
LCC2-4	290	10	96	15	12	16	189	2
LCC2-5	190	16	7	11	77	14	105	16
LCC2-6	311	15	135	16	47	15	200	17
LCC2-7	329	17	161	16	65	14	252	13
LCC2-8	282	16	99	17	10	15	166	17
LCC2-9	212	16	32	14	326	13	126	14
LCC2-10	210	14	52	14	329	16	125	16
LCC2-11	8	14	191	14	104	15	287	15
LCC2-12	346	14	159	15	97	16	251	17
LCC2-13	321	15	141	15	50	14	259	16
LCC2-14	323	15	147	14	12	14	15	15
LCC2-15	334	10	152	15	56	14	248	16
LCC2-16	314	12	137	14	48	14	202	15
LCC2-17	342	15	155	15	59	15	258	16
LCC2-18	355	13	179	14	85	16	266	1
LCC2-19	14	13	180	12	102	16	290	11
LCC2-20	354	11	181	14	98	14	282	16
LCC2-21	325	16	168	15	72	15	259	16
LCC2-22	247	15	164	15	38	12	224	15
LCC2-23	25	13	98	14	13	12	188	16
LCC2-24	210	11	30	15	310	11	119	17
LCC2-25	141	16	10	14	274	16	85	15
LCC2-26	240	16	52	15	332	16	106	16
LCC2-27	260	11	115	16	3	15	195	17
LCC2-28	328	14	139	16	48	15	232	13
LCC2-29	300	16	108	17	24	16	210	17
LCC2-30	283	15	98	13	24	13	196	6
LCC2-31	284	15	99	15	14	15	196	10
LCC2-32	267	17	74	14	351	15	162	17
LCC2-33	265	17	77	17	356	16	162	17
LCC2-34	228	9	59	14	337	15	146	17
LCC2-35	230	11	43	12	324	16	123	16
LCC2-36	312	9	140	17	55	12	244	12
LCC2-37	351	16	146	19	79	12	261	17
LCC2-38	283	16	93	15	7	8	187	13

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
Icc2-39	243	13	103	10	340	12	163	17
Icc2-40	210	16	104	7	345	17	124	14
Icc2-41	21	14	184	15	117	15	291	13
Icc2-42	38	11	200	14	118	12	306	8
Icc2-43	358	4	180	7	91	16	271	11
Icc2-44	342	14	154	13	64	15	257	13
Icc2-45	33	14	152	17	105	12	234	17
Icc2-46	245	17	47	14	336	17	129	13
Icc2-47	230	16	35	10	315	12	145	15
Icc2-48	335	15	141	15	105	16	247	17
Icc2-49	356	17	172	17	80	17	254	15
Icc2-50	51	11	220	15	130	17	324	16
Icc2-51	57	13	252	16	102	16	311	17
Icc2-52	52	13	214	13	157	16	331	15
Icc2-53	61	14	266	15	148	16	352	14
Icc2-54	45	17	235	16	135	17	321	10
Icc2-55	39	14	220	13	132	17	314	16
Icc2-56	41	11	224	15	133	16	315	13
Icc2-57	17	15	200	16	101	16	297	17
Icc2-58	22	15	225	13	121	16	300	14
Icc2-59	31	16	216	14	92	13	309	16
Icc2-60	28	19	213	13	111	16	295	9
Icc2-61	1	16	218	16	115	16	305	12
Icc2-62	23	16	214	14	110	15	300	15
Icc2-63	18	16	216	17	116	13	304	13
Icc2-64	343	14	153	8	90	12	255	14
Icc2-65	313	14	140	13	60	11	233	15
Icc2-66	16	14	134	14	43	13	232	7
Icc2-67	244	12	108	15	356	14	151	12
Icc2-68	259	16	86	17	354	12	174	16
Icc2-69	275	17	98	11	13	16	201	17
Icc2-70	226	15	110	12	317	11	148	12
Icc2-71	351	12	158	16	353	17	208	17
Icc2-72	336	14	164	14	67	10	245	17
Icc2-73	343	10	182	17	74	16	261	17
Icc2-74	291	16	112	11	25	15	200	13
Icc2-75	260	13	110	14	4	17	183	8
Icc2-76	268	3	83	5	14	10	193	1
Icc2-77	15	10	187	11	175	8	305	14
Icc2-78	39	14	212	15	131	12	318	16
Icc2-79	45	13	222	15	134	15	327	8
Icc2-80	56	16	239	13	102	10	331	16
Icc2-81	64	14	229	14	145	12	321	12
Icc2-82	54	10	222	13	136	17	326	14
Icc2-83	35	16	211	15	127	13	310	13
Icc2-84	8	15	169	15	92	13	271	17
Icc2-85	16	14	188	13	105	16	291	15
Icc2-86	9	15	178	10	102	12	245	11

