October 2024

Agency Resubmittal Draft

2024 NEVADA COUNTY HAZARD MITIGATION PLAN

Volume I—Basic Plan

NEVADA COUNTY CALIFORNIA | READY NEVADA COUNTY

TETRA TECH

NEVADA COUNTY CALIFORNIA | Office of Emergency Services

2024 Nevada County Hazard Mitigation Plan

Volume I—Basic Plan

Agency Resubmittal Draft
October 2024
#105s039542

PREPARED FOR

Nevada County Office of Emergency Services
950 Maidu Avenue, Suite 130
Nevada City, California 95959

PREPARED BY

Tetra Tech
1999 Harrison St., Ste. 500
Oakland, CA 94612
510-302-6300
tetratech.com

TETRA TECH

Executive Summary

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to minimize the loss of life, injury, and property damage that can result from a disaster. Communities, residents, and businesses across the United States have been faced with continually increasing costs associated with natural and human-caused hazards. Hazard mitigation is the first step in reducing risk and is the most effective way to reduce costs associated with hazards.

Nevada County has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County. Developed by the County and seven participating local jurisdictions (the Planning Partners), this HMP updates the 2017 Nevada County HMP. It includes countywide assessment of hazards, risk, and capabilities. The plan complies with federal and state hazard mitigation planning requirements to establish the Planning Partners' eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

The following are the jurisdictions in Nevada County that participated as Planning Partners:

- Nevada County
- Town of Truckee
- City of Grass Valley
- City of Nevada City
- Nevada Irrigation District
- Nevada County Consolidated Fire District
- Truckee Donner Public Utility District
- Washington County Water District

The Planning Process

Overall Approach

To support the planning process for this HMP, the Planning Partners accomplished the following:

- Developed a Steering Committee consisting of key stakeholders and a countywide Planning Partnership made up of the Steering Committee members, the Planning Partners, and other regional stakeholders
- Reviewed the 2017 Nevada County Local Hazard Mitigation Plan Update
- Involved a wide range of stakeholders and the public in the plan update process
- Identified hazards of concern to the County to be included in the update
- Profiled the hazards of concern
- Estimated the inventory at risk and potential losses associated with these hazards
- Reviewed and updated the mitigation goals and objectives

- Reviewed mitigation actions outlined in the 2017 HMP to determine progress
- Developed new mitigation actions to reduce the vulnerability of assets from hazards of concern
- Developed HMP maintenance procedures to be executed after obtaining approval of the plan from Cal OES and FEMA

Multiple Agency Support for Hazard Mitigation

Primary responsibility for hazard mitigation lies with local governments. Partners at the regional, state, and federal levels are available to assist local communities with their mitigation strategies. FEMA provides grants, tools, guidance, and training to support mitigation planning. In California, Cal OES is the lead agency providing hazard mitigation planning assistance to local jurisdictions.

The participating jurisdictions provided significant input into the preparation of this HMP, in particular the preparation of jurisdiction-specific annexes included in Volume II. They fully coordinated with and solicited participation from county and local governments, relevant organizations and groups, state and federal agencies, and the general public. This coordination ensured that stakeholders had established communication channels and relationships to support mitigation planning and mitigation actions included in the plan.

Under the project management of the Nevada County Office of Emergency Services, the Nevada County Hazard Mitigation Steering Committee provided oversight for the preparation of this plan. The Steering Committee included representatives from the following:

- Nevada County Office of Emergency Services
- Town of Truckee Office of Emergency Services
- FREED Center for Independent Living
- CAL FIRE
- Nevada Irrigation District
- Bear Yuba Land Trust
- Nevada County Consolidated Fire District
- Truckee Fire Protection District
- Washington County Water District Fire Department
- Yuba Watershed Institute
- South Yuba River Citizens League
- Coalition of Firewise Communities
- Nevada City, City Manager

Risk Assessment for Local Hazards of Concern

The Planning Partners evaluated each jurisdiction's vulnerability to each of 12 identified hazards of concern, based on past events, past and predicted future losses, and the expected probability of future occurrence. From these evaluations, hazards were ranked as high, medium, or low risk to each jurisdiction. The hazard rankings were used to focus and prioritize individual jurisdictional mitigation strategies. Summary overall hazard rankings for all of Nevada County are as follows:

- Avalanche—Low
- Dam Failure—Low
- Drought—Medium
- Earthquake—Low
- Extreme Cold—Low
- Extreme Heat—Medium
- Flood—Low
- Hazardous Materials Release—Low
- Landslide—Low
- Volcano—Low
- Wildfire—High
- Winter Storms—High

Capability Assessment and Plan Integration into Other Local Mechanisms

Effective mitigation is achieved when hazard awareness and risk management become integral parts of public activities and decision-making. Nevada County has many plans and programs that support hazard risk management. This HMP integrates, complements, and references those plans and programs to the extent practical in order for it to be a comprehensive resource for hazard mitigation.

The HMP includes a capability assessment to review relevant local mechanisms for each participating jurisdiction. This assessment identifies where each jurisdiction is currently able to implement hazard mitigation measures and where each would benefit from improved capabilities for such measures. The capability assessment provides a summary of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support hazard mitigation in the County. In the jurisdictional annexes, each participating jurisdiction identifies how it has integrated hazard risk management into its existing planning, regulatory and operational/administrative framework, and how it intends to continue to promote this integration.

Mitigation Strategy

Hazard Mitigation Plan Goals and Objectives

The HMP includes mitigation goals for reducing or avoiding long-term vulnerabilities to the identified hazards of concern. The planning process included a review and update of previous mitigation goals and objectives developed to guide the selection of mitigation actions. The goals and objectives were updated based on the updated risk assessment, discussions, research, and input from plan participants and stakeholders. The goal development process considered the goals expressed in the California State Hazard Mitigation Plan, as well as other relevant county and local planning documents.

Implementation of the 2017 Plan

The status of the mitigation projects identified in the 2017 HMP was reviewed for this HMP. Numerous projects and programs have been implemented that have reduced hazard vulnerability to assets in the planning area. Uncompleted projects have been revaluated, modified as necessary, and incorporated into this plan. The Planning Partners' annexes describe these mitigation activities in more detail, and plan maintenance procedures have been developed to encourage thorough integration with local decisions and processes and regular review of implementation progress.

2024 Mitigation Strategy

Based on the risk assessment and the review of previously identified mitigation actions, each participating jurisdiction established a new set of recommendations for ongoing mitigation under the 2024 HMP and assigned a priority for each action. Figure ES-1 summarizes the number and priority of mitigation actions for each jurisdiction.

Figure ES-1. Summary of Mitigation Actions for the 2024 HMP

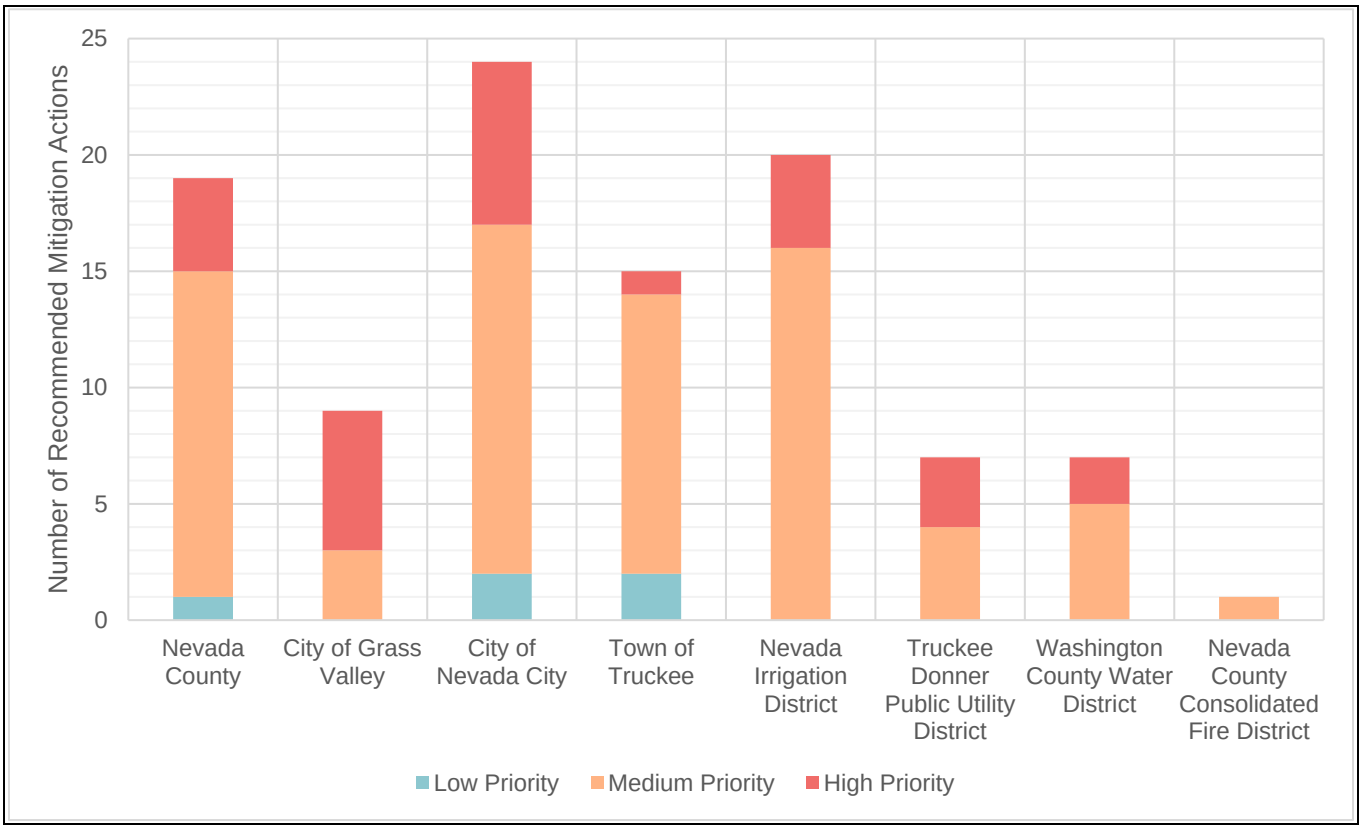


Table of Contents

Appendices

List of Tables

List of Figures

Part 1: The Planning Process and Planning Area

1. Introduction

Nevada County has developed a hazard mitigation plan (HMP) to reduce risks from disasters to the people, property, economy, and environment within the County. Developed by the County and seven participating local jurisdictions (the Planning Partners), this HMP updates the 2017 Nevada County HMP. The updated 2024 HMP (also referred to as "the plan") includes countywide analysis and assessment of hazards, risk, and capabilities.

1.1 Overview of Hazard Mitigation Planning

1.1.1 What Is Hazard Mitigation?

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk and effects that can result from hazards. The Federal Emergency Management Agency (FEMA) defines a hazard mitigation plan as the documentation of a state or local government's evaluation of natural hazards and strategies to mitigate them.

Effective mitigation planning helps people, organizations, and government agencies to better prepare for and respond when disasters occur. It also allows local governments to remain eligible for FEMA grant funding for mitigation projects that will reduce the impact of future disaster events. The long-term benefits of mitigation planning and implementation include the following:

- An increased understanding of hazards faced by local communities
- A more sustainable and disaster-resistant community
- Financial savings through partnerships that support planning and mitigation efforts
- Focused use of limited resources on hazards that have the biggest impact on the community
- Reduced long-term impacts on human health and structures
- Reduced costs associated with response and recovery efforts, including repairs

The **Federal Emergency Management Agency** (FEMA) estimates that for every dollar spent on damage prevention (mitigation), twice that amount is saved by not having to perform post-disaster repairs.

1.1.2 Regulatory Framework

In the early 1990s, a new federal policy regarding disasters began to evolve. Rather than simply reacting whenever disasters strike communities, the federal government began encouraging communities to assess their vulnerability to various hazards before disaster strikes, and then take actions to reduce or eliminate potential risks. The policy is based on the logic that a disaster-resistant community can rebound from a natural disaster with less loss of property or human injury, at much lower cost and, consequently, more quickly. Moreover, other costs associated with disasters are minimized, such as the time lost from productive activity by businesses and industries.

The federal Disaster Mitigation Act of 2000 (DMA 2000) encouraged states, tribes, and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the

Robert T. Stafford Disaster Relief and Emergency Assistance Act by revising the previous law's mitigation planning requirements. Under the revised requirements, communities are eligible for certain hazard-related federal funding only if they prepare, maintain, and regularly update a plan that identifies actions to mitigate hazards and establishes a strategy to implement those actions.

To be eligible for hazard mitigation assistance from the federal government, participating local jurisdictions must identify potential natural hazards that threaten the health, safety, and well-being of their residents and identify and prioritize actions to mitigate those hazards before disaster strikes. Federal approval of HMPs expires after five years, after which communities must update them to maintain funding eligibility.

One goal of the federal regulations is to facilitate cooperation between state and local authorities, prompting them to work together. This enhanced planning process enables local and state governments to better articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects.

Regulations implementing the intent and requirements of DMA 2000 are included in Title 44 of the Code of Federal Regulations, Section 201 (44 CFR 201). In California, responsibility for fulfilling the requirements of 44 CFR 201 and administering the FEMA Hazard Mitigation Program has been delegated to the California Governor's Office of Emergency Services (Cal OES). Table 1-1 summarizes the 44 CFR 201 requirements and where each is addressed in this HMP for the Nevada County Planning Partners.

1.1.3 Specialized Terms and Concepts

Like any technical field, hazard mitigation has developed over the years its own set of terms and concepts with particular meanings within the hazard mitigation practice. A full glossary and list of acronyms is provided in Appendix E. The list below provides a quick reference for specialized terms whose use is especially prominent in this hazard mitigation plan:

- **Adaptive capacity—**the ability of a human or natural system to adjust to climate change by moderating potential damage, taking advantage of opportunities, or coping with the consequences (U.S. EPA 2023a)
- **Asset—**anything that is important to the character and function of a community (e.g., people, structures, community lifelines, the economy, and natural, historic, and cultural resources) (FEMA 2023b)
- **Capability assessment—**an evaluation of the authorities, policies, programs, funding and resources a participant has to accomplish hazard mitigation (FEMA 2023b)
- **Cascading impact—**the chain of secondary consequences that follow a primary event (such as heavy rainfall, seismic activity, or rapid snowmelt); cascading impacts can be modest (less than the primary event) or substantial (National Academies of Sciences, Engineering, and Medicine 2022)
- **Community lifelines—**the most fundamental services in a community that, when stabilized, enable all other aspects of society to function (FEMA 2023b)

TABLE 1-1. FEMA LOCAL MITIGATION PLAN REVIEW CROSSWALK

Plan Criteria	Primary Location in Plan
Prerequisites	
Adoption by the Local Governing Body: §201.6(c)(5)	Section 2.6; Appendix A
Planning Process	
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	Chapter 2
Risk Assessment	
Identifying Hazards: §201.6(c)(2)(i)	Chapter 5
Profiling Hazards: §201.6(c)(2)(i)	Chapters 6 – 17
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Chapter 4
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Sections 3.8, 0
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Sections X.2 in Chapters 6 – 17
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Section 3.8.2; Sections X.3.1 in Chapters 6 – 17; Volume II Annexes
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Section 20.2; Volume II Annexes
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Section 20.3; Volume II Annexes
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Section 20.3; Volume II Annexes
Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	Section 20.3; Volume II Annexes
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Section 21.2
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Section 21.2.2; Volume II Annexes
Continued Public Involvement: §201.6(c)(4)(iii)	Section 21.2.6

- **Extent—**the range of anticipated intensities of the identified hazards within a community, most commonly expressed using various scientific scales (FEMA 2022c)
- **Hazard profile—**a description of a hazard's location, extent, previous occurrences and probability of future events within a community (FEMA 2023b)
- **Hazard ranking—**the process of identifying the hazards that pose the greatest risk to a community, based on how likely the hazard is to occur, the potential consequences if the hazard does occur, and other relevant local factors
- **Impact—**the consequences or effects of a hazard on a community's assets identified in the vulnerability assessment. (FEMA 2023b)
- **Integration—**the inclusion of hazard mitigation principles, vulnerability information and mitigation actions into other existing community planning programs to leverage activities that have co-benefits, reduce risk, and increase resilience (FEMA 2022c)

- **Mitigation action—**measures, projects, plans or activities to reduce the current and future vulnerabilities identified in the risk assessment (FEMA 2023b)
- **Mitigation strategy—** the long-term blueprint for reducing the potential hazard-related losses identified in the risk assessment; the strategy consists of mitigation goals, mitigation actions, and a plan for implementing the actions (FEMA 2023b)
- **Natural hazard—**a source of harm or difficulty created by a meteorological, environmental or geological event (FEMA 2023b)
- **Plan maintenance—**monitoring and updating a hazard mitigation plan as warranted by changing conditions, availability of new information, and progress on the proposed mitigation actions (FEMA 2023b)
- **Planning process—**the procedures used to develop a hazard mitigation plan with broad acceptance across the community
- **Risk—**the potential for damage or loss when natural hazards interact with people or assets (FEMA 2023b)
- **Risk assessment—**a data-driven analysis to find where a local jurisdiction is vulnerable to hazards (FEMA 2023b)
- **Social vulnerability—**the potential for loss within an individual or social group, as affected by traits that influence the individual's or group's resilience, which is their ability to prepare, respond, cope or recover from an event (FEMA 2023b)
- **Stakeholder—**individuals or groups that a mitigation action or policy affects, including businesses, private organizations and residents (FEMA 2023b)
- **Vulnerability—**a description of which assets within locations identified to be hazard prone are at risk from the effects of the hazard (FEMA 2023b)

1.2 History of Hazard Mitigation Planning in Nevada County

1.2.1 Previous Nevada County HMPs

Nevada County prepared and adopted its first hazard mitigation plan in 2006. The plan has been regularly updated since then, with updates adopted in 2011 and 2017. The most recent Nevada County HMP update identified the following as the greatest hazards of concern in Nevada County:

- Agricultural hazards
- Avalanche
- Climate change
- Dam failure
- Drought and water shortage
- Earthquake
- Flood
- Hazardous materials transport
- Landslides and debris flows
- Levee failure
- Severe weather
- Subsidence
- Volcano
- Wildfire

The 2017 plan included 66 mitigation action items. Three special purpose districts and three municipalities participated in the planning process in cooperation with the County in order to draft these mitigation actions. The participating partners integrated the hazard analyses completed for the 2017 planning process into the following other planning initiatives:

- Various emergency operation plan updates, including the Town of Truckee's 2024 update
- Updated Safety Elements for various general plans, including the 2023 Town of Truckee general plan
- The City of Grass Valley's 2022 READY Nevada County Extreme Climate Event Mobility and Adaptation Plan
- The County's Community Wildfire Protection Plan
- Review of zoning codes and plan developments
- The Nevada Irrigation District's 2020 Urban Water Management Plan (UWMP) (the District consulted the County HMP and was required to submit a copy of it as part of the UWMP submittal process to the California Department of Water Resources)

Truckee Donner Public Utility District and Washington County Water District did not incorporate any information from the previous HMP into local planning mechanisms.

1.2.2 Key Changes in the Current Update

The following are the most significant changes between the 2017 County HMP and the 2024 update:

- The Steering Committee evaluated the 2017 Nevada County HMP hazards of concern and made the following changes:
  - Elimination of the agricultural hazard and incorporation of this hazard as a cascading impact in applicable hazard profiles
  - Elimination of the climate change hazard and incorporation of this effect in the probability and analysis of future conditions in each hazard profile
  - Renaming of drought and water shortage to drought
  - Inclusion of extreme cold as a new hazard
  - Inclusion of extreme heat as a new hazard
  - Renaming of landslide and debris flows to landslide
  - Elimination of the levee failure hazard and incorporation of this hazard into the dam failure and flood hazards
  - Renaming severe weather to winter storm to focus on the specific events that result in hazardous conditions
  - Elimination of the subsidence hazard and incorporation of this hazard as a cascading impact of drought and earthquake.
- Mitigation actions were enhanced to include more detailed information to support implementation.
- The structure of the HMP was reorganized to meet new planning requirements and improve readability.

1.3 Plan Organization

The 2024 Nevada County HMP update provides a detailed review and analysis of each hazard of concern, resources, and relevant statistical information for the Planning Partners. The plan is organized into two volumes: Volume I includes all information that applies to the entire planning area (Nevada County); and Volume II includes specific information for each participating jurisdiction.

Volume I is a resource for ongoing mitigation analysis. It includes a description of the County and its jurisdictions as well as information on mitigation planning and how the risk assessment and capability assessment were performed. Volume I of the plan includes the following chapters:

- Part 1—The Planning Process and Planning Area
  - Chapter 1, Introduction
  - Chapter 2, Planning Process—A description of the plan development process, committee and stakeholder roles and activities, and how the plan will be incorporated into existing programs; includes information regarding the adoption of the plan by each participating jurisdiction
  - Chapter 3, County Profile—An overview of Nevada County, including general information and physical conditions, land use patterns and trends, population and demographics, economy, general building stock, community lifelines, and natural, historic, and cultural resources
- Part 2—Risk Assessment
  - Chapter 4, Methodology—Description of the methodology used to assess hazard risk and the status of local data
  - Chapter 5, Hazards of Concern Identification—Documentation of the process of identifying the natural hazards of concern for further profiling and evaluation
  - Chapters 6 – 17, Hazard profiles and findings of the risk assessment—Estimates of the impact of hazard events on life, safety, and health; general building stock; critical facilities; the economy, and natural, historic, and cultural resources
  - Chapter 18, Hazard Ranking—Description and summary of the hazard ranking process
- Part 3—Capability Assessment
  - Chapter 19, Capability Assessment—A summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, local) that support hazard mitigation within the County
- Part 4, Mitigation Strategy
  - Chapter 20, Mitigation Strategy—Information regarding the mitigation goals and objectives identified by the Steering Committee in response to priority hazards of concern, and the process by which County and local mitigation strategies have been developed or updated
- Part 5—Plan Maintenance
  - Chapter 21, Plan Maintenance Procedures—A system to continue to monitor, evaluate, maintain, and update the plan

Volume II consists of annexes for each participating jurisdiction. Each annex summarizes the jurisdiction's planning, regulatory, and fiscal capabilities; evaluates vulnerabilities to hazards; describes the status of past mitigation actions; and provides a specific mitigation strategy. The annexes provide each jurisdiction with an expedient resource for implementing mitigation projects and maximizing future grant opportunities.

Appendices provide additional detail about general information discussed in the HMP.

2. Planning Process

This chapter describes the planning process used to update the Nevada County HMP, including how it was prepared, who was involved in the process, and how the public was involved. The planning approach aimed to achieve the following results:

- The plan will be multi-jurisdictional, including all municipalities within the County and four special districts. Nevada County invited all jurisdictions in the County to join in the planning process. To date, all four local municipal governments in the County (the Planning Partnership) have participated in the 2024 plan update process:
  - City of Grass Valley
  - City of Nevada City
  - Nevada County
  - Nevada County Consolidated Fire District
  - Nevada Irrigation District
  - Town of Truckee
  - Truckee/Donner Public Utility District
  - Washington County Water District
- The format of this plan is such that other entities can easily join at a later date as part of the regulatory 5-year plan update process.
- The plan considers all natural hazards that pose a risk to the area, as required by 44 CFR 201. Non-natural hazards that pose significant risk were considered as well.
- The plan was developed following FEMA regulations and prevailing FEMA and state guidance. This ensures that all the requirements are met and supports plan review.

Nevada County applied for and was awarded a multi-jurisdictional planning grant under the Hazard Mitigation Grant Program (HMGP), which has supported the development of this HMP. Grant administration was the responsibility of the Nevada County Office of Emergency Services (OES).

2.1 General Mitigation Planning Approach

FEMA provides hazard mitigation planning support to local communities through guidance, resources, and plan reviews. This hazard mitigation plan was prepared in accordance with the following regulations and guidance:

- FEMA Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002)
- FEMA How-To Guide for Using Hazus for Risk Assessment FEMA Document No. 433, February 2004.
- FEMA Local Mitigation Plan Review Guide, October 1, 2011.
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013.
- FEMA Integrating Hazard Mitigation into Local Planning, March 1, 2013.
- FEMA Plan Integration: Linking Local Planning Efforts, July 2015.

- FEMA Local Mitigation Planning Policy Guide, April 19, 2022.
- FEMA Local Mitigation Planning Handbook, May 2023.
- DMA 2000 (Public Law 106-390, October 30, 2000).
- 44 CFR 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004, Interim Final Rules).
- Cal OES Local Hazard Mitigation Planning Fact Sheet, 2023
- Cal OES California State Hazard Mitigation Plan, 2023

2.2 Organization of Planning Process

2.2.1 Planning Process Participants

Project Management and Planning Consultant

Project management was the responsibility of the Nevada County Office of Emergency Services (OES). A contract planning consultant (Tetra Tech) was tasked with the following:

- Assisting with the organization of a Steering Committee and the Planning Partnership
- Assisting with the development and implementation of a public and stakeholder outreach program
- Data collection
- Facilitation and attendance at meetings (Steering Committee, municipal, stakeholder, public and other)
- Review and update of the hazards of concern, and hazard profiling and risk assessment
- Assistance with the review and update of mitigation planning goals and objectives
- Assistance with the review of past mitigation strategy progress
- Assistance with the screening of mitigation actions and the identification of appropriate actions
- Assistance with the prioritization of mitigation actions
- Authoring of the draft and final plan documents

Planning Partnership

In July 2022, the County Office of Emergency Services (OES) contacted all municipalities and special districts in the county by email to notify them of the pending planning process and invite them to formally participate. Jurisdictions were asked to formally notify the County OES by email of their intent to participate via a letter of intent and to identify planning points of contact to facilitate their participation and represent the interests of their communities. All participating jurisdictions, including the County, are recognized as Planning Partners and belong to the Planning Partnership for this HMP. The Planning Partnership was charged with the following:

- Review of existing Nevada County Hazard Mitigation Plan
- Identification of local hazards, risk assessment, and vulnerability analysis
- Participation in the formulation of mitigation goals and actions

- Participation in community engagement and public outreach in the development of the Plan update
- Timely response to requests for information by the coordinating agency and consultants, and adherence to established deadlines
- Formal adoption of the Hazard Mitigation Plan update by the Planning Partner jurisdiction's governing body
- Tracking and monthly submission of personnel hours spent on the hazard mitigation planning effort

Table 2-1 shows the current members of the Planning Partnership as of the time of publication of this plan update.

TABLE 2-1. NEVADA COUNTY HAZARD MITIGATION PLANNING PARTNERSHIP MEMBERS

Jurisdiction	Primary Point of Contact	Title	Alternate Point of Contact	Title
Nevada County	Paul Cummings	OES Program Manager	—	—
City of Grass Valley	Mark Buttron	Fire Chief	Amy Wolfson	City Planner
Nevada City	Sean Grayson	City Manager	Evan McLenithan	Community Risk Reduction and Outreach Officer
Town of Truckee	Robert Womack[a]	Emergency Services Manager	James Blattler[b]	Emergency Services Coordinator
Nevada Irrigation District	Greg Jones	Assistant General Manager	Keane S. Sommers	Director of Power Systems
Truckee/Donner Public Utility District	Steven Poncelet	PIO & Strategic Affairs Director	—	—
Nevada County Consolidated Fire District	Jason Robitaille	Fire Chief	Nicole Long	Administrative Services Manager
Washington County Water District	Mike Stewart	Fire Chief	Tina Jackson	Manager

a. retired July 2024
b. became primary point of contact as of July 2024

The various jurisdictions in Nevada County have differing levels of capabilities and resources available to apply to the plan update process, as well as differing levels of vulnerability to and impacts from the natural hazards being considered in this plan. It was Nevada County's intent to encourage participation by all jurisdictions, and to accommodate their specific needs and limitations while still meeting the intent and purpose of plan update participation. Such accommodations have included establishing a Steering

Committee, engaging a contract consultant to assume certain elements of the plan update process on behalf of the jurisdictions, and providing alternative mechanisms for planning participation.

Ultimately, jurisdictional participation is evidenced by a completed annex of the HMP, wherein jurisdictions individually identify their planning points of contact, evaluate their risk from the hazards of concern, identify their capabilities to effect mitigation in their community, identify and prioritize a suite of actions to mitigate their hazard risk, and adopt the updated plan via resolution. Annexes are included in Volume II of this HMP.

It is noted that all municipalities in the County actively participate in the National Flood Insurance Program and have a designated NFIP floodplain administrator. All floodplain administrators have been informed of the planning process and asked to review the plan documents and provide direct input to the plan update. Local floodplain administrators are identified as part of each jurisdiction's hazard mitigation planning team (if the jurisdiction participates in the NFIP), as presented in the jurisdictional annexes in Volume II.

After completion of the plan, implementation and ongoing maintenance will become a function of the Planning Partnership as described in Chapter 21 (Plan Maintenance). The Planning Partnership will be responsible for reviewing the draft plan and soliciting public comment as part of an annual review and as part of the five-year mitigation plan updates.

Communication with the Planning Partners was through emails, telephone calls, and in-person meetings.

Planning Team

Nevada County OES selected a Planning Team that typically met biweekly to navigate and provide direction to the planning process and overall project. These meetings included Tetra Tech project staff and the following staff from Nevada County and the Town of Truckee:

- Nevada County Office of Emergency Services—Paul Cummings, OES Program Manager
- Town of Truckee—Robert Womack, Emergency Services Manager (2023 – 2024)
- Town of Truckee—James Blattler, Emergency Services Manager (2024)

Communication was through email, telephone calls, and in-person meetings.

Steering Committee

Nevada County developed a Steering Committee to provide guidance and direction to the HMP update effort, and to ensure that the resulting document will be embraced by local government leaders as well as all who live and work within the planning area. Steering Committee members were charged with the following:

- Providing guidance and oversight of the planning process on behalf of the general planning partnership
- Attending and participating in Steering Committee meetings
- Assisting with the development and completion of certain planning elements, including:

  - Reviewing and updating the hazards of concern
  - Developing a public and stakeholder outreach program
  - Ensuring that the data and information used in the plan update process is the best available
  - Reviewing and updating the hazard mitigation goals
  - Identifying and screening appropriate mitigation strategies and activities
- Reviewing and commenting on plan documents prior to submission to Cal OES and FEMA.

The Steering Committee provided guidance, leadership, and oversight of the planning process and acted as the point of contact for all participating jurisdictions and various interest groups in the planning area. Table 2-2 lists the members of the Steering Committee.

TABLE 2-2. NEVADA COUNTY HAZARD MITIGATION STEERING COMMITTEE MEMBERS

Affiliation	Name	Title
Nevada County Office of Emergency Services	Paul Cummings	OES Program Manager
Town of Truckee	Robert Womack	Emergency Services Manager
City of Grass Valley	Mark Buttron	Fire Chief
City of Grass Valley	Amy Wolfson	City Planner
City of Nevada City	Sean Greyson	City Manager
Nevada County Consolidated Fire District	Jason Robitaille	Fire Chief
Washington County Water District	Mike Stewart	Fire Chief
Truckee/Donner Public Utility District	Steven Poncelet	PIO & Strategic Affairs Director
Nevada Irrigation District	Greg Jones	Assistant General Manager
Truckee Fire Protection District	Kevin McKechnie	Fire Chief
South Yuba River Citizens League[a]	Aaron Zettler-Mann	Executive Director
Yuba Watershed Institute[a]	Chris Friedel	Executive Director
Nevada County Office of Emergency Services	Ricky Martinez	Defensible Space Supervisor
Bear Yuba Land Trust[a]	Erin Tarr	Executive Director
Coalition of Firewise Communities[a]	Bob Long	Steering Committee Member
CAL FIRE	Landon Haack	Fire Chief

a. Interaction with socially vulnerable populations and/or groups

Communication with the Steering Committee was primarily through emails supplemented by telephone calls and in-person meetings.

2.2.2 Planning Activities

Members of the Planning Partnership (individually and as a whole), as well as key stakeholders, met and communicated as needed to share information. This included workshops to identify hazards, assess risks, update inventories of critical facilities, and assist in updating mitigation goals and

strategies. All members of the Planning Partnership had the opportunity to review the draft plan, supported interaction with other stakeholders, and assisted with public involvement efforts. These activities provided continuity through the process to ensure that natural hazard vulnerability information and appropriate mitigation strategies were incorporated.

Table 2-3 summarizes meetings and other planning activities conducted during the development of the plan. It also identifies which 44 CFR 201 requirements each activity satisfies. Documentation of meetings (agendas, sign-in sheets, minutes, etc.) may be found in Appendix B. Table 2-3 identifies only formal meetings and milestone events in the plan update process. In addition to these meetings, there was a great deal of communication between Planning Partnership members and the consultant through individual local meetings, phone, and email.

TABLE 2-3. SUMMARY OF MITIGATION PLANNING ACTIVITIES / EFFORTS

Date	44 CFR 201 Requirement	Description of Activity	Participants
July 2023	2	Jurisdictions invited by email to participate in the planning process.	18 agencies invited
August 23, 2023	2, 3c	GIS data collection process kickoff	Nevada Co. OES & Tetra Tech
August 28, 2023	2	HMP Project Kickoff Meeting; Discuss planning process, requirements, benefits of hazard mitigation	17
October 18, 2023	-	Core Planning Team Meeting #1; Project status meeting to discuss action items	6 (Nevada Co. OES, Truckee OES & Tetra Tech)
October 31, 2023	-	Core Planning Team Meeting #2; Project status meeting to discuss action items	5 (Nevada Co. OES, Truckee OES & Tetra Tech)
November 14, 2023	-	Core Planning Team Meeting #3; Project status meeting to discuss action items	6 (Nevada Co. OES, Truckee OES & Tetra Tech)
November 15, 2023	1b, 2, 3a, 3b, 3c, 4a	Planning Partnership Kickoff Meeting: Complete overview of planning process, plan participant expectations, review of hazards and hazards of concern identification, discussion of data needs and data collection process explaining all provided worksheets, discussion of public and stakeholder outreach efforts	County and municipal representatives and stakeholders.

Date	44 CFR 201 Requirement	Description of Activity	Participants
November 21, 2023	1b, 2, 3a, 3b, 3c, 4a, 5c	Steering Committee Meeting #1; Review project schedule; review local jurisdiction participation, discuss Planning Partnership Kick Off meeting and local data collection; review and discuss sources and availability of County and regional data; discuss public and stakeholder outreach efforts.	16
December 1, 2023	-	Core Planning Team Meeting #4; Project status meeting to discuss action items	6 (Nevada Co. OES, Truckee OES & Tetra Tech)
December 14, 2023	-	Core Planning Team Meeting #5; Project status meeting to discuss action items	5 (Nevada Co. OES, Truckee OES & Tetra Tech)
January 9, 2024	-	Core Planning Team Meeting #6; Project status meeting to discuss action items	4 (Nevada Co. OES, Truckee OES & Tetra Tech)
January 23, 2024	-	Core Planning Team Meeting #7; Project status meeting to discuss action items	4 (Nevada Co. OES, Truckee OES & Tetra Tech)
February 20, 2024	-	Core Planning Team Meeting #8; Project status meeting to discuss action items	4 (Nevada Co. OES, Truckee OES & Tetra Tech)
February 22, 2024	-	Steering Committee Meeting #2; Develop goals and objectives, discuss hazards of concern	18
March 4, 2024	1b	Public Survey Links Released to the Public	Planning Team, Tetra Tech
March 19, 2024	-	Core Planning Team Meeting #9; Project status meeting to discuss action items	3 (Nevada Co. OES, Truckee OES & Tetra Tech)
April 2, 2024	-	Core Planning Team Meeting #10; Project status meeting to discuss action items	3 (Nevada Co. OES, Truckee OES & Tetra Tech)
June 10, 2024	1b	Neighboring community and stakeholder survey distributed	Stakeholders
June 11, 2024		Core Planning Team Meeting #11	6 (Nevada Co. OES & Tetra Tech)
June 12, 2024	1b	Outreach and data request sent to owners and operators of high hazard potential dams	Nevada Co. OES, Truckee OES & Tetra Tech
June 25, 2024		Core Planning Team Meeting #12	Nevada Co. OES, Truckee OES & Tetra Tech

Date	44 CFR 201 Requirement	Description of Activity	Participants
July 15, 2024		Steering Committee communication reviewing progress and correction on labeling of hazards	16
July 30, 2024		Core Planning Team Meeting #13	Nevada Co. OES, Truckee OES & Tetra Tech
August 12, 2024	1b, 2, 3, 4, 5	Steering Committee communication-Plan Maintenance, Draft Plan Review	Steering Committee, Contract Consultant
August 13, 2024	2	Draft Plan posted to public project website	Public and Stakeholders
August 28, 2024	1b, 2	Public and stakeholder comments to Draft Plan received and incorporated into Final Plan.	Public and Stakeholders
August 30, 2024	All requirements	Final plan submitted to Cal OES and FEMA Region 9	Nevada Co. OES & Tetra Tech
Upon plan approval by FEMA	1a	Plan adoption by resolution by the governing bodies of all participating jurisdictions	All plan participants

Numbers in column 2 identify specific federal requirements, as follows:
1a – Prerequisite – Adoption by the Local Governing Body
1b – Public Participation
2 – Planning Process – Documentation of the Planning Process
3a – Risk Assessment – Identifying Hazards
3b – Risk Assessment – Profiling Hazard Events
3c – Risk Assessment – Assessing Vulnerability: Identifying Assets
3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses
3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends
4a – Mitigation Strategy – Local Hazard Mitigation Goals
4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures
4c – Mitigation Strategy – Implementation of Mitigation Measures
5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan
5b – Plan Maintenance Procedures – Implementation through Existing Programs
5c – Plan Maintenance Procedures – Continued Public Involvement

2.3 Stakeholder Outreach and Involvement

The 2024 Nevada County HMP update was written using the best available information obtained from a wide variety of sources. Throughout the HMP update process, a concerted effort was made to gather information from municipal and regional agencies and staff as well as stakeholders, federal and state agencies, and the residents of the County. A Steering Committee solicited information from local agencies and individuals with specific knowledge of certain natural hazards and past historical events. In addition, the Steering Committee and Planning Partnership took into consideration planning and zoning codes, ordinances, and recent land use planning decisions.

This section details the outreach to and involvement of the agencies and organizations that have a stake in managing hazard risk and mitigation, commonly referred to as stakeholders. Contact with these agencies was primarily through email exchanges.

Diligent efforts were made to ensure broad regional, county, and local representation in this planning process. A comprehensive list of stakeholders was developed with the support of the Steering Committee and each Planning Partner. Stakeholder outreach was performed early and throughout the planning process, including mass media notification efforts. Identified stakeholders were invited to attend the Planning Partnership risk assessment meeting, and key stakeholders were requested to participate on the Steering Committee or the Planning Partnership. The ability of the Steering Committee and Planning Partnership to reach out to a broader list of stakeholders than individual Planning Partners could do on their own is one of the key benefits of multi-jurisdictional hazard mitigation planning.

The following sections describe how the stakeholders who were invited by email to participate in the development of this plan contributed to the planning process. Information and input provided by these stakeholders has been included throughout this plan. Many stakeholders not listed here also followed or contributed to the planning process through outreach efforts by individual Planning Partners.

2.3.1 Federal and State Agencies

The federal and state agencies listed in Table 2-4 were contacted during the planning process. The table describes how each participated.

TABLE 2-4. PARTICIPATION OF FEDERAL AND STATE AGENCIES

Agency	Participation
FEMA Region 9	Provided updated planning guidance; provided information on previous federal disasters, conducted plan review.
• National Centers for Environmental Information (NCEI) • National Oceanic and Atmospheric Administration (NOAA) • National Weather Service (NWS) • Storm Prediction Center • U.S. Army Corps of Engineers (USACE) • U.S. Census Bureau • U.S. Geological Survey (USGS)	Information regarding hazard identification and the risk assessment for this HMP update was requested and received or incorporated by reference.
California Governor's Office of Emergency Services (Cal OES)	Provided information on state emergency proclamations, administered planning grant and facilitated FEMA review; provided updated planning guidance; provided review of Draft and Final Plan.
California Department of Forestry and Fire Protection (CAL FIRE)	Participated on the Steering Committee
California Department of Transportation (Caltrans)	Completed stakeholder survey

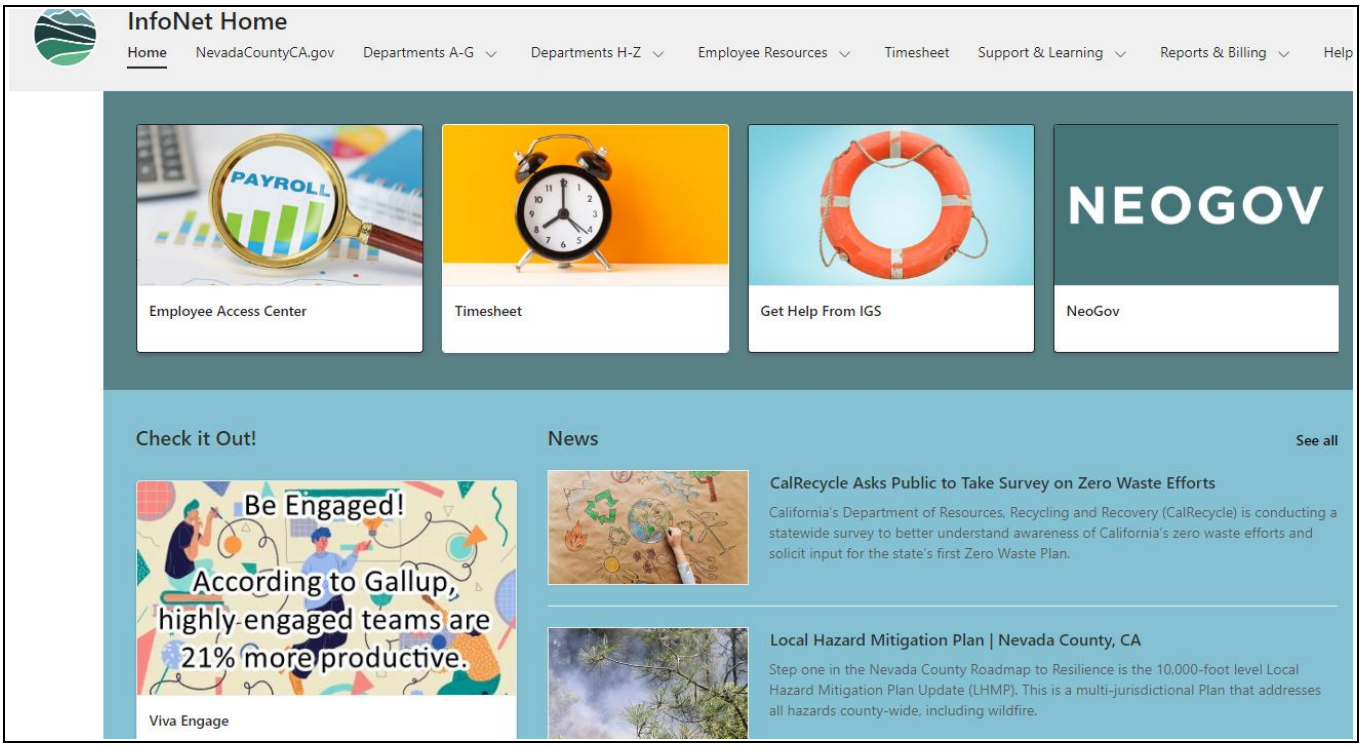
2.3.2 County and Regional Agencies

The County and regional agencies listed in Table 2-5 were invited by email to participate during the planning process. The table describes how each participated. County staff also were notified about the HMP planning process through the County's internal employee SharePoint site, as shown in Figure 2-1.

TABLE 2-5. COUNTY AND REGIONAL AGENCIES

Agency	Participation
Nevada County Office of Emergency Services	Served as chair of Steering Committee, attended meetings, provided data and information, and reviewed draft plan
Nevada County Planning Department	Provided information on County planning capabilities, new development, and NFIP administration
Nevada County Sheriff's Department	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan
Nevada County Consolidated Fire District	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan
Nevada County Superintendent of Schools	Completed stakeholder survey
FREED Center for Independent Living	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan
Nevada Irrigation District	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan.
Bear Yuba Land Trust	Served on Steering Committee, attended meetings, and reviewed draft plan
Sierra Streams Institute	Served on Steering Committee, attended meetings, and reviewed draft plan
Yuba Watershed Institute	Served on Steering Committee, attended meetings, and reviewed draft plan
Nevada County Coalition of Firewise Communities	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan
South Yuba River Citizens League	Served on Steering Committee, attended meetings, completed stakeholder survey, and reviewed draft plan

Figure 2-1. HMP Planning Process Notification on Nevada County Employees' Internal SharePoint Page



2.3.3 Stakeholders by Community Lifeline Category

FEMA defines community lifelines as fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize community lifelines. All participating jurisdictions were asked to invite their internal agencies associated with community lifeline categories to complete a stakeholder survey. Many jurisdictions also directly involved representatives of these agencies in the planning process, as identified in Table 2-1. This section describes outreach to and participation by other stakeholders in the planning process associated with FEMA's eight designated community lifeline categories. Invitations and any follow-up communications occurred primarily through email. More detailed information about community lifelines in the planning area is provided in Section 3.9.

Communication with stakeholders was primarily through emails. Stakeholders were asked to take a stakeholder survey (distributed June 10, 2024) and were notified when the draft plan was posted for public review.

Safety and Security

Law Enforcement

Many municipalities directly involved police and other law enforcement representatives in the planning process. Municipalities were asked to invite their law enforcement agencies to complete a stakeholder survey. Further, the following police departments and law enforcement agencies were invited to complete a stakeholder survey and review the draft plan:

- California Highway Patrol - Truckee Office (completed stakeholder survey)
- City of Grass Valley Police Department
- Nevada City Police Department
- Nevada County Sheriff's Department (completed stakeholder survey)
- Town of Truckee Police Department
- Town of Truckee Office of Emergency Services (completed stakeholder survey)

Fire Districts and Fire Departments

Many jurisdictions involved firefighting, hazmat, and rescue team representatives in the planning process. Jurisdictions were asked to invite their fire departments to complete a stakeholder survey. The following fire districts or departments, hazardous materials response teams, and rescue teams were invited to complete a stakeholder survey and review the draft plan:

- United States Forest Service, Truckee Ranger District
- California Department of Forestry and Fire Protection (CAL FIRE) (served on Steering Committee)
- Truckee Fire Protection District (served on Steering Committee and completed stakeholder survey)
- Washington Water District Fire Department (served on Steering Committee and completed stakeholder survey)
- Nevada County Consolidated Fire District (served on Steering Committee and completed stakeholder survey)
- Sherwood Forest Firewise Community (completed stakeholder survey)
- Nevada County Coalition of Firewise Communities (served on Steering Committee and completed stakeholder survey)

Dams

The following dam owners and/or the dam safety agency were invited to complete a stakeholder survey and review the draft plan:

- Pacific Gas and Electric
- Nevada Irrigation District
- Yuba County Water Agency
- Donner Summit Public Utility District
- Lake Wildwood Association
- Lake of the Pines Association
- U.S. Army Corps of Engineers

In addition, the following information was requested of non-federal operators of high hazard potential dams, via email, on June 12, 2024:

- Information, data, or resources regarding the risk from dam failure as a result of deficiencies or exposure to hazards such as flooding, geologic impacts, and severe storms
- Concerns with dam safety due to changing climate conditions
- Concerns with emergency action plan deficiencies (warning time, evacuation needs, etc.)
- Completed or in progress repairs/improvements to dams
- New mitigation actions that should be considered for inclusion in the HMP mitigation strategy

Food, Hydration, Shelter

Jurisdictions were asked to invite their emergency management related agencies to provide information on sheltering procedures. The following stakeholders that provide food, hydration, and shelter in the County were invited to complete a stakeholder survey and review the draft plan:

- Farm Advisor Division (joint venture of Nevada County, the University of California, and the U.S. Department of Agriculture providing information on agriculture, nutrition, youth and community development)
- Nevada County Agricultural Commissioner
- Nevada County Department of Environmental Health
- Nevada County Health and Human Services Agency

Health and Medical

Hospitals and Health-Care Facilities

The following hospitals and health-care facilities were invited to complete a stakeholder survey and review the draft plan:

- Nevada County Department of Public Health
- American Red Cross
- Sierra Nevada Memorial Hospital (completed stakeholder survey)
- Tahoe Forest Hospital
- Tahoe Forest Cancer Center
- Truckee Surgery Center (completed stakeholder survey)

Ambulance/Emergency Medical Services

Jurisdictions were asked to invite their ambulance and emergency medical service providers to complete a stakeholder survey. In addition, the following ambulance and emergency medical service providers in the County were invited to complete a stakeholder survey and review the draft plan:

- Sierra Nevada Ambulance Service
- Truckee Fire Protection District

Energy

In addition to municipal utilities, the following electrical, natural gas, and fuel companies/utilities were invited to complete a stakeholder survey and review the draft plan:

- Nevada Irrigation District (served on Steering Committee)
- NV Energy
- Liberty Utilities
- Truckee Donner Public Utility District
- Truckee Tahoe Airport (fuel storage)
- AmeriGas
- PG&E

Communications

Each jurisdiction was asked to provide information on emergency communication and warning systems. In addition, the following communications entities were invited to complete a stakeholder survey and review the draft plan:

- Nevada County Office of Emergency Services
- Verizon Wireless (completed stakeholder survey)
- AT&T Corporation
- AlticeUSA (Optimum) (completed stakeholder survey)

Transportation

The following transportation companies and organizations were invited to complete a stakeholder survey and review the draft plan:

- Nevada County Connects (local and regional fixed-route bus)
- Nevada County Airport Commission
- Truckee Tahoe Airport
- Town of Truckee Transportation
- Caltrans - Kingvale (Donner Summit) maintenance area
- Caltrans – Truckee maintenance area (completed stakeholder survey)

Hazardous Materials

The following hazardous material facilities/operators were invited to complete a stakeholder survey and review the draft plan:

- Nevada County Department of Environmental Health
- Nevada County Solid Waste Division of Public Works Department
- Tahoe Truckee Propane
- AmeriGas

- Bi-State Propane
- Union Pacific Railroad

Water Systems

The following water and wastewater utilities were invited to complete a stakeholder survey and review the draft plan:

- Nevada Irrigation District (served on Steering Committee and completed stakeholder survey)
- Nevada County Wastewater Division of the Public Works Department
- Nevada County Department of Environmental Health
- Donner Summit Public Utility District (completed stakeholder survey)
- Tahoe-Truckee Sanitation Agency
- Truckee Sanitary District
- Truckee Donner Public Utility District
- Floriston Water System
- Washington County Water District

2.3.4 Additional Stakeholder Groups

Additional stakeholder outreach was made to academia and organizations that support socially vulnerable populations and underserved populations, as listed in the sections below.

School Districts and Other Academic Institutions

The following school districts, colleges, and academic organizations were invited to complete a stakeholder survey and review the draft plan:

- Sierra College, Tahoe-Truckee Campus
- Nevada Joint Union High School District (completed stakeholder survey)
- Tahoe Truckee Unified School District

Groups Involved in Land Management and Natural Resource Preservation

The following groups and agencies involved in land management and natural resource preservation were invited to complete a stakeholder survey and review the draft plan:

- Bear Yuba Land Trust (served on Steering Committee)
- Sierra Streams Institute (served on Steering Committee)
- Nevada Irrigation District (served on Steering Committee)
- Yuba Watershed Institute (served on Steering Committee)
- South Yuba River Citizens League (served on Steering Committee and completed stakeholder survey)
- University of California Cooperative Extension livestock and natural resources management (completed stakeholder survey)

Groups Supporting Socially Vulnerable Populations and Underserved Communities

The following groups and agencies that provide support to and work with socially vulnerable populations and underserved communities were invited to complete a stakeholder survey and review the draft plan and were provided mitigation updates:

- FREED Center for Independent Living (served on Steering Committee and completed stakeholder survey)
- Nevada County Department of Housing & Child Support Services
- Nevada County Department of Social Services
- Nevada County Economic Development Office
- Nevada County Health and Human Services Agency
- Gold Country Senior Services

2.3.5 Adjacent Jurisdictions

The County kept surrounding jurisdictions apprised of the project, invited them to complete a neighboring community survey, and requested their review of the draft plan. The following adjoining county representatives were contacted by email in February 2024 and invited to attend a Steering Committee meeting to inform them about the HMP update and to invite them to provide input to the planning process:

- Sierra County, CA Office of Emergency Services
- Placer County, CA Office of Emergency Services
- Yuba County, CA Emergency Services
- Washoe County, NV Emergency Services (completed stakeholder survey)

These representatives were also asked to complete a neighboring communities survey on June 10, 2024. When the draft plan was posted for public review, these representatives were notified of the draft plan's availability for review and asked to provide comments.

2.3.6 Survey Summaries

This section summarizes the results and feedback received by those who completed the stakeholder and neighboring community surveys. Feedback was reviewed by the Steering Committee and integrated where appropriate in the plan.

Stakeholder Survey

The stakeholder survey was designed to identify general needs for hazard mitigation and resiliency within Nevada County from the perspective of stakeholders, as well as to identify specific projects that may be included in the mitigation plan. It was distributed to identified stakeholders, including County and municipal departments and agencies.

As of July 7, 2024, 20 stakeholders completed the survey, with the majority of respondents representing the emergency management sector (55 percent) and infrastructure sector (30 percent).

Other respondents represented backgrounds of climate change; economic development; health and social services; housing, food, water, shelter; land use and development; natural and cultural resources; social and cultural equity; communications; and livestock management. The majority of respondents represented groups that served Nevada County as a whole (55 percent), with other representation from the Nevada County Consolidated Fire District, Nevada Irrigation District, Washington County Water District, City of Grass Valley, City of Nevada City, Town of Truckee, Donner Summit Public Utility District, and Yuba River Watershed.

When asked if their organization maintains or manages anything within their designated service area, 45 percent said they manage buildings, 25 percent said they manage water/sewer facilities, 15 percent said they manage bridges, 15 percent said they manage roads, 5 percent said they manage stormwater, and 5 percent said they manage cellular communications networks; 56 percent noted that their buildings/facilities/structures have been impacted by previous hazard events, including damage from winter storms and fires.

Sixty percent of respondents noted that they work with socially vulnerable populations. Examples of this included supporting the following socially vulnerable populations:

- Access and functional needs (AFN)
- English as a second language
- Seniors
- Medically fragile populations
- Underserved farmers and ranchers
- Public health clinics
- Pediatric and adolescents
- Individuals with disabilities

Support for socially vulnerable populations included establishing personal services, funding/financial assistance, human rights, regulatory oversight, and emergency services. Seventy percent of stakeholders noted that they provide support to these populations during times of disaster.

Funding was repeatedly identified as the main challenge or barrier to reducing vulnerability in Nevada County.

Neighboring Community Survey

The neighboring community survey was sent to the County governments that border Nevada County via email on June 10, 2024. The survey aimed to gather information from these counties due to their proximity to the County and because the effects of hazard events that impact Nevada County would be similar to those impacting these neighbors. As of July 10, 2024, one county submitted the survey (Washoe County, Nevada).

Washoe County noted that Nevada County is included in its emergency management planning. Washoe County has shared best practices related to evacuation studies and dashboards and shares

information about mitigation projects. Washoe County continues to plan, train, exercise, and coordinate response with the Town of Truckee as well.

2.3.7 Public Outreach

In order to facilitate better coordination and communication between the Planning Partnership and all community members and to involve the public in the planning process, draft documents were made available to the public through a variety of venues, including printed and online format. The Steering and Planning Partnership made the following efforts toward public participation in the development and review of the Plan:

- A public website (https://nevadacountyca.gov/3830/Local-Hazard-Mitigation-Plan) is being maintained to facilitate communication between the Steering Committee, planning partnership, public and stakeholders. The website contains a project overview, County and local contact information, access to the citizens survey, and sections of the HMP for public review and comment.
- All participating jurisdictions were encouraged to distribute press releases on the project, including links to the project webpage and citizen and stakeholder surveys.
- In order to facilitate coordination and communication between the Planning Partnership and citizens and involve the public in the planning process, the Plan Update will be available to the public through a variety of venues. A printed version of the Plan will be maintained at the Nevada County Office of Emergency Services.
- An on-line natural hazards preparedness citizen survey was developed to gauge household preparedness that may impact Nevada County and to assess the level of knowledge of tools and techniques to assist in reducing risk and loss of those hazards. The survey asks quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The survey also asks several demographic questions to help analyze trends. This survey was available in English and Spanish.

  The survey was posted on the County website on September 14, 2023, and was available through May 2024 for public input. All participating jurisdictions were requested to advertise the availability of the survey via local homepage links, and other available public announcement methods (e.g., Facebook, Twitter, email blasts, social media, among others.). Over 100 responses have been collected. A summary of survey results is provided later in this section with full results provided in Appendix C of this plan.
- A StoryMap website was deployed in spring 2024 to continue to distribute information on the planning process, educate the public on the hazards of concern included in the HMP, and continue to foster public input and feedback. (https://storymaps.arcgis.com/stories/49f0c49e19d34a028c6007d555dd779d)
- The Draft Plan was posted to the County's public website on August 13, 2024, for public review and comment. The public review draft was sent by email to the Planning Partners, Steering Committee members, and stakeholders, including ones that provide services to socially vulnerable groups. The plan was also available at County OES for review. Individuals, groups, or organizations were asked to direct comments to the Nevada County Office of Emergency Management. Comments were received from three sources. The HMP Planning Team reviewed

all comments and incorporated their corrections and suggestions into the final plan as appropriate.

- Once submitted to Cal OES/FEMA, the Final Plan will be available for public review and comment in the same manner and format as the Draft Plan, as well as in hard-copy format at the following as identified in Chapter 21,

Examples of virtual outreach via websites and social media completed by the Planning Partners are provided in Figure 2-2, Figure 2-3, and Figure 2-4. Nevada County Office of Emergency Services personnel attended an in-person event in May 2024 to promote the survey and distribute printed versions of the survey. Photos of the event are provided in Figure 2-5.

Figure 2-2. Nevada County Irrigation District Website HMP Outreach

Figure 2-3. Nevada County HMP Webpage and Local On-Line Outreach

Local Hazard Mitigation Plan

Local Hazard Mitigation Plan Update

Step one in the Nevada County **Roadmap to Resilience** is the 10,000 foot level – **Local Hazard Mitigation Plan Update (LHMP)**. This is a Multi-Jurisdictional Plan that addresses all hazards county-wide, including wildfire. Jurisdictions included in this effort are County of Nevada, City of Grass Valley, City of Nevada City, Town of Truckee, Nevada Irrigation District, Truckee Donner Public Utility District, and Washington Water District. The goal of hazard mitigation planning is to minimize the impact of future disasters.

2024 Nevada County Hazard Mitigation Plan Update Survey

Nevada County and the Multi-Jurisdictional Partners are committed to engaging the community throughout the update to the Nevada County Local Hazard Mitigation Plan. The survey below is designed to help the County better prepare our communities to withstand the hazards and potential disasters that are most relevant to the area.

- https://www.surveymonkey.com/r/WJJBFMN

Figure 2-4. Nevada County Office of Emergency Services Social Media HMP Outreach

Nevada County Office of Emergency Services
Mar 20 ·

Nevada County – WE WANT TO HEAR FROM YOU!

The Office of Emergency Services is currently in the process of updating our Local Hazard Mitigation Plan (LHMP). This important strategic planning effort looks at all-hazards County-wide with an eye toward how risk can be reduced. Now is your chance to voice your priorities and concerns!

Learn more about the plan update here: https://www.nevadacountyca.gov/3830/Local-Hazard-Mitigation-Plan

Take the public survey here: https://www.surveymonkey.com/r/WJJBFMN

Your input will help us better understand where strengths and weaknesses exist in our community around disaster preparedness, mitigation, response, and recovery. This will allow us to identify where disasters are likely to happen, what will make these disasters challenging for our community, and what resources would alleviate the impact and support resilience.

#readynevadacounty

Figure 2-5. Nevada County Office of Emergency Services In-Person Outreach Event

Outreach to Underserved and Vulnerable Populations

Working in collaboration with some of the planning partners, the County aimed to engage underserved and socially vulnerable populations through the following activities:

- Advertising public meetings and comment periods using social media and websites.
- Providing physical copies of the plan document for review, including availability at public libraries, so those with limited access to technology or the internet could provide comments.
- Providing the public survey in Spanish, including printed copies at public libraries, so those with limited English proficiency could respond.
- Conducting in-person events and providing physical materials publicizing the planning process to engage individuals who may not normally engage in such activities or may have limited access to technology or the internet.

All Planning Partners worked to engage underserved and vulnerable populations and supported the County's efforts to do so:

- The City Grass Valley, City of Nevada City, Town of Truckee, and Nevada Irrigation District shared social media posts in both English and Spanish advertising the planning process and publicizing the opportunity for in-person engagement, such as reviewing a physical copy of the plan at the County Office of Emergency Services.
- The Nevada County Consolidated Fire District presented the draft plan to its citizens oversight committee, along with several homeowner groups, non-profits, and socially vulnerable organizations.
- The Town of Truckee and Truckee Donner Public Utilities District distributed a link to the public review draft on their Community Organizations Active in Disaster (COAD) listserv and provided hazard mitigation information. The listserv includes the following organizations that provide direct services to underserved and socially vulnerable populations; many of them serve people living in the jurisdiction of several Planning Partners:
  - North Tahoe-Truckee Homeless Services
  - Connecting Point
  - United for Action
  - Nevada County Public Health
  - Sierra College
  - Tahoe Ability Program
  - Tahoe-Truckee Community Foundation
  - Boys & Girls Club North Lake Tahoe
  - Sierra Community House
  - Gateway Mountain Center
  - Truckee North Tahoe Transportation Management Association
  - Sierra Senior Services
  - Humane Society of Tahoe-Truckee
  - Sierra Business Council
  - Christ the King Lutheran Congregation
  - United Way of Nevada County
  - Episcopal Disaster Resilience
  - Episcopal Diocese of Northern California for VOAD/COAD in Placer County
  - North Tahoe Community Alliance
  - Sierra Services-
  - Camp WAMP
  - Friends of the Truckee Library
  - Town of Truckee Animal Services
  - The Speedy Foundation, Suicide Prevention Coalition

- Outreach by the Washington County Water District, which has a small paid staff of fewer than five, was limited to the broader team activities associated with its role as a Planning Partner and Steering Committee member.

Public Survey Summary

The public survey was developed to assess the level of knowledge of tools and techniques to assist in reducing risk and loss associated with hazards. It asked quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The County advertised the survey on their website and social media accounts. As of May 2024, the survey received 108 responses.

Most residents receive information concerning natural hazards through the internet (77.5%) or social media (67.6%).

Demographically, the most common (39.8 percent) age of respondents was over the age of 65. 48.2 percent of respondents work within the County, 41.7 percent are retired, and 4.6 percent work outside of the County.

The survey included questions regarding social vulnerability. Respondents were asked about disabilities among individuals within their households. 12.6 percent of respondents have an individual who has difficulty hearing or is deaf; 4.8 percent have an individual who has difficulty seeing or identifies as blind; 7.5 percent have an individual with a physical, mental, or emotional condition that makes it difficult to concentrate, remember, or make decisions; and 7.7 percent have an individual in their household that has serious difficulty walking. 5.6 percent of respondents reported a gross income under $25,000. 5.6 percent of respondents reported being unemployed. Less than 2 percent of respondents use a language other than English as the primary language in their household. 52.5 percent of respondents noted financial constraints present a major hurdle to being prepared to withstand hazard events.

The majority (88.9 percent) of respondents own their home. While the majority of respondents (61.1 percent) felt confident in knowing how to protect themselves during a major disaster and have an evacuation plan or know where to go in an evacuation, 7.4 percent of respondents reported being unsure of where to go during an evacuation. 27 percent of respondents reported having difficulty obtaining homeowners or renters insurance due to risks from natural hazards. A majority of respondents reported their home is located in a Fire Hazard Severity Zone (81.1 percent). 12 percent reported being located in an earthquake fault zone and 4 percent reported being located in a FEMA designated floodplain. 65.7 percent of respondents noted they carry an additional fire insurance policy and 15.2 percent reported carrying an earthquake insurance policy.

Of the hazards of concern in the HMP update, 68.2 percent of respondents are extremely concerned about wildfires, followed by the cascading impacts of public safety power shutoff or de-energization (22.4 percent), and impacts from severe weather-related events (21.9 percent). These three categories were also the most common events that respondents had been impacted by.

Refer to Appendix C for the full list of survey questions and responses.

2.4 Incorporation of Existing Plans, Studies, Reports and Technical Information

The 2024 Nevada County HMP update uses the best available information to support hazard profiling, risk assessment, review and evaluation of mitigation capabilities, and the development and prioritization of County and local mitigation strategies. Plans, reports, and other technical information were identified and accessed online through independent research by the planning consultant or provided directly by the County, participating jurisdictions, and stakeholders involved in the planning effort. Detailed sources of technical data and information used are listed in the References section.

The asset inventory data used for the risk assessment is presented in the County Profile (Chapter 3). Details of the source of this data, along with technical information on how the data was used to develop the risk assessment, are presented in Chapter 4, as well as throughout the hazard profiles in this HMP. The County and participating jurisdictions provided relevant jurisdiction-specific planning and regulatory documents, which were reviewed to identify:

- Existing jurisdictional capabilities
- Needs and opportunities to develop or enhance capabilities, which may be identified in the County or local mitigation strategies
- Mitigation-related goals or objectives, considered in the review and update of the overall Goals and Objectives (see Section 20.2)
- Proposed, in-progress, or potential mitigation actions to be incorporated into the updated County and local mitigation strategies

The following regulations, codes, ordinances, and plans were reviewed to develop mitigation planning goals and objectives and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms:

- Comprehensive/master plans
- Building codes
- Zoning and subdivision ordinances
- Flood insurance studies
- Flood insurance rate maps
- NFIP flood damage prevention ordinances
- Site plan requirements
- Stormwater management plans
- Emergency management and response plans
- Land use and open space plans
- Capital plans
- Community rating system
- 2023 California State Hazard Mitigation Plan (Cal OES 2023a)

The County and participating jurisdictions were tasked with updating the assessment of their planning and regulatory capabilities (see capability assessment section of each jurisdictional annex in Volume II). They reviewed relevant plans contributing to the capability of the County and each jurisdiction to integrate effective mitigation efforts into their daily activities. This review is reflected in the capability assessment table in each of the municipal annexes. These tables list plan types, names, and dates, as well as a summary of how each plan supports mitigation and resilience.

2.5 Integration with Existing Planning Mechanisms and Programs

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Many existing plans and programs support hazard mitigation in the County. It is critical that this HMP integrate, coordinate with, and complement, those existing plans and programs.

The capability assessment presented in Chapter 19 provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county and local) that support hazard mitigation in the County. In the jurisdictional annexes in Volume II, each participating jurisdiction identifies how it has already integrated hazard mitigation into its planning, regulatory and administrative framework (“integration capabilities”) and how it intends to promote this integration (“integration actions”).

A description of continued efforts toward a holistic approach to hazard mitigation is presented in Chapter 21.

2.6 Plan Adoption

Adoption by the local governing bodies of each participating jurisdiction demonstrates the commitment of the Planning Partners to fulfill the mitigation goals and strategies outlined in this HMP. Adoption via a municipal resolution legitimizes the HMP and authorizes responsible agencies to execute their responsibilities.

All participating jurisdictions will submit a copy of a formal adoption resolution or other legal instrument to the Nevada County HMP Coordinator in the Nevada County Office of Emergency Services. Nevada County will forward the executed resolutions to the California Governor’s Office of Emergency Services (Cal OES), after which they will be forwarded to FEMA for the record.

A draft HMP will be submitted to the state and FEMA for approval prior to adoption by the jurisdictions. When FEMA determines that the plan as a whole and each participating jurisdiction have met all the requirements except adoption, FEMA will inform the state that the plan is “approvable pending adoption” (APA). After that, once FEMA receives documentation of adoption resolutions from at least one jurisdiction, the status is changed from APA to approved for the entire plan and for that jurisdiction. Other jurisdictions that participated in the planning process then receive approval once they pass their

own adoption resolutions. A jurisdiction with a plan in APA status does not meet the requirement for an approved mitigation plan to apply for and receive funding assistance.

Adoption of the HMP is necessary because:

- It lends authority to the plan to serve as a guiding document for all local and state government officials.
- It gives legal status to the plan in the event it is challenged in court.
- It certifies to program and grant administrators that the plan's recommendations have been properly considered and approved by the jurisdictions' governing authority and citizens.
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. How to Series: Bringing the Plan to Life (FEMA 386-4).

FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the plan to the Nevada County HMP Coordinator. The plan approval date begins the five-year approval period and sets the expiration date for the plan. All participating jurisdictions will have the same expiration date regardless of their own jurisdiction's adoption date. The date indicated on FEMA's approval letter is the official approval date.

The resolutions issued by each jurisdiction to support adoption of this HMP are included in Appendix A.

2.7 Continued Public Involvement

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This Plan update will be posted on-line (currently at https://nevadacountyca.gov/3830/Local-Hazard-Mitigation-Plan), and jurisdictions will be encouraged to maintain links to the plan website. Further, the County will make hard copies of the Plan available for review at public locations as identified on the public plan website.

A notice regarding annual updates of the plan and the location of plan copies will be publicized annually after the Planning Partnership's annual evaluation and posted on the County's OES website.

Each jurisdiction's governing body shall be responsible for receiving, tracking, and filing public comments regarding this plan.

The public will have an opportunity to comment on the plan as a part of the annual mitigation planning evaluation process and the next five-year mitigation plan update. The HMP Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting, and reviewing the comments, and ensuring their incorporation in the 5-year plan update as appropriate; however, members of the Planning Partnership will assist the HMP Coordinator. Additional meetings may also be held as deemed necessary by the Planning Partnership. The purpose of these meetings would be to provide the public an opportunity to express concerns, opinions, and ideas about the plan.

After completion of this plan, implementation and ongoing maintenance will continue to be a function of the Planning Partnership. The Planning Partnership will review the plan and accept public comment as part of an annual review and as part of five-year mitigation plan updates.

A notice regarding annual updates of the plan and the location of plan copies will be publicized annually after the HMP Committee's annual evaluation and posted on the public web site.

The Nevada County Office of Emergency Services has been identified as the ongoing County HMP Coordinator (see Chapter 21), and is responsible for receiving, tracking, and filing public comments regarding this Plan Update. Contact information is:

Mailing Address:	Nevada County Office of Emergency Services 950 Maidu Avenue, Suite 129 Nevada City, CA 95959
Email Address:	OES@nevadacountyca.gov
Telephone:	(530) 265-1515

3. County Profile

The planning area for this HMP is the entirety of Nevada County. This chapter presents general information about the land, people, and assets of Nevada County. This information provides a baseline for understanding the economic, structural, and population assets at risk from the hazards addressed in this HMP.

3.1 Location

As shown in Figure 3-1, Nevada County, in northeastern California, is a strip of land 10 to 25 miles wide that extends some 70 miles across the north-central Sierra Nevada range from Yuba County to the California-Nevada state line. It is bordered by Washoe County, Nevada to the east; Sierra County to the north; Yuba County to the west; and Placer County to the south. With a total land area of 625,920 acres, Nevada County is one of the smaller counties in California. It extends from oak woodlands at lower foothill elevations on the west to Donner Summit at elevation 7,239 feet near Truckee and then into East Sierra. The County contains three incorporated jurisdictions: the cities of Grass Valley and Nevada City (the County seat) and the Town of Truckee. Major roadways are U.S. Highway 80 and State Highways 20, 49, 89, and 174 (Nevada County 2017).

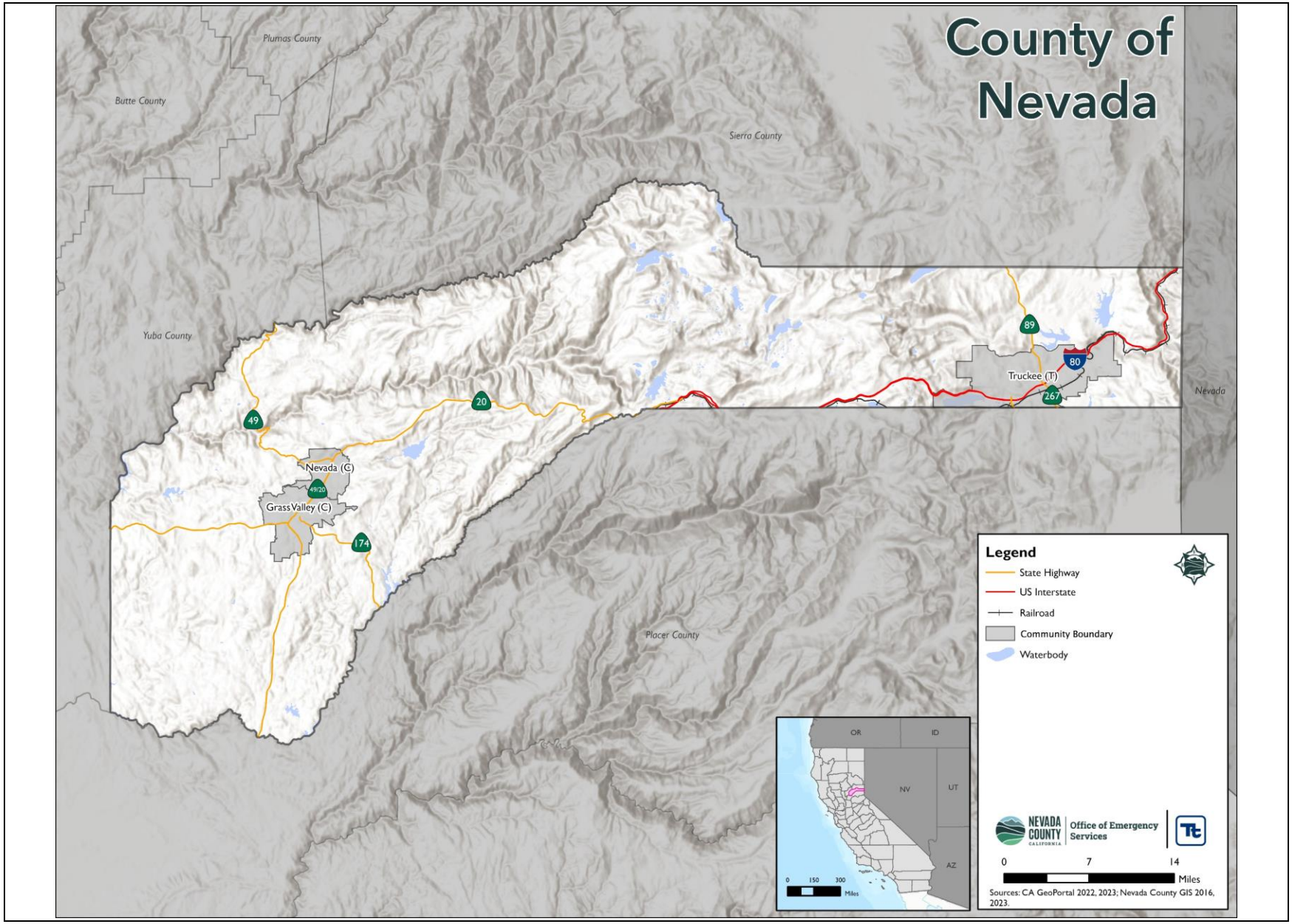
3.2 History

Prior to the beginning of the California gold rush, the region now known as Nevada County was primarily populated by Nisenan and Maidu Native Americans. After gold was discovered in 1848 at Coloma, miners settled along the streams and creeks of the Nevada County region searching for placer gold. The gold rush cities of Nevada City and Grass Valley were well established by the time Nevada County was formed out of Yuba County in September 1851 with Nevada (city) as the “seat of justice.” The community was renamed Nevada City when neighboring Nevada became the 36th state. Donner Summit entered into history in the winter of 1847-48 after the Donner Party died there, near the present-day Town of Truckee. By 1859, the end of available placer gold and the discovery of the Comstock Lode in Nevada reduced the settlement of Nevada County.

In 1850, a ledge of hard rock gold discovered in Grass Valley gave rise to an underground gold mining industry. In the practice of hydraulic mining, large areas of alluvial sand and gravel deposits were washed away with water. The byproduct, a muddy debris flowing into rivers, was outlawed by a federal court decision issued in January 1884 in response to a lawsuit against the practice. In the mid-twentieth century, the Empire and Northstar Mines closed their mining operations. The Empire became a California State Park. (Nevada County 2017).

Truckee, the site of a major construction camp of the Central Pacific Transcontinental railroad in the 1860s, continued into the 20th century as a lumber, ice harvesting, and snow skiing industry town. By the 1990s Truckee had become an incorporated town and the fastest growing area in the County.

Figure 3-1. Nevada County Hazard Mitigation Plan Area



Agricultural pursuits have traditionally been horse and cattle ranching, wine grape production, fruit production—primarily in the Chicago Park-Peardale area—and timber production. While most of these pursuits have endured into the 21st century, timber production has declined from its historical high level (Nevada County 2017).

3.3 Jurisdictions Within the County

Nevada County has two incorporated cities, one incorporated town, and 11 census-designated places:

- Cities:
  - City of Grass Valley
  - City of Nevada City
- Towns:
  - Town of Truckee
- Census-Designated Places:
  - Alta Sierra
  - Floriston
  - Graniteville
  - Kingvale
  - Lake of the Pines
  - Lake Wildwood
  - North San Juan
  - Penn Valley
  - Rough and Ready
  - Soda Springs
  - Washington

Other unincorporated communities also can be found in the County. Under its General Plan, the County has defined community regions as the areas of the County within which growth should be directed to provide compact areas of development that can be effectively served with necessary urban services (Nevada County General Plan, Land Use, Policy 1.2). In this HMP, all analyses related to the participating municipalities (Grass Valley, Nevada City, and Truckee) use the County's defined community boundaries for those municipalities rather than the city limits (Nevada County GIS 2020). These are the boundaries shown on Figure 3-1.

Numerous special districts operate within the boundaries of the County. Services they offer include fire protection, irrigation, water, wastewater, schools, power, airports, cemeteries, and more. Of these, the following participated as Planning Partners in this HMP:

- Nevada County Consolidated Fire District
- Nevada Irrigation District
- Truckee Donner Public Utility District
- Washington County Water District

3.4 Physical Setting

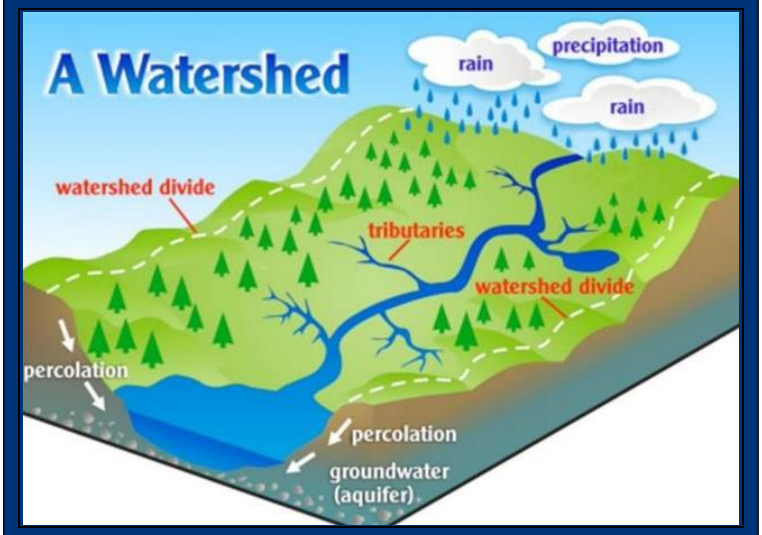
3.4.1 Surface Waters

Nevada County is characterized by a large and diverse hydrologic system consisting of the Truckee River watershed in the eastern part of the County and the Yuba River and Bear River watersheds in the western part of the County. These watersheds supply water to serve portions of both northern California and western Nevada, and many of the creeks and rivers produce hydroelectricity as well.

The eastern portion of Nevada County drains east into tributaries of the Truckee River, which enters the County near the Town of Truckee and flows northeast to the California-Nevada state line. The Yuba and Bear Rivers, which have been developed for irrigation and power, drain the western portion of the County. A network of perennial (year-round) and intermittent (seasonal) creeks, streams, and rivers crosses the County, ranging in size from the South Yuba River to small, unnamed seasonal drainages. Riparian corridors along these water courses provide important year-round and migratory wildlife habitats and allow for linkages across wider areas of the County (Nevada County 1995).

The County has many lakes, as well as reservoirs held by dams that are used for flood control, water storage, and recreation (Nevada County 2017).

A **watershed** is the area of land that drains into a body of water such as a river, lake, stream, or bay. It is separated from other systems by high points such as hills or slopes. It includes the waterway and all land area that drains to it. Drainage basins generally refer to large areas that encompass the watersheds of many smaller rivers and streams. Watersheds can cross municipal and county boundaries.



Source: (RCRCD n.d.)

3.4.2 Geology and Topography

Nevada County has generally shallow soils (typically loam and sandy loam underlain by clay or no substratum, with a rock outcrops) overlying dense igneous and metamorphic rock. Elevations range from about 100 feet above sea level in the south and west (Penn Valley) to over 10,000 feet above sea level in the east (Nevada County 2017).

3.4.3 Climate

The western portion of Nevada County is characterized by mild winters with little snow. Winters along the crest of the Sierra Nevada range and eastward are long and cold, with heavy snowfalls. Annual precipitation ranges from approximately 35 inches in the west to nearly 70 inches at the summits of the ranges. Daily high temperatures average between 95 °F and 100 °F in July and between 35 °F and 55 °F in January. The growing season (free from freezing temperatures) varies from in excess of 250 days in the western portions of the County (usually from mid-March to November), to as low as 25 days in the eastern portions (usually from mid-June to July) (Nevada County 2017).

3.5 Land Use

3.5.1 Current Land Use and Land Cover

Table 3-1 and Figure 3-2 summarize land cover and land use in Nevada County. The majority of Nevada County's land use is forest; 22 percent is rangeland; 7.7 percent is developed (urban area); and less than 0.1 percent is classified as agriculture. Vegetation in Nevada County has an extreme range in type due to the large variation in elevation, climate, and soil.

TABLE 3-1. NEVADA COUNTY 2021 LAND USE CLASSIFICATION

Category Description	Area (acres)	% of Total
Agriculture	4	<0.1%
Barren Land	180	<0.1%
Forest	426,869	68.5%
Rangeland	137,216	22.0%
Urban Area	47,940	7.7%
Water	8,801	1.4%
Wetland	2,297	0.4%
Nevada County (Total)	623,308	100.0%

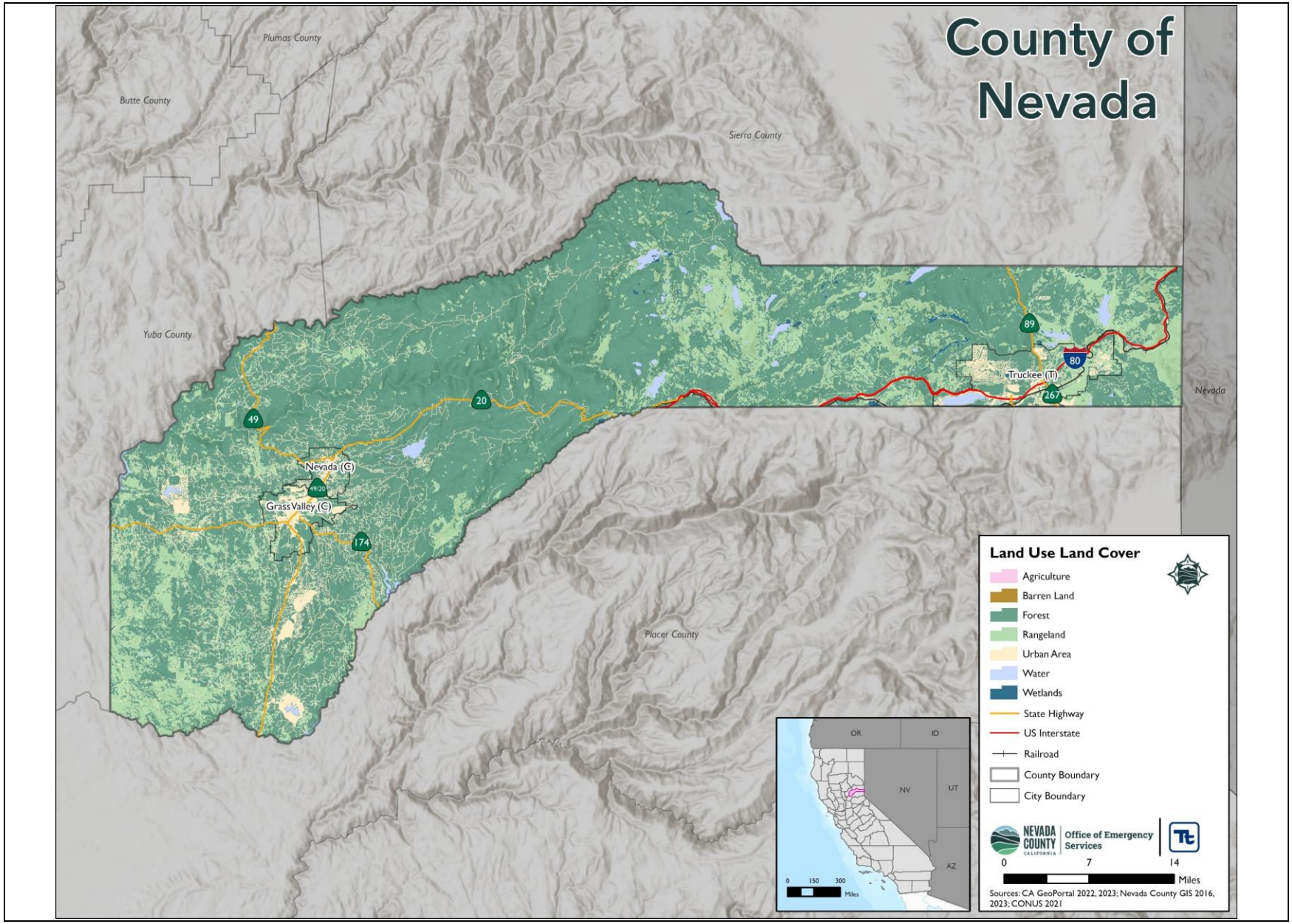
Sources: (MRLC 2021) (Nevada County GIS 2023a) (State of California 2023)

Residential Land Uses

Residential and commercial areas are largely contained within Nevada City, Grass Valley, and Truckee. The predominant type of residential development has been single-family dwelling units, with multiple-family development occurring mainly in the Grass Valley and Nevada City areas. In the unincorporated County, the greatest residential density occurs in the Alta Sierra area to the south of Grass Valley/Nevada City, Lake Wildwood to the west of Grass Valley/Nevada City, and Lake of the Pines to the south of Alta Sierra along the most southern County boundary. Residences are found along many of the highways and roadways in the rural areas of the County. Residential development is also found in a dozen or so smaller rural communities (Nevada County GIS 2020).

Land development tends to be more consolidated in the eastern portion of Nevada County than in the western portion. Residential land uses in eastern Nevada County are concentrated around Donner Lake, in the large Tahoe-Donner development, in the Glenshire area to the east, and the Prosser subdivisions to the north on Highway 89. Soda Springs, Kingvale and Floriston are small rural places of fewer than 100 residences in the eastern County (Nevada County GIS 2020).

Figure 3-2. Nevada County Land Use and Land Cover



Commercial and Industrial Land Uses

Most of the commercial and industrial development in western Nevada County is located in or around the City of Grass Valley and Nevada City. Commercial uses are concentrated in the downtown areas of each City, the Brunswick/Glenbrook Basin area, and the Pine Creek Shopping Center on Highway 49 south of Grass Valley. Within the Grass Valley Community Region (as defined in the Nevada County General Plan), the Loma Rica Industrial Park is a major location for industrial development and also includes commercial land uses adjacent to the Nevada County Airport. Within the Penn Valley Village Center, there is a mixture of primarily commercial and some industrial developments. In eastern County, commercial development is concentrated in the Town of Truckee and industrial development is located adjacent to the Tahoe-Truckee Airport and to the north along Highway 89 (Nevada County GIS 2020).

Agriculture Land Uses

The U.S. Department of Agriculture's 2022 Census of Agriculture reported 620 farms in Nevada County, an 8 percent decrease from the 2017 census. The average farm size was 104 acres (USDA 2023). Table 3-2 summarizes the 2022 acreage of agricultural land in Nevada County.

TABLE 3-2. AGRICULTURAL LAND IN NEVADA COUNTY IN 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Pastureland (acres)	Woodland (acres)
620	64,185	4,133	34,500	15,469

Source: (USDA 2023)

3.5.2 Land Use Trends

The cities of Grass Valley and Nevada City, and the Town of Truckee are focal points for the ongoing development of multiple land uses. There has also been considerable growth in unincorporated areas of the County over the past 50 years (Nevada County GIS 2020).

Within the last decade, the Higgins Corner-Lake of the Pines Village Center in South County has experienced increased commercial development.

While cattle ranching remains the main producer of Nevada County's agriculture lands, vineyards and wineries are steadily increasing on the landscape. In addition, the promotion of local agriculture has increased opportunities for direct agricultural marketing, certified farmers' markets, and agritourism attractions. Agriculture in Nevada County is evolving in response to emerging markets that incorporate a wide range of innovative activities, including on-farm direct marketing, entertainment, farm accommodations, outdoor recreation, and educational programming. Therefore, the new land use pattern for agricultural lands is more intensive farming on smaller parcels that are more accessible to the public (Nevada County GIS 2020).

3.6 Population and Demographics

3.6.1 Current Population

With just over 100,000 residents, Nevada County is the 36th most populous county in California. The 2020 U.S. Census listed Nevada County's population as 102,241. A significant portion of this population —16.4 percent—resides in the Town of Truckee. Table 3-3 displays population statistics from the 2020 Census and the 2022 American Community Survey 5-year estimates. Figure 3-3 shows the total population per square mile by Census tract in Nevada County. The population is concentrated around the municipalities of Grass Valley, Nevada City, and Truckee.

TABLE 3-3. NEVADA COUNTY POPULATION STATISTICS, 2010 CENSUS AND 2022 ACS 5-YEAR ESTIMATES

	U.S. Census Decennial 2020		2022 ACS 5-Year Estimates	
	Population	% of County Total	Population	% of County Total
Grass Valley	14,016	13.7%	13,964	13.6%
Nevada City	3,152	3.1%	3,142	3.1%
Truckee	16,729	16.4%	16,784	16.4%
Unincorporated	68,344	66.8%	68,432	66.9%
Nevada County (Total)	**102,241**	**100.0%**	**102,322**	**100.0%**

Sources: (U.S. Census Bureau 2020, U.S. Census Bureau 2024)
Note: Total populations for listed incorporated communities were subtracted from the Nevada County total population to determine the unincorporated county population.

3.6.2 Socially Vulnerable Populations

Socially vulnerable populations are those that are more susceptible to hazard events based on a factors such as their physical and financial ability to react or respond during a hazard, and the location and construction quality of their housing. This HMP considers several socially vulnerable population groups: the elderly (persons over the age of 65), the young (persons under the age of 5), non-English speaking households, those with disabilities, and those living below the poverty level (as defined by the U.S. Census Bureau).

Table 3-4 summarizes population statistics for these socially vulnerable populations for each municipality in the County, based on 2020 Census and 2022 American Community Survey data. The distributions of the general population density (persons per square mile) for these metrics of social vulnerability are shown in Figure 3-4.