Canopy Cover Study: Assessment via Densiometer

updated 9/1/2018

Project _____ Date SEPT 18, 2017

Client / Owner _____ Surveyors M Oats, S. Carnahan

Reach ID _____ Reach Length _____

Reach Location Segment 2 (South portion) of LCC from Bannertang capture to treatment pond

Reach Start Coordinates _____

Reach End Coordiantes _____

Notes _____

IN GPS data N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
LCC2-87	357	10	168	8	85	16	270	0
LCC2-88	17	11	176	13	90	16	264	17
LCC2-89	10	15	202	15	122	16	304	17
LCC2-90	33	15	183	15	105	14	270	17
LCC2-91	350	15	166	14	83	15	249	16
LCC2-92	0	17	176	16	104	17	280	15
LCC2-93	352	12	151	1	73	14	233	5
LCC2-94	320	16	138	16	53	17	226	16
LCC2-95	305	8	110	7	27	11	205	17
LCC2-96	311	2	124	9	44	12	214	15
LCC2-97	336	15	150	17	61	17	243	9
LCC2-98	331	9	166	5	79	8	245	17
LCC2-99	351	6	159	2	69	13	264	0
LCC2-100	344	0	158	0	76	7	252	0
LCC2-101	344	0	165	0	76	7	252	0
LCC2-102	347	0	168	0	80	0	248	0

Canopy Cover Study: Assessment via Densiometer updated 9/1/2018

Project: LCC-2017 Monitoring (Year 4)
Date: SEPT 22, 2017
Client / Owner: NID
Surveyors: M. Oats, E Carnahan
Reach ID: UGVC
Reach Length: 0.50 miles
Reach Location: Banner Lavacap Rd.
Reach Start Coordinates: 39.23898195, -120.99830102718
Reach End Coordiantes: 39.23597992, -121.00528980
Notes: mostly conifer sp. along canal
at ugvc-18, switched to southside of canal

IN GPS DATA: N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
UGVC-1	81	13	262	15	165	16	342	14
UGVC-2	85	13	270	14	180	15	20	7
UGVC-3	95	13	276	16	180	14	4	7
UGVC-4	102	13	276	13	184	15	8	16
UGVC-5	100	12	277	14	188	16	10	15
UGVC-6	110	15	275	15	186	16	0	17
UGVC-7	72	15	250	11	165	12	350	7
UGVC-8	64	15	235	15	147	16	337	16
UGVC-9	33	13	217	15	125	11	320	16
UGVC-10	23	11	204	14	118	13	310	13
UGVC-11	32	11	208	13	115	10	305	9
UGVC-12	8	15	200	16	111	17	294	12
UGVC-13	10	6	210	15	115	15	285	14
UGVC-14	35	16	230	15	130	15	301	17
UGVC-15	54	17	239	7	144	17	308	11
UGVC-16	52	15	240	15	153	13	343	14
UGVC-17	36	5	220	9	127	10	301	8
UGVC-18	25	11	200	14	117	15	290	10
UGVC-19	0	15	192	11	100	16	288	13
UGVC-20	11	9	197	10	100	15	267	9
UGVC-21	0	14	194	14	100	17	272	10
UGVC-22	10	15	210	15	127	16	362	10
UGVC-23	23	15	213	13	110	12	297	14
UGVC-24	43	9	232	10	142	10	320	10
UGVC-25	81	11	246	13	173	14	354	12
UGVC-26	77	15	279	16	168	16	344	9
UGVC-27	133	16	310	17	229	17	25	15

Canopy Cover Study: Assessment via Densiometer *updated 9/1/2018*

Project: LCC- 2017 Monitoring (year 4) | Date: Sept 15, 2017
Client / Owner: NID | Surveyors: M. Oak, E. Carnahan
Reach ID: DS canal | Reach Length: 1.0 mile
Reach Location: began West → east
Reach Start Coordinates: 39.243120641 -121.01019 43603
Reach End Coordiantes: 39.24578 3455 -120.99216242605
Notes: *left bank, left hand side facing downstream* - true of all data collected this Reach was conducted walking upstream