Figure 3-3. Total Population Per Square Mile by Census Tract in Nevada County

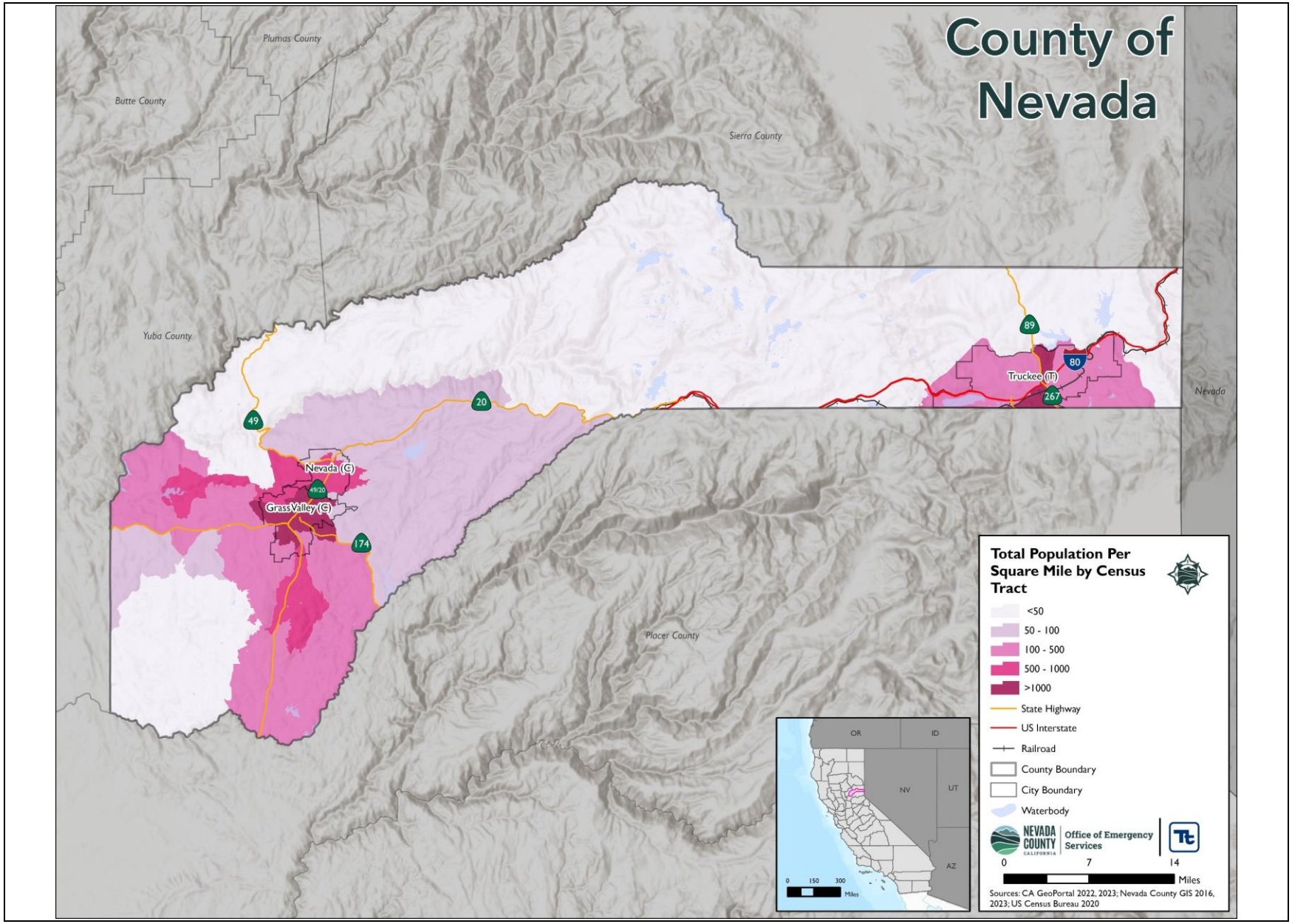


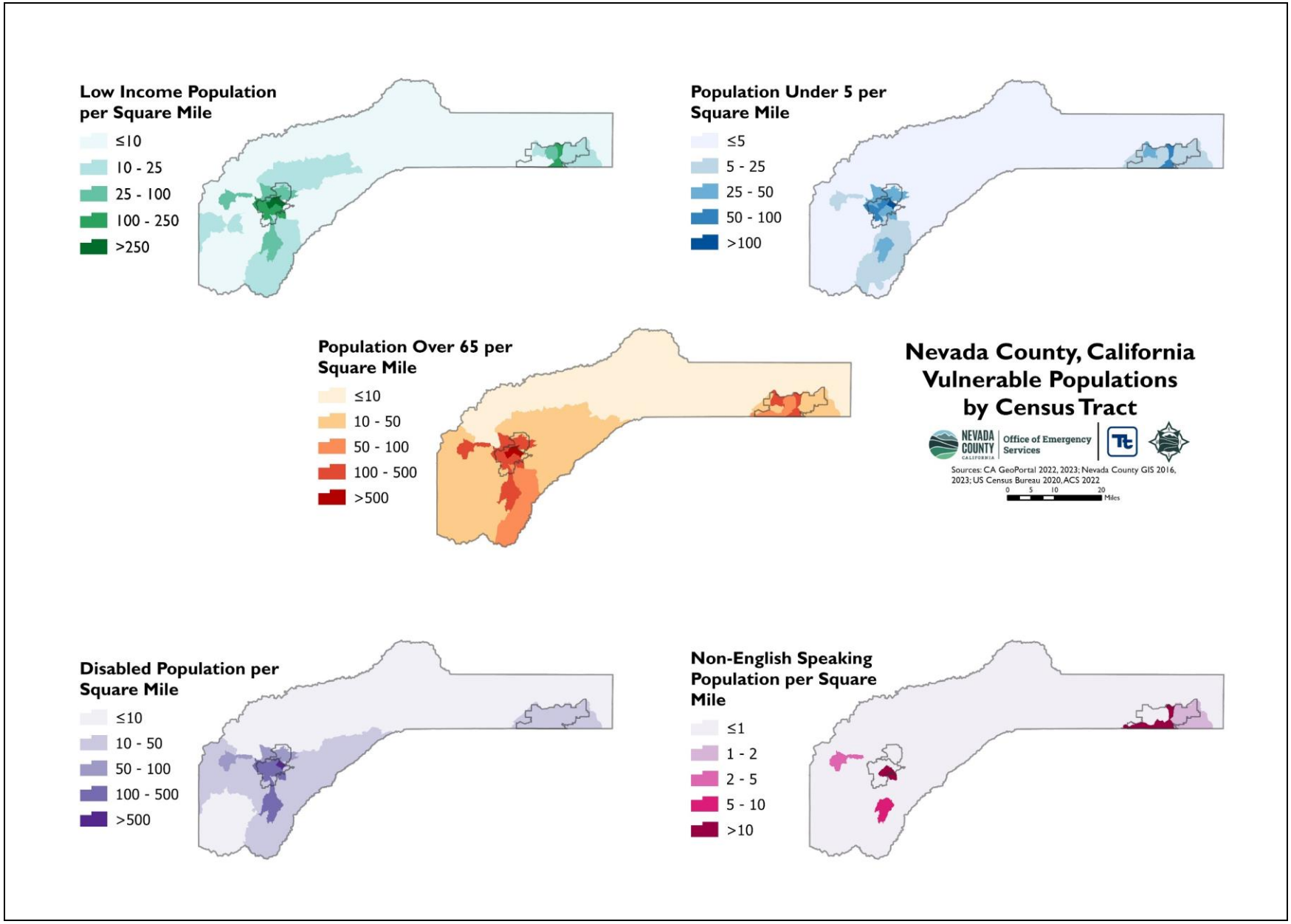
TABLE 3-4. NEVADA COUNTY POPULATION AND DEMOGRAPHIC STATISTICS 2020 CENSUS, AMERICAN COMMUNITY SURVEY 5-YEAR ESTIMATES

		65 and Older		5 and Younger		Non-English-Speaking		Disability		Below Poverty Level	
	Total Population	Population	% of Total	Population	% of Total	Population	% of Total	Population	% of Total	Population	% of Total
City of Grass Valley	14,016	4,043	29.0%	869	6.2%	93	0.7%	2,947	21.1%	2,423	17.4%
City of Nevada City	3,152	1,321	42.0%	111	3.5%	0	0.0%	261	8.3%	297	9.5%
Town of Truckee	16,729	2,767	16.5%	1,123	6.7%	603	3.6%	1,096	6.5%	1,508	9.0%
Unincorporated	68,344	20,914	30.6%	2,106	3.1%	315	0.5%	11,301	16.5%	6,872	10.0%
Nevada County	**102,241**	**29,045**	**28.4%**	**4,209**	**4.1%**	**1,010**	**1.0%**	**15,605**	**15.3%**	**11,100**	**10.8%**

Sources: (U.S. Census Bureau 2020, U.S. Census Bureau 2024)

Note: Total populations for listed incorporated communities were subtracted from the Nevada County total population to determine the unincorporated county population. 2.44 persons per household statistic was used to determine Non-English speaking populations.

Figure 3-4. Vulnerable Populations by Census Tract in Nevada County



3.6.3 Population Trends

Population trends over time provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas.

Nevada County remained a small rural county with barely 26,000 residents until the boom years of the middle 1970s. Nevada County saw its highest growth between the 1950s and 1990s (Nevada County Executive Office 2021). As seen in Table 3-5, Nevada County's population has continued to increase in recent decades. However, as seen in Table 3-6, population is projected to decline in the upcoming decades (California Department of Finance 2024).

TABLE 3-5. HISTORICAL POPULATION CHANGE IN NEVADA COUNTY

	Population			
	1990	2000	2010	2020
Nevada County	78,510	92,033	98,766	102,241

Sources: (California Department of Finance 2007, Nevada County 2023b)

TABLE 3-6. PROJECTED POPULATION CHANGE IN NEVADA COUNTY

Projected Nevada County Population				
2020	2030	2040	2050	2060
102,241	97,464	94,444	89,649	87,648

Source: (California Department of Finance 2024)

3.7 Economy

3.7.1 Employment

Nevada County is home to 3,230 businesses employing 26,683 people (U.S. Census Bureau 2023).The service-providing sector leads the county in the number of people employed (61.3 percent), followed by the government (19.4 percent) and goods-producing (14.7 percent) sectors (Nevada County Executive Office 2021).

The County's unemployment rate tends to be below the rate for the Sacramento region and has been consistently lower than the California average since 1990, while generally following statewide trends. The rate of unemployment reached its peak in 2010 and steadily declined prior to the COVID-19 pandemic to a level of 3.4 percent (Nevada County Executive Office 2021).

3.7.2 Income

Average annual wages in Nevada County range from $31,293 in food and serving to $104,505 in legal occupations. Per capita income is $39,233 and median household income is $66,096 (Nevada County Executive Office 2021).

3.7.3 Major Institutions

Nevada County's largest industry sectors are government (Nevada County itself has more than 800 employees); health care and social assistance; construction; and retail trade (NoRTEC 2019, Nevada County n.d.). Major employers in the County identified by California's Employment Development Department are as follows (EDD 2024):

- Aja Video
- American Rivers Inc
- B & C Ace Home & Garden Center
- Briarpatch Community Market
- Clear Capital
- Donner Ski Ranch
- Golden Empire Nurse & Rehab
- Interfaith Food Ministry
- Jehovah's Witnesses
- Lodge At Tahoe Donner
- Micro Precision Calibration
- Nevada County Superintendent
- Nevada Irrigation District
- Nevada Union High School
- Raley's
- Robinson Enterprises Inc.
- Safeway
- Sierra Nevada Home Care
- Sierra Nevada Memorial Hospital
- Spring Hill Manor Rehab
- Sugar Bowl Ski Area
- Tahoe Forest Health System Foundation
- Tahoe Forest Hospital District
- Track At Truckee Donner Recreation & Park District

3.7.4 Economic Trends

Significant industries adding the most jobs in Nevada County include other services (except public administration) (+806 jobs); health care and social assistance (+627 jobs); accommodation and food services (+622 jobs); and construction (+499 jobs). The target industries for Nevada County are health care, information technology, manufacturing, and tourism (NoRTEC 2019).

3.8 General Building Stock

3.8.1 Existing Development

For this plan, 57,141 structures were identified from available tax data and spatial data. These structures have a total estimated replacement cost value of $32.8 billion and an estimated contents value of $20.8 billion. Residential buildings make up 71.3 percent of the number of buildings and 69.2 percent of the replacement cost value. Table 3-7 presents building stock statistics by occupancy class for Nevada County.

TABLE 3-7. BUILDING STOCK COUNT AND REPLACEMENT COST VALUE BY OCCUPANCY CLASS

	Count	RCV (Structure + Contents)
Residential		
Grass Valley	4,366	$3,547,551,435
Nevada City	1,918	$1,740,618,117
Truckee	12,316	$12,598,004,855
Unincorporated	22,145	$19,347,077,233
Nevada County (Total)	**40,745**	**$37,233,251,640**
Commercial		
Grass Valley	1,712	$2,952,653,943
Nevada City	608	$850,560,505
Truckee	3,578	$2,993,167,730
Unincorporated	8,440	$5,219,886,542
Nevada County (Total)	**14,338**	**$12,016,268,720**
Industrial		
Grass Valley	188	$881,254,975
Nevada City	25	$88,096,808
Truckee	147	$237,744,705
Unincorporated	44	$153,735,398
Nevada County (Total)	**404**	**$1,360,831,885**
Other[a]		
Grass Valley	144	$696,153,183
Nevada City	68	$295,265,660
Truckee	134	$550,000,030
Unincorporated	1,308	$1,578,952,357
Nevada County (Total)	**1,654**	**$3,120,371,230**

Sources: (Town of Truckee 2023) (Nevada County GIS 2022) (Nevada County GIS 2023b) (Nevada County GIS 2023a) (Microsoft 2020) (Gordian 2024)

a. "Other" occupancy classes include government, religion, agricultural, and education

Figure 3-5 through Figure 3-7 show the value density of residential, commercial, and industrial buildings in Nevada County. Such maps can assist communities in visualizing areas of high loss potential and in evaluating aspects of the study area in relation to specific hazard risks.

The Census data identified 54,546 housing units in the County. A housing unit is a house, apartment, mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters (or if vacant, intended for occupancy as separate living quarters). According to 2023 Census data, 41,415 households are located in Nevada County. A household is the group of all the people who occupy a single housing unit as their usual residence. Roughly 20 percent of housing units in the County are vacant.

Figure 3-5. Residential Building Stock Value Density in Nevada County

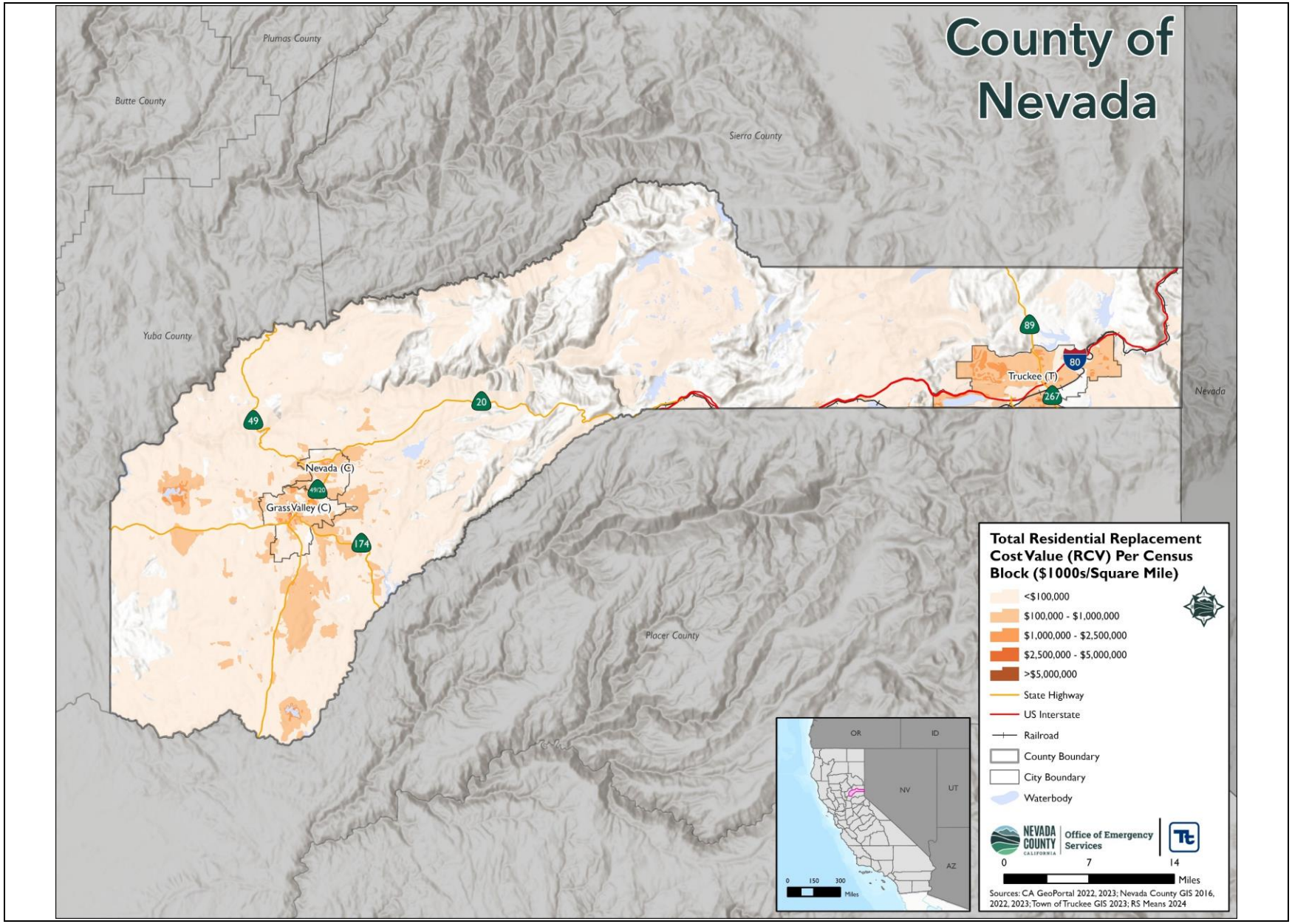


Figure 3-6. Commercial Building Stock Value Density in Nevada County

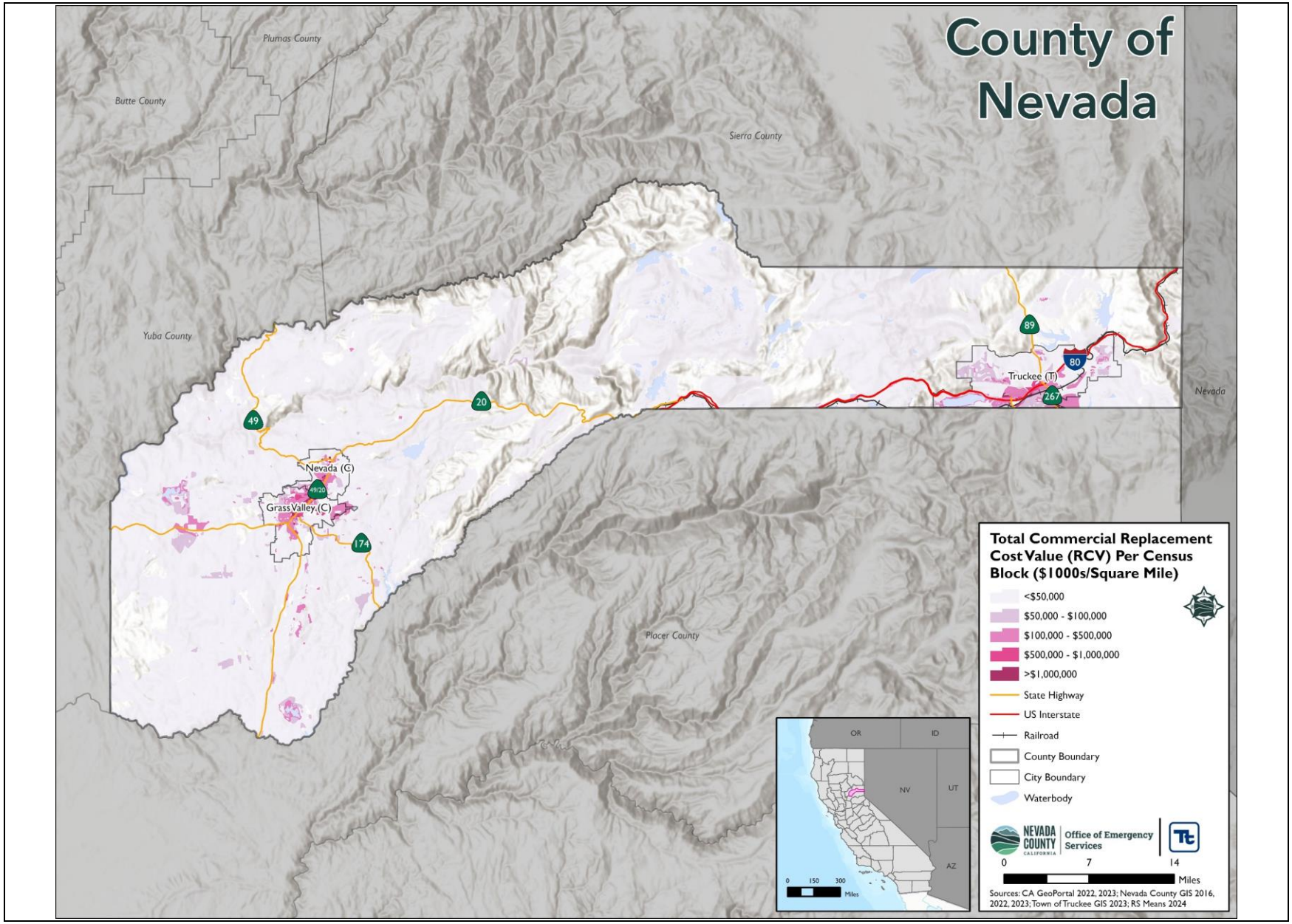
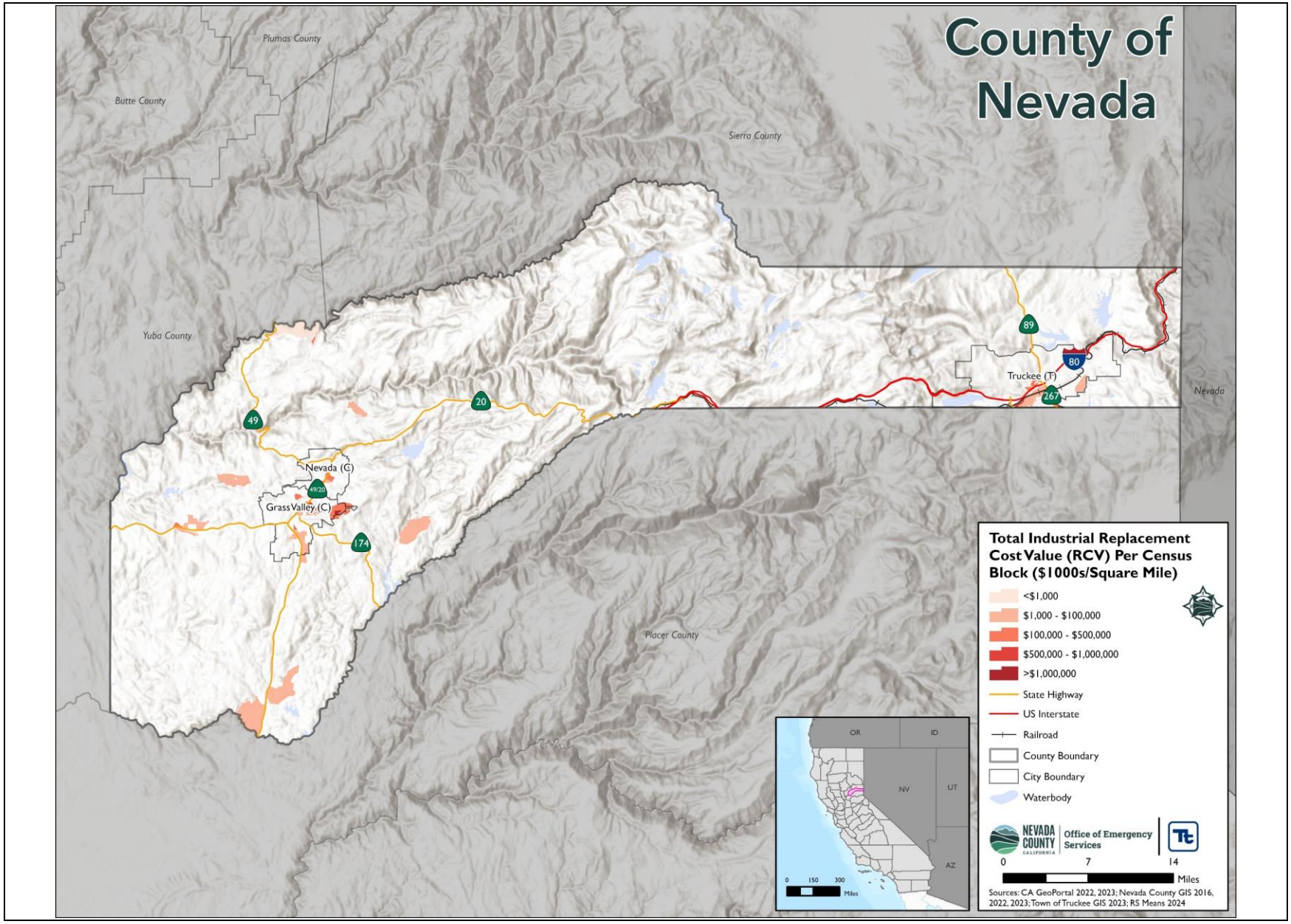


Figure 3-7. Industrial Building Stock Value Density in Nevada County



3.8.2 New Development

For new development, the County uses best available data to avoid potential exposure of development to hazard events. The County intends to discourage development in vulnerable areas (including special flood hazard areas) and areas with high population density and encourage higher regulatory standards at the local level.

Within the last decade, the Higgins Corner-Lake of the Pines Village Center in South County has experienced increased commercial development. Based on recent development proposals, such as the Higgins Marketplace shopping center, this commercial development pattern is expected to continue (Nevada County GIS 2020). Individual development projects are detailed in Volume II under each jurisdictional annex.

Since the previous HMP update, there have been no changes to construction or land use codes, and no significant increases in permitting in potential hazard areas, indicating no significant increase in vulnerability. While the total number of permits has increased, the proportion within the Special Flood Hazard Area (SFHA) remains minimal, reflecting a cautious approach to development in flood-prone areas. Grass Valley has experienced increased construction in Very High Fire Hazard Severity Zones (FHSZ), raising fire risk exposure. The City of Nevada City's risk exposure has remained stable, with most new developments outside high-risk areas, though some projects are on soil contamination sites. The Town of Truckee has seen increased development in FHSZs, emphasizing the need for fire-resistant practices. Nevada Irrigation District (NID), Truckee Donner Public Utility District (TDPUD), and Washington County Water District (WCWD) have not experienced major developments in hazard-prone areas, maintaining stable vulnerability levels. The Nevada County Consolidated Fire District (NCCFD) did not participate in the previous HMP update.

3.9 Community Lifelines

Facilities that are essential to the health and welfare of the population and that maintain essential and emergency functions are designated as critical facilities. These typically include police and fire stations, schools, emergency operations centers, and infrastructure such as roads, bridges and utilities that provide water, electricity, and communications. Facilities that use or store hazardous materials are designated as critical facilities as well. All of these facilities are especially important after any hazard event (FEMA 1997).

FEMA defines some types of critical facilities, as well as public services or activities, as "community lifelines." Community lifelines provide the fundamental services in a community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize lifelines. FEMA defines eight categories of community lifelines as summarized in Table 3-8.

A comprehensive inventory of community lifelines in Nevada County was developed from various sources, including input from the Steering Committee and Planning Partnership. The following sections describe the inventory of community lifelines that was used for the risk assessment in this HMP. Although many lifeline facilities could fall within numerous categories, each lifeline facility identified for this planning effort was categorized according to its primary function.

TABLE 3-8. FEMA-DEFINED CATEGORIES OF COMMUNITY LIFELINES

Community Lifeline Category	Types of Facilities and Services Included
 **Safety and security**	Law enforcement/security, fire service, search and rescue, government service, community safety
 **Food, hydration, shelter**	Food, hydration, shelter, agriculture
 **Health and medical**	Medical care, public health, patient movement, medical supply chain, fatality management
 **Energy**	Power grid, fuel
 **Communications**	Infrastructure, responder communications, alerts warnings and messages, finance, 911 and dispatch
 **Transportation**	Highway/roadway/motor vehicle, mass transit, railway, aviation, maritime
 **Hazardous materials**	Facilities, hazmat, pollutants, contaminants
 **Water systems**	Potable water infrastructure, wastewater management

Source: (FEMA 2024b)

3.9.1 Safety and Security

Figure 3-8 shows the location of safety and security lifeline facilities included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- There are 10 law enforcement facilities, 45 fire department facilities, 3 wildland fire lookouts, and 1 fire control air operations base in Nevada County.
- The California Highway Patrol and Nevada County Sheriff's Office provide law enforcement in Nevada County. Grass Valley, Nevada City, and Truckee operate their own police departments.
- The Nevada County Office of Emergency Services (OES) coordinates with County departments, local cities, and special districts to prevent, protect, mitigate, respond to, and recover from disasters. OES designs and conducts disaster preparedness and response exercises and evaluates emergency staff training. OES maintains the County emergency operations center (EOC). OES coordinates, distributes, and maintains comprehensive emergency management plans. The primary plan maintained and utilized by OES is the Nevada County Emergency Operations Plan (Nevada County n.d.).
- The National Inventory of Dams lists 56 dams in Nevada County (USACE n.d.): 27 high hazard; 1 significant hazard; and 28 low-hazard (see Chapter 7 for details on dams).
- The National Levee Database lists one levee in Nevada County, located in the Town of Truckee along Donner Creek. This levee is minor and provides protection to a single building. It was excluded from the inventory as it was determined not to be a critical facility for Nevada County.
- There are no military installations in Nevada County.

3.9.2 Food, Hydration, Shelter

Figure 3-9 shows the location of food, hydration, and shelter facilities included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- There are over 40 grocery stores in the County for food and hydration needs.
- There are 30 public and private elementary and middle schools, 18 high schools and 1 college in Nevada County. These can function as shelters during emergencies.
- Nevada County has numerous departments, agencies, and programs to support socially vulnerable populations. The Nevada County Health and Human Services Agency provides support to at-risk families including food, health care services, health and wellness, housing assistance for the homeless, and cash assistance. The Nevada County Housing and Community Services Program pursues, secures, and administers state and federal funds to benefit low-income households. The Department of Social Services (DSS) serves County residents needing social, eligibility, or employment and training services (Nevada County n.d.). These groups operate from County government buildings.

Figure 3-8. Safety and Security Lifelines in Nevada County

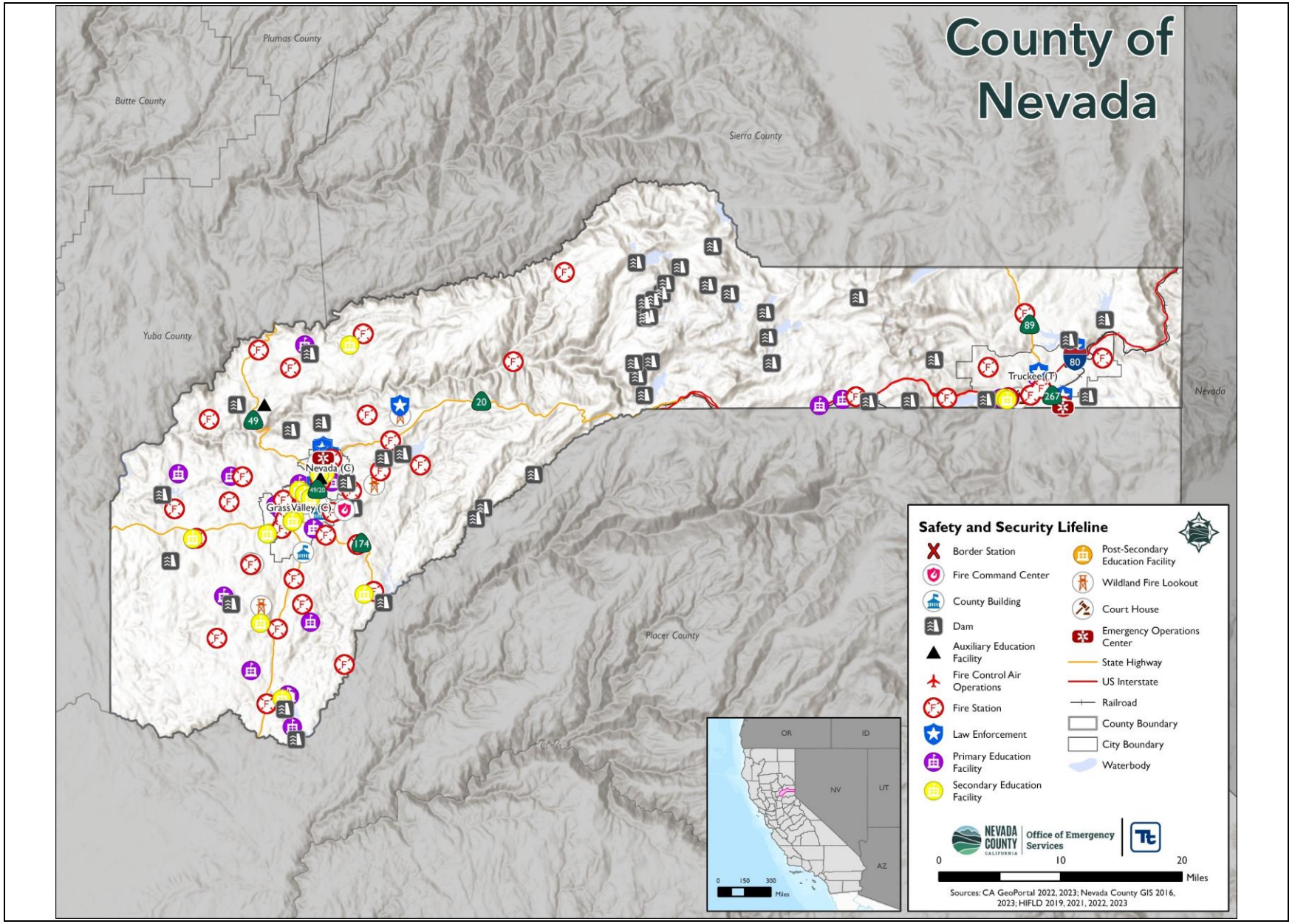
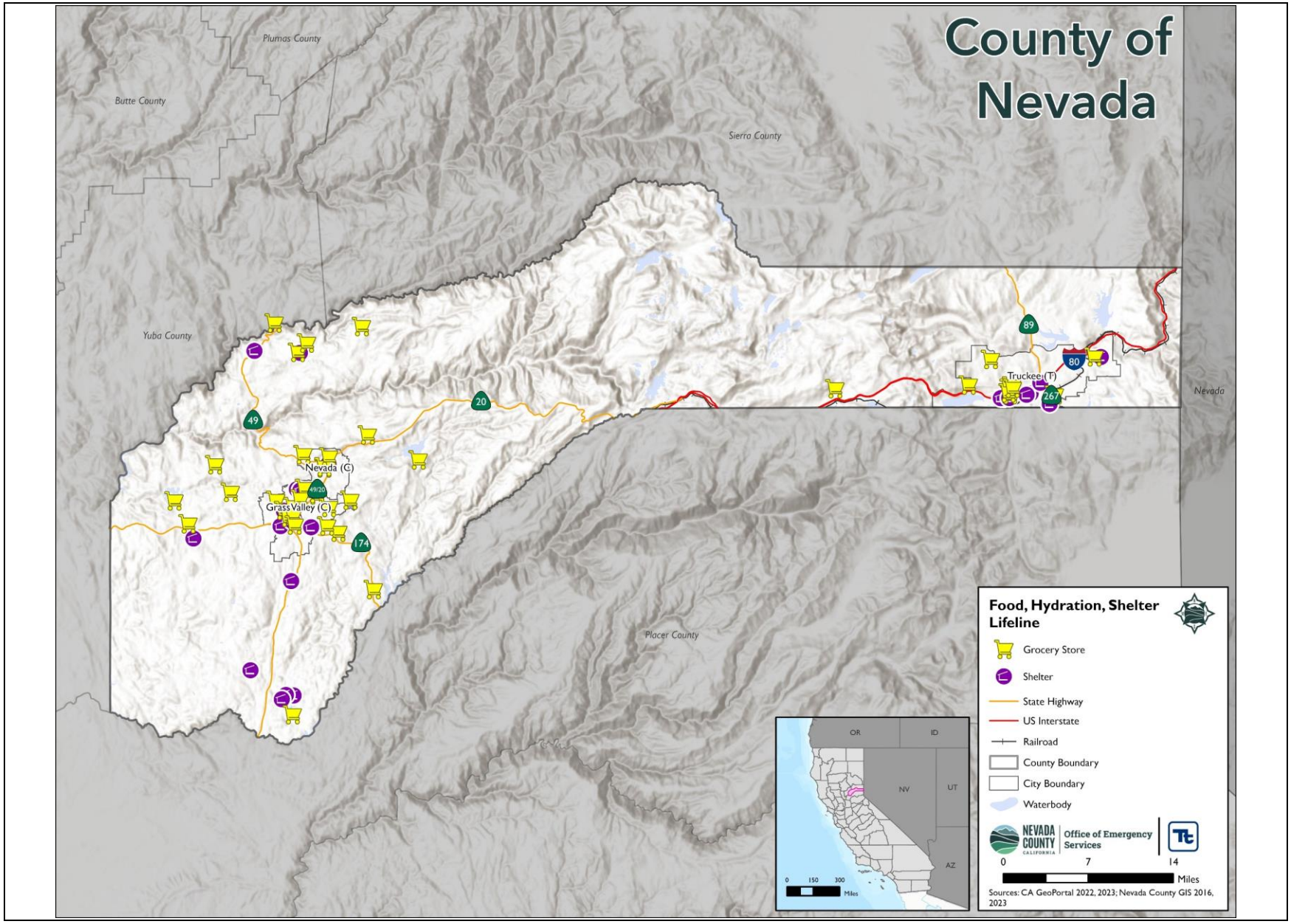


Figure 3-9. Food, Hydration, and Shelter Lifelines in Nevada County



3.9.3 Health and Medical

Figure 3-10 shows the location of health and medical facilities included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- The County has multiple hospitals and health care facilities ranging in size and primary function from smaller community health centers to larger, regional hospitals.
- For non-emergency health care, urgent care centers are located throughout the County.
- The County has a number of pharmacies and rehabilitation facilities.
- Programs and services for the senior population in Nevada County include 10 nursing homes. These facilities are highly vulnerable to impacts from disasters and knowing their location facilitates pre- and post-disaster response planning.

3.9.4 Energy

Figure 3-11 shows the location of energy facilities included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- Gas and electric power are transmitted and distributed by PG&E. Southwest Gas provides gas in eastern Nevada County. NV Energy transmits electric power to eastern Nevada County, which is distributed by Liberty Utilities and Truckee Donner Public Utility District.
- Roughly 10 power plants are in the County, with roughly 30 electrical distribution facilities.
- There are dozens of gas stations and one hydrogen charging station in the County.

3.9.5 Communications

Figure 3-12 shows the location of communications facilities included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- Nevada County OES has capability to alert public officials and the general public of actual or impending emergencies. Resources include the media, internet, and telephones (see Figure 3-13). A County-funded emergency notification system (CodeRED) can send alerts to thousands of residents' landline telephones within minutes (Nevada County OES n.d.)
- The Nevada County EOC is a multi-agency coordination point for emergencies affecting multiple jurisdictions or disciplines. During a disaster, the EOC is the communication link with the operations centers of other County agencies, municipalities, adjacent counties, and state and federal offices. EOC staffing draws from a pool of County employees who have been identified and trained to assume each EOC staff position.
- Communications systems in Nevada County include traditional land line, fiber optic, and cellular service provided by multiple companies, such as AT&T, Verizon, and Comcast. There are 946 communication facilities in Nevada County, including mobile tower, microwave service towers, and private land mobile towers.
- Current broadband speeds and availability in the region still lag behind non-rural counties but are equal to or above average in comparison to similar peer rural Northern California Sierra communities (Nevada County Executive Office 2021).

Figure 3-10. Health and Medical Lifelines in Nevada County

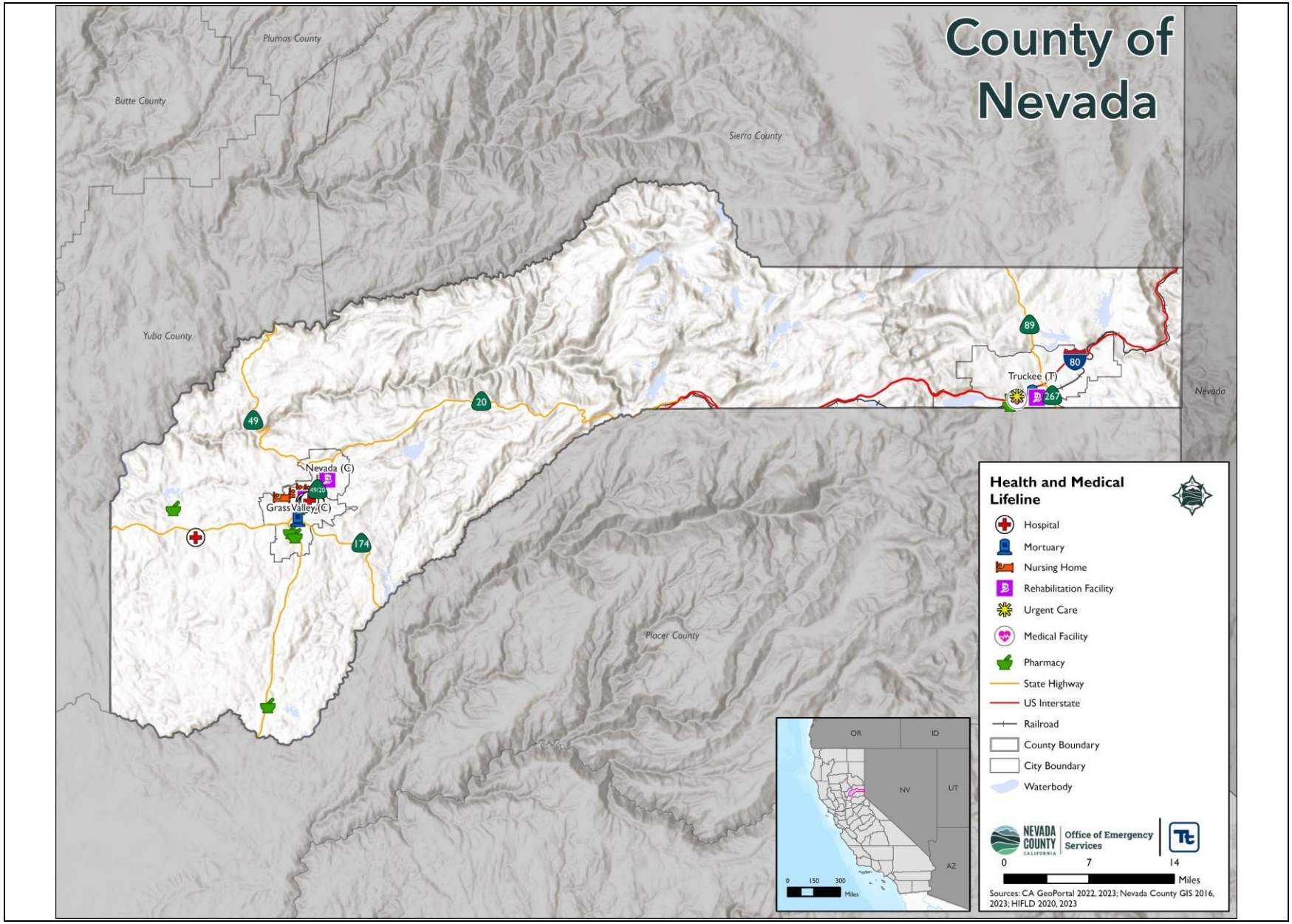


Figure 3-11. Energy Lifelines in Nevada County

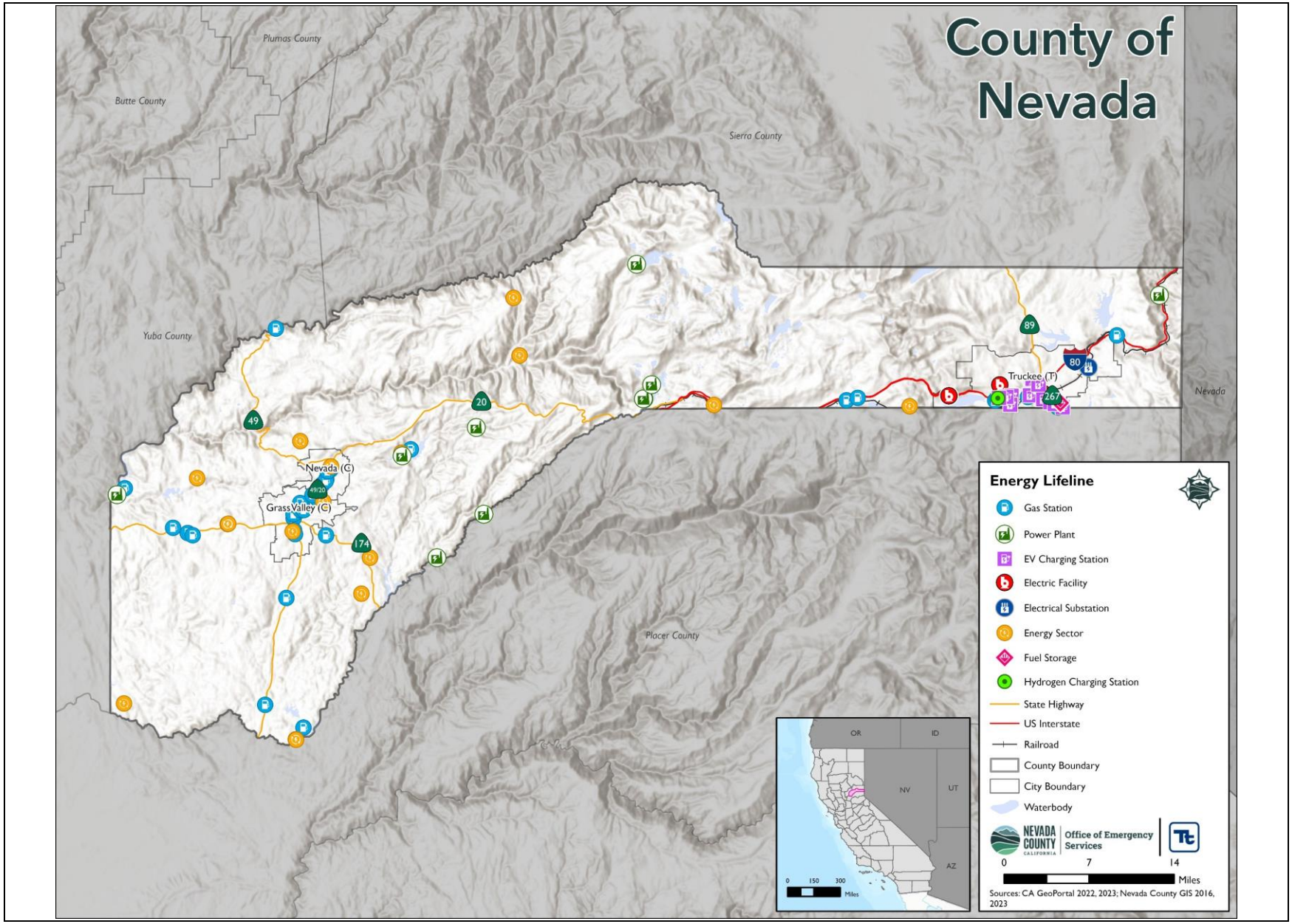


Figure 3-12. Communications Lifelines in Nevada County

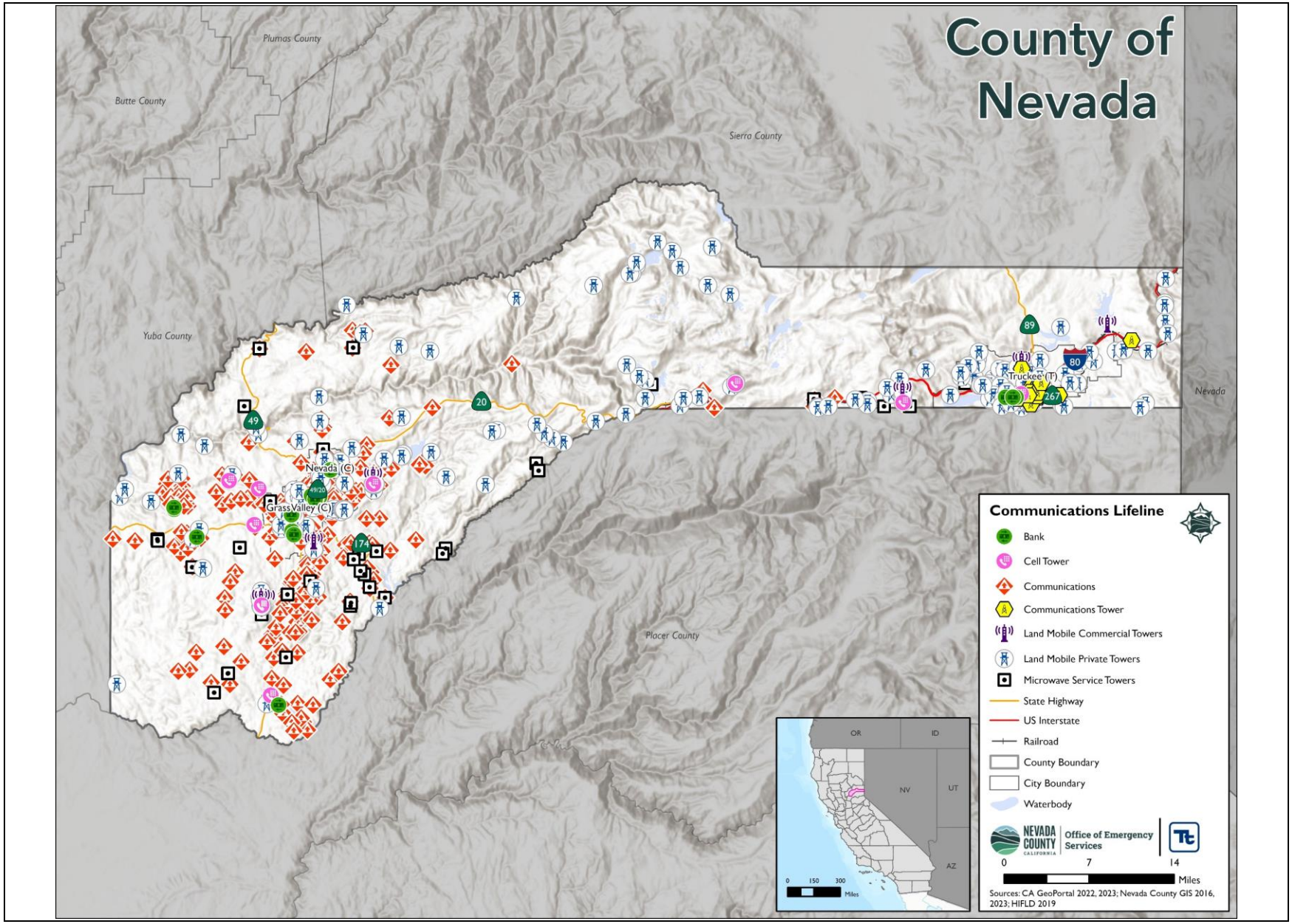


Figure 3-13. Emergency Alert Systems in Nevada County

TYPE OF EMERGENCY ALERT	DESCRIPTION	HOW TO GET IT
CodeRED Emergency Alert	Landline and cell calls, emails, texts for emergencies impacting your home address.	**Registration required.** Register online at ReadyNevadaCounty.org on the Emergency Alerts tab or call 2-1-1 or 1-833-DIAL211.
CodeRED Mobile Alert App	Push notifications to your smartphone for emergencies within 25 miles of your current location.	**Download required.** Visit your app store and search for CodeRED Mobile Alert.
Genasys Protect App	With the Genasys Protect mobile app, follow a zone or turn on your location to get notified about danger wherever you are.	**Download required.** Visit your app store and search for Genasys Protect.
Wireless Emergency Alert	Notification to your cellphone based on location.	**No registration required.** This alert is issued by local government as part of the Integrated Public Alert & Warning System.
Emergency Alert System	Alerts radio listeners and TV viewers.	**No registration required.** This alert is issued by local government as part of the Integrated Public Alert & Warning System.
Hi-Lo Siren	Alerts neighborhoods of an Evacuation Order using a European-style, two-tone siren.	Law enforcement will go door to door when Evacuation Orders have been issued.

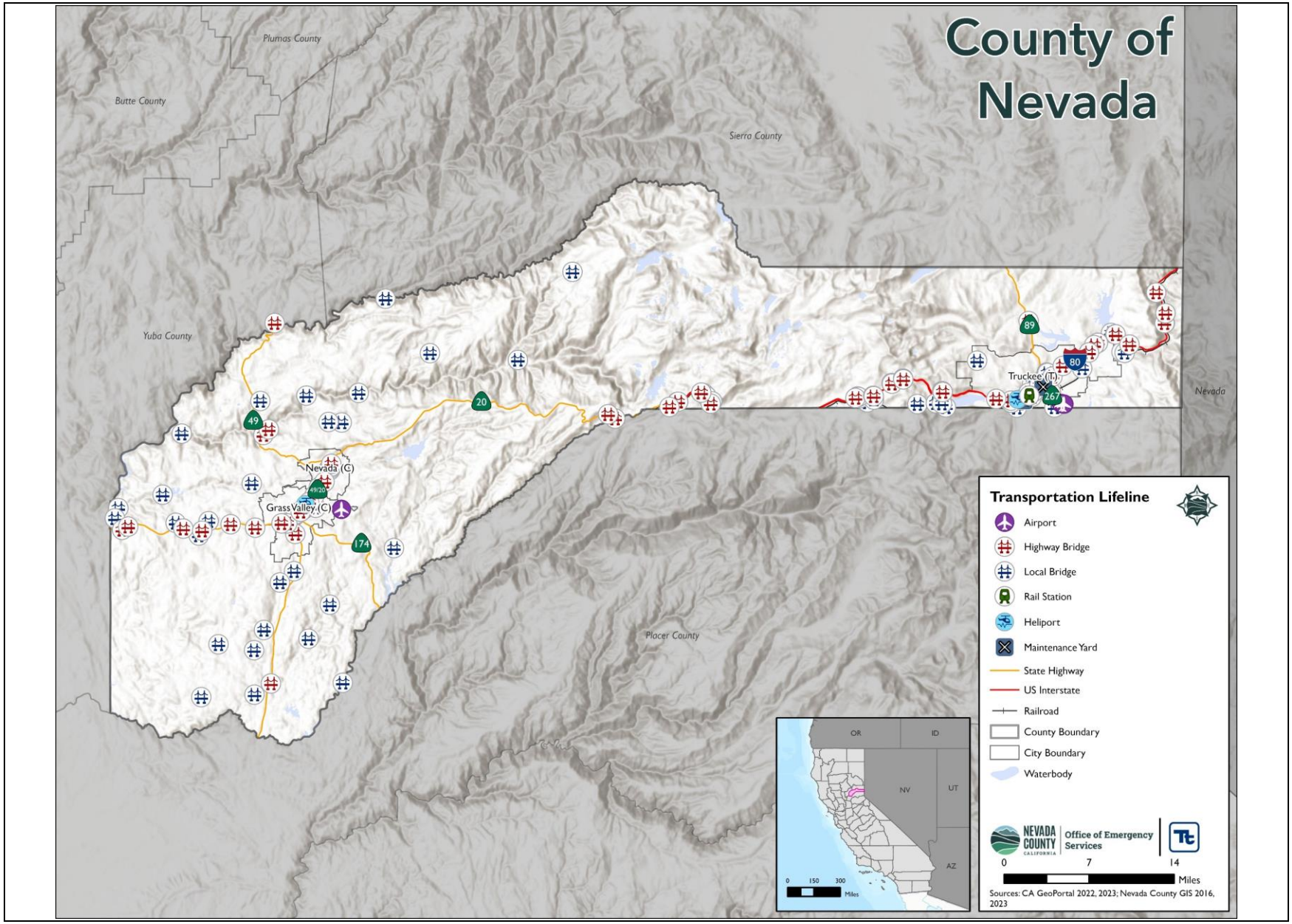
Source: (Nevada County OES n.d.)

3.9.6 Transportation

Figure 3-14 shows the location of transportation facilities in Nevada County included in the lifelines inventory. Key facilities and services considered for the inventory under this category are as follows:

- Transportation in and around Nevada County includes highway, rail, air, bus, and increasingly, cycling and pedestrian.
- The County maintains nearly 600 miles of roads and highways.
- Interstates, freeways, highways, and other principal arterial routes serve as the primary means of egress during an evacuation from the County and ingress for emergency personnel. Routes designated as minor arterial and major collector routes supplement the primary evacuation routes and provide egress from local neighborhood and communities (Nevada County GIS 2020).

Figure 3-14. Transportation Lifelines in Nevada County



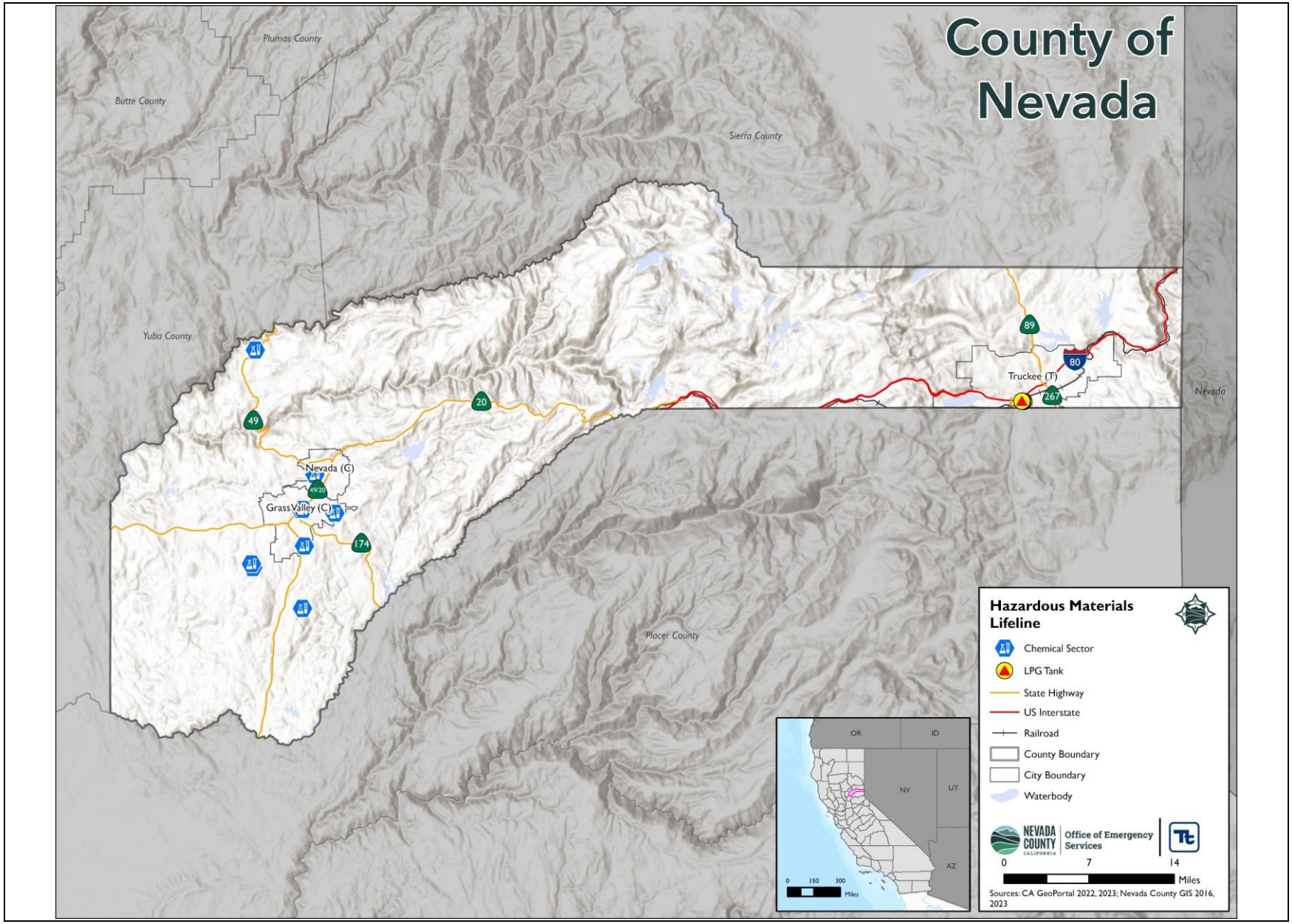
- Over 17,000 commuters enter or leave the County daily for work. The top destination out for work is Placer County (6,170), followed by Sacramento County (1,732), and Washoe County, Nevada (844). Typical commute times are 30 minutes to Placer, 2 hours to Washoe, and nearly 4 hours to parts of the Sacramento Valley (Nevada County Executive Office 2021).
- Nevada County Connects provides local and regional fixed-route bus service to the municipalities and unincorporated areas of western Nevada County, including Nevada City, Grass Valley, Penn Valley, Rough and Ready, Lake Wildwood, Alta Sierra, Lake of the Pines, and the regional hub at the Auburn Amtrak station.
- There are bus routes for Greyhound and connections to neighboring county bus systems.
- Gold Country Lift is a paratransit bus company that provides door to door service for seniors and persons with disabilities in Grass Valley, Nevada City, and Penn Valley.
- There is one Amtrack rail station, in the Town of Truckee. The rail line runs along the Truckee River in the eastern end of the County.
- The Truckee Tahoe Airport straddles Nevada County and Placer County 2 miles east of the Town of Truckee. The Airport is managed by the Truckee Tahoe Airport District, a bi-county special district (Truckee Tahoe Airport District n.d.).
- There is no commercial air service from the Nevada County Airport, but charter flights are available (Nevada County n.d.).
- There is a private airport (Alta Sierra Airport) south of Grass Valley.

3.9.7 Hazardous Materials

Figure 3-15 shows the location of hazardous materials facilities in Nevada County included in the lifelines inventory. Due to security concerns, local hazardous materials lifeline data was only partially obtained. Key facilities and services considered for the inventory under this category are as follows:

- The U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation and Liability Information System Public Access Database reports one Superfund site in Nevada County—the 33-acre Lava Cap Mine. Superfund sites are locations requiring a long-term response to clean up contamination. The Lava Cap Mine is a former gold mine in Nevada City. Cleanup is ongoing, with a cap completed on site in 2006 (U.S. EPA 2023c).
- As of 2023, the Lava Cap Mine site is the only site in Nevada County listed on the federal National Priorities List (NPL). Abandoned hazardous waste sites on the NPL include those that the EPA has determined present “a significant risk to human health or the environment.”
- The majority of the hazardous waste stream in Nevada County is generated by small quantity generators. The major hazardous waste stream is waste oil. Miscellaneous waste, such as asbestos, metal dust, and chemical toilet waste, is another major group. Other groups include non-halogenated solvents, dye and paint sludges, resins, and non-metallic inorganic liquids.
- The Nevada County Department of Environmental Health maintains a complaint site list of contaminated sites within Nevada County. The most commonly found form of groundwater contamination on this list results from hydrocarbons (gasoline, diesel, and other fuels) (Nevada County GIS 2020).

Figure 3-15. Hazardous Material Lifelines in Nevada County



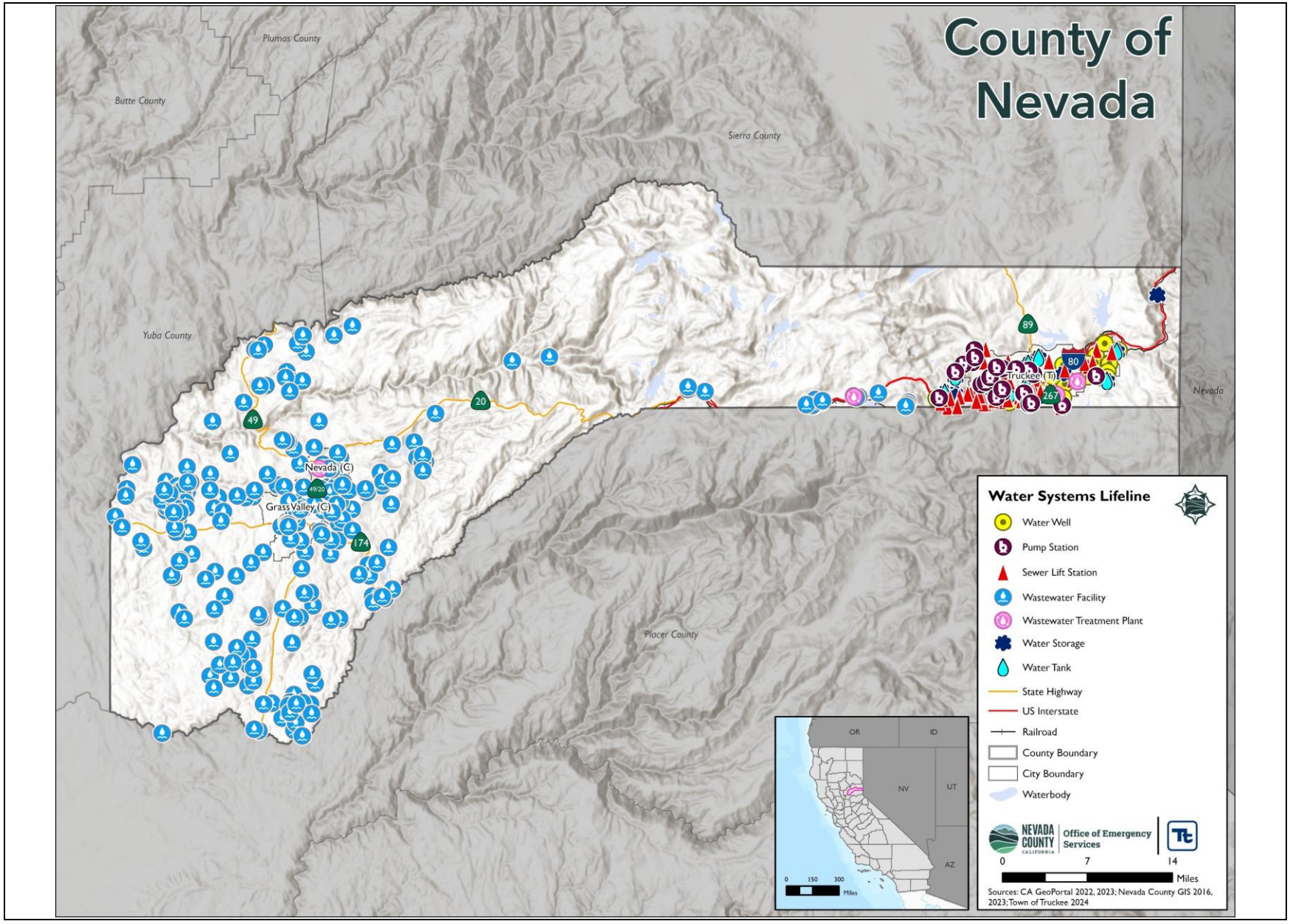
- Interstate 80, the Union Pacific Railroad, and the Kinder Morgan petroleum pipeline are the major transportation routes by which hazardous materials are transported through the County.
- Interstate 80 weaves in and out of the County from the State Route 20 interchange to the Nevada state line. It is within this corridor that the incident of an accidental release of hazardous material is most likely to occur. Traffic volumes, the winding character of the Interstate, and snow and ice make this corridor especially dangerous in winter.
- The remoteness of Nevada County from outside help increases the risk associated with a major hazardous materials incident. In the event of a hazardous materials spill, assistance from areas outside the County could be unavailable for a period of 1 to 4 hours (Nevada County GIS 2020).

3.9.8 Water Systems

Figure 3-16 shows the location of water system facilities in Nevada County included in the lifelines inventory. Due to security concerns, water system lifeline data was only partially obtained. Key facilities and services considered for the inventory under this category are as follows:

- Water wells are commonly used as the only potable water supply in Nevada County. A small water system is defined as water for human consumption that has 15 or more service connections or regularly served at least 25 individuals at least 60 days out of the year.
- Nevada County Environmental Health Department regulates the construction, modification, and destruction of water wells throughout the County in order to protect groundwater resources.
- Through the Local Primacy Agency under contract with the State Water Resources Control Board, Nevada County ensures that small water systems deliver safe, adequate, and dependable potable water (Nevada County n.d.)
- By population percentage, 99 percent of Nevada City, 100 percent of Grass Valley, 91 percent of the Town of Truckee, and 19 percent of the unincorporated areas of the County have treated wastewater (Nevada County Executive Office 2021).
- Currently, the majority of the outlying unincorporated areas rely on private septic wastewater treatment systems. The Sanitation District provides wastewater treatment in the unincorporated areas of Western Nevada County. A regionalization project has been completed to expand wastewater treatment to the Penn Valley area.

Figure 3-16.Water Systems Lifelines in Nevada County



3.10 Natural, Historic and Cultural Resources

Nevada County is rich with natural resources, historic locations, and cultural resources, events, and facilities. These include four California State Parks (Go Nevada County 2024b):

- South Yuba River State Park—This park covers 11,000 protected acres along a scenic 20-mile stretch of dramatic granite-carved river canyons and turquoise green water. The park encompasses four historic crossings. The headquarters in Bridgeport includes a ranger station and visitor center, beaches, and wildflower trails with guided tours. The newly restored Bridgeport wooden covered bridge is the longest single-span covered bridge in the world.
- Malakoff Diggins State Historic Park—This 3,500-acre park features a massive abandoned hydraulic mine, miles of forested trails, a fishing pond, a campground, and a charming ghost town known as North Bloomfield.
- Donner Memorial State Park—This park sits at the heart of the ancestral Washoe homeland in the scenic Sierra Nevada mountain range at an elevation of about 6,000 feet. This alpine park offers summer camping, picnicking, boating, fishing, water-skiing and hiking. During winter, visitors can cross-country ski, snowshoe on trails, and play in the snow.
- Empire Mine State Historic Park—This park in Grass Valley preserves what was once the richest hard rock gold mine in California. Between 1850 and its closure in 1956, the Empire Mine produced 5.8 million ounces of gold, extracted from 367 miles of underground passages.

Most of the County east of Nevada City lies within the Tahoe National Forest, which includes more than 850,000 acres of public land intermixed with 350,000 acres of private land. Many miles of roads and trails on the forest offer recreational opportunities (U.S. Forest Service n.d.).

Regular events and festivals in the County include the Nevada City Film Festival, numerous farmers markets, the Nevada County Fair, the California Worldfest music festival, Thursday Night Markets in Grass Valley, and Friday Artwalks in Nevada City (Go Nevada County 2024a).

PART 2:
RISK ASSESSMENT

4. Risk Assessment Methodology and Tools

A risk assessment is the process of evaluating the potential loss of life, personal injury, and economic and property damage that could result from hazard events. Identifying potential hazards and vulnerable assets allows planning personnel to find ways to reduce hazard impacts and allows emergency management personnel to establish early response priorities. Results of the risk assessment are used in subsequent mitigation planning processes, including developing mitigation strategies to reduce each jurisdiction's risk from each hazard. The process focuses on the following elements:

- **Identify Hazards of Concern**—Use all available information to determine what types of hazards may affect a jurisdiction.
- **Profile Each Hazard**—Understand each hazard in terms of:
  - Location—Geographic area most likely to be affected by the hazard
  - Extent—The potential severity of each hazard
  - Previous occurrences and losses
  - Probability of future hazard events (including impacts of climate change)
  - Cascading impacts—Secondary consequences of the hazard and other hazards that may cause or result from the hazard
- **Assess Vulnerability and Impact**—Use best available information to identify populations and assets that are at risk from the hazard and to estimate the hazard's potential adverse impacts on them:
  - Determine vulnerability—Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
  - Estimate potential impacts—Assess the impact of hazard events on the people, property, economy, and environment of the region, including estimates of the cost of potential damage or cost that can be avoided by mitigation.
- **Evaluate Future Changes That May Affect Vulnerability and Impacts**—Analyze how demographic changes, projected development and climate change impacts can alter current vulnerability and potential impacts.

4.1 Asset Inventories

The following types of Nevada County assets were identified to assess potential vulnerability and impacts associated with the hazards of concern: population, buildings, critical facilities/community lifelines, the environment, and new development. Each asset type is described below. For privacy

The risk assessment included the development of an enhanced asset inventory to estimate hazard vulnerability and impacts.

and security consideration, information on properties assessed is presented in aggregate, without details about specific individual personal or public properties.

4.1.1 Population

The 2020 Decennial Census and 2018-2022 American Community Survey (ACS) 5-year estimate were used to assess the vulnerability of and potential impacts on the County's population:

- The 2020 U.S. Census data included in FEMA's Hazus program was used to estimate potential population impacts from flood and seismic events—specifically, shelter needs and injuries.
- ACS data was used to estimate vulnerable populations in Nevada County—specifically, children, older people, those living below the poverty level, non-English speaking individuals, and persons with a disability.

Population counts at the jurisdictional level were averaged among the residential structures in the County to estimate the population at the structure level. This provides a more precise distribution of population across the County compared to using only the Census block or Census tract boundaries. Limitations of these analyses are recognized, but the results are acceptable for planning purposes.

4.1.2 Buildings

Building Footprints and Attributes

A custom general building stock was created using 2022 parcel address provided by Nevada County (Nevada County GIS 2022), 2023 parcel tax assessor information provided by Nevada County (Nevada County GIS 2023b), in addition to inventory data provided by the Town of Truckee (Town of Truckee 2023) and building footprints provided by Microsoft (Microsoft 2020). Building attributes—such as year built, number of stories, basement type, occupancy class, and square footage—were updated using the parcel tax assessor information; inventory data supplied by the Town of Truckee was used as-is. The centroid of each building footprint was used to estimate the building location.

Occupancy Class

The occupancy classes available in Hazus were condensed into the categories of residential, commercial, industrial, and "other" (agricultural, religious, governmental, and educational) to facilitate analysis and presentation of results. The residential class includes both multi-family and single-family dwellings.

Building Value

Replacement cost value (RCV) is the cost of returning a completely damaged structure to its pre-damaged condition using present-day costs of labor and materials. Total RCV consists of both the structural cost to replace a building and the estimated value of contents of the building.

Structural RCV was calculated for each building using the assessor data, the building footprint, and 2024 RSMeans values. Content value was estimated as 50 percent of the RCV for residential buildings

and 100 percent of the RCV for non-residential buildings. The inventory used the following location factors based on zip code:

- Zip codes beginning in 942, 956-958:
  - Residential location factor = 1.16
  - Non-Residential location factor = 1.11
- Zip codes beginning in 959:
  - Residential location factor = 1.16
  - Non-Residential location factor = 1.12
- Zip codes beginning in 961:
  - Residential location factor = 1.18
  - Non-Residential location factor = 1.18

4.1.3 Critical Facilities and Community Lifelines

A critical facility inventory, which includes essential facilities, utilities, transportation features and user-defined facilities, was created by the Planning Partnership. The development involved a review for accuracy, additions, or deletions of new or moved critical assets, identification of backup power for each asset (if known) and whether the critical facility is considered a lifeline in accordance with FEMA's definition.

A lifeline provides indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security (FEMA).

4.1.4 Environment and Land Use

National data provided by the U.S. Geological Survey (USGS) in 2021 was used to assess land cover characteristics of the County. This dataset was converted from a raster to vector polygons to define boundaries of built and natural land cover areas. Built-up areas (developed open space and low, medium, and high intensity locations) were categorized as urban areas. Non-urban areas were categorized as agricultural, barren land, forest, rangeland, water, or wetlands.

4.1.5 New Development

Integrating anticipated new development into the risk assessment provides information to consider when developing the mitigation strategy to reduce vulnerabilities in the future. Each Planning Partner jurisdiction was asked to provide a list by address of major development over two timeframes: developed over the last 5 years; and anticipated in the next 5 years. New development is listed in each jurisdictional annex in Volume II.

4.2 Previous Events and Probability of Occurrence

Based on records of previous hazard events and consideration of potential future changes that could affect the frequency of future events, the risk assessment for each hazard assigns a rating for the probability of occurrence of that hazard in the future. The following were the primary sources for identifying previous occurrences:

- Federal disaster declarations—Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can manage without assistance from the federal government. The federal government established the disaster declaration process in the 1950s. Initially, declarations applied to entire states. Beginning in 1969, the process was refined to specify the individual counties affected by each declaration.
- California governor's emergency proclamations—The governor of California is authorized to proclaim an emergency statewide or at local levels. Such proclamations trigger emergency powers and assistance programs. The governor can issue an emergency proclamation when a state of emergency exists, defined in state code as conditions of disaster or extreme peril to people and property that are of a magnitude to be beyond the control of individual local governments. Emergency proclamations are a prerequisite when requesting a federal disaster declaration (Cal OES 2022).
- U.S. Department of Agriculture disaster declarations—The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in contiguous counties.
- Hazard-specific databases—Sources that provide records of specific types of hazard events include the National Centers for Environmental Information's Storm Events Database, the National Integrated Drought Information System's U.S. Drought Monitor, and the U.S. Geological Survey's Earthquake Catalog.
- News reports and previously published planning documents such as the California State Hazard Mitigation Plan and the previous Nevada County HMP.

The probability of occurrence ratings were assigned as follows:

- Unlikely—Less than 1 percent annual probability of a hazard event occurring.
- Rare—Between 1 and 10 percent annual probability of a hazard event occurring.
- Occasional—Between 10 and 100 percent annual probability of a hazard event occurring.
- Frequent—Likelihood that a hazard event will occur multiple times per year.

4.3 Methodology for Assessing Vulnerability and Impact

Nevada County used standardized tools, combined with local, state, and federal data and expertise, to assess vulnerability and potential losses associated with hazards of concern. Three levels of analysis were used, depending upon the data available for each hazard:

- **Historical Occurrences and Qualitative Analysis—**This analysis includes an examination of historical impacts to understand potential impacts of future events of similar size. Potential impacts and losses are discussed qualitatively using best-available data and professional judgment.
- **Vulnerability Analysis—**This analysis for hazards with defined locations uses geographic information system (GIS) tools to overlay available spatial hazard layers on asset mapping and determine which assets are in the impact area of the hazard.

- **Loss Estimation**—The FEMA Hazus modeling software was used to estimate potential losses for the following hazards: flood and earthquake.

Table 4-1 summarizes the type of analysis conducted by hazard of concern. Where vulnerability analyses and loss estimates are broken down by local jurisdiction, the mapping of those jurisdictions uses the County's defined community boundaries (see Section 3.3) rather than city limits.

TABLE 4-1. SUMMARY OF RISK ASSESSMENT ANALYSES

Hazard	Population	General Building Stock	Critical Facilities
Avalanche	V	V	V
Dam Failure	V, H	V, H	V, H
Drought	Q	Q	Q
Earthquake	V, H	V, H	V, H
Extreme Temperatures	Q	Q	Q
Flood	V, H	V, H	V, H
Hazardous Materials Release	Q	Q	Q
Landslide	V	V	V
Volcano	Q	Q	Q
Winter Storm	Q	Q	Q
Wildfire	V	V	V

Notes: V = Vulnerability analysis; H = Hazus analysis; Q = Qualitative analysis

4.3.1 Hazus

Hazus is a software tool developed by FEMA that estimates damage and loss using calculations developed by hazard and information technology experts. The use of this software promotes consistency of data output and standardization of data collection and storage. Its methodologies are accepted by FEMA and provide a consistent framework for assessing risk from a variety of hazards.

Hazus uses GIS technology to produce maps and analytical reports that estimate direct physical damage to buildings, critical facilities, transportation systems, and utility systems. The software incorporates default data for inventory, vulnerability, and hazards. The default data can be supplemented with local data for a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. Hazus' open data architecture can be used to manage local GIS data in a central location.

Three levels of analysis can be conducted using the Hazus software:

- **Level 1**—Hazus provides hazard and inventory data with minimal outside data collection or mapping.
- **Level 2**—Analysis involves augmenting the Hazus-provided hazard and inventory data with more recent or detailed local data for the study region
- **Level 3**—Analysis involves adjusting the built-in loss estimation models used for the hazard loss analyses. This level is typically done in conjunction with the use of local data.

For this HMP, modeled losses were estimated in Hazus using depth grids for the flood analysis and probabilistic analyses were performed to develop expected or estimated distribution of losses (mean return period losses) for seismic hazards. The probabilistic model generates estimated damage and loss for specified return periods (e.g., 100- and 500-year).

4.3.2 Hazard-Specific Assessment Approaches

Avalanche

A vulnerability analysis was conducted for the County's assets (population, building stock, critical facilities) using avalanche hazard data provided by the Town of Truckee (2023). Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from an avalanche event. This data was only available within the Town of Truckee.

Dam Failure

A vulnerability analysis was conducted for the County's assets (population, building stock, critical facilities) using data provided by the Division of Safety of Dams and the National Inventory of Dams. The following high-hazard and extremely-high-hazard dams were used in the analysis: Lake Angela; Lake Fordyce; French Lake; Faucherie; Jackson Meadows; Bowman; Lake Spaulding; Scotts Flat; Deer Creek Division; Loma Rica Airport; Anthony House; Swan; Magnolia; Combie; Rollins; Kidd Lake; Lower Peak; Upper Peak; and Martis Creek. The mapped dam failure inundation areas of these dams were merged into a single dam inundation layer. Assets with their centroid located in the hazard area were totaled to estimate the number and value of assets at risk from impacts of a dam failure event.

Potential impacts were estimated using a Level 2 Hazus riverine flood analysis with the combined depth grids of the dams listed above, apart from Lake Fordyce, French Lake, Lake Spaulding, Loma Rica, Kidd Lake, Lower Peak, and Upper Peak. These dams were left out of the analysis due to lack of depth data availability.

Drought

All of Nevada County is at risk from the impacts of drought events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Earthquake

A Level 2 Hazus analysis to estimate damage and losses included two parts:

- A probabilistic assessment for the 100-year mean return period event—The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes, and computes the probable ground shaking that may be experienced during a defined period by Census tract. The default assumption is a magnitude 7.0 earthquake.
- A deterministic assessment of the Polaris ShakeMap with a magnitude of 6.8—Data obtained from USGS was used as the basis for this assessment.

Damage estimates were calculated for losses to buildings (structural and non-structural) and contents. Structural losses are for damage to load-carrying components of the structure. Non-structural losses include those to mechanical and electrical components (HVAC systems, boilers, etc.) and architectural elements such as nonbearing walls, veneer and finishes.

Although damage was estimated at the census tract level, results were presented at the municipal level. Because there are multiple Census tracts that contain more than one jurisdiction, an area analysis was used to extract the percent of each tract that falls within individual jurisdictions. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Extreme Cold

All of Nevada County is at risk from the impacts of extreme cold events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Extreme Heat

All of Nevada County is at risk from the impacts of extreme heat events. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Flood

The 1 percent and 0.2 percent annual chance flood events were examined to evaluate the County's risk from the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as NFIP.

To estimate vulnerability, the 1 percent and 0.2 percent annual chance flood boundaries were overlaid on the centroids of updated assets (population, building stock, critical facilities, and new development). The hazard area boundaries were taken from FEMA's effective Digital Flood Insurance Rate Map (DFIRM) for Nevada County, dated February 3, 2010, with a latest revision date of June 12, 2023. Centroids that intersected the flood boundaries were totaled to estimate the building RCV and population vulnerable to the flood inundation areas.

To estimate potential losses for the 1 percent and 0.2 percent annual chance flood events, flood depth grids based on the DFIRM and data from USGS's 1-meter-resolution Digital Elevation Model from 2023 were integrated into the Hazus riverine flood model. The critical facility and building inventories were

formatted to be compatible with Hazus and its Comprehensive Data Management System. Buildings located within the floodplain were imported as user-defined facilities to estimate potential losses to the building stock at the structural level. A Level 2 Hazus riverine flood analysis calculated the estimated potential losses to the population (default 2020 U.S. Census data across dasymetric blocks), potential damage to the general building stock, and potential damage to critical facility inventories based on the default Hazus damage functions in the flood model.

Hazardous Materials

All of Nevada County is at risk from the impacts of hazardous materials. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Landslide

The County's assets (population, buildings, critical facilities) were analyzed to determine vulnerability to mapped post-fire debris flow hazard areas and to moderate, high, and very high landslide susceptibility hazard areas. The vulnerability analysis used landslide susceptibility data from the California Department of Conservation (California Department of Conservation 2020) and 2022 post-fire debris flow data from USGS and Cal OES. Assets with their centroid located in the hazard areas were totaled to estimate the numbers and values at risk from this hazard.

Volcano

The primary risk to Nevada County from volcano is ashfall and air quality, and these risks are not location-specific across the county. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

Wildfire

Wildfire data provided by Nevada County (2023) was used to delineate wildfire hazard priority areas across the County for two fire scenarios: fuel-driven and wind-driven. To identify assets exposed to wildfire, asset inventory GIS data were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from the impacts of a wildfire event.

Winter Storm

All of Nevada County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, but not building content. Current modeling tools are not available to estimate specific losses for this hazard. A qualitative analysis was conducted to assess the County's vulnerability to this hazard of concern.

4.4 Data Source Summary

Table 4-2 summarizes the data sources used for the risk assessment for this plan.

TABLE 4-2. RISK ASSESSMENT DATA DOCUMENTATION

Data	Source	Date	Format
Population data	U.S. Census Bureau Decennial Census; American Community Survey 5-Year Estimates	2020; 2018-2022	.csv
Building inventory	Nevada County GIS; Town of Truckee; Microsoft	2022, 2023; 2023; 2020	Digital (GIS)
Critical facilities and lifelines	Nevada County Planning Partnership and County Jurisdictions; Town of Truckee; California State Geoportal; Homeland Infrastructure Foundation-Level Data	2016, 2022; 2024; 2023; 2017, 2019-2023	Digital (GIS)
Flood hazard areas	FEMA Digital Flood Insurance Rate Maps	2010	Digital (GIS)
1-meter digital elevation model	USGS	2023	TIFF
Avalanche hazard zones	Town of Truckee	2023	Digital (GIS)
Dam inundation area	Division of Safety of Dams; National Inventory of Dams		TIFF; Digital (GIS)
Polaris ShakeMap M6.8	USGS	2017	Digital (GIS)
Post-fire debris flow	Cal OES; USGS	2022	Digital (GIS)
Susceptibility to deep-seated landslides	California Department of Conservation	2018	Digital (GIS)
Wildfire hazard areas	Nevada County	2023	Digital (GIS)

Notes: Cal OES = California's Governor's Office of Emergency Services; FEMA = Federal Emergency Management Agency; USGS = U.S. Geological Survey

4.5 Limitations

Loss estimates, vulnerability analyses, and hazard-specific impact evaluations rely on the best-available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct such a study
- Incomplete or dated inventory, demographic, or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed by the participating jurisdictions
- The amount of advance notice residents have to prepare for a specific hazard event
- Uncertainty of climate change projections

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential vulnerability and loss estimates are approximate. These results do not predict

precise results and should be used to understand relative risk. Over the long term, Nevada County will collect additional data and update and refine existing inventories to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock using best-available data. The County acknowledges significant impacts may occur to critical facilities and infrastructure as a result of these hazard events causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure, and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industry such as tourism and the real-estate market were not analyzed.

As noted in FEMA's 2020 Hazus Earthquake User Manual, "*Although the software offers users the opportunity to prepare comprehensive loss estimates, it should be recognized that uncertainties are inherent in any estimation methodology, even with state-of-the-art techniques. Any region or city studied will have an enormous variety of buildings and facilities of different sizes, shapes, and structural systems that have been constructed over a range of years under diverse seismic design codes. There are a variety of components that contribute to transportation and utility system damage estimations. These components can have differing seismic resistance.*" However, Hazus' potential loss estimates are acceptable for the purposes of this HMP.

4.6 Considerations for Mitigation and Next Steps

The following items are to be discussed for considerations for the next plan update to enhance the risk assessment:

- All Hazards
  - Create an updated user-defined general building stock dataset using up-to-date parcels, footprints, and RSMeans values.
  - Utilize updated and current demographic data.
- Earthquake
  - Identify unreinforced masonry in critical facilities and privately owned buildings (i.e., residences) by accessing local knowledge, tax assessor information, and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response or recovery efforts at these properties can be developed.
- Extreme Temperatures
  - Track extreme temperature data for injuries, deaths, shelter needs, pipe freezing, agricultural losses, and other impacts to determine distributions of most at-risk areas.
- Flood
  - The general building stock inventory can be updated to include attributes regarding first floor elevation and foundation type (basement, slab on grade, etc.) to enhance loss estimates.
  - Conduct a Hazus loss analysis for more frequent flood events (e.g., 10- and 50-year flood events).
  - Conduct a repetitive loss area analysis.

  - Continue to expand and update urban flood areas to further inform mitigation.
  - As more current FEMA floodplain data become available (i.e., DFIRMs), update the vulnerability analysis and generate a more detailed flood depth grid that can be integrated into the current Hazus version.
- Landslide
  - Continue using the most up to data landslide hazard data available
- Wildfire
  - General building stock inventory can be updated to include attributes such as roofing material, fire detection equipment, or distance to fuels as another measure of vulnerability.

5. Identification of Hazards of Concern

Nevada County considered a full range of hazards that could impact the planning area and then identified and ranked those that present the greatest concern. These hazards of concern were identified based on the following:

- Input from all Planning Partners
- Review of the 2023 California State Hazard Mitigation Plan (Cal OES 2023a)
- Review of the 2017 Nevada County HMP
- Research on the frequency, magnitude, and costs associated with hazards that have previously or could feasibly impact the region
- Qualitative information regarding natural (not human-caused) hazards and the perceived vulnerability of the study area's assets to them.

Hazards of Concern are the hazards that are most likely to impact a community. These are identified using available data and local knowledge.

Natural Hazards are hazards created by a meteorological, environmental, or geological event.

Based on the review of potential hazards of concern, 12 hazards were identified as hazards of concern to be addressed at the County level in this plan (shown here in alphabetical order):

- Avalanche
- Dam failure
- Drought
- Earthquake
- Extreme cold
- Extreme heat
- Flood
- Hazardous materials release
- Landslide
- Volcano
- Wildfire
- Winter storm

The Steering Committee approved use of the following hazard event groupings:

- The flood hazard includes riverine flooding, flash flooding, and stormwater/urban flooding. Inclusion of the various forms of flooding under a single flood hazard is consistent with FEMA's Multi-Hazard Identification and Risk Assessment guidance and the California State Hazard Mitigation Plan.
- The hazardous materials profile includes accidental releases and spills of materials and wastes that are considered severely harmful to human health and the environment, as defined by the U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (also known as Superfund).
- The landslide hazard includes rock falls, rock topples, rotational slump, transitional slide, earth flows, creep, block slides, debris avalanche, and debris flows.
- The severe winter storm hazard includes high winds, heavy snow, and blizzards.

These groupings are the same as those provided by FEMA (*FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses*; *Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy*; *Local Mitigation Planning Handbook*) and take into consideration the hazard groupings in the California State Hazard Mitigation Plan.

Other natural and human-caused hazards that have occurred within Nevada County are not addressed in this update for one or more of the following reasons:

- The hazard is considered a cascading impact of the identified hazards of concern.
- The hazard has a low potential to occur.
- The hazard is addressed by other planning mechanisms.
- Occurrences of the hazard would not result in significant impacts within the County.

If deemed necessary by the County, these hazards may be considered in future plan updates. Table 5-1 compares the hazards for Nevada County's planning area to the hazards listed in the State Hazard Mitigation Plan.

TABLE 5-1. IDENTIFICATION OF HAZARDS OF CONCERN FOR NEVADA COUNTY

2023 California State Hazard Mitigation Plan	2024 Nevada County Hazard Mitigation Plan	Comment
Air Pollution	Not included	This hazard is considered a cascading impact of extreme heat, volcano, and wildfire and is addressed in those hazard profiles.
Civil Disorder	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Cyber Threats	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Dam Failure	Dam Failure	This local hazard aligns with the State Hazard Mitigation Plan.
Drought	Drought	This local hazard aligns with the State Hazard Mitigation Plan.
Earthquake	Earthquake	This local hazard aligns with the State Hazard Mitigation Plan.
Electromagnetic Pulse Attack	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Energy Shortage	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Epidemic, Pandemic, Vector-Borne Disease	Not included	Although a threat, the Steering Committee determined this hazard is a best addressed through public health planning.
Extreme Cold or Freeze	Extreme Cold	This local hazard aligns with the State Hazard Mitigation Plan.
Extreme Heat	Extreme Heat	This local hazard aligns with the State Hazard Mitigation Plan.

2023 California State Hazard Mitigation Plan	2024 Nevada County Hazard Mitigation Plan	Comment
Geomagnetic Storm (Space Weather)	Not included	Although a threat, the Steering Committee determined this hazard is not a significant hazard of concern for Nevada County.
Hazardous Materials Release	Hazardous Materials Release	This local hazard aligns with the State Hazard Mitigation Plan.
Invasive and Nuisance Species	Not included	The Steering Committee did not determine this hazard to be a significant risk to the County.
Landslide, Debris Flow, and other Mass Movements	Landslide	This local hazard aligns with the State Hazard Mitigation Plan.
Levee Failure	Not included	The Steering Committee did not determine this hazard to be a significant risk to the County.
Natural Gas Pipeline Hazards	Hazardous Materials Release	This hazard was considered under the Hazardous Materials Release hazard.
Oil Spills	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Other Potential Causes of Long-Term Electrical Outage	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Public Safety Power Shutoff	Not included	This is considered a cascading impact of various other hazards and is addressed in those hazard profiles.
Radiological Accidents	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Riverine, Stream and Alluvial Flood	Flood	The flood chapter addresses riverine, stormwater, and localized floods as well as debris and mud flows.
Sea-Level Rise, Coastal Flooding and Erosion	Not included	Nevada County is not exposed to this hazard.
Severe Wind, Weather, and Storms	Winter Storm	These hazards are addressed under the Winter Storm hazard as they apply to Nevada County.
Snow Avalanche	Avalanche	This local hazard aligns with the State Hazard Mitigation Plan.
Subsidence	Not included	This is considered a cascading impact of earthquake and is addressed in the earthquake hazard profile.
Terrorism	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.

2023 California State Hazard Mitigation Plan	2024 Nevada County Hazard Mitigation Plan	Comment
Transportation Accidents Resulting in Explosions or Toxic Releases	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Tree Mortality	Not included	The Steering Committee did not determine this hazard to be a significant risk to the County.
Tsunami and Seiche	Not included	As an inland county, Nevada County is not exposed to tsunami. The Steering Committee did not determine seiche to be a significant risk to the County.
Urban Structural Fire	Not included	Although a threat, the Steering Committee determined this hazard is a human-caused hazard best addressed through emergency response planning.
Volcano	Volcano	This local hazard aligns with the State Hazard Mitigation Plan.
Well Stimulation and Hydraulic Fracturing	Not included	Although a threat, the Steering Committee determined this hazard is not a significant hazard of concern for Nevada County.
Wildfire	Wildfire	This local hazard aligns with the State Hazard Mitigation Plan.

6. Avalanche

6.1 Hazard Profile

6.1.1 Hazard Description

An avalanche is a slope failure composed of a mass of rapidly moving, fluidized snow that slides down a mountainside. The flow can be composed of ice, water, soil, rock, and trees. The amount of damage depends on the type of avalanche, the composition and consistency of the material contained in the avalanche, the velocity and force of the flow, and the avalanche path.

An avalanche is caused by several factors, but primarily by large accumulations of snow on a steep slope. Most avalanches occur on slopes between 30 and 40 degrees. They can be triggered by natural seismic or climatic factors—such as earthquakes, thermal changes, or blizzards—or by human activities. In 90 percent of avalanche incidents in which people are harmed, the snow slides are triggered by the victim or someone in the victim's party (NWS n.d.-a)

The most common types of avalanches are loose-snow and slab avalanches. A **loose-snow avalanche** is composed of dry, fresh snow deposits that accumulate as an unstable mass atop a stable snow and slick ice sub-layer. A loose-snow avalanche releases when the sheer force of its mass overcomes the underlying resistant forces of the cohesive layer.

A **slab avalanche** generally is composed of a thick, cohesive snowpack deposited or accumulated on top of a light, cohesion-less snow layer or slick ice sub-layer. At the starting surface or top of the slab, a deep fracture develops in the slab of well-bonded, cohesive snow. A slab avalanche release is usually triggered by turbulence or impulse waves. Release also occurs when the internal cohesive strength of the slab layer is greater than the bonding at the base and lateral slab boundaries. As a release occurs, the slab accelerates, gaining mass and speed as it travels down the avalanche path.

An **avalanche path** is determined by physical limitations of the local terrain and constructed features. An avalanche may follow a path along a channelized or confined terrain, similar to debris flows or streams, before spreading onto alluvial fans or gentle slopes. The avalanche path varies in width as it transitions along the path, depending on the confinement of the terrain and the velocity of flow. An avalanche path is described as having three zones:

- The **starting zone** is typically near the top of a ridge, bowl, or canyon, with steep slopes of 25 degrees or more.
- The **track zone** is the reach with mild slopes of 15 to 30 degrees and the area where the avalanche will achieve maximum velocity and considerable mass.
- The **runout zone** is the area of gentler slopes (5 to 15 degrees) at the base of the path, where the avalanche decelerates and massive snow and debris deposition occurs.

When avalanche material is deposited in the runout zone, it tends to harden quickly. Even very light avalanches of powdery, dry snow can form concrete-like masses after being "worked" by the

mechanical forces involved in the slide. Victims are rarely able to extract themselves from even very shallow burials. Those caught in avalanches face the risk of suffocation, trauma, or hypothermia (U.S. DHS Ready 2024). Avalanches kill more than 150 people worldwide each year (NWS n.d.-a)

The fact that avalanches take place in remote settings far from large population centers means they pose the greatest risk to transportation infrastructure and structures and people engaged in recreational activities in avalanche hazard areas (Cal OES 2023a). The people most vulnerable to avalanches are skiers, snowboarders, and others engaged in recreational activities in snow-covered, mountainous areas (Cal OES 2023a).

6.1.2 Location

Avalanches can occur in any steep mountainous areas that receive significant amounts of snow (Cal OES 2023a). In Nevada County, avalanche hazard zones have been identified in the areas on the south and southwest sides of Donner Lake (see Figure 6-1).

6.1.3 Extent

The North American Avalanche Danger Scale is a tool used by avalanche forecasters to communicate the potential for avalanche occurrence and the general size and distribution of avalanches if they occur (Avalanche.org 2024). The scale is a five-category estimation of the avalanche danger: low, moderate, considerable, high, and extreme, as presented in Table 6-1.

The National Weather Service provides current weather conditions and forecast information to regional avalanche forecast centers that in turn issue avalanche forecasts. Avalanche warnings and special advisories are included on NWS websites and broadcast over NOAA Weather Radio (NWS n.d.-a). In California, several avalanche centers provide forecasts, advisories, and warnings. Each center employs avalanche forecasters to provide daily avalanche advisories and field observations (Sierra Avalanche Center n.d.).

6.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for avalanche-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any avalanche-related state emergency proclamations since the previous HMP update.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA avalanche-related agricultural disaster declarations (USDA 2023a).

Figure 6-1. Avalanche Hazard Zones in Nevada County

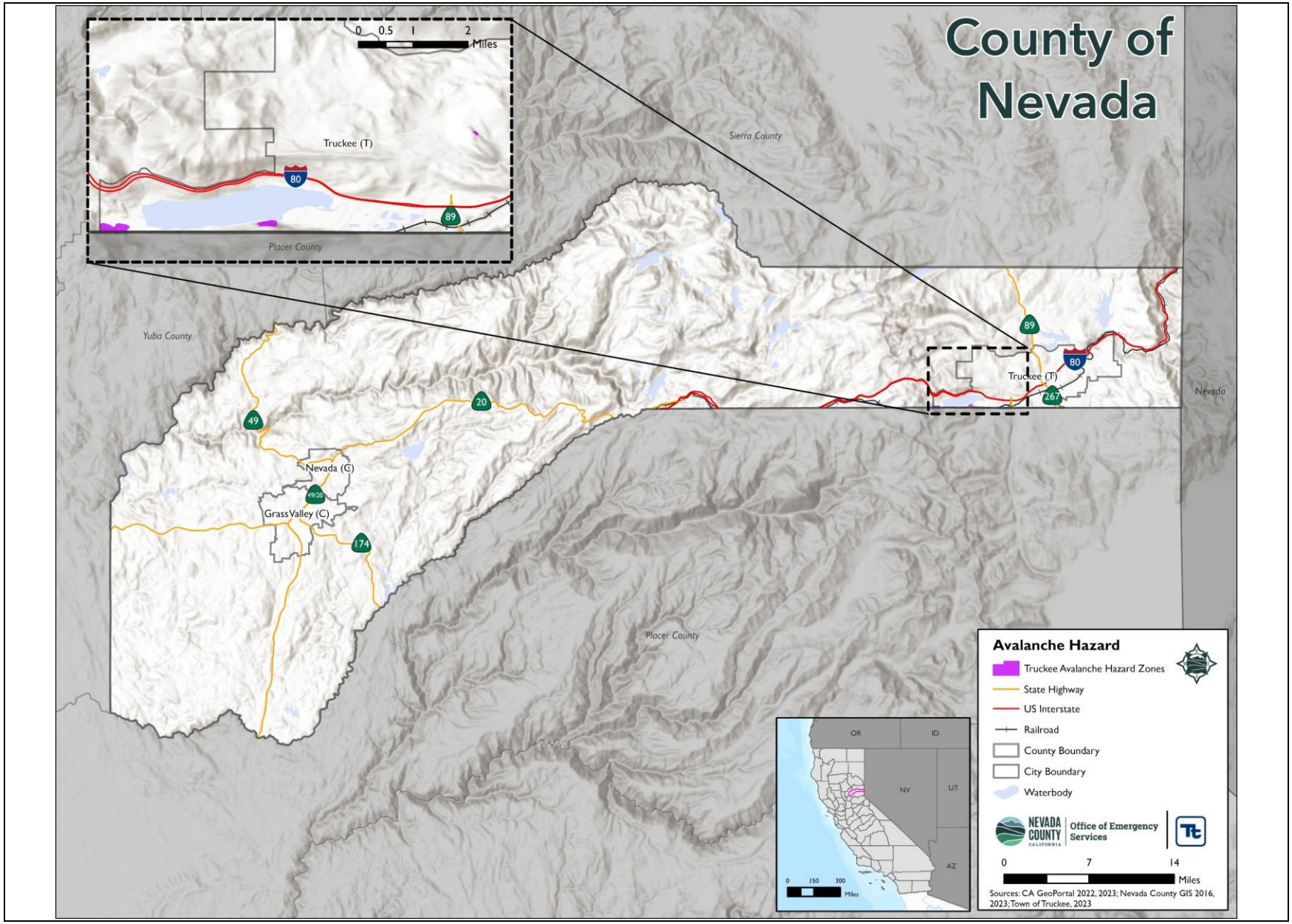


TABLE 6-1. NORTH AMERICAN PUBLIC AVALANCHE DANGER SCALE

Danger Level	Travel Advice	Likelihood	Size and Distribution
5- Extreme 	**Extraordinarily dangerous avalanche conditions.** Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Very large avalanches in many areas.
4- High 	**Very dangerous avalanche conditions.** Travel In avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches In many areas; or very large avalanches In specific areas.
3 - Considerable 	**Dangerous avalanche conditions.** Careful snowpack evaluation, cautious route-finding, and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches In many areas; or large avalanches In specific areas; or very large avalanches in isolated areas.
2 • Moderate 	**Heightened avalanche conditions on specific terrain features.** Evaluate snow and terrain carefully; Identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches In Isolated areas.
1 • Low 	**Generally safe avalanche conditions.** Watch for unstable snow on Isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches In Isolated areas or extreme terrain.

Source: (Avalanche.org 2024)

Previous Events

Table 6-2 lists known avalanche hazard events that occurred in or near Nevada County between January 2017 and December 2023. For earlier events, refer to the 2017 Nevada County HMP.

6.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous avalanche occurrences in the vicinity of the County was used to calculate the probability of future occurrence of such events, as summarized in Table 6-3. Based on historical records and input from the Planning Team, the probability of occurrence for avalanche in the County is considered “rare.”

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

TABLE 6-2. AVALANCHE EVENTS IN OR NEAR NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration	Location Impacted	Description
January 27, 2018	N/A	N/A	Donner Summit Area	A dry slab avalanche was triggered by a snowboarder on North Castle Peak near the Donner Summit Area. The crown height was 1 foot. The avalanche length and width were 150 feet and 60 feet, respectively. No injuries were reported.
March 2, 2018	N/A	N/A	Squaw Valley Ski resort	An avalanche at the base of the Olympic Lady chair lift at Squaw Valley Ski resort caught five people. One person sustained a serious lower body injury. A second person had to be rescued but was taken to the base of Squaw Valley and released. Three others left unharmed, according to KOLO8 News Reno.
April 1, 2019	N/A	N/A	Echo Summit	Thunderstorms brought road flooding and a minor debris flow from heavy rain, and an avalanche closed Highway 50 at Echo Summit.
January 17, 2020	N/A	N/A	Independence Lake	The Sierra Avalanche Center reported a full burial slab avalanche along the north side of Independence Lake. One skier of three triggered the slab avalanche about 40 feet from the crown line. The crown size varied from 10 to 48 inches and went about 100 feet wide. The slide traveled from an elevation of about 8,400 feet down to 7,400 feet. The skier tried to ski out but was immediately buried and remained buried for 45 minutes. The skier's only injuries were some bruising and a small cut. The two other skiers were left unharmed about 200 feet from the bottom edge of the avalanche.
February 28-March 1, 2023	N/A	N/A	Olympic Valley	Law enforcement reported an avalanche at around 7 p.m. that struck an occupied three-story apartment building in Olympic Valley. All occupants were uninjured and able to evacuate with help from fire crews. The avalanche was approximately 200 yards wide and 25 feet deep and engulfed the bottom 2 stories of the building.

Sources: (NOAA NCEI 2024, FEMA 2024)
Data shown includes only the events listed in NOAA's storm events database

TABLE 6-3. PROBABILITY OF FUTURE AVALANCHE EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Avalanche	17	1.6	61%

Sources: (NOAA NCEI 2024, FEMA 2024c)

Warming temperatures will result in more precipitation falling as rain instead of snow. Snowmelt is also likely to occur earlier. As a result of projected warming, Sierra Nevada snowpacks will likely be eradicated below about 6,000 feet elevation and will be much reduced—by more than 60 percent—across nearly all of the range (State of California 2018).

According to some experts, greater variability in weather patterns will cause layers of rain to fall after light layers of snow, and this sequence can destabilize snowpack and increase the frequency and severity of avalanches (U.S. Forest Service 2019). Some experts believe that an overall reduction in snowpack could lead to fewer avalanches in winter but changing precipitation patterns could make avalanches more frequent in the springtime instead (Peitzsch 2021).

6.1.6 Cascading Impacts

The most significant cascading impacts from snow avalanches are the closure of transportation corridors, which can isolate populations and interrupt commodity flows. Avalanches might cause erosion on sloped terrain, thereby increasing the likelihood of future landslides. In addition, debris deposited in a river or stream because of avalanches might alter its flow and contribute to flooding later.

6.2 Vulnerability and Impact Assessment

A spatial analysis was conducted using 2023 avalanche hazard data from the Town of Truckee. To determine what assets are exposed to landslide hazards, the asset inventories prepared for this HMP (population, buildings, critical facilities) were overlaid with the avalanche hazard area. Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from the impacts of avalanche hazards. Refer to Chapter 4 for additional details on the methodology used to assess avalanche risk.

6.2.1 Life, Health, and Safety

Overall Population

As shown in Table 6-4, there is a residential population of 62 living in the avalanche hazard zone, all in the Town of Truckee.

TABLE 6-4. POPULATION IN THE AVALANCHE HAZARD AREA

Jurisdiction	Total Population (US Census Decennial 2020)	Population in the Avalanche Hazard Area	
		Number of Persons	% of Jurisdiction Total[a]
Grass Valley	14,016	0	0.0%
Nevada City	3,152	0	0.0%
Truckee	16,729	62	0.4%
Unincorporated	68,344	0	0.0%
Nevada County (Total)	**102,241**	**62**	**0.1%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. *Percentage is slightly inaccurate because total population is based on city limits and vulnerable population is based on community boundaries; the accuracy of the result is adequate for planning purposes.*

Socially Vulnerable Population

Because avalanches tend to occur at higher elevations, there is minimal population exposed to direct impact of an avalanche, including socially vulnerable populations. Those who might be vulnerable to an avalanche include those with limited mobility who might have difficulty escaping the rapidly moving snow, including young children, the elderly, and people with disabilities or access and functional needs.

Table 6-5 presents the estimated socially vulnerable populations located in the avalanche hazard area. Of the 62 persons located in the hazard area, there are 10 persons over the age of 65 years, four persons under the age of 5 years, two non-English speakers, four persons with a disability, and five living in poverty.

6.2.2 General Building Stock

Areas of snow avalanche susceptibility are typically not well suited to development due to the steepness of slope in these areas. The runout areas down-slope are more likely to see development. Most lands identified as susceptible to snow avalanches are either state or national forest or have existing uses associated with winter sport recreation (Cal OES 2023a).

There are 54 buildings in the avalanche hazard area, representing approximately 0.1 percent of the County's total general building stock and 0.1 percent of the County's inventory replacement cost value. Table 6-6 and Table 6-7 summarize estimated exposure of the general building stock to the avalanche hazard. The replacement cost value represents the potential loss if the exposed structures were completely destroyed by an avalanche.

6.2.3 Community Lifelines and Other Critical Facilities

Critical infrastructure such as roads are more likely to be exposed. Impacts on these lifelines could isolate populations and interrupt commodity flows (Cal OES 2023a). None of the community lifelines inventoried for this HMP are within the mapped avalanche hazard area.

6.2.4 Economy

An avalanche can result in economic losses by disrupting recreational facilities, obstructing transportation routes, and occasionally destroying property (FEMA n.d.-a). All economic losses from this hazard would be associated with limitations on activities in avalanche risk areas (Cal OES 2023a).

6.2.5 Natural, Historic and Cultural Resources

Although avalanches can be disruptive in the short term to natural system, damaging and burying ecosystems in their path, in the long term, they are seen as beneficial. For example, the chutes and debris created by avalanches help provide favorable habitat for a variety of flora and fauna. Trees that experience avalanches become stronger and more resilient, and these more robust trees in turn reduce the frequency of avalanches by reinforcing the snowpack and reducing the effects of strong winds (Cal OES 2023a).

TABLE 6-5. VULNERABLE POPULATIONS IN THE AVALANCHE HAZARD AREA

	Vulnerable Populations in the Avalanche Hazard Area									
	65 and Older		5 and Younger		Non-English Speaking		Disability		Below Poverty Level	
Jurisdiction	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Grass Valley	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nevada City	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Truckee	10	0.4%	4	0.4%	2	0.3%	4	0.4%	5	0.3%
Unincorporated	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nevada County (Total)	**10**	**<0.1%**	**4**	**0.1%**	**2**	**0.2%**	**4**	**0.0%**	**5**	**0.0%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Note: "% of Total" represents the vulnerable population in the hazard area as a percentage of the total vulnerable population in the jurisdiction (e.g., population 65 or older in the hazard area in Truckee as a percent of the total population 65 or older in Truckee). See Table 3-4 for total vulnerable population in each jurisdiction.

TABLE 6-6. BUILDINGS IN THE AVALANCHE HAZARD AREA

Jurisdiction	Total Buildings in Jurisdiction		Number of Buildings in Hazard Area		Replacement Cost Value in Hazard Area	
	Number of Buildings	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Grass Valley	6,410	$8,077,613,536	0	0.0%	$0	0.0%
Nevada City	2,619	$2,974,541,089	0	0.0%	$0	0.0%
Truckee	16,175	$16,378,917,320	54	0.3%	$33,833,071	0.2%
Unincorporated	31,937	$26,299,651,530	0	0.0%	$0	0.0%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**54**	**0.1%**	**$33,833,071**	**0.1%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 6-7. BUILDINGS IN THE AVALANCHE HAZARD AREA BY GENERAL OCCUPANCY CLASS

Jurisdiction	Number of Buildings in the Hazard Area			
	Residential	Commercial	Industrial	Other[a]
Grass Valley	0	0	0	0
Nevada City	0	0	0	0
Truckee	46	8	0	0
Unincorporated	0	0	0	0
Nevada County (Total)	**46**	**8**	**0**	**0**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include government, religion, agricultural, and education

6.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

6.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County taking place within avalanche hazard areas would increase the overall risk from the avalanche hazard.

6.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in less risk to the population over time.

6.3.3 Climate Change

Some experts believe that an overall reduction in snowpack could lead to fewer avalanches in winter, but changing precipitation patterns could make avalanches more frequent in the springtime instead (Peitzsch 2021). Greater variability in weather patterns in the planning area may cause layers of rain to fall after light layers of snow, a sequence that can destabilize snowpack and increase the frequency and severity of avalanches (U.S. Forest Service 2019).

7. Dam Failure

7.1 Hazard Profile

7.1.1 Hazard Description

A dam is an artificial barrier that can store water, wastewater, or liquid-borne materials for many reasons—flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of these functions. Dams can be classified according to their purpose, the construction material or methods used, their slope or cross-section, the way they resist the force of the water pressure, or the means used for controlling seepage. Materials used to construct dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, plastic, rubber, and combinations of these.

The average age of dams in the United States is 53 years. Over time, dams decay and require maintenance to retain their structural integrity. Dam failures occur when a dam is damaged or destroyed, or when the spillway is inadequate and excess flow overtops the dam. Internal erosion, known as piping, through the dam or foundation can also lead to dam failures. Dam failures are most likely to occur as a result of one or a combination of the following (Association of State Dam Safety Officials 2021):

- Overtopping caused by floods that exceed the dam capacity (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides)

Many dam failures in the United States have been secondary results of other disasters. The most common causes are earthquakes, landslides, extreme storms, equipment malfunction, structural damage, foundation failures, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

When dams fail or are overtopped, they can cause catastrophic impacts (Association of State Dam Safety Officials 2023). The failure of dams with large storage amounts could cause significant flooding downstream (FEMA 2013d). Complete failure is when internal erosion or overtopping results in a

complete structural breach, releasing a high-velocity wall of debris-filled water that rushes downstream, damaging or destroying anything in its path. A failure characterized by the sudden and uncontrolled release of water from a dammed impoundment can cause massive destruction to the ecosystems and communities downstream. Downstream development increases the potential consequences of a dam's failure. Any dam has the potential to adversely affect downstream areas and lives. Many dams, should they fail, can also affect the delivery of essential utilities or flood control (FEMA 2013d).

Throughout history, hundreds of dams have failed in the United States, causing property and environmental damage, injuries, and fatalities. Approximately 15,600 dams today pose a significant hazard to life and property if failure occurs. About 2,000 unsafe dams are dispersed throughout the United States, in almost every state (FEMA 2021).

Planning Requirements

State of California

In California, dams are regulated by the State of California Division of Safety of Dams (DSOD). Additional regulatory oversight of dams is described in Chapter 19. The California Water Code (Division 3) defines a regulated dam as any artificial barrier, together with appurtenant works, that does or may impound or divert water, and that either:

- Has a height of more than 6 feet and impounds 50 acre-feet or more of water, or
- Has a height of 25 feet or higher and impounds more than 15 acre-feet of water.

California's Legislature passed a law in 2017 (California Water Code section 6161) requiring all State jurisdictional dams, except low hazard dams, to develop inundation maps and emergency action plans (EAPs). The EAPs must include the following (Cal OES 2021):

- Emergency notification flow charts
- Information on a four-step response process
- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (Cal OES 2021).

Inundation maps for extremely high, high, and significant hazard dams and their critical appurtenant structures are prepared by licensed engineers and submitted by dam owners for review and approval by the DSOD. DSOD has made inundation mapping available online for extremely high, high, and significant hazard dams (DSOD 2024).

Federal Energy Regulatory Commission

Dams that fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC) also have specified planning requirements. FERC has the largest dam safety program in the United States. It cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans are designed to serve as an early warning system if there is a potential for, or a sudden release of water from, a dam failure or accident to the dam. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, and procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations, thus saving lives and minimizing property damage.

FEMA Guidance for Flood Mapping

FEMA's *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures* is part of the National Dam Safety Program, a partnership of states, federal agencies, and other stakeholders formed to encourage individual and community responsibility for dam safety. Under this program, states are responsible for regulating non-federal dams. The guidelines provide information for federal and state agencies, local governments, dam owners, and emergency management officials to use for reducing flood hazards and the resulting potential for economic damage and loss of life. This document is a resource for developing state-specific guidelines for dam safety and a reference manual for mapping dam failure inundation areas (FEMA 2013b).

Risk Types and Hazard Rankings

The risk that a dam poses to communities can be split into the following components (FEMA 2022b):

- **Non-Breach Risk**—The risk in the reservoir pool area and downstream floodplain due to normal operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or instances of overtopping of the dam without breaching.
- **Incremental Risk**—The risk that can be attributed to the presence of a dam should the dam breach or undergo component malfunction or mis-operation, where the consequences are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but significant consequences in the pool area upstream of the dam can be caused by loss of the pool.
- **Residual Risk**—The risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

The U.S. Army Corps of Engineers' National Inventory of Dams categorizes dams as low, significant, or high hazard. The DSOD has developed a hazard potential classification system for state-jurisdiction dams that adds a fourth hazard classification of "extremely high," as shown in Table 7-1. Dams classified as extremely high hazard may impact highly populated areas or critical infrastructure or have short evacuation warning times.

TABLE 7-1. STATE OF CALIFORNIA DOWNSTREAM HAZARD POTENTIAL CLASSIFICATION

Hazard Classification	Potential Downstream Impacts on Life and Property
Low	No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.
Significant	No probable loss of human life but can cause economic loss, environmental damage, impacts on community lifelines, or other significant impacts.
High	Expected to cause loss of at least one human life.
Extremely High	Expected to cause loss of at least one human life and one of the following: result in an inundation area with a population of 1,000 or more; or result in the inundation of facilities or infrastructure, the inundation of which poses a significant threat to public safety as determined by the DSOD on a case-by-case basis.

Source: (DWR 2021a)

7.1.2 Location

The dam failure inundation area is the area downstream of a dam that would be flooded in the event of a failure or uncontrolled release of water. This zone is generally much larger than the area for the normal river or stream flood event. Figure 7-1 shows the dam failure inundation areas for the Nevada County high and extremely high hazard dams that have inundation mapping prepared. These dam failure inundation areas largely follow the rivers and streams downstream of the dams. The total area within the inundation areas of all high and extremely high hazard dams in Nevada County is referred to in this HMP as the combined dam failure inundation area; it is the hazard area evaluated in the vulnerability analysis presented below.

Inundation maps are based on a hypothetical failure of a dam or critical appurtenant structure and the information depicted on the maps is approximate. Areas to be evacuated in the event of an actual failure of a dam or critical appurtenant structure are determined by local emergency managers (Cal OES 2023a).

7.1.3 Extent

Nevada County Dam Hazard Ratings

The National Inventory of Dams lists 56 dams in Nevada County, as presented in Table 7-2. The inventory categorizes 27 of these as high hazard, one as significant hazard, and 28 as low hazard (USACE n.d.). Seven of the dams rated as high hazard in the federal system are rated as extremely high hazard under California's system.

Figure 7-1. High and Extremely High Hazard Dam Failure Inundation Areas in Nevada County

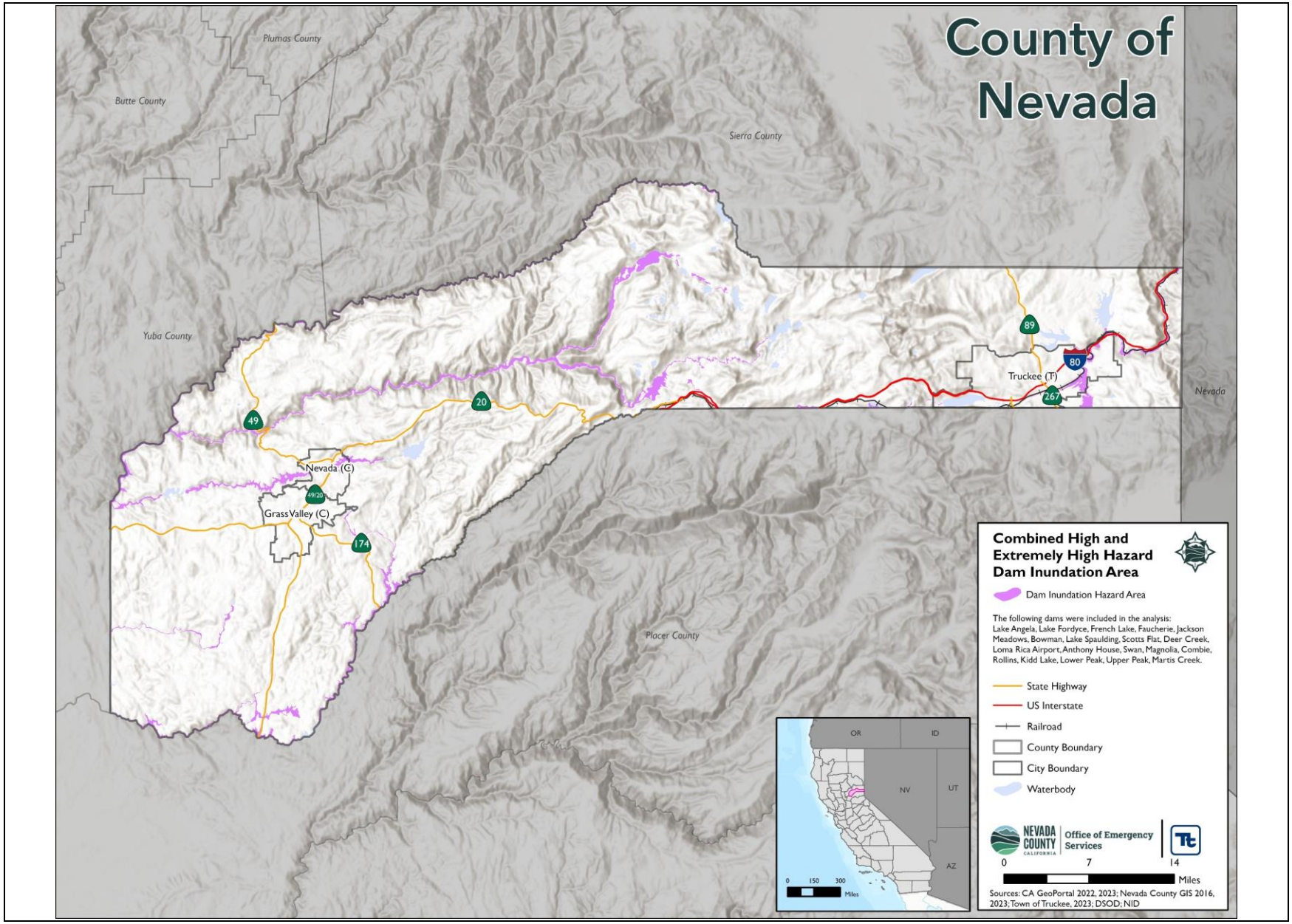


TABLE 7-2. DAMS IN NEVADA COUNTY

Dam Name	Hazard Rating	Dam Owner
Lake Spaulding	High (DSOD rating: Extremely High)	Pacific Gas and Electric Company
Rollins	High (DSOD rating: Extremely High)	Nevada Irrigation District
Jackson Meadows	High (DSOD rating: Extremely High)	Nevada Irrigation District
Scotts Flat	High (DSOD rating: Extremely High)	Nevada Irrigation District
Bowman Main	High (DSOD rating: Extremely High)	Nevada Irrigation District
Prosser Creek	High	Bureau of Reclamation
Lake Fordyce	High (DSOD rating: Extremely High)	Pacific Gas and Electric Company
Boca	High	Bureau of Reclamation
Martis Creek Dam	High	USACE
Lake Combie	High	Nevada Irrigation District
Our House	High	Yuba County Water Agency
French Lake	High (DSOD rating: Extremely High)	Nevada Irrigation District
Deer Creek Diversion	High	Nevada Irrigation District
Anthony House	High	Lake Wildwood Association
Magnolia	High	Lake of the Pines Association
Faucherie Lake Main	High	Nevada Irrigation District
Swan	High	Lakewood Association
Loma Rica Airport	High	Nevada Irrigation District
Jackson Lake	High	Nevada Irrigation District
Lake Angela	High	Donner Summit Public Utility District
Blue Lake	High	Pacific Gas and Electric Company
Rucker Lake	High	Pacific Gas and Electric Company
Bowman Arch	High	Nevada Irrigation District
Lake Spaulding No. 3 Auxiliary	High	Pacific Gas and Electric Company
Faucherie Spillway Auxiliary	High	Nevada Irrigation District
Donner Lake	Significant	Truckee Meadows Water Authority
Dutch Flat Afterbay	Low	Nevada Irrigation District
Dutch Flat Forebay	Low	Nevada Irrigation District
Sawmill Main	Low	Nevada Irrigation District
Chicago Park Forebay	Low	Nevada Irrigation District
Bellet	Low	Private Entity
Nevada City Raw Water Reservoir	Low	City of Nevada

Dam Name	Hazard Rating	Dam Owner
Anderson Ranch	Low	Private Entity
Pine Grove	Low	San Juan Ridge County Water District
Penn Valley Wastewater	Low	Nevada County Department of Sanitation
Fuller Lake	Low	Pacific Gas and Electric Company
Meadow Lake	Low	Pacific Gas and Electric Company
Milton Main	Low	Nevada Irrigation District
Lake Sterling	Low	Pacific Gas and Electric Company
Weaver Lake Dam	Low	USDA FS
Upper Feeley	Low	Pacific Gas and Electric Company
Donner Euer Valley	Low	Donner Euer Valley Corporation
Culbertson Lake	Low	Pacific Gas and Electric Company
Lower Feeley	Low	Pacific Gas and Electric Company
Upper Rock Lake Main	Low	Pacific Gas and Electric Company
Lake Vera	Low	Lake Vera Mutual Water Company
Lower Lindsey	Low	Pacific Gas and Electric Company
White Rock Lake	Low	Pacific Gas and Electric Company
Lower Rock Lake	Low	Pacific Gas and Electric Company
Middle Lindsey	Low	Pacific Gas and Electric Company
Upper Lindsey	Low	Pacific Gas and Electric Company
Milton South	Low	Nevada Irrigation District
Sawmill Spillway	Low	Nevada Irrigation District
Upper Rock Lake Auxiliary	Low	Pacific Gas and Electric Company

Source: (USACE n.d.)

Note: Hazard ratings shown are for both the federal and state classification systems except where noted as High (DSOD rating: Extremely High); those dams are rated high hazard under the federal system and extremely high hazard under California's system

Warning Time

Warning time for dam failure depends on the cause of the failure. In the event of a structural failure due to earthquake, there may be no warning time. In events of extreme precipitation or massive snowmelt, the weather can be predicted, and evacuations can be planned with sufficient time. When dam operators need to release water to relieve pressure from a dam, with potential for flooding downstream, advance warning can be provided (Monterey County Office of Emergency Services 2022a).

A dam's structural type affects the warning time and how quickly a failure occurs. A dam failure can sometimes occur within hours of the first signs of breaching. Other failures can take much longer—from days to weeks—as a result of debris jams, the accumulation of melting snow, buildup of water pressure on a dam with deficiencies after days of heavy rain, etc. (FEMA 2013a, FEMA 2016).

7.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for dam failure-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any dam failure-related state emergency proclamations since the previous HMP update.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA dam failure-related agricultural disaster declarations (USDA 2023a).

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 7-3. For events prior to 2017, refer to the 2017 Nevada County HMP.

TABLE 7-3. DAM FAILURE EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
April 30, 2019	N/A	N/A	Lake Van Norden Dam (Nevada County and Placer County)	Large hole at the downstream right end of the spillway invert during high spring spill flows. No evacuations or damage reported for this event

Sources: (NOAA NCEI 2024, FEMA 2024c, Cal OES 2023b)

7.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous dam failure occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 7-4. Based on historical records and input from the Planning Team, the probability of occurrence for dam failure in the County is considered "occasional."

TABLE 7-4. PROBABILITY OF FUTURE DAM FAILURE EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Dam Failure	1	28	3.57%

Sources: (NOAA NCEI 2024, FEMA 2024c, Cal OES 2023b)

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

Climate change can impact stored water systems as increased rainfall accumulations can cause reservoirs to overtop. Dams are designed using a hydrograph to evaluate situations in which the peak reservoir inflow is greater than the maximum spillway capacity, the reservoir has large surcharge storage, or the reservoir has dedicated flood control space. Increased precipitation may result in overtopping, as the hydrographs are based on historical events (USBR 2003).

7.1.6 Cascading Impacts

Dam failure events are frequently associated with other natural hazard events such as earthquakes, landslides, or extreme precipitation, which limits their predictability and compounds the hazard. The shaking associated with earthquakes may weaken the structure of a dam, particularly earthen dams, and in very rare cases may cause them to fail. Landslides can directly impact a dam, causing damage or failure. Landslides of the ground around a dam may weaken the ground on which the dam exists, causing the potential for the dam structure to fail. Landslides into the water being impounded by the dam can cause a wave to travel the length of the dam's impoundment area, ultimately crashing on the dam itself. Extreme precipitation can result in large quantities of rain upstream of the dam that will ultimately be impounded by the dam, which could raise water levels behind the dam, resulting in overtopping of the dam or flooding of properties upstream of the dam.

7.2 Vulnerability and Impact Assessment

A spatial analysis was conducted using data obtained from the DSOD and the National Inventory of Dams. To determine what assets are exposed to dam inundation, the asset inventories prepared for this HMP (population, buildings, critical facilities) were overlaid with the combined dam failure inundation area. Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from the impacts of dam failure. To estimate potential losses associated with dam failure, a Level 2 Hazus riverine flood analysis was performed using asset inventories prepared for this HMP and the combined depth grids of the dams.

7.2.1 Life, Health, and Safety

Overall Population

The impact of dam failure on life, health, and safety depends on factors such as the class of dam, the area being protected, the location, and the proximity of structures, infrastructure, and critical facilities to the dam. The impacts of a dam failure may be similar to those of a flood event, depending on the size of the dam reservoir and the breach. Dam failure can displace persons in the area if flooding of

structures occurs. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living within these areas.

The entire population residing within a dam failure inundation area is considered exposed and vulnerable to an event. As shown in Table 7-5, there is a residential population of 1,159 living in the combined dam failure inundation area; the unincorporated County has the greatest exposed population, with 845 persons in the dam failure inundation area. The Hazus analysis for dam failure estimated displacements of the population as listed in Table 7-6.

TABLE 7-5. POPULATION IN THE COMBINED DAM FAILURE INUNDATION AREA

Jurisdiction	Total Population (US Census Decennial 2020)	Population in the Combined Dam Failure Inundation Area	
		Number of Persons	% of Jurisdiction Total[a]
Grass Valley	14,016	0	0.0%
Nevada City	3,152	289	9.2%
Truckee	16,729	25	0.1%
Unincorporated	68,344	845	1.2%
Nevada County (Total)	**102,241**	**1,159**	**1.1%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. *Percentage is slightly inaccurate because total population is based on city limits and vulnerable population is based on community boundaries; the accuracy of the result is adequate for planning purposes.*

TABLE 7-6. DISPLACEMENTS AND SHELTER REQUIREMENTS FROM COMBINED DAM FAILURE SCENARIO

Jurisdiction	Displaced Population	Persons Seeking Short-Term Sheltering
Grass Valley	0	0
Nevada City	655	100
Truckee	35	5
Unincorporated	801	217
Nevada County (Total)	**1,491**	**322**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Socially Vulnerable Population

Of the 1,159 persons living in the combined dam failure inundation area, there are 383 over the age of 65, 37 under the age of 5, 3 non-English speaking, 163 with a disability, and 114 living in poverty (see Table 7-7). Economically disadvantaged populations are more likely to make decisions on whether to evacuate based short-term costs of doing so. Elderly populations are likely to need medical attention, which may be difficult to access during a dam failure event, or have difficulties in evacuating. Populations without adequate warning of the event are highly vulnerable. These may include those who lack an internet connection, do not speak English proficiently, or do not regularly use the communication tool used for warnings, such as a cellphone or social media account.

TABLE 7-7. VULNERABLE POPULATIONS IN THE COMBINED DAM FAILURE INUNDATION AREA

	Vulnerable Populations in the Dam Failure Hazard Area									
	65 and Older		5 and Younger		Non-English Speaking		Disability		Below Poverty Level	
Jurisdiction	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Grass Valley	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nevada City	121	9.2%	10	9.0%	0	0.0%	23	8.8%	27	9.1%
Truckee	4	0.1%	1	0.1%	0	0.0%	1	0.1%	2	0.1%
Unincorporated	258	1.2%	26	1.2%	3	1.0%	139	1.2%	85	1.2%
Nevada County (Total)	**383**	**1.3%**	**37**	**0.9%**	**3**	**0.3%**	**163**	**1.0%**	**114**	**1.0%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Note: "% of Total" represents the vulnerable population in the hazard area as a percentage of the total vulnerable population in the jurisdiction (e.g., non-English-speaking population in the hazard area in Truckee as a percent of the total non-English-speaking population in Truckee). See Table 3-4 for total vulnerable populations in each jurisdiction.

7.2.2 General Building Stock

Buildings Located in the Combined Dam Failure Inundation Area

There are 799 buildings in the combined dam failure inundation area, representing 1.4 percent of the County's total general building stock count and 1.6 percent of the total replacement cost value. Table 7-8 and Table 7-9 summarize estimated exposure of the general building stock to the dam inundation area.

TABLE 7-8. BUILDINGS IN THE COMBINED DAM FAILURE INUNDATION AREA

	Total Buildings in Jurisdiction		Number of Buildings in Hazard Area		Replacement Cost Value in Hazard Area	
Jurisdiction	Number of Buildings	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Grass Valley	6,410	$8,077,613,536	1	<0.1%	$2,012,738	<0.1%
Nevada City	2,619	$2,974,541,089	248	9.5%	$336,230,905	11.3%
Truckee	16,175	$16,378,917,320	106	0.7%	$155,009,717	0.9%
Unincorporated	31,937	$26,299,651,530	444	1.4%	$380,138,380	1.4%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**799**	**1.4%**	**$873,391,740**	**1.6%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 7-9. BUILDINGS IN THE COMBINED DAM FAILURE INUNDATION AREA BY GENERAL OCCUPANCY CLASS

	Number of Buildings in the Hazard Area			
Jurisdiction	Residential	Commercial	Industrial	Other[a]
Grass Valley	0	1	0	0
Nevada City	176	66	0	6
Truckee	19	50	37	0
Unincorporated	274	156	1	13
Nevada County (Total)	**469**	**273**	**38**	**19**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Government, Religion, Agricultural, and Education

Estimated Cost of Damage

Buildings located downstream of a dam are at risk of being damaged should there be a failure. The overall damage caused by dam failure will vary depending on the depth and velocity of the inundation. Properties closest to the inundation area have the greatest potential to experience the most destructive surge of water. Table 7-10 shows the Hazus estimated losses for the combined dam failure inundation

hazard area. Over the entire combined dam failure inundation area, roughly $500 million in damage is estimated, with Nevada City estimated to see the majority of damage ($225 million).

TABLE 7-10. ESTIMATED DAMAGE COSTS DUE TO DAM FAILURE EVENT

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Damage to Structure and Contents				
		Residential	Commercial	Other[a]	Total Damage	% of RCV
Grass Valley	$8,077,613,536	$0	$0	$0	$0	0.0%
Nevada City	$2,974,541,089	$92,683,455	$117,934,983	$14,030,145	$224,648,583	7.6%
Truckee	$16,378,917,320	$1,284,551	$54,642,945	$13,343,125	$69,270,620	0.4%
Unincorporated	$26,299,651,530	$140,485,685	$61,475,927	$10,819,553	$212,781,164	0.8%
Nevada County (Total)	**$53,730,723,475**	**$234,453,690**	**$234,053,854**	**$38,192,822**	**$506,700,367**	**0.9%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.
a. "Other" occupancy classes include Industrial, Government, Religion, Agricultural, and Education

Estimated Debris Generated by Dam Failure Event

Debris management may be a large expense after a dam failure event. Hazus breaks down debris generated by a dam failure event into three categories: finishes (dry wall, insulation, etc.); structural (wood, brick, etc.) and foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris.

Table 7-11 shows the estimated debris generated by the evaluated dam failure scenario. The cost of this debris cleanup and removal can be significant. The majority of the debris would be generated in Nevada City, with 84 percent of the countywide total.

TABLE 7-11. DAM-FAILURE-GENERATED DEBRIS

Jurisdiction	Debris Generated (tons)		
	Finish	Structure	Foundation
Grass Valley	0	0	0
Nevada City	3,794	14,287	11,308
Truckee	126	0	0
Unincorporated	780	2,571	2,304
Nevada County (Total)	**4,700**	**16,858**	**13,612**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

7.2.3 Community Lifelines and Other Critical Facilities

For critical facilities and lifelines located in the downstream inundation area, dam failure can cut evacuation routes, limit emergency access, and create isolation issues. Dam failure can cause severe downstream flooding that may transport large volumes of sediment and debris. Widespread damage to

buildings and infrastructure affected by an event would result in large costs for repairs. In addition to physical damage costs, businesses can be closed while flood waters retreat, and utilities are returned to a functioning state. Further, utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

Table 7-12 summarizes the number of community lifelines in the dam failure inundation area. In total, 99 lifelines (5 percent of the total number of lifelines) are vulnerable to dam failure. The community lifeline category with the greatest number of exposed facilities is transportation (31 facilities).

7.2.4 Economy

Flooding from a dam failure can cause extensive structural damage to private property and public utilities and can cut off essential services. Loss of power and communications may occur and drinking water and wastewater treatment facilities can be put temporarily out of operation. Debris from damaged buildings can accumulate, with additional costs associated with its removal.

7.2.5 Natural, Historic and Cultural Resources

Natural Resources

The environmental impacts of a dam failure can include significant water-quality and debris-disposal issues, as well as severe erosion that can impact local ecosystems. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals may get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties (U.S. EPA 2024).

Historic and Cultural Resources

Cultural resources include “moveable heritage,” such as collections of artifacts, statuary, artwork, and important documents or repositories. These resources are housed in libraries, museums, archives, historical repositories, or historic properties. Flood waters released by a dam failure may damage or destroy irreplaceable historic structures, sites, monuments, districts, and documents.

TABLE 7-12. NUMBER OF COMMUNITY LIFELINES IN COMBINED DAM FAILURE INUNDATION AREA

Jurisdiction	Number of Community Lifelines in Combined Dam Failure Inundation Area										
										Total	
	Commu-nications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transport-ation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Grass Valley	0	0	0	0	0	0	0	0	0	0	0.0%
Nevada City	12	2	1	0	0	4	7	3	4	33	22.9%
Truckee	3	0	0	0	0	0	5	4	0	12	2.4%
Unincorporated	15	6	0	0	0	2	19	11	1	54	4.7%
Nevada County (Total)	**30**	**8**	**1**	**0**	**0**	**6**	**31**	**18**	**5**	**99**	**4.7%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

7.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

7.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County taking place within dam failure inundation areas would increase the overall risk from the dam failure hazard.

7.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). Decreases in population in the dam failure inundation areas are likely to result in a decrease in risk to the population over time.

7.3.3 Climate Change

Future precipitation is likely to slightly increase due to climate change, and precipitation extremes (both as high and low) are projected to increase markedly at the same time. Dams are designed using a hydrograph to assess whether the reservoir inflow peak discharge is likely to exceed the maximum spillway capacity, whether the reservoir has surcharge storage, and whether the reservoir has dedicated flood control space. The hydrographs are based on historical events, and changes from the historical pattern may result in flows exceeding those for which the dam was designed (USBR 2003).

8. Drought

8.1 Hazard Profile

8.1.1 Hazard Description

Drought is a significant decrease in water supply relative to what is typical in a given location. It is a normal phase in the climate cycle of most regions, originating from a deficiency of precipitation over an extended period of time, usually a season or more. This leads to a water shortage for some activity, group, or environmental sector. Drought can be characterized based on the following (NOAA 2024):

- Meteorological measurements such as rainfall deficit compared to normal or expected rainfall
- Agricultural impacts due to reduced rainfall and water supply (e.g., crop loss, herd culling, etc.)
- Hydrological measurements of stream flows, groundwater, and reservoir levels relative to normal conditions
- Direct and indirect socio-economic impacts on society and the economy (e.g., increased unemployment due to failure of an industry because of drought)

Droughts are climatic patterns that occur over long periods of time as the result of many causes. Global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast result in warm, dry air and reduced precipitation. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of global weather systems.

Drought Effects

Drought can have a widespread effect on the environment and the economy, although it typically does not result in loss of life or damage to structures, as do other natural disasters. The National Drought Mitigation Center (NDMC) uses three categories to describe likely drought effects (NDMC 2024):

- **Economic Effects**—These effects of drought cost people (or businesses) money. Farmers' crops are destroyed; low water supply necessitates spending on irrigation or drilling of new wells; water-related businesses (such as sales of boats and fishing equipment) may experience reduced revenue.
- **Environmental Effects**—Plants and animals depend on water. When a drought occurs, their food supply can shrink, and their habitat can be damaged.
- **Social Effects**—Social effects include public safety, health, conflicts between people when there is not enough water to go around, and changes in lifestyle.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental protection—contributes to drought effects. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression. There are also issues such as growing

conflicts between agricultural uses of surface water and in-stream uses, surface water and groundwater interrelationships, and the effects of growing water demand on uses of water.

The likelihood that an activity will experience impacts from drought depends on its water demand and the water supplies available to meet the demand. The effects of drought vary between sectors of the community in both timing and severity:

- **Water supply**—The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes groundwater supplies due to reduced recharge from rainfall.
- **Agriculture and commerce**—Effects on the agriculture and commerce sectors include the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing.
- **Environment, public health, and safety**—The environment, public health, and safety sector focuses on wildfires that are both detrimental to the forest ecosystem and hazardous to the public. It also includes the effects of desiccating streams, such as the reduction of in-stream habitats for native species.

Monitoring and Rating Drought

NOAA Drought Indices

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations (NWS 2024):

- The ***Palmer Crop Moisture Index*** measures short-term drought weekly to assess impacts on agriculture.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale.
- The ***Palmer Drought Index*** is based on long-term weather patterns. The intensity of drought in a given month is dependent on current weather plus the cumulative patterns of previous months. Weather patterns can change quickly, and the Palmer Drought Severity Index can respond fairly rapidly.
- The ***Palmer Hydrological Drought Index*** quantifies hydrological effects (reservoir levels, groundwater levels, etc.), which take longer to develop and last longer. This index responds more slowly to changing conditions than the Palmer Drought Index.
- The ***Standardized Precipitation Index*** considers only precipitation. A value of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Maps of these indices show drought conditions nationwide at a given point in time. They are not necessarily indicators of any given area's long-term susceptibility to drought.

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that is updated weekly to show the location and intensity of drought across the country. The USDM uses a five-category system:

- D0—Abnormally Dry
  - Short-term dryness slowing planting, growth of crops
  - Some lingering water deficits
  - Pastures or crops not fully recovered
- D1—Moderate Drought
  - Some damage to crops, pastures
  - Some water shortages developing
  - Voluntary water-use restrictions requested
- D2—Severe Drought
  - Crop or pasture loss likely
  - Water shortages common
  - Water restrictions imposed
- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

The USDM categories show experts' assessments of conditions related to drought. These experts check variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. They also check whether areas are showing drought impacts such as water shortages and business interruptions. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought, and how many people are affected. USDM data goes back to 2000.

Declaring a Drought

The State of California has not established an official definition of when a drought begins or ends or process for defining or declaring drought but a proclamation of emergency conditions pursuant to the California Emergency Services Act may be used to respond to drought impacts (DWR 2021b).

Future Water Conservation in California

The State of California's 2020 Water Plan Update projects that water demand in the state will increase through 2045. The California Department of Water Resources (DWR) predicts a modest decrease in single-family water demand from 2020 through 2045, a slight increase in commercial/government water demand, and a moderate increase in multifamily water demand.

With an aim to make water conservation a way of life in California, Executive Order B-37-16 required the State Water Resources Control Board to maintain urban water use reporting requirements and prohibitions on wasteful practices such as watering during or after rainfall, hosing off sidewalks and irrigating ornamental turf on public street medians. The State of California Legislature enacted two bills in response to Executive Order B-37-16 to overhaul the State's approach to conserving water (DWR 2020):

- Senate Bill 606 requires the State Water Resources and Control Board and DWR to adopt water efficiency regulations, outlines requirements for urban water suppliers, including urban drought risk assessments, and implements penalties for violations. The law contains directives on water shortage planning and water loss reporting for urban wholesale water suppliers and offers a bonus incentive for potable reuse water.
- Assembly Bill 1668 requires the State Water Resources Control Board, in coordination with the DWR, to adopt water efficiency standards and regulations; drought and water shortage contingency plan guidance; standards for per capita daily indoor residential water use; and performance measures for commercial, industrial, and institutional water use.

The required new long-term urban water use efficiency standards include components for indoor residential use, outdoor residential use, water losses and other uses. Regarding indoor residential use, the new laws set a standard of 55 gallons per person per day through January 1, 2025. After that date, the amount will be incrementally reduced over time. The legislation also specifies penalties on local water suppliers for violations to these standards. Starting in 2027, local water suppliers' failure to comply with the Water Resources Control Board's adopted long-term standards could result in fines of $1,000 per day during non-drought years and $10,000 per day during declared drought emergencies and certain dry years.

A report prepared by DWR and the California State Water Resources Board, "Making Water Conservation a California Way of Life," directs permanent changes to use water more wisely, eliminate water waste, strengthen local drought resistance, and improve agricultural water use efficiency and drought planning (DWR 2018).

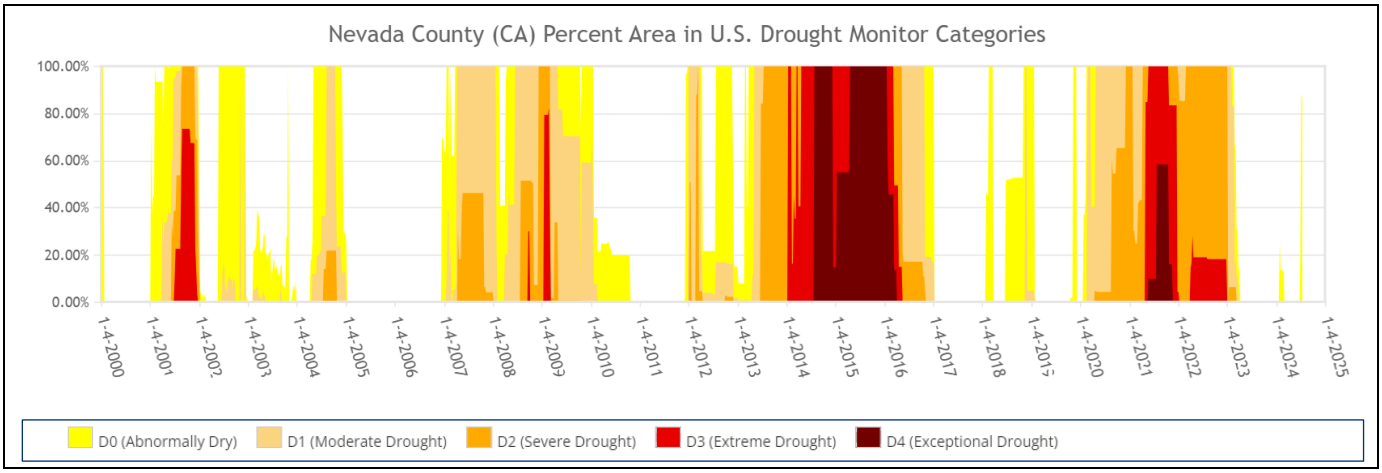
8.1.2 Location

The entire County of Nevada is vulnerable to drought, although the conditions of drought are not experienced uniformly across the County (California Water Watch 2022a).

8.1.3 Extent

The severity of any given drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Nevada County has a history of severe droughts. As shown in Figure 8-1, at least part of the county experienced extreme (D3) or exceptional (D4) droughts on six occasions since 2000.

Figure 8-1. Percent of Nevada County Affected by Each USDM Rating, 2000 – 2023



8.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 2017 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for drought-related events (FEMA 2023a).

State Emergency Proclamations

On May 10, 2021, Governor Newsom modified a State of Emergency Proclamation that declared a State of Emergency in California due to severe drought conditions to include 41 counties, including Nevada County. Nevada Irrigation District (NID) declared a drought emergency throughout the District's service area on April 28, 2021, and requested that customers conserve 10 percent of their normal water usage. Both NID and Nevada City mandated at least 20 percent conservation requirements. On June 22, 2021, the Grass Valley City Council approved resolutions declaring a local emergency due to drought conditions and mandating water conservation. All treated water customers were required to reduce water use by 20 percent (City of Grass Valley 2024).

USDA Declarations

Between 2017 and 2023, Nevada County was included in eight USDA drought-related agricultural disaster declarations (USDA 2023a), as listed in Table 8-1.

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 8-2. For events prior to 2017, refer to the 2017 Nevada County HMP.

TABLE 8-1. USDA DECLARATIONS FOR DROUGHT EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	USDA Declaration Number	Description
April 21, 2020	S4697	Drought
August 28, 2020	S4427	Drought
October 1, 2020	S4916	Drought
January 1, 2021	S4921	Drought
October 1, 2021	S5146	Drought
January 1, 2022	S5155	Drought
October 10, 2022	S5371	Drought
January 1, 2023	S5379	Drought

Source: (USDA 2023a)

TABLE 8-2. DROUGHT EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
January 2021-January 2023	N/A	N/A	Across Northern California	Severe drought conditions continually plagued almost the entire State of California from 2013-2021. Significant rainfall eventually aided in reducing the severity of conditions until the extreme drought classification was removed.

Sources: (NOAA NCEI 2024, FEMA 2024c)

8.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous drought occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 8-3. Based on historical records and input from the Planning Team, the probability of occurrence for drought in the County is considered "frequent."

TABLE 8-3. PROBABILITY OF FUTURE DROUGHT EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Drought	55	0.5	100%[a]

a. *100% probability represents a statistical likelihood that an event will occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.*

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

Climate change is likely to exacerbate the region's frequent and severe droughts. Declines in precipitation, and shifts from snow to rain, cause snow drought, which impacts spring runoff, stream flow reliability, and groundwater recharge. The seasonal availability of surface-water supplies will change, with potentially large impacts on local to state-scale water management systems. The vulnerability of groundwater supplies to climate change is less well understood but probably will vary from area to area (State of California 2018).

8.1.6 Cascading Impacts

Drought increases conditions that may trigger fires in the County, such as dead and dying trees, and grasses. Drought can lead to increasing temperatures and evaporation of moisture, which are ideal dry conditions for wildfire events to occur. Dry, hot, and windy weather combined with dry vegetation makes some areas more susceptible to wildfires when met with a spark created by humans or natural events, including lightning. Drought is also often accompanied by extreme heat, exposing people to the risk of sunstroke, heat cramps and heat exhaustion. Additionally, droughts can lead to the following (NIDIS 2019):

- Long-term damage to crop quality and crop losses
- Insect infestation leading to crop losses and reduced tree canopy
- Reduction in the ability to perform outdoor activities, which could result in loss of tourism and recreation opportunities.

8.2 Vulnerability and Impact Assessment

All of Nevada County is vulnerable to drought events. The following subsections provide a qualitative discussion of Nevada County's vulnerability to the drought hazard.

8.2.1 Life, Health, and Safety

Overall Population

Drought can affect people's health and safety and can lower the quantity and quality of potable water for human consumption. A decrease in available water may also impact power generation and availability to residents. Short-term or long-term health effects from drought include heat-related illnesses, waterborne illnesses, recreational risks, limited food availability, and reduced air quality or sanitation. The entire population of Nevada County (102,241) is exposed to this hazard.

Socially Vulnerable Population

Socially vulnerable populations are susceptible to drought events based on their physical and financial ability to react or respond during a drought. Vulnerable populations can be particularly susceptible due to age, health conditions, and limited ability to mobilize to facilities with shelter, cooling, or medical resources. (CDC 2021). Vulnerable populations include homeless persons, people over 65 years old, low income or linguistically isolated populations, people with life-threatening illnesses, and residents with limited access to water. As shown in Table 3-4 Nevada County has a population of 11,100 persons living below the poverty level, 29,045 persons over the age of 65, 4,209 persons under the age of 5, 1,010 non-English speakers, and 15,605 persons with a disability.

8.2.2 General Building Stock

No structures are anticipated to be directly affected by a drought event. However, droughts contribute to conditions conducive to wildfires and reduce fire-fighting capabilities. See Chapter 16 for the wildfire risk assessment.

8.2.3 Community Lifelines and Other Critical Facilities

Drought events generally do not impact buildings; however, droughts have the potential to impact agriculture-related facilities and critical facilities that are associated with water supplies, such as water used with fire-fighting services. Critical facilities in and adjacent to wildfire hazard areas are considered vulnerable to wildfire.

Drought affects groundwater sources, but generally not as quickly as surface water supplies. Groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells.

8.2.4 Economy

One economic impact of drought is its impact on water supply. When drought conditions persist with little to no relief, water restrictions may be put into place by local or state governments. These restrictions may include placing limitations on lawn watering, car washing services, or recreational/commercial outdoor uses of water supplies. In exceptional drought conditions, watering of lawns and crops may not be an option. If crops are not able to receive water, farmland will dry out and crops will die. This can lead to crop shortages, which, in turn, increases the price of food (NC State University 2013).

Increased demand for water and electricity can also result in shortages and higher costs for these resources. Industries that rely on water for business could be impacted the most. Although most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant within the recreation and tourism industry. Moreover, droughts in another area could impact the food supply and price of food for residents within the County.

When a drought occurs, the agricultural industry is most at risk in terms of economic impact and damage. Crops may not mature, leading to a lessened crop yield, wildlife and livestock may become undernourished, land values could decrease, and ultimately there could be a financial loss for the farmer (IPCC 2016). The 2022 Census of Agriculture reported 620 farms in Nevada County, an 8 percent decrease from the 2017 census. The average farm size was 104 acres. Nevada County farms had a total market value of products sold of $9.4 million for crops and $3.5 million for livestock (USDA 2023). Table 8-4 summarizes the acreage of agricultural land exposed to the drought hazard.

TABLE 8-4. AGRICULTURAL LAND IN NEVADA COUNTY IN 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Pastureland (acres)	Woodland (acres)
620	64,185	4,133	34,500	15,469

Source: (USDA 2023)

8.2.5 Natural, Historic and Cultural Resources

Natural Resources

Droughts can impact the environment because they can trigger wildfires, increase insect infestations, and exacerbate the spread of disease (IPCC 2016). When a drought occurs, the existing pressure on the ecosystem's natural water supplies are amplified, leading to the loss in the critical services it provides such as purifying water and air, preventing erosion, and providing recreation opportunities (NIDIS n.d.). Droughts also have the potential to lead to water pollution due to the lack of rainwater to dilute any chemicals in water sources. Contaminated water supplies may be harmful to plants and animals. If water is not getting into the soil, the ground will dry up and become unstable. Unstable soils increase the risk of erosion and loss of topsoil (NC State University 2013).

Historic and Cultural Resources

Droughts have significant impacts on historic assets. One primary consequence is an increased risk of wildfires, which can threaten these resources. Additionally, structures—especially historic ones—may experience foundation issues due to the shrink-well cycle of expansive soils. Reduced water availability during drought also affects outdoor recreational activities (FAO 2019).

8.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

8.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the drought hazard as development is likely to require additional water resources for drinking water, landscaping, and other uses.

8.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in lower water needs and lower risk from drought.

8.3.3 Climate Change

Climate change is likely to exacerbate the region's frequent and severe droughts. Declines in precipitation and shifts from snow to rain cause snow drought, which impacts spring runoff, stream flow reliability, and groundwater recharge. The seasonal availability of surface-water supplies will change, with potentially large impacts on local to state-scale water management systems. The vulnerability of groundwater supplies to climate change probably will vary from area to area (State of California 2018).

9. Earthquake

9.1 Hazard Profile

9.1.1 Hazard Description

An earthquake is a shaking of the earth's surface by energy waves emitted by tectonic plates overcoming friction with one another underneath the earth's surface (FEMA n.d.-b) This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

Earthquake Location

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the earth's surface to the region where the earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the earth's surface directly above the hypocenter (USGS n.d.-d).

Earthquake Geology

Tectonic Plates

The earth's crust, which is the rigid outermost shell of the planet, is broken into seven or eight major tectonic plates and many minor plates. Where the plates meet, they move in one of three ways along their mutual boundary: convergent (two plates moving together), divergent (two plates moving apart), or transform (two plates moving parallel to one another). Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along these plate boundaries. Subduction is a geological process that takes place at convergent boundaries of tectonic plate, in which one plate moves under another. Regions where this process occurs are known as subduction zones, and they have the potential to generate highly damaging earthquakes.

California is seismically active because of movement of the North American Plate, east of the San Andreas Fault, and the Pacific Plate to the west, which includes the state's coastal communities. The transform (parallel) movement of these tectonic plates against one another creates stresses that build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a fault. The rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

Faults

Geologists have found that earthquakes reoccur along faults, which are zones of weakness in the earth's crust. When a fault experiences an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake can still occur. In fact, relieving stress along one part of a fault may increase it in another part.

Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years) (California Department of Conservation 2019).

The State Division of Mines and Geology indicates that increased earthquake activity throughout California may cause tectonic movement along currently inactive fault systems. Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. Most seismic hazards are on well-known active faults. However, inactive faults, where no displacements have been recorded, also have the potential to experience displacement sometime in the future. For example, the Foothills Fault Zone was considered inactive until evidence was found near Spencerville, California, of an earthquake approximately 1.6 million years ago. Then, in 1975, an earthquake occurred on another branch of the zone near Oroville, California.

Ground Motion

Earthquake hazard assessment is based on expected ground motion. The ground experiences acceleration when it shakes during an earthquake. Instruments called accelerographs record levels of ground acceleration due to earthquakes at stations throughout a region. The peak ground acceleration (PGA) is the largest increase in velocity recorded at a particular location during an earthquake. PGA is a measure of how hard the earth shakes in a given geographic area. It is measured in g (the acceleration due to gravity) or expressed as a percent of the acceleration of gravity (%g). These readings are recorded by state and federal agencies that monitor and predict seismic activity. Estimates are developed of the probability that given ground motion acceleration will be exceeded over a defined period of time.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g., single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges).

Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (Mw), the most common scale used today. The moment magnitude scale is a more accurate measure of earthquake size than the better-known Richter scale (U.S. Geological Survey 2021). This scale is based on the total moment release of the earthquake (the product of the distance a fault moved and the force required to move it). The scale is as follows:

- Great—Mw > 8
- Major—Mw = 7.0 – 7.9
- Strong—Mw = 6.0 – 6.9
- Moderate—Mw = 5.0 – 5.9
- Light—Mw = 4.0 – 4.9
- Minor—Mw = 3.0 – 3.9
- Micro—Mw < 3

Intensity

The most commonly used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 9-1. The table also lists PGA factors associated with each level of the Mercalli scale.

TABLE 9-1. MERCALLI SCALE AND PEAK GROUND ACCELERATION COMPARISON

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II – III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA = peak ground acceleration. Measured in percent of g, where g is the acceleration of gravity.
Sources: (USGS 2021, USGS 2011)

Earthquake Mapping Programs

National Seismic Hazard Map

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown, et al. 2001). The U.S. Geological Survey (USGS) updated the National Seismic Hazard Maps in 2018. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2018 map, shown in Figure 9-1, represents the best available data as determined by the USGS.

ShakeMaps

The USGS Earthquake Hazards Program produces maps called ShakeMaps that map ground motion and shaking intensity following significant earthquakes. ShakeMaps focus on the ground shaking caused by the earthquake, rather than on characteristics of the earthquake source, such as magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust.

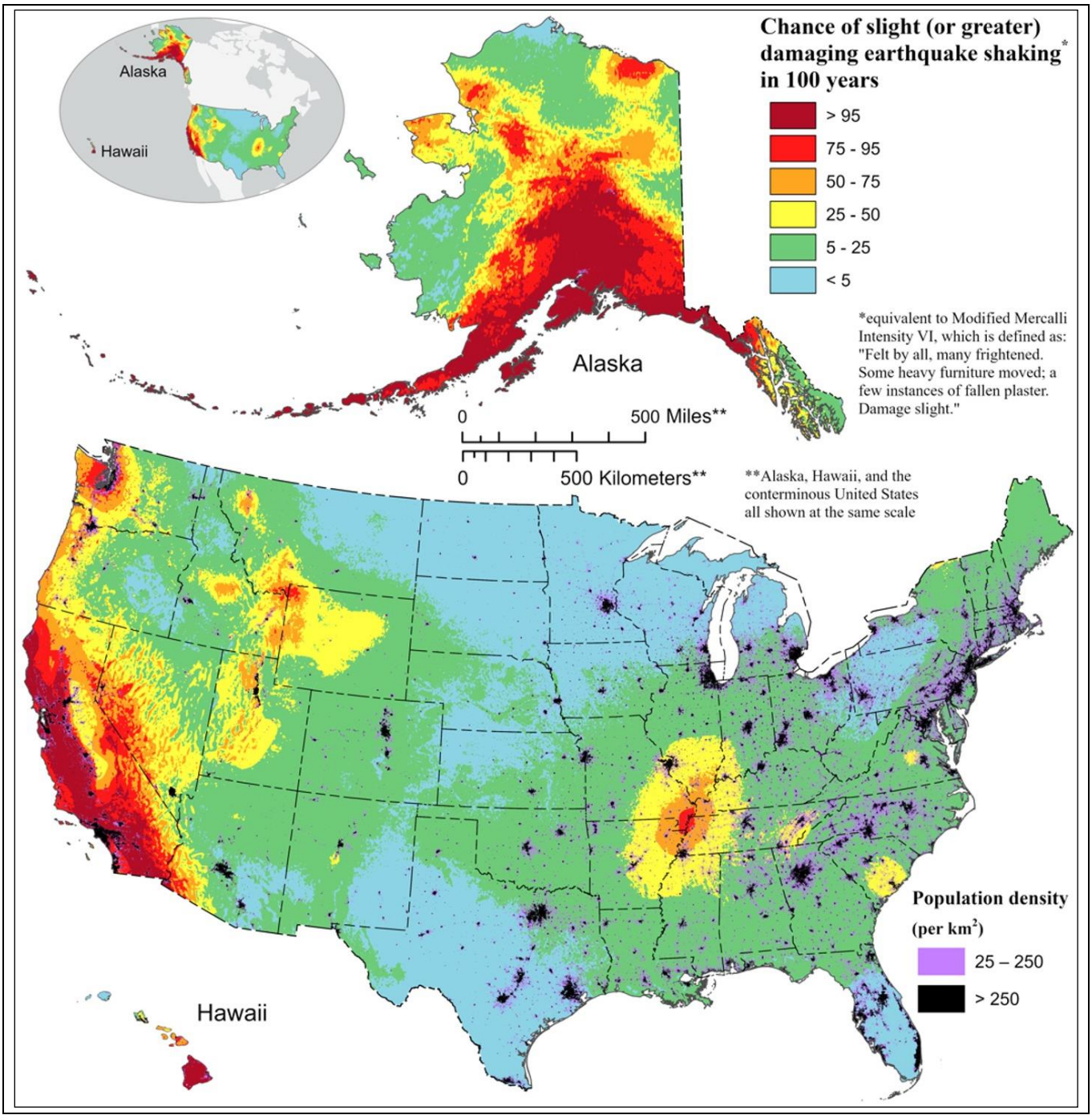
A ShakeMap shows the extent and variation of ground shaking immediately across the surrounding region following significant earthquakes. Such mapping is derived from peak ground motion amplitudes recorded on seismic sensors, with interpolation where data is lacking. Color-coded intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. In addition to the maps of recorded events, the USGS creates the following:

- Scenario ShakeMaps of hypothetical earthquakes of an assumed magnitude on known faults.
- Probabilistic ShakeMaps, based on predicted shaking from all possible earthquakes over a 10,000-year period. In a probabilistic map, information from millions of scenario maps is combined to make a forecast for the future. The maps indicate the ground motion at any given point that has a given probability of being exceeded in a given timeframe, such as a 100-year (1 percent-annual chance) event.

9.1.2 Location

The potential for an earthquake that affects Nevada County is uniform across the entire county. However, the potential intensity of any given earthquake varies with the geology across the county—specifically in the soil types. Soil conditions greatly affect how an earthquake is felt at the ground surface. Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into the ground.

Figure 9-1. 2023 USGS National Seismic Hazard Map



Source: (USGS 2018)

A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. NEHRP soil types define the locations that will be significantly affected by an earthquake. Table 9-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking and liquefaction have NEHRP Soils D, E and F.

TABLE 9-2. NEHRP SOIL CLASSIFICATION SYSTEM

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

Source: (FEMA n.d.-d)

Figure 9-2 displays the soil classifications for Nevada County. The majority of the County is classified as Class C soils (dense soil/soft rock). Areas of Class D soils (still soil) are found in the eastern half of the County.

9.1.3 Extent

Figure 9-3 displays the 100-year PGA in Nevada County. This shows that in a 100-year earthquake event, most of the County is unlikely to feel shaking, but the event may be weakly felt in and around the Town of Truckee.

9.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for earthquake-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any earthquake-related state emergency proclamations since the previous HMP update.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA earthquake-related agricultural disaster declarations (USDA 2023a).

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 9-3. For events prior to 2017, refer to the 2017 Nevada County HMP.

Figure 9-2. NEHRP Soil Hazard Areas in Nevada County

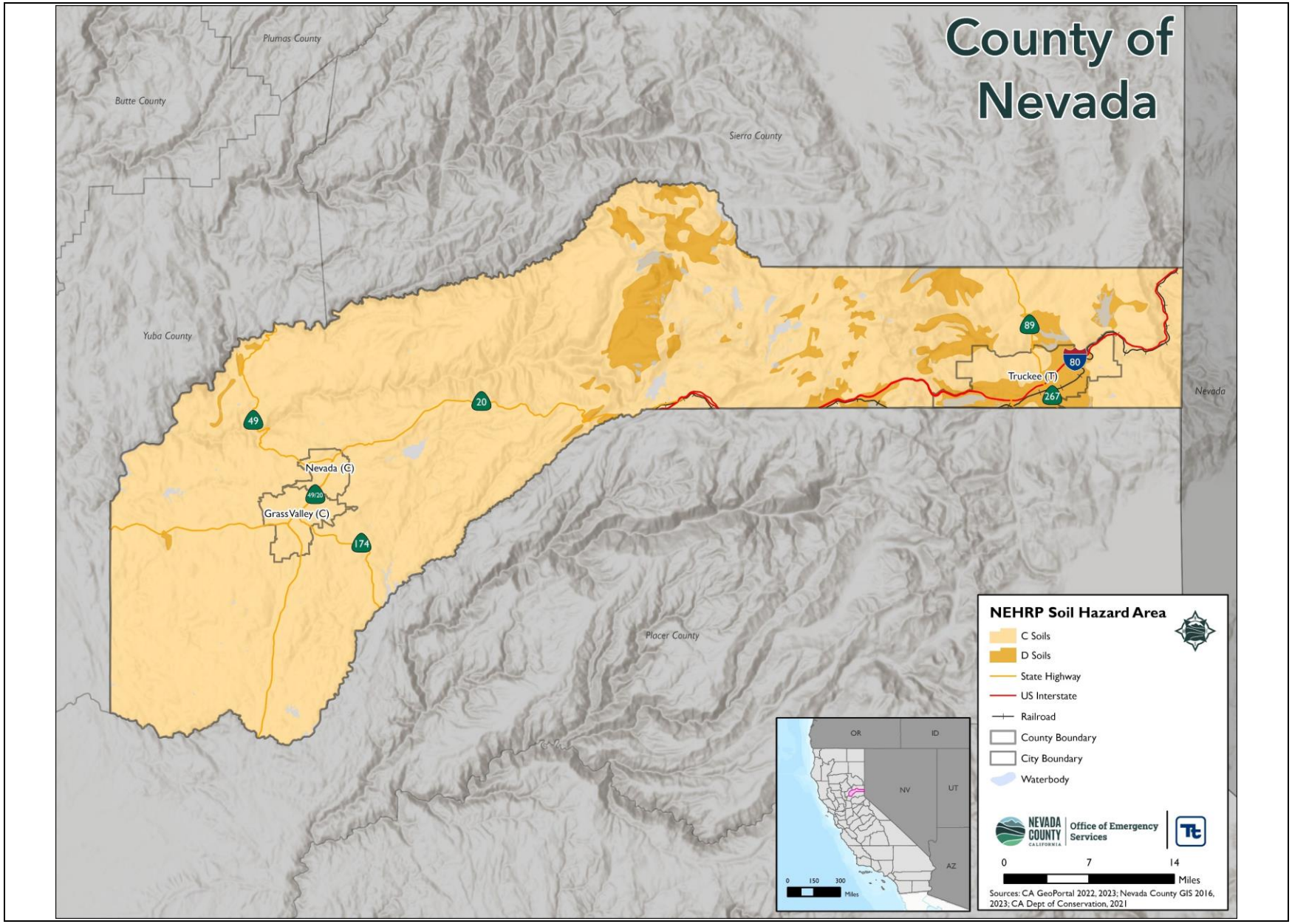


Figure 9-3. 100-Year PGA (%) in Nevada County

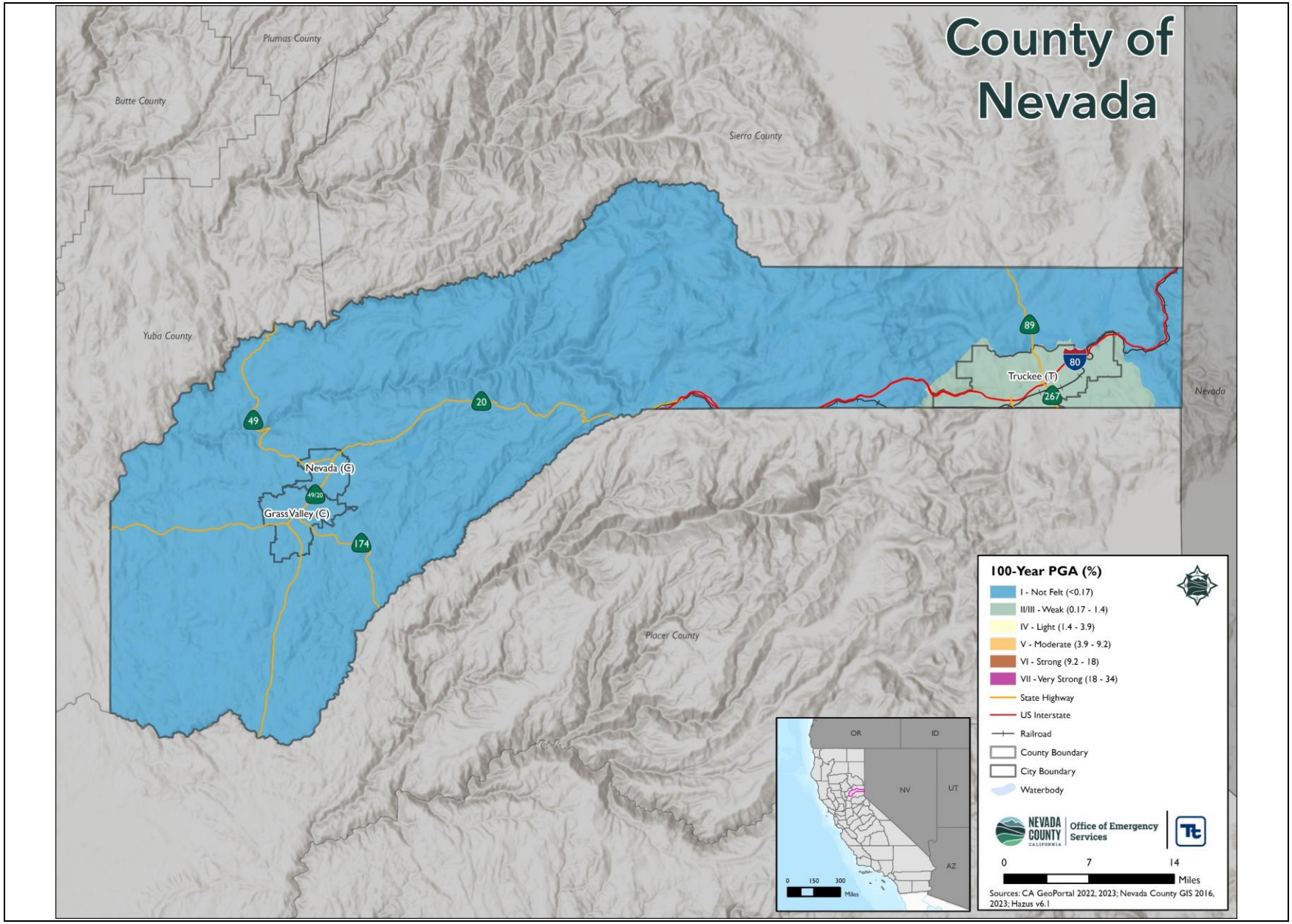


TABLE 9-3. EARTHQUAKE EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration	Location Impacted	Description
May 3, 2017	N/A	N/A	9km NW of Truckee	A magnitude 2.5 earthquake centered 5.6 miles northwest of Truckee was felt but no significant impacts were reported.
February 21, 2018	N/A	N/A	12km North of Tahoe Vista	A magnitude 2.9 earthquake centered 7.4 miles north of Tahoe Vista was felt but no significant impacts were reported.
June 26, 2018	N/A	N/A	4km East of Truckee	A magnitude 2.6 earthquake centered 2.5 miles east of Truckee was felt but no significant impacts were reported.
June 7, 2019	N/A	N/A	14km North of Kings Beach	Magnitude 2.8 and 2.6 earthquakes centered 8.7 miles north of Kings Beach were felt but no significant impacts were reported.
October 3, 2019	N/A	N/A	19km west of Truckee	A magnitude 2.1 earthquake centered 11.8 miles west of Truckee was felt but no significant impacts were reported.
May 13, 2020	N/A	N/A	16km West of Truckee	A magnitude 2.5 earthquake centered 9.9 miles west of Truckee was felt but no significant impacts were reported.
June 11, 2020	N/A	N/A	15km NW of Truckee	A magnitude 2.8 earthquake centered 9.3 miles northwest of Truckee was felt but no significant impacts were reported.
July 21, 2020	N/A	N/A	15km NW of Truckee	A magnitude 2.6 earthquake centered 9.3 miles northwest of Truckee was felt but no significant impacts were reported.
January 11, 2021	N/A	N/A	8km north of Truckee	A magnitude 2.6 earthquake centered 5 miles north of Truckee was felt but no significant impacts were reported.
June 23, 2021	N/A	N/A	24km east of Truckee	A magnitude 3.3 earthquake centered 14.9 miles east of Truckee was felt but no significant impacts were reported.
January 30, 2022	N/A	N/A	4km east of Truckee	A magnitude 2.2 earthquake centered 2.5 miles east of Truckee was felt but no significant impacts were reported.
April 26, 2022	N/A	N/A	4km east of Truckee	A magnitude 2.7 earthquake centered 2.5 miles east of Truckee was felt but no significant impacts were reported.
March 11, 2023	N/A	N/A	14km north of Kings Beach	Magnitude 3.0 and 2.6 earthquakes centered 8.7 miles north of Kings Beach were felt but no significant impacts were reported.
September 6, 2023	N/A	N/A	Floriston	A magnitude 1.1 earthquake centered in Floriston was felt but no significant impacts were reported.

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration	Location Impacted	Description
September 7, 2023	N/A	N/A	Truckee	A magnitude 1.4 earthquake centered in Truckee was felt but no significant impacts were reported.

Source: (USGS n.d.-b)

9.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous earthquake occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 9-4. Based on historical records and input from the Planning Team, the probability of occurrence for earthquake in the County is considered "occasional."

TABLE 9-4. PROBABILITY OF FUTURE EARTHQUAKE EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1950 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Earthquake	19	3.9	26%

Source: (USGS n.d.-b)
Notes: The number of occurrences is restricted to earthquakes with epicenters within Nevada County with a magnitude greater than 2.5.

Climate Change Projections

The potential direct impacts of climate change on earthquake probability are unknown. However, climate change can increase the risk of cascading hazards related to earthquakes, including landslides. (Cal OES 2023a).

9.1.6 Cascading Impacts

According to the USGS Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect people's normal activities. Earthquake hazards include the following:

- **Surface Faulting**—Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes (those with an epicenter less than 20 kilometers).
- **Tectonic Deformation**—A change in the original shape of a material due to stresses.
- **Liquefaction**—A process by which water-saturated sediment temporarily loses strength and acts as a fluid. Earthquake shaking can cause this effect.
- **Landslide**—A movement of surface material down a slope.

Earthquakes can cause large and sometimes disastrous landslides and mudslides. Any steep slope is vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils.

Unless properly secured, hazardous materials can be released during an earthquake, causing significant damage to the environment and people. Structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway. Transportation corridors can be disrupted, leading to the release of materials carried by moving vehicles.

Earthen dams and levees are highly susceptible to seismic events, and their failures can be considered secondary risks for earthquakes. The most common mode of earthquake-induced dam failure is slumping or settlement of earth-fill dams where the fill has not been properly compacted. If the slumping occurs when the dam is full, then overtopping of the dam, with rapid erosion leading to dam failure is possible. Dam failure is also possible if strong ground motions heavily damage concrete dams. Earthquake-induced landslides into reservoirs have also caused dam failures.

Ground liquefaction is often observed in low-lying areas near water bodies. Liquefaction is the conversion of water-saturated soil into a fluid-like mass. This can occur when loosely packed, waterlogged sediments lose their strength in response to strong shaking. Liquefaction effects may occur along the shorelines of any water body; they can also happen in low-lying areas away from water bodies where the groundwater is near the earth's surface.

9.2 Vulnerability and Impact Assessment

Earthquake events tend to affect large areas, such that no portion of Nevada County is considered to be more at risk than others based on location. The potential for damage may be somewhat greater on Class D NEHRP soils than elsewhere, but no quantitative assessment was made of that increased risk.

A Level 2 analysis in Hazus was performed to provide a range of loss estimates using the asset inventories prepared for this HMP and earthquake data for the 100-year mean return period event, and the Magnitude 6.8 Polaris scenario event.

9.2.1 Life, Health, and Safety

Overall Population

The entire population of the county is vulnerable to the earthquake hazard. Populations considered most vulnerable to earthquake events are those located in or near buildings at the time of the event, particularly buildings of unreinforced masonry construction.

The Hazus analysis for two earthquake scenarios estimated casualties as listed in Table 9-5 and displacements of the population as listed in Table 9-6.

Socially Vulnerable Population

Factors leading to higher susceptibility to earthquakes for socially vulnerable populations include decreased mobility, lack of resources to respond during a hazard, and the location and construction quality of their housing. All socially vulnerable populations in Nevada County, as listed in Table 3-4, are equally exposed to the earthquake hazard.

TABLE 9-5. ESTIMATED CASUALTIES FROM EVALUATED EARTHQUAKE SCENARIOS

Time of Day Event Occurs	Non-Hospitalized Injuries	Hospitalizations	Deaths
100-Year Probabilistic Earthquake			
2:00 a.m.	17	2	0
2:00 p.m.	35	7	1
5:00 p.m.	27	7	1
Magnitude 6.8 Polaris Scenario Event			
2:00 a.m.	8	1	0
2:00 p.m.	13	2	0
5:00 p.m.	9	1	0

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 9-6. DISPLACEMENTS AND SHELTER REQUIREMENTS FOR THE EVALUATED EARTHQUAKE SCENARIOS

Jurisdiction	100-Year Probabilistic Earthquake		Magnitude 6.8 Polaris Scenario Event	
	Displaced Households	Persons Seeking Short-Term Sheltering	Displaced Households	Persons Seeking Short-Term Sheltering
Grass Valley	0	0	0	0
Nevada City	0	0	0	0
Truckee	19	7	107	44
Unincorporated	2	0	1	0
Nevada County (Total)	**21**	**7**	**108**	**44**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

9.2.2 General Building Stock

Level of Damage by Occupancy Class

The entire general building stock of the county is exposed to the earthquake hazard. Table 9-7 displays the estimated severity of damage by occupancy class for the evaluated earthquake scenarios. Overall, industrial buildings in the County are at highest risk with moderate damage or greater predicted for 8.4 percent of the County's industrial building stock for the 100-year earthquake and 30.6 percent for the Polaris scenario event. Another key factor in degree of vulnerability is age of facilities and infrastructure, which correlates with building standards in place at times of construction.

TABLE 9-7. EARTHQUAKE EVENT DAMAGE SEVERITY BY OCCUPANCY CLASS

Total Number of Buildings in Occupancy	Severity of Expected Damage	100-Year Probabilistic Earthquake		Magnitude 6.8 Polaris Scenario Event	
		Building Count	% Buildings in Occupancy Class	Building Count	% Buildings in Occupancy Class
Residential Buildings (Single and Multi-Family)					
40,745	NONE	36,021	88.4%	31,705	77.8%
	MINOR	3,814	9.4%	6,743	16.5%
	MODERATE	848	2.1%	2,043	5.0%
	SEVERE	56	0.1%	235	0.6%
	DESTRUCTION	6	<0.1%	18	<0.1%
Commercial Buildings					
14,338	NONE	12,413	86.6%	10,973	76.5%
	MINOR	1,169	8.2%	1,126	7.9%
	MODERATE	639	4.5%	1,707	11.9%
	SEVERE	108	0.8%	490	3.4%
	DESTRUCTION	9	0.1%	42	0.3%
Industrial Buildings					
404	NONE	327	80.8%	260	64.3%
	MINOR	43	10.6%	21	5.1%
	MODERATE	29	7.1%	81	20.1%
	SEVERE	5	1.3%	40	9.9%
	DESTRUCTION	0	0.0%	2	0.6%
Other Buildings[a]					
1,654	NONE	1,540	93.1%	1,547	93.5%
	MINOR	82	4.9%	65	4.0%
	MODERATE	29	1.8%	34	2.0%
	SEVERE	3	0.2%	7	0.4%
	DESTRUCTION	0	0.0%	0	0.0%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Government, Religion, Agricultural, and Education

Estimated Cost of Damage

Table 9-8 shows the Hazus estimated losses for the evaluated earthquake scenarios. For the 100-year event, roughly $300 million in damage is estimated, with the Town of Truckee estimated to see the majority of damage ($240 million). For the Polaris scenario event, roughly $790 million in damage is estimated, with the Town of Truckee again estimated to see the majority of damage ($760 million).