IN GPS data: N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
DS_1	355°	10	181°	7	120°	13	312	11
DS_2	338°	12	150°	7	59°	10	244	11
DS_3	333°	9	149°	9	103°	12	253°	8
DS_4	344°	7	162°	8	76°	8	256	9
DS_5	350°	11	168°	8	73°	8	270°	11
DS_6	18°	4	183°	9	95°	12	274°	1
DS_7	62°	11	230°	15	133°	15	316°	16
DS_8	77°	8	241°	8	180°	8	7°	12
DS_9	98°	10	263°	8	167°	5	16°	13
DS_10	88°	13	262°	8	174°	9	354°	16
DS_11	70°	12	250°	10	165°	11	346°	10
DS_12	62°	13	241°	14	152°	14	347°	13
DS_13	90°	10	272	11	195°	14	13°	16
DS_14	103	9	280	9	200	7	23	17
DS_15	105	9	273	10	181	5	12	15
DS_16	95	14	275	7	172	11	3	11
DS_17	114	13	278	9	190	12	15	14
DS_18	140°	15	265	11	194	12	18	12
DS_19	118°	13	290°	15	200	16	25	16
DS_20	144°	12	303°	14	229	13	30	13
DS_21	162	14	343	16	241	15	82	17
DS_22	182	11	355	13	280	12	47	14
DS_23	200°	14	17	9	289	15	111	11
DS_24	332°	10	225	11	135	14	28	10
DS_25	94°	12	209	13	182	12	5	10
DS_26	101°	14	262	11	173	14	303	13
DS_27	28°	13	207	15	118	12	316	17
DS_28	30°	11	203	12	108	14	279	16
DS_29	356°	13	188	16	91	16	298	16
DS_30	21°	14	198	13	110	15	293	15
DS_31	9°	13	205	12	108	15	296	14
DS_32	30	10	222	14	132	14	308	14
DS_33	47	13	224	12	145	12	318	11
DS_34	69	12	254	12	163	10	344	13
DS_35	70	14	244	10	182	15	0	17
DS_36	118	13	293	13	204	12	34	15
DS_37	162	13	345	4	255	4	69	15
DS_38	19	11	290	11	182	13	1	11

N S E W

Data Point ID #	Upstream		Downstream		Left Bank		Right Bank	
	Direction	Total	Direction	Total	Direction	Total	Direction	Total
DS-39	360°	14	225	13	110	14	329	17
DS40	90°	8	245	12	154	11	313	15
DS_41	130°	12	272	12	180	12	8	16
DS_42	111°	13	301	13	214	13	255	14
DS_43	120°	13	300	17	214	15	412	14
DS_44	133	15	314	13	234	15	53	17
DS_45	144	15	338	15	250	14	70	16
DS_46	156	15	249	11	262	12	85	17
DS_47	169	14	258	15	270	11	84	16
DS_48	200	14	20	15	292	15	112	15
DS-49	357	7	212	8	314	8	125	14
DS-50	0	9	197	16	338	17	93	14
ds_51	57	10	235	15	266	16	58	16
ds_52	100	11	271	5	10	17	197	13
ds_53	30	4	232	7	338	2	125	10
ds_54	25	7	209	8	307	15	120	16
ds_55	34	5	196	4	276	7	88	14
ds_56	47	9	229	6	322	16	140	15
ds_57	96	6	268	10	8	11	202	15
ds_58	89	6	296	12	26	8	190	11
ds_59	78	5	279	6	254	16	182	14
ds_60	8	8	201	10	294	14	169	13
ds_61	24	13	211	8	314	14	131	12
ds_62	84	9	270	10	5	13	179	15
ds_63	105	5	261	12	245	16	160	14
ds_64	92	8	264	9	0	16	180	16
ds_105	80	10	266	9	359	16	172	17
ds_106	91	11	264	11	7	17	188	10
ds_67	79	9	303	11	19	8	134	8
ds_108	32	13	300	8	290	17	116	14
ds_109	109	9	247	12	324	12	149	14
ds_70	44	10	229	10	310	12	129	13
ds_71	91	10	254	8	10	16	183	13
ds_72	141	8	339	10	164	17	244	13
ds_73	46	9	338	9	79	16	228	10
ds_74	160	10	346	8	87	9	265	17
ds_75	33	13	250	9	216	10	120	12
ds-76	17	14	204	15	290	14	110	15
ds-77	80	12	260	15	339	17	166	13
ds-78	137	13	314	9	48	11	231	16
ds-79	48	9	226	10	324	9	140	14
ds-80	13	9	189	15	291	12	104	15
ds-81	348	9	149	16	256	12	76	9
ds-82	39	14	215	14	306	14	132	16
ds-83	106	11	278	13	8	16	195	12
ds-84	85	9	264	16	324	16	164	14
ds-85	76	10	250	8	349	12	146	13