TABLE 9-8. ESTIMATED DAMAGE COSTS DUE TO EARTHQUAKE EVENT

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Damage to Structure and Contents				
		Residential	Commercial	Other[a]	Total Damage	Total % of RCV
100-Year Probabilistic Earthquake						
Grass Valley	$8,077,613,536	$4,151,347	$4,400,772	$1,415,922	$9,968,042	0.1%
Nevada City	$2,974,541,089	$2,085,417	$1,537,432	$496,801	$4,119,650	0.1%
Truckee	$16,378,917,320	$170,227,454	$58,176,153	$10,367,458	$238,771,065	1.5%
Unincorporated	$26,299,651,530	$28,520,674	$13,837,203	$4,678,237	$47,036,113	0.2%
Nevada County (Total)	**$53,730,723,475**	**$204,984,893**	**$77,951,560**	**$16,958,418**	**$299,894,870**	**0.6%**
Magnitude 6.8 Polaris Scenario Event						
Grass Valley	$8,077,613,536	$73,680	$129,157	$46,426	$249,263	<0.1%
Nevada City	$2,974,541,089	$30,855	$45,931	$18,985	$95,772	<0.1%
Truckee	$16,378,917,320	$533,708,460	$195,191,599	$34,867,260	$763,767,319	4.7%
Unincorporated	$26,299,651,530	$12,797,956	$8,539,932	$1,999,033	$23,336,921	0.1%
Nevada County (Total)	**$53,730,723,475**	**$546,610,952**	**$203,906,619**	**$36,931,704**	**$787,449,275**	**1.5%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Industrial, Government, Religion, Agricultural, and Education

Estimated Debris Generated by Earthquake Event

Table 9-9 shows the estimated debris generated by the evaluated earthquake scenarios. The cost of this debris cleanup and removal can be significant. The majority of the debris would be generated in Truckee, with 73 percent of the countywide total for the 100-year earthquake and 97 percent of the total for the Polaris scenario event.

TABLE 9-9. EARTHQUAKE-GENERATED DEBRIS

Jurisdiction	Debris Generated (tons)			
	100-Year Probabilistic Earthquake		Magnitude 6.8 Polaris Scenario Event	
	Brick/Wood	Concrete/Steel	Brick/Wood	Concrete/Steel
Grass Valley	845	840	10	1
Nevada City	284	338	3	1
Truckee	11,784	10,691	36,900	46,623
Unincorporated	3,131	2,694	917	1,225
Nevada County (Total)	**16,044**	**14,563**	**37,830**	**47,850**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

9.2.3 Community Lifelines and Other Critical Facilities

All community lifelines in Nevada County are exposed to the earthquake hazard. Refer to Section 0 of this HMP for a complete inventory of community lifelines in Nevada County. Earthquake events can significantly affect bridges, many of which provide the only access to certain neighborhoods. Because softer soils generally follow floodplain boundaries, bridges that cross watercourses should be considered vulnerable.

For earthquake analysis, Hazus provides estimates of the likely level of damage to each community lifeline, as well as an assessment of how quickly damaged facilities can be returned to full functionality after an earthquake event. These results are shown for the two evaluated earthquake scenarios in Table 9-10 and Table 9-11.

9.2.4 Economy

Earthquake impacts on the economy include loss of business function, damage to inventory, relocation costs, wage loss, and rental loss due to the repair/replacement of buildings.

9.2.5 Natural, Historic and Cultural Resources

Natural Resources

Earthquakes can cause damage to the surface of the earth. Surface faulting is a component of earthquakes that can create wide ruptures in the ground. These can have a direct impact on the landscape and natural environment (USGS n.d.-f). They can alter landscapes, affecting vegetation, soil stability, and water bodies. Wetlands, riparian areas, and woodlands may experience changes due to ground shaking, landslides, or liquefaction. In addition, earthquakes can alter water availability, levels, and quality in wetlands and riparian areas. Earthquakes can also cause disruption in movement corridors, hindering seasonal migrations, causing animals to be displaced or have challenges when moving between habitats. Overall, earthquakes can have cascading effects on natural resources, habitats, and wildlife in Nevada County.

Ground failure as a result of soil liquefaction can have an impact on soil pores and retention of water resources The greater the seismic activity and liquefaction properties of the soil, the more likely it is that drainage of groundwater can occur, which depletes groundwater resources. In areas where there is higher pressure of groundwater retention, the pores can build up more pressure and make soil behave like a fluid, increasing risk of localized flooding and deposition or accumulation of silt (USGS n.d.-f).

Earthquakes can cause large and sometimes disastrous landslides and mudslides. Any steep slope is vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods due to landslides.

TABLE 9-10. ESTIMATED LEVEL OF DAMAGE TO COMMUNITY LIFELINES FROM EARTHQUAKE

	Average percent Probability of Sustaining Damage 100-Year Mean Return Period				
	None	Slight	Moderate	Extensive	Complete
100-Year Probabilistic Earthquake					
Communications	78.0%	12.5%	7.3%	1.9%	0.3%
Energy	72.5%	14.7%	9.6%	2.7%	0.5%
Food, Hydration, Shelter	78.8%	12.0%	7.0%	1.8%	0.3%
Hazardous Materials	83.7%	9.9%	5.1%	1.1%	0.2%
Health and Medical	80.2%	12.7%	5.7%	1.1%	0.2%
Safety and Security	79.5%	9.3%	8.1%	2.9%	0.3%
Transportation	97.3%	1.3%	0.9%	0.3%	0.1%
Water Systems	72.5%	14.7%	9.6%	2.7%	0.5%
Magnitude 6.8 Polaris Scenario Event					
Communications	78.3%	5.4%	8.0%	6.3%	2.0%
Energy	63.8%	4.1%	12.4%	13.9%	5.9%
Food, Hydration, Shelter	73.6%	2.7%	10.3%	10.1%	3.4%
Hazardous Materials	84.9%	0.8%	5.6%	6.7%	2.0%
Health and Medical	71.7%	1.9%	13.4%	10.5%	2.4%
Safety and Security	81.7%	1.3%	4.5%	7.2%	5.3%
Transportation	89.9%	2.4%	2.4%	3.4%	1.9%
Water Systems	57.3%	7.5%	17.9%	13.0%	4.3%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 9-11. ESTIMATED TIME TO RETURN TO FUNCTIONALITY FOLLOWING EARTHQUAKE

	Average percent Functionality			
	Day 1	**Day 7**	**Day 30**	**Day 90**
100-Year Probabilistic Earthquake				
Communications	90.4%	97.8%	99.6%	78.0%
Energy	87.1%	96.7%	99.4%	72.4%
Food, Hydration, Shelter	90.8%	97.8%	99.6%	78.8%
Hazardous Materials	93.6%	98.6%	99.8%	83.7%
Health and Medical	92.7%	98.6%	99.7%	80.1%
Safety and Security	88.5%	96.8%	98.4%	79.4%
Transportation	98.6%	99.5%	99.8%	97.4%
Water Systems	87.1%	96.7%	99.4%	72.4%
Magnitude 6.8 Polaris Scenario Event				
Communications	78.2%	83.6%	91.6%	97.9%
Energy	63.7%	67.7%	80.2%	94.0%
Food, Hydration, Shelter	73.6%	76.2%	86.5%	96.6%
Hazardous Materials	84.9%	85.6%	91.2%	97.9%
Health and Medical	71.7%	73.5%	87.0%	96.0%
Safety and Security	81.6%	82.9%	87.4%	91.7%
Transportation	92.0%	93.6%	94.9%	97.6%
Water Systems	57.2%	64.7%	82.6%	95.6%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Historic and Cultural Resources

Earthquake events affecting the County could damage property in and around historical and cultural landmarks. Many historical buildings and homes, which may not be built to withstand earthquakes, are more vulnerable than other infrastructure. Seismic damage can result in reduced access and potential closures of assets and areas.

9.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

9.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the earthquake hazard, though new development is likely to be better protected than older building stock due to meeting modern building code requirements.

9.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from earthquake events.

9.3.3 Climate Change

The potential direct impacts of climate change on earthquake probability are unknown. However, climate change may increase the risk of cascading hazards related to earthquakes, including landslides. (Cal OES 2023a).

10. Extreme Cold

10.1 Hazard Profile

10.1.1 Hazard Description

Extreme cold events are when temperatures drop well below the normal low temperatures for an area. In some areas, temperatures below freezing are far enough below normal to be considered extreme cold. For Nevada County, this HMP defines extreme cold as temperatures of 0 °F or below (NWS n.d.-b).

Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Extreme cold can cause emergencies for susceptible populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes). Infants and the elderly are most susceptible to the effects of extreme changes in temperatures and are particularly at risk (CDC 2012).

10.1.2 Location

The western portion of Nevada County is characterized by mild winters. Winters along the crest of the Sierra Nevada range and eastward are long and cold. The growing season (free from freezing temperatures) can be as short as 25 days in the eastern county (usually from mid-June to July) (Nevada County 2017).

10.1.3 Extent

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the wind chill temperature index. The index provides an accurate, understandable, and useful formula for calculating the dangers from wind and cold temperatures. Wind chill temperature is presented in Figure 10-1. Currently, the only way to headline very cold temperatures is with NWS-designated wind chill advisories or warnings. When actual temperatures reach wind chill warning criteria with little to no wind, extreme cold warnings may be issued (NWS 2021c).

10.1.4 Previous Occurrences

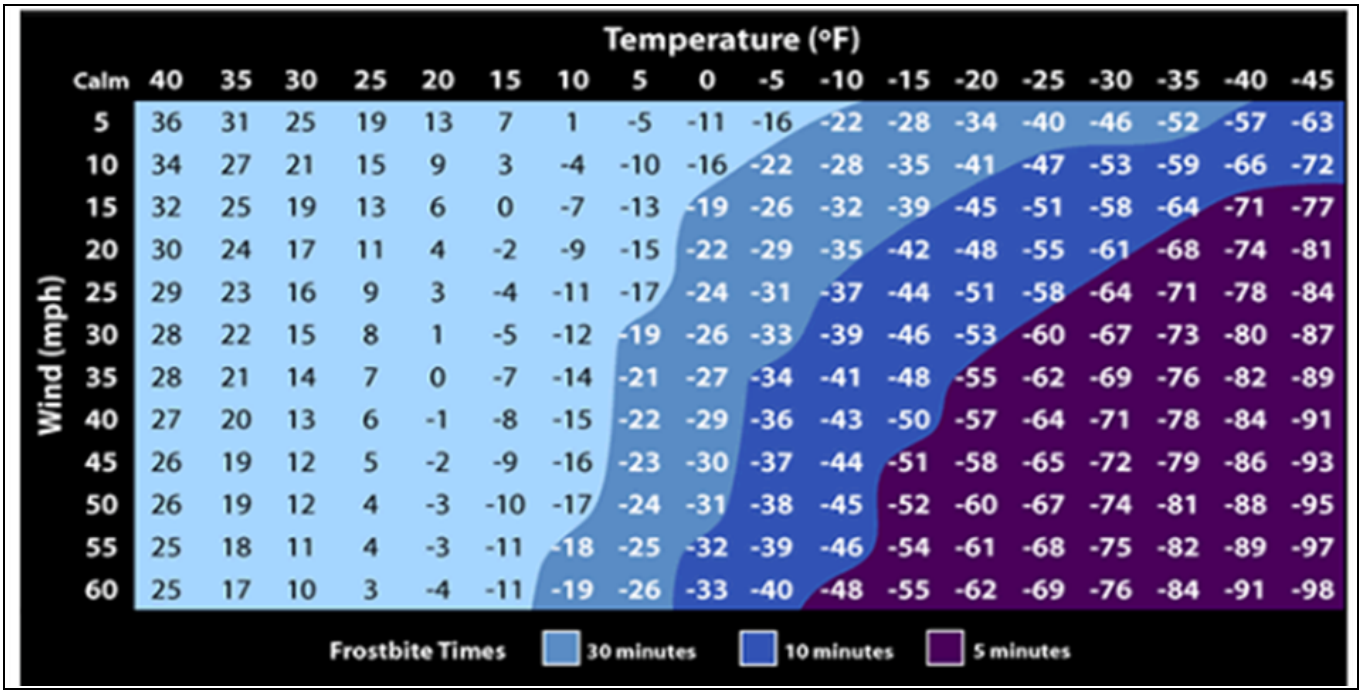
FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for extreme cold-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any extreme cold-related state emergency proclamations since the previous HMP update.

Figure 10-1. Wind Chill Index



Source: (NWS 2021c)

USDA Declarations

Between 2017 and 2023, Nevada County was included in two USDA extreme cold-related agricultural disaster declarations, as listed in Table 10-1.

TABLE 10-1. USDA DECLARATIONS FOR EXTREME COLD EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	USDA Declaration Number	Description
February 21-28, 2022	S5229	Freeze
April 11-12, 2022	S5332	Freeze

Source: (USDA 2023a)

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 10-2. For events prior to 2017, refer to the 2017 Nevada County HMP.

10.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous extreme cold occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 10-3. Based on historical records and input from the Planning Team, the probability of occurrence for extreme cold in the County is considered "rare."

TABLE 10-2. EXTREME COLD EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
April 2022	N/A	N/A	Nevada County	April 8 recorded a high of 82 °F. Many varieties of fruit, including wine grapes, were beginning to break dormancy and set out flowers. Then a cold front arrived, bringing below freezing temperatures to the area. The local weather station reported lows of 27 °F, 27 °F, 30 °F and 31 °F for the next four nights, with some locations reporting colder temperatures. The freezing temperatures significantly damaged or killed tender new growth,.
May 2022	N/A	N/A	Nevada County	Beginning May 10, Nevada County experienced three consecutive nights at 33 °F, 32 °F and 30 °F. Some locations reported colder temperatures. In most cases, the grape crop was damaged, incurring significant losses—up to 100% crop loss at some vineyards. A survey of grape growers revealed an overall estimated production loss of 55% throughout the County, including anticipated yields of 1.75 tons per acre compared to the five-year average of 3.85 tons per acre. This would result in $1.2 million of lost revenue for Nevada County grape growers. While many other crops also experienced damage, the grape crop was the only crop determined to have met the 30 percent loss threshold to qualify for a USDA disaster declaration request.
November 24-27, 2023	N/A	N/A	Central Sacramento Valley	Clear skies and cold air led to freezing morning low temperatures across the Central Valley November 25 – 27, with widespread frost. Temperatures as low as 28 °F to 35 °F were observed for the morning lows.

Sources: (NOAA NCEI 2024, FEMA 2024c, Nevada County 2023a)

TABLE 10-3. PROBABILITY OF FUTURE EXTREME COLD EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Extreme Cold	3	9.3	11%

Source: (NOAA NCEI 2024)

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. These changes will

depend on many factors, including elevation within the mountain range, with quicker warming trends at highest elevations (State of California 2018).

As temperatures warm, the occurrence of extreme cold conditions is likely to decrease. However, more severe storms may still result in continued occurrence of extreme cold events.

10.1.6 Cascading Impacts

Extreme cold events can exacerbate the threats from wind and winter weather events for the County. Extreme variation in temperatures could also create ideal atmospheric conditions for severe storms or worsen the outcome of severe winter weather during freezing and thawing periods.

10.2 Vulnerability and Impact Assessment

All of Nevada County is vulnerable to extreme cold events. The following subsections provide a qualitative discussion of Nevada County's vulnerability to the extreme cold hazard.

10.2.1 Life, Health, and Safety

Overall Population

For the purposes of this HMP, the entire population of Nevada County (102,241) is exposed to extreme cold events. The following health hazards are related to extreme cold temperatures (NWS 2022):

- *Wind chill* measures how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- *Frostbite* is damage to body tissue caused by extreme cold. A wind chill of -20 °F will cause frostbite in 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in extremities.
- *Hypothermia* is a condition brought on when the body temperature drops to less than 95°F, and it can be deadly. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

Socially Vulnerable Population

Populations most at risk from extreme cold include the elderly, who are less able to withstand cold temperatures due to health conditions and limited mobility to access shelters; infants and young children; individuals with chronic medical conditions (e.g., heart disease, high blood pressure); and low-income persons who cannot afford adequate heating (CDC 2022a, CDC 2005).

Those experiencing homelessness are particularly likely to experience the impacts of extreme cold or freezing temperature. The cumulative effects over several days of continuous exposure to cold temperatures, without relief, pose additional risks for the homeless, especially those with underlying medical conditions.

Meteorologists can accurately forecast extreme heat and cold event development and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for

public health and other officials to notify vulnerable populations, implement short-term emergency response actions, and focus on surveillance and relief efforts for those at greatest risk. Adhering to extreme temperature warnings and conducting appropriate preparation measures can significantly reduce the risk of temperature-related deaths. Designating and developing emergency heating facilities can also enhance the resilience and safety of communities.

As shown in Table 3-4 Nevada County has a population of 11,100 persons living below the poverty level, 29,045 persons over the age of 65, 4,209 persons under the age of 5, 1,010 non-English speakers, and 15,605 persons with a disability.

10.2.2 General Building Stock

All the building stock in the County (see Chapter 3) is exposed to the extreme temperature hazard. Extreme cold temperature can damage buildings through freezing/bursting pipes and freeze/thaw cycles, as well as increasing vulnerability to home fires. Additionally, manufactured homes (mobile homes) and old or poorly constructed facilities can have inadequate capabilities to withstand extreme cold events.

Proper strategies help safeguard buildings and their contents. Sudden and dramatic fluctuations in heating or cooling should be minimized. Slower heating and cooling give building materials and stored contents time to acclimate to new temperatures in the building and corresponding new humidity levels (CCAHA 2019).

10.2.3 Community Lifelines and Other Critical Facilities

All critical facilities in the County are exposed to the extreme cold hazard. Impacts on lifelines and critical facilities are the same as described for general building stock. It is essential that critical facilities remain operational during natural hazard events.

10.2.4 Economy

Impacts of extreme cold events on the economy include loss of business function and damage to and loss of inventory. Business-owners can be faced with increased financial burdens due to unexpected repairs caused to the building (e.g., pipes bursting), higher than normal utility bills, or business interruption due to power failure (i.e., loss of electricity, telecommunications due to power lines downed by ice).

Extreme cold events can have a large impact on the agricultural industry, resulting in economic losses. According to the Nevada County 2022 Crop and Livestock Report, the 2022 gross value was down roughly 12 percent from the previous year due to frost experienced in the spring of 2022. Nearly all of the County's white wine grape varietals were lost due to frost, as well as approximately 55 percent of red wine grape varietals. The total loss was approximately $1.8 million (Nevada County 2023a).

The 2022 Census of Agriculture reported 620 farms in Nevada County, an 8 percent decrease from the 2017 census. The average farm size was 104 acres. Nevada County farms had a total market value of products sold of $9.4 million for crops and $3.5 million for livestock (USDA 2023). Table 10-4 summarizes the acreage of agricultural land exposed to the extreme cold hazard.

TABLE 10-4. AGRICULTURAL LAND IN NEVADA COUNTY IN 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Pastureland (acres)	Woodland (acres)
620	64,185	4,133	34,500	15,469

Source: (USDA 2023)

10.2.5 Natural, Historic and Cultural Resources

Natural Resources

Freezing and warming weather patterns can create changes in natural processes (USGS 2020a). Extreme cold events can affect ecosystems, which can destroy food webs and deplete resources in the environment.

Historic and Cultural Resources

Historic and cultural resources are vulnerable to freeze and thaw cycles and rapid wetting and drying cycles (NPS 2016). Cultural landscapes may experience declines in vegetation species and faster deterioration of constructed landscape features (e.g., corrosion, decay, desiccation) due to increased freeze and thaw cycles. Furthermore, buildings, facilities, and structures are susceptible to extreme cold, resulting in surface cracking, flaking, and sugaring of building stone, as well as spalling of brick due to wet frost (NPS 2016).

10.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

10.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the extreme cold hazard.

10.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from extreme cold events.

10.3.3 Climate Change

By the end of the century, temperatures in the Sierra Nevada are projected to warm by 6 to 10 ºF on average (State of California 2018). As temperatures warm, the occurrence of extreme cold conditions is likely to decrease. However, more severe storms may still result in continued occurrence of extreme cold events.

11. Extreme Heat

11.1 Hazard Profile

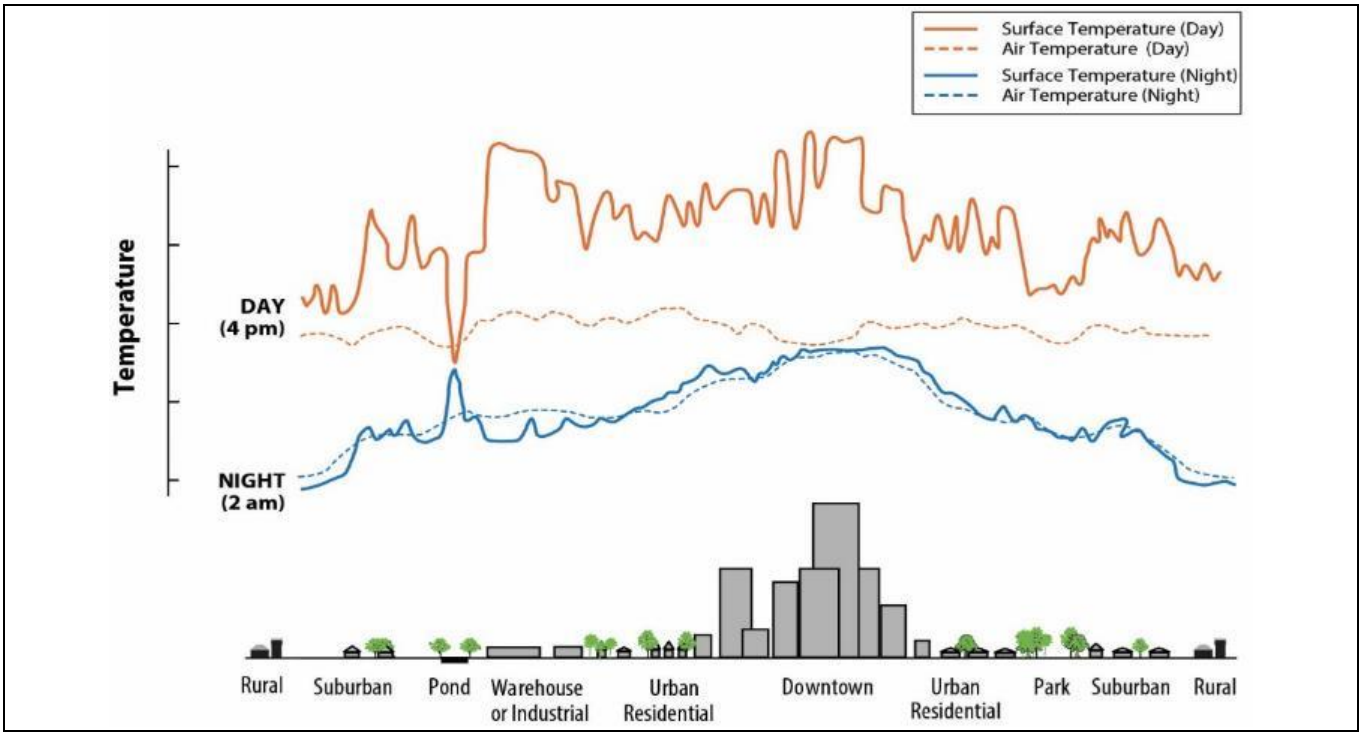
11.1.1 Hazard Description

Extreme heat is defined as temperatures that hover 10 °F or more above the average high temperature of a region for an extended period (CDC 2016). The term is relative to the usual weather in a particular area.

Heat Island Effect

Urban areas face greater risk during an extreme heat event than rural and suburban areas. When urban buildings, roads, and other infrastructure replace open land and vegetation, surfaces that were once permeable and moist become impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas. (U.S. EPA 2019). As shown in Figure 11-1, surface temperatures vary more than atmospheric air temperatures during the day. The dip in surface temperatures over the pond area shows how water maintains a nearly constant temperature day and night because it does not absorb the sun's energy the same way as buildings and paved surfaces. Parks, open land, and bodies of water can create cooler areas within a city. Temperatures are typically lower at suburban-rural borders than in downtown areas.

Figure 11-1. Heat Island Effect Diagram



Source: (U.S. EPA 2019)

The term “heat island” describes built up areas that are hotter than nearby less-developed areas. The annual mean air temperature of a city with more than a million people can be between 1.8 ºF and 5.4ºF warmer than its surrounding areas. In the evening, the difference in air temperatures can be as high as 22 ºF. Heat islands occur on the surface and in the atmosphere. On a hot, sunny day, the sun can heat dry, exposed urban surfaces to temperatures 50 ºF to 90 ºF hotter than the air. Heat islands can affect communities by increasing peak energy demand during the summer, contributing to air pollution and greenhouse gas emissions, causing heat-related illness and death, and degrading water quality (U.S. EPA 2019).

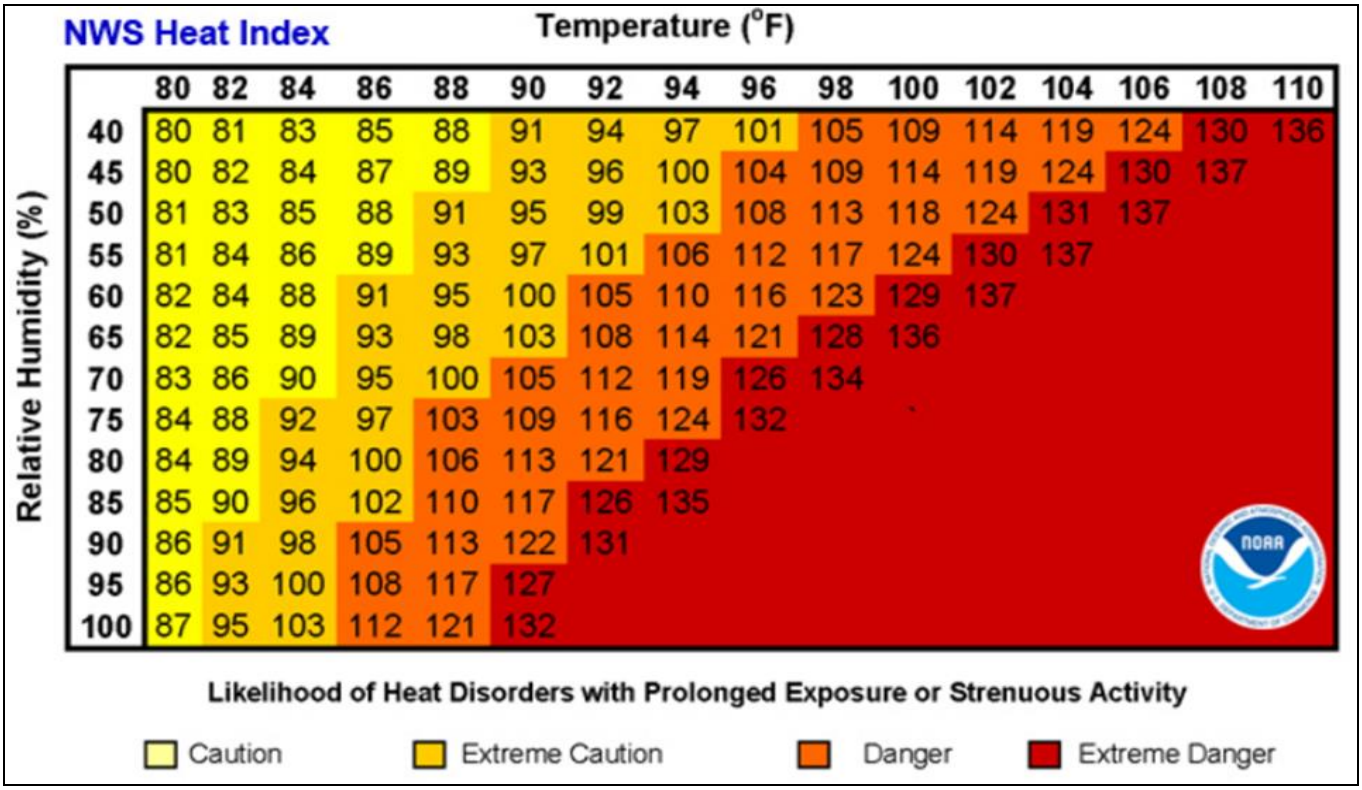
11.1.2 Location

All of Nevada County is exposed to the extreme heat hazard. Population centers are more likely to experience higher temperatures due to urban heat island effect.

11.1.3 Extent

The extent of extreme heat temperatures is generally measured through the heat index (see Figure 11-2). Created by the NWS, the heat index is a chart that accurately measures apparent temperature of the air as it increases with the relative humidity. The temperature and relative humidity are needed to determine the heat index. Once both values have been identified, the heat index is the corresponding number of both values. This index provides a measure of how temperatures feel; however, the values are devised for shady, light wind conditions.

Figure 11-2. NWS Heat Index Chart – Shaded Areas



Source: (NWS 2021b)

The NWS issues excessive heat outlooks when the potential exists for an excessive heat event in the next three to seven days. Watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. Excessive heat warning/advisories are issued when an excessive heat event is expected in the next 36 hours (NWS 2021b).

11.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for extreme heat-related events (FEMA 2023a).

State Emergency Proclamations

Emergency proclamations N-14-22 and N-15-22 were declared for August 31 – September 7, 2022, due to an extreme heat event that placed significant demand and strain on California's energy grid (Cal OES 2024b).

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA heat-related agricultural disaster declarations (USDA 2023a).

Previous Events

Known extreme heat hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 11-1. For events prior to 2017, refer to the 2017 Nevada County HMP.

11.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous extreme heat occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 11-2. Based on historical records and input from the Planning Team, the probability of occurrence for extreme heat in the County is considered "frequent."

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends at highest elevations (State of California 2018). As temperatures warm, the frequency of extreme heat events is likely to increase.

TABLE 11-1. EXTREME HEAT EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
June 17, 2017	N/A	N/A		High pressure ridge brought an unusually long and strong heat wave for the month of June, with 24 new record high temperatures and 16 record high minimum temperatures being set in the area.
June 22-24, 2018	N/A	N/A		There was widespread unseasonable heat across the Central Valley over a period of 3 days, with triple digit high temperatures. The NWS Experimental Heat Risk reached High readings that prompted a heat warning for the central Sacramento Valley. PG&E activated its emergency operations center in support of the June heat event.
July 15-20, 2018	N/A	N/A	Central Sacramento Valley, Motherlode	The NWS Experimental Heat Risk reached Moderate to High readings for several days, prompting a heat advisory for the Central Sacramento Valley and for the Motherlode.
July 24-27, 2018	N/A	N/A	Central Sacramento Valley	The NWS Experimental Heat Risk reached High to Very High readings that prompted an excessive heat warning for the Central Sacramento Valley.
May 30 – June 3, 2021	N/A	N/A	Central Sacramento Valley	High pressure ridge brought a heat wave to Northern California. Several new record daily high temperatures and one record monthly high temperature record were set in the area.
June 16-20, 2021	N/A	N/A	West Slope Northern Sierra Nevada, Central Sacramento Valley	High pressure from the desert southwest built westward into California, resulting in very hot daytime temperatures across the region and warm overnight low temperatures. High to very high heat risk impacted the region with a four-day heatwave. Portions of the West Slope region saw high temperatures in the mid to upper 90s with warm overnight lows. The Central Sacramento Valley region saw high temperatures upwards of 110 °F.
June 26-29, 2021	N/A	N/A	Central Sacramento Valley	Temperatures well above normal in the central and northern Sacramento Valley brought very high heat risk to the area. The Central Sacramento Valley region saw high temperatures exceed 110 °F.
July 9-12, 2021	N/A	N/A	West Slope Northern Sierra Nevada, Central Sacramento Valley	High pressure from the four-corners region built westward into California, resulting in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk impacted the region with a several day heatwave. Portions of the West Slope region saw high temperatures reach the mid to upper 90s.The Central Sacramento Valley region saw high temperatures of 111 °F.

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
August 14-15, 2021	N/A	N/A	Central Sacramento Valley	High pressure over California resulted in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk impacted the region. The Central Sacramento Valley region saw high temperatures reach 109 °F.
September 7-9, 2021	N/A	N/A	West Slope Northern Sierra Nevada, Central Sacramento Valley	High pressure over California resulted in very hot daytime temperatures and warm overnight low temperatures across interior Northern California. High to very high heat risk impacted the region. The Western Slope region saw high temperatures reach the mid to upper 90s. The Central Sacramento Valley region saw high temperatures reach 105 °F.
May 24-25, 2022	N/A	N/A	Central Sacramento Valley	High pressure over interior northern California brought widespread moderate to locally high heat risk to the region. Reported high temperature readings ranged from 97 to 102 °F.
June 10-11, 2022	N/A	N/A	Central Sacramento Valley	High pressure brought widespread moderate to locally high heat risk to the region. Triple digit temperatures were observed across much of the Valley June 10 – 11. A daily high temperature record was tied in the area.
September 4-9, 2022	N/A	N/A	Central Sacramento Valley	The Central Sacramento Valley region saw high temperatures reach 115 °F. Low temperatures were in the low to upper 70s.
July 1-2, 2023	N/A	N/A	Central Sacramento Valley	Excessive heat led to record breaking temperatures and Major Heat Risk. Daytime highs across this zone were in the 100 to 110 °F range. Overnight lows were in the mid-70s to low 80s.
July 15-16, 2023	N/A	N/A	West Slope Northern Sierra Nevada, Central Sacramento Valley	Excessive heat brought very hot temperatures to interior northern California and Major Heat Risk. Widespread triple digit temperatures were observed in the Valley and foothills. Daytime highs reached near 100 °F. Very warm overnight low temperatures were observed, generally in the 70s to mid-80s.
July 21-22, 2023	N/A	N/A	West Slope Northern Sierra Nevada, Central Sacramento Valley	Hot temperatures brought widespread Moderate Heat Risk and areas of Major Heat Risk. Daytime highs reached 110 °F on July 15 and 16. Overnight lows were in the upper 70s.
August 14-17, 2023	N/A	N/A	Central Sacramento Valley	Hot temperatures brought triple digit daytime temperatures with warm overnight lows to portions of the Valley, foothills and lower elevations of the mountains. Daytime high temperatures were up to 110 °F. Overnight lows were in the 70s.

Sources: (NOAA NCEI 2024, FEMA 2024c)

TABLE 11-2. PROBABILITY OF FUTURE EXTREME HEAT EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Extreme Heat	27	1.0	96%

Source: (NOAA NCEI 2024)

11.1.6 Cascading Impacts

Extreme heat events can exacerbate the drought hazard and increase the potential risk of wildfires for the County. For example, extreme heat events may accelerate evaporation rates, which may dry out the air and soils, making some terrestrial plants and soil more susceptible to catching fire. Extreme variation in temperatures could also create ideal atmospheric conditions for severe storms.

Extreme heat events also result in heavy loading on the electrical grid and may cause brownouts or periods of utility failure. Extreme heat can result in very poor air quality. Heat is a major contributor to ozone pollution, which happens when emissions react under heat and sunlight (PBS News 2022).

11.2 Vulnerability and Impact Assessment

All of Nevada County is vulnerable to extreme heat events. The following subsections discuss Nevada County's vulnerability, in a qualitative nature, to the extreme heat hazard.

11.2.1 Life, Health, and Safety

Overall Population

The entire population of Nevada County (102,241) is exposed to extreme heat events. Extreme heat events have potential health impacts including injury and death. The following health hazards are related to extreme heat (CDC 2022b):

- *Heat exhaustion* is the body's response to an excessive loss of water and salt, usually through excessive sweating. Symptoms can include headache, cramping, dizziness, and weakness.
- *Heat stroke* is the most serious heat-related illness. It occurs when the body can no longer control its temperature: the body's temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106 °F or higher within 10 to 15 minutes. Heat stroke can cause permanent disability or death if the person does not receive emergency treatment

Table 11-3 summarizes the effects of prolonged exposure to direct sunlight on the human body during extreme heat events. Adhering to extreme temperature warnings and conducting appropriate mitigation and preparation measures can significantly reduce the risk of temperature-related deaths.

TABLE 11-3. ADVERSE EFFECTS OF PROLONGED EXPOSURE TO HIGH HEAT INDEX

Category	Heat Index	Effects on the Body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Source: (NWS 2021b)

Socially Vulnerable Population

Populations most at risk extreme heat events include the elderly, who are less able to withstand temperatures extremes due to their age, health conditions, and limited mobility to access shelters; infants and children up to 4 years of age; individuals with chronic medical conditions (e.g., heart disease, high blood pressure); and low-income persons that cannot afford adequate cooling; (CDC 2022a, CDC 2005).

Meteorologists can accurately forecast extreme temperature event development and the severity of the associated conditions with several days lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions, and focus on surveillance and relief efforts on those at greatest risk. Designating and developing emergency cooling facilities can enhance the resilience and safety of communities.

Low Income Populations

Poor housing conditions, lack of adequate temperature control, and inability to locate cooler shelter make low-income populations particularly vulnerable to extreme heat. According to the U.S. Census Bureau's American Housing Survey, about 9 percent of American households lack air conditioning (U.S. Census Bureau 2021).

Many individuals and families that are considered to be low-income reside in urban centers, which can undergo the urban heat island effect. This creates an area of higher temperatures compared to the surrounding areas that are less urbanized, which contributes to heat-related illnesses in these areas (National Geographic 2023).

Infants and Children

Infants and children under the age of 4 are considered to be more susceptible to the effects of high temperatures. Children are not equipped to independently regulate their activity levels or understand when to rest or seek out hydration and cooling. Their body temperature rises 3 to 5 times faster than an adult, and they absorb heat faster due to their greater surface area relative to their mass (Columbia University 2023).

Older Adults

Adults over the age of 65 are more likely than other subsets of the population to have pre-existing medical conditions and/or take specific medications that can affect their body's ability to control temperature, which can lower their threshold to tolerate heat. Older adults are also more likely to be more socially isolated and not have anyone to check up on their health during a heat wave. (AARP 2022).

People with Chronic Pre-Existing Health Issues

Illnesses that can increase an individual's susceptibility to heat-related illness include respiratory disease, cardiovascular disease, mental illness, obesity, and diabetes. Many chronic conditions require medication for treatment, and many of these can cause dysregulation of body temperature that lessens the body's ability to tolerate high temperatures (CDC 2017).

Those Who are Pregnant and Breastfeeding

Pregnancy and breastfeeding cause significant strain on the body. The parent is sharing a blood supply and any water intake with the fetus or baby, and this greatly increases the risk of dehydration or heat exhaustion if the body is not allowed time to cool and hydrate. Overheating during pregnancy can harm a fetus and result in slow growth and premature birth (CDC 2022c).

People Experiencing Homelessness

People experiencing homelessness are disproportionately impacted by heat. Factors that can make this population more at risk from heat include physical conditions such dehydration, disabilities, chronic health issues, cardiovascular issues, and more. Those with mental health conditions are especially at risk of heat-related illnesses. People experiencing homelessness may not seek medical treatment during a heat event due to distance, lack of access to transportation, financial means, and more. Their access to cooling centers or shelters may be limited due to distance and lack of transportation, building hours of access, stigma, and several other factors. People that live in rural areas may have even less access to resources and services (NIHHIS n.d.).

Workers

Many occupations require work in all types of inclement weather. From construction and agricultural workers to bakers and warehouse managers, heat-related illness is a risk during hot weather, especially in combination with the wearing of hot protective or safety gear or a lack of efficient cooling

(OSHA 2023). According to the 2022 Census of Agriculture, there are over 1,200 workers on farms in Nevada County (USDA 2023).

Extreme heat can cause health risks to people who work in hot environments. Overexposure to heat can result in heat stroke, heat exhaustion, heat cramps, or heat rashes. Heat can also increase the risk of injuries in workers as it may result in sweaty palms, fogged-up safety glasses, and dizziness. Burns may occur as a result of accidental contact with hot surfaces. Sunlight exposure is highest during the summer and between 10:00 a.m. and 4:00 p.m. Working outdoors during these times increases the chances of getting sunburned. Workers at greater risk of heat stress include those who are 65 years of age or older, are overweight, have heart disease or high blood pressure, or take medications that may be affected by extreme heat (CDC 2020, CDC 2018).

Athletes and People Playing Sports

Intense exercise causes a rapid rise in body temperature, which is greatly exacerbated by high environmental temperatures. Many activities also require specific equipment or protective gear, such as helmets and pads, which can be heavy and retain a significant amount of heat and moisture that will accelerate the speed at which heat exhaustion may occur (Academy of Nutrition and Dietetics 2024).

11.2.2 General Building Stock

All the building stock in the County (see Chapter 3) is exposed to the extreme heat hazard. Extreme or prolonged heat exposure may affect older, poorly built, or uninsulated buildings. Newer built structures generally are not impacted; however, elevated summer temperatures increase the energy demand for cooling. Losses can be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems.

11.2.3 Community Lifelines and Other Critical Facilities

All critical facilities in the County are exposed to the extreme heat hazard. It is essential that these facilities remain operational during natural hazard events. Extreme heat events can cause short periods of utility failures, commonly referred to as brownouts, due to increased usage of air conditioners.

Impacts on transportation infrastructure from extreme heat include softening or buckling of road pavement and deterioration of concrete structures, compromising the integrity of roadways or reducing their useful lifetimes. Similarly, bridge joints and other structural elements expand and contract during periods of extreme heat and cold, requiring maintenance and reducing their useful lifetimes (OPR, CNRA, CEC 2018).

11.2.4 Economy

Impacts of extreme heat events on the economy include loss of business function and damage to and loss of inventory. Business-owners can be faced with increased financial burdens due to unexpected repairs caused to the building, higher than normal utility bills, or business interruption due to power failure (i.e., loss of electricity, telecommunications).

The agricultural industry is most at risk in terms of economic impact and damage caused by extreme heat events. Extreme heat events can result in drought and dry conditions and directly affect livestock and crop production.

The 2022 Census of Agriculture reported 620 farms in Nevada County, an 8 percent decrease from the 2017 census. The average farm size was 104 acres. Nevada County farms had a total market value of products sold of $9.4 million for crops and $3.5 million for livestock (USDA 2023). Table 11-4 summarizes the acreage of agricultural land exposed to the extreme heat hazard.

TABLE 11-4. AGRICULTURAL LAND IN NEVADA COUNTY IN 2022

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Pastureland (acres)	Woodland (acres)
620	64,185	4,133	34,500	15,469

(USDA 2023)

11.2.5 Natural, Historic and Cultural Resources

Natural Resources

Extreme heat events can have particularly negative impacts on aquatic systems, contributing to fish kills, aquatic plant die offs, and increased likelihood of harmful algal blooms. These events can also affect ecosystems, which can destroy food webs and deplete resources in the environment.

Historic and Cultural Resources

Extreme heat can increase the risk of ignition of fires and their propagation. Fire causes material loss and deformation of cultural heritage assets and may also increase the probability of cracking or splitting in built structures. Under extreme heat, stones can face both macro (e.g., cracking of stones, soot accumulation, color change in stone containing iron) and micro degradation (e.g., mineralogical, and textural changes), leading to potential structural instability. The long-term impacts include weakened stones and increased susceptibility to deterioration processes such as salt weathering and temperature cycling (Sesana, et al. 2021). Outdoor events and festivals may suffer from low attendance or cancellation due to extreme heat conditions.

11.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

11.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the extreme heat hazard.

11.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from extreme heat events.

11.3.3 Climate Change

By the end of the century, temperatures in the Sierra Nevada are projected to warm by 6 to 10 ºF on average (State of California 2018). As temperatures warm, the occurrence and severity of extreme heat events is likely to increase.

12. Flood

12.1 Hazard Profile

12.1.1 Hazard Description

Flooding is any overflowing of water onto land that is normally dry, due to rain, ocean waves, or the failure of a dam or levee. Areas near rivers or streams are at risk from floods during heavy rain or periods of upstream snowmelt. In urban areas, where buildings, highways, driveways, and parking lots reduce the ground's ability to absorb rainfall, the resulting increase in runoff can overwhelm constructed storm drain systems, resulting in flooding of nearby roads and buildings. Flooding can also result from the failure of a water control structure, such as a dam or levee (NWS 2019a). Floods kill more people in the United States each year than tornados, hurricanes, or lightning (NOAA n.d.).

Flooding includes any of the following temporary partial or complete inundations of normally dry land (NWS 2019a):

- Riverine overbank flooding
- Flash floods
- Alluvial fan floods
- Mudflows or debris floods
- Dam- and levee-break floods
- Local draining or high groundwater levels
- Fluctuating lake levels
- Ice-jams
- Coastal flooding

The main types of flood discussed in this HMP are riverine, flash, and stormwater/urban, as described in the sections below.

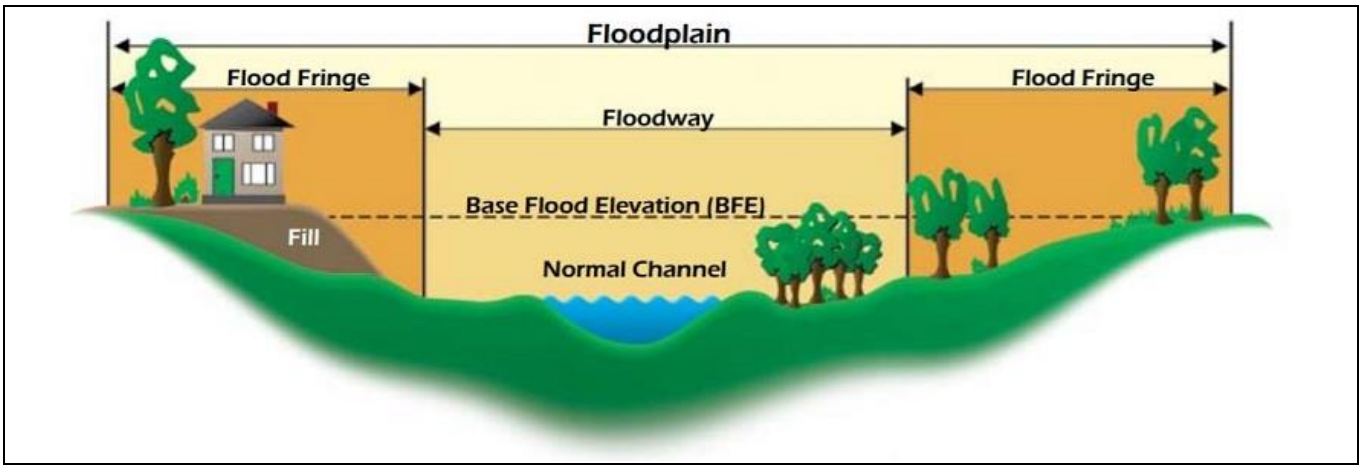
Riverine Flooding

Riverine floods are the most common flood type. They occur along a channel when rising waters overflow the channel's banks. Channels are defined ground features that carry water through and out of a watershed. They include rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2019).

Floodplains

A floodplain is flat land adjacent to a river, creek, or stream that is subject to periodic inundation (Figure 12-1). Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control.

Figure 12-1. Characteristics of a Floodplain



Source: (FEMA 2020a)

FEMA Flood Maps

FEMA prepares maps of floodplains based on riverine flooding conditions. FEMA's flood maps indicate the Special Flood Hazard Area (SFHA) as the area that will be inundated by the riverine flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the base flood. The percent annual chance is only a statistical average; it is possible for the base flood to occur more than once in a relatively short period of time. The 1 percent annual chance floodplain establishes the area that has flood insurance and floodplain management requirements (FEMA 2020a). FEMA also maps the floodplain of the 0.2 percent annual chance flood, which extends beyond the SFHA.

FEMA defines flood hazard areas through statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on Flood Insurance Rate Maps (FIRMs), which are official maps of a community on which FEMA has delineated SFHAs. Digital versions of FIRMs are called DFIRMs.

The base flood is the regulatory standard adopted by federal agencies and most states to administer floodplain management programs. Within the SFHA (also called the 1 percent annual chance floodplain) National Flood Insurance Program (NFIP) floodplain management regulations must be enforced, and flood insurance is mandatory. A structure within the SFHA has a 26 percent chance of undergoing flood damage during the term of a 30-year mortgage.

Common Flood Map Zones

DFIRMS show the boundaries of floodways and floodplains, as well as expected floodwater elevations at specific sites during the base flood. They define the following specific flood-related areas:

- **Zone A (also known as Unnumbered A-zones**)—SFHAs where no base flood elevations or depths are shown because detailed hydraulic analyses have not been performed.

- **Zones A1-30 and AE**—SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base flood elevations are shown within these zones.
- **Zone AH and AO—**SFHAs subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to ponding (Zone AH) or shallow sheet flow flooding on sloping terrain (Zone AO).
- **Zone B and X (shaded)—**Zones where the land elevation has been determined to be above the base flood elevation, but below the 0.2 percent annual chance flood elevation. These zones are not SFHAs.
- **Zones C and X (unshaded)—**Zones where the land elevation has been determined to be above both the base flood elevation and the 0.2 percent annual chance flood elevation. These zones are not SFHAs.

Ecosystems and Beneficial Functions

Floodplains can support ecosystems that are rich in plant and animal species. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick growing compared to non-riparian trees.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain accumulations of sand, gravel, loam, silt, and/or clay, often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce, and residential development.

Effects of Human Activities on Floodplains

The boundaries of floodplains are altered by changes in land use, the amount of impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, and utilization of different hydrologic modeling techniques (USGS 2016a).

Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. Structures can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream’s capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities

can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

Flash Flooding

The National Weather Service defines a flash flood as "a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam" (NWS 2009a).

Stormwater/Urban Flooding

Stormwater/urban flooding is flooding of streets, underpasses, low lying areas, or storm drains resulting from heavy precipitation in areas outside delineated floodplains and not along recognizable channels. Heavy rainfall that overwhelms a developed area's stormwater infrastructure can cause such flooding. If local systems cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and flooding results. Flooding of this nature generally occurs in areas with flat gradients and generally increases with urbanization, which speeds the accumulation of floodwaters because of impervious areas. FEMA does not map areas of urban flooding.

Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. The systems make use of a closed conveyance system that channels water away from an urban area to surrounding streams. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development in that area (Harris 2008).

The growing number of extreme rainfall events that produce intense precipitation are resulting in increased urban flooding (Center for Disaster Resilience 2016). Urban flooding can be worsened by aging and inadequate infrastructure and over development of land. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 2007).

High groundwater levels can be a concern and cause problems even where there is no surface flooding. Basements are susceptible to high groundwater flooding. Seasonally high groundwater is common in many areas (USGS 2016b).

12.1.2 Location

Riverine Flooding

Figure 12-2 shows the mapped 1 percent 0.2 percent annual chance flood areas in Nevada County. The land area covered by each of those flood hazard areas is listed in Table 12-1.

Figure 12-2. FEMA Flood Hazard Areas in Nevada County

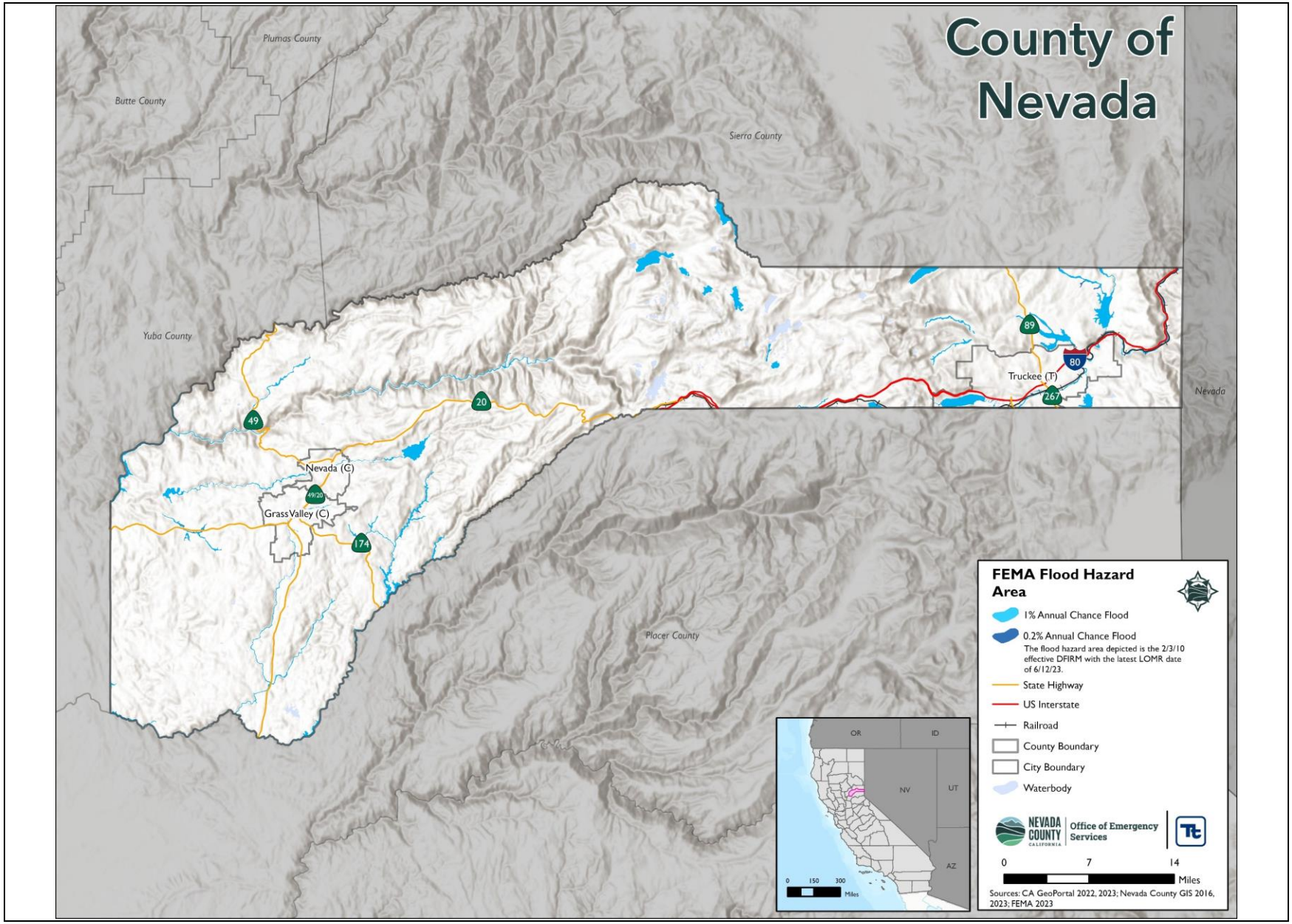


TABLE 12-1. LAND AREA COVERED BY THE MAPPED FLOODPLAIN

Jurisdiction	Total Land Area (Excluding Water Bodies) (acres)	Land Area in the Flood Hazard Area (Excluding Water Bodies)			
		1% Annual Chance Flood		0.2% Annual Chance Flood	
		Total Area (acres)	% of Jurisdiction Total	Total Area (acres)	% of Jurisdiction Total
Grass Valley	4,850	118	2.4%	164	3.4%
Nevada City	20,595	65	0.3%	68	0.3%
Truckee	9,793	565	5.8%	625	6.4%
Unincorporated	576,975	5,895	1.0%	6,026	1.0%
Nevada County (Total)	**612,214**	**6,644**	**1.1%**	**6,883**	**1.1%**

Riverine flooding caused by heavy rainfall can occur in Nevada County at any time from November through April. This type of flood is characterized by high peak flows of moderate duration and large volume runoff. Flooding is more severe when previous rainfall has resulted in saturated ground conditions (FEMA 2010).

Cloudburst storms, sometimes lasting as long as three hours, can occur at any time from early fall to late spring, and may occur as an extremely severe sequence within a general winter rainstorm. These are high-intensity storms that can produce peak flows equal to or somewhat greater than those of general rainstorms in portions of Nevada County. Flooding from cloudbursts is characterized by high peak flow, short duration of flood flow, and small volume runoff (FEMA 2010).

Flash Flooding

Flash flooding can occur throughout Nevada County. However, the distinctive flash flood event characterized by fast moving water and damaging impacts is most common in areas with steep topography.

Stormwater/Urban Flooding

Stormwater/urban flooding is not mapped but is most likely to occur in highly developed areas with high percentages of impervious coverage that contribute to high rates of runoff.

12.1.3 Extent

Riverine and Flash Flooding

For riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by the NWS include the following (NWS 2011):

- Minor Flooding—Minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding—Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.

- Major Flooding—Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

The severity of riverine and flash flooding is determined by a combination of factors:

- Stream and river basin topography and physiography
- Precipitation and weather patterns
- Percent soil moisture conditions
- Degree of vegetative clearing and impervious surface

Generally, floods are long-term events that last for several days. Severity depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows and any more water must flow as runoff (Harris 2008).

Stormwater/Urban Flooding

Currently, there is no measurement used to define the severity of stormwater/urban flooding.

12.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was included in 12 major disaster (DR) or emergency (EM) declarations for flood-related events (FEMA 2023a). Table 12-2 lists these declarations.

State Emergency Proclamations

Nevada County has been included two flood-related state emergency proclamations as listed in Table 12-3.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA flood-related agricultural disaster declarations (USDA 2023a).

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 12-4. For events prior to 2017, refer to the 2017 Nevada County HMP.

12.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous flood occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 12-5. Based on historical records and input from the Planning Team, the probability of occurrence for flood in the County is considered "frequent."

TABLE 12-2. FEMA DECLARATIONS FOR FLOOD RELATED EVENTS IN NEVADA COUNTY (1954 TO 2023)

Event Date	Declaration Date	Declaration Number	Description
December 24, 1964	December 24, 1964	DR-183	California heavy rains & flooding
February 12 – March 10, 1986	February 21, 1986	DR-758	California severe storms, flooding
January 3 - February 10, 1995	January 10, 1995	DR-1044	California severe winter storms, flooding, landslides, mud flows
February 13 - April 19, 1995	March 12, 1995	DR-1046	California severe winter storms, flooding, landslides, mud flows
December 28, 1996 - April 1, 1997	January 4, 1997	DR-1155	California severe storms/flooding
December 17, 2005 - January 3, 2006	February 3, 2006	DR-1628	California severe storms, flooding, mudslides, and landslides
March 29 - April 16, 2006	June 5, 2006	DR-1646	California severe storms, flooding, landslides, and mudslides
January 3-12, 2017	February 14, 2017	DR-4301	Severe winter storms, flooding, and mudslides in California
February 1-23, 2017	April 1, 2017	DR-4308	Severe winter storms, flooding, mudslides in California
February 21 - July 10, 2023	April 3, 2023	DR-4699	California severe winter storms, straight-line winds, flooding, landslides, and mudslides
December 27, 2022 - January 31, 2023	January 14, 2023	DR-4683	California severe winter storms, flooding, landslides, and mudslides
March 9 – July 10, 2023	March 10, 2023	EM-3592	California severe winter storms, flooding, landslides, and mudslides

Source: (FEMA 2024c)

TABLE 12-3. STATE EMERGENCY PROCLAMATIONS FOR FLOOD EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Description
February-March 2023	Severe winter storms struck California, bringing damaging winds and historic precipitation, including snowfall in areas unaccustomed to snow. These storms damaged and forced the closure of federal and state highways and roads, threatened power outages, forced evacuations, and stranded residents and motorists in impacted counties.
December 2021	A series of winter storm systems struck California, bringing substantial precipitation, including record-breaking snowfall, damaging winds, and flooding. Communications and other critical infrastructure saw impacts due to the effects of these storm systems,

Source: (Cal OES 2024b)

TABLE 12-4. FLOOD EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
January 7, 2017	N/A	N/A	Soda Springs	Winter storms resulted in significant flooding on roadways and in residential buildings. $10,000 in damage resulted from this incident.
February 8, 2017	N/A	N/A	Nevada City	A collection of winter storms significantly impacted the area through heavy rain, flooding, mudslides, and washouts. Highway 49 was closed due to multiple washouts. This incident resulted in $3.56 million in damage.
March 21, 2018	N/A	N/A	Wolf	Following heavy rain, Combie Road was flooded and access to Lake Van Norden was obstructed. $100,000 in property damage resulted from this incident.
April 6, 2018	N/A	N/A	Crystal Lake	Roadway flooding was reported after heavy rain along I-80 offramp at State Route 20. No damage or injuries were reported.
September 18, 2019	N/A	N/A	Nevada City	Localized street flooding took place in Nevada City. No damage or injuries were reported.
October 24, 2021	N/A	N/A	Soda Springs	Flash flooding on Donner Pass Road between Truckee and Donner Summit caused road closures due to erosion and falling debris. No injuries or damage were reported.
December 2021	State of Emergency	Yes	Nevada County	A series of winter storm systems struck California, bringing substantial precipitation, including record-breaking snowfall, damaging winds, and flooding. Communications and other critical infrastructure saw impacts from these storm systems,
January 14, 2023	N/A	N/A	Rough and Ready	Heavy rain led to 6 inch deep roadway flooding at Rough and Ready Highway and Hard Rock Road. No damage or injuries were reported.

Sources: (NOAA NCEI 2024, FEMA 2024c, Cal OES 2023b)

TABLE 12-5. PROBABILITY OF FUTURE FLOOD EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Flash Flood	2	14.0	7%
Flood	23	1.2	82%
Total	**25**	**1.1**	**89%**

Source: (NOAA NCEI 2024)

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

Increased incidence of winter rainfall, cool season snowmelt episodes, and rain-on-snow events are projected to increase winter flooding as they increase average winter stream flows. Floods are projected to increase as climate change increases storm intensities and temperatures. Loss of snowpack and overall drying will lead to reductions in warm-season flows. Accurate estimates of the coming changes in flood characteristics (e.g., flood frequencies and magnitudes, flood durations, seasonal timing) have yet to emerge (State of California 2018).

12.1.6 Cascading Impacts

Bank erosion, a secondary effect of flooding, can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much property damage, but scour the banks, edging properties closer to the floodplain. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills can be a secondary effect of flooding if floodwaters cause storage tanks to rupture. Other secondary effects of a flood include the following:

- Drinking water supplies may become polluted, especially if sewage treatment plants are flooded. This may result in disease and other health effects.
- Flooded buildings may have gas and electrical service disrupted if the service panel, generator, meter, or other equipment are not elevated above the flood protection level.
- Oversaturated soils may cause utility poles to tip over or fall completely, interrupting the power grid for a potentially large area, especially if the transformer is impacted.
- Transportation systems may be disrupted, resulting in shortages of food and supplies.
- Location of river channels may change as the result of flooding. New channels develop, leaving the old channels dry.
- Sediment deposited by flooding may destroy farmland (although silt deposited by floodwaters could also help to increase agricultural productivity).
- Jobs may be lost due to the disruption of services, destruction of business, etc. (although jobs may be gained in the construction industry to help rebuild or repair flood damage).
- Insurance rates may increase.

12.2 Vulnerability and Impact Assessment

A spatial analysis was conducted using FEMA flood mapping (effective February 3, 2010). To determine what assets are exposed to flooding, the asset inventories prepared for this HMP

(population, buildings, critical facilities) were overlaid with the 1 percent and 0.2 percent annual chance flood hazard areas. Assets with their centroid located in the hazard areas were totaled to estimate the numbers and values at risk from the impacts of flood. To estimate potential losses associated with flood, a Level 2 Hazus riverine flood analysis was performed using asset inventories prepared for this HMP and the 1 percent and 0.2 percent annual chance flood hazard area flood depth grids.

12.2.1 Life, Health, and Safety

Overall Population

Table 12-6 summarizes the population living in the 1 percent annual chance floodplain and the 0.2 percent annual chance floodplain. There are an estimated 604 residents living in the 1 percent annual chance floodplain, or 0.6 percent of the County's total population, and 887 in the 0.2 percent annual chance floodplain (0.9 percent of the County total). The unincorporated county has the greatest number of residents living in the floodplain, with approximately 293 residents living in the 1 percent annual chance floodplain and 327 residents in the 0.2 percent annual chance floodplain. The Hazus analysis for flood estimated displacements of the population as listed in Table 12-7.

TABLE 12-6. POPULATION IN THE MAPPED FLOOD HAZARD AREAS

Jurisdiction	Total Population (US Census Decennial 2020)	Population in the 1 Percent Annual Flood Hazard Area		Population in the 0.2 Percent Annual Flood Hazard Area	
		Number of Persons	% of Jurisdiction Total[a]	Number of Persons	% of Jurisdiction Total[a]
Grass Valley	14,016	144	1.0%	321	2.3%
Nevada City	3,152	6	0.2%	6	0.2%
Truckee	16,729	161	1.0%	233	1.4%
Unincorporated	68,344	293	0.4%	327	0.5%
Nevada County (Total)	**102,241**	**604**	**0.6%**	**887**	**0.9%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. *Percentage is slightly inaccurate because total population is based on city limits and vulnerable population is based on community boundaries; the accuracy of the result is adequate for planning purposes.*

TABLE 12-7. DISPLACEMENTS AND SHELTER REQUIREMENTS FOR THE EVALUATED FLOOD SCENARIOS

Jurisdiction	1 Percent Annual Flood Hazard Area		0.2 Percent Annual Flood Hazard Area	
	Displaced Population	Persons Seeking Short-Term Sheltering	Displaced Population	Persons Seeking Short-Term Sheltering
Grass Valley	232	105	530	146
Nevada City	52	20	54	21
Truckee	104	5	193	5
Unincorporated	275	113	297	116
Nevada County (Total)	**663**	**243**	**1,074**	**288**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

The impact of flooding on life, health, and safety depends on factors such as the severity of the event and whether adequate warning time is provided to residents. The number of injuries and deaths resulting from flooding is generally limited based on advance weather forecasting, blockades, and warnings. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which involves persons trying to cross flooded roadways or channels during a flood. However, persons can become displaced from their homes or require shelter due to the impacts of a flood event.

Socially Vulnerable Population

Socially vulnerable populations are most susceptible to flood events based on several factors, including their physical and financial ability to react or respond during a flood. Vulnerable populations include homeless persons, people over 65 years old, low income or linguistically isolated populations, people with life-threatening illnesses, and residents that may struggle to evacuate. The population over the age of 65 may require extra time to evacuate or need assistance to evacuate and are more likely to need medical attention.

Table 12-8 presents the estimated socially vulnerable populations located in the 1 percent and 0.2 percent annual chance flood hazard areas. Of the 604 persons living in the 1 percent annual chance flood hazard area, there are 158 persons over the age of 65 years, 27 persons under the age of five years, 6 non-English speakers, 88 persons with a disability, and 67 persons living in poverty. Of the 887 persons living in the 0.2 percent annual chance flood hazard area, there are 232 persons over the age of 65 years, 44 persons under the age of five years, 11 non-English speakers, 136 persons with a disability, and 108 persons living in poverty.

12.2.2 General Building Stock

Buildings Located in the Mapped Flood Hazard Areas

Table 12-9 summarizes the number of structures located in the 1 percent and 0.2 percent annual chance flood events by jurisdiction. There are 405 buildings (3 percent of the total building stock) located in the 1 percent annual chance flood hazard area with an estimated $301 million of replacement cost value (building and content replacement costs). There are 606 buildings (1 percent of the total building stock) located in the 0.2 percent annual chance flood hazard area with an estimated $521 million of replacement cost value.

Table 12-10 provides a summary of buildings in the flood hazard areas by occupancy class. In the 1 percent annual chance flood hazard area, there are 263 residential properties, 121 commercial properties, 10 industrial properties, and 11 governmental, religion, agricultural and education properties. In the 10.2 percent annual chance flood hazard area, there are 382 residential properties, 194 commercial properties, 12 industrial properties, and 18 governmental, religion, agricultural and education properties.

TABLE 12-8. VULNERABLE POPULATIONS IN THE MAPPED FLOOD HAZARD AREAS

	Vulnerable Populations in Mapped Flood Hazard Areas									
	65 and Older		5 and Younger		Non-English Speaking		Disability		Below Poverty Level	
Jurisdiction	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
1 Percent Annual Chance Flood Hazard Area										
Grass Valley	41	1.0%	8	0.9%	0	0.0%	30	1.0%	24	1.0%
Nevada City	2	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Truckee	26	0.9%	10	0.9%	5	0.8%	10	0.9%	14	0.9%
Unincorporated	89	0.4%	9	0.4%	1	0.3%	48	0.4%	29	0.4%
Nevada County (Total)	**158**	**0.5%**	**27**	**0.6%**	**6**	**0.6%**	**88**	**0.6%**	**67**	**0.6%**
0.2 Percent Annual Chance Flood Hazard Area										
Grass Valley	92	2.3%	19	2.2%	2	2.2%	67	2.3%	55	2.27%
Nevada City	2	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Truckee	38	1.4%	15	1.3%	8	1.3%	15	1.4%	21	1.4%
Unincorporated	100	0.5%	10	0.5%	1	0.3%	54	0.5%	32	0.5%
Nevada County (Total)	**232**	**0.8%**	**44**	**1.0%**	**11**	**1.1%**	**136**	**0.9%**	**108**	**1.0%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Note: "% of Total" represents the vulnerable population in the hazard area as a percentage of the total vulnerable population in the jurisdiction (e.g., population 65 or older in the hazard area in Truckee as a percent of the total population 65 or older in Truckee). See Table 3-4 for total vulnerable population in each jurisdiction.

TABLE 12-9. BUILDINGS IN THE MAPPED FLOOD HAZARD AREAS

Jurisdiction	Total Buildings in Jurisdiction		Number of Buildings in Hazard Area		Replacement Cost Value in Hazard Area	
	Number of Buildings	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
1 Percent Annual Chance Flood Hazard Area						
Grass Valley	6,410	$8,077,613,536	79	1.2%	$56,806,861	0.7%
Nevada City	2,619	$2,974,541,089	6	0.2%	$1,964,127	0.1%
Truckee	16,175	$16,378,917,320	169	1.0%	$126,754,989	0.8%
Unincorporated	31,937	$26,299,651,530	151	0.5%	$115,967,560	0.4%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**405**	**3.0%**	**$301,493,537**	**0.6%**
0.2 Percent Annual Chance Flood Hazard Area						
Grass Valley	6,410	$8,077,613,536	168	2.6%	$183,403,913	2.3%
Nevada City	2,619	$2,974,541,089	6	0.2%	$1,964,127	0.1%
Truckee	16,175	$16,378,917,320	265	1.6%	$210,038,889	1.3%
Unincorporated	31,937	$26,299,651,530	167	0.5%	$125,306,851	0.5%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**606**	**1.1%**	**$520,713,780**	**1.0%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 12-10. BUILDINGS IN THE MAPPED FLOOD HAZARD AREAS BY GENERAL OCCUPANCY CLASS

Jurisdiction	Number of Buildings in the Hazard Area			
	Residential	Commercial	Industrial	Other[a]
1 Percent Annual Chance Flood Hazard Area				
Grass Valley	45	30	4	0
Nevada City	4	2	0	0
Truckee	119	48	2	0
Unincorporated	95	41	4	11
Nevada County (Total)	**263**	**121**	**10**	**11**
0.2 Percent Annual Chance Flood Hazard Area				
Grass Valley	100	58	6	4
Nevada City	4	2	0	0
Truckee	172	88	2	3
Unincorporated	106	46	4	11
Nevada County (Total)	**382**	**194**	**12**	**18**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Government, Religion, Agricultural, and Education

Estimated Cost of Damage

Table 12-11 summarizes estimated building losses due to the 1- and 0.2 percent annual chance flood event. For the 1 percent annual chance flood, roughly $27 million in damage is estimated, with unincorporated areas estimated to see the majority of damage ($17 million). For the 0.2 percent annual chance flood, roughly $66 million in damage is estimated, with Grass Valley estimated to see the majority of damage ($35 million).

TABLE 12-11. ESTIMATED DAMAGE COSTS DUE TO FLOOD EVENT

Jurisdiction	Total Replacement Cost Value (RCV)	Estimated Damage to Structure and Contents				
		Residential	Commercial	Other[a]	Total Damage	% of RCV
1 Percent Annual Flood Hazard Area						
Grass Valley	$8,077,613,536	$94,065	$515,036	$501,160	$1,110,261	<0.1%
Nevada City	$2,974,541,089	$327,847	$371,760	$0	$699,607	<0.1%
Truckee	$16,378,917,320	$5,350,873	$2,593,946	$0	$7,944,819	<0.1%
Unincorporated	$26,299,651,530	$5,641,584	$7,957,697	$3,984,969	$17,584,250	0.1%
Nevada County (Total)	**$53,730,723,475**	**$11,414,369**	**$11,438,439**	**$4,486,129**	**$27,338,937**	**0.1%**
0.2 Percent Annual Flood Hazard Area						
Grass Valley	$8,077,613,536	$8,305,803	$13,884,341	$12,972,198	$35,162,343	0.4%
Nevada City	$2,974,541,089	$327,847	$371,760	$0	$699,607	<0.1%
Truckee	$16,378,917,320	$6,090,684	$5,357,962	$3,500	$11,452,146	0.1%
Unincorporated	$26,299,651,530	$6,290,746	$8,275,633	$3,984,969	$18,551,348	0.1%
Nevada County (Total)	**$53,730,723,475**	**$21,015,079**	**$27,889,696**	**$16,960,668**	**$65,865,444**	**0.1%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Industrial, Government, Religion, Agricultural, and Education

Estimated Debris Generated by Flooding

Debris management may be a large expense after a flood event. Hazus breaks down flood debris into three categories: finishes (dry wall, insulation, etc.); structural (wood, brick, etc.) and foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris.

Table 12-12 summarizes the countywide debris estimates for the 1 percent and 0.2 percent annual chance flood events. The table only estimates structural debris generated by flooding and does not include non-structural debris or debris generated by wind that may be associated with a storm that causes flooding. Overall, Hazus estimates that there will be 2,257 tons of debris generated during the 1 percent annual chance flood event and 3,594 tons of debris generated during a 0.2 percent annual chance flood event in Nevada County.

TABLE 12-12. ESTIMATED DEBRIS DURING THE 1 PERCENT ANNUAL CHANCE FLOOD EVENT

Jurisdiction	Debris Generated (tons)					
	1 Percent Annual Flood Hazard Area			0.2 Percent Annual Flood Hazard Area		
	Finish	Structure	Foundation	Finish	Structure	Foundation
Grass Valley	85	10	9	524	391	323
Nevada City	149	264	227	159	272	233
Truckee	497	257	231	613	278	253
Unincorporated	120	213	192	132	217	199
Nevada County (Total)	**852**	**745**	**660**	**1,428**	**1,157**	**1,009**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

NFIP Statistics

For the flood risk assessment, the following insurance-related data provided by FEMA was analyzed for residential properties in the county:

- Number of flood policies
- Number of claims
- Repetitive loss properties—A property for which two or more losses for $1,000 or more were paid. The two losses must be within 10 years of each other and be at least 10 days apart.
- Severe repetitive loss properties—A residential property covered under an NFIP flood insurance policy, and satisfying either of the first two conditions below in addition to the third:
  - At least four NFIP claim payments for the property (including building and contents) over $5,000 each have occurred, and the cumulative amount of such claims payments exceeded $20,000.
  - At least two separate claims payments for the property (building payments only) have occurred, and the cumulative amount of the building portion of such claims exceeded the market value of the building.
  - For either of the above, at least two of the referenced claims must have occurred within any 10-year period and must have occurred more than 10 days apart.

Table 12-13 summarizes the NFIP policies, claims, and repetitive loss statistics for Nevada County. Total loss payments and breakdown by occupancy class was unavailable for this HMP update. This information is current as of June 2024.

TABLE 12-13. NFIP DATA FOR NEVADA COUNTY

Jurisdiction	Number of Policies	Number of Claims	Number of Repetitive Loss Properties	Number of Severe Repetitive Loss Properties
Nevada County	48	29	1	0
City of Grass Valley	15	13	3	0
City of Nevada City	2	7	1	0
Town of Truckee	46	9	1	0

Sources: (FEMA 2024d, FEMA 2024a)
Note: Total loss payments and breakdown by occupancy class was unavailable for this HMP update. NFIP data is current as of June 2024.

12.2.3 Community Lifelines and Other Critical Facilities

Potential flood impacts on community lifelines and other critical facilities are numerous:

- Oversaturated soils from periods of heavy rain and flooding may cause utility poles to tip over or fall, interrupting the power grid for a potentially large area, especially if a transformer is impacted.
- Excess floodwater can contaminate private drinking water sources, such as wells and springs.
- Excess water makes it more difficult for water treatment plants to treat the water efficiently and effectively.
- Floodwater picks up debris, increasing the number of bacteria, sewage, and other industrial waste and chemicals into the water source or leaky pipes. If there is a contamination at any step of the water flow process, this puts consumers at risk of exposure to dangerous toxins that could result in serious harm, such as wound infections, skin rashes, gastrointestinal illnesses, and tetanus; in extreme cases, death may occur.
- Isolation can be caused by bridges being washed out or blocked by floods or debris,

Mitigation planning should consider means to reduce flood impacts to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs. In cases where short-term functionality is impacted by flooding, facilities of neighboring municipalities may need to increase support response functions.

Community lifeline exposure to the 1 percent and 0.2 percent annual chance flood hazard event boundary was examined. Table 12-14 summarizes the number of community lifelines exposed to the 1 percent and 0.2 percent flood inundation areas by jurisdiction. The largest number are transportation facilities: 32 of 72 in the 1 percent annual chance flood area; and 35 of 96 exposed facilities in the 0.2 percent annual chance flood area.

TABLE 12-14. NUMBER OF COMMUNITY LIFELINES IN MAPPED FLOOD HAZARD AREAS

Jurisdiction	Number of Community Lifelines in Mapped Flood Hazard Area									Total	
	Commu-nications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transport-ation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
1 Percent Annual Chance Flood Hazard Area											
Grass Valley	1	0	0	0	0	0	3	1	0	5	1.6%
Nevada City	2	0	0	0	0	0	2	0	0	4	2.8%
Truckee	1	1	0	0	0	1	10	6	0	19	3.8%
Unincorporated	9	4	0	0	0	10	17	4	0	44	3.8%
Nevada County (Total)	13	5	0	0	0	11	32	11	0	72	3.4%
0.2 Percent Annual Chance Flood Hazard Area											
Grass Valley	5	0	0	0	0	1	4	4	2	16	5.1%
Nevada City	2	0	0	0	0	0	2	0	0	4	2.8%
Truckee	2	3	2	0	1	1	10	9	2	30	6.0%
Unincorporated	9	4	0	0	0	10	19	4	0	46	4.0%
Nevada County (Total)	**18**	**7**	**2**	**0**	**1**	**12**	**35**	**17**	**4**	**96**	**4.5%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

12.2.4 Economy

Flood impacts on the local and regional economy include general building stock damage and associated tax loss, impacts on utilities and infrastructure, business interruption, impacts on tourism, and impacts on the local tax base. In areas that are directly flooded, renovations of commercial and industrial buildings may be necessary, disrupting associated services. Loss of facility use, functional downtime, and socio-economic factors are likely. Flood damage to public utilities can disrupt delivery of services. Loss of power and communications may occur, and drinking water and wastewater treatment facilities may be temporarily out of operation.

12.2.5 Natural, Historic and Cultural Resources

Natural Resources

Floodwaters can wash pollution from roads—such as oil and hazardous materials—onto normally dry soils, polluting them for agricultural uses. Floodwater can also alter the landscape, for instance, by eroding riverbanks and causing them to collapse. As floodwater carries material from the eroded banks, it suspends sediment in the water, which can degrade water quality and lead to harmful algae blooms. Suspended sediment eventually settles out of the water, which can clog riverbeds and streams, smother aquatic organisms, and destroy habitats. Erosion and sedimentation have a more negative impact on ecosystems that are already degraded or heavily modified.

Historic and Cultural Resources

Historic places, cultural institutions, parks and open spaces, community facilities, and religious institutions are all vulnerable to impacts from flooding. Venues such as museums and historic buildings face structural damage during flood events, with additional risk of damage to important cultural artifacts housed within. Historic structures often are not built to modern building code requirements, including design flood elevation and construction standards. Historic resources and structures were often built close to waterways, increasing their flood risk.

Parks, recreation, and community space closures due to flood events can disrupt residents' lives and hinder access to critical community services. Although parks and recreational areas located near waterways are exposed to flooding, they are often developed with flooding in mind. Many parks are considered as open space to disallow development.

12.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

12.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the flood hazard, with the highest risk increase for development within the mapped Special Flood Hazard Area.

12.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from flood events.

12.3.3 Climate Change

By the end of the century, high and low precipitation extremes are projected to increase markedly and simultaneously. The amount of change vary with elevation, with quicker warming trends and precipitation changes at highest elevations (State of California 2018). Loss of snowpack and overall drying will lead to increased winter stream flows and floods, and to reductions in warm-season flows. Increased incidence of winter rainfall, cool season snowmelt episodes, and rain-on-snow events are projected to increase winter flooding and the average winter stream flow rates.

Flood risks are projected to increase within and downstream from the Sierra Nevada as climate change increases storm intensities and temperatures. However, accurate estimates of the coming changes in flood characteristics (e.g., flood frequencies and magnitudes, flood durations, seasonal timing) have yet to emerge (State of California 2018). Future flooding conditions from factors such as changes in rainfall are not included in FEMA's development of floodplain mapping. As such, floodplain maps may underestimate flood risk in many areas. As a result, the public may also underestimate risk.

13. Hazardous Materials Release

13.1 Hazard Profile

13.1.1 Hazard Description

Hazardous materials are present in nearly every community in facilities that produce, store, or use them. Hazardous materials are transported along interstate highways and railways daily. Water treatment plants use chlorine to eliminate bacterial contaminants. Even the natural gas used in every home and business is a dangerous substance when a leak occurs.

Title 49 of the Code of Federal Regulations (CFR) lists thousands of hazardous materials, including gasoline, insecticides, household cleaning products, and radioactive materials. State-regulated substances that have the greatest probability of adversely affecting the community are listed in the California Code of Regulations (CCR), Title 19.

Incident Types

The following are the most common type of hazardous material incidents:

- **Fixed-Facility Hazardous Materials Incident**—This is the uncontrolled release of materials from a fixed site capable of posing a risk to health, safety, and property. Many businesses, through intentional action, lack of awareness, or accidental occurrences, have contamination in and around their property. It is possible to identify and prepare for a fixed-site incident because laws require those facilities to notify state and local authorities about what is being used or produced at the site. Hazardous materials at fixed sites are regulated nationally by the U.S. Environmental Protection Agency (EPA) and in California by the California Environmental Protection Agency (CalEPA).
- **Hazardous Materials Transportation Incident**—A hazardous materials transportation incident is any event resulting in uncontrolled release of materials during transport that can pose a risk to health, safety, and property. The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) is responsible for regulating and ensuring the safe and secure movement of hazardous materials to industry and consumers by all modes of transportation. Hazardous materials transportation incidents can occur anywhere, although most occur on interstate highways, major federal or state highways, or major rail lines. Many incidents occur in sparsely populated areas and affect very few people.
- **Interstate Pipeline Hazardous Materials Incident**—A significant number of interstate natural gas, heating oil, and petroleum pipelines run through California. They provide natural gas to utilities in California and transport these materials from production facilities to end-users.

Oversight

Hazardous materials management is regulated by federal and state codes. In Nevada County, the Fire Department is the designated enforcement agency. The State Fire Marshal and the PHMSA enforce oil

and gas pipeline safety regulations. PHMSA also enforces hazardous material transport regulations (USDOT 2023).

The Department of Toxic Substances Control (DTSC), a division of CalEPA, acts to protect California from exposure to hazardous wastes by cleaning up existing contamination and looking for ways to reduce the hazardous waste produced in the state (DTSC 2023). The DTSC regulates hazardous waste in California primarily under the authority of the federal Resource Conservation and Recovery Act and the California Health and Safety Code. The DTSC has the authority to implement permitting, inspection, compliance and corrective action programs to ensure that people who manage hazardous waste follow state and federal requirements. Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, clean-up, and emergency planning.

Businesses are required to disclose all hazardous materials and waste above certain designated quantities that they use, store, or handle at their facility. They must prepare chemical inventory and business emergency plans, review the plans regularly, and perform annual training. Any release or possible release of hazardous material must be reported to the California Office of Emergency Services (Cal OES) Warning Center pursuant to Section 11004 of Title 42 of the U.S. Code (Cal OES 2023c). Businesses using certain regulated substances (a list of about 260 specific flammable or toxic chemicals) must develop a risk management plan. The risk management plan includes analysis of operations on-site and projection of off-site consequences with accompanying mitigation plans.

The U.S. EPA's Toxics Release Inventory (TRI) tracks the management of over 650 toxic chemicals that pose a threat to human health and the environment. U.S. facilities in industry sectors that manufacture, process, or otherwise use these chemicals in amounts above established levels must report how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment. A "release" of a chemical means that it is emitted to the air or water or placed in some type of land disposal. The information submitted by facilities to the EPA and states is compiled annually as the TRI and is stored in a publicly accessible database. TRI facilities are required to report to EPA each year by July 1**.** Data are available for facilities that have submitted information since the program began in 1987.

13.1.2 Location

Locations at risk from a hazardous materials release depend on whether it is from a fixed or mobile source, the size of impact, the toxicity and properties of the substance, duration of the release, and environmental conditions (wind, precipitation, terrain, etc.). Areas closest to the releases are generally at greatest risk; however, depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (up to thousands of years).

Twenty facilities have been identified as hazardous material lifelines in the County. Fixed site locations at risk of hazardous material releases are not identified in this HMP for safety and security reasons. Likeliest locations of hazardous materials transportation incidents are Interstate 80 and State Routes 20, 49, 89, 174, and 267; the Union Pacific railroad tracks (which roughly parallel I-80) and the Kinder Morgan petroleum pipeline.

13.1.3 Extent

Hazardous materials releases can contaminate air, water, and soils, possibly resulting in illness, injuries, or death. Hazardous materials can include toxic chemicals, radioactive substances, infectious substances, and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. Dispersion can take place rapidly when the hazardous material is transported by water and wind.

Exacerbating or Mitigating Circumstances

Hazardous materials releases can occur because of human carelessness, intentional acts, or natural hazards. Exacerbating or mitigating circumstances will affect an event's severity.

Mitigating conditions are measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous materials release.

Exacerbating conditions, which magnify the effects of a hazardous materials release, include the following

- Weather conditions, which affect how the hazard occurs and develops
- Micro-meteorological effects of buildings and terrain, which alters dispersion of hazardous substances
- Lack of compliance with applicable codes (such as building or fire codes)
- Maintenance failures (such as fire protection and containment features), which can substantially increase the damage to the facility and to surrounding buildings

Warning and Response

A hazardous materials event requires an urgent response to contain released material and protect humans and the environment. Variables that determine how a hazardous materials event will play out include the method of transport for the chemicals (or if it occurred at a fixed facility), whether shelter in place and/or evacuations were ordered, if any persons became contaminated and were not decontaminated properly, and whether a complete response team was dispatched. The severity varies with the type of substance released and the response time of emergency response teams.

A hazardous materials incident can occur without any warning, such as an explosion, or may slowly develop, as in the case of a leaking container. Facilities that store extremely hazardous substances are required to notify local officials when an incident occurs. Local emergency responders and emergency management officials determine whether they need to evacuate the public or advise them to shelter in place. The warning time for incidents associated with hazardous substances in transit varies based on the nature and scope of the incident. If an explosion did not occur immediately following an accident, officials may have time to warn adjacent neighborhoods and facilitate appropriate protective actions.

In the worst cases, a hazardous materials event would not be able to be controlled for hours to days, with the identified materials being dispersed into the air and/or absorbed into the groundwater. Persons could inhale the material, which would cause adverse side effects and potable water could become

contaminated, leading to a water advisory, declaring individuals should rely on bottled water. Hundreds or thousands of persons, up to a few miles from the incident site, may need medical attention due to the inhalation of the material; responders would need to rotate operational periods and perform decontamination operations to maintain scene security and safe working conditions.

A key part of maintaining control during a hazardous material event is to keep the public calm, and share clear, concise, and relevant information to the public through a verified method. A hazardous materials event can quickly escalate to public panic if correct information is not dispersed.

13.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for hazardous material-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any hazardous material-related state emergency proclamations since the previous HMP update.

USDA Declarations

Nevada County was not included in any USDA hazardous material-related agricultural disaster declarations since the last HMP update (USDA 2023a).

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 13-1. For events prior to 2017, refer to the 2017 Nevada County HMP.

TABLE 13-1. HAZARDOUS MATERIAL RELEASE EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
April 24, 2022	N/A	N/A	Norden	891 gallons of liquid hazardous material were in transit by rail from Portland, OR. A liquid valve leak was discovered upon inspection in Soda Springs, and a hazardous materials team was contacted to respond to the incident. No injuries or property loss were reported.

Sources: (PHMSA 2024, FEMA 2024c)

Toxics Release Inventory

TRI on-site and off-site reports of materials disposed of or otherwise released by Nevada County industries for 2021 present the following data (U.S. EPA 2023d):

- Total On-Site Disposal or Other Releases—4,413,613 pounds
- Total Off-Site Disposal or Other Releases—4,673,398 pounds
- Total On-Site and Off-Site Disposal or Other Releases—9,087,012 pounds

This list includes 61 chemical types released during the 2021 reporting year. It reflects releases and other waste management activities of chemicals, but not whether, or to what degree, the public has been exposed to those chemicals. Release estimates are not sufficient to determine vulnerability or to calculate potential adverse effects on human health and the environment. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities that involve toxic chemicals. The determination of potential risk depends on many factors, including the toxicity of the chemical, the disposal of the chemical, and the amount and duration of human or other exposure to the chemical after it is released.

13.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous hazardous material release occurrences in the County was gathered to determine the probability of future occurrence of such events. As hazardous material releases are considered a non-natural hazard, the occurrence of event was determined through qualitative assessment. Based on historical records and input from the Planning Team, the probability of occurrence for hazardous material releases in the County is considered “occasional.”

Climate Change Projections

Climate changes are already underway in the Sierra Nevada region, and all modern climate models predict that the changes will accelerate in coming decades. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

While hazardous materials releases are not a natural hazard, they may still be indirectly impacted by climate change. For example, damage to infrastructure from heat and flooding and unsafe transportation conditions associated with severe weather could increase due to climate change.

13.1.6 Cascading Impacts

Many of the natural hazards assessed in this HMP have the potential to damage the facilities that store hazardous materials, resulting in a release. This includes avalanche, dam failure, earthquake, flood, landslide, and wildfire. A hazardous materials release is not likely to trigger other natural hazards.

13.2 Vulnerability and Impact Assessment

Because hazardous material releases can be spread via air and water, all of Nevada County is considered vulnerable to hazardous material releases. The following subsections provide a qualitative discussion of Nevada County's vulnerability to hazardous material releases.

13.2.1 Life, Health, and Safety

Overall Population

A hazardous materials incident can affect large areas that cross jurisdictional boundaries. Due to the varied location of different hazardous substances and waste sites in Nevada County, the entire County is considered vulnerable to this hazard. Populations living along railway routes are particularly vulnerable because of the quantities of chemicals transported on these routes. People who are employed at facilities producing elevated levels of hazardous materials also face an increased risk of exposure due to their direct contact with these hazardous substances.

Hazardous substances released to the air, water, or land contaminate the environment and pose danger to human health. These types of incidents can lead to injury, illnesses, or death for the involved persons and those living in the impacted areas. Exposure may be either acute or chronic, depending on the nature of the substance and extent of release and contamination. Large chemical incidents can contaminate sources of potable water, crops, and livestock, leading to a reduced local food supply. A chemical incident may also include an explosion, with additional injuries and deaths being caused by the pressure wave from the explosion.

Biological incident effects on the population depend on the nature of the agent involved, transmissibility, incubation period, time before detection, and other factors. Biological agents may cause disease from which some individuals will recover while others will not.

Hazardous materials pose a significant risk to emergency response personnel. All potential first responders and follow-on emergency personnel in the County currently are and will be properly trained to the level of emergency response actions required of their individual position at the response scene.

Socially Vulnerable Population

Depending on the location of the release, segments of the population may be more vulnerable to this type of event. For example, if a facility is located in a densely populated neighborhood with high rates of overcrowded units or low-income households, then these populations may face elevated vulnerability compared to the rest of the planning area. Additional groups at risk in an affected area may include unhoused or homeless individuals and those with pre-existing medical conditions, such as the elderly.

13.2.2 General Building Stock

Potential losses to the general building stock caused by a hazardous substance releases, whether in transit or at fixed sites, are difficult to quantify. The degree of damage depends on the scale of the incident. Potential losses may include contamination or potential structural and content losses if an explosion occurs.

13.2.3 Community Lifelines and Other Critical Facilities

Potential losses to critical assets caused by a hazardous material incident may include inaccessibility, loss of service, contamination, or potential structural and content losses if an explosion occurs. Hazardous material releases can result in shut down of utilities. Access to critical facilities may be cut off as a result of releases.

13.2.4 Economy

Hazardous material events in transit impact the companies transporting the materials as well as facilities surrounding the location of the event. A hazardous materials event can become costly quickly due to the cost of responders, response equipment, and clean-up.