F.3 POND STUDY FIELD DATA COLLECTION FORMS

Pond / Wetland General Assessment Datasheet updated 9/1/2017

Project LCC Date 05 SEPT 2017

Client / Owner NID Surveyors M. KENNEDY, E. MACNAMARA

Latitude 39.23571 Longitude -120.988615 Datum WGS 1984

Site ID Pond #1

Site Location Spring Street, private residence (upper Pond).

Site Description pond w/in upland forested/forested wetland. Separated from Pond #2 by road, however culvert connect the two ponds. (see additional land manager notes on reverse).

NWI Classification PUBFh

Area of Inundation Description ~~(boundaries)~~ inundation only within pond.

Water Depth Range (Feet) 1-6' (visual estimate)

Soil Map Unit Name / Source AFD - USDA/NCSS SSURGO map

Area of Soil Saturation Description Confined to inundated area (1)

Is site within current and/or historic range of CRLF? yes no

Are there any known records of CRLF within 1 mile of site? yes no

CRLF Habitat Assessment Remarks Little to; very little emergent veg/overhanging veg, poor water quality, yearly flushing/inconsistent water level, predatory species

Observed Vegetation *R-riparian, U-upland

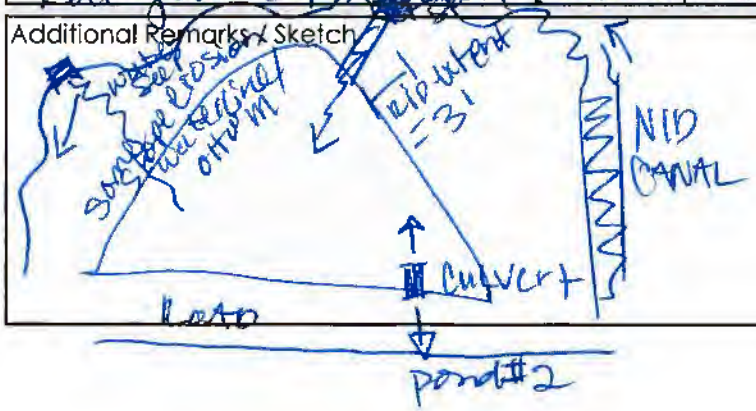
	Hydrophytic	Status
Calocedrus decurrens (R,U)*		
Escaped Cultivars (R,U).		
Madrone (R,U).		
Cutleaf blackberry (R,U)		
Himalayan Blackberry (R,U)		
Alder (R)		
various aquatics (aquatic)		
Sword-fern (R,U).		
honeysuckle		
Lathyrus (sp.)		

Observed Wildlife

	Status
Bullfrog (Tadpole).	
dragonfly (Damsel fly)	
Red bellied nuthatch	
Mosquito fish	
Stellar Jay	
Orange crowned warbler	
Spotted Towhee	
Hummingbird sp.	

water level (Con... on reverse)

Additional Remarks / Sketch



Vegetation (con...)

Solomons Seal. (u)
Black oak - (u)
thimbleberry (u).
Scotchbroom (u.)
typha (e) - one small patch
Bramble (upland).

CRLF Notes:

- Predatory species observed.
- Flesh - lack of aquatic species (i.e. veg) in comparison to pond #2.
- Poor water quality. (Cloudy)

Landowner / additional notes:

(1) Land Manager indicates where canal feeds pond, area of inundation is sub-surface and frequently exhibits water swaling.
- Down woody debris on north slope of pond.
- South slope of pond is void of vegetation, thus observation of potential increased erosion here.
- At overflow area, there is increased sediment.
- Receives into 2 two places from upland Canal. Flows seep yearly from Canal - however mgr. Says this is highly variable by NID control, and ponds are subject to these flow changes. When NID not controlling, specifically in winter during high rains, input is heavily viewed and less variable.