A significant incident in an urban area may force businesses to close for an extended period of time because of contamination or direct damage caused by an explosion if one occurred. As businesses close and tourists are prohibited from entering the affected area, tourism may decline and public perception of the area may be permanently affected.

Hazardous substance incidents have the potential to lead to major transportation route closures. The closure of waterways, railroads, airports, and highways as a result of these incidents has the potential to impact the ability to deliver goods and services. Potential impacts may be local, regional, or statewide, depending on the magnitude of the event and the level of service disruptions.

13.2.5 Natural, Historic and Cultural Resources

Natural Resources

Certain chemicals and hazardous materials can be toxic to plants and animals, damaging their habitats and food sources. Radioactive materials released into the environment could enter the food chain and ultimately contaminate the human food supply.

Hazardous materials that are released into the environment can be harmful to species and their habitat. Wastes that get into waterways will be disruptive and sometimes deadly to aquatic species and can contaminate drinking water supplies. Hazardous wastes can also leach into soils and travel with wind, which can create issues for surrounding communities. Strict disposal regulations have been defined by organizations like the EPA to ensure that the environment and community are protected from these types of events (U.S. EPA 2023b).

Historic and Cultural Resources

Unless a spill is directly adjacent to a site or if the site stores hazard materials, a hazardous materials incident is unlikely to affect historic or cultural resources. Cultural events and/or festivals often take place in outdoor areas. A hazardous materials incident could impact the participants or visitors at these events and festivals or result in the event or festival becoming postponed or cancelled.

13.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

13.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from hazardous material releases.

13.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from hazardous material releases.

13.3.3 Climate Change

Hazardous materials releases may be indirectly impacted by climate change. For example, damage to infrastructure from heat and flooding and unsafe transportation conditions associated with severe weather could increase due to climate change.

14. Landslide

14.1 Hazard Profile

A landslide is a downslope movement of earthen materials. Landslides destroy property and infrastructure and can take the lives of people. When landslides deform and tilt the ground surface, the result can be destruction of foundations, offset of roads, breaking of underground pipes, or overriding of downslope property and structures.

14.1.1 Hazard Description

Landslide Types

Figure 14-1 shows common landslide types as classified by the USGS. All these types of landslides are considered aggregately in USGS landslide mapping.

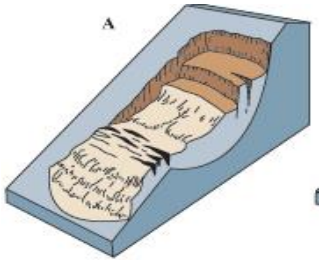
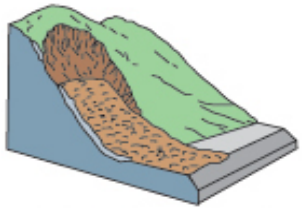
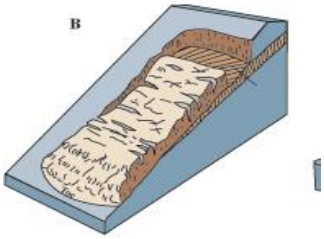
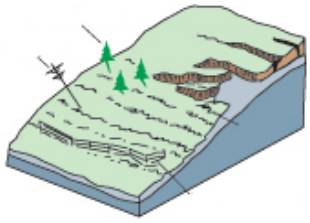
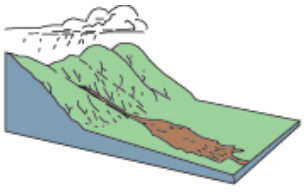
Landslide Causes

Landslides are caused by a combination of geological and climate conditions and the influence of urbanization. They can be initiated by storms, earthquakes, fires, volcanic eruptions, or human modification of the land. While small landslides are frequently a result of human activity, the largest landslides are often naturally occurring phenomena with little or no human contribution. Landslides are associated primarily with the following factors (USGS 2004):

- **Water—**Intense rainfall, changes in groundwater level, and water level changes along coastlines, earthen dams, and the banks of lakes, reservoirs, and rivers are the primary triggers of landslides.
- **Seismic Activity—**Earthquakes in landslide-prone areas greatly increase the likelihood that landslides will occur, either due to ground shaking alone or shaking-caused dilation of soil materials.
- **Mining—**Large vibrations, including blasting, reach yards under the soil surface, which poses a greater threat to areas that are already at risk for sliding.
- **Other Human Activity—**Construction activity that undercuts or overloads dangerous slopes or that redirects the flow of surface or groundwater can trigger slope failures.

Landslides are typically a function of soil type and slope steepness. Soil type is a key indicator for landslide potential and is used by geologists and geotechnical engineers to determine soil stability for construction standards.

Figure 14-1. Common Landslides Types

Rotational slides—Slides in which the surface of rupture is curved upward, and the slide movement rotates parallel to the ground surface. 	**Debris avalanches—** Debris flows that travel faster than about 10 miles per hour (mph). Speeds in excess of 20 mph are not uncommon, and speeds in excess of 100 mph, although rare, can occur. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars, and anything else in its path. 
Translational slides— Slides in which the mass moves along a roughly flat surface with little rotation. 	**Earthflows—**Landslides with an “hourglass” shape. The slope material liquefies and runs out, forming a bowl or depression at the head. 
Falls—Abrupt movements of geologic materials, such as rocks and boulders, that become detached from steep slopes or cliffs. Falls are strongly influenced by gravity, weathering, and the presence of water in a mineral’s pores. 	**Creep—**Slow, steady, downward movements of slope-forming soil or rock. Creep is indicated by curved tree trunks, bent fences, or retaining walls, tilted poles or fences, and small soil ripples or ridges. 
Topples—Slides involving the forward rotation of a unit about some point under the actions of gravity and forces exerted by surrounding objects or by fluids in cracks. 	**Lateral Spreads—**Slides on very gentle slopes or flat terrain caused by liquefaction, the process whereby saturated, loose, sediments are transformed from a solid into a liquefied state. The failure starts suddenly in a small area and spreads rapidly. 
Debris flows—Rapid landslides in which loose soil, rock, organic matter, air, and water mobilize as a slurry that flows downslope. Commonly caused by intense surface water flow due to heavy rain or rapid snowmelt that erodes loose soil or rock on steep slopes. **Post-Wildfire Debris Flows**—Debris flows resulting from post-fire conditions, where burned soil surfaces enhance rainfall runoff that concentrates and picks up debris as it moves. 	

Source: (U.S. Geological Survey 2006, USGS 2004)

The following also can contribute to slide formation:

- Change in slope of the terrain
- Increased load on the land
- Shocks and vibrations
- Change in water content
- Groundwater movement
- Frost action
- Weathering of rocks
- Removing or changing the type of vegetation covering slopes
- Wildfire

14.1.2 Location

In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 33 percent
- History of landslide activity or movement during the last 10,000 years
- Recent history of wildfire
- Stream or wave activity that has caused erosion, undercut a bank, or cut into a bank to cause the surrounding land to be unstable
- An alluvial fan, indicating historical flows of debris or sediments
- Impermeable soils, such as silt or clay, mixed with granular soils, such as sand or gravel
- Historical hydraulic mine sites

The sites of past movements are likely sites of future landslides. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years and can cover a few acres or square miles. A small proportion of them may become active in any given year. The recognition of ancient dormant landslide sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are at risk of construction-triggered sliding.

The California Department of Conservation has mapped susceptibility to deep-seated landslides based on regional estimates of rock strength and steepness of slopes. Generally, weak rocks and steep slopes are most likely to generate landslides. The map uses information on the location of past landslides, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (California Department of Conservation 2020). Figure 14-2 shows the areas mapped has having moderate, high, or very high susceptibility.

The USGS computes thresholds for post-burn areas (burn areas less than 2 years old) based on statistical occurrences of debris flows and associated rainfall rates. For post-burn areas assessed by the California Watershed Emergency Response Teams (WERT), Cal OES has further refined USGS-generated thresholds using inputs from erosion modeling to field-validated soil burn severity. Those thresholds are adjusted on a continuous basis with input from local jurisdictions to reflect the revegetation of a post-burn area. Mapping of the post-fire debris flow hazard has been established based on these analyses. Figure 14-3 shows the moderate-level post-fire debris flow hazard areas for Nevada County.

Figure 14-2. Susceptibility to Deep Seated Landslides Hazard Area in Nevada County

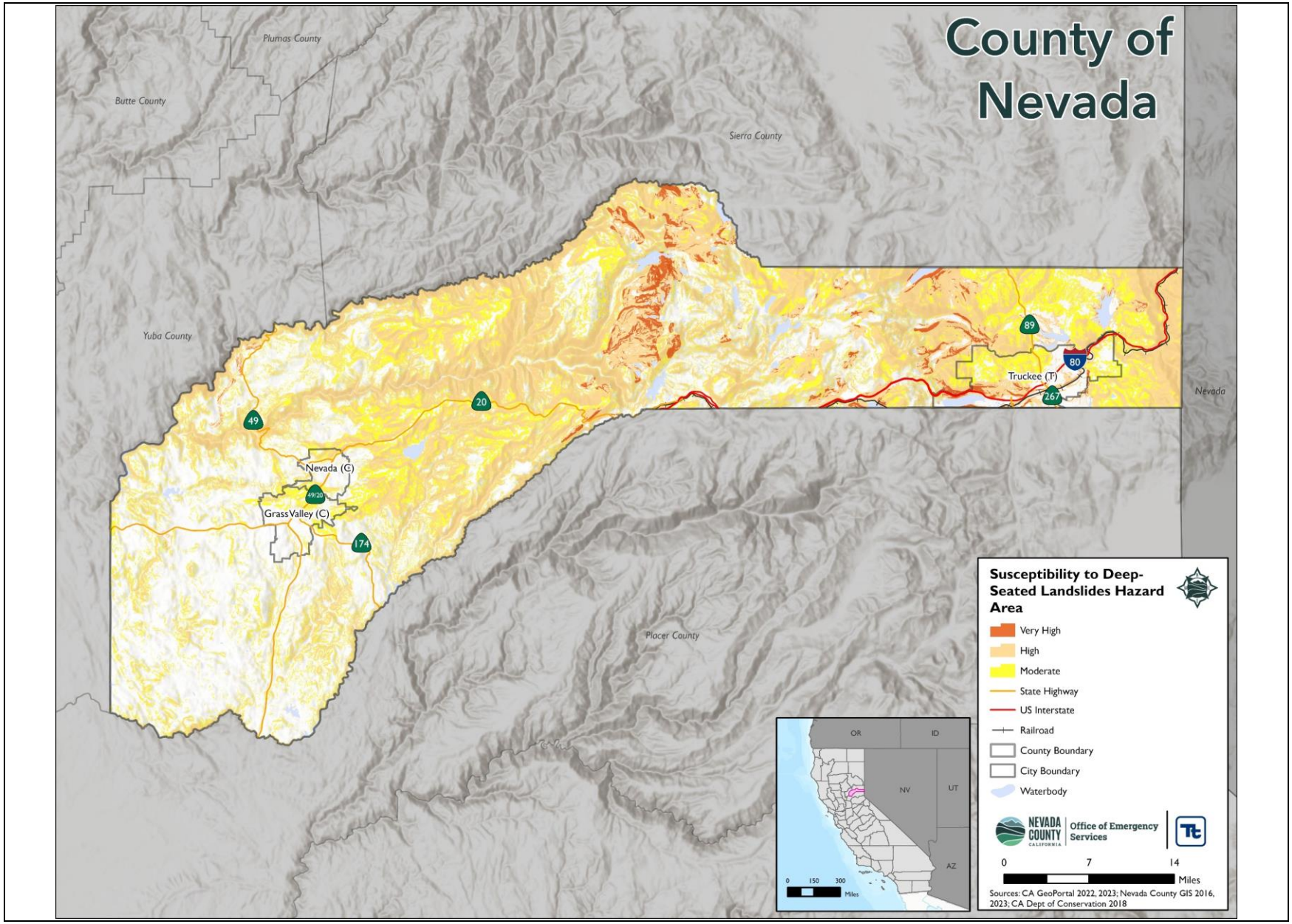
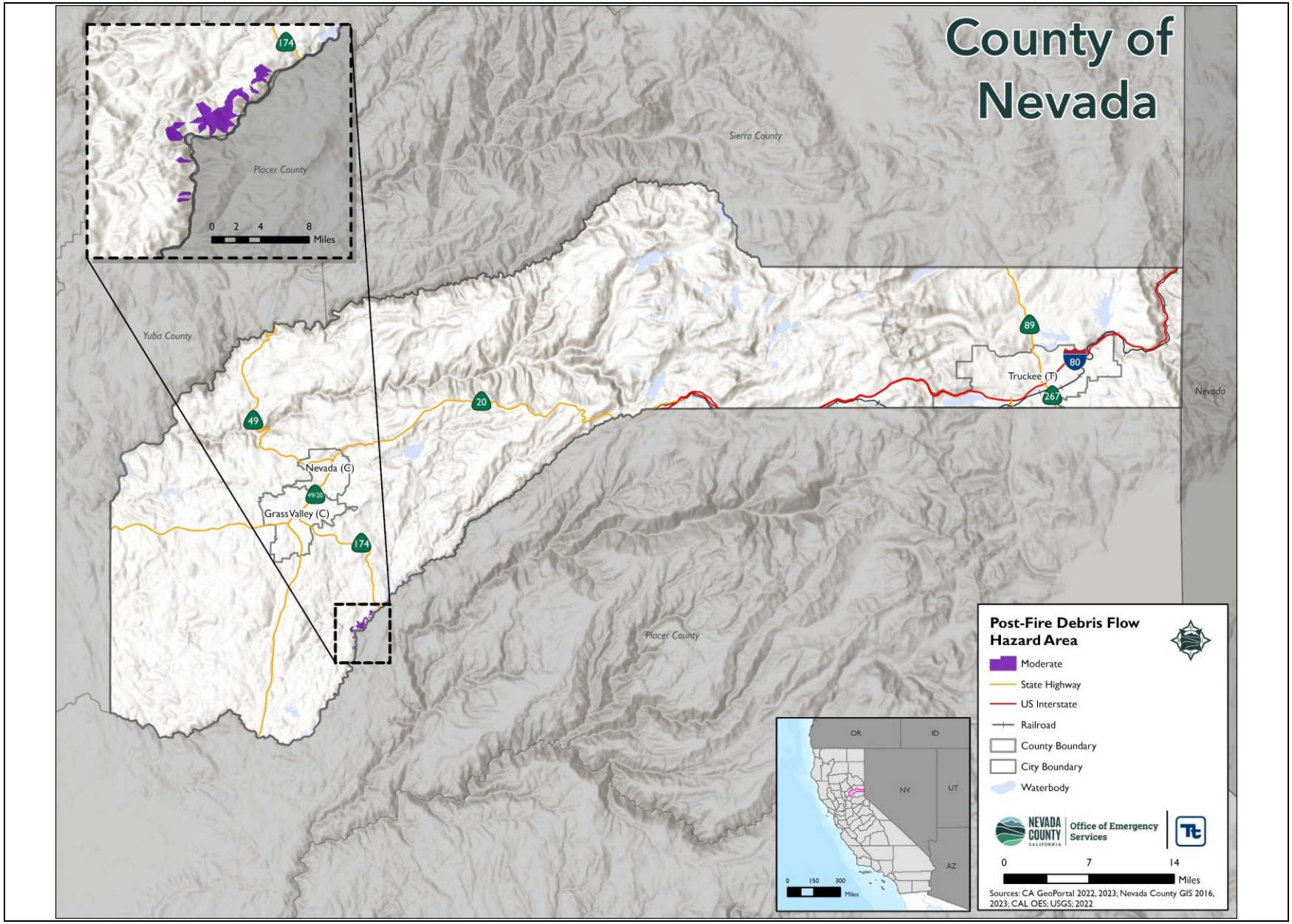


Figure 14-3. Post-Fire Debris Flow Hazard Area in Nevada County



14.1.3 Extent

The severity of a landslide will depend on its type and the size. Landslides can be measured using the size/volume of the material that was moved during the events. This is also affected by the velocity of the landslide. The rate at which materials move ranges from inches per year to tens of miles per hour (mph) (USGS n.d.-c).

Residents who live on or below hillsides can experience the possibility of debris flow—a fast-moving slurry of water, rock, soil, vegetation, boulders, and trees. Debris flows are triggered by short, intense periods of rainfall or rapid snowmelt, and can cause serious property damage and loss of life (California Department of Conservation 2024). A debris flow typically travels at about 10 mph but can exceed 35 mph in extreme cases (USGS 2022).

Warning Time

Landslides can occur suddenly or slowly. The velocity may be a slow creep of inches per year for large, deep-seated landslides, while the runout from debris flows may be many feet per second. Earthquake-induced landslides, including rock avalanches, may be almost instantaneous.

The warning time for landslides depends on awareness of the hazard as well as monitoring and alert systems. Assessments of pre-existing landsliding and areas that may be prone to landsliding helps to develop awareness of the hazard and planning for potential slope movement, depending on slope angle, material, and water content. Some methods used to monitor landslides can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine what areas are at risk during general time periods. Assessing geology, vegetation, amount of predicted precipitation, and potential earthquake ground motions can help in these assessments.

For landslides or debris flows that may be triggered by rainfall, improved forecasting of El Niño events or other potentially high rainfall years can provide some advanced warning. Rainfall forecasting allows for better preparation and response to potential slope failures and flood events. The WERT works with the USGS, the NWS, and Cal OES to develop thresholds as guidance for watches and warnings of possible flash flooding and debris flows.

Warning time for earthquake-induced landslide may be gained as the California Earthquake Early Warning System is developed. The California Earthquake Early Warning System may be able to provide the public with time for situational awareness of rapid earth movement.

Some large, deep-seated landslides can be instrumented with surficial and/or subsurface monitoring devices. This kind of monitoring is used when landslides may impact infrastructure or housing. The monitoring can provide alerts if movement begins or accelerates. This information can assist with evacuation alerts and provide data for protection and repair of infrastructure.

14.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was included in nine major disaster (DR) or emergency (EM) declarations for events that included landslides (FEMA 2023a). Table 14-1 lists these declarations.

TABLE 14-1. FEMA DECLARATIONS FOR WINTER STORM RELATED EVENTS IN NEVADA COUNTY (1954 TO 2023)

Event Date	Declaration Date	Declaration Number	Description
January 3 - February 10, 1995	January 10, 1995	DR-1044	Severe Winter Storms, Flooding, Landslides, Mud Flows
February 13 - April 19, 1995	March 12, 1995	DR-1046	Severe Winter Storms, Flooding, Landslides, Mud Flows
December 17, 2005 - January 3, 2006	February 3, 2006	DR-1628	Severe Storms, Flooding, Mudslides, and Landslides
March 29 - April 16, 2006	June 5, 2006	DR-1646	Severe Storms, Flooding, Landslides, and Mudslides
January 3-12, 2017	February 14, 2017	DR-4301	Severe Winter Storms, Flooding, and Mudslides in California
February 1-23, 2017	April 1, 2017	DR-4308	Severe Winter Storms, Flooding, Mudslides in California
February 21 - July 10, 2023	April 3, 2023	DR-4699	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides
December 27, 2022 - January 31, 2023	January 14, 2023	DR-4683	Severe Winter Storms, Flooding, Landslides, and Mudslides
March 9 – July 10, 2023	March 10, 2023	EM-3592	Severe Winter Storms, Flooding, Landslides, and Mudslides

Source: (FEMA 2024c)

State Emergency Proclamations

Nevada County has not been included in any landslide-related state emergency proclamations since the last HMP update.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA landslide-related agricultural disaster declarations (USDA 2023a).

Previous Events

Known hazard events that impacted Nevada County between January 2017 and December 2023 are listed in Table 14-2. For events prior to 2017, refer to the 2017 Nevada County HMP.

TABLE 14-2. LANDSLIDE EVENTS IN NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
January 8, 2017	N/A	N/A	Norden	A large mudslide near the Donner Lake Interchange on Interstate 80 caused the closure of the freeway. $480,000 in property damage was reported.
January 9-10, 2017	N/A	N/A	Soda Springs	Caltrans and CHP reported a 60 foot mudslide. Interstate 80 was closed in both directions over the Sierra Nevada near Donner Lake. Interstate 80 was shut down for 17 hours west bound, 14 hours east bound, until Caltrans removed the debris. $480,000 in property damage was reported.
January 10-11, 2017	N/A	N/A	Birchville	Rocks, mud, and a tree slide across the roadway on Highway 49. The roadway was unpassable due to numerous slides on both sides of the South Yuba River Bridge. $1.12 million in property damage was reported.
June 9, 2023	N/A	N/A	Old Highway 40	Portions of Donner Pass Road (Old Highway 40) were closed due to a rockslide/ large boulder following major thunderstorm activity in the area.

Sources: (NOAA NCEI 2024, FEMA 2024c)

14.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous landslide occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 14-3. Based on historical records and input from the Planning Team, the probability of occurrence for landslides in the County is considered "occasional."

TABLE 14-3. PROBABILITY OF FUTURE LANDSLIDE EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Landslide/Debris Flow	10	2.8	36%

Sources: (NOAA NCEI 2024, FEMA 2024c)

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes

will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All these factors would increase the probability of landslide occurrences.

14.1.6 Cascading Impacts

Landslides can cause secondary effects such as blocking roads, which can isolate residents and businesses and delay commercial, public, and private transportation. Other potential problems can result from landslides if vegetation or poles on slopes are knocked over, causing losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat. Landslides into floodways can block the flow of water and cause flooding.

14.2 Vulnerability and Impact Assessment

A spatial analysis was conducted using two sets of landslide mapping: landslide susceptibility areas from the California Department of Conservation (moderate, high, and very high); and post-fire debris flow hazard areas from Cal OES and USGS (see Figure 14-2 and Figure 14-3). To determine what assets are exposed to landslide hazards, the asset inventories prepared for this HMP (population, buildings, critical facilities) were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from the impacts of landslides. Refer to Section 4.3 for additional details on the methodology used to assess landslide risk.

14.2.1 Life, Health, and Safety

Overall Population

Generally, a landslide event is an isolated incident and impacts only the populations within the immediate area of the incident. The population downslope of the landslide hazard areas is particularly vulnerable. Landslide events can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area.

Table 14-4 summarizes the estimated population exposed to the moderate, high, or very high susceptibility to deep-seated landslides hazard area. The exposed population ranges from 479 in the very high susceptibility area (0.5 percent of the total County population) to 17,317 in the moderate susceptibility area (16.9 percent of the total County population). The County population in the post-fire debris flow hazard area is very low (3), as shown in Table 14-5.

TABLE 14-4. POPULATION IN DEEP-SEATED LANDSLIDE HAZARD AREAS

Jurisdiction	Total Population (US Census Decennial 2020)	Population Living in Deep-Seated Landslide Hazard Areas					
		Moderate Susceptibility		High Susceptibility		Very High Susceptibility	
		Number of Persons	% of Jurisdiction Total[a]	Number of Persons	% of Jurisdiction Total[a]	Number of Persons	% of Jurisdiction Total[a]
Grass Valley	14,016	2,947	21.0%	308	2.2%	0	0.0%
Nevada City	3,152	509	16.1%	223	7.1%	0	0.0%
Truckee	16,729	5,840	34.9%	4,835	28.9%	467	2.8%
Unincorporated	68,344	8,021	11.7%	3,604	5.3%	12	<0.1%
Nevada County (Total)	**102,241**	**17,317**	**16.9%**	**8,970**	**8.8%**	**479**	**0.5%**

Source: U.S. Census Bureau 2020; CA Department of Conservation 2018

a. *Percentage is slightly inaccurate because total population is based on city limits and vulnerable population is based on community boundaries; the accuracy of the result is adequate for planning purposes.*

TABLE 14-5. POPULATION IN THE POST-FIRE DEBRIS FLOW HAZARD AREA

Jurisdiction	Total Population (US Census Decennial 2020)	Population in the Post-Fire Debris Flow Hazard Area	
		Number of Persons	% of Jurisdiction Total
Grass Valley	14,016	0	0.0%
Nevada City	3,152	0	0.0%
Truckee	16,729	0	0.0%
Unincorporated	68,344	3	<0.1%
Nevada County (Total)	**102,241**	**3**	**<0.1%**

Source: U.S. Census Bureau 2020; Cal OES; USGS 2020

Socially Vulnerable Population

Populations with access and functional needs, as well as elderly populations and the very young, may be unable to evacuate quickly enough to avoid the impacts of a landslide. Other vulnerable groups are those experiencing homelessness or residents and visitors whose primary language is not English.

No vulnerable persons live in the post-fire debris flow hazard area. Table 14-6 presents the estimated socially vulnerable populations located in the moderate, high, and very high deep-seated landslide susceptibility hazard areas. The range of exposure in the three hazard areas is as follows:

- Population 65 and older—80 (very high) to 4,483 (moderate)
- Population 5 and younger—31 (very high) to 838 (moderate)
- Non-English speaking population—16 (very high) to 265 (moderate)
- Population with disability—32 (very high) to 2,369 (moderate)
- Population below poverty level—43 (very high) to 1,889 (moderate)

TABLE 14-6. VULNERABLE POPULATIONS IN DEEP-SEATED LANDSLIDE HAZARD AREAS

	Vulnerable Populations in Deep-Seated Landslide Hazard Areas									
	65 and Older		5 and Younger		Non-English Speaking		Disability		Below Poverty Level	
Jurisdiction	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Moderate Susceptibility										
Grass Valley	850	21.0%	182	20.9%	19	20.5%	619	21.0%	509	21.0%
Nevada City	213	16.1%	17	15.3%	0	0.0%	42	16.1%	48	16.2%
Truckee	966	34.9%	392	34.9%	210	34.8%	382	34.9%	526	34.9%
Unincorporated	2,454	11.7%	247	11.7%	36	11.4%	1,326	11.7%	806	11.7%
Nevada County (Total)	**4,483**	**15.4%**	**838**	**19.9%**	**265**	**26.2%**	**2,369**	**15.2%**	**1,889**	**17.0%**
High Susceptibility										
Grass Valley	88	2.2%	19	2.2%	2	2.2%	64	2.2%	53	2.2%
Nevada City	93	7.0%	7	6.3%	0	0.0%	18	6.9%	21	7.1%
Truckee	799	28.9%	324	28.9%	174	28.9%	316	28.8%	435	28.8%
Unincorporated	1,103	5.3%	111	5.3%	16	5.1%	596	5.3%	362	5.3%
Nevada County (Total)	**2,083**	**7.2%**	**461**	**11.0%**	**192**	**19.0%**	**994**	**6.4%**	**871**	**7.8%**
Very High Susceptibility										
Grass Valley	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nevada City	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Truckee	77	2.8%	31	2.8%	16	2.7%	30	2.7%	42	2.8%
Unincorporated	3	<0.1%	0	0.0%	0	0.0%	2	<0.1%	1	<0.1%
Nevada County (Total)	**80**	**0.3%**	**31**	**0.7%**	**16**	**1.6%**	**32**	**0.2%**	**43**	**0.4%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Note: "% of Total" represents the vulnerable population in the hazard area as a percentage of the total vulnerable population in the jurisdiction (e.g., population 65 or older in the hazard area in Truckee as a percent of the total population 65 or older in Truckee). See Table 3-4 for total vulnerable population in each jurisdiction.

14.2.2 General Building Stock

Buildings constructed on soils that are susceptible to landsliding are vulnerable to the landslide hazard. Potential losses include the damage sustained by buildings, property, and infrastructure due to ground failure (USGS 2003).

Table 14-7 summarizes the number of structures located in the deep-seated landslide susceptibility hazard areas. There are 10,465 buildings (18.3 percent of the total building stock) located in the moderate susceptibility hazard area with an estimated $10.7 billion of replacement cost value (building and content replacement costs). There are 6,508 buildings (11.4 percent of the total building stock) located in the high susceptibility hazard area with an estimated $6.4 billion of replacement cost value. There are 460 buildings (0.8 percent of the total building stock) located in the very high susceptibility hazard area with an estimated $429 million of replacement cost value.

TABLE 14-7. BUILDINGS IN DEEP-SEATED LANDSLIDE HAZARD AREAS

	Total Buildings in Jurisdiction		Number of Buildings in Hazard Area		Replacement Cost Value in Hazard Area	
Jurisdiction	Number of Buildings	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Moderate Susceptibility to Deep-Seated Landslide						
Grass Valley	6,410	$8,077,613,536	1,374	21.4%	$2,334,665,495	28.9%
Nevada City	2,619	$2,974,541,089	404	15.4%	$428,563,190	14.4%
Truckee	16,175	$16,378,917,320	5,139	31.8%	$4,918,020,385	30.0%
Unincorporated	31,937	$26,299,651,530	3,548	11.1%	$2,979,596,330	11.3%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**10,465**	**18.3%**	**$10,660,845,400**	**19.8%**
High Susceptibility to Deep-Seated Landslide						
Grass Valley	6,410	$8,077,613,536	130	2.0%	$218,562,937	2.7%
Nevada City	2,619	$2,974,541,089	174	6.6%	$165,762,793	5.6%
Truckee	16,175	$16,378,917,320	4,603	28.5%	$4,738,118,790	28.9%
Unincorporated	31,937	$26,299,651,530	1,601	5.0%	$1,303,482,091	5.0%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**6,508**	**11.4%**	**$6,425,926,611**	**12.0%**
Very High Susceptibility to Deep-Seated Landslide						
Grass Valley	6,410	$8,077,613,536	0	0.0%	$0	0.0%
Nevada City	2,619	$2,974,541,089	0	0.0%	$0	0.0%
Truckee	16,175	$16,378,917,320	453	2.8%	$424,341,271	2.6%
Unincorporated	31,937	$26,299,651,530	7	<0.1%	$4,239,793	<0.1%
Nevada County (Total)	**57,141**	**$53,730,723,475**	**460**	**0.8%**	**$428,581,065**	**0.8%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Table 14-8 provides a summary of buildings by occupancy class in the deep-seated landslide susceptibility hazard areas. Residential properties make up 77.7 percent of the buildings located in the moderate susceptibility area, 76.2 percent of those in the high susceptibility area, and 75.7 percent of those in the very high susceptibility area.

TABLE 14-8. BUILDINGS IN DEEP-SEATED LANDSLIDE HAZARD AREAS BY GENERAL OCCUPANCY CLASS

Jurisdiction	Number of Buildings in the Hazard Area			
	Residential	Commercial	Industrial	Other[a]
Moderate Susceptibility to Deep-Seated Landslide				
Grass Valley	918	319	103	34
Nevada City	310	87	4	3
Truckee	4,300	837	0	2
Unincorporated	2,599	845	3	101
Nevada County (Total)	**8,127**	**2,088**	**110**	**140**
High Susceptibility to Deep-Seated Landslide				
Grass Valley	96	25	8	1
Nevada City	136	36	0	2
Truckee	3,560	971	58	14
Unincorporated	1,168	368	0	65
Nevada County (Total)	**4,960**	**1,400**	**66**	**82**
Very High Susceptibility to Deep-Seated Landslide				
Grass Valley	0	0	0	0
Nevada City	0	0	0	0
Truckee	344	105	4	0
Unincorporated	4	2	0	1
Nevada County (Total)	**348**	**107**	**4**	**1**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Government, Religion, Agricultural, and Education

Only one building—a residential building with an estimated replacement cost value of $1.1 million—is located in the post-fire debris flow hazard area.

14.2.3 Community Lifelines and Other Critical Facilities

Table 14-9 summarizes the number of community lifelines located in the deep-seated landslide hazard areas. Of the 26 community lifelines in very high susceptibility to very high landslide hazard areas, water systems and communications have the greatest number of facilities (12 each). Of the 401 community lifelines in high susceptibility hazard areas, communications has the greatest number of facilities (201). For moderate susceptibility, there are a total of 326 community lifelines with communication having the greatest number of facilities (146).

TABLE 14-9. NUMBER OF COMMUNITY LIFELINES IN DEEP-SEATED LANDSLIDE HAZARD AREAS

Jurisdiction	Number of Community Lifelines in Deep-Seated Landslide Hazard Areas										
										Total	
	Commu-nications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transport-ation	Water Systems	Other Critical Facilities	Number	% of Jurisdiction Total
Moderate Susceptibility to Deep-Seated Landslide											
Grass Valley	31	3	4	0	8	13	3	8	5	75	24.0%
Nevada City	13	2	0	2	0	4	0	2	0	23	16.0%
Truckee	13	1	1	0	0	0	4	50	1	70	14.0%
Unincorporated	89	7	5	0	0	8	15	30	4	158	13.6%
Nevada County (Total)	**146**	**13**	**10**	**2**	**8**	**25**	**22**	**90**	**10**	**326**	**15.4%**
High Susceptibility to Deep-Seated Landslide											
Grass Valley	1	0	0	1	0	0	0	1	0	3	1.0%
Nevada City	0	0	0	0	0	1	0	2	0	3	2.1%
Truckee	77	13	4	1	7	6	11	75	10	204	40.8%
Unincorporated	123	9	2	1	0	12	10	33	1	191	16.5%
Nevada County (Total)	**201**	**22**	**6**	**3**	**7**	**19**	**21**	**111**	**11**	**401**	**19.0%**
Very High Susceptibility to Deep-Seated Landslide											
Grass Valley	0	0	0	0	0	0	0	0	0	0	0.0%
Nevada City	0	0	0	0	0	0	0	0	0	0	0.0%
Truckee	10	0	0	0	0	0	1	10	0	21	4.2%
Unincorporated	2	0	0	0	0	1	0	2	0	5	0.4%
Nevada County (Total)	**12**	**0**	**0**	**0**	**0**	**1**	**1**	**12**	**0**	**26**	**1.2%**

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Landslides can cause significant damage to buildings and the supply chains that provide community lifeline services. If these lifelines are not functional during or after an emergency, the County may experience cascading impacts, such as injuries, health issues, or prolonged economic impacts.

Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads and bridges, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can result in economic losses for businesses. Landslides can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use. Similar to roads, rail lines are important for response and recovery operations after a disaster. Landslides can block travel along the rail lines, which do not have detour options as local roads or highways do.

Power lines are generally elevated above steep slopes; but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses. For individuals who rely on medical equipment, a prolonged power outage can present serious health risks or complications.

Other types of infrastructure that may also be exposed to landslide hazards include water and sewer infrastructure. Water systems can become dammed or contaminated by landslide materials.

14.2.4 Economy

Direct costs of landslides include the damage sustained by buildings, property, transportation corridors, fuel and energy conduits, and communication lines (USGS 2022). Indirect costs, such as clean-up costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity may also occur. Buildings losses will impact the local tax base and economy. Landslide events that block access to roads can isolate residents and businesses and delay commercial, public, and private transportation.

14.2.5 Natural, Historic and Cultural Resources

Natural Resources

A landslide alters topography and can damage or destroy vegetation and wildlife habitat. Soil and sediment runoff accumulating downslope can block waterways and roadways and degrade water quality in streams and other water bodies. Mudflows that erode into downstream waterways can threaten the life of freshwater species (USGS 2020b). The impacts of eroded landscape can travel for miles downstream into adjacent waterways and create issues for surrounding watersheds. Additional environmental impacts include loss of forest productivity.

Historic and Cultural Resources

Landslide impacts on historic and cultural resources are highest in areas near hillsides that are characterized by unstable soil and erosion. Historical structures are often not built to modern building standards and are more prone to damages. Landslides can damage property and infrastructure in and around cultural landmarks, resulting in reduced access and potential closures of assets and areas.

14.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

14.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any areas of growth could be potentially impacted by the landslide hazard if located within the hazard areas or downslope. In general, development of slopes is not recommended due to the increased risk of erosion, stormwater runoff and flooding potential. The additional runoff results in sedimentation of downslope surface waters, which damages habitat and has the potential to damage property.

14.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from landslide events.

14.3.3 Climate Change

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All these factors would increase the probability and severity of landslides.

15. Volcano

15.1 Hazard Profile

15.1.1 Hazard Description

Volcanoes are openings where lava, tephra (small rocks), and steam erupt onto the earth's surface. Volcanic eruptions can last days, months, or years. Originating many miles beneath the ground, magma (molten rock) is driven toward the earth's surface by buoyancy (it is lighter than the surrounding rock) and by pressure from gas within it. Magma forces its way upward and may ultimately break through weak areas in the earth's crust (USGS n.d.-a).

Eruptions can occur in multiple ways. Sometimes molten rock simply pours from the vent as fluid lava. Alternatively, it can shoot violently into the air as dense clouds of tephra and gas. Larger fragments fall back around the vent, and clouds of tephra may move down the slope of the volcano under the force of gravity. Ash, consisting of tiny pieces of tephra, may be carried by the wind and fall to the ground many miles away. The smallest ash particles may be erupted miles into the sky and carried many times around the world by winds high in the atmosphere before falling to the ground (USGS n.d.-a).

Low-energy eruptions are destructive, but generally not life threatening. Volcanic areas can be hazardous even when the volcano is not erupting, with unstable ground, noxious gas emissions, intense heat, and steaming ground. In addition, some post-eruption hazards—rain remobilized debris flows, re-suspended ash, and seeping volcanic gas—may disrupt human activities or cause annoyances for years, even decades after an eruption has stopped (USGS 2019).

High-energy explosive eruptions are both destructive and life threatening. Characteristics and potential impacts of volcano hazards are listed in Table 15-1.

The volcanic explosivity index is a measure of the explosiveness of volcanic eruptions, based on volume of product, eruption cloud height, and qualitative observations (using terms ranging from "gentle" to "mega-colossal"). A value of zero is given for non-explosive eruptions, defined as less than 350,000 cubic feet of tephra ejected; and a value of 8 represents a mega-colossal eruption that can eject 240 cubic miles of tephra and have a cloud column height of over 66,000 feet. The scale is logarithmic, with each interval representing a tenfold increase in observed criteria (USGS n.d.-e). Figure 15-1 shows the volcanic explosivity index and product volume correlation.

15.1.2 Location

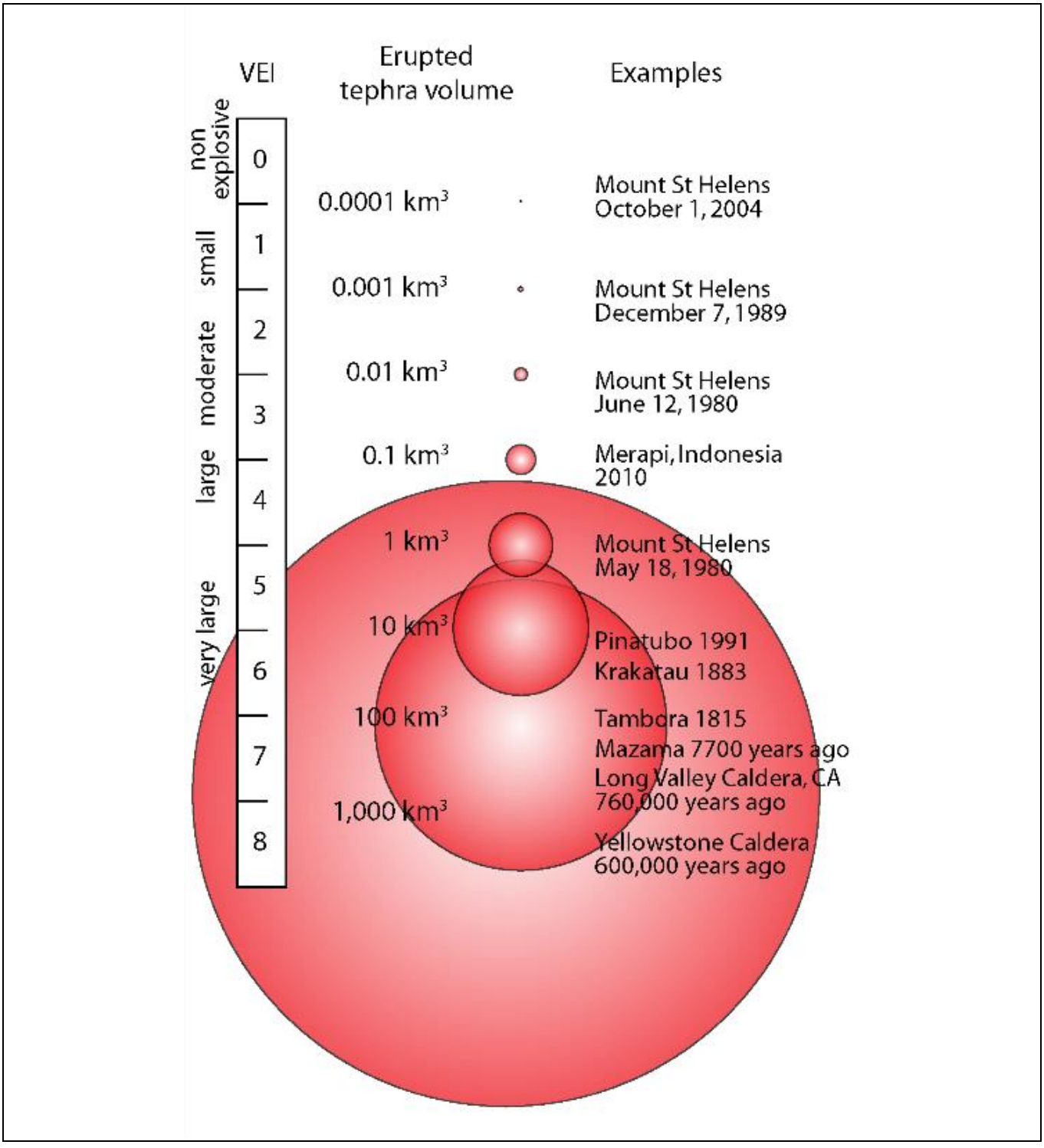
In California, volcanic events happen predominantly in the northern part of the state where the Cascade Mountain range terminates. According to USGS, there are no volcanoes in Nevada County that have erupted within the last 3,500 years. Figure 15-2 shows the volcanoes nearest to the County. Eruption of nearby volcanoes could result in ash being carried over the County, depending on wind currents. Timely warnings reduce the risk of fatalities, but depending on hazard type, destruction and disruptions to the community can extend many miles from the volcano.

TABLE 15-1. CHARACTERISTICS AND POTENTIAL IMPACTS OF VOLCANO HAZARDS

	Characteristics	Impact
Pyroclastic Flow	Sudden eruption of ash and lava from the volcano with great force, at ground speeds greater than 50 mph. Typically follow valleys but can overtop ridges and travel 30 miles from the volcano.	Pyroclastic flows travel much too fast for people to outrun and are thus a main cause of eruption-related fatalities. Flows knock down, shatter, bury, or carry away nearly all objects and structures. Extreme temperatures burn forests, crops, buildings, furnishings, and vehicles.
Lava Flow	Gradual inundation by lava from sustained low-level eruptions moving at speeds of less than 30 mph. Lava may pile up near the vent in a lava dome or move across the landscape for many miles as rivers of molten rock.	Everything in the path of slow speed lava flows will be knocked down, buried, or burned. The flows generally travel slowly enough that people and transportable infrastructure can be moved out of the way. The flows often ignite wildfires, and areas inundated by flows can be buried by 10 feet or more of hardened rock.
Debris Flows	Floods of ash, rock, and water that look like wet concrete. Large flows may carry boulders 30 feet across and travel through valleys and stream channels at speeds of 20 to 40 mph. Flows can be hot, with temperatures close to boiling.	Most debris flows travel much too fast for people to outrun and are thus a main cause of eruption-related fatalities. Debris flows can destroy buildings and bridges and bury vast areas with deposits of mud and rock up to 160 feet thick as far as 65 miles from the volcano.
Lahar Flows	Eruptions may trigger lahars by melting snow and ice or by ejecting water from a crater lake. Pyroclastic flows can generate lahars when extremely hot, flowing rock debris erodes, mixes with, and melts snow and ice as it travels rapidly down steep slopes.	Large lahars can crush, abrade, bury, or carry away almost anything in their paths. Buildings and valuable land may be partially or completely buried. By destroying bridges and roads, lahars can also trap people in areas vulnerable to other hazardous volcanic activity, especially if the lahars leave fresh deposits that are too deep, too soft, or too hot to cross
Ballistics	Ballistic ejection of coarse, hot fragments of lava from the volcanic vent, usually softball size or smaller.	The impact of coarse air fall is limited to the immediate area of the volcanic vent. Structures may be damaged by accumulation of falling lava fragments or burnt by their high heat. Wildfires may be ignited.
Ash Fall	Fine fragments of lava deposited from drifting ash clouds. Impact zone may be hundreds of miles from the volcano.	Fine ash fall is the most widespread and disruptive volcanic hazard. People exposed to fine ash experience eye, nose, and throat symptoms. Ash covers surfaces and infiltrates openings in machinery, buildings, and electronics. It can reduce visibility to zero. When wet, it can make paved surfaces slippery. Fine ash is abrasive, damaging surfaces. Ash may result in short-term physical and chemical changes in water quality. Close to the volcano, heavy ash fall may cause roofs to collapse. Fine ash can damage crops and sicken livestock.
Floods	Sudden melting of snow or ice by volcanic heat, or diversion of water by blocked drainages or breached embankments.	Impacts are similar those of non-volcanic floods, but the onset is usually sudden.
Volcanic Gas	Large eruptions can release enormous amounts of gas in a short time.	Significant amounts of carbon dioxide, sulfur dioxide, hydrogen sulfide and hydrogen halides can also be emitted from volcanoes. Depending on their concentrations, these gases are all potentially hazardous to people, animals, agriculture, and property.

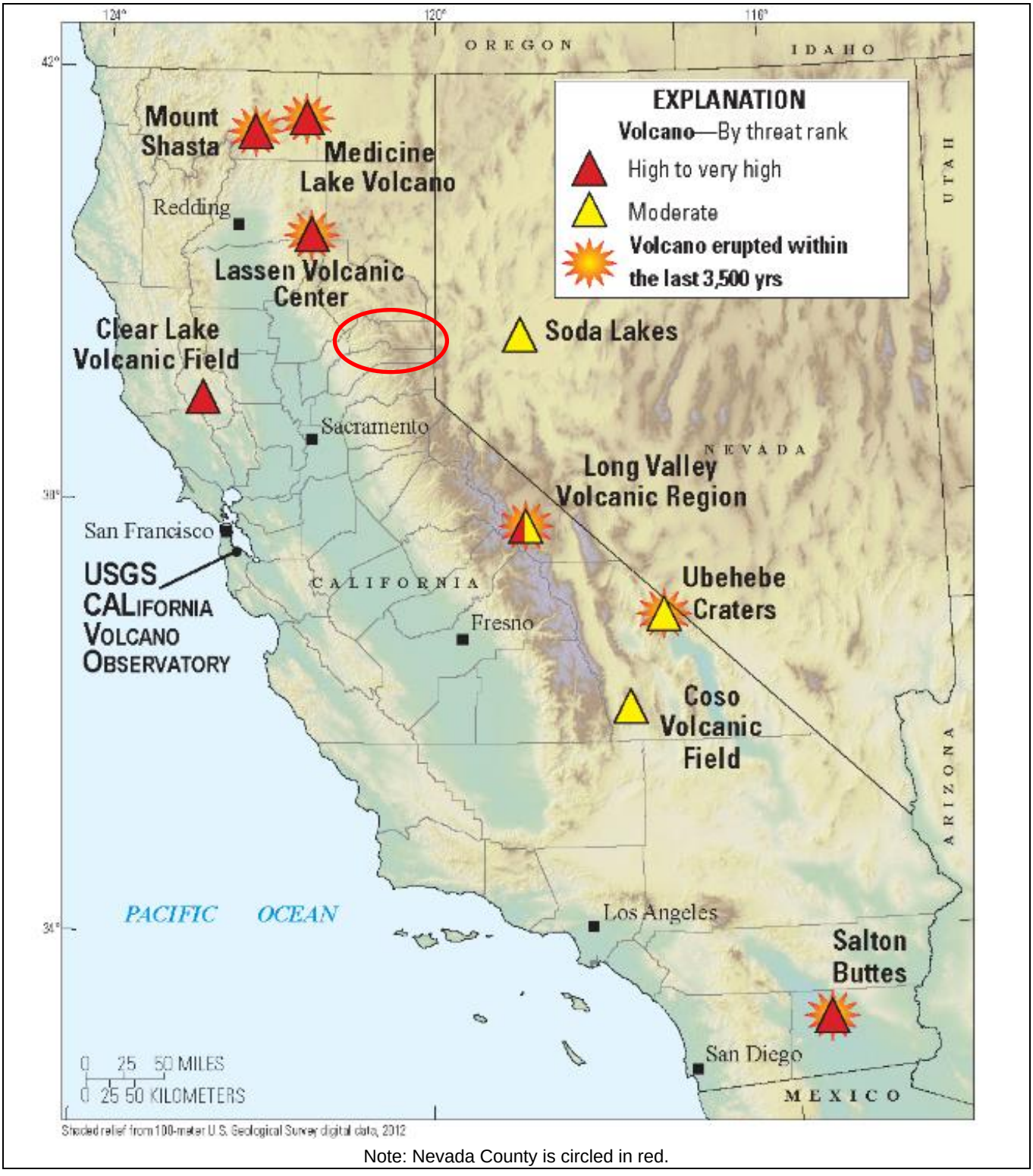
Source: (Cal OES 2024b)

Figure 15-1. Volcanic Explosivity Index



Source: (USGS n.d.-a)

Figure 15-2. Map of Moderate, High, and Very High Threat Volcanoes in CA



Note: Nevada County is circled in red.

Source: (USGS 2012)

15.1.3 Extent

The Clear Lake Volcanic Field to the west of the of the County and the Lassen Volcanic Center to the north are considered to be high to very high threats (USGS 2012). The threat rankings are derived from a combination of factors:

- Age of the volcano
- Potential hazards (the destructive natural phenomena produced by a volcano)
- Exposure (people and property at risk from the hazards)
- Current level of monitoring (real-time sensors in place to detect volcanic unrest)

Threat rankings are periodically re-evaluated and revised, if necessary, as ongoing research provides new information on potential hazards or exposure is altered by changes in population and regional aviation (USGS 2018).

Warning Time

Eruption hazards are most severe within a few miles of the vent, with life-threatening or highly destructive phenomena evolving rapidly, often within seconds to minutes, leaving little time to mount evasive actions. The time available to issue warnings increases as distance from the vent increases (Cal OES 2022).

Seismic activity beneath the volcanic area is an important warning sign of an impending volcanic eruption. Seismologists can interpret differences between earthquakes related to the rise of magma and those caused by tectonic faulting. Other warning signs of magma rising into the shallow subsurface might include increased release of volcanic gases from openings and changes in the gas composition. Deformation of the ground surface in the vicinity of a volcano may also indicate that magma is approaching the surface. Typically, these warning signs appear a few weeks to months before an eruption, but they can last for decades or even centuries without leading to an eruption (USGS 2005).

15.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was not included in any major disaster (DR) or emergency (EM) declarations for volcano-related events (FEMA 2023a).

State Emergency Proclamations

Nevada County has not been included in any volcano-related state emergency proclamations since the previous HMP update.

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA volcano-related agricultural disaster declarations (USDA 2023a).

Previous Events

Although California is susceptible to volcanic events, they are infrequent. At least 76 volcanic vents have erupted, some repeatedly, during the last 10,000 years (Seismic Safety Commission n.d.). The last recorded volcanic event in California was the eruption of Mount Lassen to the north of Nevada County from 1914 to 1917 (NPS 2015). Avalanches, mudflows, and flows of hot ash and gas devastated nearby areas, and volcanic ash fell as far away as 200 miles to the east (USGS 2005). Impacts on Nevada County from this event were unable to be identified but would have been limited to ashfall.

15.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Based on the record of volcanic activity over the last five millennia, the probability of another small- to moderate sized eruption in California in the next 30 years is estimated to be about 16 percent (USGS 2019). The probability in any given year of renewed volcanism in the state is on the order of one in a few hundred to one in a few thousand (Cal OES 2023a). Based on historical records and input from the Planning Team, the probability of occurrence for volcano in the County is considered “rare.”

Climate Change Projections

Climate change is not expected to have an impact on the frequency of volcanic activity.

15.1.6 Cascading Impacts

Volcanic activity can trigger seismic activity, floods, landslides, and wildfires. Volcanic events can severely impact ground transportation on roads and railways, disrupting daily activities, commerce, and response capabilities. Poor visibility may increase the risk of transportation accidents (Cal OES 2023a).

15.2 Vulnerability and Impact Assessment

As risk areas for volcano have not been mapped in Nevada County, the entire County is considered to be equally at risk. The following subsections provide a qualitative discussion of Nevada County’s vulnerability to the volcano hazard.

15.2.1 Life, Health, and Safety

Overall Population

Lava flows can travel many miles, typically slowly enough that people can avoid contact (USGS 2019). However, anything in the way of an advancing lava flow will be surrounded, buried, or burned by extreme heat. Lava deltas can catastrophically collapse and blast large rocks hundreds of feet into the air.

Hazardous fumes, including carbon dioxide and sulfur dioxide at lava water-entry sites can make breathing difficult. During an eruption or vigorous gas emission, volcanic smog spreads with the wind and can affect areas hundreds of miles from the volcano (USGS 2019).

Airborne fragments and ash lower air quality, affecting human health through inhalation or the abrasion of skin and eyes. Volcanic eruptions can result in heightened health concerns, including infectious disease, respiratory illness, burns, injuries from falls, and motor vehicle crashes related to poor visibility (Cal OES 2023a).

Volcanoes in areas with ample groundwater can result in hot springs, geysers, and other hydrothermal features. The ground surface in thermal areas can be slippery or covered with a thin breakable crust that overlies scalding fluid. Physical contact with hot springs and thermal features can cause severe burns, and submersion is potentially deadly (USGS 2019).

Socially Vulnerable Population

Economically disadvantaged populations are more vulnerable to volcanic events because they are likely to make decisions on evacuation based on the economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to need medical attention that may not be available due to isolation during a volcanic event, and they may have more difficulty evacuating.

Ash, smoke, and air pollution from volcanoes can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases.

15.2.2 General Building Stock

Lava flows and pyroclastic flows are likely to destroy any buildings in their path. Buildings constructed of wood or vinyl siding are generally more likely to be impacted (potential ignition) by heat from airborne particles than buildings constructed of brick or concrete. Older structures may have roof damage or collapse from accumulation of ash that is several inches thick.

15.2.3 Community Lifelines and Other Critical Facilities

Lifeline facilities have the same vulnerabilities as the general building stock. Volcanic ash is a threat to aviation, ground transportation, communications, and utility systems. For both ground and air transportation, ash reduces visibility, short-circuits electronic equipment, and damages engines—jet aircraft are particularly vulnerable. Flight delays and cancellations can interrupt delivery of goods and supplies. Accumulation of ash several inches thick, especially when wet, can clog wastewater systems and reduce the quality of drinking water (USGS 2019).

15.2.4 Economy

Exposure of crops, pastures, and livestock to volcanic ash fall can be serious, even for a light dusting. Ash falling on forage results in digestive tract problems in livestock, including gastrointestinal tract obstruction, and it is common for dairy production to drop significantly (Cal OES 2023a).

Damaged infrastructure and buildings can result in significant economic losses. Volcanic events can cause delays and shutdowns of transportation systems, which can have major economic impacts.

15.2.5 Natural, Historic and Cultural Resources

Natural Resources

Airborne fragments can damage vegetation by direct burial, heat, or breakage. Airborne fragments and ash lower air quality. Volcanic eruptions can substantially disrupt hydrologic systems, most notably by altering stream flow and choking waterways with ash and volcanic debris (Cal OES 2023a).

Volcanic events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of the Interior 2012).

Historic and Cultural Resources

Historic structures with lumber construction may be more prone to damage from heat (potential ignition) and ash and debris loading (roof collapse). Volcanic activity can result in hazardous outdoor conditions that can result in cancellation of outdoor events and festivals or shut down parks and other recreational areas.

15.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

15.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the volcano hazard.

15.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from the volcano hazard.

15.3.3 Climate Change

Climate change could result in increased impact from volcanic events. As the atmosphere warms due to climate change, the plumes of ash and gas emitted by large volcanic eruptions will rise higher. Climate change will also accelerate the transport of volcanic material from the tropics to higher latitudes. For large eruptions, the combined effect of these phenomena will cause the haze created by volcanic aerosols to block more sunlight from reaching the earth's surface, ultimately amplifying the temporary cooling caused by volcanic eruptions (University of Cambridge 2021).

16. Wildfire

16.1 Hazard Profile

16.1.1 Hazard Description

A wildfire is an uncontrolled fire that is burning vegetation in wildland or rural areas, that can spread into communities or developed areas, and that requires fire suppression. Wildfires can be ignited by natural forces such as lightning, or by human activity such as powerlines, smoking, campfires, equipment use, and arson. The potential for significant damage to life and property exists in areas designated as wildland/urban interface (WUI) areas, where development is adjacent to or intermixed with vegetated areas.

California is recognized as one of the most fire-prone regions in the world due to the combination of complex terrain, climate, fire-adapted ecosystem, history of fire suppression, and community development patterns, all of which have contributed to extensive wildfires. Flammable expanses of brush, diseased timberland, overstocked forests, hot and dry summers, extreme topography, intense wind events, summer lightning storms, WUI communities, and human acts all contribute to California's wildfire threat.

General Wildfire Types

Wildfires can generally be classified as ground, surface, or crown. Ground fires occur when fuels ignite and burn underground. Ground fires may eventually burn through the ground surface and become surface fires. Surface fires burn on the surface of the ground and are primarily fueled by low-lying vegetation. Active crown fires spread from treetop to treetop at a rapid pace. Crown fires can be accelerated by wind conditions resulting in high intensity wildfire (De La Torre 2021).

Wildfire Protection Responsibility in California

Hundreds of local, state, and federal agencies have fire protection responsibility for wildfires in California. In many instances, two or more organizations have dual primary responsibility on the same parcel of land—one for wildfire protection, and others for structural or "improvement" fire protection. In some areas, fire agencies have responsibility for both wildfire and structure fires. To address wildfire jurisdictional responsibilities, the California state legislature adopted legislation establishing the following responsibility areas:

- **Federal Responsibility Areas (FRAs)**—FRAs are fire-prone wildland areas that are owned or managed by a federal agency such as the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary fire protection responsibility rests with the federal agency. In many instances, FRAs are interspersed with private lands. Fire protection for developed private property is usually not the responsibility of the federal agency; such responsibility is that of a local government agency.

- **State Responsibility Areas (SRAs)**—SRAs are lands in California where the California Department of Forestry and Fire Protection (CAL FIRE) has responsibility for wildfire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRAs are defined as lands that meet the following criteria:
  - Are unincorporated county areas
  - Are not federally owned
  - Have wildland vegetation cover rather than agricultural or ornamental plants
  - Have watershed or range/forage value
  - Have housing densities not exceeding three units per acre

  Where SRAs contain built environment or development, the responsibility for fire protection of those improvements is that of a local government agency.
- **Local Responsibility Areas (LRAs)**—LRAs include land in cities, cultivated agriculture lands, non-flammable areas in unincorporated areas, and lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city fire departments, fire protection districts, and counties, or by CAL FIRE under contract to local governments. LRAs may include flammable vegetation and areas where the financial and jurisdictional responsibility for improvement and wildfire protection is that of a local government agency.

State law requires local governments to update the safety elements in their general plans to recognize wildfire risks in SRAs. The safety element must include information and policies on unreasonable risk from potential hazards, including fire. The state encourages integration among jurisdictions to enhance mitigation and prevention efforts.

Factors Contributing to Wildfire

As required by Public Resource Code 4201-4204, California Code of Regulations Title 14 Section 42024, and California Government Code 51175-89, CAL FIRE classifies lands in the state as Fire Hazard Severity Zones. Fire Hazard Severity Zones are designated as either moderate, high, or very high.

CAL FIRE's fire hazard severity model for wildfire has two key elements: probability of an area burning and expected fire behavior under extreme fuel and weather conditions. The zones reflect areas that have similar burn probabilities and fire behavior characteristics. The factors considered in determining fire hazard in wildland areas are fire history, flame length, terrain, local weather, and potential fuel over a 50-year period. Outside of wildlands, the model considers factors that might lead to buildings being threatened, including terrain, weather, urban vegetation cover, blowing embers, proximity to wildland, fire history, and fire hazard in nearby wildlands. Fire Hazard Severity Zones are not a structure loss model, as key information regarding structure ignition (such as roof type, etc.) is not included (CAL FIRE 2024b).

16.1.2 Location

Wildfires affect grass, forest, and brushlands, as well as any structures located within them or adjacent to them. Where there is human access to wildland areas, such as the Sierra Nevada and foothills areas, the risk of fire increases due to a greater chance for human ignition sources and historical fire

management practices. Much of the land area of Nevada County is foothill area with dense vegetation, making the County exceptionally vulnerable to wildfires.

Process Used to Map Wildfire Hazard

CAL FIRE has classified 92 percent of the area it has mapped within Nevada County as being either high or very high Fire Hazard Severity zone. This presents a challenge when determining how to prioritize different parts of the County. To address this, Nevada County OES completed the Wildfire Hazard Assessment in 2023 to map the wildfire hazard across the County and determine wildfire hazard priority using a comparative analysis. The Landscape Burn Probability model of the Interagency Fuel Treatment Decision Support System (IFTDSS) fire behavior modeling software was used to determine the wildfire hazard priority in Nevada County (Nevada County OES 2023). The model was used to assess wildfire hazard under critical fire-weather conditions for two fire scenarios:

- **Fuel-Driven Fire**—Fuel and topography are the primary drivers of fire behavior and fire growth is predominantly driven by fuel type, density, condition, and moisture. Wind speeds in these types of fires tended to be lower, and the terrain had a significant influence on fire behavior. Such conditions could occur at any time of the year but are at critical condition in summer.
- **Wind-Driven Fire**—Wind-driven fire is driven by extreme wind speed and wind gusts and experiences rapid-fire growth, extreme rates of spread, long-range spotting, and extreme fire behavior. Such conditions typically occurred in late summer/early fall.

The County was divided into four Forecast Zones (FZs) for the assessment. The selection of the FZs was based on the fire environment, local weather patterns, fire history, community boundaries, and expertise from a technical advisory committee. While the modeling was completed at the FZ scale to better capture differences in fire environment, the Wildfire Hazard Assessment analysis focused on the County-scale. Analysis at the FZ scale is included in the Community Wildfire Protection Plan (Nevada County OES 2023). The four FZs were:

- Higgins/Penn Valley (143,740 acres)
- Grass Valley/Nevada City (134,593 acres)
- Tahoe National Forest Area (263,159 acres)
- Truckee/Donner (108,453 acres)

The fire scenarios were determined using FireFamily Plus (version 5.0) and Remote Automated Weather Stations. In Nevada County, the first half of the fire season tends to be dominated by fuel-driven fires. In a fuel-driven scenario, the main factors influencing fire growth are fuel (type, loading, and condition) and topography. During this period, winds tend to come from the southwest, are less than 10 mph, and align with significant topography such as canyons. As summer transitions into fall, the County can experience significant wind events from the north/northeast with high windspeeds that result in wind-driven fires. In wind-driven fires, the wind is the main factor contributing to fire growth. In the Truckee/Donner FZ, wind-driven fires (northeasterly wind events) are less common due to snow/precipitation at that time of year. However, with climate change, less precipitation is predicted to fall in Eastern County, and wind events are predicted to increase (Nevada County OES 2023).

The Landscape Burn Probability model determines the prioritized wildfire hazard by combining fire behavior model results for burn probability (probability of a fire occurring at a specific point under a specified set of conditions) and conditional flame length (intensity of a fire at a specific point given that a fire occurs). The priority of the hazard is determined based on the landscape hazard in each analysis area. The Landscape Burn Probability model compares all the results within the analysis to the highest hazard within the analysis area. For instance, one location in the landscape may have a high hazard but a low hazard priority because it is not as hazardous as other locations in the analysis area. The analysis of one area cannot be compared to that of another area (Nevada County OES 2023).

Hazard priority was divided into six classes:

- Defensible Space/Home Hardening/Non-Burnable Fuel Zone
- Lowest Priority Hazard
- Lower Priority Hazard
- Moderate Priority Hazard
- Higher Priority Hazard
- Very High Priority Hazard

The “Defensible Space/Home Hardening/Non-Burnable Fuel Zone” is a combination of the “Non-Burnable” and “Burnable but Not Burned” classification from IFTDSS. Non-Burnable locations have a non-burnable fuel model and cannot burn. Burnable but Not Burned locations have burnable fuels but did not burn in the modeling performed for this analysis (e.g., a fire never reached the location, or a fire started within the location but was unable to burn out of that location because the fire spread rate was too slow). Locations in these classes tended to be concentrated within the developed areas of the County where residents and structures are concentrated. Because of limitations associated with fire behavior modeling, it is not possible to predict how the built environment will burn. Further, within these areas, there is very little open space for wildland areas and the primary fuel reduction action is individual property owner defensible space and structure hardening. Therefore, these areas were reclassified to more accurately reflect the primary mitigation action with developed areas (Nevada County OES 2023).

The Wildfire Hazard Analysis is focused on the landscape level. Analysis at the FZ level can be found within the Nevada County 2025 Community Wildfire Protection Plan.

Nevada County Wildfire Hazard Priority Maps

The maps in Figure 16-1 and Figure 16-2 show the hazard priorities determined by the study for the fuel-driven and wind-driven fire scenarios, respectively.

Figure 16-1. Wildfire Hazard Priority, Fuel-Driven Scenario in Nevada County

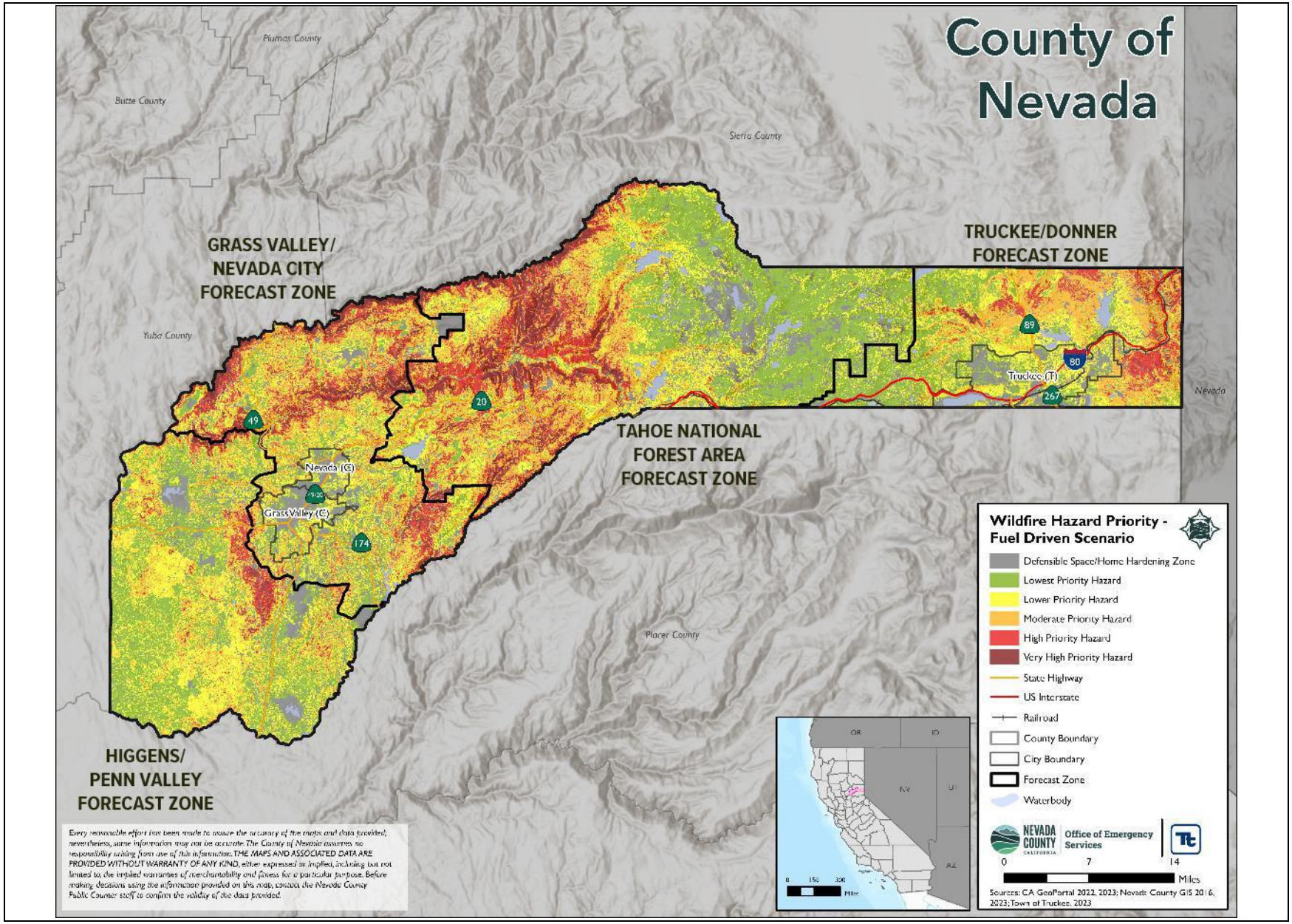
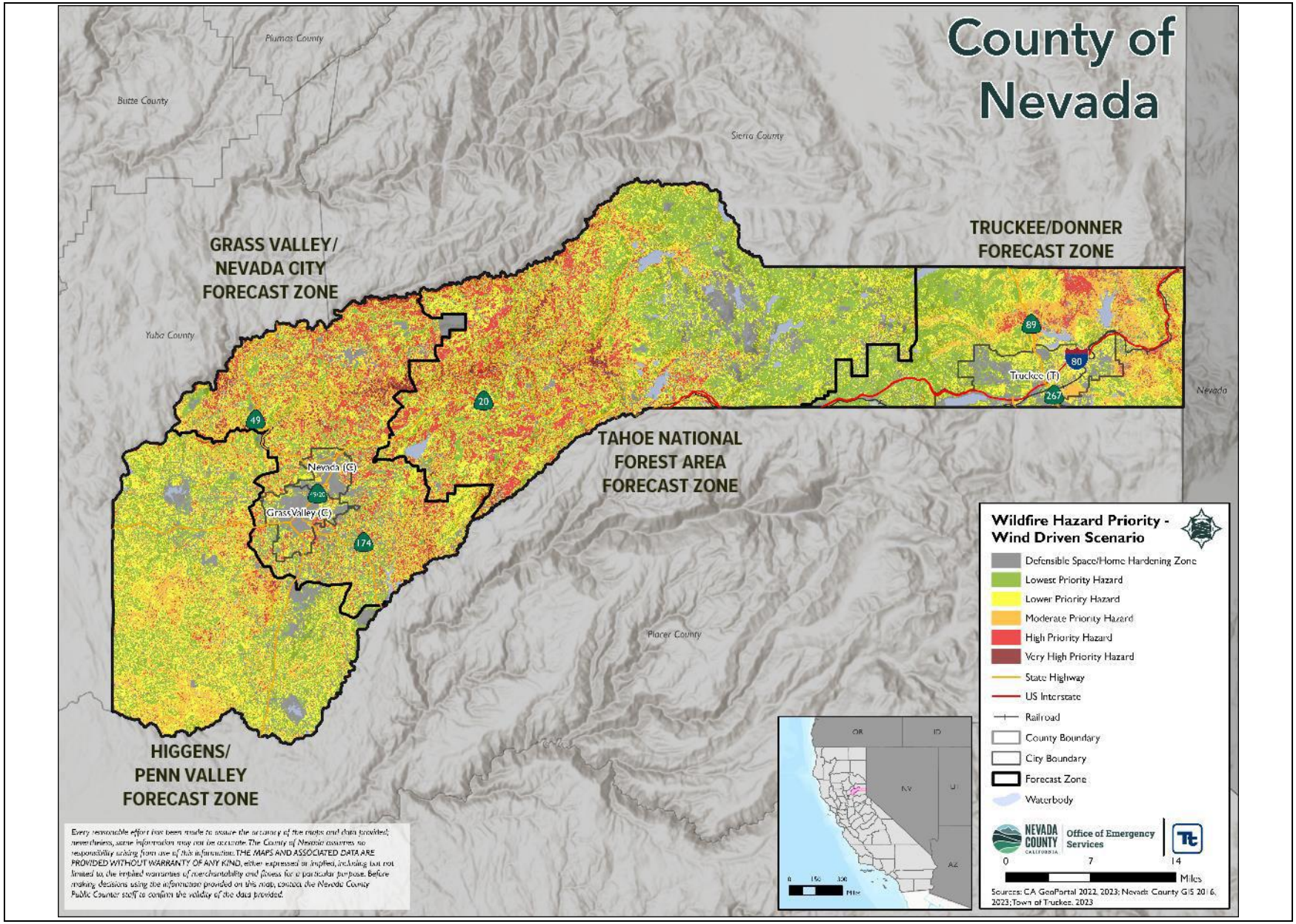


Figure 16-2. Wildfire Hazard Priority, Wind-Driven Scenario in Nevada County



16.1.3 Extent

Factors contributing to wildfire hazard and wildfire risk in Nevada County include the following:

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures
- Excessive vegetation along roadsides and hanging over roads, fire engine access, and evacuation routes
- Drought contributing to increased beetle infestation in weakened and stressed trees
- Narrow and often one-lane or dead-end roads complicating evacuation and emergency response, as well as many subdivisions that have only one means of ingress/egress (Pyroanalysis LLC and Ladris Technologies 2024)
- Inadequate or missing street signs on private roads and house address signs
- Property development patterns
- Lightning ignitions
- Increasing population density leading to more ignitions

Wildfires that burn in isolated natural settings with little or no human development can be part of a natural ecological cycle and can be beneficial to the landscape. Historically, Nevada County's ecosystems were kept healthy and in balance by a variety of natural disturbances, including fire, insects, pathogens, floods, weather variations, landslides, avalanches, and earthquakes. This balance has been affected by anthropogenic alterations to forest disturbance cycles, such as fire exclusion/suppression, livestock grazing, roads and development, logging, and introduced plants, animals, and pathogens. Due to these changes, fire behavior may now deviate considerably from the historical fire conditions.

Altered fire regimes can destabilize ecosystems and landscapes, creating conditions that promote catastrophic disturbance events. They may seriously reduce ecosystem resiliency that would allow burned areas to return to prior levels of productivity. Today, historical policies of fire exclusion and aggressive suppression are giving way to a better understanding of the importance fire plays in the natural cycle of certain forest types.

16.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was included in three major disaster (DR) or emergency (EM) declarations for wildfire-related events (FEMA 2023a). Nevada County was also included in two fire management assistance (FM) declarations for wildfire-related events. Table 16-1 lists these declarations.

State Emergency Proclamations

Between 2017 and 2023, Nevada County has been included in three wildfire-related state emergency proclamations as listed in Table 16-2.

TABLE 16-1. FEMA DECLARATIONS FOR WILDFIRE EVENTS IN NEVADA COUNTY (1954 TO 2023)

Event Date	Declaration Date	Declaration Number	Description
July 14 - October 25, 2021	August 24, 2021	DR-4610-CA	The 2021 California wildfires burned over 2.5 million acres, resulted in three firefighter fatalities, and damaged or destroyed nearly 4,000 structures. 7,396 wildfires burned during this destructive fire season.
August 14 – September 26, 2020	August 22, 2020	DR-4558-CA	Historic wildfires swept across the State of California during the largest wildfire season in California's recorded modern history. At the end of 2020, approximately 10,000 fires in the state had burned over 4.2 million acres – more than 4% of California's total land.
August 18, 2020	August 18, 2020	FM-5332-CA	The CA Jones Fire was active for 11 days and burned 705 acres in Nevada County.
October 9-10, 2017	October 10, 2017	DR-4344-CA; FM-5217-CA	250 wildfires were ignited in Northern California and burned across 8 counties. At least 245,000 acres were scorched in these fires, resulting in $14.5 billion in damage and $1.5 billion in fire suppression costs. 8,900 buildings were destroyed, 44 people lost their lives, and 192 were injured.

Sources: (FEMA 2024c, Associated Press 2018)

TABLE 16-2. STATE EMERGENCY PROCLAMATIONS FOR WILDFIRE EVENTS IN NEVADA COUNTY

Event Date	State Proclamation Number	Description
July 16, 2021 – August 10, 2021	2021-04	The River Fire burned 2,619 acres through Nevada County and neighboring Placer County. This fire was active for 9 days. The Lava fire, Beckworth Complex fire, and Monument fire also blazed through the area. Over $330 million in damage resulted from these fires.
August 18, 2020	2020-06	A State of Emergency was declared following the 2020 California wildfire season, which was the most destructive in modern history. An extreme heat event and extreme drought conditions exasperated the effects of wildfire hazards. These fires resulted in over $634 million in damage.
October 9-10, 2017	2017-09	A number of wildfires impacted the state, with damage exceeding $538 million.

Source: (Cal OES 2024b)

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA wildfire-related agricultural disaster declarations (USDA 2023a).

Previous Events

Table 16-3 lists some of the significant wildfires that impacted Nevada County (including smoke impacts from fires in counties adjacent to Nevada County) between January 2017 and December 2023. For events prior to 2017, refer to the 2017 Nevada County HMP.

TABLE 16-3. WILDFIRE EVENTS THAT IMPACTED NEVADA COUNTY (2017 – 2023)

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration	Location Impacted	Description
August 30, 2017	N/A	N/A	Off Hwy 49 & Pleasant Valley Rd, south of North San Juan	The Pleasant Fire burned 392 acres, injured one person, and damaged two structures
October 2017	DR-4344-CA; FM-5217-CA; 2017-09	Yes	Fires throughout Northern California	Nevada County fires included in this region-wide declaration included the Wind Complex (Lobo Fire and McCourtney Fire) and Garden Fire, with over 900 acres burned in the County.
November 8, 2018	N/A	N/A	Pulga Road at Camp Creek in Butte County	The devastating 153,336-acre Camp Fire had smoke impacts on Nevada County
June 16, 2020	N/A	N/A	Plumas National Forest	The Walker Fire burned for 4 days, destroying 2 structures and burning 1,455 acres. No injuries or deaths were reported.
August 18-27, 2020	FM-5332-CA	Yes	Near Jones Bar Road, northwest of Nevada City	The Jones Fire burned 705 acres, destroyed 18 residential and commercial structures, damaged three other structures, and resulted In seven injuries.
August 4 – October 12, 2021	DR-4610-CA	Yes	Near Colfax, CA	The River Fire near the City of Colfax, CA burned 2,619 acres in Nevada and Placer Counties and destroyed 142 structures.
August 14 - October 21, 2021	N/A	N/A	East of Omo Ranch, South of Grizzly Flats	The Caldor Fire burned nearly 222,000 acres, remaining active for 68 days. Over 500 structures were destroyed in this incident.
August 25 – 28, 2021	N/A	No	East Bennett Rd. and Lava Rock Ave., Grass Valley	The Bennett Fire burned 59 acres just east of the downtown area of Grass Valley
June 28 -July 1, 2022	N/A	N/A	South of Dobbins	The Rices Fire burned 904 acres and destroyed 1 structure. No injuries or deaths were reported, but widespread evacuations and power outages occurred.
September 6 - October 22, 2022	FM-5453-CA	No	Western slope of the Northern Sierra Nevada Mountain Range	The Mosquito Fire, 20 miles east of Higgins Corner, threatened over 9,000 structures and resulted in the evacuation of over 11,000 people. 76,788 acres were burned in this wildfire event. Nevada County affected by smoke and influx of evacuees.

Event Date	Declaration or Proclamation Number	Nevada County Included in Declaration	Location Impacted	Description
September 13, 2022	N/A	N/A	I-80 & Ridge Road	The Dutch Fire started on I-80 and resulted in evacuations. A power outage due to this fire impacted 1,785 people, and 48 acres were burned. No injuries or deaths were reported. Smoke impacts in Nevada County.

Sources: (NOAA NCEI 2024, FEMA 2024c, CAL FIRE 2024a, CBS Sacramento 2019)

16.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous wildfire occurrences that impacted the County was used to calculate the probability of future occurrence of such events, as summarized in Table 16-4. Based on historical records and input from the Planning Team, the probability of occurrence for wildfire impacting the County is considered "frequent."

TABLE 16-4. PROBABILITY OF FUTURE WILDFIRE EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 2017 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Wildfire	10	0.7	100%[a]

Sources: (NOAA NCEI 2024, FEMA 2024c, CAL FIRE 2024a, CBS Sacramento 2019)

a. 100% probability represents a statistical likelihood that an event will occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

Combined effects of drought, declining snowpack, and increasing temperatures have significantly increased fire severity, frequency, and size throughout the region. In the Sierra Nevada, currently projected changes in climate are associated with large increases in the area burned by wildfires and in the frequency of large fires (State of California 2018). According to California's Fourth Climate Change Assessment (OPR, CNRA, CEC 2018), California is likely to see a 50 percent increase in fires larger than 25,000 acres as well as a 77 percent increase in average area burned by 2100. The following changes will influence wildfire risk in the state and in Nevada County:

- **Increasing Temperatures**—Wildfire risk in Nevada County is rising with increasing temperatures. Forests in the Sierra Nevada Mountains that experience drought face increasing

susceptibility to wildfire. Warming temperatures will also likely worsen air quality due to extended agriculture fallowing. This, in turn, can exacerbate health impacts from wildfire smoke.

- **Shifting Wind Patterns**—Shifting wind patterns will continue to impact the growth and behavior of wildfires in Nevada County.
- **Shifting Water Patterns**—Changing patterns of rainfall will impact plant growth, thereby altering the amount of fuel for fires. Changing precipitation will factor heavily into post-fire risk assessments in areas that are especially vulnerable to post-fire flooding and landslides.
- **Shifting Insect Habitat**—Bark beetle infestations are rising in response to the changing climate, increasing tree mortality and reducing carbon storage.
- **Human Impacts**—Human factors, such as development and risk mitigation, will have a direct impact on Nevada County's ability to mitigate and adapt to the impacts of climate change.

16.1.6 Cascading Impacts

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. A major fire can lead to ancillary effects such as landslides in steep ravine areas and flooding due to the effects of silt in local watersheds. Wildfires cause the contamination of reservoirs, destroy transmission lines, and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes, sometimes several years after a wildfire.

Wildfires can have a significant effect on air quality, especially with prolonged periods of burning combined with climatic conditions. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing. Aesthetic impacts include odors and reduction in visibility.

16.2 Vulnerability and Impact Assessment

A spatial analysis was conducted using 2023 wildfire hazard data from Nevada County. To determine what assets face potential risk, the asset inventories prepared for this HMP (population, buildings, critical facilities) were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the numbers and values at risk from the impacts of wildfire.

The following analysis assesses where crucial assets and resources occur within the prioritized wildfire hazard landscape to identify potential opportunities for mitigation. Whether an asset or resource is located within priority hazard areas does not indicate whether that resource would be exposed to wildfire. Wildfire hazard does not predict if a wildfire will occur but rather the potential fire intensity in the given location if a fire occurs.

16.2.1 Life, Health, and Safety

Overall Population

Table 16-5 summarizes the estimated population living in each wildfire priority hazard area in each FZ. The Defensible Space/Home Hardening Zone is assigned to more highly developed areas, as indicated by the high percentage of population in the Defensible Space/Home Hardening Zone in the Truckee/Donner FZ and the much lower percentage in the Tahoe National Forest Area FZ. Where the high and very high priority hazards occur is mostly in wildland areas that are not heavily populated. However, these are areas where fire could spread to populated areas. This shows that, to prevent fire from transitioning from wildlands to communities, mitigation work needs to be concentrated in wildland areas to alter fire behavior and then complemented with defensible space improvements and home hardening in community zones where most of the population lives.

Socially Vulnerable Population

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. These effects can be felt even from wildfires that are many miles away. Economically disadvantaged populations are more vulnerable because they may lack the financial resources to evacuate when a wildfire is approaching. The population over age 65 is also more vulnerable because they are more likely to need medical attention that may not be available due to isolation during a wildfire event, and they may have more difficulty evacuating. Socially vulnerable populations also may lack resources to quickly recover after a wildfire occurs.

In each of the mapped FZs, socially vulnerable populations will face wildfire risk at rate proportionate to their overall percentage of the total FZ population. Table 16-6 presents the estimated socially vulnerable populations in FZ.

16.2.2 General Building Stock

IFTDSS, like most current fire modeling software, is not capable of simulating how fire burns structures or developed areas. This is due to the high variability in how structures burn. Structures typically burn in fires due to house-to-house spread or firebrands, neither of which can be modeled using fuel-based fire behavior modeling software. For these reasons, IFTDSS classifies all structures and developed areas as non-burnable. However, fire science does recognize that structures burn at a high intensity and are at significant risk from wildfire. It is recognized that structures are not only a risk from wildfire but also are considered fuel. This modeling limitation was taken into account when determining the results. Structures and developed areas are classified as “Defensible Space/Home Hardening Zone,” in recognition of their role on the fire landscape and of the type of mitigation that would be prioritized in heavily residential/developed areas.

Table 16-7 presents the estimates of building counts and values in each wildfire priority hazard area and each FZ for the fuel-driven and wind-driven fire scenarios. Table 16-8 shows the building counts by occupancy class.

TABLE 16-5. POPULATION LIVING IN EACH WILDFIRE HAZARD PRIORITY AREA

Wildfire Hazard Priority	Fuel-Driven Fire Scenario		Wind-Driven Fire Scenario	
	Exposed Population	% of FZ Total	Exposed Population	% of FZ Total
Higgins/Penn Valley FZ				
Defensible Space/Home Hardening Zone	21,396	49.4%	20,825	48.1%
Lowest Priority Hazard	12,925	29.8%	12,684	29.3%
Lower Priority Hazard	5,817	13.4%	7,018	16.2%
Moderate Priority Hazard	2,715	6.3%	2,246	5.2%
High Priority Hazard	407	0.9%	533	1.2%
Very High Priority Hazard	70	0.2%	24	0.1%
Grass Valley/Nevada City FZ				
Defensible Space/Home Hardening Zone	21,515	55.7%	21,473	55.6%
Lowest Priority Hazard	8,264	21.4%	8,732	22.6%
Lower Priority Hazard	5,305	13.7%	4,214	10.9%
Moderate Priority Hazard	3,075	8.0%	2,453	6.3%
High Priority Hazard	457	1.2%	1,743	4.5%
Very High Priority Hazard	33	0.1%	33	0.1%
Tahoe National Forest Area FZ				
Defensible Space/Home Hardening Zone	490	23.9%	503	24.5%
Lowest Priority Hazard	641	31.3%	675	32.9%
Lower Priority Hazard	499	24.4%	373	18.2%
Moderate Priority Hazard	351	17.1%	283	13.8%
High Priority Hazard	61	3.0%	206	10.1%
Very High Priority Hazard	6	0.3%	9	0.4%
Truckee/Donner FZ				
Defensible Space/Home Hardening Zone	13,981	77.1%	13,851	76.4%
Lowest Priority Hazard	3,193	17.6%	3,329	18.4%
Lower Priority Hazard	743	4.1%	779	4.3%
Moderate Priority Hazard	198	1.1%	172	0.9%
High Priority Hazard	26	0.1%	10	0.1%
Very High Priority Hazard	0	0.0%	0	0.0%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 16-6. SOCIALLY VULNERABLE POPULATIONS IN EACH FZ

Wildfire Hazard Priority	Persons Over 65		Persons Under 5		Non-English Speaking Persons		Persons with a Disability		Persons in Poverty	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
Higgins/Penn Valley FZ	13,258	30.6%	1,333	3.1%	196	0.5%	7,163	16.5%	4,354	10.0%
Grass Valley/Nevada City FZ	11,934	30.9%	1,638	4.2%	190	0.5%	6,758	17.5%	4,877	12.6%
Tahoe National Forest Area FZ	624	30.5%	60	2.9%	7	0.3%	338	16.5%	204	10.0%
Truckee/Donner FZ	3,197	17.6%	1,164	6.4%	608	3.4%	1,328	7.3%	1,647	9.1%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

Note: "% of Total" represents the vulnerable population in the FZ as a percentage of the total population in the FZ (e.g., non-English-speaking population in the Trucker/Donner FZ as a percent of the total population in that FZ).

TABLE 16-7. BUILDINGS IN EACH WILDFIRE PRIORITY HAZARD AREA AND FZ

	Fuel-Driven Fire Scenario				Wind-Driven Fire Scenario			
	Number of Buildings		Replacement Cost Value		Number of Buildings		Replacement Cost Value	
Wildfire Hazard Priority	Count	% of FZ Total	Value	% of FZ Total	Count	% of FZ Total	Value	% of FZ Total
Higgins/Penn Valley FZ								
Defensible Space/Home Hardening Zone	8,614	43.3%	7,807,606,621	46.7%	8,386	42.1%	7,602,345,224	45.5%
Lowest Priority Hazard	6,415	32.2%	4,990,297,187	29.8%	6,110	30.7%	4,814,801,303	28.8%
Lower Priority Hazard	3,224	16.2%	2,558,045,598	15.3%	3,830	19.2%	3,064,413,926	18.3%
Moderate Priority Hazard	1,405	7.1%	1,158,080,742	6.9%	1,267	6.4%	1,013,320,847	6.1%
High Priority Hazard	213	1.1%	183,138,121	1.1%	291	1.5%	212,046,289	1.3%
Very High Priority Hazard	31	0.2%	24,044,724	0.1%	18	0.1%	14,285,404	0.1%
Grass Valley/Nevada City FZ								
Defensible Space/Home Hardening Zone	10,729	55.7%	12,356,817,933	64.8%	10,737	55.7%	12,361,214,798	64.9%
Lowest Priority Hazard	4,143	21.5%	3,292,254,449	17.3%	4,286	22.2%	3,443,218,499	18.1%
Lower Priority Hazard	2,643	13.7%	2,118,942,617	11.1%	2,213	11.5%	1,729,050,720	9.1%
Moderate Priority Hazard	1,497	7.8%	1,101,565,560	5.8%	1,183	6.1%	881,517,775	4.6%
High Priority Hazard	234	1.2%	163,139,327	0.9%	835	4.3%	621,792,838	3.3%
Very High Priority Hazard	28	0.1%	22,888,996	0.1%	20	0.1%	18,814,252	0.1%
Tahoe National Forest Area FZ								
Defensible Space/Home Hardening Zone	220	22.6%	161,112,398	22.6%	224	23.0%	165,605,138	23.2%
Lowest Priority Hazard	307	31.6%	224,193,221	31.4%	311	32.0%	228,084,336	32.0%
Lower Priority Hazard	246	25.3%	180,399,467	25.3%	190	19.5%	144,628,670	20.3%
Moderate Priority Hazard	172	17.7%	130,623,255	18.3%	132	13.6%	90,635,070	12.7%
High Priority Hazard	25	2.6%	15,576,365	2.2%	112	11.5%	83,642,776	11.7%
Very High Priority Hazard	2	0.2%	1,620,161	0.2%	3	0.3%	928,878	0.1%

Wildfire Hazard Priority	Fuel-Driven Fire Scenario				Wind-Driven Fire Scenario			
	Number of Buildings		Replacement Cost Value		Number of Buildings		Replacement Cost Value	
	Count	% of FZ Total	Value	% of FZ Total	Count	% of FZ Total	Value	% of FZ Total
Truckee/Donner FZ								
Defensible Space/Home Hardening Zone	12,891	76.0%	13,251,635,465	77.0%	12,779	75.3%	13,236,628,361	76.9%
Lowest Priority Hazard	2,974	17.5%	2,948,635,592	17.1%	3,115	18.4%	2,998,004,532	17.4%
Lower Priority Hazard	891	5.3%	810,910,302	4.7%	884	5.2%	792,934,308	4.6%
Moderate Priority Hazard	171	1.0%	185,258,565	1.1%	176	1.0%	181,837,327	1.1%
High Priority Hazard	35	0.2%	18,099,592	0.1%	9	0.1%	5,429,073	<0.1%
Very High Priority Hazard	1	<0.1%	294,084	<0.1%	0	0.0%	0	0.0%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 16-8. BUILDINGS IN EACH WILDFIRE PRIORITY HAZARD AREA AND FZ BY GENERAL OCCUPANCY CLASS

	Buildings in the Hazard Area							
	Fuel-Driven Fire Scenario				Wind-Driven Fire Scenario			
Wildfire Hazard Priority	Residential	Commercial	Industrial	Other[a]	Residential	Commercial	Industrial	Other[a]
Higgins/Penn Valley FZ								
Defensible Space/Home Hardening Zone	6,933	1,465	22	194	6,748	1,426	21	191
Lowest Priority Hazard	4,188	1,939	4	284	4,110	1,767	1	232
Lower Priority Hazard	1,885	1,155	1	183	2,274	1,332	5	219
Moderate Priority Hazard	880	450	0	75	728	443	0	96
High Priority Hazard	132	58	0	23	173	98	0	20
Very High Priority Hazard	23	7	0	1	8	8	0	2
Grass Valley/Nevada City FZ								
Defensible Space/Home Hardening Zone	7,505	2,708	209	307	7,483	2,724	215	315
Lowest Priority Hazard	2,811	1,185	6	141	2,959	1,151	5	171
Lower Priority Hazard	1,771	732	7	133	1,415	683	5	110
Moderate Priority Hazard	999	404	3	91	805	310	2	66
High Priority Hazard	148	64	1	21	572	231	2	30
Very High Priority Hazard	11	10	3	4	11	4	0	5
Tahoe National Forest Area FZ								
Defensible Space/Home Hardening Zone	159	56	0	5	163	56	0	5
Lowest Priority Hazard	208	95	0	4	219	86	0	6
Lower Priority Hazard	162	71	0	13	121	61	0	8
Moderate Priority Hazard	114	46	0	12	92	37	0	3
High Priority Hazard	20	5	0	0	67	33	0	12
Very High Priority Hazard	2	0	0	0	3	0	0	0

Wildfire Hazard Priority	Buildings in the Hazard Area							
	Fuel-Driven Fire Scenario				Wind-Driven Fire Scenario			
	Residential	Commercial	Industrial	Other[a]	Residential	Commercial	Industrial	Other[a]
Truckee/Donner FZ								
Defensible Space/Home Hardening Zone	9,927	2,702	126	136	9,859	2,658	126	136
Lowest Priority Hazard	2,277	676	9	12	2,325	769	12	9
Lower Priority Hazard	475	393	13	10	501	365	7	11
Moderate Priority Hazard	86	82	0	3	84	83	3	6
High Priority Hazard	9	26	0	0	5	4	0	0
Very High Priority Hazard	0	0	0	1	0	0	0	0

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

a. "Other" occupancy classes include Government, Religion, Agricultural, and Education

16.2.3 Community Lifelines and Other Critical Facilities

Wildfires significantly impact community lifelines and critical facilities. For example, wildfires have an impact on the water supplies throughout the County because of residual pollutants landing in water resources, which can clog wastewater pipes, culverts, etc. Wildfires can also result in the sedimentation of reservoirs reducing water storage. Wildfire events are getting more extreme in terms of acres burned, duration and intensity, and they can disrupt transportation, communications, water supply, power, and gas services (WHO 2024). In general, roads and bridges surrounding the areas of fire risk are important because they provide ingress and egress to large areas and, in some cases, to isolated neighborhoods. In 2024, Nevada County prepared an evacuation study to provide a road map for enhancing community resilience against wildfire. The study evaluated areas of focus based on potential catastrophic wildfire events and evacuation clearance time (Pyroanalysis LLC and Ladris Technologies 2024)

If a wildfire reached the following critical facilities, their vulnerability could complicate response and recovery efforts during and following an event:

- **Hazardous Materials and Fuel Storage**—During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition, they could leak into surrounding areas, saturating soils, and seeping into surface waters, and have a disastrous effect on the environment.
- **Communication Facilities**—If these facilities are damaged and become inoperable, it would exacerbate already difficult communication in the planning area.
- **Fire Stations**—If fire stations were compromised during a wildfire event, it would make fire suppression and support services even more challenging.

Table 16-9 and Table 16-10 summarize the number of community lifeline facilities within priority wildfire hazard areas.

16.2.4 Economy

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed businesses and decreases in tourism. Wildfires can cost thousands of taxpayer dollars to suppress and control; hundreds of operating hours on fire apparatus; and thousands of labor hours from firefighters. Further Nevada County's economy is dependent on tourism driven to access outdoor recreation resources. Given that the majority of outdoor recreation resources within Nevada County are both a wildfire hazard and a wildfire risk the economic stability would be significantly impacted if these areas were to burn.

TABLE 16-9. NUMBER OF COMMUNITY LIFELINES IN EACH WILDFIRE PRIORITY HAZARD AREA FOR THE FUEL-DRIVEN FIRE SCENARIO

Wildfire Hazard Priority	Number of Community Lifelines in Wildfire Priority Hazard Area										
										Total	
	Commu-nications	Energy	Food, Hydra-tion, Shelter	Hazard-ous Materials	Health & Medical	Safety & Security	Transport ation	Water Systems	Other Critical Facilities	Number	% of FZ Total
Higgins/Penn Valley FZ											
Defensible Space/Home Hardening Zone	85	6	10	7	2	22	14	73	10	229	47.8%
Lowest Priority Hazard	38	6	2	0	1	5	6	32	2	92	19.2%
Lower Priority Hazard	21	5	0	0	0	2	2	19	0	49	10.2%
Moderate Priority Hazard	37	0	0	0	0	0	1	9	0	47	9.8%
High Priority Hazard	23	0	0	0	0	1	0	0	0	24	5.0%
Very High Priority Hazard	37	0	0	0	0	1	0	0	0	38	7.9%
Grass Valley/Nevada City FZ											
Defensible Space/Home Hardening Zone	225	26	29	7	30	67	34	57	47	522	67.2%
Lowest Priority Hazard	82	1	4	3	0	8	4	29	12	143	18.4%
Lower Priority Hazard	25	2	2	0	0	3	2	20	1	55	7.1%
Moderate Priority Hazard	25	0	3	0	0	4	0	9	0	41	5.3%
High Priority Hazard	9	0	0	0	0	1	1	2	0	13	1.7%
Very High Priority Hazard	3	0	0	0	0	0	0	0	0	3	0.4%
Tahoe National Forest Area FZ											
Defensible Space/Home Hardening Zone	24	3	1	0	0	16	10	5	0	59	33.0%
Lowest Priority Hazard	13	1	0	0	0	9	2	9	0	34	19.0%
Lower Priority Hazard	43	5	0	0	0	2	0	4	0	54	30.2%
Moderate Priority Hazard	12	2	0	0	0	3	1	3	1	22	12.3%
High Priority Hazard	1	1	0	0	0	0	0	0	0	2	1.1%

Wildfire Hazard Priority	Number of Community Lifelines in Wildfire Priority Hazard Area										
										Total	
	Commu-nications	Energy	Food, Hydra-tion, Shelter	Hazard-ous Materials	Health & Medical	Safety & Security	Transport ation	Water Systems	Other Critical Facilities	Number	% of FZ Total
Very High Priority Hazard	8	0	0	0	0	0	0	0	0	8	4.5%
Truckee/Donner FZ											
Defensible Space/Home Hardening Zone	145	34	17	3	13	29	57	117	33	448	65.8%
Lowest Priority Hazard	38	3	2	0	0	3	5	75	3	129	18.9%
Lower Priority Hazard	52	1	0	0	0	0	0	32	0	85	12.5%
Moderate Priority Hazard	7	0	0	0	0	0	1	7	1	16	2.3%
High Priority Hazard	2	0	0	0	0	1	0	0	0	3	0.4%
Very High Priority Hazard	0	0	0	0	0	0	0	0	0	0	0.0%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

TABLE 16-10. NUMBER OF COMMUNITY LIFELINES IN EACH WILDFIRE PRIORITY HAZARD AREA FOR THE WIND-DRIVEN FIRE SCENARIO

Wildfire Hazard Priority	Number of Community Lifelines in Wildfire Priority Hazard Area										
										Total	
	Commu-nications	Energy	Food, Hydra-tion, Shelter	Hazard-ous Materials	Health & Medical	Safety & Security	Transport ation	Water Systems	Other Critical Facilities	Number	% of FZ Total
Higgins/Penn Valley FZ											
Defensible Space/Home Hardening Zone	83	6	10	6	2	21	14	71	7	220	45.9%
Lowest Priority Hazard	46	0	1	1	1	3	8	32	3	95	19.8%
Lower Priority Hazard	88	7	1	0	0	7	0	19	2	124	25.9%
Moderate Priority Hazard	19	4	0	0	0	0	1	8	0	32	6.7%
High Priority Hazard	5	0	0	0	0	0	0	3	0	8	1.7%
Very High Priority Hazard	0	0	0	0	0	0	0	0	0	0	0.0%
Grass Valley/Nevada City FZ											
Defensible Space/Home Hardening Zone	227	27	29	7	30	67	34	57	49	527	67.8%
Lowest Priority Hazard	77	1	3	3	0	8	4	31	9	136	17.5%
Lower Priority Hazard	39	0	3	0	0	8	1	15	1	67	8.6%
Moderate Priority Hazard	16	0	1	0	0	0	1	6	0	24	3.1%
High Priority Hazard	9	1	2	0	0	0	1	7	1	21	2.7%
Very High Priority Hazard	1	0	0	0	0	0	0	1	0	2	0.3%
Tahoe National Forest Area FZ											
Defensible Space/Home Hardening Zone	24	3	1	0	0	16	10	6	0	60	33.5%
Lowest Priority Hazard	55	2	0	0	0	5	1	9	0	72	40.2%
Lower Priority Hazard	9	5	0	0	0	8	1	1	0	24	13.4%
Moderate Priority Hazard	5	0	0	0	0	1	0	1	1	8	4.5%
High Priority Hazard	8	1	0	0	0	0	1	4	0	14	7.8%
Very High Priority Hazard	0	1	0	0	0	0	0	0	0	1	0.6%

Wildfire Hazard Priority	Number of Community Lifelines in Wildfire Priority Hazard Area										
	Commu-nications	Energy	Food, Hydra-tion, Shelter	Hazard-ous Materials	Health & Medical	Safety & Security	Transport ation	Water Systems	Other Critical Facilities	Total	
										Number	% of FZ Total
Truckee/Donner FZ											
Defensible Space/Home Hardening Zone	143	34	17	3	13	30	57	121	33	451	66.2%
Lowest Priority Hazard	33	4	1	0	0	2	2	70	2	114	16.7%
Lower Priority Hazard	59	0	1	0	0	0	4	34	2	100	14.7%
Moderate Priority Hazard	7	0	0	0	0	1	0	6	0	14	2.1%
High Priority Hazard	2	0	0	0	0	0	0	0	0	2	0.3%
Very High Priority Hazard	0	0	0	0	0	0	0	0	0	0	0.0%

See Sections 4.3 and 4.4 for data sources used in the risk assessment.

16.2.5 Natural, Historic and Cultural Resources

Natural Resources

Wildfires are a necessary part of ecosystem health, but intense wildfires severely damage the environment, including the burning and killing of plant and animal life. Intense fires can also heat narrow and shallow waterways, resulting in damage to aquatic systems.

According to the USGS, post-fire runoff polluted with debris and contaminants can be extremely harmful to terrestrial ecosystems and aquatic life (USGS 2023). The age and density of infrastructure in Nevada County can exacerbate the consequences of fires on the environment because of the increased amount of chemicals and contaminants that may be released from burning infrastructure. These chemicals, such as iron, lead, and zinc, may leach into the stormwater, contaminate nearby streams, and impair aquatic life. Intense wildfire events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of the Interior 2012).

Historic and Cultural Resources

Wildfires are a major threat to historic resources, with the potential to cause extensive damage, and in some cases, complete destruction. The potential impacts on historic resources, particularly infrastructure, from wildfire depend heavily on the materials used for construction. Many historic structures are made of wood, which is a highly flammable material.

Wildfires may burn historic and cultural buildings, destroy cultural landscapes, and erode archeological sites (NPS 2021). Outdoor events are likely to be postponed or cancelled as the result of wildfire conditions, as smoke conditions can have harmful impacts on the human body.

16.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

16.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County, particularly in areas bordering wildlands, would increase the overall risk from the wildfire hazard.

16.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from wildfire events.

16.3.3 Climate Change

Numerous climate drivers will influence wildfire risk across the state and throughout Nevada County. According to California's Fourth Climate Change Assessment (OPR, CNRA, CEC 2018) California is likely to see a 50 percent increase in fires larger than 25,000 acres as well as a 77 percent increase in average area burned by 2100.

17. Winter Storm

17.1 Hazard Profile

17.1.1 Hazard Description

For the purposes of this HMP update, the winter storm hazard includes the following severe winter conditions that are threatening to life and property:

- **High Winds—**High winds are often associated with severe winter storm events and can result in blowing snow, toppled trees, and damage to structures.
- **Heavy Snow—**Snow falls in different forms, such as snowflakes, snow pellets, or sleet. Snowflakes are clusters of ice crystals that form from a cloud. Snow pellets are opaque ice particles in the atmosphere. They form as ice crystals fall through super-cooled cloud droplets that are below freezing but remain a liquid. The cloud droplets then freeze to the crystals. A heavy snowstorm is defined as a snowstorm with accumulations of 4 inches or more of snow in a 12-hour period, or 6 inches of snow in a 24-hour period (NWS 2009b).
- **Blizzard—**A blizzard is a snowstorm with sustained or frequent wind gusts of 35 miles per hour (mph) or more, accompanied by falling or blowing snow reducing visibility to or below a quarter mile. These conditions must be the predominant over a three-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. The hazard, created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20 °F (NWS n.d.-g). See Chapter 10 for more information about cold temperatures that can accompany winter storms.

17.1.2 Location

Winter weather typically impacts Nevada County between October and March. The western portion of the County experiences periodic snowfall on a seasonal basis. The eastern portion, where elevations are higher, receives an abundance of snow, mostly from November through March. Closure of roads and highways due to blowing snow is a common and annual event above 5,000 feet in the Sierra Nevada (Nevada County 2017).

17.1.3 Extent

Winter snowstorms in the eastern part of the County, including strong winds and blizzard conditions, can result in localized power and phone outages and closures of streets, highways, schools, businesses, and nonessential government operations. During periods of heavy snow there is also an increase in the number and severity of traffic accidents. People can become isolated in their homes and vehicles and be unable to receive essential services.

High Winds

High elevations in Nevada County can experience wind gusts over 100 mph during severe winter storms. Mono winds, which blow downhill across the western slopes of the central Sierra Nevada from the northeast, can reach speeds in excess of 50 mph and in extreme cases as high as over 100 mph.

The National Weather Service (NWS) often categorizes wind producing events using the scale outlined in Table 17-1. NWS issues advisories and warnings for winds, which are normally site-specific. High wind advisories, watches, and warnings are issued by the NWS when wind speeds may pose a hazard or may be life threatening.

TABLE 17-1. NWS WIND DESCRIPTIONS

Description	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: (NWS n.d.-c)

The Beaufort scale was originally developed to help sailors estimate winds via visual observations. As shown in Table 17-2, the scale defines wind forces from ratings of 0 to 12 (NWS n.d.-c).

Heavy Snow

The NWS operates a widespread network of observing systems such as geostationary satellites, Doppler radars, and automated surface observing systems that feed into computer models to provide a look into what will happen next, ranging from hours to days. The models are analyzed by NWS meteorologists who then write and disseminate forecasts (NWS n.d.-d).

The NWS uses winter weather watches and warnings to help people anticipate what to expect in the days and hours prior to an approaching storm (NWS 2009c).

- A ***winter storm watch*** is issued when severe winter conditions (heavy snow, ice, etc.) may affect a certain area, but its occurrence, location, and timing are uncertain. A watch is issued to provide 24 to 72 hours of notice of the possibility of severe winter weather.
- A ***winter storm warning*** is issued when hazardous winter weather, in the form of heavy snow, heavy freezing rain, or heavy sleet, is imminent or occurring. A warning is usually issued 12 to 24 hours before the event is expected to begin.

TABLE 17-2. BEAUFORT WIND SCALE

Force	Speed (mph)	Description	Visual Clues and Damage Effects
0	0-1	Calm	Calm wind. Smoke rises vertically with little if any drift.
1	1-3	Light Air	Direction of wind shown by smoke drift, not by wind vanes. Little if any movement with flags. Wind barely moves tree leaves.
2	4-7	Light Breeze	Wind felt on face. Leaves rustle and small twigs move. Ordinary wind vanes move.
3	8-12	Gentle Breeze	Leaves and small twigs in constant motion. Wind blows up dry leaves from the ground. Flags are extended out.
4	13-18	Moderate Breeze	Wind moves small branches. Wind raises dust and loose paper from the ground and drives them along.
5	19-24	Fresh Breeze	Large branches and small trees in leaf begin to sway. Crested wavelets form on inland lakes and large rivers.
6	25-31	Strong Breeze	Large branches in continuous motion. Whistling sounds heard in overhead or nearby power and telephone lines. Umbrellas used with difficulty.
7	32-38	Near Gale	Whole trees in motion. Inconvenience felt when walking against the wind.
8	39-46	Gale	Wind breaks twigs and small branches. Wind generally impedes walking.
9	47-54	Strong Gale	Structural damage occurs, such as chimney covers, roofing tiles blown off, and television antennas damaged. Ground is littered with many small twigs and broken branches.
10	55-63	Whole Gale	Considerable structural damage occurs, especially on roofs. Small trees may be blown over and uprooted.
11	64-72	Storm Force	Widespread damage occurs. Larger trees blown over and uprooted.
12	72-83	Hurricane Force	Severe and extensive damage. Roofs can be peeled off. Windows broken. Trees uprooted. RVs and small mobile homes overturned. Moving automobiles can be pushed off the roadways.

Source: (NWS n.d.-c)

Blizzard

Blizzards occur when there is a wind velocity of 35 mph or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period. A severe blizzard occurs when there is wind velocity of 45 mph, temperatures of 10 °F or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period (NWS 2021a). NWS may issue a ***blizzard warning*** when snow and strong winds combine to produce the potential for blinding snow, deep drifts, and wind chill (NWS 2009c).

17.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2023, Nevada County was included in 12 major disaster (DR) or emergency (EM) declarations for winter storm-related events (FEMA 2023a). Table 17-3 lists these declarations.

TABLE 17-3. FEMA DECLARATIONS FOR WINTER STORM RELATED EVENTS IN NEVADA COUNTY (1954 TO 2023)

Event Date	Declaration Date	Declaration Number	Description
December 24, 1964	December 24, 1964	DR-183	Heavy Rains & Flooding
February 12 – March 10, 1986	February 21, 1986	DR-758	Severe Storms, Flooding
January 3 - February 10, 1995	January 10, 1995	DR-1044	Severe Winter Storms, Flooding, Landslides, Mud Flows
February 13 - April 19, 1995	March 12, 1995	DR-1046	Severe Winter Storms, Flooding, Landslides, Mud Flows
December 28, 1996 - April 1, 1997	January 4, 1997	DR-1155	Severe Storms/Flooding
December 17, 2005 - January 3, 2006	February 3, 2006	DR-1628	Severe Storms, Flooding, Mudslides, and Landslides
March 29 - April 16, 2006	June 5, 2006	DR-1646	Severe Storms, Flooding, Landslides, and Mudslides
January 3-12, 2017	February 14, 2017	DR-4301	Severe Winter Storms, Flooding, and Mudslides in California
February 1-23, 2017	April 1, 2017	DR-4308	Severe Winter Storms, Flooding, Mudslides in California
February 21 - July 10, 2023	April 3, 2023	DR-4699	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides
December 27, 2022 - January 31, 2023	January 14, 2023	DR-4683	Severe Winter Storms, Flooding, Landslides, and Mudslides
March 9 – July 10, 2023	March 10, 2023	EM-3592	Severe Winter Storms, Flooding, Landslides, and Mudslides

Source: (FEMA 2024c)

State Emergency Proclamations

Nevada County has been included in four winter storm-related state emergency proclamations since the previous HMP update, as listed in Table 17-4.

TABLE 17-4. STATE EMERGENCY PROCLAMATIONS FOR WINTER STORM EVENTS IN NEVADA COUNTY

Event Date	State Disaster Code	Description
January 2017	77	January Winter Storms
December 2021	127	December Winter Storms
December 2022 & January 2023	140	Severe Winter Storms
February 2023 & March 2023	141	Severe Winter Storms

Source: (Cal OES 2024b)

USDA Declarations

Between 2017 and 2023, Nevada County was not included in any USDA winter storm-related agricultural disaster declarations (USDA 2023a).

Previous Events

Winter storm events that impacted Nevada County with heavy snow, strong wind, or blizzard between January 2017 and December 2023 are listed in Table 17-5. Due to the number of events, only events resulting in $100,000 or more in property damage are listed. For events prior to 2017, refer to the 2017 Nevada County HMP.

17.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous winter storm occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 17-6. Based on historical records and input from the Planning Team, the probability of occurrence for winter storm in the County is considered “occasional.”

Climate Change Projections

By the end of the century, average temperatures in the Sierra Nevada are projected to warm by 6 °F to 10 °F, enough to raise the divide between rain and snow by 1,500 to 3,000 feet. Future precipitation totals are less certain, and long-term changes may not be more than about 10 to 15 percent. Still, high and low precipitation extremes are projected to increase markedly and simultaneously. These changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations (State of California 2018).

An important aspect of the projected climate is the increased potential for extreme events like storms. The largest storms are projected to become even larger, which, in combination with trends toward more precipitation falling as rain, are also projected to increase Sierra Nevada flood risks and magnitudes (State of California 2018).

TABLE 17-5. WINTER STORM IMPACTING NEVADA COUNTY (2017 – 2023)

Event Date	Event Type	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
March 1-2, 2018	Blizzard	N/A	N/A	Greater Lake Tahoe Region	A strong upper level low brought high winds and snowfall to the Sierra Nevada. Schools and businesses closed due to the heavy snowfall. Interstate 80 closed from Colfax to the Nevada State line due to whiteout conditions. Chains and snow tires were required on roads around the Greater Lake Tahoe Area. Wind gusts ranged from 47 to 63 mph in the Greater Lake Tahoe area below 8,000 feet MSL.
March 15-17, 2018	Winter Storm	N/A	N/A	West Slope Northern Sierra Nevada	Heavy snow impacted travel on Sierra highways with chain controls, holds, and closures for elevations above 3000 feet. Road closures included I-80 east of Applegate due to heavy snow, Highway 89 between Truckee and Alpine Meadows due to a collision involving 20 vehicles, and Highway 20 east of Nevada City due to heavy snow. $150K in property damage was reported.
February 4-5, 2019	Heavy Snow	N/A	N/A	Motherlode/ Camptonville to Groveland	There was very heavy mountain snow, especially in the Sierra, with snow accumulations to 6 to 8 feet. The heavy snow coupled with strong winds brought whiteout conditions and shut down major mountain roads such as I-80. Snow accumulations extended to the foothills, causing tens of thousands of homes to lose power and many schools to close. $1M in property damage was reported.
February 8-10, 2019	Heavy Snow	N/A	N/A	Motherlode/ Camptonville to Groveland	A wet storm brought heavy mountain snow with travel delays. Snow extended into the upper foothills, with some local power outages. $100K in property damage was reported.
February 27, 2019	Strong Wind	N/A	N/A	Motherlode/ Camptonville to Groveland	A strong atmospheric river brought heavy high elevation snow, flooding, debris flows, strong mountain winds, and periods of whiteout conditions. CHP reported numerous trees and power lines down due to strong winds. A gust to 50 mph was measured at Pike County Lookout. A downed tree blocked a northbound lane of Highway 49. Downed trees blocked the entrance into Greenwood Court 2 north of Grass Valley. $500K in property damage was reported.

Event Date	Event Type	Declaration or Proclamation Number	Nevada County Included in Declaration?	Location Impacted	Description
October 25-27, 2020	Strong Wind	N/A	N/A	Motherlode/ Camptonville to Groveland	A tight pressure gradient led to strong and damaging winds, with reported peak wind gusts between 45 and 73 mph. Stronger gusts up to 119 mph were observed at elevations above 8,000 feet. A local utility company reported 22 instances of wind related damage or hazards. $132K in property damage was reported.
January 27-29, 2021	Blizzard	N/A	N/A	Greater Lake Tahoe Area	Very heavy snowfall was reported across the Greater Lake Tahoe Area with totals of 2 to 5 feet above 7,000 feet and 12 to 30 inches at lake level. Wind gusts were up to 50 mph. Sierra ridge gusts were as strong as 125 mph. I-80 was closed for a period between Colfax and the Nevada state line due to multiple spinouts.
February 26-28, 2023	Blizzard	DR-4699	Yes	West Slope Northern Sierra Nevada	A major winter storm brought heavy blizzard conditions in the Sierra, where 5 to 7 feet of snow was reported. Lower elevations observed widespread rain, gusty winds, and isolated thunderstorms. California Highway Patrol reported the closure of mountain highways due to heavy snow and strong wind, including Highway 50 and Interstate 80. Local weather stations reported gusts to 57 mph on Donner Pass Road. Local media reported the closure of numerous schools in the Sierra, with extensive power outages.
March 7-9, 2023	Heavy Snow	EM-3592	Yes	Motherlode/ Camptonville to Groveland	A cold winter storm brought low snow levels, with accumulating snow extending into the northern Sacramento Valley and the foothills. Accumulated heavy snow from a series of storms caused the roof of a school in Nevada City to collapse. There was 3.6 inches of snow on the March 8, in addition to previous snow from earlier storms. $100K in property damage was reported

Sources: (NOAA NCEI 2024, FEMA 2024c)
Note: Only heavy snow and strong wind events resulting in $100K or more in property damage are listed.

TABLE 17-6. PROBABILITY OF FUTURE WINTER STORM EVENTS IN NEVADA COUNTY

Hazard Type	Number of Occurrences Between 1996 and 2023	Average Number of Years Between Occurrences	Annual Probability of Occurrence
Blizzard	6	4.7	21%
Heavy Snow	227	0.1	100%[a]
High/Strong Wind	169	0.2	100%[a]
Winter Storm	187	0.1	100%[a]
Total	**589**	**0.0**	**100%[a]**

Sources: Source: (NOAA NCEI 2024)

a. 100% probability represents a statistical likelihood that an event will occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

17.1.6 Cascading Impacts

The following are notable cascading impacts associated with winter storms:

- Heavy snow events increase the risk of avalanches in steep terrain.
- Winter storm events often coincide with or are followed by extreme cold events.
- Winter storm events may exacerbate flooding.
- Heavy snowfall during winter can lead to flooding or landslides during the spring if the snowpack melts too quickly. Rapidly melting snow combined with heavy rain can overwhelm both natural and constructed drainage systems, causing overflow and property destruction.
- Winter storm events can escalate the impacts of utility failure. Ice and snow accumulation and high winds can be destructive to the functionality of utilities through falling tree branches, often breaching power lines and disconnecting the utility systems.
- Winter storm events can result in dangerous driving conditions and result in traffic accidents. Severe events often result in road closures. Road closures caused by weather can restrict the movement of people and goods.

17.2 Vulnerability and Impact Assessment

All of Nevada County is vulnerable to winter storm events, although the greatest risk of severe conditions occurs at higher elevations. The following subsections provide a qualitative discussion of Nevada County's vulnerability to the winter storm hazard.

17.2.1 Life, Health, and Safety

Overall Population

According to the NOAA National Severe Storms Laboratory, winter weather kills hundreds of people in the U.S. every year, primarily from automobile accidents, overexertion, and exposure. Winter storm events are often accompanied by strong winds, creating blizzard conditions with blinding wind-driven

snow, drifting snow and extreme cold temperatures and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold (NOAA 2023).

Socially Vulnerable Population

The elderly are susceptible to this hazard due to their increased risk of injuries and death from falls and overexertion and/or hypothermia from attempts to clear snow and ice. In addition, winter storm events can reduce the ability of these populations to access emergency services.

Homeless people and residents below the poverty level may not have access to housing, or their housing could be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). For more information on the extreme cold hazard, refer to Chapter 10.

17.2.2 General Building Stock

The entire general building stock inventory is exposed and vulnerable to the winter storm hazard. An extreme blizzard or snowstorm event can carry and deposit significant amounts of snow that are heavy enough to damage roofs and aging buildings. For example, accumulated heavy snow from a series of storms caused the roof of a school in Nevada City to collapse; $100,000 in property damage was reported (NOAA NCEI 2024). In general, structural impacts include partial damage to roofs and building frames, rather than an entire building.

17.2.3 Community Lifelines and Other Critical Facilities

Full functionality of critical facilities such as police, fire, and medical facilities is essential for response during and after a severe winter weather event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from winter storm events. Because power interruption can occur, backup power is recommended.

Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires the clearing of roadways and alerting citizens to dangerous conditions. Following the winter season, resources are required for road maintenance and repair of winter weather related damage, including cracks and potholes caused by freezing and plowing (NWS 2019c).

Heavy accumulations of snow and ice can bring down electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS 2019b). Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services (NOAA 2023).

One of the challenges in the Sierra Nevada area is with household propane tanks. As snow shifts, it can break lines or regulators. This can leave homes without a heat source. Several homes have been lost due to propane explosions. Winter weather also can prevent propane providers from accessing home to refill propane, leaving affected residents without heat (Nevada County 2017).

17.2.4 Economy

Depending on the severity and duration of the winter storm event, damage to the general building stock, critical facilities, and community lifelines can include roof damage from heavy snow loads, structural damage from downed trees, and power outages.

The cost of snow and ice removal, roadway treatments (salt and brine) and repair of roads from the freeze/thaw process and plowing damage can drain local financial resources. In addition to snow removal costs, winter storm affects the ability of persons to commute into and out of the area for work or school. The loss of power and closure of roads prevents the commuter population traveling to work within and outside of the County and may cause a loss in economic productivity. The economic impact of winter storms each year is considerable, with costs for snow removal, damage, and loss of business in the millions (NOAA 2023).

17.2.5 Natural, Historic and Cultural Resources

Natural Resources

Severe winter storms can have a major impact on the environment. An excess amount of snowfall and earlier warming periods may affect natural processes such as flow within water resources. Severe winter storms create changes in natural processes. The residual impacts of a community's winter weather maintenance may also have an impact on the environment (NSIDC n.d.).

Rain-on-snow events can exacerbate runoff rates with warming winter weather. Consequentially, these flow rates and excess volumes of water can erode banks, tear apart habitat along the banks, and disrupt terrestrial plants and animals. Road-salt runoff can cause groundwater salinization and modify the soil structure. Additionally, road salt can cause changes in the composition of aquatic invertebrate assemblages and pose threats to birds, roadside vegetation, and mammals (Tiwari and Rachlin 2018).

Historic and Cultural Resources

Historic buildings may be susceptible to damage from winter storm conditions, especially if they were not built to modern building standards for snow loading (CCAHA 2019). Cultural heritage sites, particularly those exposed to the elements, are subject to weathering. Climate change is a potential threat to these sites as it exacerbates the expected rates of decay and contributes to the appearance of new decay. Climatic changes may aggravate the physical, chemical, and biological mechanisms causing degradation by affecting the structure or composition of building materials. Changes in temperature, precipitation, atmospheric moisture, and wind intensity, in addition to the interaction between climatic changes and air pollution, have been identified as concerns by the United Nations Educational, Scientific and Cultural Organization (Sesana, et al. 2021).

17.3 Future Changes That May Affect Risk

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

17.3.1 Potential or Planned Development

Individual development projects are detailed in Volume II under each jurisdictional annex. Any increases in development in the County would increase the overall risk from the winter storm hazard, though new development is likely to meet modern building standards and be protected from damage such as roof collapse.

17.3.2 Projected Changes in Population

Nevada County's population is projected to decline in upcoming decades, from 102,241 in 2020 to 87,648 in 2060—a 14 percent decrease (California Department of Finance 2024). A decrease in population is likely to result in a decrease in overall risk from winter storm events.

17.3.3 Climate Change

By the end of the century, temperatures in the Sierra Nevada are projected to warm by 6 to 10ºF on average, enough to raise the divide between rain and snow during a storm by about 1,500 to 3,000 feet. Future precipitation totals are less certain and long-term changes may not be more than about 10 to 15 percent, but high and low precipitation extremes are projected to increase markedly and simultaneously. These climatic changes will depend on and reflect many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations. An important aspect of the projected climate is the increased potential for extreme events like storms. In addition to the effects of warming, the largest storms are projected to become even larger, with trends towards more precipitation falling as rain instead of snow (State of California 2018).

18. Hazard Ranking

Hazard rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Volume II. These rankings may vary among the jurisdictions. For example, a hazard may be ranked low in one municipality but due to differences in vulnerability and impact, be ranked as high for the County or another municipality. Finalized jurisdictional ranking results are presented in each jurisdictional annex in in Volume II.

18.1 Hazard Ranking Methodology

Each jurisdiction participating in this HMP has differing levels of vulnerability to and potential impacts from each of the hazards assessed in this plan. Each jurisdiction needs to recognize the hazards that pose the greatest risk to its community and direct its attention and resources accordingly to manage risk and reduce losses. To achieve this, the hazards of concern were ranked using methodologies promoted by FEMA's hazard mitigation planning guidance and input from all participating jurisdictions. Relative ranking scores were generated by FEMA's Hazus risk assessment tool.

18.2 Categories Used in Ranking

The ranking methodology is based on four risk assessment categories (probability of occurrence, consequence, adaptive capacity, and climate change), with the following scoring parameters defined for each category:

- *Level*—The level is a qualitative description of how each hazard rates in each category (such as low to high, or unlikely to frequent)
- *Benchmark value*—The benchmark values are clearly determinable quantities or descriptions that define which level should apply to each hazard
- *Numeric value*—The numeric value is the hazard's score in each category, based on the assigned level
- *Weighting*—The weighting is a multiplier applied to each hazard's numeric value in each category, to represent the relative importance of the category (the higher the weighting, the more important the category)

The following sections describe the categories and their associated scoring parameters.

18.2.1 Probability of Occurrence

For some hazards, probability of occurrence was based on the likelihood that an event scenario of a specified magnitude (such as a 1 percent annual chance flood or a M7.2 earthquake) would occur in any given year.

When no scenario was assessed, an examination of the historical record and judgment was used to estimate the probability of occurrence of an event that will impact the County. Table 18-1 summarizes the scoring parameters for probability of occurrence.

The hazard ranking methodology for some hazards of concern is based on a scenario event that only impacts specific areas (such as a floodplain), while others are based on their potential risk to the County as a whole. In order to account for these differences, the hazard ranking scores were adjusted using professional judgment.

TABLE 18-1. VALUES AND WEIGHTS FOR PROBABILITY OF OCCURRENCE

Level	Benchmark Value	Numeric Value	Weighting
Unlikely	Hazard event has less than a 1 percent annual probability of occurring.	0	30%
Rare	Hazard event has between 1 and 10 percent annual probability of occurring.	1	
Occasional	Hazard event has between 10 and 100 percent annual probability of occurring.	2	
Frequent	100 percent annual probability; hazard event is likely to occur multiple times per year.	3	

18.2.2 Consequence

Consequence represents the expected vulnerability and impact associated with the hazard. This is rated for three subcategories: vulnerability of people; vulnerability of property; and economic impacts on the community. A numeric value based on defined benchmarks is assigned for each subcategory, and a factor is applied to those values representing the relative importance of each subcategory. The total numeric value for consequence is the sum of the factored numeric values for each subcategory. Table 18-2 summarizes the scoring parameters for consequence.

18.2.3 Adaptive Capacity

Adaptive capacity describes a jurisdiction's administrative, technical, planning/regulatory and financial ability to protect against or withstand a hazard event. Mitigation measures that can increase a jurisdiction's capacity to withstand and rebound from events include codes or ordinances with higher standards to withstand hazards due to design or location; deployable resources; or plans and procedures for responding to an event.

A rating of "weak" for adaptive capacity means a jurisdiction does not have the capability to effectively respond, which increases vulnerability. A "strong" adaptive capacity means the jurisdiction does have the capability to effectively respond, which decreases vulnerability. These ratings were assigned using the results of the core capability assessment, with input from each jurisdiction. Table 18-3 summarizes the scoring parameters for adaptive capacity.

TABLE 18-2. VALUES AND WEIGHTS FOR CONSEQUENCE

Level	Benchmark Value	Numeric Value	Factor	Weighting
Population (Numeric Value x 3)				**30%**
None	No population vulnerable to the hazard	0	3	
Low	14 percent or less of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	1		
Medium	15 to 29 percent of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	2		
High	30 percent or more of population is exposed to a hazard with potential for measurable life-safety impact, due to its extent and location.	3		
Property (Numeric Value x 2)				
None	No property vulnerable to the hazard	0	2	
Low	Property vulnerability is 14 percent or less of the total number of structures for the community.	1		
Medium	Property vulnerability is 15 to 29 percent of the total number of structures for the community.	2		
High	Property vulnerability is 30 percent or more of the total number of structures for the community.	3		
Economy (Numeric Value x 1)				
None	No estimated loss due to the hazard	0	1	
Low	Estimated loss is 9 percent or less of the total replacement cost for the community.	1		
Medium	Estimated loss is 10 to 19 percent of the total replacement cost for the community.	2		
High	Estimated loss is 20 percent or more of the total replacement cost for the community.	3		

TABLE 18-3. VALUES AND WEIGHTS FOR ADAPTIVE CAPACITY

Level	Benchmark Value	Numeric Value	Weighting
Weak	Weak, outdated, or inconsistent plans, policies, codes, or ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.	1	30%
Moderate	Plans, policies, codes/ordinances in place and meet minimum requirements; mitigation strategies identified but not implemented on a widespread scale; county/jurisdiction can recover but needs outside resources; moderate county/Jurisdiction capabilities.	0	
Strong	Plans, policies, codes/ordinances in place that exceed minimum requirements; mitigation/protective measures in place; county/jurisdiction has ability to recover quickly because resources are readily available, and capabilities are high.	-1	

18.2.4 Climate Change

The hazard ranking addresses climate change in order to help guide and prioritize the mitigation strategy as a long-term future vision for mitigating the hazards of concern. Current climate change projections were evaluated as part of the hazard ranking to account for potential increases in severity or frequency of the hazard. The potential impacts that climate change may have on each hazard of concern are discussed in the risk assessment chapters for each hazard. Table 18-4 summarizes the scoring parameters for climate change.

TABLE 18-4. VALUES AND WEIGHTS FOR CLIMATE CHANGE

Level	Benchmark Value	Numeric Value	Weighting
Low	No local data are available; modeling projects are uncertain on whether there is increased future risk; confidence level is low (inconclusive evidence).	1	10%
Medium	Studies and modeling projections indicate a potential for exacerbated conditions due to climate change; confidence level is medium to high (moderate evidence).	2	
High	Studies and modeling projections indicate exacerbated conditions and increased future risk due to climate change; very high confidence level (strong evidence, well documented, and acceptable methods).	3	

18.2.5 Total Ranking Score

The total ranking score based on the categories described above is calculated using the following equation:

Risk Ranking Score Equation

Ranking Score= [(Consequence on Population x 3) + (Consequence on Property x 2) + (Consequence on Economy x 1)] x 0.3 + [Adaptive Capacity x 0.3] + [Climate Change x 0.1] + [Probability of Occurrence x 0.3]

Using this equation, the highest possible ranking score is 6.9. The higher the number, the greater the relative risk. Based on the score for each hazard, a hazard ranking is assigned to each hazard of concern as follows:

- Low = Values less than 3.9
- Medium = Values between 3.9 and 4.9
- High = Values greater than 4.9.

All Planning Partners applied the same methodology to develop the hazard rankings to ensure consistency in the overall ranking of risk. However, each jurisdiction had the ability to alter rankings based on local knowledge and experience in handling each hazard. Refer to each jurisdiction's annex for its finalized hazard ranking.

18.3 Hazard Ranking Results

Using the methodology described above, the preliminary hazard ranking for the identified hazards of concern was determined for each Planning Partner. The preliminary hazard ranking for Nevada County is detailed in the following tables that present the step-wise process for the ranking:

- Table 18-5 shows the unweighted numeric values assigned for the probability of occurrence for each hazard.
- Table 18-6 shows the numeric values assigned for each subcategory of consequence for each hazard. Results are shown for applying the subcategory factors, but not the category-wide weighting.
- Table 18-7 shows the unweighted numeric values assigned for adaptive capacity and climate change for each hazard.
- Table 18-8 shows the total weighted hazard ranking scores for each hazard of concern.

The Countywide hazard ranking includes the entire planning area and may not reflect the highest risk for all Planning Partners. The preliminary ranking for each jurisdiction is included in Table 18-9, and the finalized rankings with input from the Planning Partners is in the annexes in Volume II.

TABLE 18-5. PROBABILITY OF OCCURRENCE FOR HAZARDS OF CONCERN FOR NEVADA COUNTY

Hazard of Concern	Probability	Numeric Value
Avalanche	Rare	1
Dam Failure	Occasional	2
Drought	Frequent	3
Earthquake	Occasional	2
Extreme Cold	Rare	1
Extreme Heat	Frequent	3
Flood	Frequent	3
Hazardous Materials Release	Occasional	2
Landslide	Occasional	2
Volcano	Rare	1
Wildfire	Frequent	3
Winter Storm	Occasional	2

TABLE 18-6. CONSEQUENCE RATING FOR HAZARDS OF CONCERN FOR NEVADA COUNTY

Hazard of Concern	Population			Property			Economy			Total
	Consequence	Numeric Value	Multiplied by Factor (3)	Consequence	Numeric Value	Multiplied by Factor (2)	Consequence	Numeric Value	Multiplied by Factor (1)	
Avalanche	Low	1	3	Low	1	2	Medium	2	2	7
Dam Failure	Low	1	3	Low	1	2	Medium	2	2	7
Drought	High	3	9	Low	1	2	Low	1	1	12
Earthquake	Low[a]	1	3	Low[b]	1	2	Low	1	1	6
Extreme Cold	Medium	2	6	Low	1	2	Low	1	1	9
Extreme Heat	High	3	9	Low	1	2	Low	1	1	12
Flood	Low	1	3	Low	1	2	Low	1	1	6
Hazardous Materials Release	Low	1	3	Medium	2	4	Medium	2	2	7
Landslide	Low	1	3	Low	1	2	Low	1	1	6
Volcano	Medium	2	6	Low	1	2	Low	1	1	9
Wildfire	High	3	9	Low	1	2	Medium	2	2	13
Winter Storm	High	3	9	Medium	2	4	Medium	2	2	15

a. Earthquake population consequence rated low based on the Hazus-determined low number of casualties and displacements (see Table 9-5 and Table 9-6).
b. Earthquake property consequence rated low based on the high Hazus-determined percentage of buildings with minor or no damage (see Table 9-7).

TABLE 18-7. ADAPTIVE CAPACITY AND CLIMATE CHANGE RATINGS FOR HAZARDS OF CONCERN FOR NEVADA COUNTY

Hazard of Concern	Adaptive Capacity		Climate Change	
	Level	Numeric Value	Level	Numeric Value
Avalanche	Moderate	0	Medium	2
Dam Failure	Moderate	0	Medium	2
Drought	Moderate	0	High	3
Earthquake	Moderate	0	Low	1
Extreme Cold	Moderate	0	Medium	2
Extreme Heat	Moderate	0	High	3
Flood	Moderate	0	High	3
Hazardous Materials Release	Moderate	0	Low	1
Landslide	Moderate	0	High	3
Volcano	Moderate	0	Low	1
Wildfire	Moderate	0	High	3
Winter Storm	Moderate	0	Medium	2

TABLE 18-8. TOTAL HAZARD RANKING SCORES FOR THE HAZARDS OF CONCERN FOR NEVADA COUNTY

Hazard of Concern	Probability x 0.3	Total Consequence x 0.3	Adaptive Capacity x 0.3	Climate Change x 0.1	Total Hazard Ranking Score
Avalanche	0.3	2.1	0	0.2	2.6
Dam Failure	0.6	2.1	0	0.2	2.9
Drought	0.9	3.6	0	0.3	4.8
Earthquake	0.6	1.8	0	0.1	2.5
Extreme Cold	0.3	2.7	0	0.2	3.2
Extreme Heat	0.9	3.6	0	0.3	4.5
Flood	0.9	1.8	0	0.3	3.0
Hazardous Materials Release	0.6	2.1	0	0.1	2.8
Landslide	0.6	1.8	0	0.3	2.7
Volcano	0.3	2.7	0	0.1	3.1
Wildfire	0.9	3.9	0	0.3	5.1
Winter Storm	0.6	4.5	0	0.2	5.3

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9

TABLE 18-9. PRELIMINARY RANKING OF HAZARDS BY JURISDICTION

	Avalanche	Dam Failure	Drought	Earthquake	Extreme Cold	Extreme Heat	Flood	Hazardous Material Release	Landslide	Volcano	Wildfire	Winter Storm
Nevada County	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Grass Valley	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Nevada City	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Truckee	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Unincorporated County	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Nevada Irrigation District	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Truckee Donner Public Utilities District	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Washington County Water District	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High
Nevada County Consolidated Fire District	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	High	High

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9
The hazard rankings for the Special Districts are the same as the County.

PART 3: CAPABILITY ASSESSMENT

19. Capability Assessment

A capability assessment is an inventory of a community's missions, programs, and policies and an analysis of its capacity to carry them out (FEMA 2003). This integral part of the planning process analyzes current governmental programs, policies, regulations, and funding that could either facilitate or hinder mitigation. Through assessing its capabilities, a jurisdiction learns whether it can implement certain mitigation actions by determining the following:

- The range of local and/or state administrative, programmatic, regulatory, financial, and technical resources available to assist in implementing mitigation actions
- Types of mitigation actions that may be technically, legally, administratively, politically, or fiscally challenging or infeasible because they are outside of current capabilities
- Opportunities to enhance local capabilities to support long-term mitigation and risk reduction

This chapter summarizes existing capabilities at all levels of government (federal, state, county, local) for supporting hazard mitigation within the planning area. These capabilities are presented in three categories:

- Planning and regulatory capabilities
- Administrative and technical capabilities
- Fiscal capabilities

Each Planning Partner's annex in Volume II also includes a capability assessment specific to those jurisdictions. In addition to the above categories, the annexes review capabilities in the more localized categories of adaptive capacity and education and outreach. Participating jurisdictions evaluated the effectiveness of their capabilities for supporting hazard mitigation and identified opportunities to enhance those capabilities. Each jurisdiction identified how it has integrated hazard mitigation into its existing planning, regulatory, and operational/administrative framework and how it intends to promote ongoing integration.

19.1 Planning and Regulatory Capabilities

Planning and regulatory capabilities are based on ordinances, policies, local laws, state statutes, plans, and programs that relate to managing growth and development. Planning and regulatory capabilities refer not only to current plans and regulations, but also to the jurisdiction's ability to change and improve those plans and regulations as needed. This section summarizes planning and regulatory capabilities for Nevada County. Further information is provided in the jurisdictional annexes in Volume II.

19.1.1 Federal

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program that was established to allow property owners in participating communities to purchase insurance against losses from flooding.

Participation in the NFIP is based on an agreement between local communities and the federal government in which the community adopts and enforces a floodplain management ordinance to reduce future flood risks to new construction and substantial improvements in special flood hazard areas (SFHA), and the federal government makes flood insurance available within the community (FEMA 2020b).

Municipal compliance with the NFIP is described in each of the jurisdictional annexes in Volume II. Additional information on the NFIP program and its implementation throughout the County may be found in the flood hazard profile (Chapter 12).

FEMA recently introduced "Risk Rating 2.0: Equity in Action" to provide more modern, individualized, and equitable flood insurance rates by considering specific characteristics of each insured building. The new rating methodology considers frequency of flooding, multiple flood types, proximity to flood sources, and building characteristics such as first floor heights and costs to rebuilt. The update was fully implemented as of April 1, 2023 (FEMA 2022a).

Across the country, officials are finding it to be increasingly difficult to communicate the benefits of mitigation to some property owners where insurance rates are likely to stay high even after mitigation due to factors such as proximity to flood sources and frequency of flooding. Continued shifts in flood insurance costs and coverage, impacts of mitigation for flood prone properties, and potential updates to Risk Rating 2.0 will be monitored by Nevada County throughout the period of performance of the 2024 HMP.

NFIP Community Rating System

As an additional component of the NFIP, the Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

As of May 2023, no communities in Nevada County participate in the CRS program.

U.S. Army Corps of Engineers

Under Section 404(e) of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) can issue general permits to authorize activities that have only minimal individual and cumulative adverse environmental effects. A nationwide permit (NWP) is a general permit that authorizes activities across the country unless a district or division commander revokes the nationwide permit in a state or other geographic region. There are 41 nationwide permits, and they authorize a wide variety of activities, including linear transportation projects, bank stabilization activities, residential development, commercial and industrial developments, aids to navigation and certain maintenance activities (USACE 2021).

19.1.2 State

Table 19-1 summarizes state programs that may interface with the actions identified in this plan.

TABLE 19-1. STATE PLANS AND REGULATIONS IMPACTING HAZARD MITIGATION

Plan or Regulation	Relevance
AB 70: Flood Liability	A city or county may be required to partially compensate for property damage caused by a flood if it unreasonably approves new development in areas protected by a state flood control project
AB 162: Flood Planning	Cities and counties must address flood-related matters in the land use, conservation, and safety and housing elements of their general plans.
AB 747: General Plans—Safety Element	The safety elements of cities' and counties' general plans must address evacuation routes and include any new information on flood and fire hazards and climate adaptation and resiliency strategies.
AB 1409: Planning and Zoning, General Plan—Safety Element	This bill requires the safety element to be reviewed and updated to identify evacuation locations.
AB 2140: General Plans—Safety Element	This bill enables state and federal disaster assistance and mitigation funding to communities with compliant hazard mitigation plans.
AB 2800: Climate Change—Infrastructure Planning	This act requires state agencies to take into account the effects of climate change when developing state infrastructure.
Alquist-Priolo Earthquake Fault Zoning Act	This act restricts construction of buildings used for human occupancy on the surface trace of active faults.
California Environmental Quality Act	This act establishes a protocol of analysis and public disclosure of the potential environmental impacts of development projects. Any project action identified in this plan will seek full California Environmental Quality Act compliance upon implementation.
California General Planning Law	This law requires every county and city to adopt a comprehensive long-range plan for community development, and related laws call for integration of hazard mitigation plans with general plans.
California Multi-Hazard Mitigation Plan	Local hazard mitigation plans must be consistent with their state's hazard mitigation plan.
California State Building Code	Local communities must adopt and enforce building codes, which include measures to improve buildings' ability to withstand hazard events.
Division of the State Architect's AB 300 List of Seismically At-Risk Schools	The Division of the State Architect recommends that local school districts conduct detailed seismic evaluations of seismically at-risk schools identified in the inventory that was required by AB 300.
Senate Bill (SB) 32:	This bill requires the California State Air Resources Board to ensure the state's greenhouse gas emissions are reduced to 40 percent below 1990 levels by 2030.
SB 92: Public Resources Portion of Biennial Budget Bill	This bill requires dams (except for low-risk dams) to have emergency action plans that are updated every 10 years and inundation maps updated every 10 years, or sooner if specific circumstances change.

Plan or Regulation	Relevance
SB 97: Guidelines for Greenhouse Gas Emissions	This bill establishes that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for California Environmental Quality Act analysis.
SB 99: General Plans: Safety Element: Emergency Evacuation Routes	This bill requires that safety elements include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes.
SB 379: General Plans: Safety Element—Climate Adaptation	This bill requires cities and counties to include climate adaptation and resiliency strategies in the safety element of their general plans.
SB 1000: General Plan Amendments—Safety and Environmental Justice Elements	Under this bill, review and revision of general plan safety elements are required to address only flooding and fires (not climate adaptation and resilience), and environmental justice is required to be included in general plans.
SB 1035: Fire, Flood, and Adaptation Safety Element Updates	This bill clarifies that revisions to the safety element to address fire hazards, flood hazards, and climate adaptation and resilience strategies all must occur upon each revision to a housing element or local hazard mitigation program.
SB 1241: Fire Hazards	This bill requires the safety element to be reviewed and updated as necessary to address the risk of fire in state responsibility areas and very high Fire Hazard Severity Zones, taking into account the most recent version of the Office of Planning and Research's "Fire Hazard Planning" document.
Standardized Emergency Management System	Local governments must use this system to be eligible for state funding of response-related personnel costs.

19.1.3 County and Local

Jurisdictions in California have the ability to develop policies and programs and to implement rules and regulations to protect and serve residents. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body. A summary of County and local planning and regulatory capabilities is provided below. Detailed information on each participating jurisdiction's planning and regulatory capabilities is provided in Volume II (jurisdictional annexes).

Planning and Zoning

Development in Nevada County is subject to a variety of California planning and zoning laws and regulations. These policies determine where new construction can take place, what types of development are allowable in areas that are already developed, and the processes by which communities make development decisions. Planning and zoning policies influence hazard mitigation by determining whether development will continue or expand in high-risk areas (Cal OES 2023a).

California requires all cities and counties to adopt a comprehensive general plan including land use, circulation, housing, safety, open space, conservation, and noise elements. It mandates consistency among all general plan elements and between the general plan and measures such as zoning and subdivision review. Natural hazards must be addressed in local general plans. The safety element of

the general plan establishes policies and programs to protect the community from risks associated with earthquakes, floods, wildfire, and other natural and human-caused hazards (Cal OES 2023a).

Subdivision Maps

Under California's Subdivision Map Act, no subdivision map can be approved unless the city or county finds that the subdivision, including its design and improvements, is consistent with the general plan. This requirement for direct implementation of the general plan through subdivision review allows cities and counties to make sound land use decisions on the subdivision of lands in known hazard areas (Cal OES 2023a).

Building Codes

Building design regulations that affect the ability of buildings to withstand hazard events are included in the codes summarized in the following building codes (Cal OES 2023a):

- **California Building Standards Code (California Code of Regulations [CCR] Title 24)—** Establishes the regulations applied to construction in California. Hazard-resistant provisions include flood and soil provisions.
- **Chapter A3, California Building Code—**Prescribes provisions for seismic strengthening of cripple walls and sill plate anchorage of light, wood frame residential buildings. Hazard resistant provisions include codes for the voluntary retrofit of single-family residences that are wood-framed and have a raised foundation.
- **California Water Code—**Establishes regulations applied to water resources and water service providers in California. Hazard resistant provisions include Division 5—Flood Control and Division 14—California Water Storage District Law.
- **California Health and Safety Code—**Establishes regulations applied to public health and safety resources and services in California. Hazard resistant provisions include Division 32—Seismic Safety Building Rehabilitation Loans.

These codes are adopted at the local level:

19.2 Administrative and Technical Capabilities

This section summarizes administrative and technical capabilities in Nevada County. Further information is provided in the jurisdictional annexes in Volume II.

19.2.1 Federal

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) is responsible for providing assistance before, during, and after disasters. FEMA is the federal reviewer of hazard mitigation plans and sets federal standards for local and state hazard mitigation plans.

National Dam Safety Program

The National Dam Safety Program is a partnership of state and federal agencies and other stakeholders that encourages individual and community responsibility for dam safety to protect people from dam failures. It is administered through the Department of Homeland Security and FEMA. The program improves safety and security around dams by providing grants to state dam safety agencies to assist them in improving their regulatory programs; producing educational materials for dam owners; funding research to enhance technical expertise as dams are built and rehabilitated; establishing training programs for dam safety inspectors; and creating the National Inventory of Dams (FEMA 2023c).

National Weather Service

The National Weather Service (NWS) monitors weather and delivers weather forecasting. Nevada County is serviced by the Sacramento weather forecast office (NWS n.d.-e).

The NWS also operates the StormReady program, which provides emergency managers with guidelines on how to improve their communities' hazardous weather operations. To be recognized by the program, a community must establish a 24-hour warning point and emergency operations center; have more than one way to receive severe weather warnings and forecasts and to alert the public; create a system that monitors weather conditions locally; promote the importance of public readiness through community seminars; and develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises (NWS n.d.-f). Nevada County is a county level participant in the program.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) builds and maintains public infrastructure. Projects include dredging, storm damage reduction, and ecosystem restoration in and near waterways (USACE n.d.). The USACE Dam Safety Program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act and maintains the National Inventory of Dams.

U.S. Geological Survey

The U.S. Geological Survey (USGS) provides data and monitoring for geological and flood hazards. This includes numerous stream gauges within Nevada County and regional seismograph stations.

19.2.2 State

State programs impacting hazard mitigation are described in Table 19-2.

TABLE 19-2. STATE PROGRAMS IMPACTING HAZARD MITIGATION

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
California Department of Parks and Recreation (State Parks)	Wildfire Hazard	State Parks Resources Management Division has wildfire protection resources available to suppress fires on State Park lands.
California Department of Water Resources (DWR)	Flood Hazard	This department is the state coordinating agency for floodplain management. DWR, on behalf of FEMA, provides individual technical assistance to California communities participating in the NFIP by conducting Community Assistance Visits and Community Assistance Contacts. DWR provides statewide NFIP workshops that are designed to interpret and explain the NFIP regulations and to give an overview of the need for community-based floodplain management (Cal OES 2023a).
California Division of Safety of Dams (DSOD)	Dam Failure Hazard	This division of DWR monitors the dam safety program at the State level and maintains a working list of dams in California.
CAL FIRE	Wildfire Hazard	CAL FIRE has responsibility for wildfires in areas that are not under the jurisdiction of the U.S. Forest Service or a local fire organization.
Cal OES	All Hazards	Cal OES serves as the state's leadership hub during all major emergencies and disasters. This includes responding, directing, and coordinating state and federal resources and mutual aid assets. Cal OES also supports local jurisdictions and communities through planning and preparedness activities, training, and facilitating the immediate response to an emergency through the longer-term recovery phase. During this process, Cal OES serves as the state's overall coordinator and agent to secure federal government resources through FEMA (Cal OES 2024a).
California Fire Alliance	Wildfire Hazard	The alliance works with communities at risk from wildfires to facilitate the development of community fire loss mitigation plans.
California Fire Safe Council	Wildfire Hazard	This council facilitates the distribution of National Fire Plan grants for wildfire risk reduction and education.
Office of the State Fire Marshal	Wildfire Hazard	This office has a wide variety of fire safety and training responsibilities.

19.2.3 County and Local

Nevada County Office of Emergency Services

The Nevada County Office of Emergency Services (OES) is responsible for coordinating with County departments, local cities, and special districts to prevent, protect, mitigate, respond to, and recover from disasters. OES is responsible for designing and conducting simulated disaster preparedness and response exercises and evaluating emergency staff training. OES is also responsible for maintaining the County emergency operations center (EOC) in a state of readiness. Responsibilities include the following (Nevada County n.d.):

- **Hazard Identification, Risk Assessment, & Mitigation—**OES identifies conditions that have the potential of causing injury to people and damage to property or the environment. OES assesses the potential risks and consequences from hazardous situations. This is primarily accomplished by maintaining and updating the Nevada County hazard mitigation plan.
- **Planning—**OES coordinates, distributes, and maintains comprehensive emergency management plans. The primary plan maintained and utilized by OES is the Nevada County Emergency Operations Plan. The plan delineates the preparation for, emergency response to, and recovery from the effects of a natural disaster or human-caused incident occurring wholly within or affecting any unincorporated area of Nevada County.
- **Direction, Control, and Coordination—**OES manages Nevada County's response to and recovery from a disaster and provides support to any city, town, or special district responding to and recovering from a disaster. The central site for managing and coordinating the County's support of tactical field operations is the Nevada County EOC. The EOC is a multi-agency coordination point for emergencies affecting multiple jurisdictions or disciplines. During a disaster, the EOC is also the communication link with city/town EOCs, department/agency operating centers, adjacent counties, the California Inland Regional EOC, and other state and federal offices.
- **Resource Management—**During a disaster, OES coordinates resource requests from agencies supporting emergency response activities. If resources are not available from agencies in Nevada County, OES will coordinate requests with the State Regional Operations Center. Resource requests may be for equipment or personnel. OES may fill personnel requests by utilizing the Nevada County Emergency Services Organization (ESO), which is comprised of all Nevada County government employees.
- **Communications and Warning—**OES develops and maintains the capability to alert and warn public officials and the general public of an actual or impending emergency or disaster. This is accomplished by utilizing all resources available at the time of the event, to include the media, internet, and telephones. The County-funded emergency notification system (currently CodeRED) gives OES the ability to create, target, and send a voice or text alert to thousands of residents' phones within minutes. Residents of Nevada County also have the option of adding their cell phone number and email address to the notification system data base.
- **Training and Exercises—**OES implements training and educational programs for the public, County staff, and emergency response personnel. To validate this training and emergency response plans, OES coordinates periodic tabletop and functional exercises.
- **Home and Family Emergency Preparation Information—**The County's Home and Family Emergency Preparedness Center gives the public access to preparedness brochures for many regional hazards and provides information from partnering agencies such as the Public Health Department or the American Red Cross. Contact information for the public to receive additional information for specific preparedness activities is also available.
- **Finance and Administration—**OES is the coordinating agency for Homeland Security Grants approved for public safety agencies in Nevada County. Following a disaster, OES is the coordinating agency for jurisdictions seeking to apply for reimbursement for public infrastructure

damage and agency response related costs. OES serves as liaison between all County public agencies and the public with Cal EMA, FEMA, and the Small Business Association (SBA).

Nevada County Community Development Agency

The Nevada County Community Development Agency is broken into numerous departments, divisions, and offices to support and oversee community development in the County (Nevada County n.d.).

- **Department of Agriculture—**The Department of Agriculture is dedicated to sustaining a healthy agricultural industry while protecting the environment, the agricultural workforce, and the community. California's County Agricultural Commissioners serve as the primary local enforcement agents for state agricultural laws and regulations.
- **Building Department—**The Building Department's goal is to provide services that result in compliance with minimum housing, building and safety laws. This includes permitting and the enforcement of the Building Code.
- **Code Compliance Division—**The Code Compliance Program works with the people of Nevada County to promote and maintain a healthy, safe, and desirable living and working environment. Code Compliance helps maintain or improve the quality of the community by administering a fair and unbiased enforcement program to correct violations of codes and ordinances enacted by the Board of Supervisors in regard to property, buildings, and structures. The Division provides code consultation as part of regular services.
- **Economic Development Office—**The Nevada County Economic Development Office assists new, existing, and expanding businesses and nonprofits in navigating local and regional business resources.
- **Department of Environmental Health—**The Environmental Health Department is responsible for programs focused on environmental protection and public health in Nevada County. These programs regulate food preparation in restaurants, installation of wells and septic systems, handling hazardous materials, and other topics related to consumer protection.
- **Farm Advisor Division—**The Farm Advisor is a cooperative venture between the County of Nevada, the University of California, and the U.S. Department of Agriculture. to provide information and training to residents in the areas of agriculture, nutrition, youth, and community development.
- **Planning Department—**The Planning Department applies community land-use policies for individuals and businesses. The Department works to protect the environment to ensure that Nevada County remains a desirable place to live and work. It is responsible for the administration of land use applications. Project and application guidelines for common land use applications are provided, and staff are available to answer questions.
  - **Development Review Committee**—The Nevada County Community Development Agency may host a project-specific Development Review Committee (DRC) meeting with project applicants, facilitated by a planner assigned to the project. Senior-level staff from multiple departments attend and discuss applications in terms of complete/incomplete status, compliance, additional requirements, design issues, and potential conditions of approval. Staff is available to answer questions and assist the applicant in understanding relevant

County standards. The goal is to encourage constructive feedback and promote a streamlined and timely review process.

- **Public Works—**The mission of Public Works is to maintain public health and safety through its six divisions:
  - **Engineering Division—**The Engineering Division provides a variety of technical services, support, and planning. The Division provides management to the formation of special districts and develops information about the County road system (traffic volumes, pavement condition, and accident rates) to support the prioritization of County transportation resources.
  - **Fleet Services—**Fleet Services is responsible for maintaining the Department's vehicles.
  - **Road Maintenance Division—**The Road Maintenance Division protects, repairs, and maintains Nevada County's road system infrastructure, which includes snow removal, storm damage response, vegetation management, drainage and shoulder maintenance, bridge maintenance, and surface preservation.
  - **Solid Waste Division—**The Solid Waste Division oversees garbage disposal, recycling services, and transfer station operations throughout Nevada County. The Division also oversees the maintenance of closed landfills.
  - **Transit Services Division—**The Transit Services Division provides fixed-route transit services and specialized paratransit services to the residents of western Nevada County. Nevada County Connects provides local and regional fixed-route bus service to the cities, towns, and unincorporated areas of western Nevada County, including Nevada City, Grass Valley, Penn Valley, Rough and Ready, Lake Wildwood, Alta Sierra, Lake of the Pines, and the regional hub at the Auburn Amtrak station.
  - **Wastewater Division—**The Wastewater Division administers and maintains sewage collection systems and treatment facilities for Nevada County Sanitation District Number 1. There are 10 zones within the Sanitation District, with facilities that collect and treat 1.2 million gallons of wastewater each day. The Sanitation District provides sewer service to 5,000 accounts in western Nevada County with a population of 14,000. In all District Zones, except for very low flow areas in the system, District-maintained generators are equipped to run automatically in the event of a power outage. District systems will continue to function during these outages and District staff visits and monitors all these locations for proper function until normal power operation is restored.

Nevada County Information and General Services Agency

The Information and General Services Agency maintains vital infrastructure and related services for the County including maintenance and repair of County facilities. The GIS Division provides mapping and analysis support for County departments, outside agencies, and the public. GIS is the public's portal to geographically referenced data for all County departments, with links to other County systems (Nevada County n.d.).

Nevada County Health and Human Services

Health and Human Services works to protect lives, promote health and wellness, and provide services to help Nevada County residents meet their basic needs. This includes support for many of the most socially vulnerable populations in the County (Nevada County n.d.):

- **Nevada County Behavioral Health Department**—The Department provides high quality, culturally competent mental health and substance abuse treatment services to County residents.
- **Child Support Services—**This group works to enhance the well-being of children and self-sufficiency of families by delivering professional child support services.
- **Housing and Community Services Program—**The Program pursues, secures, and administers state and federal funds for efforts that benefit low-income households.
- **Public Health Department—**This Department works to prevent disease, promote, and support optimal health and wellness, and protect the community against disasters.
- **Department of Social Services—**This Department offers vital human services to the citizens of Nevada County, including cash assistance, food assistance, health care, housing, and preventing abuse.

Nevada County Board of Supervisors

The Board of Supervisors is the legislative and executive body of County government and serves as the governing body of the Nevada County Sanitation District No. 1 and the Nevada County Housing Authority. In addition, members of the Board represent the County on numerous intergovernmental bodies (Nevada County n.d.).

Nevada County Transportation Commission

The Nevada County Transportation Commission (NCTC) is a Regional Transportation Planning Agency created pursuant to Title 7.88 of the State of California Government Code. The NCTC coordinates transportation with the citizens and decision-makers of Grass Valley, Nevada City, Nevada County, the Town of Truckee, and Caltrans to identify transportation needs, propose solutions, and assist in implementing projects to create a balanced regional transportation system, while protecting the rural qualities and historic character of Nevada County (NCTC 2015).

19.3 Fiscal Capabilities

This section summarizes fiscal capabilities in Nevada County. Further information is provided in the jurisdictional annexes in Volume II. Appendix O of the 2023 California State Hazard Mitigation Plan describes mitigation-related funding available to eligible jurisdictions to fund mitigation actions.

19.3.1 Federal Hazard Mitigation Funding Opportunities

Cal OES is the administrator in California for federal Hazard Mitigation Assistance (HMA) programs that provide funding for mitigation planning and projects that protect life and property from disaster damage (FEMA 2023d):

- The Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation planning and projects following a federal major disaster declaration. HMGP funding is generally 15 percent of the total amount of federal assistance provided to a state, territory, or federally recognized tribe following a major disaster declaration.
- The Pre-Disaster Mitigation (PDM) program provides funds for hazard mitigation planning and projects. PDM funding depends on the amount Congress appropriates each year.
- Flood Mitigation Assistance (FMA) provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP). FMA funding depends on the amount Congress appropriates each year.
- Building Resilient Infrastructure & Communities (BRIC) supports jurisdictions in hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC is funded by a 6 percent ($500 million) set-aside from federal post-disaster grant funding.

Federal mitigation grant funding is available to all communities with a current hazard mitigation plan (this plan); however, most of these grants require a “local share” in the range of 10 to 25 percent of the total grant amount. Individual homeowners and business owners may not apply directly to FEMA. Eligible local governments may apply on their behalf (FEMA 2023d). Table 19-3 provides an overview of funding eligibility and cost share for HMA programs (FEMA n.d.-c)

TABLE 19-3. FEMA HMA GRANT COST SHARE REQUIREMENTS

Programs	Cost Share (Percent of Federal / Non-Federal Share)
Hazard Mitigation Grant Program (HMGP)[a]	75 / 25
HMGP Post Fire	75 / 25
Flood Mitigation Assistance (FMA) (community flood mitigation, project scoping, individual mitigation of insured properties, and planning grants)	75 / 25
FMA—repetitive loss property[b]	90 / 10
FMA—severe repetitive loss property[b]	100 / 0
Pre-Disaster Mitigation (PDM)	75 / 25
PDM—small and impoverished community	Up to 90 / 10
Building Resilient Infrastructure & Communities (BRIC)	75 / 25
BRIC—small and impoverished community	Up to 90 / 10

Source: (FEMA 2023d)

a. Sub-applicants should consult their State Hazard Mitigation Officer (SHMO) for the amount of percentage of HMGP subrecipient management cost funding their State has determined to be passed through subrecipients.

b. To be eligible for an increased federal cost share, a FEMA-approved state or tribal (standard or enhanced) mitigation plan that addressed repetitive loss properties must be in effect at the time of award, and the property is being submitted for consideration must be a repetitive loss property.

Hazard Mitigation Grant Program

The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard-prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements, and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved hazard mitigation plan (this plan).

Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf.

For additional information, see: https://www.fema.gov/hazard-mitigation-grant-program

Flood Mitigation Assistance Program

The FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP-insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is at least 75 percent. At most, 25 percent of the total eligible costs must be provided by a non-federal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. The FMA funds are distributed from FEMA to the state. Cal OES serves as the grantee and program administrator for the FMA program in California.

For additional information, see: https://www.fema.gov/flood-mitigation-assistance-grant-program

Building Resilient Infrastructure and Communities Program

BRIC supports states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

For additional information, see: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

Rehabilitation of High Hazard Potential Dams Program

The Rehabilitation of High Hazard Potential Dams (HHPD) grant program provides technical, planning, design, and construction assistance for eligible rehabilitation activities that reduce dam risk and increase community preparedness. The HHPD Grant Program provides assistance for technical, planning, design, and construction activities toward repair, removal, and structural/nonstructural rehabilitation of eligible high hazard potential dams.

For additional information, see: https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams

Extraordinary Circumstances

When justification is provided, and with concurrence from FEMA headquarters, a FEMA region may grant an exception to mitigation planning requirements for a project based on extraordinary circumstances. If an exception is granted, a local mitigation plan must be approved by FEMA within 12 months of the funding award. Extraordinary circumstances exist if the proposed project is consistent with the priorities and strategies identified in the state (standard or enhanced) mitigation plan and the jurisdiction meets at least one of the following criteria:

- The jurisdiction meets the small, impoverished community criteria.
- The jurisdiction has had insufficient capacity due to lack of available funding, staffing, or other necessary expertise to satisfy the mitigation planning requirement prior to the current disaster or application deadline.
- The jurisdiction has been at low risk from hazards because of low frequency of occurrence or minimal damage from previous occurrences as a result of sparse development.
- The jurisdiction experienced significant disruption from a declared disaster or another event that impacted its ability to complete the mitigation planning process prior to award or final approval of project funding.
- The jurisdiction does not have a mitigation plan for reasons beyond the control of the state, federally-recognized tribe, or local community, such as Disaster Relief Fund restrictions that delay FEMA from granting a subaward prior to the expiration of the local or Tribal Mitigation Plan.

For HMGP, BRIC, and FMA, the applicant must provide written justification that identifies the specific criteria or circumstances listed above, explains why there is no longer an impediment to satisfying the mitigation planning requirement, and identifies the specific actions or circumstances that eliminated the deficiency.

When HMGP project funding is awarded under extraordinary circumstances, the recipient must acknowledge in writing to FEMA that a plan will be completed within 12 months of the award and provide a work plan for completing the mitigation plan, including milestones and a timetable. This requirement will be incorporated into the award.

19.3.2 Federal Disaster and Recovery Assistance Programs

Following a disaster, various types of assistance may be made available by local, state, and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. The following sections describe the general types of assistance that may be provided.

Individual Assistance

Individual Assistance (IA) provides help for homeowners, renters, businesses, and some nonprofit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property, and an additional 20 percent for mitigation. For businesses, loans may be made to repair or replace disaster damage to property owned by the business, including real estate, machinery and equipment, inventory, and supplies. Businesses of any size are eligible. Nonprofit organizations such as charities, churches, private universities, etc. are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

For additional information, see: https://www.fema.gov/individual-disaster-assistance

Public Assistance

Public Assistance (PA) provides cost reimbursement aid to local governments (state, county, local, municipal authorities, and school districts) and certain nonprofit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required.

For additional information, see: https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit

Small Business Administration Loans

The Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, business of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Homeowners may apply for up to $200,000 to replace or repair their primary residence. Renters and homeowners may borrow up to $40,000 to replace or repair personal property (such as clothing, furniture, cars, and appliances) damaged or destroyed in a disaster. Physical disaster loans of up to $2 million are available to qualified businesses and most private nonprofit organizations.

For additional information, see: https://www.sba.gov/managing-business/running-business/emergency-preparedness/disaster-assistance.

Community Development Block Grants

Community Development Block Grants (CDBG) are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, a suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during times of "urgent need" as defined by the CDBG National Objectives (e.g., post-disaster), CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event.

For additional information, see: https://www.hudexchange.info/programs/cdbg-entitlement/

U.S. Economic Development Administration Funds

The U.S. Economic Development Administration (USEDA) is an agency of the U.S. Department of Commerce that supports regional economic development in communities around the country. It provides funding to support comprehensive planning and makes strategic investments that foster employment creation and attract private investment in economically distressed areas of the United States. Through its Public Works Program, USEDA invests in key public infrastructure, such as in traditional public works projects, including water and sewer systems improvements, expansion of port and harbor facilities, brownfields, multitenant manufacturing and other facilities, business and industrial parks, business incubator facilities, redevelopment technology-based facilities, telecommunications, and development facilities. Through its Economic Adjustment Program, USEDA administers its Revolving Loan Fund Program, which supplies small businesses and entrepreneurs with the gap financing needed to start or expand their business, in areas that have experienced or are under threat of serious structural damage to the underlying economic base.

Federal Highway Administration Emergency Relief

Federal Highway Administration Emergency Relief (FHWA-ER) is a grant program that may be used for repair or reconstruction of federal-aid highways and roads on federal lands that have suffered serious damage because of a disaster. Cal OES serves as the liaison between local municipalities and FHWA.

For additional information, see: https://www.fhwa.dot.gov/bipartisan-infrastructure-law/er_fact_sheet.cfm

Federal Transit Administration Emergency Relief

The Federal Transit Administration's (FTA) Emergency Relief (ER) Program is authorized by Congress and enables FTA to reimburse public transit operators in the aftermath of an emergency or major disaster to help pay for protecting, repairing, or replacing equipment and facilities that may suffer or

have suffered serious damage. The program also funds the operating costs of evacuation, rescue operations, or temporary public transportation service during or after an emergency.

For additional information, see: https://www.transit.dot.gov/funding/grant-programs/emergency-relief-program

19.3.1 Federal Mitigation Funding Sources Summary

Table 19-4 provides a list of programs, descriptions, and links for those seeking funding to implement hazard mitigation strategies. This table is not a comprehensive list, but a starting point to help identify potential sources of funding for mitigation strategies.

TABLE 19-4. MITIGATION FUNDING SOURCES

Program	Description	Sponsor	Website
Hazard Mitigation Assistance (HMA)	Grants to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damage—includes FMA, HMGP, BRIC.	FEMA	https://www.fema.gov/hazard-mitigation-assistance
Flood Mitigation Assistance (FMA)	Program grants to states and communities for pre-disaster mitigation planning and projects to help reduce or eliminate the long-term risk of flood damage to structures insurable under the National Flood Insurance Program.	FEMA	https://www.fema.gov/flood-mitigation-assistance-grant-program
Hazard Mitigation Grant Program (HMGP)	Grants to states and communities for planning and projects providing long-term hazard mitigation measures following a major disaster declaration.	FEMA	https://www.fema.gov/hazard-mitigation-grant-program
Building Resilient Infrastructure and Communities (BRIC)	Grants to states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.	FEMA	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
Public Assistance: Hazard Mitigation Funding Under Section 404 and Section 406	Hazard mitigation discretionary funding available under Section 404 and 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a federally declared disaster.	FEMA	https://www.fema.gov/press-release/20220328/fema-hazard-mitigation-grants-404-and-406#:~:text=Section%20406%20mitigation%20measures%20are%20funded%20under%20the,limited%20to%20declared%20counties%20and%20eligible%20damaged%20facilities.
Assistance to Firefighters Grant Program	Grants to eligible fire departments, nonaffiliated emergency medical services organizations, and state fire training academies for resources to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience.	FEMA	https://www.fema.gov/welcome-assistance-firefighters-grant-program

Program	Description	Sponsor	Website
Disaster Housing Program	Emergency assistance for housing, including minor repair of homes to establish livable conditions and mortgage and rental assistance.	HUD	https://www.hud.gov/program_offices/public_indian_housing/publications/dhap
HOME Investment Partnerships Program	Grants to local and state governments and consortiums for permanent and transitional housing, (including financial support for property acquisition and rehabilitation for low income persons).	HUD	https://www.hudexchange.info/programs/home/
HUD Disaster Recovery Assistance	Grants to fund gaps in available recovery assistance after disasters (including mitigation).	HUD	https://www.hud.gov/info/disasterresources
Section 108 Loan Guarantee	Federally guaranteed loans for disaster-distressed areas to states and local governments participating in the Community Development Block Grant (CDBG) program.	HUD	https://www.hudexchange.info/programs/section-108/
Smart-Growth Implementation Assistance program	Assistance for stormwater management, code revision, transit-oriented development, affordable housing, infill development, corridor planning, green building, and climate change.	EPA	https://www.epa.gov/smartgrowth
Partners for Fish and Wildlife	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.	U.S. Fish and Wildlife Service	https://www.fws.gov/partners/
FHWA Emergency Relief Program	Funds for the repair or reconstruction of federal-aid highways that have suffered serious damage as a result of natural disasters or catastrophic failures from an external cause.	U.S. Department of Transportation (DOT)	https://www.fhwa.dot.gov/programadmin/erelief.cfm
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Investments in critical road, rail, transit, and port projects across the nation	U.S. DOT	https://www.transportation.gov/RAISEgrants/about
Smith-Lever Special Needs Competitive Grant Program	Grants to enable families, communities, and businesses to successfully prepare for, respond to, and cope with disaster losses and critical incidents.	USDA	https://www.nifa.usda.gov/grants/funding-opportunities/smith-lever-special-needs-competitive-grants-program
Community Facilities Direct Loan & Grant Program	Funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial, or business undertakings.	USDA	https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program
Disaster Assistance Programs	Assistance to farmers, ranchers, communities, and businesses impacted by natural disasters through various programs supporting livestock, farmland, and crop losses.	USDA	https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/

Program	Description	Sponsor	Website
Emergency Watershed Protection Program	Technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms and other natural disasters that impair a watershed.	USDA	https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection
Watershed and Flood Prevention Operations Program	Technical and financial assistance to help plan and implement watershed projects for flood prevention, watershed protection, public recreation, public fish and wildlife, and water quality management.	USDA	https://www.nrcs.usda.gov/programs-initiatives/watershed-and-flood-prevention-operations-wfpo-program
Emergency Loan Program	Emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters or quarantine.	USDA	https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/emergency-farm-loans/index
Financial Assistance	Financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forest land.	NRCS	https://www.nrcs.usda.gov/getting-assistance/conservation-practices
Regional Conservation Partnership Program	Coordination of NRCS conservation activities with partners that offer value-added contributions to expand the collective ability to address on-farm, watershed, and regional natural resource concerns. Investment in solutions to conservation challenges and measurable improvements and outcomes tied to the resource concerns they seek to address.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/rcpp/
Emergency Management Performance Grants Program	Funding to assist local, tribal, territorial, and state governments in enhancing and sustaining all-hazards emergency management capabilities.	U.S. DHS	https://www.fema.gov/emergency-management-performance-grant-program
Land & Water Conservation Fund	Matching grants to states and local governments for the acquisition and development of public outdoor recreation areas and facilities (as well as funding for shared federal land acquisition and conservation strategies).	National Park Service	https://www.nps.gov/subjects/lwcf/index.htm
Rehabilitation of High Hazard Potential Dams Grant Program	Technical, planning, design, and construction assistance in the form of grants to non-federal sponsors for rehabilitation of eligible high hazard potential dams.	FEMA	https://www.fema.gov/emergency-managers/risk-management/dam-safety/grants/resources

Program	Description	Sponsor	Website
Planning Assistance to States Program	Funding for studies dealing with water resource issues such as water supply and demand, water quality, environmental conservation and restoration, wetlands evaluation, dam safety and failure, flood damage reduction, coastal zone management and protection, harbors and ports, and floodplain management.	USACE	https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Planning-Assistance-to-States/
Floodplain Management Services	Technical and planning services to support effective floodplain management.	USACE	https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Floodplain-Management-Services/
Environmental Program	Guidance for implementing environmental programs such as ecosystem restoration and environmental cleanup.	USACE	https://www.usace.army.mil/missions/environmental/
Community Wildfire Assistance	Funding and technical expertise for hazardous fuels reduction on adjacent non-federal lands, completing Community Wildfire Protection Plans, prevention efforts to reduce human-caused fires, and wildland fire training for fire departments and rangeland fire protection associations.	U.S. Bureau of Land Management	https://www.nifc.gov/about-us/our-partners/blm/fuels/community-assistance

19.3.2 State Hazard Mitigation Funding Opportunities

California Earthquake Authority Earthquake Brace + Bolt Program

The California Earthquake Authority (CEA) Earthquake Brace + Bolt (EBB) Program helps homeowners strengthen their homes against earthquakes by offering a grant of up to $3,000 toward a seismic retrofit for qualifying houses.

For additional information, see: https://www.californiaresidentialmitigationprogram.com/our-seismic-retrofit-programs/the-retrofits/ebb-retrofit

California Department of Water Resources Proposition 84

Proposition 84 authorizes general obligation bonds to fund safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, state and local park improvements, public access to natural resources, and water conservation efforts.

For additional information, see: https://bondaccountability.resources.ca.gov/p84.aspx

DWR Small Communities Flood Risk Reduction Program

The Small Communities Flood Risk Reduction Program is a local assistance program whose objective is to reduce flood risk for small communities protected by State Plan of Flood Control facilities, as well as for legacy communities.

For additional information, see: https://water.ca.gov/Work-With-Us/Grants-And-Loans/Small-Communities-Flood-Risk-Reduction

DWR Flood Control Subventions Program

The Flood Control Subventions Program provides financial assistance to local agencies cooperating in the construction of federally authorized flood control projects.

For additional information, see: https://water.ca.gov/Work-With-Us/Grants-And-Loans/Flood-Control-Subventions-Program

DWR Integrated Regional Water Management Grant Programs

The Integrated Regional Water Management Grant Programs are a collaborative effort to manage all aspects of water resources in a region. The grant programs fund planning, implementation, and disadvantaged community and tribal involvement.

For additional information, see: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Work-With-Us/Grants-And-Loans/IRWM-Grants/Files/Prop-1-Implementation/Round-2/2022-Integrated-Regional-Water-Management-Grant-Program-Guidelines.pdf

19.3.3 County and Local

Nevada County and individual jurisdictions have the authority to fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and a variety of federal and state loan and grant programs. Some jurisdictions participating in this HMP are faced with fiscal constraints that limit their ability to implement mitigation actions. In an effort to overcome these fiscal challenges, jurisdictions have continued to leverage the sharing of resources and combining available funding with grants and other sources. Plans and interjurisdictional cooperation are beneficial in obtaining grants.

Part 4: Mitigation Strategy

20. Mitigation Strategy

This chapter presents mitigation strategies for Nevada County to reduce potential vulnerability and losses identified as concerns in the risk assessment portion of this plan. The Steering Committee reviewed the risk assessment and capability assessment to identify and develop these mitigation strategies.

Hazard mitigation reduces the potential impacts of, and costs associated with, emergency and disaster-related events.

Mitigation actions address a range of impacts, including impacts on the population, property, the economy, and the environment. They can include activities such as revisions to land-use planning, training and education, and structural and nonstructural safety measures.

20.1 Past Mitigation Accomplishments

The County, through previous and ongoing hazard mitigation activities, has demonstrated that it is proactive in protecting its physical assets and citizens against losses from natural hazards. Examples of previous and ongoing actions and projects include the following:

- The County facilitated the development of the original Nevada County HMP. The current planning process represents the regulatory five-year plan update process, which includes the participation of seven jurisdictions in the County, along with key County and regional stakeholders.
- All municipalities participating in this HMP update participate in the National Flood Insurance Program (NFIP), which requires the adoption of FEMA floodplain mapping and minimum standards for building within the floodplain.
- Reports, plans, and studies relating to or including information on natural hazards or natural hazard policies affecting Nevada County have been reviewed and incorporated into this plan update as appropriate, as discussed in Chapter 2 (Planning Process) and the list of references.

20.2 Mitigation Goals and Objectives

This section describes the process of updating hazard mitigation goals and objectives for reducing or avoiding long-term vulnerabilities to identified hazards. For the purposes of this plan, goals and objectives are defined as follows:

"The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards."

44 CFR 201.6(c)(3)(i)

- **Goals** are general guidelines that explain what is to be achieved. They are usually broad, long-term, policy-type statements and represent global visions. Goals help define the benefits that the plan is trying to achieve. The success of the plan, once implemented, should be measured

by the degree to which its goals have been met (that is, by the actual benefits in terms of hazard mitigation).

- **Objectives** are short-term aims that form a strategy or course of action to meet a goal. Objectives are stand-alone measurements of the effectiveness of a mitigation action. The objectives also are used to help establish priorities. Broadly defined mitigation objectives were eliminated from the updated strategy unless accompanied by discrete actions.

The goals for a hazard mitigation plan reflect a community's current priorities, which evolve over time in response to a wide range of community changes. The Steering Committee reviewed the goals and objectives from the 2017 HMP and made revisions for the 2024 update based on current community priorities in Nevada County. These priorities have changed since the previous plan based on the following considerations:

- Hazard events and losses since the 2017 plan
- The updated hazard profiles and risk assessment
- The goals and objectives established in the 2023 California State Hazard Mitigation Plan
- The Planning Partnership's interests in integrating this plan with other planning mechanisms, including Nevada County and local risk management plans
- Direct input from the Steering Committee, stakeholders, and the public on how the County and jurisdictions need to move forward to best manage their hazard risk
- Discussions and research on existing authorities, policies, programs, resources
- Support for mitigation through the protection of natural systems

FEMA defines ***Mitigation Actions*** as specific actions that help to achieve the mitigation goals and objectives.

As a result of this review process, the goals for the 2024 update were updated to the following:

- Goal 1—Ensure that hazards are identified and considered in planning and land use decisions.
- Goal 2—Improve local emergency management capability.
- Goal 3—Evaluate risks and create mitigation activities while considering access and functional needs.
- Goal 4—Promote community awareness, understanding, and interest in hazard mitigation policies and programs.
- Goal 5—Incorporate hazard mitigation as an integrated public policy and standard practice.
- Goal 6—Reduce community exposure and vulnerability to hazards where the greatest risk exists.
- Goal 7—Increase resilience of critical infrastructure and facilities.
- Goal 8—Promote an adaptive and resilient planning area that responds proactively to future conditions.

- Goal 9—Develop and implement mitigation strategies that identify the best alternative to protect natural resources, promote equity and environmental justice, and use public funds in an efficient and cost-effective manner.
- Goal 10—Prioritize and direct resources to increase disaster resiliency among historically underserved populations, for individuals with access and functional needs, and in communities disproportionately impacted by disasters.

The objectives for the 2024 update were updated to the following:

- Objective 1—Develop and provide updated information to improve the understanding of the locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life, safety, health, property, and the environment.
- Objective 2—Use local general plan (safety element), zoning, and subdivision requirements to help establish resilient and sustainable communities.
- Objective 3—Increase public participation in systems that provide alert and warning as well as emergency communications.
- Objective 4—Encourage the retrofit of vulnerable structures in the planning area.
- Objective 5—Consider programs that incentivize quantifiable risk reduction in accordance with industry standards.
- Objective 6—Reduce repetitive property losses due to hazards by updating land use, design, and construction policies.
- Objective 7—Continually build linkages and promote dialog about emergency management within the public and private sectors.
- Objective 8—Incorporate risk reduction considerations in new and updated infrastructure and development plans to reduce the impacts of hazards.
- Objective 9—Inform the public, including underrepresented and marginalized community groups, on the risk of exposure to hazards and ways to increase the public's capability to prepare for, respond to, recover from, and mitigate the impacts of these events.
- Objective 10—Identify projects that simultaneously reduce risk while increasing planning area resilience and sustainability.
- Objective 11—Where feasible and cost-effective, research, develop, and promote adoption of building and development laws, regulations, and ordinances exceeding the minimum levels needed for life safety.
- Objective 12—Encourage hazard mitigation measures that promote and enhance natural processes, minimize adverse impacts on the ecosystem, and promote social equity and environmental justice.

20.3 Mitigation Strategy Development and Update

20.3.1 Update of Local Jurisdiction Mitigation Strategies

Review of Previous Actions

To evaluate progress on local mitigation actions, each planning partner was provided with a Mitigation Action Plan Review Worksheet, pre-populated with the actions identified for their jurisdiction in the prior (2017) plan. The Planning Partners were asked to indicate the status of each action ("No Progress," "In Progress," "Ongoing Capability," or "Complete") and whether actions that have not been completed should be discontinued or carried forward into the plan update. They were requested to provide comments to quantify the extent of progress and provide reasons for the level of progress or why actions were discontinued. This information is included in the jurisdictional annexes.

Mitigation actions identified as "Complete" or "Discontinued" have been removed from the Planning Partners' updated mitigation strategies. Actions identified as "No Progress" or "In Progress" have been carried forward in the updated mitigation strategies. Planning partners were asked to provide further details on these projects to help better define the projects, identify benefits and costs, and improve implementation.

Certain continuous or ongoing actions (Ongoing Capabilities) from the previous plan that represent programs that are now fully integrated into the normal operational and administrative framework of the community are identified in the capabilities assessment of each annex and removed from the updated mitigation strategy (marked as "Discontinued").

Identifying New Actions

At the kickoff and during subsequent local level planning meetings, all participating jurisdictions were surveyed to identify completed mitigation actions, in progress actions, or ongoing capabilities, and potential new actions. Communities were made aware of potential new mitigation actions as such actions became evident during the plan update process (e.g., through the capability assessment, risk assessment, or the public and stakeholder outreach process).

Developing the Overall Strategy

Beginning in August 2023, members of the Steering Committee and contract consultants worked directly with each jurisdiction (by phone, email, or virtual meetings) to update their annex with mitigation strategies that focus on well-defined, implementable projects that meet the definition or characteristics of mitigation. Mitigation actions were selected with a careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

Three annex support meetings were held for Planning Partners to assist in the development of additional actions, foster collaboration between neighboring jurisdictions for mitigation actions, discuss actions that involve cooperation between the County and jurisdictions, and identify steps needed to complete the jurisdictional annexes.

Addressing Known Vulnerabilities

To help support the selection of an appropriate risk-based mitigation strategy, each annex includes a summary of hazard vulnerabilities. These were identified during the plan update process by planning partner representatives, through review of available plans and reports, or through the hazard profiling and risk assessment process.

A mitigation strategy workshop was conducted on November 15, 2023, for all participating jurisdictions to support the development of focused problem statements based on the impacts of natural hazards in the County and their communities. These problem statements provide a detailed description of a problem area, including its impacts on the jurisdiction; past damage; loss of service; etc. An effort was made to include the street address of the problem location, adjacent streets, water bodies, and well-known structures as well as a brief description of existing conditions (topography, terrain, hydrology) of the site. These problem statements form a bridge between the hazard risk assessment, which quantifies impacts on each community, and the development of actionable mitigation strategies.