Pond / Wetland General Assessment Datasheet updated 9/1/2017

Project LCC - tree & pond monitoring. Date 05SEPT2017

Client / Owner NID Surveyors M. KENNEDY, E. CALNAHAN

Latitude 39.235182 Langitude -120.989522 Datum WGS 1984

Site ID Pond #2

Site Location Spring Street, private residence (Lower pond).

Site Description pond w/in upland forest. / emergent or scrp forested wetland. NID Canal resides upslope (NE). Pond surrounded by road on all sides
also see landowner Water (reverse).

NWI Classification PUBFh

Area of Inundation Description water line significantly lower (~5') to wetted area.

Water Depth Range (Feet) 0 - ≥5' (visual estimate).

Soil Map Unit Name / Source AgD / USDA/NCSS SSURGO map

Area of Soil Saturation Description Confined to pond inundation area.

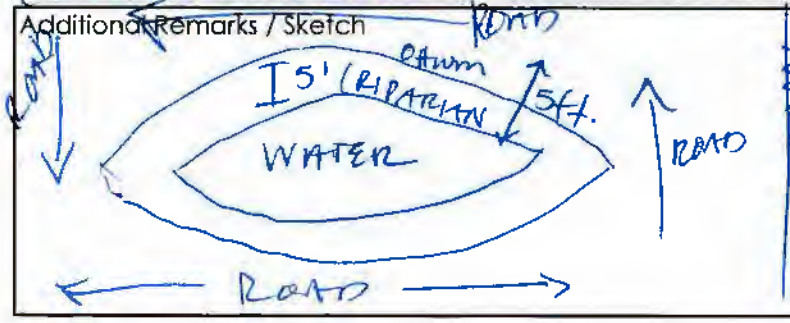
Is site within current and/or historic range of CRLF? yes no

Are there any known records of CRLF within 1 mile of site? yes no

CRLF Habitat Assessment Remarks TMA, emergent veg yes, little overhanging veg, annual overflow/flushing, large predatory species observed

Observed Vegetation	Hydrophytic	Status	Observed Wildlife	Status
*(R) Riparian, (*U) Upland.			Black phoebe	
Cutleaf blackberry (RU)			Brown Creeper	
Himalayan Blackberry (RU)			Lesser goldfinch	
Madrone (U)			Deer (skat only)	
honeysuckle (RU)			Turtle (slider?)	
Doug fir (U)			Pacific tree frog	
Calocedrus decurrens (RU)			Bullfrog (verbal ref.)	
sword fern (U)			Brown trout	
Black oak (U)			Butterfly (orange tips)	
(Continued on BACK)			(Continued on BACK)	

Additional Remarks / Sketch



GPS delineation take 5' above datum and encompasses wetland/riparian vegetation.

vegetation Con...

mountain maple (RM)
narrow leaf cattail. (R)
various aquatics spp. (ref. photos) (R)
escaped cultivar (various) (RM)
Dogwood (U)
Mullein (RM).
Juncus spp. (R)
periwinkle (UP).
Populus fremontii (R).
wild cucumber (up)
Carex sp. (non-native)
Synosaurus sp.
ponderosa pine (U.).
Duckweed (Aquatic).
Henbit.

wildlife (Con...)

Cricket

RED presented nuthatch.
Mosquito sp.

CRLF NOTES: Likely not CRLF habitat, overflow waters flush out pond. In addition, predatory aquatic species observed. Increased invasive wildlife & veg present. also decreases habitat viability. Not much overhanging vegetation.

Landowner/Additional Notes:

- Hydrophytic vegetation within basin appears parched/depleted H_2O. Land manager indicates this condition present just during this field season.
- Landowner indicates they put in new culvert on entrance road due to rust and increased overflows from pond.
- trout in pond getting through from canal and trapped in pond, until overflows rains, then are flushed out into upland/non-water source. (pisc entrapment).
- Land Manager indicates pond leaks, but culvert blocked until NRD cleared out approx. 3 weeks ago - influence of decreased pond level.
- Landowner using pond for irrigation. Stated this started 3 years ago. May have intermittent & minor).

Pond / Wetland General Assessment Datasheet updated 9/1/2017

Project LCC - tree & pond Monitoring Date 05 SEPT. 2017

Client / Owner NID Surveyors M. Kennedy, E. Carnahan

Latitude 39.240913 Longitude -121.020355 Datum WGS84

Site ID Pond #3

Site Location OFF Pittsburg Mine Road (upper pond).