Incorporating a Range of Action Types

Concerted efforts were made to ensure that Planning Partners develop updated mitigation strategies that cover the range of mitigation action types described in recent FEMA planning guidance (FEMA 2023b):

- **Local Plans and Regulations**—These actions include government authorities, policies or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Project**—These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as community lifelines and other critical facilities. This type of action also involves projects to construct structures to reduce the impact of hazards.
- **Natural Systems Protection**—These are actions that minimize damage and losses to natural systems and preserve or restore their functions.
- **Education and Awareness Programs**—These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program, Community Rating System, StormReady (NOAA), and Firewise (NFPA).

Efforts were also made to develop mitigation strategies that cover the range of mitigation action types described in recent CRS guidance (FEMA 2018):

- **Preventative Measures**—Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, local floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—These actions include public activities to reduce hazard losses or actions that involve modification of existing buildings or structures to protect them from a hazard or

removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Information**—Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.
- **Natural Resource Protection**—Actions that minimize hazard loss and also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Structural Flood Control Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Emergency Services**—Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities

Protecting Critical Facilities

Planning partner mitigation actions that address vulnerable critical facilities have been proposed in consideration of protection against worst-case scenarios. For projects funded through federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. For locally self-funded projects, local jurisdiction discretion must be recognized. It must be recognized that the County and jurisdictions have limited authority with regard to mitigation at any level of protection over privately owned critical facilities.

Accounting for Climate Change

As discussed in the hazard profiles in this HMP, the long-term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards (e.g., flood, winter storm, and wildfire). Communities are working to evaluate and recognize these long-term implications and to incorporate their mitigation strategies into planning and capital improvement updates.

Mitigation Best Practices

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use in the mitigation strategies, in compliance with 44 CFR Section 201.6(c)(3)(ii). One catalog was developed for each hazard of concern evaluated in this plan. The catalogs present alternatives that are categorized in two ways:

- By whom would have responsibility for implementation:
  - Individuals—personal scale
  - Businesses—corporate scale
  - Government—government scale
- By what the alternatives would do:

- Reduce the probability of hazard events
- Limit risk to people or structures
- Increase ability to respond to or be prepared for hazard

The alternatives presented include actions that will mitigate current risk from hazards and actions that will help reduce risk from changes in the impacts of these hazards resulting from climate change. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the established goals and objectives, and are within the capabilities of the Planning Partners to implement. Some of these actions may not be feasible based on the selection criteria identified for this plan. The purpose of the catalogs was to provide a list of what could be considered to reduce risk from natural hazards within the planning area. Appropriate hazard mitigation actions were selected from among the alternatives in the catalogs for inclusion in the mitigation strategies. Actions in the catalog that are not included for the partnership's mitigation strategy were not selected for one or more of the following reasons:

- The action is not feasible
- The action is already being implemented
- There is an apparently more cost-effective alternative
- The action does not have public or political support.

The catalogs are included in Appendix F.

20.3.2 Mitigation Strategy Evaluation

Prioritization

Section 201.c.3.iii of 44 CFR establishes how mitigation strategies are to be prioritized, implemented, and administered by local jurisdictions. For this plan update, each mitigation strategy was prioritized using criteria suitable for evaluating hazard mitigation strategies. This method provided a systematic approach that considered the opportunities and constraints of implementing each mitigation action. The Steering Committee chose a set of 14 evaluation criteria for this process:

1. **Life Safety**—How effective will the action be at protecting lives and preventing injuries? Will the proposed action adversely affect one segment of the population?
2. **Property Protection**—How significant will the action be at eliminating or reducing damage to structures and infrastructure? For example: development in the floodplain or high-risk areas?
3. **Cost-Effectiveness**—Are the costs to implement the action commensurate with the benefits achieved?
4. **Political**—Is there overall public support for the action? Is there the political will to support it? Is the action at odds with development pressures?
5. **Legal**—Does the jurisdiction have the authority to implement the action?
6. **Fiscal**—Can the action be funded under existing program budgets (i.e., is this action currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?

7. **Environmental**—What are the potential environmental impacts of the action? Will it comply with environmental regulations? Are there co-benefits of this action?
8. **Social Vulnerability**—Does the action benefit socially vulnerable populations and underserved communities? Additional considerations can include appropriate numerical measures of social vulnerability.
9. **Administrative**—Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary? Does the scale and scope of the action align with the jurisdiction's capabilities?
10. **Hazards of Concern**—Does the action address one or more of the jurisdiction's high-ranked hazards?
11. **Climate Change**—Does the action incorporate climate change projections? Is the action designed to withstand/address long-term conditions?
12. **Timeline**—Can the action be completed in less than five years?
13. **Community Lifelines**—Does this action benefit community lifelines?
14. **Other Local Objectives**—Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

Participating jurisdictions were asked to use these criteria to prioritize their identified mitigation actions. For each mitigation action, the jurisdictions assigned a numeric score for each of the 14 evaluation criteria:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Jurisdictions were asked to provide a brief summary of the rationale behind the numeric rankings assigned. The numerical results were totaled and then used by each jurisdiction to help prioritize the action or strategy as *low*, *medium*, or *high*. Actions that had a numerical value between 0 and 6 were categorized as *low priority*; actions with numerical values between 7 and 10 were categorized as *medium priority*; and actions with numerical values between 11 and 14 were categorized as *high priority*. While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, jurisdictions may have additional considerations that could influence their overall prioritization of mitigation actions.

Mitigation actions carried forward from prior mitigation strategies may have been prioritized using a different, but not inherently contrary, approach. At their discretion, jurisdictions carrying forward prior actions were encouraged to re-evaluate their priority, particularly if conditions that would affect the prioritization criteria had changed.

For the plan update there has been an effort to develop more clearly defined and action-oriented mitigation strategies. These local strategies include actions that are seen by the community as the most effective approaches to advance their local mitigation goals and objectives within their capabilities. In addition, each planning partner was asked to develop problem statements. The partners were able to

develop action-oriented and achievable mitigation strategies. For that reason, many of the actions in the updated mitigation strategy were ranked as *high* or *medium* priority, as reflective of the community's clear intent to implement them, available resources notwithstanding. In general, actions that would have had *low* priority rankings were appropriately screened out during the local action evaluation process.

Benefit/Cost Review

Section 201.6.c.3iii of 44 CFR requires the prioritization of the mitigation strategy to emphasize a benefit/cost comparison of the proposed actions. For all actions identified in the local strategies, jurisdictions identified the associated costs and benefits as follows:

- **Costs** presented include the total project estimation. This can include administrative, construction (engineering, design, and permitting), and maintenance costs.
- **Benefits** are the savings from losses avoided through project implementation. These can include life safety, structure and infrastructure damage, loss of service or function, and economic and environmental damage and losses.

Where numerical costs or benefits could not be quantified, jurisdictions evaluated cost-effectiveness using qualitative *high*, *medium*, and *low* ratings based on the definitions in Table 20-1

TABLE 20-1 QUALITATIVE COST AND BENEFIT RATINGS

Costs	
High	Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).
Medium	The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
Low	The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
Benefits	
High	Project will have an immediate impact on the reduction of risk exposure to life and property.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
Low	Long-term benefits of the project are difficult to quantify in the short-term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-effective.

For some of the Nevada County actions identified, the Planning Partnership may seek financial assistance under FEMA's Hazard Mitigation Assistance (HMA) programs. These programs require detailed benefit/cost analysis as part of the application process. The benefit/cost review for the prioritization of actions in this update did not include the level of detail required by FEMA for project

grant eligibility under HMA grant programs. These analyses will be performed when funding applications are prepared, using FEMA's Benefit-Cost Analysis model.

The Planning Partnership is committed to implementing mitigation strategies with benefits that exceed costs. For projects not seeking financial assistance from grant programs that require this sort of analysis, the Planning Partnership reserves the right to define benefits according to parameters that meet its needs and the goals and objectives of this plan.

Part 5: Plan Maintenance

21. Plan Maintenance and Implementation Procedures

This chapter details the formal process that will ensure that the hazard mitigation plan remains an active and relevant document and that the Planning Partnership maintains its eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. In addition, this chapter describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this plan update will be incorporated into existing planning mechanisms and programs, such as comprehensive land use planning processes, capital improvement planning, and building code enforcement and implementation.

21.1 HMP Coordinator and Jurisdiction Points of Contact

The HMP Coordinator is assigned to manage the maintenance and update of the plan during its approval period (the five-year period between FEMA's approval of the plan and its expiration), with the following responsibilities:

- Convene the Planning Partnership
- Be the prime point of contact for questions regarding the plan and its implementation
- Coordinate the incorporation of additional information into the plan
- Manage the monitoring, evaluation, and updating responsibilities identified in this section

Currently, the Nevada County HMP Coordinator is designated as:

Nevada County Office of Emergency Services
950 Maidu Avenue, Suite 129
Nevada City, CA 95959
OES@NevadaCountyCA.gov
(530) 265-1515

As of the date of this plan, primary and secondary mitigation planning representatives (points of contact) are identified in each jurisdictional annex in Volume II. It will be the responsibility of each jurisdiction and its representatives to inform the HMP Coordinator of any changes in representation.

21.2 Maintenance and Implementation Tasks

The procedures for monitoring, evaluating, and updating the plan are provided below. The plan maintenance matrix shown in Table 21-1 provides a synopsis of responsibilities for plan monitoring, integration, evaluation, and update, which are discussed in further detail in the sections below.

TABLE 21-1. PLAN MAINTENANCE MATRIX

Task	Approach	Timeline	Lead Responsibility	Support Responsibility
Monitoring	Planning partners to recommend update of mitigation strategies, progress toward implementation of actions, identification of new actions, and update of information on funding opportunities.	Each year in the month of the approval of the plan or after the occurrence of a federally declared disaster	County HMP Coordinator as the group lead	Jurisdictional points of contact as identified in Volume II
Integrating	Distribute the safe growth worksheet (see Table 21-2) for annual review and update by all participating jurisdictions.	Each year on the month preceding the approval anniversary date with interim email reminders to address integration in County and local jurisdiction activities	County HMP Coordinator as the group lead	Jurisdictional points of contact as identified in Volume II
Evaluating	Review the status of previous actions, as submitted by the monitoring task lead, and assess the effectiveness of the plan; compile and finalize update of mitigation strategy.	Updated progress report completed each year in the month of the approval of the plan	County HMP Coordinator as the group lead	Jurisdictional points of contact as identified in Volume II
Updating	Reconvene the Planning Partners to guide a comprehensive update to review and revise the plan.	Every 5 years or upon major update to County General Plan or after the occurrence of a major disaster	County HMP Coordinator as the group lead	Jurisdictional points of contact as identified in Volume II
Grant Monitoring	Notify Planning Partners about grant opportunities, maintain a list of eligible jurisdiction-specific projects for funding consideration, and notify Planning Partners of fiscal year mitigation priorities.	Continuously and as grant opportunities are identified	County HMP Coordinator	Jurisdictional points of contact as identified in Volume II
Public Outreach	Maintain the HMP, inform the public of hazard events via social media outlets, promote educational workshops on hazard topics, and track and file public comments received regarding the HMP.	Continuously	County HMP Coordinator and jurisdictional points of contact identified in Volume II	Alternate jurisdictional points of contact

21.2.1 Monitoring

The Planning Partnership will be responsible for monitoring and documenting annual progress on the plan. Each year, beginning one year after plan development, Nevada County and local Planning Partnership representatives will collect and process information from the persons responsible for initiating or overseeing the mitigation projects in each department, agency, and organization involved in implementing mitigation actions identified in their jurisdictional annexes. In the first year of the approval period, this will be accomplished using an online performance progress reporting system (the BATool[SM]), which will enable each planning partner to:

- Directly access mitigation actions
- Easily update the status of each project
- Document successes or obstacles to implementation
- Add or delete projects to maintain mitigation strategy implementation

Participating partners will be prompted by the tool to update progress on a quarterly basis, encouraging them to refresh their mitigation strategies and to continue implementation of actions. This reporting system facilitates the sorting and prioritization of projects and will support the submittal of an increased number of project grant fund applications. Planning Partnership representatives will be expected to document the following:

- Progress on the implementation of mitigation actions
- Obstacles or impediments to implementation of actions
- Any grant applications filed on behalf of any of the participating jurisdictions
- Hazard events and losses occurring in their jurisdiction
- Additional mitigation actions believed to be appropriate and feasible
- Public and stakeholder input.

Plan monitoring for years 2 through 4 of the approval period will be addressed via the BATool[SM] or manually.

21.2.2 Integrating the HMP into Municipal Planning Mechanisms

Hazard mitigation is sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. Integrating hazard mitigation into a community's existing plans, policies, codes, and programs leads to development patterns or redevelopment that reduce risk from known hazards. The Planning Partnership was tasked with identifying how hazard mitigation is integrated into existing planning mechanisms. The jurisdictional annexes in Volume II describe how this is done for each planning partner. During this process, many partners recognized the importance and benefits of incorporating hazard mitigation into future local planning and regulatory processes.

All participating jurisdictions will integrate information from the mitigation strategy into their respective planning mechanisms through a coordinated and standardized process. This process includes reviewing the mitigation strategy, engaging stakeholders, updating relevant plans and ordinances, and implementing and monitoring the identified mitigation actions. Each jurisdiction will ensure that the integration process is tailored to specific local needs and resources, while maintaining consistency with the overall 2024 hazard mitigation plan.

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the County, there are many existing plans and programs that support hazard risk management, and it is critical that this HMP integrate and coordinate with and complement those existing plans and programs.

The Capability Assessment (Chapter 19) provides a summary and description of the existing plans, programs, and regulatory mechanisms at all levels of government (federal, state, county, and local) that support hazard mitigation within the County. In the jurisdictional annexes in Volume II, each planning partner identified how it has integrated hazard risk management into its existing planning, regulatory, and administrative framework ("existing integration") and how they intend to promote this integration further ("opportunities for future integration").

Planning Partnership representatives will incorporate mitigation planning as an integral component of government operations. They will work with local government officials to integrate hazard mitigation goals and actions into general operations. The sample adoption resolution (Appendix A) states the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Planning Partnership anticipates that:

- Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts.
- The HMP, comprehensive plans, emergency management plans and other relevant planning mechanisms will become mutually supportive documents that work in concert to meet the goals and needs of County residents.

Other planning processes and programs to be coordinated with the recommendations of the HMP include the following:

- Emergency response plans
- Training and exercise of emergency response plans
- Debris management plans
- Recovery plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Community wildfire protection plans
- Comprehensive flood hazard management plans
- Resiliency plans
- Community Development Block Grant Disaster Recovery action plans
- Public information and improved public participation
- Educational programs
- Continued interagency coordination

During the HMP annual review process, participating jurisdictions will be asked to document how they are utilizing and incorporating the HMP into their day-to-day operations and planning and regulatory

processes. Each municipality will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions and include these findings and recommendations in the annual HMP progress report. The checklist in Table 21-2, adapted from FEMA's 2013 Local Mitigation Handbook, will help a community analyze how hazard mitigation is integrated into local plans, ordinances, regulations, and policies. Completing the checklist will help jurisdictions identify areas that currently integrate hazard mitigation and where to make improvements and reduce vulnerability to future development.

TABLE 21-2. SAFE GROWTH CHECK LIST

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Operating, Municipal, and Capital Improvement Program Budgets			
When constructing upcoming budgets, are hazard mitigation actions funded as budget allows?			
Are construction projects evaluated to see if they meet the hazard mitigation goals?			
Does the municipality review mitigation actions when allocating funding during annual budget adoption processes?			
Do budgets limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?			
Do infrastructure policies limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards?			
Do budgets provide funding for hazard mitigation projects identified in the HMP?			
Human Resource Manual			
Do any job descriptions specifically include identifying and/or implementing mitigation projects/actions or other efforts to reduce natural hazard risk?			
Building and Zoning Ordinances			
Prior to zoning changes or development permitting, does the municipality review the HMP and other hazard analyses to ensure consistent and compatible land use?			
Does the zoning ordinance discourage development or redevelopment within natural areas, including wetlands, floodways, and floodplains?			
Does the zoning ordinance contain natural overlay zones that set conditions			
Does the zoning ordinance require developers to take additional actions to mitigate natural hazard risk?			
Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use?			

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Does the zoning ordinance prohibit development within or filling of wetlands, floodways, and floodplains?			
Subdivision Regulations			
Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?			
Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources?			
Do the regulations allow density transfers where hazard areas exist?			
Comprehensive Plan			
Are the goals and policies of the plan related to those of the HMP?			
Does the future land use map clearly identify natural hazard areas?			
Does the plan provide adequate space for expected future growth in areas located outside natural hazard areas?			
Land Use			
Does the future land use map clearly identify natural hazard areas?			
Do the land use policies discourage development or redevelopment in natural hazard areas?			
Transportation Plan			
Does the transportation plan limit access to hazard areas?			
Is transportation policy used to guide growth to safe locations?			
Are transportation systems designed to function under disaster conditions (e.g., evacuation)?			
Environmental Management			
Are environmental systems that protect development from hazards identified and mapped?			
Do environmental policies maintain and restore protective ecosystems?			
Do environmental policies provide incentives to development located outside protective ecosystems?			
Grant Applications			
Are data and maps used as supporting documentation in grant applications?			

Planning Mechanisms	Yes	No	How is it being done or how will this be utilized in the future?
Municipal Ordinances			
Is hazard mitigation a priority when updating municipal ordinances?			
Economic Development			
Does the local economic development group take into account information regarding identified hazard areas when assisting new businesses in finding a location?			
Public Education and Outreach			
Does the municipality have any public outreach mechanisms/ programs in place to inform citizens on natural hazards, risk, and ways to protect themselves during such events?			

21.2.3 Evaluating

Evaluation of the mitigation plan is an assessment of whether the planning process and actions have been effective, whether the HMP goals are being achieved, and whether changes are needed. The HMP Coordinator will consult with the Planning Partnership members to evaluate the effectiveness of the plan implementation and to reflect changes that could affect mitigation priorities or available funding.

The status of the HMP will be discussed and documented at an annual plan review meeting of the Planning Partnership to be held either in person or via teleconference approximately one year from the date of local adoption of this update and successively thereafter. The HMP Coordinator will be responsible for calling participants to coordinate the annual plan review meeting and soliciting input regarding progress toward meeting plan goals and objectives. At least two weeks before the annual plan review meeting, the HMP Coordinator will advise Planning Partnership members of the meeting date, agenda, and expectations of the members. These evaluations will assess whether:

- Goals and objectives address current and expected conditions
- The nature or magnitude of the risks has changed
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available
- Actions were cost effective
- Schedules and budgets are feasible
- Implementation problems are present, such as technical, political, legal, or coordination issues with other agencies
- Outcomes have occurred as expected
- Changes in local resources impacted plan implementation (e.g., funding, personnel, and equipment)
- New agencies, departments, and staff are included, involving other local governments as defined under 44 CFR 201.6.

Specifically, the Planning Partnership will review the mitigation goals, objectives, and activities using performance-based indicators, including:

- New agencies/departments
- Project completion
- Underspending/overspending
- Achievement of the goals and objectives
- Resource allocation
- Timeframes
- Budgets
- Lead/support agency commitment
- Resources
- Feasibility

Finally, the Planning Partnership will evaluate how other programs and policies have conflicted with or augmented planned or implemented mitigation actions and will identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions. Other programs and policies can include those that address:

- Economic development
- Environmental preservation
- Historic preservation
- Redevelopment
- Health and safety
- Recreation
- Land use and zoning
- Public education and outreach
- Transportation

The Planning Partnership should refer to evaluation forms from the FEMA 386-4 guidance document to assist in the evaluation process (Worksheets #2 and #4; see Appendix D). Further, the Planning Partnership should refer to any process and plan review deliverables developed by the County or participating jurisdictions as a part of the plan review processes established for prior or existing local HMPs within the County.

The HMP Coordinator will be responsible for preparing an annual HMP progress report for each year of the approval period based on the information provided by the Planning Partners and other information as appropriate. These annual reports will provide data for the five-year update of this HMP and will assist in pinpointing any implementation challenges. By monitoring the implementation of the HMP, the Planning Partnership will be able to assess which actions are completed, which are no longer feasible, and which require additional funding.

Following any major disasters, the HMP will be evaluated and revised to determine if the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to see if any changes are necessary based on the pattern of disaster damage or if data listed in the hazard profiles of this plan has been collected to facilitate the risk assessment. This is an opportunity to increase the community's disaster resistance and build a better and stronger community.

21.2.4 Updating

44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval to remain eligible for benefits awarded under DMA 2000. It is the intent of the Nevada County HMP Planning Partnership to update this plan on a five-year cycle from the date of initial plan adoption.

To facilitate the update process, the HMP Coordinator, with support of the Planning Partnership, will use the second annual Planning Partnership meeting to develop and commence the implementation of a detailed plan update program. Prior to the five-year update, the HMP Coordinator will invite representatives from Cal OES to provide guidance on plan update procedures. At a minimum, this will establish who will be responsible for managing and completing the plan update effort, items that need to be included in the updated plan, and a detailed timeline with milestones to ensure that the update is completed according to regulatory requirements. At this meeting, the project team will determine what resources will be needed to complete the update and seek to secure these resources.

Following each 5-year update of the HMP, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all Planning Partners.

21.2.5 Grant Monitoring and Coordination

Nevada County intends to be a resource to the Planning Partnership in the support of project grant writing and development. The degree of this support will depend on the level of assistance requested by the Planning Partners during openings for grant applications. As part of grant monitoring and coordination, Nevada County intends to provide the following:

- Notification to Planning Partners about impending grant opportunities
- A current list of eligible, jurisdiction-specific projects for funding pursuit consideration
- Notification about mitigation priorities for the fiscal year to assist the Planning Partners in the selection of appropriate projects.

21.2.6 Continued Public Involvement

The Planning Partners are committed to the continued involvement of the public in the hazard mitigation process. This HMP update will continue to be posted online at the following link: https://nevadacountyca.gov/3830/Local-Hazard-Mitigation-Plan. In addition, public outreach and dissemination of the HMP will include the following:

- Links to the plan on local websites of each jurisdiction with capability

- Continued utilization of existing social media outlets (Facebook, X) to inform the public of natural hazard events, such as floods and severe storms; the public can be educated via the jurisdictional websites on how these applications can be used in an emergency situation
- Promotion of articles or workshops on hazards to educate the public and keep them aware of the dangers of hazards

The HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding this HMP. The public will have an opportunity to comment on the plan via the hazard mitigation website at any time. The HMP Coordinator will ensure that:

- Public and stakeholder comments and input on the plan, and hazard mitigation in general, are collected, recorded, and addressed as appropriate.
- The Nevada County HMP website is maintained and updated as appropriate.
- Copies of the latest approved plan are available for review at appropriate County facilities, along with instructions to facilitate public input and comment on the plan.
- Public notices, including media releases, are made (as appropriate) to inform the public of the availability of the plan, particularly during plan update cycles.

References

AARP. 2022. *How Extreme Heat Affects the Body After 50.* American Association of Retired Persons. July 26. https://www.aarp.org/health/conditions-treatments/info-2022/heat-wave-dangers.html.

Academy of Nutrition and Dietetics. 2024. *Exercise Safely in Hot Weather.* May 17. https://www.eatright.org/fitness/physical-activity/exercise-nutrition/exercise-safely-in-hot-weather.

Associated Press. 2018. *California spent nearly $1.8 billion last year fighting major wildfires.* March 1. https://www.latimes.com/local/lanow/la-me-wildfire-costs-20180301-story.html.

Association of State Dam Safety Officials. 2021. *Dam Failures and Incidents.* Accessed 2023. https://damsafety.org/dam-failures.

—. 2023. *Dams 101.* https://damsafety.org/dams101.

Avalanche.org. 2024. *North American Public Avalanche Danger Scale.* https://avalanche.org/avalanche-encyclopedia/human/resources/north-american-public-avalanche-danger-scale/#:~:text=The%20North%20American%20Public%20Avalanche%20Danger%20Scale%20%28NAPADS%29,%E2%80%93%20Considerable%2C%204%20%E2%80%93%20High%2C%205%20%E2%.

Brown, William M. III, David M. Perkins, Edgar V. Leyendecker, Arthur D. Frankel, James W. II Hendley, and Peter H. Stauffer. 2001. *Hazard Maps Help Save Lives and Property.* July. Accessed April 6, 2022. https://pubs.usgs.gov/fs/1996/fs183-96/fs183-96.pdf.

CAL FIRE. 2024a. *Current Emergency Incidents.* Accessed January 10, 2024. https://www.fire.ca.gov/Incidents.

—. 2024b. "Frequently Asked Questions AboutT: 2023 Fire Hazard Severity Zones." California Department of Forestry and Fire Protection. March 11. Accessed August 9, 2024. https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/fire-hazard-severity-zones-map/2023-fhsz-faqs-march-11-2024.pdf.

Cal OES. 2021. *Dam Safety Planning Division.* Accessed November 17, 2021. https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/dam-safety-planning-division.

—. 2022. *Emergency Proclamations .* October. https://www.caloes.ca.gov/wp-content/uploads/2022/11/Cal-OES-Proclamation-Guide-2022-4.pdf.

—. 2023a. "2023 California State Hazard Mitigation Plan." California Governor's Office of Emergency Services. https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1-Part-5_11.10.2023.pdf.

—. 2023b. *Open State Emergency Proclamations.* November 11. Accessed January 3, 2024. https://www.caloes.ca.gov/office-of-the-director/policy-administration/legal-affairs/emergency-proclamations/.

—. 2023c. *Spill Release Reporting.* California Governor's Office of Emergency Services. Accessed May 2, 2021. https://www.caloes.ca.gov/office-of-the-director/operations/response-operations/fire-rescue/hazardous-materials/spill-release-reporting/#:~:text=In%20California%2C%20any%20significant%20release%20or%20threatened%20release,911%20as%20meeting%20the%20requir.

—. 2024a. *About Cal OES.* https://www.caloes.ca.gov/cal-oes/about-cal-oes/.

—. 2024b. *Open State of Emergency Proclamations.* California Governor's Office of Emergency Services. Accessed April 22, 2024. https://www.caloes.ca.gov/office-of-the-director/policy-administration/legal-affairs/emergency-proclamations/.

California Department of Conservation. 2019. *Earthquakes and Faults.* Accessed November 19, 2021. https://www.conservation.ca.gov/cgs/earthquakes.

—. 2020. *Deep-Seated Landslide Susceptibility.* January 16. https://hub.arcgis.com/maps/cadoc::deep-seated-landslide-susceptiblity/about.

—. 2024. *Post-Wildfire Debris Flows.* Accessed 2024. https://www.conservation.ca.gov/cgs/landslides/debris-flows#:~:text=A%20debris%20flow%20is%20a,damage%20and%20loss%20of%20life.

California Department of Finance. 2007. *Historical Population and Housing Estimates.* August. Accessed February 19, 2024. https://dof.ca.gov/forecasting/demographics/estimates/e-8-historical-population-and-housing-estimates-for-cities-counties-and-the-state-1990-2000/.

—. 2024. *Projections.* https://dof.ca.gov/Forecasting/Demographics/projections/.

California Water Watch. 2022a. *Understanding Our Current Drought.* https://cww.water.ca.gov/droughtindicator.

CBS Sacramento. 2019. *49er Fire Was Once The Third Most Destructive, Now It's Not In Top 20.* May 10. https://www.cbsnews.com/sacramento/news/49er-fire-destruction/.

CCAHA. 2019. *Winterizing Historic Buildings.* December 4. Accessed August 31, 2023. https://ccaha.org/resources/winterizing-historic-buildings.

CDC. 2005. *Extreme Cold.* March 22. Accessed September 1, 2023. https://www.cdc.gov/disasters/winter/pdf/extreme-cold-guide.pdf.

—. 2012. "Natural Disasters and Severe Weather." *Center for Disease Control and Protection.* December 03. Accessed August 27, 2023. https://www.cdc.gov/disasters/winter/guide.html.

—. 2016. *Extreme Heat.* https://www.cdc.gov/disasters/extremeheat/index.html.

—. 2017. Centers for Disease Control and Prevention. https://www.cdc.gov/disasters/extremeheat/medical.html.

—. 2018. *Sun Exposure.* June 1. Accessed September 8, 2023. https://www.cdc.gov/niosh/topics/sunexposure/default.html.

—. 2020. *Heat Stress.* August 31. Accessed September 8, 2023. https://www.cdc.gov/niosh/topics/heatstress/default.html.

—. 2021. *Health Impacts of Drought.* March 21. https://www.cdc.gov/nceh/drought/implications.htm.

—. 2022a. *Extreme Heat.* June 17. Accessed September 1, 2023. https://www.cdc.gov/disasters/extremeheat/index.html.

—. 2022b. *Heat Stress – Heat Related Illness.* May 13. https://www.cdc.gov/niosh/topics/heatstress/heatrelillness.html#exhaustion.

—. 2022c. *Pregnant Women.* Centers for Disease Control and Prevention. https://www.cdc.gov/disasters/extremeheat/heat_and_pregnant_women.html#:~:text=Why%20are%20pregnant%20women%20more,body%20and%20the%20developing%20baby.

Center for Disaster Resilience. 2016. *The Growing Threat of Urban Flooding: A National Challenge.* https://cdr.umd.edu/sites/cdr.umd.edu/files/resource_documents/COMPRESSEDurban-flooding-report-online-compressed-0319.pdf.

City of Grass Valley. 2024. "Local Emergency Proclamation (Drought Conditions)." City of Grass Valley City Council Agenda Action Sheet. January 9. Accessed August 9, 2024. https://mccmeetingspublic.blob.core.usgovcloudapi.net/grassvalca-meet-157b43dda86040989b9116f7fae2e3fd/ITEM-Attachment-001-ce78acc0337e4a04adc0a74d78e37bcd.pdf.

Columbia University. 2023. *Columbia University Irving Medical Center.* https://www.cuimc.columbia.edu/news/heat-stroke-kids-what-watch-and-know#:~:text=%E2%80%9CHeatstroke%20is%20a%20serious%20medical,cannot%20take%20care%20of%20themselves.

De La Torre, Amanda. 2021. *The Different Types of Wildland Fires.* February 26. Accessed July 1, 2022. https://www.supplycache.com/blogs/news/the-different-types-of-wildland-fires.

DSOD. 2024. Accessed 2024. https://fmds.water.ca.gov/maps/damim/.

DTSC, Department of Toxic Substances Control. 2023. *About DTSC.* Accessed May 2, 2023. https://dtsc.ca.gov/who-we-are/.

DWR. 2018. "Making Water Conservation a California Way of Life." *water.ca.gov.* Department of Water Resources. November. Accessed January 24, 2024. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Final-WCL-Primer.pdf?la=en&hash=B442FD7A34349FA91DA5CDEFC47134EA38ABF209.

—. 2020. *Urban Water Use Efficiency Standards, Variances and Performance Measures.* Department of Water Resources. August 31. Accessed January 24, 2024. https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/Urban-Water-Use-Efficiency-Standards-Variances-and-Performance-Measures.

—. 2021a. *Definitions for Downstream Hazard and Condition Assessments.* California Department of Water Resources Division of Safety of Dams . September. Accessed April 6, 2023. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/Division-of-Safety-of-Dams-Definitions-for-Downstream-Hazard-and-Condition-Assessment.pdf.

—. 2021b. *Drought in California.* https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Publications-And-Reports/DroughtBrochure2021update_ay11.pdf.

EDD. 2024. *Major Employers in Nevada County.* California Employment Development Department. https://labormarketinfo.edd.ca.gov/majorer/countymajorer.asp?CountyCode=000057.

FAO. 2019. *Proactive drought management.* November. Accessed August 28, 2023. https://www.fao.org/climate-smart-agriculture/knowledge/practices/drought/en/.

FEMA. 1997. *Multi Hazard Identification and Risk Assessment.* Technical, FEMA. http://www.fema.gov/library/viewRecord.do?id=2214.

FEMA. 2003. *State and Local Mitigation Planning how-to guide: Developing the Mitigation Plan; identifying mitigation actions and implementation strategies.* Federal Emergency Management Agency. https://mitigation.eeri.org/wp-content/uploads/FEMA_386_3.pdf.

—. 2007. *Types of Floods and Floodplains.* jULY 12. Accessed aUGUST 6, 2023. https://training.fema.gov/hiedu/docs/fmc/chapter%202%20-%20types%20of%20floods%20and%20floodplains.pdf#:~:text=If%20local%20drainage%20conditions%20are%20inadequate%20to%20accommodate,in%20certain%20areas%20may%20cause%20localized%20flooding%20problems.

—. 2010. *Flood Insurance Study, Nevada County, California and Incorporated Areas.* February 3. https://map1.msc.fema.gov/data/06/S/PDF/06057CV000A.pdf?LOC=ea414de9701adea41465342d35bbb0c0.

—. 2013a. *Federal Guidlines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures.* July. https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_inundation-mapping-flood-risks.pdf.

—. 2013b. *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures.* July. https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_inundation-mapping-flood-risks.pdf.

FEMA. 2013c. *Mitigation Ideas; A Resource for Reducting Risk to Natural Hazards.* Federal Emergency Management Agency. https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf.

—. 2013d. *Living With Dams.* February. Accessed June 13, 2023. https://www.fema.gov/sites/default/files/2020-08/fema_living-with-dams_p-956.pdf.

—. 2016. *Be Aware of Potential Risk of Dam Failure in Your Community.* https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_aware-community_fact-sheet_2016.pdf.

—. 2018. "Mitigation Planning and the Community Rating System Key Topics Bulletin." October. https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-planning-and-the-community-rating-system-key-topics-bulletin_10-1-2018.pdf.

—. 2019. *Riverine Flooding.* Accessed January 03, 2023. https://hazards.fema.gov/nri/riverine-flooding.

—. 2020a. *Flood Zones.* https://www.fema.gov/glossary/flood-zones.

—. 2020b. *Participation in the NFIP.* July 08. Accessed April 10, 2023. https://www.fema.gov/glossary/participation-nfip.

—. 2021. "FEMA Fact Sheet: FEMA National Dam Safety Program Overview." Federal Emergency Management Agency. June. Accessed 2023. https://www.fema.gov/sites/default/files/documents/fema_nsdp-overview-fact-sheet.pdf.

—. 2022a. *FEMA Fact Sheet – Understanding Risk Rating 2.0: Equity in Action.* February. https://agents.floodsmart.gov/sites/default/files/fema-Risk-Rating-2.0-Fact-Sheet-2022.pdf.

—. 2022b. "FEMA Region 3 High Hazard Potential Dams: State Mitigation Planning Tips." Federal Emergency Management Agency. September. Accessed 2023. https://www.fema.gov/sites/default/files/documents/fema_r3_high-hazard-potential-dams_state-mitigation.pdf.

FEMA. 2022c. *Local Mitigation Planning Policy Guide.* OMB Collection #1660-0062, Federal Emergency Management Agency. Accessed December 2023. https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf.

—. 2023a. *Disaster Declarations for States and Counties.* Accessed 2023. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.

FEMA. 2023b. *Local Mitigation Planning Handbook.* Federal Emergency Management Agency. Accessed December 2023. https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-handbook_052023.pdf.

—. 2023c. *National Dam Safety Program Strategic Plan.* June. https://www.fema.gov/sites/default/files/documents/fema_ndsp-strategic-plan-fy24-29.pdf#:~:text=The%20National%20Dam%20Safety%20Program%20%28NDSP%29%20is%20a,property%2C%20and%20the%20environment%20from%20dam%20related%20hazards.

—. 2023d. *Summary of FEMA Hazard Mitigation Assistance (HMA) Programs.* https://www.fema.gov/fact-sheet/summary-fema-hazard-mitigation-assistance-hma-programs.

—. 2024a. *Community Information System.* Federal Emergency Management Agency. Oracle-based system available to registered users only.

—. 2024b. *Community Lifelines.* Federal Emergency Management Agency. March 8. Accessed 2024. https://www.fema.gov/emergency-managers/practitioners/lifelines.

—. 2024c. *Disaster Declarations for States and Counties.* Federal Emergency Management Agency. Accessed April 12, 2024. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.

—. 2024d. *National Flood Insurance Program Pivot General Support System.* Federal Emergency Management Agency. https://pivot.fema.gov (requires registration).

—. n.d.-a. *Avalanche.* Accessed 2024. https://community.fema.gov/ProtectiveActions/s/article/Avalanche.

—. n.d.-b. *Earthquake.* Accessed 2024. https://hazards.fema.gov/nri/earthquake.

—. n.d.-c. *Hazard Mitigation Assistance Grants.* Federal Emergency Management Agency. Accessed December 2023. https://www.fema.gov/grants/mitigation.

—. n.d.-d. "Soil and Rock Types." Accessed June 13, 2024. https://training.fema.gov/emiweb/earthquake/neh0102360.htm.

Go Nevada County. 2024a. *Events all year for everyone.* https://gonevadacounty.com/festivals-special-events/.

—. 2024b. *Nevada County – Home To 4 Scenic And Unique California State Parks.* https://gonevadacounty.com/california-state-parks/.

Gordian. 2024. *Construction Cost Estimating Software.* https://rsmeans.com.

Harris, T. 2008. *How Floods Work.* http://science.howstuffworks.com/flood.htm.

Haygot Technologies. 2020. *Forest Fire or Wildfire.* Accessed July 1, 2022. https://www.toppr.com/ask/content/concept/man-made-disaster-fire-accident-206070/.

IPCC. 2016. *Food Security Chapter 5 "Drought".* https://www.ipcc.ch/srccl/.

Microsoft. 2020. "National building footprint data in GIS format." *USBuildingFootprints.* Microsoft Maps. https://github.com/microsoft/USBuildingFootprints?tab=readme-ov-file.

Monterey County Office of Emergency Services. 2022a. *Dam Failure.* https://www.countyofmonterey.gov/government/departments-a-h/administrative-office/office-of-emergency-services/ready-monterey-county/hazard-ready/dam-failure.

MRLC. 2021. "2021 land cover data for the continental United States." *National Land Cover Database; 2021 CONUS Land Cover.* Multi-Resolution Land Characteristics Consortium. https://www.mrlc.gov/viewer/.

National Academies of Sciences, Engineering, and Medicine. 2022. *Resilience for Compounding and Cascading Events.* Washington, DC: : The National Academies Press. Accessed December 2023. https://nap.nationalacademies.org/read/26659/chapter/3.

National Geographic. 2023. *Urban Heat Island.* https://education.nationalgeographic.org/resource/urban-heat-island/.

National Wildfire Coordinating Group. 2021. *Glossary of Wildland Fire Terminology.* July. Accessed July 1, 2022. https://www.nwcg.gov/sites/default/files/data-standards/glossary/pms205.pdf.

NC State University. 2013. *Temperatures Moderate and Drought Abates in April.* May 10. https://climate.ncsu.edu/blog/2013/05/climate-summary-april-2013/.

NCTC. 2015. *About NCTC.* https://www.nctc.ca.gov/About-NCTC/index.html.

NDMC. 2024. *How Does Drought Affect Our Lives?* National Drought Mitigation Center. Accessed January 24, 2024. https://drought.unl.edu/Education/DroughtforKids/DroughtEffects.aspx#:~:text=Economic%20impacts%20are%20those%20impacts%20of%20drought%20that,money%20on%20irrigation%20or%20to%20drill%20new%20wells.

Nevada County. 1995. "Nevada County General Plan Section 3: Resource Conservation and Development."

Nevada County. 2017. "Nevada County Local Hazard Mitigation Plan Update."

—. 2023a. *2022 Crop and Livestock Report.* https://www.nevadacountyca.gov/ArchiveCenter/ViewFile/Item/1520.

—. 2023b. *Census Maps.* Accessed February 19, 2024. https://nevadacountyca.gov/627/Census-Maps.

Nevada County Executive Office. 2021. "DEMOGRAPHIC & STATISTICAL PROFILE." *Nevadacountyca.gov.* May. Accessed February 16, 2024. https://nevadacountyca.gov/DocumentCenter/View/38786/Nevada-County-Demographic-and-Statistical-Profile.

Nevada County GIS. 2020. *Community Boundaries, Nevada County, California, 2020.* Nevada County Geographic Information Systems. Accessed 2024. https://hgl.harvard.edu/catalog/stanford-jv998wc1572.

—. 2022. "Parcel address information in GIS format." *Parcel_Situs_Address.shp.* Nevada County Geographic Information System Division.

—. 2023a. "Various data in GIS format." *Open Data Portal.* Nevada County Geographic Information System Division. https://maps-nevcounty.opendata.arcgis.com/.

—. 2023b. "Tax assessor parcel information in GIS format." *Parcel_Information.shp.* Nevada County Geographic Information System Division.

Nevada County. n.d. *Human Resources.* https://www.nevadacountyca.gov/471/Human-Resources.

—. n.d. *Nevada County California.* Accessed June 12, 2024. https://nevadacountyca.gov/.

Nevada County OES. 2023. *Wildfire Hazard Assessment.* Memorandum. June 2023, Nevada County Office of Emergency Services.

—. n.d. *About OES.* Nevada County Office of Emergency Services. Accessed June 12, 2024. https://nevadacountyca.gov/3812/About-OES.

NIDIS. 2019. *Fire.* April 5. Accessed August 28, 2023. https://www.drought.gov/drought/data-maps-tools/fire.

—. n.d. *Ecosystems - Drought.* National Integrated Drought Information System. Accessed 2024. https://www.drought.gov/sectors/ecosystems.

NIHHIS. n.d. *Who Is Most At Risk To Extreme Heat?* National Integrated Heat Health Information System. Accessed August 9, 2024. https://www.heat.gov/pages/who-is-at-risk-to-extreme-heat.

NOAA. 2023. *Winter Weather Basics.* January 4. Accessed August 27, 2023. https://www.nssl.noaa.gov/education/svrwx101/winter/#:~:text=Most%20deaths%20from%20win

ter%20storms%20are%20not%20directly,threat%20to%20you%20depends%20on%20your%20specific%20situation.

—. 2024. *Drought Basics.* National Oceanic and Atmospheric Administration. Accessed January 24, 2024. https://www.drought.gov/what-is-drought/drought-basics.

NOAA NCEI. 2024. *Storm Events Database.* https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Cold%2FWind+Chill&eventType=%28Z%29+Excessive+Heat&eventType=%28Z%29+Extreme+Cold%2FWind+Chill&eventType=%28Z%29+Frost%2FFreeze&eventType=%28C%29+Hail&eventType=%28Z%29+Heat&eventType=.

NOAA. n.d. *Severe Weather 101 - Floods .* Accessed April 6, 2022. https://www.nssl.noaa.gov/education/svrwx101/floods/.

NoRTEC. 2019. *Nevada County Labor Market Profile and Industry Sector Analysis.* Northern Rural Training and Employment Consortium . July. https://nevadacountyca.gov/DocumentCenter/View/32412/Nevada-County-Labor-Market-Profile-Report_NorTechPDF#:~:text=Nevada%20County%E2%80%99s%20largest%20industry%20sectors%20include%20Government%3B%20Health,Care%20and%20Social%20Assistance%3B%20Constructio.

NPS. 2015. *The Eruption of Lassen Peak.* https://www.nps.gov/lavo/learn/nature/eruption_lassen_peak.htm.

—. 2016. *Climate Change Impacts on Cultural Resources.* National Park Service. Accessed 2024. https://www.nps.gov/subjects/climatechange/impactsonculturalresources.htm.

—. 2021. *Cultural Resource Data for Fire Management.* National Park Service. August 31. Accessed 2024. https://www.nps.gov/articles/cultural-resource-data-for-fire-management.htm#:~:text=The%20impact%20to%20cultural%20resources,trenching%2C%20archeological%20sites%20may%20erode.

NSIDC. n.d. *Snow.* Accessed August 27, 2023. https://nsidc.org/learn/parts-cryosphere/snow/why-snow-matters#:~:text=Faster%20snow%20cover%20retreat%20means%20earlier%20soil%20exposure%2C,runoff%20potentially%20leaves%20rivers%20drier%20in%20late%20summer.

NWS. 2009a. *Flash Flood.* http://w1.weather.gov/glossary/index.php?word=flash+flood.

—. 2009b. *National Weather Service Glossary.* June 25. https://forecast.weather.gov/glossary.php.

—. 2009c. *National Weather Service Glossary.* June 25. https://w1.weather.gov/glossary/.

—. 2011. *Flood Safety.* http://www.erh.noaa.gov/car/WCM/Awareness_Campaigns_files/flood_part_1.htm.

—. 2019a. *Flood Related Hazards.* September 16. Accessed January 03, 2023. https://www.weather.gov/safety/flood-hazards.

—. 2019b. *Ice Storms.* July 31. Accessed August 27, 2023. https://www.weather.gov/safety/winter-ice-frost.

—. 2019c. *Snow Storm Safety.* July 31. Accessed August 27, 2023. https://www.weather.gov/safety/winter-snow.

NWS. 2021a. *Definitions, Threshold, Criteria for Warning.* NWS.

—. 2021b. *NWS Heat Forcasting Tools.* 06 2. Accessed 2021. https://www.weather.gov/safety/heat-index.

—. 2021c. *Wind Chill Chart.* 06 01. Accessed 2021. https://www.weather.gov/safety/cold-wind-chill-chart.

—. 2022. *Stay Safe in the Extreme Cold.* February 8. Accessed Augut 27, 2023. https://www.weather.gov/dlh/extremecold.

—. 2024. *Drought Information.* National Weather Service. Accessed January 24, 2024. https://www.cpc.ncep.noaa.gov/products/Drought/.

—. n.d.-a. *Avalanche Safety.* Accessed June 5, 2024. https://www.weather.gov/safety/winter-avalanche#:~:text=%2B%20Avalanche%20Warning%20Signs%201%20You%20see%20an,Significant%20warming%20or%20rapidly%20increasing%20temperatures%20More%20items.

—. n.d.-b. *Cold Weather Safety.* Accessed August 27, 2023. https://www.weather.gov/safety/cold.

—. n.d.-c. *Estimating Wind.* Accessed June 26, 2024. https://www.weather.gov/pqr/wind.

—. n.d.-d. *NOAA Observation Systems.* Accessed October 29, 2023. https://www.weather.gov/about/observation-equipment.

—. n.d.-e. *NWS Forecast Office Sacramento, CA.* Accessed May 31, 2024. https://www.weather.gov/sto/#.

—. n.d.-f. *NWS StormReady Program.* Accessed June 23, 2023. https://www.weather.gov/stormready/.

—. n.d.-g. *WINTER STORMS AND BLIZZARDS.* Accessed October 29, 2023. https://www.weather.gov/fgz/WinterStorms.

OPR, CNRA, CEC. 2018. *California's Fourth Climate Change Assessment.* California Governor's Office of Planning and Research; California Natural Resources Agency; California Energy Commission. Accessed October 11, 2023. https://climateassessment.ca.gov/.

OSHA. 2023. *Heat Illness at Work.* Occupational Health and Safety Administration. https://www.osha.gov/heat-exposure#:~:text=Workers%20suffering%20from%20heat%20stroke,Related%20Illnesses%20and%20First%20Aid.

PBS News. 2022. "California has some of the worst air quality in the country. The problem is rooted in the San Joaquin Valley." June 16. https://www.pbs.org/newshour/nation/california-has-some-of-the-worst-air-quality-in-the-country-the-problem-is-rooted-in-the-san-joaquin-valley#:~:text=Heat%20is%20a%20major%20contributor%20to%20ozone%20pollution%2C,the%20air%20in%20California%20and%20oth.

Peitzsch, Erich H., Gregory T. Pederson, Karl W. Birkeland, Jordy Hendrikx, and Daniel B. Fagre. 2021. "Climate drivers of large magnitude snow avalanche years in the U.S. ." *Scientific Reports.*

PHMSA. 2024. *Hazmat Incident Report Search.* Pipeline and Hazardous Materials Safety Administration. Accessed April 24, 2024. https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPublic%20Website%20Pages%2F_portal%2FHazmat%20Incident%20Report%20Search.

Pyroanalysis LLC, and Ladris Technologies. 2024. "Nevada County Evacuation Study." *Ready Nevada County.* Prepared for Nevada County Office of Emergency Services. February. Accessed August 2024. https://nevadacountyca.gov/DocumentCenter/View/53213/Nevada_County_Evacuation_Study_2024.

RCRCD. n.d. *What is a Watershed?* Riverside-Coronoa Resource Conservation District. Accessed 2024. https://www.rcrcd.org/what-is-a-watershed.

Seismic Safety Commission. n.d. *California Volcano Information.* Accessed June 12, 2024. https://ssc.ca.gov/disasters/volcano/.

Sesana, Elena, Alexandre S. Gagnon, Chiara Ciantelli, JoAnn Cassar, and John J. Hughes. 2021. "Climate change impacts on cultural heritage: A literature review." *WIREs Climate Change*, March 15: 1-29. https://wires.onlinelibrary.wiley.com/doi/epdf/10.1002/wcc.710.

Sierra Avalanche Center. n.d. *About Us.* Accessed June 5, 2024. https://www.sierraavalanchecenter.org/about.

State of California. 2018. "California's Fourth Climate Change Assessment, Sierra Nevada Region Report."

—. 2023. "Various datasets in GIS format." *California State Geoportal.* https://gis.data.ca.gov/.

Tiwari, A., and J.W. Rachlin. 2018. "A Review of Road Salt Ecological Impacts." *Northeastern Naturalist* 123-142. https://www.jstor.org/stable/26453969.

Town of Truckee. 2023. "Building structure inventory data in GIS format."

—. 2024. "Sewer lift station data in GIS format." *SewerLift_Stations.*

Truckee Tahoe Airport District. n.d. *TRUCKEE TAHOE AIRPORT "History and Stats".* Accessed May 30, 2024. https://truckeetahoeairport.com/documents/405-ttad_history_and_stats_updated_08-2018-pdf.

U.S. Census Bureau. 2020. *2020 U.S. Census Results.* Accessed February 19, 2024. https://www.census.gov/2020results.

—. 2021. *American Community Survey.* https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2021&s_tablename=TABLE3&s_bygroup1=1&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1.

—. 2023. *QuickFacts, Nevada County, California.* https://www.census.gov/quickfacts/fact/table/nevadacountycalifornia/BPS030221.

—. 2024. *ACS Population Estimates .* Accessed February 19, 2024. https://data.census.gov/table/ACSST1Y2022.S0601?q=Nevada%20County,%20California.

U.S. Department of the Interior. 2012. "Integrating and Coordinating Wildland Fire and Invasive Species Management Efforts." October 12. https://www.doi.gov/sites/doi.gov/files/nisc-wflcmemo-final-10-12-2022.pdf.

U.S. DHS Ready. 2024. *Avalanche.* Accessed 2024. https://www.ready.gov/avalanche#:~:text=An%20avalanche%20is%20a%20large,from%20suffocation%2C%20trauma%20or%20hypothermia.

U.S. EPA. 2019. *Heat Island Effect.* US EPA. https://www.epa.gov/heat-islands.

—. 2023a. *Climate Adaptation and EPA's Role.* U.S. Environmental Protection Agency. September 6. Accessed December 2023. https://www.epa.gov/climate-adaptation/climate-adaptation-and-epas-role.

—. 2023b. *Health and Ecological Hazards Caused by Hazardous Substances.* January 3. Accessed June 15, 2023. https://www.epa.gov/emergency-response/health-and-ecological-hazards-caused-hazardous-substances.

—. 2023c. *Search for Superfund Sites Where You Live.* U.S. Environmental Protection Agency. . October. Accessed June 2023. https://www.epa.gov/superfund/search-superfund-sites-where-you-live.

—. 2023d. *TRI Explorer.* May. Accessed September 7, 2023. https://enviro.epa.gov/triexplorer/release_chem?p_view=COCH&trilib=TRIQ1&sort=_VIEW_&so

rt_fmt=1&state=06&county=06037&chemical=All+chemicals&industry=ALL&year=2021&tab_rpt=1&fld=RELLBY&fld=TSFDSP.

—. 2024. *Dealing with Debris and Damaged Buildings.* U.S. Environmental Protection Agency. May 22. Accessed May 23, 2024. https://www.epa.gov/natural-disasters/dealing-debris-and-damaged-buildings#:~:text=Remove%20wet%20materials%20and%20discard%20those%20that%20cannot,will%20likely%20remain%20a%20source%20of%20mold%20growth.

U.S. Forest Service. 2019. *County of Placer Community Development Resource Agency.* Accessed August 4, 2022. https://www.placer.ca.gov/2680/Squaw-Valley-Alpine-Meadows-Base-to-Base.

—. n.d. *Welcome to the Tahoe!* Accessed April 29, 2024. https://www.fs.usda.gov/main/tahoe/about-forest/about-area.

U.S. Geological Survey. 2006. "Landslide Types and Processes." *USGS Maps, Products & Publications.* January. Accessed 2021. https://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf.

—. 2021. *Earthquake Magnitude, Energy Release, and Shaking Intensity.* Accessed April 6, 2022. https://www.usgs.gov/natural-hazards/earthquake-hazards/science/earthquake-magnitude-energy-release-and-shaking-intensity?qt-science_center_objects=0#qt-science_center_objects.

University of Cambridge. 2021. *Climate change will transform cooling effects of volcanic eruptions, study suggests.* August 12. https://www.cam.ac.uk/stories/volcanoesandclimate.

USACE. 2021. *2021/2022 Nationwide Permits.* U.S. Army Corps of Engineers. https://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Permits/2017-Nationwide-Permits/#:~:text=These%2041%20NWPs%20and%20their%20general%20conditions%20and,%28NWPs%29%20and%20the%20issuance%20of%204%20new%20NWPs.

—. n.d. *About Us.* Accessed May 10, 2023. https://www.usace.army.mil/About/.

—. n.d. *National Inventory of Dams.* Accessed August 29, 2022. https://nid.sec.usace.army.mil/#/dams/.

USBR. 2003. *Probabilistic Extreme Flood Hydrographs That Use PaleoFlood Data for Dam Safety Applications.* June. Accessed August 4, 2023. https://www.usbr.gov/ssle/damsafety/TechDev/DSOTechDev/DSO-03-03.pdf.

USDA. 2023. *2022 Census of Agriculture, County Profile, Nevada County, California.* https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/California/cp06057.pdf.

—. 2023a. *Disaster Designation Information.* U.S. Department of Agriculture. https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.

—. n.d. "Fire Effects on the Environment." Accessed 2022. https://www.fs.usda.gov/pnw/page/fire-effects-environment.

USDOT. 2023. *Pipeline and Hazerdous Materials Safety Administration.* US Department of Transportation. Accessed May 2, 2023. https://www.phmsa.dot.gov/.

USGS. 2003. *National Landslide Hazards Mitigation Strategy.* Accessed 2024. https://pubs.usgs.gov/circ/c1244/c1244.pdf.

—. 2004. *Landslide Types and Processes.* July. Accessed July 10, 2023. https://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html.

—. 2005. *Volcano Hazards of the Lassen Volcanic National Park Area, California.* https://pubs.usgs.gov/fs/2000/fs022-00/.

—. 2011. *ShakeMap Scientific Background.* March 9. Accessed April 6, 2022. https://web.archive.org/web/20110623092131/http://earthquake.usgs.gov/earthquakes/shakemap/background.php#intmaps.

—. 2012. *Map of moderate, high and very high threat volcanoes in CA.* https://www.usgs.gov/media/images/map-moderate-high-and-very-high-threat-volcanoes-ca.

—. 2016a. *Effects of Urban Development on Floods.* November 29. Accessed August 6, 2023. https://pubs.usgs.gov/fs/fs07603/#:~:text=The%20changes%20in%20land%20use%20associated%20with%20urban,and%20frequency%20of%20floods%20increase%20in%20nearby%20streams.

—. 2016b. *Ground Water and the Rural Homeowner.* November 30. Accessed August 6, 2023. https://pubs.usgs.gov/gip/gw_ruralhomeowner/#:~:text=In%20addition%20to%20seasonal%20fluctuations%20in%20ground-water%20storage%2C,years%20of%20above-normal%20precipitation%20causes%20a%20corresponding%20rise.

—. 2018. *2018 Long-term National Seismic Hazard Map.* Accessed April 6, 2022. https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map.

—. 2018. "2018 Update to the U.S. Geological Survey National Volcanic." https://pubs.usgs.gov/sir/2018/5140/sir20185140.pdf.

—. 2019. *Living with Volcano Hazards.* https://pubs.usgs.gov/fs/2018/3075/fs2018-3075.pdf.

—. 2020a. *Drought, FIre and Extreme Weather.* https://www.usgs.gov/ecosystems/climate-adaptation-science-centers/science/drought-fire-and-extreme-weather.

—. 2020b. *Ground Failure.* https://earthquake.usgs.gov/data/ground-failure/.

—. 2021. *The Modified Mercalli Intensity Scale.* Accessed April 6, 2022. https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects.

—. 2022. *Landslide 101.* https://www.usgs.gov/programs/landslide-hazards/landslides-101.

—. 2023. *Water Quality After Wildfire.* April 11. Accessed August 30, 2023. https://www.usgs.gov/mission-areas/water-resources/science/water-quality-after-wildfire#:~:text=Wildfires%20pose%20a%20substantial%20risk%20to%20water%20supplies,nutrients%2C%20and%20metals%20to%20rivers%2C%20lakes%2C%20and%20reservoirs.

—. n.d.-a. *About Volcanoes.* Accessed June 12, 2024a. https://www.usgs.gov/programs/VHP/about-volcanoes#:~:text=Volcanoes%20are%20openings%2C%20or%20vents%20where%20lava%2C%20tephra,eruptions%20can%20last%20days%2C%20months%2C%20or%20even%20years.

—. n.d.-b. *Did You Feel It?* Accessed 15 2024, April. https://earthquake.usgs.gov/data/dyfi/.

—. n.d.-c. *Landslide Basics.* U.S. Geological Survey. https://www.usgs.gov/programs/landslide-hazards/landslide-basics.

—. n.d.-d. *The Science of Earthquakes.* Accessed 2024. https://www.usgs.gov/programs/earthquake-hazards/science-earthquakes.

—. n.d.-e. *Volcanic Explosivity Index (VEI).* Accessed June 12, 2024a. https://www.usgs.gov/media/images/volcanic-explosivity-index-vei-a-numeric-scale-measures-t.

—. n.d.-f. *What are the Effects of Earthquakes?* Accessed August 28, 2023. https://www.usgs.gov/programs/earthquake-hazards/what-are-effects-earthquakes.

WHO. 2024. *Wildfires.* Accessed 2024. https://www.who.int/health-topics/wildfires#tab=tab_1.

APPENDIX A: Planning Partner HMP Adoption Resolutions

Model Adoption Resolution

The following is an example resolution to be submitted by participating jurisdictions authorizing adoption of the Nevada County Hazard Mitigation Plan.

RESOLUTION NO. XXXX-XX
A RESOLUTION OF THE Governing Body OF THE Jurisdiction Name
AUTHORIZING THE ADOPTION OF THE
2024 NEVADA COUNTY HAZARD MITIGATION PLAN

WHEREAS Nevada County and its jurisdictions recognize the threat that natural hazards pose to people and property within Nevada County; and

WHEREAS the County and its jurisdictions have prepared a hazard mitigation plan, hereby known as the 2024 Nevada County Hazard Mitigation Plan, in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the 2024 Nevada County Hazard Mitigation Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Nevada County and its jurisdictions from the impacts of future hazards and disasters; and

WHEREAS adoption by Nevada County and its jurisdictions demonstrates commitment to hazard mitigation and achieving the goals outlined in the 2024 Nevada County Hazard Mitigation Plan.

NOW THEREFORE, BE IT RESOLVED BY THE [JURISDICTION NAME], CALIFORNIA, THAT:

In accordance with (local rule for adopting resolutions), the (jurisdiction name) adopts the 2024 Nevada County Hazard Mitigation Plan. While content related to Nevada County and [jurisdiction name] may require revisions to meet the plan approval requirements, changes occurring after adoption will not require [jurisdiction name] to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of [XX] in favor and [XX] against, and [XX] abstaining, this [XX] day of [Month], [Year].

By:	(print name)
ATTEST By:	(print name)
APPROVED AS TO FORM By:	(print name)

Approved Planning Partner Adoption Resolutions

The Nevada County and participating jurisdiction adoption resolutions will be included in this appendix upon receipt of the Federal Emergency Management Agency Approval Pending Adoption status.

INSERT RESOLUTIONS WHEN AVAILABLE

APPENDIX B: Meeting Documentation

The following pages include meeting agendas, sign-in sheets, and minutes (where appliable and available) for meetings convened as part of the planning process for the 2024 Nevada County Hazard Mitigation Plan.

Nevada County Multijurisdictional Hazard Mitigation Plan
Kickoff Meeting Agenda
12 noon – 1400 | August 28, 2023

Welcome & Introductions

- Nevada County & planning partners – Paul Cummings
- Tetra Tech – Bart Spencer

Project Overview

- What is hazard mitigation | how does it relate to emergency management | benefits
- Governance & guidance

Planning Process

- Planning partners – requirements
- Leadership and oversight
    - Planning Team – members | time commitment | roles & responsibilities
    - Steering Committee – members | time commitment | roles & responsibilities
- Plan framework
    - Goals, objectives, mission statement
- Timeline and process overview
    - Review of past action items

Hazards Analysis & Risk Assessment

- Review of past hazards
- Identify current natural hazards and other hazards of interest
- Data requests

Public Engagement

- Strategy & methodology
    - Website
    - Survey
    - Story map
    - Social media
    - Local connections
    - Socially vulnerable communities

Questions

Action Items / tasks / next steps

- Planning team members & meeting dates
- Steering committee members & meeting dates
- Review of past action items
- Data request

Nevada County
Meeting Summary

Purpose of Meeting:	Nevada County Hazard Mitigation Plan Project Kickoff Meeting
Location of Meeting:	950 Maidu Avenue, Suite 130, Nevada City, CA + Virtual
Date of Meeting:	08.28.2023, 12:00 p.m. – 2:00 p.m.

Attendees:

☒ Paul Cummings, Nevada Co., OES Program Manager
☒ Craig Greisbach, Nevada Co., OES Director
☒ Alessandra Zambrano, Nevada Co., Wildfire Coordinator
☒ Lindsey Gordon, Nevada Co., GIS Analyst
☒ Robert Womack, City of Truckee, Emergency Services Coordinator
☒ Mark Buttron, Grass Valley Fire Department, xxx
☒ Kevin McKechnie, Truckee Fire Protection District, Chief
☒ Steven Poncelet, Truckee Donner Public Utility District, PIO
☒ Greg Jones, Nevada Irrigation District, Assistant Manager
☒ Chip Close, Nevada Irrigation District, Director of Water Operations
☒ Sarah Murdock, Cal OES, Emergency Services Coordinator
☒ Sean Grayson, Nevada City, City Manager
☒ Sam Goodspeed, Nevada City, Fire Division Chief
☒ Scott Botn, TDPUD, Risk & Compliance Specialist

☒ Bart Spencer, Tetra Tech, Project Manager
☒ Jake Poland, Tetra Tech, Planner
☐ Kami Spahn, Tetra Tech, GIS Lead
☒ Jenn Lenart, Tetra Tech, GIS Coordinator

Meeting Summary:

Item No.	Description	Action/Decision item(s):

1	**Welcome & Introductions**
	• Tetra Tech
	  ○ Bart Spencer – Director of Emergency Management
	  ○ Jenn Lenart – GIS Coordinator
	  ○ Jake Poland – Planner
	• Nevada Co. & Stakeholders
	  ○ Paul Cummings – Nevada Co. OES Program Manager
	  ○ Craig Greisbach – Nevada Co. OES Director
	  ○ Alessandra Zambrano – Nevada Co. Wildfire Coordinator
	  ○ Mark Buttron – Grass Valley FD
	  ○ Robert Womack- City of Truckee Emergency Services Coordinator
	  ○ Steven Poncelet – Truckee Donner Public Utility District
	  ○ Lindsey Gordon – GIS Analyst	

	○ Greg Jones – Assistant Manager at Nevada Irrigation District ○ Chip Close – Director of Water Operations at Nevada Irrigation District ○ Kevin McKechnie – Chief at Truckee Fire Protection District ○ Sarah Murdock – Cal OES Emergency Services Coordinator	
2	**Project Overview** • What is hazard mitigation? ○ 4 phases of the emergency management cycle ○ These phases overlap - no defined start or stop to each phase ○ Hazard mitigation can be defined as: "Sustained action taken to reduce or eliminate long term risk to life and property" • Benefits of the Hazard Mitigation Plan ○ HMPs are required in order to purse mitigation funding such as BRIC grants ○ HMPs are a good emergency management practice ○ Identify low-hanging fruit projects and capitalize on them; blue sky projects require more funding ○ Truckee Donner Public Utility District is a potential partner in this MJHMP ▪ Contract will need to be reviewed to see if special districts are included and further discussion will be needed ▪ Special districts can be added if not already included, but this potential change will need to take place early in the process ▪ If the PUD becomes a partner, an annex will be created specific to this special district and will identify any unique hazards to the area ○ CWPP will help to inform the wildfire section of the HMP ○ Special districts are not required to have a HMP, but will need one to pursue mitigation grant funding ○ HMPs have 5-year life cycles, while CWPPs do not have outlined lifespan ○ Plan integration: elements of other plans will be included in the HMP such as those related to the safety element in the General Plan ○ For this HMP: evacuation plan can be referenced, but entire new evacuation plan is not necessary ▪ Evacuation annex will suffice • Governance & guidance	**Tetra Tech**: • Follow-up with Nevada Co on submitted HMP extension

- The following documents provide guidance to the formation of the HMP:
  - Robert T. Stafford Act
  - Disaster Mitigation Act of 2000
  - Homeland Security Act of 2002
  - State HMP and Cal OES Guidance
  - CA state law
- As a best practice, hazards will be compared between Nevada Co.'s HMP and the CA SHMP

- Review / Approval
  - This HMP will be submitted to Cal OES for review
  - Following Cal OES review, HMP will be submitted to FEMA for final approval
  - Updated FEMA guidance was released on April 19, 2023
    - The interpretation of this guidance is still up for debate
    - 29 plans are currently on hold by Cal OES due to falling short on FEMA guidance
  - Socially vulnerable populations (SVP) and climate change are major players in new guidance
    - SVP need to be explicitly identified and how they were provided a voice in the process
  - Nevada Co. has submitted a request to Cal OES for an extension on current HMP
    - Current grant pursuit may assist in possibility of an extension
  - If Nevada Co. can get this HMP adopted prior to waiting on FEMA approval, this may speed up timeline with only minor edits needed
- Mitigation Strategy
  - Capabilities of the entire planning area are considered during the planning process
  - CWPP is a step taken to reduce hazards, and is a helpful start in identifying grant funding opportunities
  - Previous HMP was 70 pages; new HMP will likely be around 200 pages when complete
  - Nevada Co. conducted a Wildfire Risk Analysis (WRA) and completed it in June of this year
    - 2 phase assessment utilizing a priority system of hazard modeling
    - This analysis will prove useful in the formation of the HMP
  - Recent risk assessment is good news; to maintain consistency, any risk assessment information that may

	be used as an input (inventory, population) should be sent to Tetra Tech ○ Electrical information from PG&E was not included in the last plan, but can be utilized for this update ○ The Polaris Fault is a major concern – goes right through the City of Truckee ○ Nevada Co. has not recently updated county fire maps • Establish Goals and Objectives ○ Objectives are how you see the plan succeed ○ Action items are tied to objectives at the end of the project ○ SVP are to be integrated into these discussions • Identify Action Items ○ Three power providers are located in Nevada Co., and associated natural hazards will need to be considered ○ Hazards that may hinder evacuation routes are to be considered in future action items • Action plan ○ Gives life to the HMP ○ Identifies projects to participate in following the HMP process ○ Nevada Co. is not obligated to start or complete these projects, but will need to be listed ○ During the next HMP update, action item reconciliation will take place to determine what was accomplished	
3	**Planning Process** • Overview ○ 7-phase Scope of Work ○ Many activities will take place at once: data collection, data analysis, plan writing, etc. ○ These processes do not have to occur sequentially ○ GIS: data is collected, hazards of concern are finalized, assessments solidified to meet risk analysis requirements ▪ 1–2-month process ▪ Nevada Co. and stakeholders will be given the opportunity to look over facility data during this process ○ A future data collection call will be helpful to discuss any wildfire or dam analysis previously conducted by Nevada Co. ▪ Nevada Irrigation District recently participated in a tabletop exercise – lots of new info available based on DSOD & FEMA	

	• Planning partners - requirements
	  ○ Identified in contract (partners)
	  ○ Commitment: involved throughout entire process, start from today to the end
	  ○ Provide our team with what is requested
	  ○ Technical editor putting together formatting
	• Leadership and Oversight
	  ○ Two teams will play a role: the Core Planning Team & Steering Committee
	  ▪ CPT meetings are typically held every other week for approximately one hour
	  ▪ CPT meetings deal with a lot of information initially, and cool off as the process moves forward
	  ▪ The SC is composed of the planning team as well as stakeholders
	  ▪ Representatives serving socially vulnerable populations are good to include in SC
	  ▪ The SC will meet four times during the planning process to validate items decided on by the CPT
	• Plan Framework
	  ○ Planning process
	  ○ Hazard analysis
	  ○ Plan maintenance
	  ▪ Must specifically identify who will oversee the maintenance of this HMP
	  ○ This HMP is a living document, and action items can be added over time
	  ○ Grants will be identified alongside action items that can be pursued
	  ○ Other plans can be integrated into this HMP if desired (strategic plan, etc.)
	  ▪ Not required
	• Timeline and process overview
	  ○ No established timeline yet due to upcoming holiday season	

4	**Hazard Analysis & Risk Assessment**
	• Review of past hazards
	• Identify current natural hazards and other hazards of interest
	  ○ Compare identified hazards to CA SHMP
	  ○ May identify other hazards of interest
	  ▪ Not a catch-all; may be politically driven (active shooter in the event of a recent tragedy, etc.)	

	▪ Terrorism and cybersecurity becoming more commonly profiled as hazards of interest ○ Mining is to be considered as a hazard of interest ○ A quantitative analysis will be conducted for natural hazards, while a qualitative analysis will be conducted for other hazards of interest ○ One advantage of the Tetra Tech team is due to our presence across the US, we are able to identify and implement national best practices in our data collection activities • Data requests ○ Tetra Tech GIS team sent over data wish list ○ This wish list contains links directing to possible data sources GIS has identified ○ This list can be used as a resource to build upon, and preferences can be identified between data sources • Critical facilities ○ Nevada Co. will need to identify its critical facilities (Lifelines according to FEMA) ○ When the Tetra Tech team receives info on critical facilities, we ask for address or coordinates to identify if it is located in a hazard area ▪ This information (address, latitude and longitude) will not be included in the plan as it is a public-facing document	
5	**Public Engagement** • Strategy & Methodology ○ An attempt must be made to involve the public in the planning process ○ Socially vulnerable populations are a priority, especially as of newest FEMA guidance ▪ For these populations, extra effort must be extended to them for involvement ▪ Avenues of engagement can be chosen and will need to be described in plan ○ SC meetings tend to be open to the public (opportunity for public involvement) ○ Nevada Co. recently conducted a public survey on wildfire which netted 2,200 responses ▪ Public survey responses also help to inform the preparedness side of emergency management ▪ Tetra Tech can help Nevada Co. draft their public survey	

	○ A StoryMap will be developed to provide a real-time assessment of what hazards affect given areas	
6	**Action Items / Tasks / Next Steps** • Planning team members & meeting dates • Steering Committee members & meeting dates ○ Be sure to consider socially vulnerable population outreach when forming Steering Committee ○ Members of the public may also be involved • Review of past action items ○ Previous action items will be reviewed to see if they have been completed, if they remain as a priority, and if they should be carried over to this plan ○ If some actions are no longer a priority, this must be explained ○ If planning partners are added, new hazards may have to be identified in the expanded planning area • Data request ○ GIS wish list has been sent • Timeline ○ Due to the upcoming holiday season, some lag can be expected ○ Project timeline usually runs approximately 10 months ○ New FEMA guidelines will be carefully considered to avoid resubmission due to new requirements • Questions ○ This HMP is created to help mitigate threats in the community and take steps toward future grant funding ○ Action items are not required to all be about mitigation; an action item regarding a future EOP update would be acceptable ○ Nevada Co. has secured a grant to update their CWPP and may be able to do a future flood study ○ Nevada Co. has a style guide ○ Shovel-ready projects (such as the new project identified in the Capital Improvement Program awaiting grant dollars) can be included in the plan ▪ If preliminary design is ready but waiting for grant dollars to move forward, can be considered shovel-ready ○ For fuel mitigation, a biomass section may be included with suggestions for future projects ▪ This can be formulated collaboratively as well (FEMA likes partnerships) ▪ For-profit corporations are prohibited	

	○ FEMA may assist with relocation costs if fire stations are located within a hazard area (seismic upgrade, etc.) ○ Analyses comparing the number of assets needed to number of required assets fall under response and may be covered by FMAG or EMPG grant programs ▪ Related to FEMA feasibility studies ▪ For FMAG & EMPG grants: if one federal agency (EPA, DHS) grant is being pursued, other federal agencies will not provide funding for the same grant • Point of Contact Identification ○ POC information will be sent to Paul and communicated to Bart for each jurisdiction/partners in the process ○ An assessment will need to be conducted if dams exist outside of the planning area with inundation maps affecting Nevada Co. ○ All dams in the City of Truckee were noted as owned by the USACE or Western Administration of Power ○ The Davis earthen dam is most dangerous dam in the planning area ▪ All high hazard and extreme high hazard dams are assessed ○ Future conversation will need to take place offline regarding sensitive dam information (FERC) ○ Downflow impact to transport, population, etc. will be considered ○ NID will be able to update report on all dam information	
	Adjourned 1:29 p.m.	

TETRA TECH

Nevada County

Hazard Mitigation Plan Update

Planning Partners Meeting

November 15

2023

Welcome & Introductions

- **Nevada County**
- **Planning Partners**
- **Tetra Tech**

Planning Partners

Municipalities

Nevada County

Town of Truckee

City of Grass Valley

City of Nevada City

Special Districts

Nevada Irrigation District

Nevada County Consolidated Fire District

Washington County Water District

Truckee Donner Public Utility District

Planning Partner Expectations

- Letter of intent to participate
- Participate in process
- Attend all “mandatory” meetings
- Support Steering Committee
- Respond to requests for Jurisdictional Annex information
- Develop mitigation strategy and action plan

Meeting Topics

Why Are You Here?

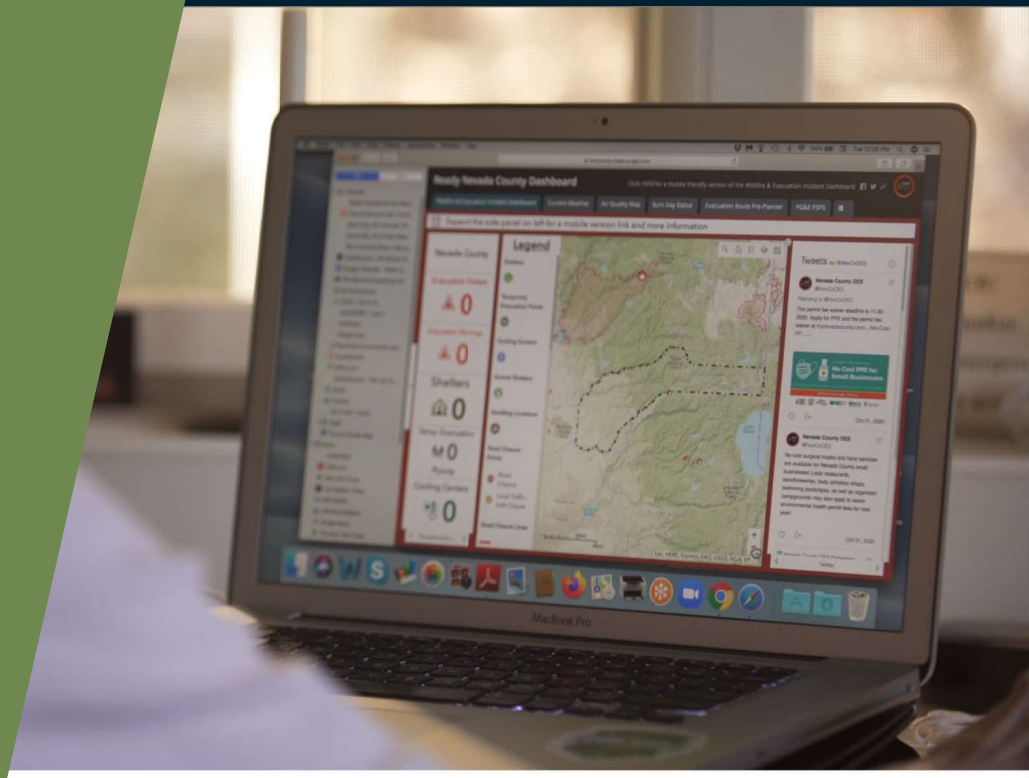
What is Hazard Mitigation?

Planning Process + Benefits

Planning Partnership Expectations

Jurisdictional Annex Phases

Public Outreach



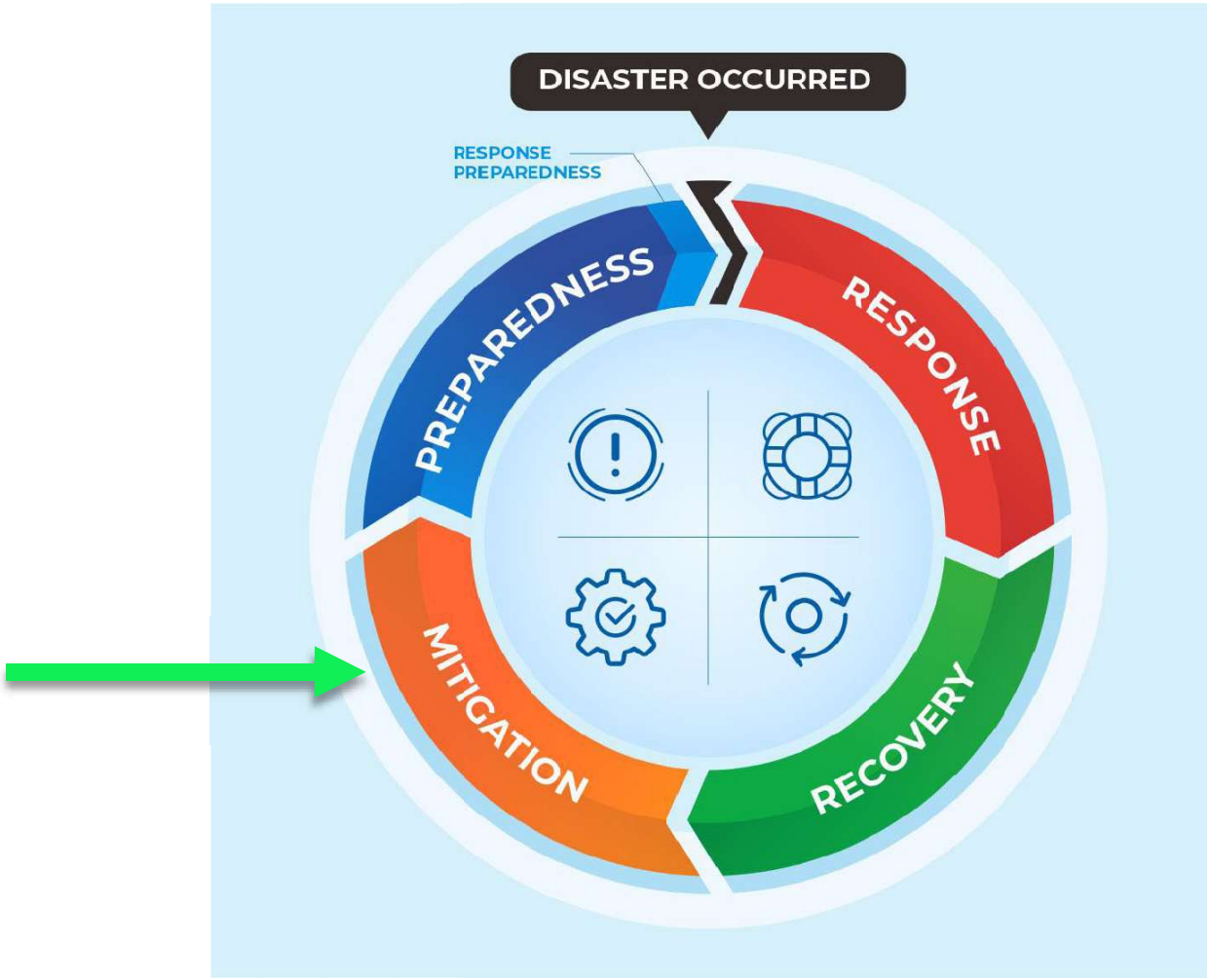
TETRA TECH

Why Are You Here?

- Planning Partners Orientation
- Understand the HMP process
- Understand what is required of you
- Benefits of HMP participation

TETRA TECH

What is Hazard Mitigation



"Sustained action taken to reduce or eliminate long-term risk to life and property"

TETRA TECH

What is Mitigation? (Continued)

Guidance: [Title 44 / Chapter I / Subchapter D / Part 201]
Disaster Mitigation Act 2000 (P.L. 106-390)
Robert T. Stafford Act (as amended)
Homeland Security Act 2002 (as amended)
Must be consistent with State and local HMPs

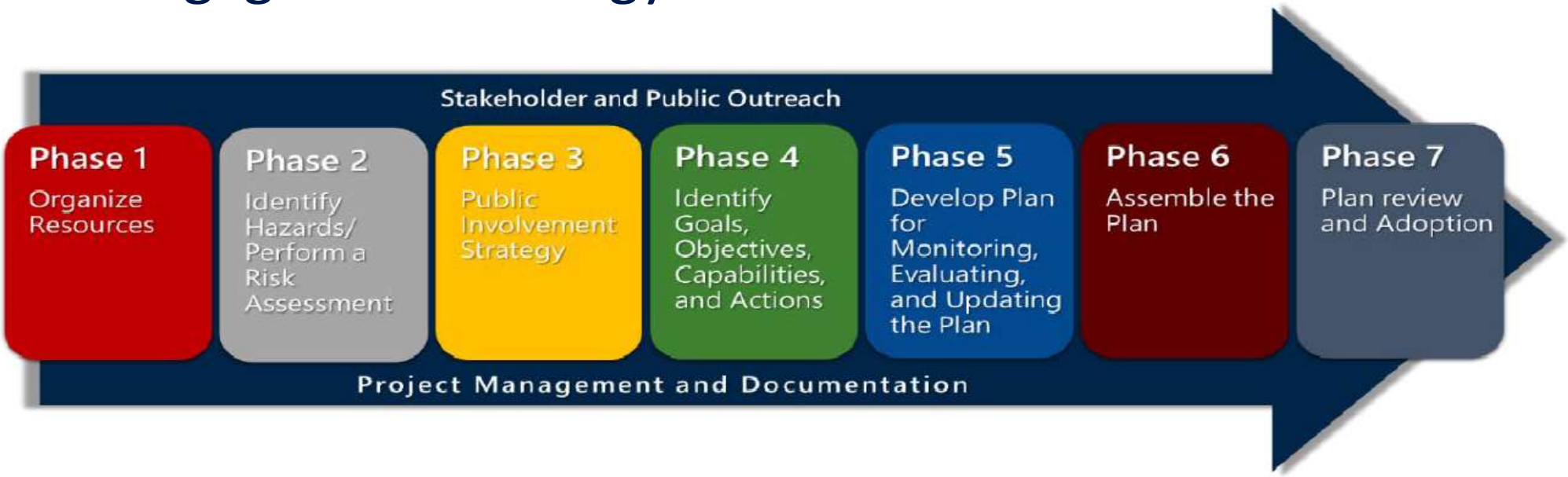
Administrators:
FEMA
Cal OES

Best Practices

No plan, No Money!

Hazard Mitigation Planning Process

- 7 Phase Scope of Work
- Centers on a comprehensive risk assessment and engagement strategy



Planning Process (Continued)

TETRA TECH

Benefits of Hazard Mitigation Plans

- Establish eligibility for grant funds ($$$ for projects)
- Improve understanding of risks and vulnerabilities
- Reduce negative impact of natural hazards – actions save lives, reduce displacement, and speed recovery
- Encourage sustainable actions – builds strong, resilient, and self-sufficient communities
- Foster collaboration between local jurisdictions and residents

Annex Phases

Phase 1:

- Worksheets A & D
  - Previous Actions & Hazard Event History

Phase 2:

- Worksheets C & E
  - NFIP & Development / Permits

Phase 3:

- Worksheet B
  - Capability Assessment

- Worksheets will be sent out in each phase for various members of planning teams to complete
- Instructions will be included on each worksheet
- Paint the picture for FEMA and Cal OES

Our ability to move the HMP update process forward depends on how quickly annex input is received!

Phase 1

- Worksheet A (Hazard Event History)
- Worksheet D (Previous actions)

Previous Actions + Hazard Event History

Due date:
January 5th

Worksheet A: Hazard Event History

Municipality: _____

Name and Title of Individual Completing Worksheet: _____

_____

Nevada County has frequently experienced natural hazard events. Please complete the table below to summarize specific loss and damages experienced during hazard events since the last hazard mitigation plan update (2017). Information already populated in the table below is based on County-wide events that resulted in significant damages and losses.

Please update the table to provide a summary of local impacts to the listed events AND note other local hazard events that resulted in damages, closures, or other impacts.

Dates of Event	Event Type (Disaster Declaration if applicable)	County Designated?	Summary of Event	Municipal Summary of Damages and Losses
February 21 – July 10, 2023	Severe Storms (DR-4699, EM-3592)	Yes	Severe winter storms, straight-line winds, flooding, landslides, and mudslides impacted communities across Nevada County.	
December 27, 2022 – January 31, 2023	Severe Storms (DR-4683)	Yes	Severe winter storms, flooding, landslides, and mudslides impacted residents and property across Nevada County.	
July 14 – October 25, 2021	Wildfires (DR-4610)	Yes	[To be filled by Tetra Tech]	
August 14 – September 26, 2020	Wildfires (DR-4558, FM-5332)	Yes	[To be filled by Tetra Tech]	
January 20, 2020 – May 11, 2023	Pandemic (DR-4482, EM-3428)	Yes	The coronavirus pandemic resulted in roughly 20,521 cases and 155 attributed deaths as of fall 2023.	
October 8 – October 31, 2017	Wildfires (DR-4344, FM-5271)	Yes	[To be filled by Tetra Tech]	

TETRA TECH

Worksheet D: Previous Actions

Project #	Project	Hazard(s) Addressed	1-2- Status (In Progress, Ongoing, No Progress, Complete) If No Progress or In Progress, approximate timeframe to complete (1-5 years)	1. Next Steps: Project to be included in 2024 HMP or Discontinue 2. If including action in the 2024 HMP, revise/reword to be more specific (as appropriate). 3. If discontinue, explain why (no longer a priority, etc.).
A1	Integrate Local Hazard Mitigation Plan into Safety Element of General Plan		1. Choose an item. 2.	1-2-3- Choose an item.
A2	Countywide, multi-agency exercises, training		1. Choose an item. 2.	1-2-3- Choose an item.
A3	Brushing and Debris Chipping		1. Choose an item. 2.	1-2-3- Choose an item.
A4	Conduct URM inventories and identify retrofit projects		1. Choose an item. 2.	1-2-3- Choose an item.
A5	Identify solutions to I-80 Gridlock		1. Choose an item. 2.	1-2-3- Choose an item.
A6	Public Outreach/Preparedness		1. Choose an item. 2.	1-2- Choose an item.

TETRA TECH

Phase 2

- Worksheet C (NFIP)
- Worksheet E (Development & Permits)

NFIP + Development

Send:
January 8, 2024

Due date:
January 26, 2024

TETRA TECH

Worksheet C: NFIP

Municipality: _____

Name and Title of Individual Completing Worksheet: _____

_____

Who can assist with completing this table: NFIP Floodplain Administrator – as identified by role/title in your Flood Damage Prevention Ordinance.

NFIP Topic	Comments
Flood Vulnerability Summary	
Describe areas prone to flooding in your jurisdiction.	
Do you maintain a list of properties that have been damaged by flooding?	
Do you maintain a list of property owners interested in flood mitigation? • If yes, how many homeowners and/or business owners are interested in mitigation (elevation or acquisition)?	
Are any RiskMAP projects currently underway in your jurisdiction? • If so, state what projects are underway.	
Do you have procedures established for Substantial Damage determinations following a disaster event?	
How many Substantial Damage determinations were declared for recent flood events in your jurisdiction?	
How many properties have been mitigated (elevation or acquisition) in your jurisdiction? • If there are mitigated properties, how were the projects funded?	
Do your flood hazard maps adequately address the flood risk within your jurisdiction? • If not, state why.	
NFIP Compliance	
What local department is responsible for floodplain management?	
Are any certified floodplain managers on staff in your jurisdiction?	

Worksheet E: Development & Permits

Municipality: _____

Name and Title of Individual Completing Worksheet: _____

Who can assist with completing these tables: The Building Department, Planning Department, and NFIP Floodplain Administrator

Type of Development	2018		2019		2020		2021		2022	
Number of Building Permits for New Construction Issued Since the Previous HMP* (within regulatory floodplain/ Outside regulatory floodplain)										
	Total	**Within SFHA**	**Total**	**Within SFHA**	**Total**	**Within SFHA**	**Total**	**Within SFHA**	**Total**	**Within SFHA**
Single Family										
Multi-Family										
Other (commercial, mixed-use, etc.)										
Total New Construction Permits Issued										

SFHA Special Flood Hazard Area (1% annual chance flood event)

** Only location-specific hazard zones or vulnerabilities identified.*

Please indicate any recent development within your community from 2018 to present. Additionally, please indicate known or anticipated major residential and/or commercial development and major infrastructure development that are identified for the next five (5) years in your community.

Property or Development Name	Type (e.g., Res., Comm.)	# of Units / Structures	Address and Parcel ID	Known Hazard Zone(s)	Description/Status of Development
Recent Major Development from 2018 to Present					
Known or Anticipated Major Development in the Next Five (5) Years					

TETRA TECH

Phase 3

- Worksheet B (Capability Assessment)

Capability Assessment

Send:
January 29th

Due date:
March 1st

Worksheet B: Capability Assessment

Municipality: _____

Name and Title of Individual Completing Worksheet: _____

_____

Who can assist with completing these tables: Municipal Planner, Clerk, Code Official, Administrator, Chief Fiscal Officer.

Planning and Regulatory Capability

Please complete the following table to summarize the regulatory tools that are available to your community, what is present in the jurisdiction, and code citation and date. For existing regulatory tools, note how it reduces risk to hazards or how it could be updated to better integrate hazard mitigation concepts to reduce risk.

Table 1. Planning and Regulatory Capability

	Jurisdiction has this? (Yes/No)	Code Citation and Date (code chapter, name of plan, date of plan)	Authority (local, county, state, federal)	Individual / Department / Agency Responsible
Codes, Ordinances, & Regulations				
Building Code			State and Local	
How does this reduce risk?				
Zoning/Land Use Code			Local	
How does this reduce risk? *Consider the following:* • Prior to zoning changes, or development permitting, does your jurisdiction review the hazard mitigation plan and other hazard analyses to ensure consistent and compatible land use? • Does the zoning ordinance discourage development or redevelopment within natural areas including wetlands, floodways, and floodplains? • Does it contain natural overlay zones that set conditions? • Does the ordinance require developers to take additional actions to mitigate natural hazard risk? • Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use?				
Subdivision Ordinance			Local	
How does this reduce risk? *Consider the following:* • Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas? • Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources? • Do the regulations allow density transfers where hazard areas exist?				
Site Plan Ordinance			Local and County	
How does this reduce risk?				
Stormwater Management Ordinance			Local	
How does this reduce risk?				