Site Description pond confined by topography and veiling input from canal upslope. (see back for additional notes)

NWI Classification PUBK

Area of Inundation Description Confined to ottum

Water Depth Range (Feet) visual estimate 1-3'

Soil Map Unit Name / Source AgD - USDA/NCSS SSURGO map

Area of Soil Saturation Description goes up to ottum area, where spills over downslope, soils are also saturated.

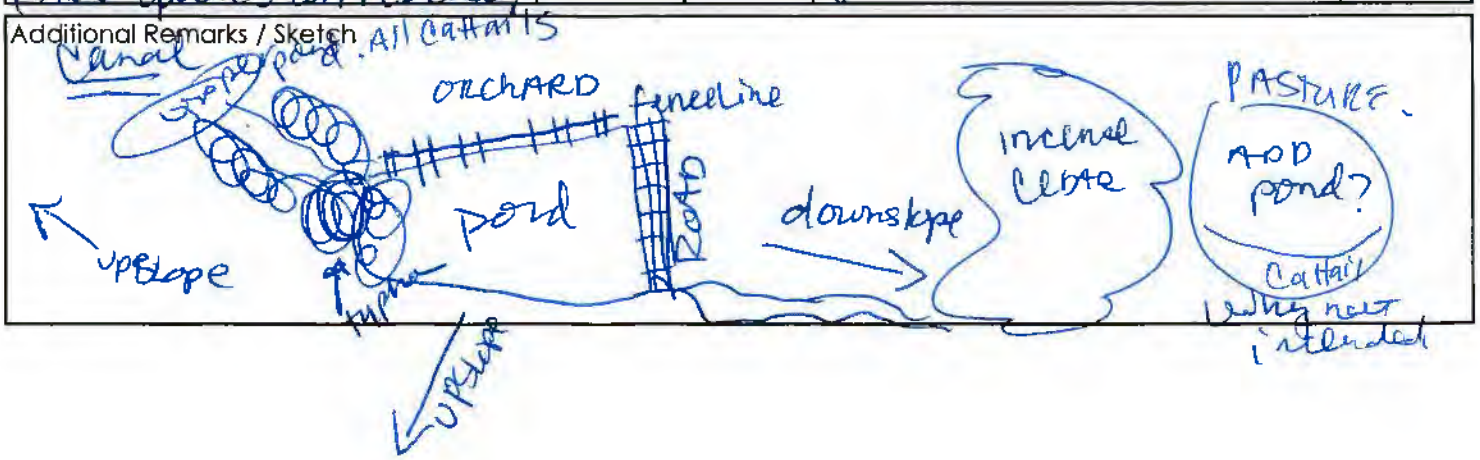
Is site within current and/or historic range of CRLF? yes no

Are there any known records of CRLF within 1 mile of site? yes no

CRLF Habitat Assessment Remarks Typha, emergent/overhanging veg observed only in small portion, pred. species observed there (bullfrog) otherwise no overhanging/emergent veg

Observed Vegetation (R=riparian, U=Upland) (A=Aquatic)	Hydrophytic	Status	Observed Wildlife	Status
Daucus Carota			TAD pole - Bullfrog.	
Brassica sp.			Squirrel	
Scotch broom.			Red tail hawk	
Juncus spp.			owl (feathers)	
Various aquatic (see note.)			frog.	
Typha (hybrid latifolia)			Black phoebe	
Cardaria draba			Anna's hummingbird	
Plantago lanceolata			Blank skimmer.	
(Add species on reverse)				

Additional Remarks / Sketch



Vegtation Con...

nutsedge.
Lathyrus.
Rumex
(Apple) orchard
Himalyan blackberry.
Artemisia.
ponderosa pine.
Black oak.
Sweet sicily?
Locust? Syringa (ref. photo)

Critt notes pond is fairly full for this time of year = likely flowing on north slope during Rainy season.
Predatory sp. (nn) present.

Additional notes

- hoof punch / cow tracks through and around pond.
- overflows creating spill to pond below (see sketch)
- water line on west side is encroaching into orchard & inundated fenceline. No access here, therefore this portion needs to be heads-up digitized.
- Riparian habitat moving up drainage toward canal.
- pipe (see photo).
- water quality = cloudy.
- East upslope no understory.
- irrigation tubing observed on east slope.