Table 4. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use? (Yes/No)
Community development Block Grants (CDBG, CDBG-DR)	
Capital improvements project funding	
Authority to levy taxes for specific purposes	
User fees for water, sewer, gas, or electric service	
Impact fees for homebuyers or developers of new development/homes	
Stormwater utility fee	
Incur debt through general obligation bonds	
Incur debt through special tax bonds	
Incur debt through private activity bonds	
Withhold public expenditures in hazard-prone areas	
Other federal or state Funding Programs	
Open Space Acquisition funding programs	
Other (for example, Clean Water Act 319 Grants [Nonpoint Source Pollution])	

Public Outreach

- Each jurisdiction is required to participate in public outreach efforts
  - Can partner with the County, but need their own unique piece (website, etc.)
- Socially Vulnerable Populations (SVPs)
  - FEMA has placed a major emphasis on SVP outreach
  - Each jurisdiction must identify and engage SVPs in public outreach efforts

For More Information

Bart Spencer, Project Manager
650-324-1810
bart.spencer@tetratech.com

Jake Poland, Planner
510-302-6225
jake.poland@tetratech.com

TETRA TECH

Questions

TETRA TECH

NEVADA COUNTY CALIFORNIA | Office of Emergency Services

NEVADA COUNTY MULTIJURISDICTIONAL HAZARD MITIGATION PLAN UPDATE
STEERING COMMITTEE MEETING #1
Tuesday, November 21, 2023 *(Virtual Conference Call)*
AGENDA

Welcome & Introductions

- Planning Partners – Paul Cummings
- Steering Committee members
- Tetra Tech – Bart Spencer

Project Overview – Bart Spencer

- What is hazard mitigation
- Plan update

Project Coordination – Chris Huch

- Planning Team
  - Members
- Steering Committee
  - Organization and purpose
  - Selection of a chair and vice chair
  - Quorum
  - Meetings and meeting times
  - Ground rules
- Mission Statement, Goals, Objectives

Hazards Assessment & Risk Assessment – Kami Spahn

- Natural Hazards
- Hazards of Interest

Outreach and Engagement – Chris & Bart

- Requirements
- Methodology

Requests from Committee members

Nevada County
Meeting Summary

Purpose of Meeting:	Nevada County Hazard Mitigation Steering Committee Meeting #1 Summary
Location of Meeting:	Virtual
Date of Meeting:	11.21.2023, 9:00 a.m. – 10:00 a.m.

Attendees:

☒ Paul Cummings, Nevada Co., OES Program Manager
☐ Robert Womack, Town of Truckee, Emergency Services Coordinator
☒ Mark Buttron, Fire Chief, City of Grass Valley
☒ Jason Robitaille, Fire Chief, Nevada County Consolidated Fire District
☒ Mike Stewart, Fire Chief, Washington County Water District
☒ Amy Kelser Wolfson, City Planner, City of Grass Valley
☐ Steven Poncelet, PIO & Strategic Affairs Director, Truckee Public Utility District
☐ Sean Grayson, City Manager, Nevada City
☒ Greg Jones, Assistant General Manager, Nevada Irrigation District
☒ Kevin McKechnie, Fire Chief, Truckee Fire Department
☒ Aaron Zettler-Mann, Executive Director, South Yuba River Citizens League
☒ Chris Friedel, Executive Director, Yuba Watershed Institute
☒ Ricky Martinez, Defensible Space Supervisor, Nevada County
☒ Erin Tarr, Executive Director, Bear Yuba Land Trust
☒ Bob Long, Coalition of Firewise Communities
☒ Landon Haack, Fire Chief, CAL FIRE
☒ Bart Spencer, Tetra Tech, Project Manager
☒ Jake Poland, Tetra Tech, Planner
☒ Chris Huch, Tetra Tech, Lead Planner
☐ Kami Spahn, Tetra Tech, GIS Lead

Meeting Summary:

Item No.	Description	Action/Decision item(s):
1	**Welcome & Introductions** ○ Planning Partners ○ Steering Committee members ○ Tetra Tech	
2	**Project Overview** • What is hazard mitigation ○ FEMA's Hazard Mitigation Grant Program (HMGP) has funded this project	

	▪ An updated HMP is required to pull FEMA funds for other projects ○ Emergency management phases overlap and flow into each other ○ HMP aims to minimize hazard risk to life and property ▪ Helps to reduce the magnitude of response required during an incident ○ Guidance ▪ DMA of 2000 ▪ Robert T. Stafford Act (as amended) • Plan update ○ Updated FEMA guidance places an emphasis on addressing climate change and socially vulnerable communities ▪ Focused on how each jurisdiction engages in outreach to the public ○ The planning process consists of a 7-phase scope of work ▪ Centered on risk assessment and public engagement strategy ▪ HMP will help planning partners identify hazards and go after FEMA grant funding	
3	**Project Coordination** • Planning Team ○ Members • Steering Committee ○ Chair: **Ricky Matinez** ▪ May be tasked with encouraging public engagement such as completing public survey or providing other input ○ Vice Chair: **Aaron Zettler-Mann** • Mission Statement, Goals, Objectives ○ Mission Statement: communicates to the public why HMP is important and worthy of their input ○ Goals: describe what HMP aims to accomplish ○ Objectives: support goals and help to gauge effectiveness ▪ Action items will be tied to objectives later in the planning process ○ Goals and objectives to be socialized via email and confirmed at next meeting • Expectations ○ Attend meetings ○ Ground rules ○ Respond to requests for information	**Nevada County**: • Ricky Martinez has been selected as Chair • Aaron Zettler-Mann has been selected as Vice Chair

	▪ Tetra Tech team will pre-populate as much information as possible to reduce workload for our partners in this process ○ Whole community to be represented in HMP	
4	**Hazard Assessment & Risk Assessment** • Hazards to be voted on by Steering Committee through email ○ Cascading impacts (secondary and tertiary) will also be considered within each hazard profile ○ Bordering counties will be reached out to for any input on hazards • Natural Hazards ○ Earthquake ○ Drought (added) ▪ Risk posed by drought to life and property differs from risk posed by other hazards such as earthquake and wildfire ○ Severe Weather ○ Flooding ○ Avalanche ○ Wildfire ○ Dam Inundation ▪ High hazard dams ❖ Focused on: what is at stake of dam fails? ❖ Dams located outside of County with impacts within the County will also be included in risk assessment ○ Landslide ▪ Seiche waves to be considered as cascading impact ❖ Consideration for Lake Tahoe and Donner Lake ○ Volcano ▪ Particulate matter ○ Climate Change • Hazards of Interest ○ Hazardous Materials ○ Transportation (rail) ○ Mines ▪ Mine contamination to be considered ❖ Contaminated groundwater ○ Air quality, pipelines, and PSPS/de-energization may be included pending Steering Committee decision ▪ PG&E may be hesitant to provide information as HMP is a public-facing document	**Tetra Tech** • Bart to check with Victoria on including PG&E in proposed pipeline hazard profile • Bart to connect Kami with Greg Jones from NID

	▪ NID has over 400 miles of pipeline ❖ Bart to follow-up with Victoria on this	
5	**Outreach and Engagement** • Requirements o Public must be provided the opportunity to engage in this process ▪ Steering Committee meetings will be opened to the public • Methodology o Storymap o Public survey o Webpage o Social media o Public Comment period	
6	**Questions** • Best available data will be utilized in preparation of hazard profiles • Next Steering Committee meeting to be held in January or February 2024 • Action items unrelated to mitigation may be included, but will not be eligible for mitigation funding o Other funding sources (FMAG, etc.) may be available for these action items	
	Adjourned 9:55 a.m.	

Nevada County
Meeting Summary

Purpose of Meeting:	Nevada County Hazard Mitigation Plan Planning Partners Meeting Summary
Location of Meeting:	Virtual
Date of Meeting:	10.15.2023, 9:00 a.m. – 10:00 a.m.

Attendees:

☒ Paul Cummings, Nevada Co., OES Program Manager
☐ Robert Womack, Town of Truckee, Emergency Services Coordinator
☒ Mark Buttron, Fire Chief, City of Grass Valley
☒ Jason Robitaille, Fire Chief, Nevada County Consolidated Fire District
☒ Mike Stewart, Fire Chief, Washington County Water District
☒ Amy Kelser Wolfson, City Planner, City of Grass Valley
☒ Steven Poncelet, PIO & Strategic Affairs Director, Truckee Public Utility District
☒ Sean Grayson, City Manager, Nevada City
☒ Greg Jones, General Manager, Nevada Irrigation District
☒ Bart Spencer, Tetra Tech, Project Manager
☒ Jake Poland, Tetra Tech, Planner
☒ Chris Huch, Tetra Tech, Lead Planner
☐ Kami Spahn, Tetra Tech, GIS Lead

Meeting Summary:

Item No.	Description	Action/Decision item(s):
1	**Welcome & Introductions** • Nevada County & Planning Partners • Tetra Tech • FEMA updated Hazard Mitigation Plan (HMP) guidance in April of this year ○ Socially vulnerable populations are a big piece in this new guidance	

2	**Planning Partner Expectations**
	• Purpose of this meeting
	  ○ Understanding the HMP process
	  ○ Understand what participation is required
	  ○ See benefits of HMP participation
	• Letter of intent to participate
	  ○ Commitment on behalf of jurisdiction
	  ▪ No resolution or other motion necessary – just willingness to commit
	  ▪ Signed by person with appropriate authority to commit such as department head
	  ▪ Letter of commitment template will be sent by Tetra Tech team and circulated by Paul
		Tetra Tech:
		• Jake to send sample letter of commitment to Paul for circulation to Planning Partners

	• Respond to requests for Jurisdictional Annex information • Attend all "mandatory" meetings • Develop mitigation strategy and action plan	

3	**What is Hazard Mitigation?**
	• Four phases of emergency management
	  ○ Seek to make all emergency plans work in concert with one another
	  ▪ Review effects on Emergency Operations Plans (EOPs), evacuation plans, recovery plans, etc.
	  ▪ Consider lessons learned in planning process
	• Guidance
	  ○ Disaster Mitigation Act of 2000
	  ○ Robert T. Stafford Act (as amended)
	  ○ Other guiding HMP documents
	• Hazard profiles developed as a part of this process include secondary and tertiary effects to provide a comprehensive view of hazard impacts
	  ○ Hazard risk may differ by jurisdiction
	  ○ Each jurisdiction will develop action items as a part of this planning process	

4	**Benefits of Hazard Mitigation Plans**
	• Identify physical and practical improvement to minimize hazard impacts
	  ○ Action items: projects that can help to reduce hazard impacts
	  ▪ Seeking grant funding for these projects
	  ▪ Can range from low-hanging fruit to blue sky projects
	• Foster collaboration and encourage sustainable actions
	  ○ Builds strong, resilient, self-sufficient communities
	• A current HMP is the key to HMGP funding, BRIC funding, and many other opportunities	

5	**Jurisdictional Annexes**
	• Instructions will be provided on worksheets outlined below
	• 3-Phase approach
	  ○ Phase 1
	  ▪ Worksheets A & D
	  ▪ Hazard Event History and Previous Actions
	  ▪ Due January 5th
	  ○ Phase 2
	  ▪ Worksheets C & E
	  ▪ NFIP & Development/Permit
	  ▪ Due January 26, 2024
	  ○ Phase 3	

	▪ Worksheet B ▪ Capability Assessment ▪ Due March 1, 2024 • County is working to identify critical facilities separate from the jurisdictional annex process o May not always be government facilities o Critical facilities must be categorized into new FEMA Community Lifelines categories • FEMA's focus has shifted from "what do you have?" to "what can your capabilities do to reduce risk?" o Helps to identify gaps	
6	**Public Outreach** • The public must be given a chance to participate in the planning process o Methods of public outreach will be documented, but responses from public are not required o Extra emphasis placed on outreach to socially vulnerable communities ▪ Socially vulnerable populations will need to be identified in each jurisdiction and how they were provided an opportunity to participate ❖ Jurisdictions may partner with the County or neighboring city, which will also need to be documented • Storymap will be developed • Public comment period o Response varies: may have little to no public comments depending on engagement	
7	**Questions** • Hazard profiling o Natural hazards will undergo a quantitative analysis o Hazards of interest will be subject to a qualitative analysis • FEMA requires the name, position, and contact information for NFIP Floodplain Administrators • Steering Committee Meeting next Tuesday, November 21	
	Adjourned 10:00 a.m.	

TETRA TECH

Nevada County

Hazard Mitigation Plan Update

Steering Committee Meeting

November 21, 2023

Welcome & Introductions

- **Nevada County**
- **Planning Partners**
- **Steering Committee**
- **Tetra Tech**

Planning Partners

Municipalities

Nevada County

Town of Truckee

City of Grass Valley

City of Nevada City

Special Districts

Nevada Irrigation District

Nevada County Consolidated Fire District

Washington County Water District

Truckee Donner Public Utility District

Meeting Topics

What is Hazard Mitigation?

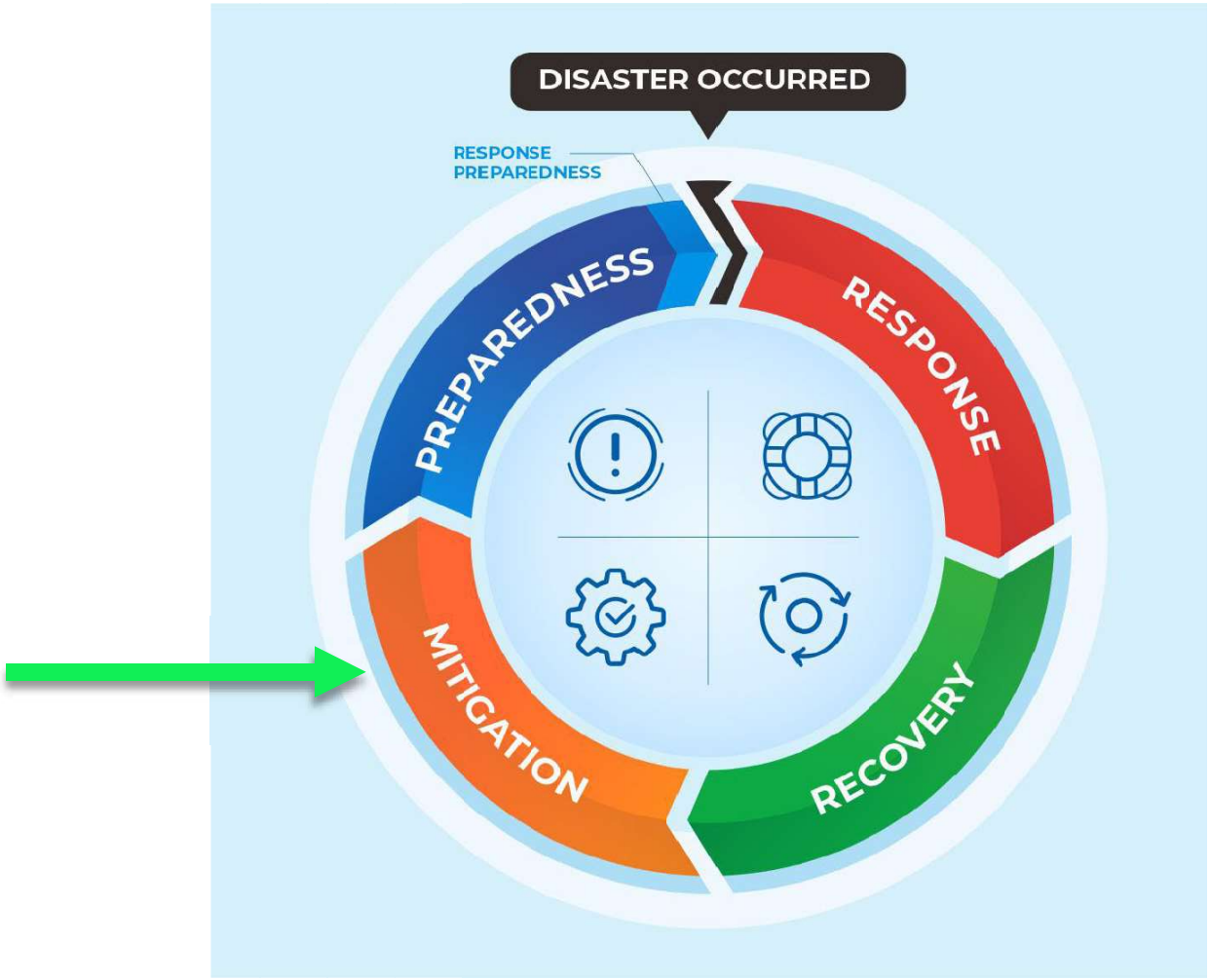
Project Coordination
- Planning Team
- Steering Committee

Hazard Assessment & Risk Analysis

Public Engagement

TETRA TECH

What is Hazard Mitigation



"Sustained action taken to reduce or eliminate long-term risk to life and property"

TETRA TECH

What is Mitigation? (Continued)

Guidance: [Title 44 / Chapter I / Subchapter D / Part 201]

Disaster Mitigation Act 2000 (P.L. 106-390)
Robert T. Stafford Act (as amended)
Homeland Security Act 2002 (as amended)
Must be consistent with State and local HMPs

Administrators / Plan Approvers:

FEMA
California Office of Emergency Services (Cal OES)

Best Practices

No plan, No Money!

Hazard Mitigation Planning Process

TETRA TECH

Mitigation Planning Process (con't)

- 7 Phase Scope of Work
- Centers on a comprehensive risk assessment and engagement strategy

Project Coordination

Planning Team

- Paul Cummings – Nevada County
- Bob Womack, Town of Truckee

Steering Committee

- Chair & Vice Chair – *to be selected in this meeting*
- Requirements (participation, meetings, quorum, ground rules)

Mission Statement, Goals, and Objectives

Hazard Assessment & Risk Analysis

Natural Hazards - *proposed*

- Earthquake
- Severe weather
- Flooding
- Avalanche
- Wildfire
- Dam inundation
  - High hazard dams
- Landslide
- Volcano
- Climate Change

Other Hazards of Interest - *examples*

- Hazardous Materials
- Transportation (rail)

Requirements

Methodology

- StoryMap
- Steering Committee mtgs
- Webpage
- Social Media
- Public Comment period

Public Engagement

What's Next

Planning Team

- Usually meets every other week

Plan Development

- Assembling the plan
- Risk profiling
- Research

Hazard Development

- Hazard profile development
- Hazard assessment & risk analysis

Steering Committee

- Next meeting - Jan / Feb
- Assist with public engagement

Questions?

TETRA TECH

Nevada County
Meeting Summary

Purpose of Meeting:	Nevada County Hazard Mitigation Steering Committee Meeting #2 Summary
Location of Meeting:	Virtual
Date of Meeting:	02.22.2024, 9:00 a.m. – 10:00 a.m.

Attendees:

☒ Paul Cummings, Nevada Co., OES Program Manager
☒ Robert Womack, Town of Truckee, Emergency Services Coordinator
☐ Mark Buttron, Fire Chief, City of Grass Valley
☒ Jason Robitaille, Fire Chief, Nevada County Consolidated Fire District
☒ Mike Stewart, Fire Chief, Washington County Water District
☒ Amy Kelser Wolfson, City Planner, City of Grass Valley
☐ Steven Poncelet, PIO & Strategic Affairs Director, Truckee Public Utility District
☐ Sean Grayson, City Manager, Nevada City
☒ Greg Jones, Assistant General Manager, Nevada Irrigation District
☐ Kevin McKechnie, Fire Chief, Truckee Fire Department
☒ Aaron Zettler-Mann, Executive Director, South Yuba River Citizens League
☒ Chris Friedel, Executive Director, Yuba Watershed Institute
☒ Ricky Martinez, Defensible Space Supervisor, Nevada County
☒ Erin Tarr, Executive Director, Bear Yuba Land Trust
☒ Bob Long, Coalition of Firewise Communities
☐ Landon Haack, Fire Chief, CAL FIRE
☒ LeTina Vanetti, Sierra County Office of Emergency Services
☒ Oscar Marin, Yuba County Office of Emergency Services
☒ Brett Fletcher, Nevada County Public Health Department
☒ Brandy Dunkel, Placer County Office of Emergency Services
☒ Brian Snyder
☒ Bart Spencer, Tetra Tech, Project Manager
☒ Jake Poland, Tetra Tech, Planner
☐ Chris Huch, Tetra Tech, Lead Planner
☐ Kami Spahn, Tetra Tech, GIS Lead

Meeting Summary:

Item No.	Description	Action/Decision item(s):

1	**Welcome & Introductions** ○ New FEMA guidance – April 2023	
2	**Planning Process** • 7 Phase scope of work ○ As a best practice and to maintain consistency, this planning process will align with FEMA Community Rating System (CRS) guidelines • Goals (confirm) ○ Goals are best kept broad to guide the planning process ▪ Nevada County receives points from the Public Health Accreditation Board when equity considerations are made ❖ Resources are available from Nevada County Public Health Department ○ Goal #7 and #10: need to be consistent with the use of "resilience" and "resiliency" ○ Socially Vulnerable Populations (SVPs) are to be defined by each respective municipality or special district • Objectives (confirm) ○ Meant to act as swim lanes and provide a framework for plan outcomes ▪ Objective #13: offline conversation regarding stronger actionable language ❖ Aaron to develop language for this objective ❖ Draft language: "Implement on the ground projects to build, enhance, or maintain hazard resilience" ▪ Objective #7: add "and across jurisdictional boundaries" ▪ Objective #5: change "consider" to "develop" ▪ Objective #4: change "encourage" to "support" • Hazards (confirm) ○ Hazards must align with the CA State Hazard Mitigation Plan (SHMP) ▪ A risk ranking will be conducted to determine which hazards pose the greatest threat to Nevada County • Action items process update ○ Action items to be collected by April 2024 ▪ At least one action item must be developed for each high hazard ▪ Funding source, hazards mitigated, and timeline must also be included	Decision items: • Steering Committee has approved the HMP goals provided that a change is made to the words "resilience" and "resiliency" for consistency • Steering Committee has approved the HMP hazards Action items: • Jake to send objectives to Paul as a Word document to be forwarded to Steering Committee for wordsmithing

	❖ Planning Partners will draft action items, and Steering Committee Members will provide input ❖ For grant-funded action items, shovels cannot be in the ground prior to grant award ○ Planning Partners may partner with the US Forest Service, but Partner must be the lead agency on the project ▪ Projects may also cross county lines ○ Community Wildfire Protection Plan (CWPP) action items may have to be conceptually brought over since CWPP is still in progress	
4	**Public Engagement** • Outreach to neighboring communities must be documented • Website • Survey ○ Public survey to be distributed shortly ▪ Responses may help to inform action items ▪ Nevada Co. meeting in May, as well as quarterly stakeholder meeting may be excellent opportunities to promote the survey	
5	**Next Steps/Requests** • Assemble draft plan • Internal and Steering Committee review • Public comment • Cal OES submission • FEMA submission	Tetra Tech: • Jake to send PowerPoint presentation and summary to Steering Committee members
	Adjourned 10:33 a.m.	

TETRA TECH

Nevada County

Hazard Mitigation Plan Update

Steering Committee Meeting

February 22, 2024

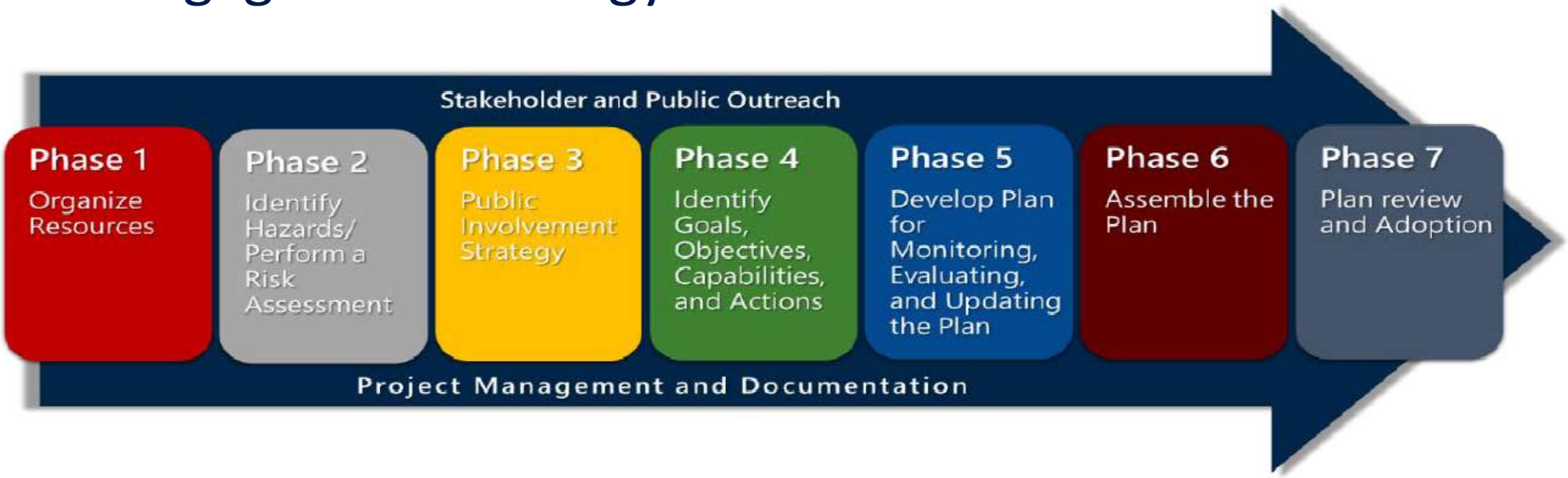
Meeting Topics

- Planning Process
- Project update
- Action Items
- Public Outreach
- Next Steps

TETRA TECH

Hazard Mitigation Planning Process

- 7 Phase Scope of Work
- Centers on a comprehensive risk assessment and engagement strategy



Benefits of Hazard Mitigation Plans

- Establish eligibility for grant funds ($$$ for projects)
- Improve understanding of risks and vulnerabilities
- Reduce negative impact of natural hazards – actions save lives, reduce displacement, and speed recovery
- Encourage sustainable actions – builds strong, resilient, and self-sufficient communities
- Foster collaboration between local jurisdictions and residents

HMP Update Goals

1. Ensure that hazards are identified and considered in planning and land use decisions.
2. Improve local emergency management capability.
3. Evaluate risks and create mitigation activities while considering access and functional needs.
4. Promote community awareness, understanding, and interest in hazard mitigation policies and programs.
5. Incorporate hazard mitigation as an integrated public policy and standard practice.
6. Reduce community exposure and vulnerability to hazards where the greatest risk exists.
7. Increase resilience of critical infrastructure and facilities.
8. Promote an adaptive and resilient planning area that responds proactively to future conditions.
9. Develop and implement mitigation strategies that identify the best alternative to protect natural resources, promote equity and environmental justice, and use public funds in an efficient and cost-effective manner.
10. Prioritize and direct resources to increase disaster resiliency among historically underserved populations, for individuals with access and functional needs, and in communities disproportionately impacted by disasters.

HMP Update Objectives

1. Develop and provide updated information to improve the understanding of the locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life safety health, property, and the environment.
2. Use local general plan (safety element), zoning, and subdivision requirements to help establish resilient and sustainable communities.
3. Increase public participation in systems that provide alert and warning as well as emergency communications.
4. Encourage the retrofit of vulnerable structures in the planning area.
5. Consider programs that incentivize quantifiable risk reduction in accordance with industry standards.
6. Reduce repetitive property losses due to hazards by updating land use, design, and construction policies.
7. Continually build linkages and promote dialog about emergency management within the public and private sectors.
8. Incorporate risk reduction considerations in new and updated infrastructure and development plans to reduce the impacts of hazards.
9. Inform the public, including underrepresented and marginalized community groups, on the risk of exposure to hazards and ways to increase the public's capability to prepare for, respond to, recover from, and mitigate the impacts of these events.
10. Identify projects that simultaneously reduce risk while increasing planning area resilience and sustainability.
11. Where feasible and cost-effective, research, develop, and promote adoption of building and development laws, regulations, and ordinances exceeding the minimum levels needed for life safety.
12. Encourage hazard mitigation measures that promote and enhance natural processes, minimize adverse impacts on the ecosystem, and promote social equity and environmental justice.

Project Update

- Planning process
  - Risk analysis
  - Annex worksheets
  - Hazard assessments
  - Develop action items
- Public engagement
- Next Steps

HMP Update Hazards

Natural Hazards

- Earthquake
- Drought
- Severe weather
- Flood
- Wildfire
- Dam failure
- Landslide
- Climate Change

Hazards of Interest

- Air quality
- Avalanche
- Hazardous Materials
- Mines
- Transportation
  - Train derail & toxic release
- Extreme Heat
- Extreme Cold
- Natural gas pipeline failure
- De-energization (PSPS)
- Volcano

ACTION ITEM DISCUSSION

Review

- Capital Improvement Plans (CIP)
- Master / strategic plans
- Building project plans

Suggestions

- Portable generators
- Reinforce buildings
- Update codes, regulations
- Public outreach
- Warning systems
- Water saving systems
- Feasibility studies

HMP Action Items

ACTION ITEM DISCUSSION

Action Items

- At least for ever high hazard
- Identify funding source
- Linked to a specific hazard
- Time period
- Priority
- How many action should we have?

HMP Action Items

Public Outreach

- Each jurisdiction is required to participate in public outreach efforts
  - Can partner with the County, but need their own unique piece (website, etc.)

- Socially Vulnerable Populations
  - FEMA has placed a major emphasis on SVP outreach
  - Each jurisdiction must identify and engage SVPs in public outreach efforts

Next Steps

- Draft plan
- Internal review
- Public Comment period
- Submitted to Cal OES
- Submitted to FEMA

Questions

TETRA TECH

For More Information

Bart Spencer, Project Manager
650-324-1810
bart.spencer@tetratech.com

Jake Poland, HMP Planner
510-302-6225
jake.poland@tetratech.com

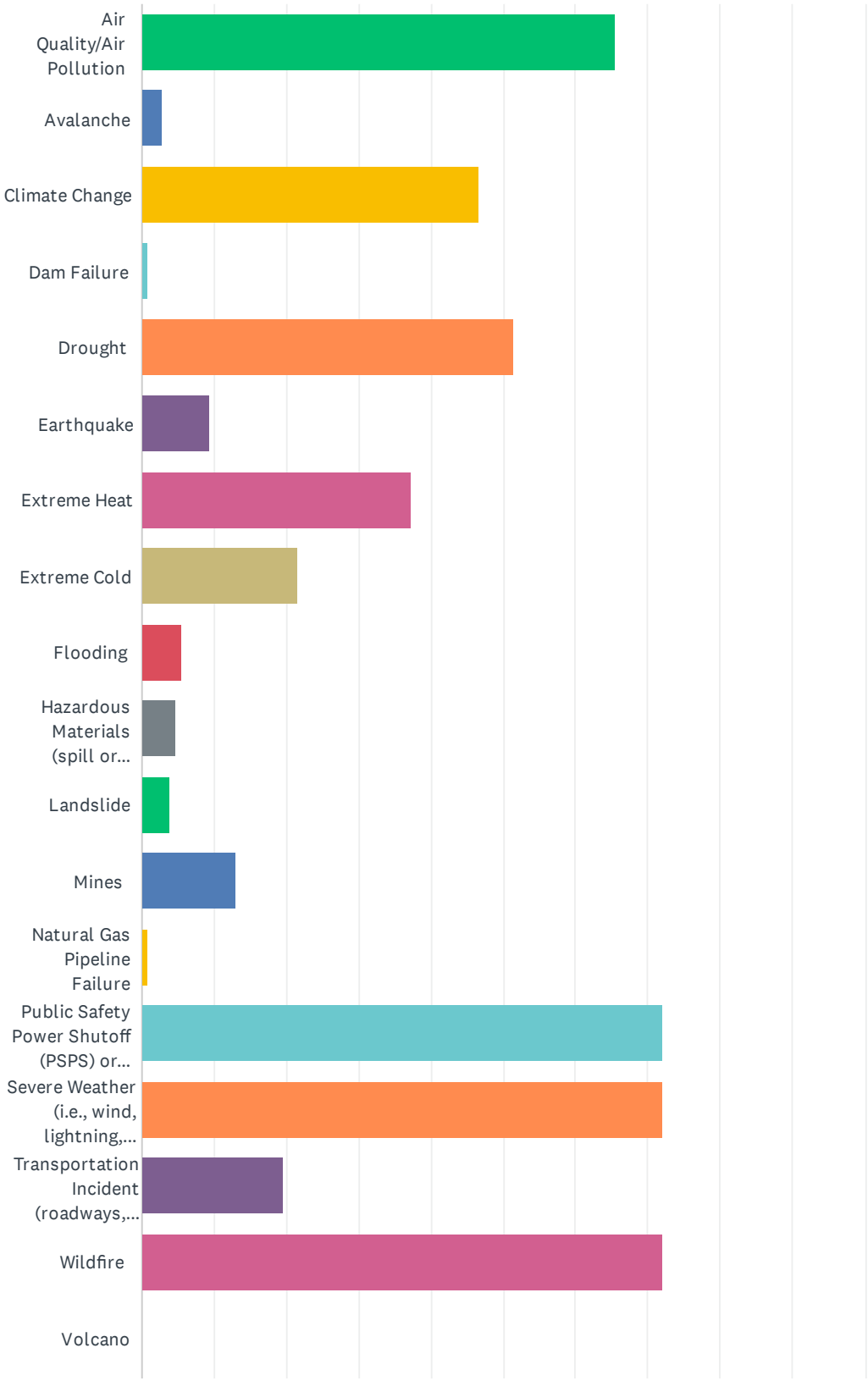
TETRA TECH

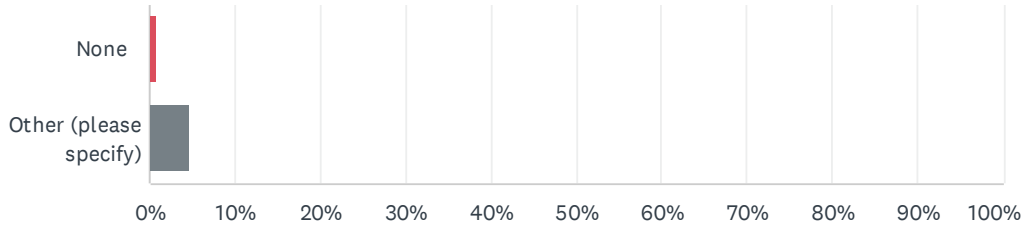
APPENDIX C: Public and Stakeholder Outreach Documentation

RESULTS OF THE PUBLIC SURVEY

Q1 Which of the following hazards have you ever been impacted by within Nevada County? (Check all that apply)

Answered: 107 Skipped: 1

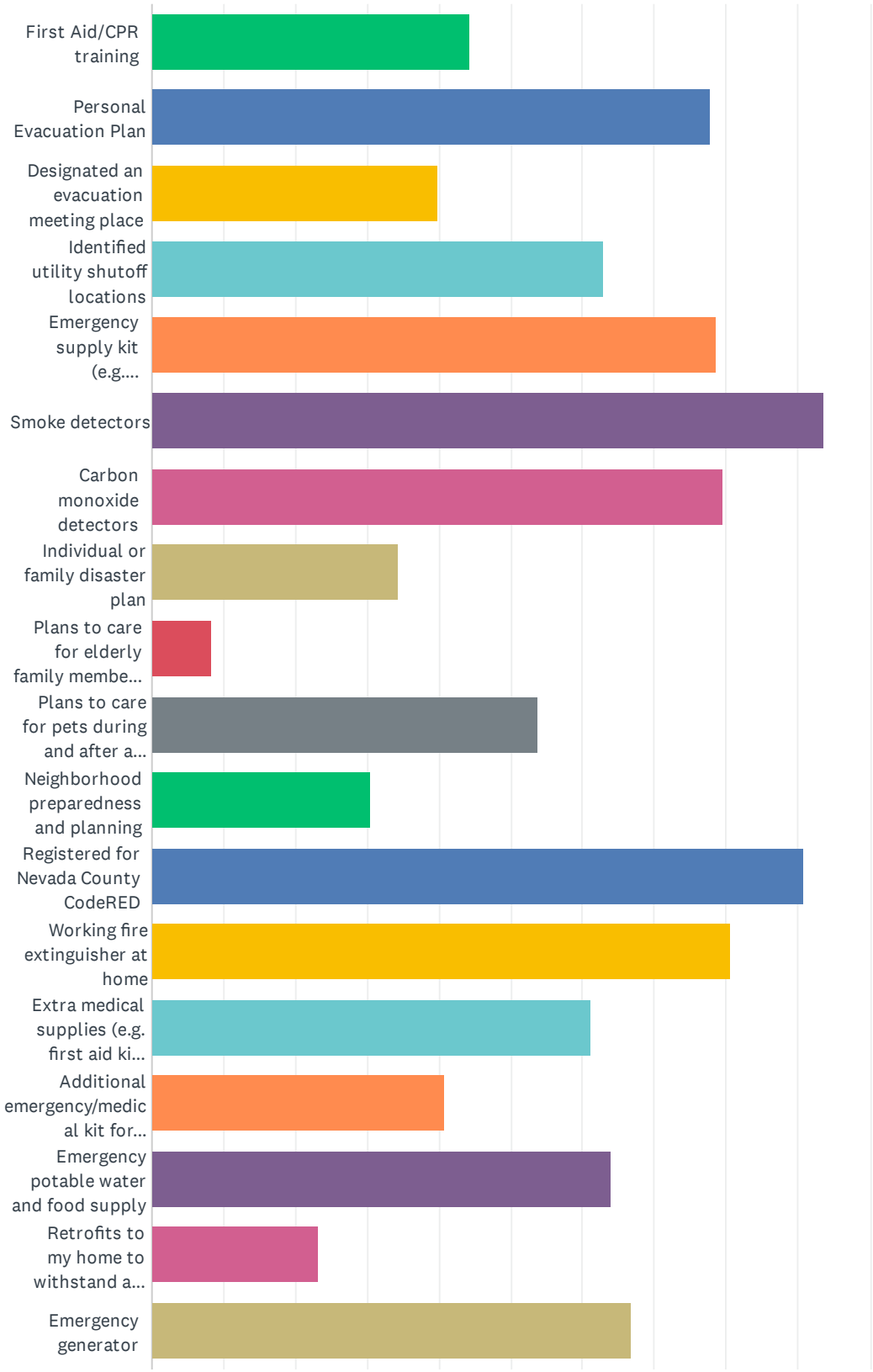


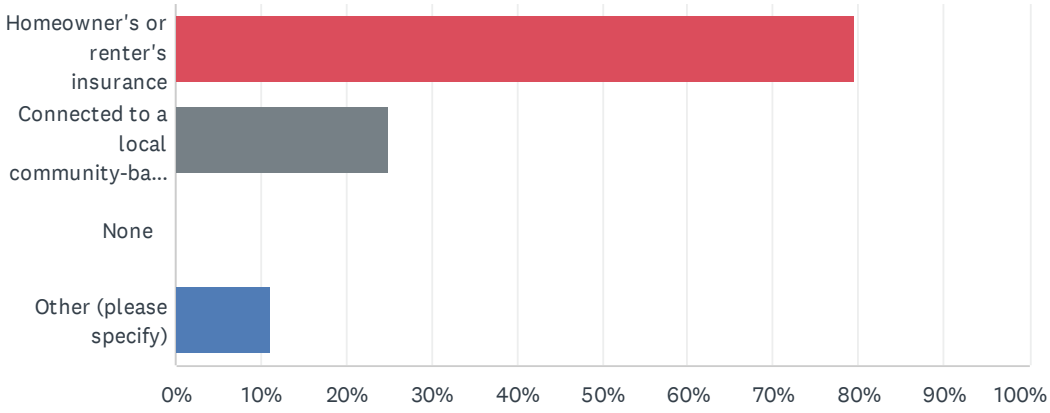


ANSWER CHOICES	RESPONSES	
Air Quality/Air Pollution	65.42%	70
Avalanche	2.80%	3
Climate Change	46.73%	50
Dam Failure	0.93%	1
Drought	51.40%	55
Earthquake	9.35%	10
Extreme Heat	37.38%	40
Extreme Cold	21.50%	23
Flooding	5.61%	6
Hazardous Materials (spill or release)	4.67%	5
Landslide	3.74%	4
Mines	13.08%	14
Natural Gas Pipeline Failure	0.93%	1
Public Safety Power Shutoff (PSPS) or De-Energization	71.96%	77
Severe Weather (i.e., wind, lightning, winter storm, tornado, etc.)	71.96%	77
Transportation Incident (roadways, rail, airport, waterways)	19.63%	21
Wildfire	71.96%	77
Volcano	0.00%	0
None	0.93%	1
Other (please specify)	4.67%	5
Total Respondents: 107		

Q2 What steps has your household taken to prepare for a disaster? (Check all that apply)

Answered: 108 Skipped: 0

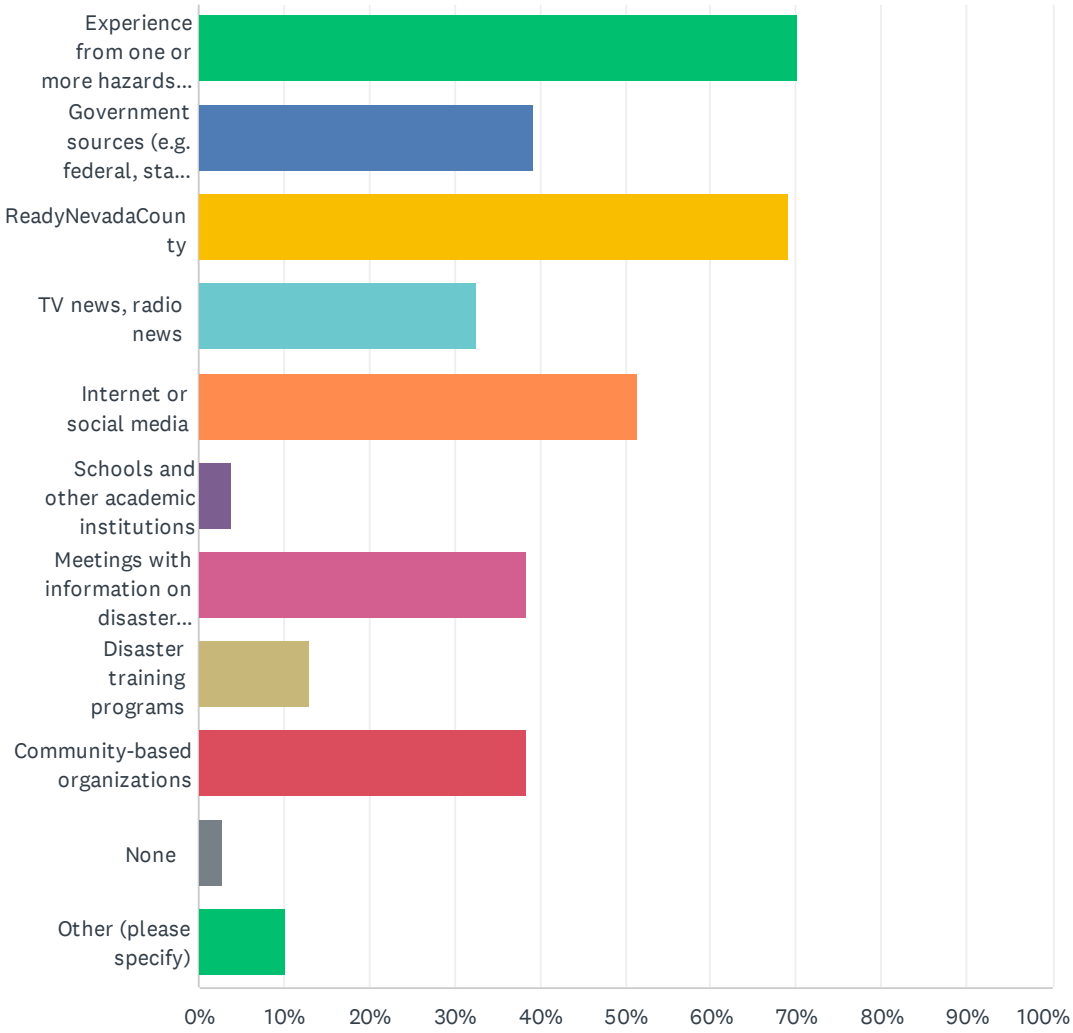




ANSWER CHOICES	RESPONSES	
First Aid/CPR training	44.44%	48
Personal Evacuation Plan	77.78%	84
Designated an evacuation meeting place	39.81%	43
Identified utility shutoff locations	62.96%	68
Emergency supply kit (e.g. batteries, flashlights, battery-powered radio, food/water)	78.70%	85
Smoke detectors	93.52%	101
Carbon monoxide detectors	79.63%	86
Individual or family disaster plan	34.26%	37
Plans to care for elderly family members during and after a disaster	8.33%	9
Plans to care for pets during and after a disaster	53.70%	58
Neighborhood preparedness and planning	30.56%	33
Registered for Nevada County CodeRED	90.74%	98
Working fire extinguisher at home	80.56%	87
Extra medical supplies (e.g. first aid kit, medications)	61.11%	66
Additional emergency/medical kit for car/work	40.74%	44
Emergency potable water and food supply	63.89%	69
Retrofits to my home to withstand a disaster	23.15%	25
Emergency generator	66.67%	72
Homeowner's or renter's insurance	79.63%	86
Connected to a local community-based organization and/or service provider	25.00%	27
None	0.00%	0
Other (please specify)	11.11%	12
Total Respondents: 108		

Q3 What resources/experiences have helped you to become prepared? (Check all that apply)

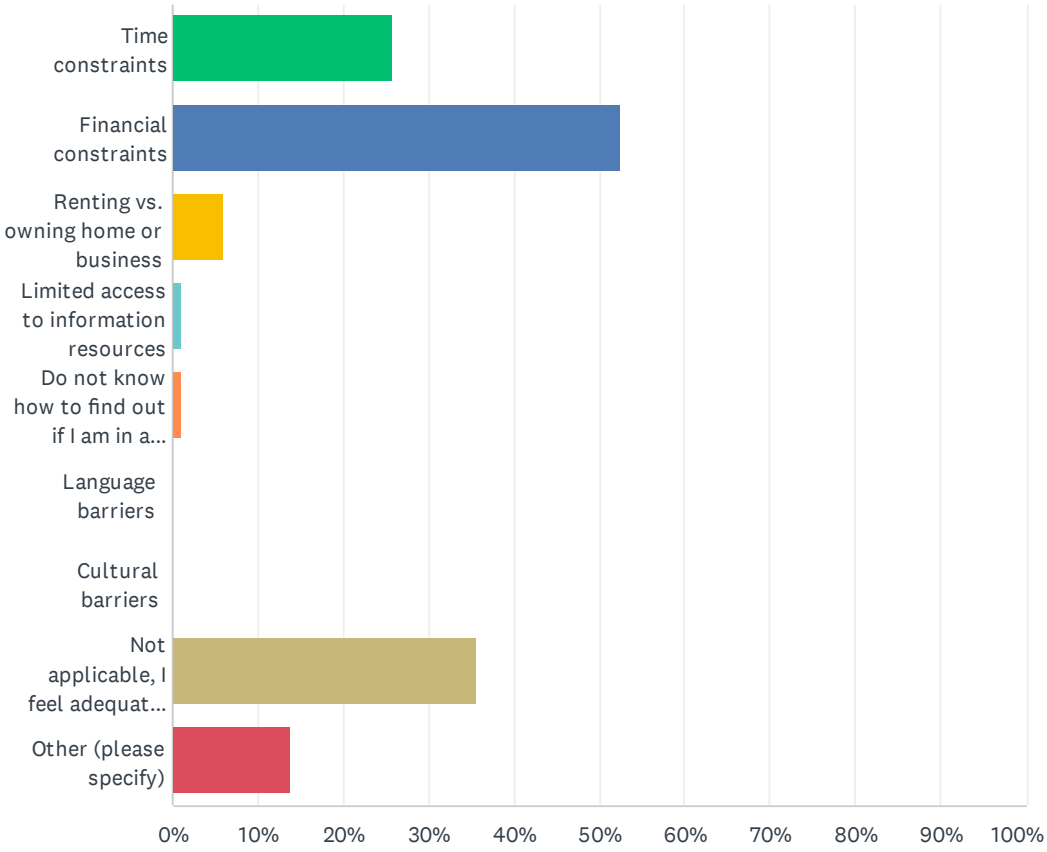
Answered: 107 Skipped: 1



ANSWER CHOICES	RESPONSES	
Experience from one or more hazards or disasters	70.09%	75
Government sources (e.g. federal, state, or local)	39.25%	42
ReadyNevadaCounty	69.16%	74
TV news, radio news	32.71%	35
Internet or social media	51.40%	55
Schools and other academic institutions	3.74%	4
Meetings with information on disaster preparedness	38.32%	41
Disaster training programs	13.08%	14
Community-based organizations	38.32%	41
None	2.80%	3
Other (please specify)	10.28%	11
Total Respondents: 107		

Q4 What are the hurdles preventing you from being prepared? (Check all that apply)

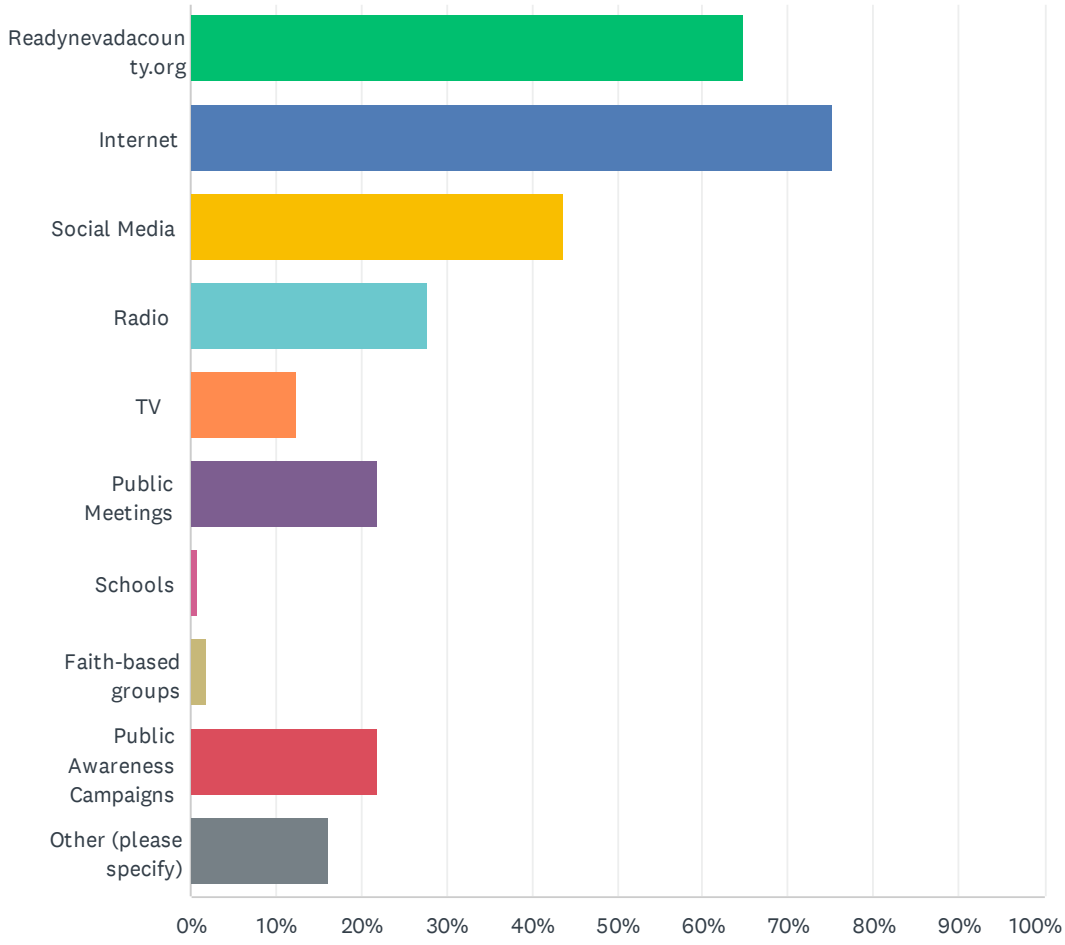
Answered: 101 Skipped: 7



ANSWER CHOICES	RESPONSES	
Time constraints	25.74%	26
Financial constraints	52.48%	53
Renting vs. owning home or business	5.94%	6
Limited access to information resources	0.99%	1
Do not know how to find out if I am in a hazard area	0.99%	1
Language barriers	0.00%	0
Cultural barriers	0.00%	0
Not applicable, I feel adequately prepared already	35.64%	36
Other (please specify)	13.86%	14
Total Respondents: 101		

Q5 Which information sources on emergency preparedness do you use the most? (Check all that apply)

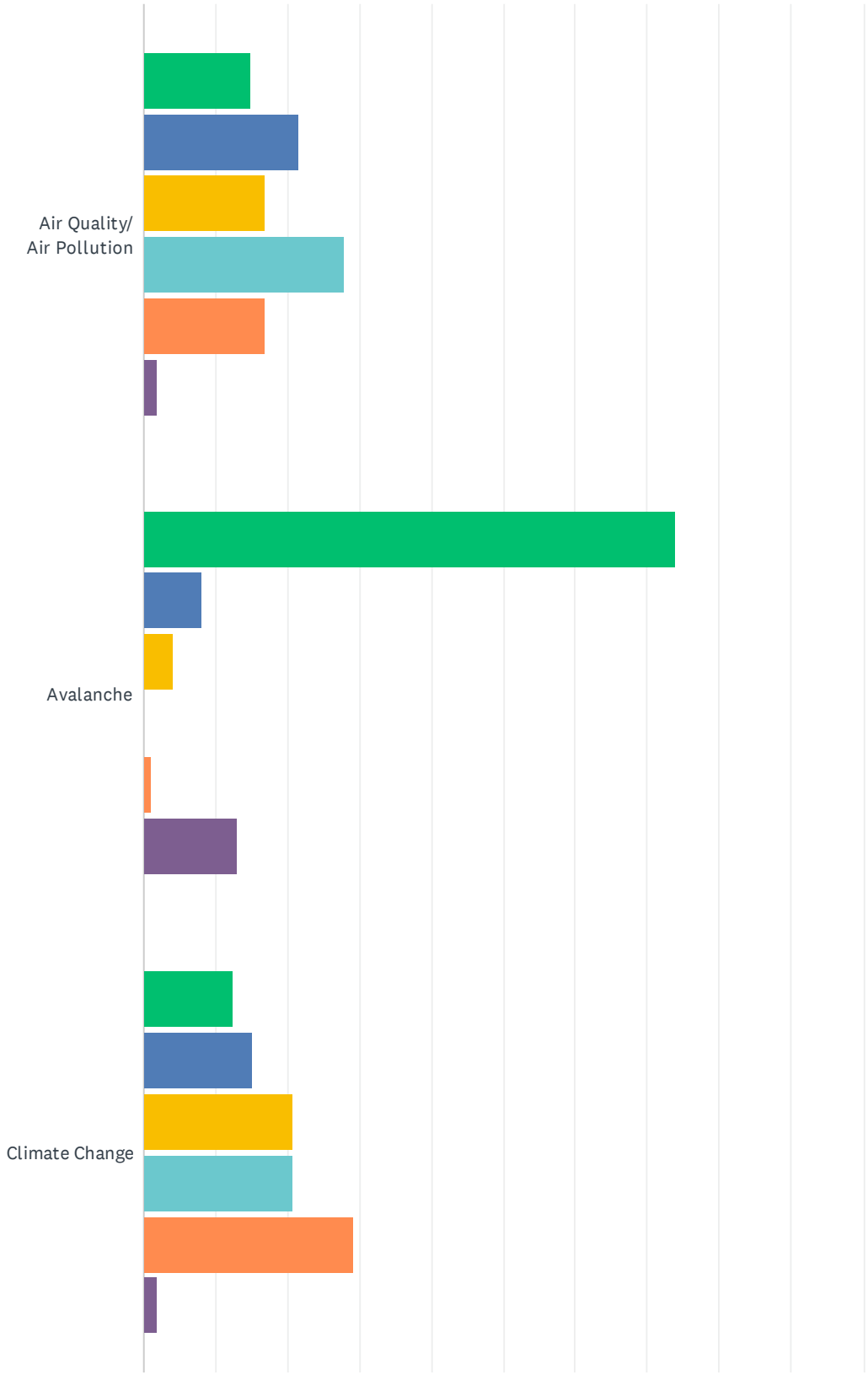
Answered: 105 Skipped: 3

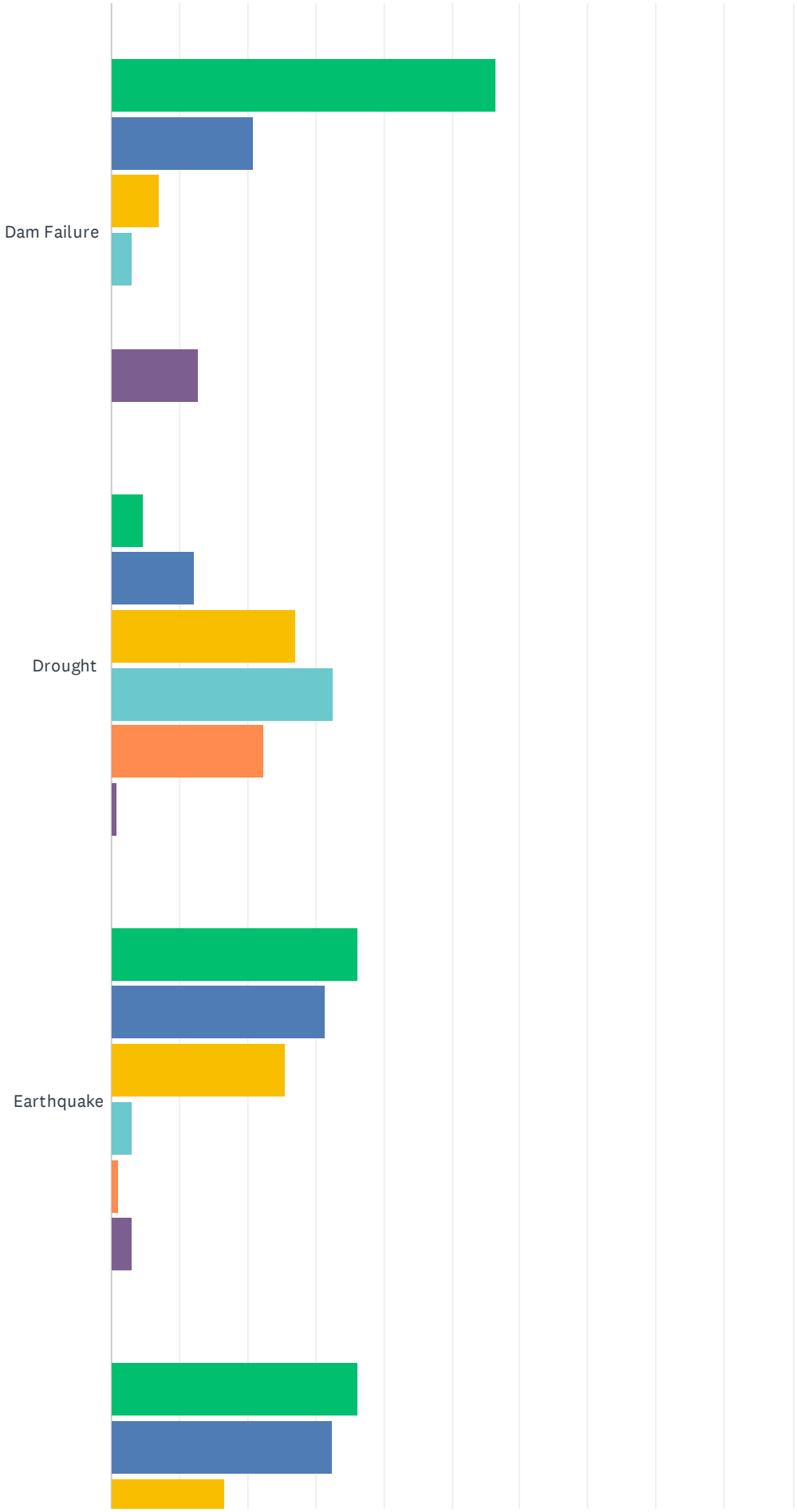


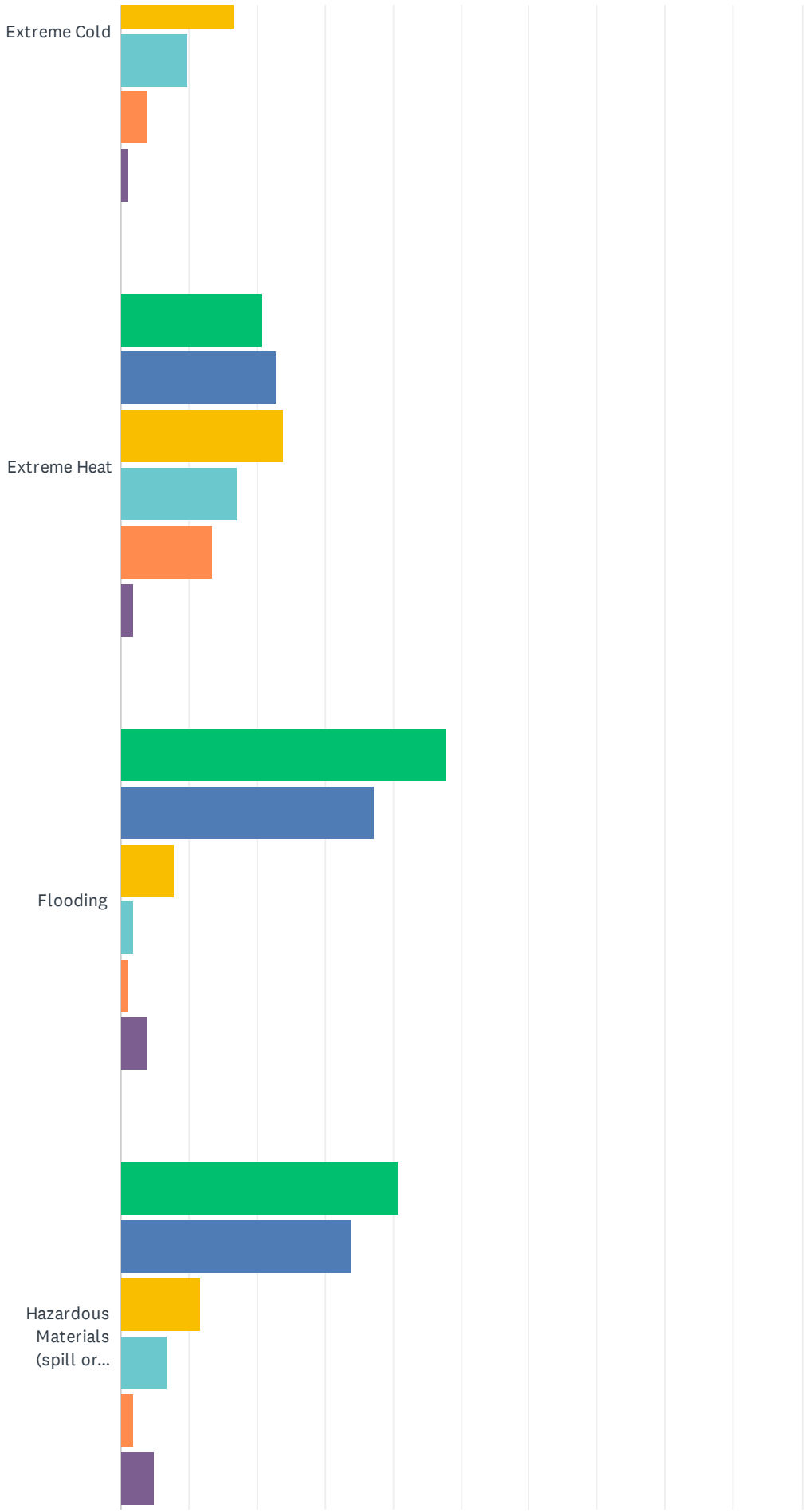
ANSWER CHOICES	RESPONSES	
Readynevadacounty.org	64.76%	68
Internet	75.24%	79
Social Media	43.81%	46
Radio	27.62%	29
TV	12.38%	13
Public Meetings	21.90%	23
Schools	0.95%	1
Faith-based groups	1.90%	2
Public Awareness Campaigns	21.90%	23
Other (please specify)	16.19%	17
Total Respondents: 105		

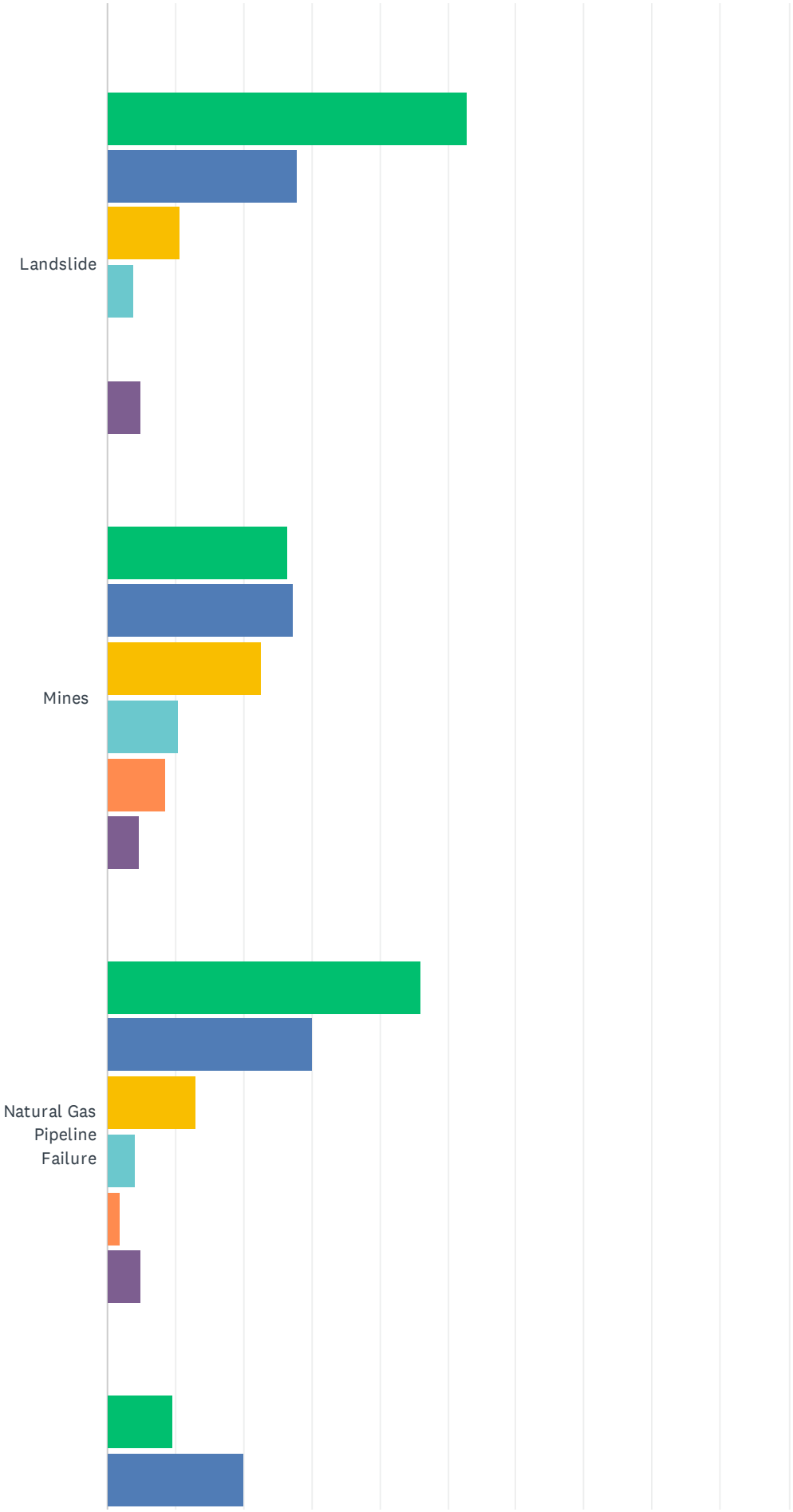
Q6 How concerned are you about the following hazards within Nevada County? (Check one response for each hazard)

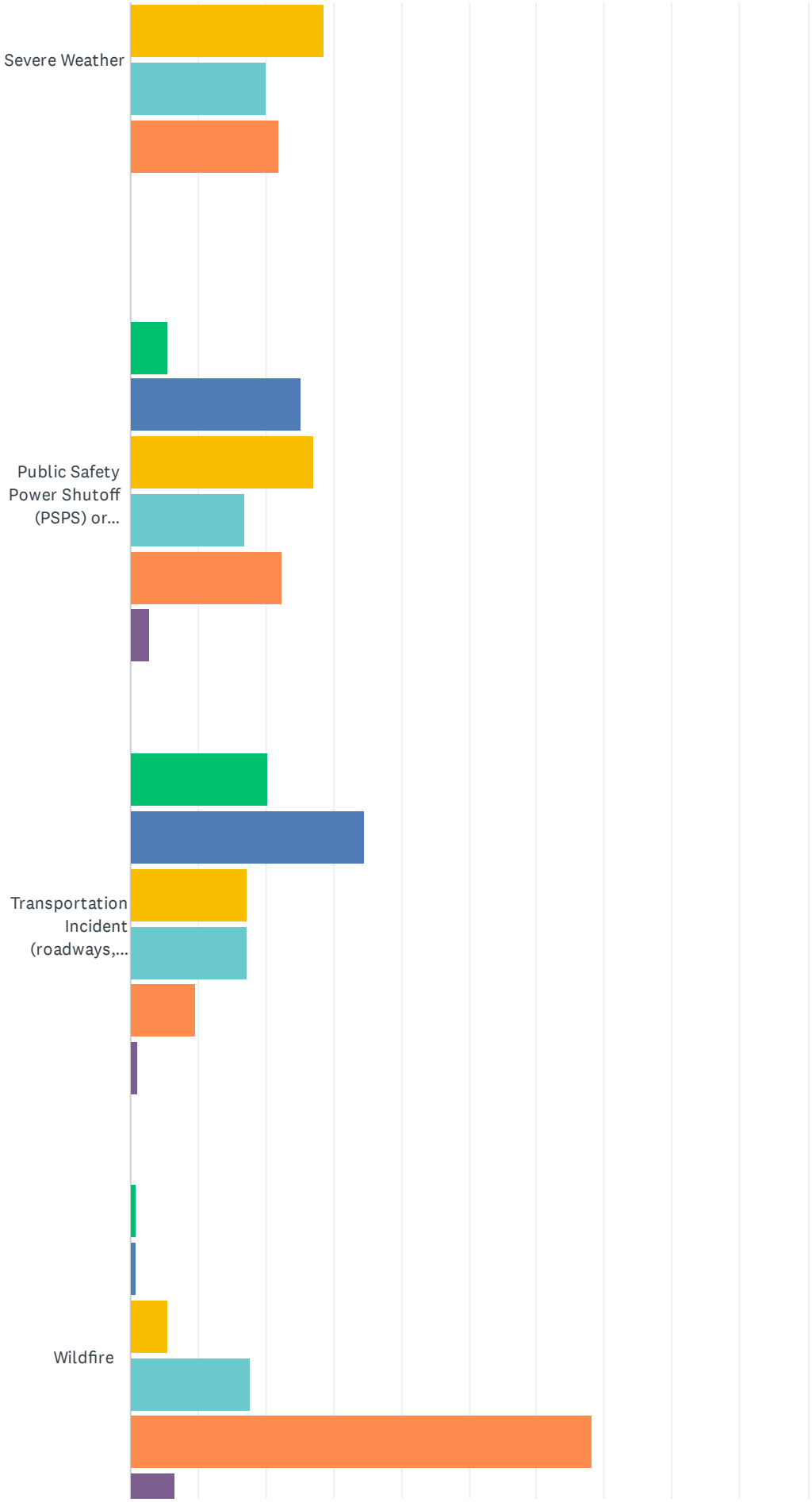
Answered: 108 Skipped: 0

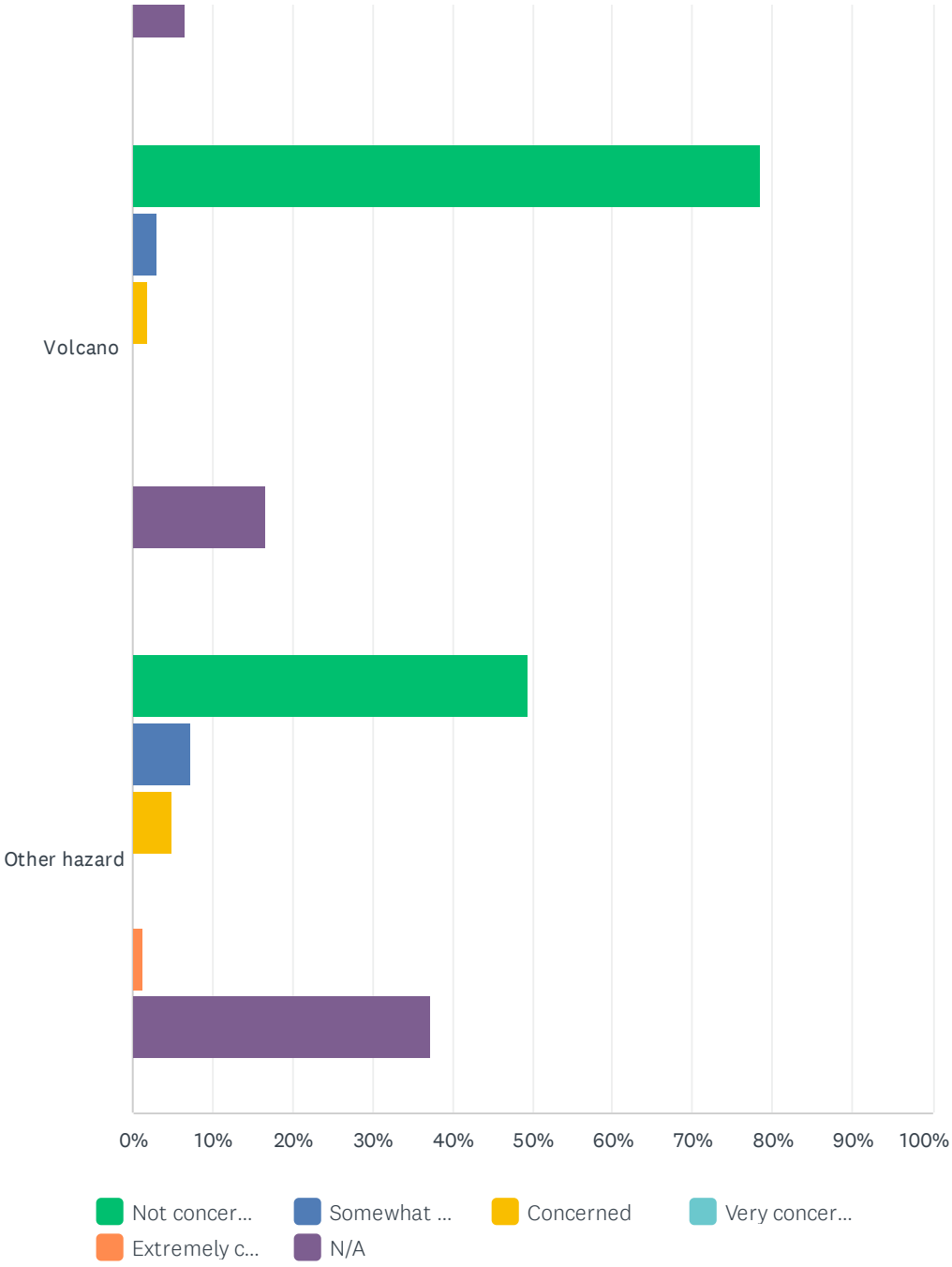



Dam Failure
Drought
Earthquake


Extreme Cold
Extreme Heat
Flooding
Hazardous Materials (spill or...


Landslide
Mines
Natural Gas Pipeline Failure

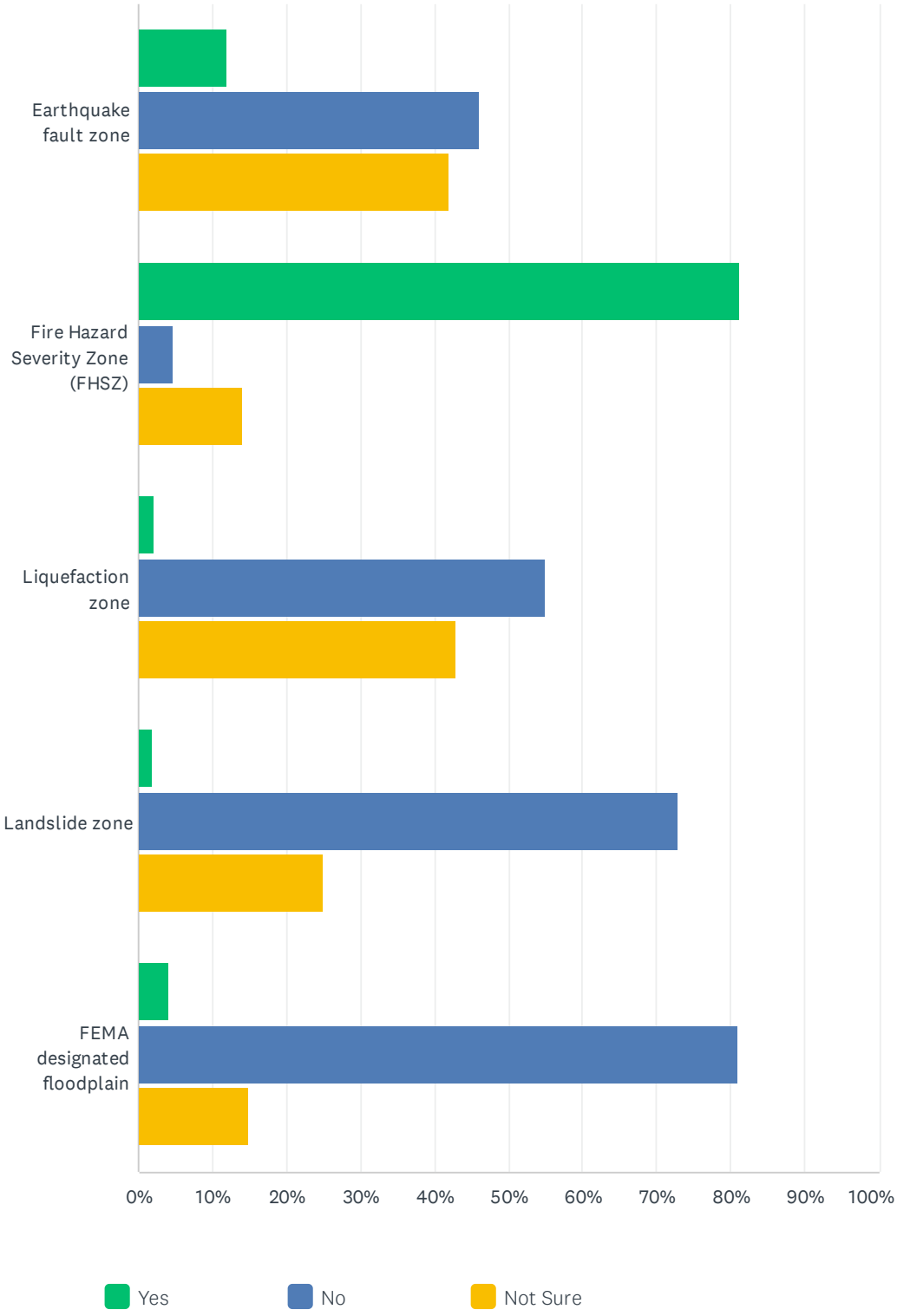

Severe Weather
Public Safety Power Shutoff (PSPS) or...
Transportation Incident (roadways,...
Wildfire


Volcano
Other hazard
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Not concer...
Somewhat ...
Concerned
Very concer...
Extremely c...
N/A

	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	N/A	TOTAL	WEIGHTE AVERAGE
Air Quality/ Air Pollution	14.95% 16	21.50% 23	16.82% 18	28.04% 30	16.82% 18	1.87% 2	107	3.1
Avalanche	74.00% 74	8.00% 8	4.00% 4	0.00% 0	1.00% 1	13.00% 13	100	1.2
Climate Change	12.26% 13	15.09% 16	20.75% 22	20.75% 22	29.25% 31	1.89% 2	106	3.4
Dam Failure	56.44% 57	20.79% 21	6.93% 7	2.97% 3	0.00% 0	12.87% 13	101	1.5
Drought	4.67% 5	12.15% 13	27.10% 29	32.71% 35	22.43% 24	0.93% 1	107	3.5
Earthquake	36.27% 37	31.37% 32	25.49% 26	2.94% 3	0.98% 1	2.94% 3	102	1.9
Extreme Cold	36.27% 37	32.35% 33	16.67% 17	9.80% 10	3.92% 4	0.98% 1	102	2.1
Extreme Heat	20.95% 22	22.86% 24	23.81% 25	17.14% 18	13.33% 14	1.90% 2	105	2.7
Flooding	48.04% 49	37.25% 38	7.84% 8	1.96% 2	0.98% 1	3.92% 4	102	1.6
Hazardous Materials (spill or release)	40.78% 42	33.98% 35	11.65% 12	6.80% 7	1.94% 2	4.85% 5	103	1.9
Landslide	52.88% 55	27.88% 29	10.58% 11	3.85% 4	0.00% 0	4.81% 5	104	1.6
Mines	26.42% 28	27.36% 29	22.64% 24	10.38% 11	8.49% 9	4.72% 5	106	2.4
Natural Gas Pipeline Failure	46.00% 46	30.00% 30	13.00% 13	4.00% 4	2.00% 2	5.00% 5	100	1.8
Severe Weather	9.52% 10	20.00% 21	28.57% 30	20.00% 21	21.90% 23	0.00% 0	105	3.2
Public Safety Power Shutoff (PSPS) or De-Energization	5.61% 6	25.23% 27	27.10% 29	16.82% 18	22.43% 24	2.80% 3	107	3.2
Transportation Incident (roadways, rail, airport, waterways)	20.19% 21	34.62% 36	17.31% 18	17.31% 18	9.62% 10	0.96% 1	104	2.6
Wildfire	0.93% 1	0.93% 1	5.61% 6	17.76% 19	68.22% 73	6.54% 7	107	4.6
Volcano	78.43% 80	2.94% 3	1.96% 2	0.00% 0	0.00% 0	16.67% 17	102	1.0
Other hazard	49.40% 41	7.23% 6	4.82% 4	0.00% 0	1.20% 1	37.35% 31	83	1.3

Q7 Is your current residence located within a mapped hazard area? (Check all that apply)

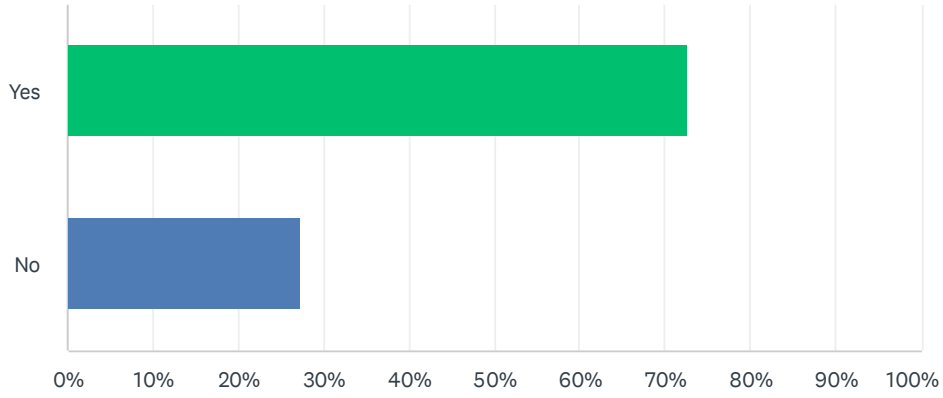
Answered: 106 Skipped: 2



	YES	NO	NOT SURE	TOTAL
Earthquake fault zone	12.00% 12	46.00% 46	42.00% 42	100
Fire Hazard Severity Zone (FHSZ)	81.13% 86	4.72% 5	14.15% 15	106
Liquefaction zone	2.04% 2	55.10% 54	42.86% 42	98
Landslide zone	2.00% 2	73.00% 73	25.00% 25	100
FEMA designated floodplain	4.00% 4	81.00% 81	15.00% 15	100

Q8 Would the disclosure of natural hazard information influence your decision to purchase or move into a home today?

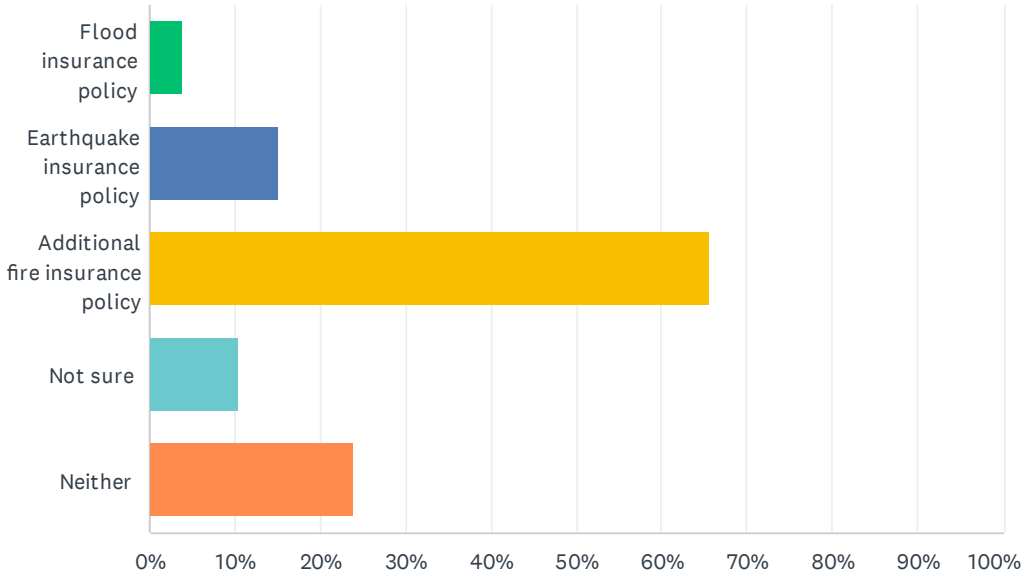
Answered: 106 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	72.64%	77
No	27.36%	29
TOTAL		106

Q9 To the best of your knowledge, does the home in which you live have: (Check all that apply)

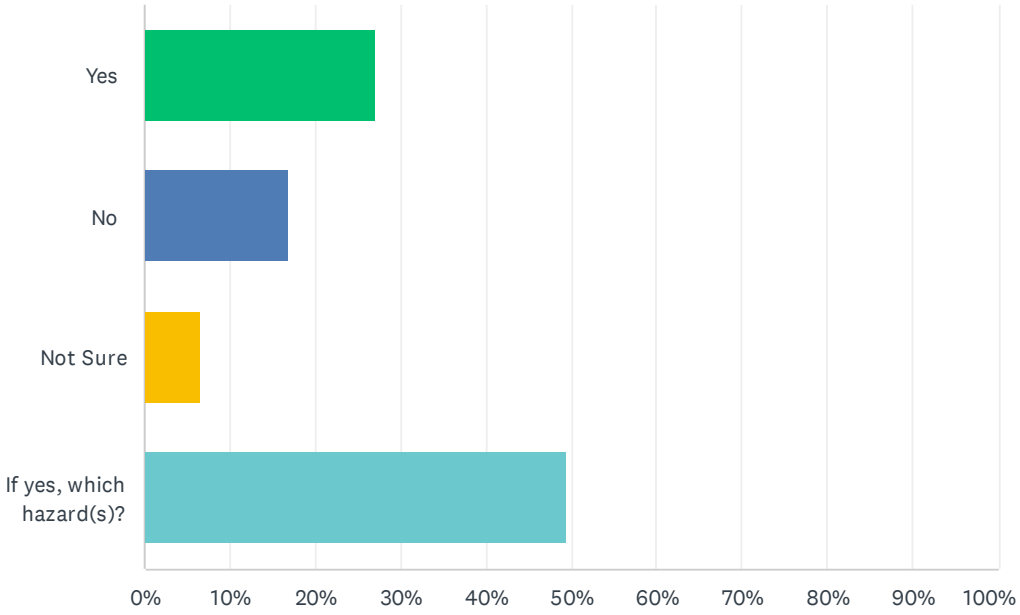
Answered: 105 Skipped: 3



ANSWER CHOICES	RESPONSES	
Flood insurance policy	3.81%	4
Earthquake insurance policy	15.24%	16
Additional fire insurance policy	65.71%	69
Not sure	10.48%	11
Neither	23.81%	25
Total Respondents: 105		

Q10 Have you ever had difficulty obtaining homeowners or renters insurance due to risks from natural hazards?

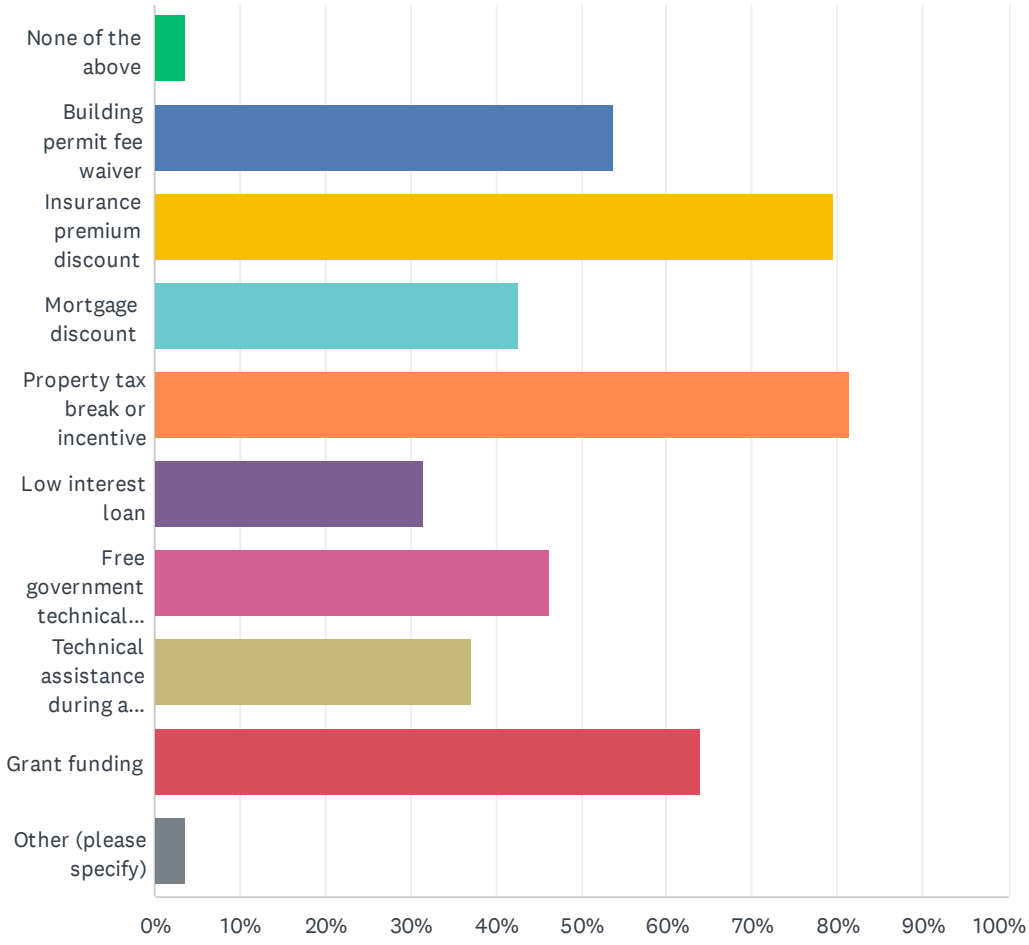
Answered: 107 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	27.10%	29
No	16.82%	18
Not Sure	6.54%	7
If yes, which hazard(s)?	49.53%	53
TOTAL		107

Q11 Which incentives would encourage you to retrofit your home to protect against natural disasters? (Check all that apply)

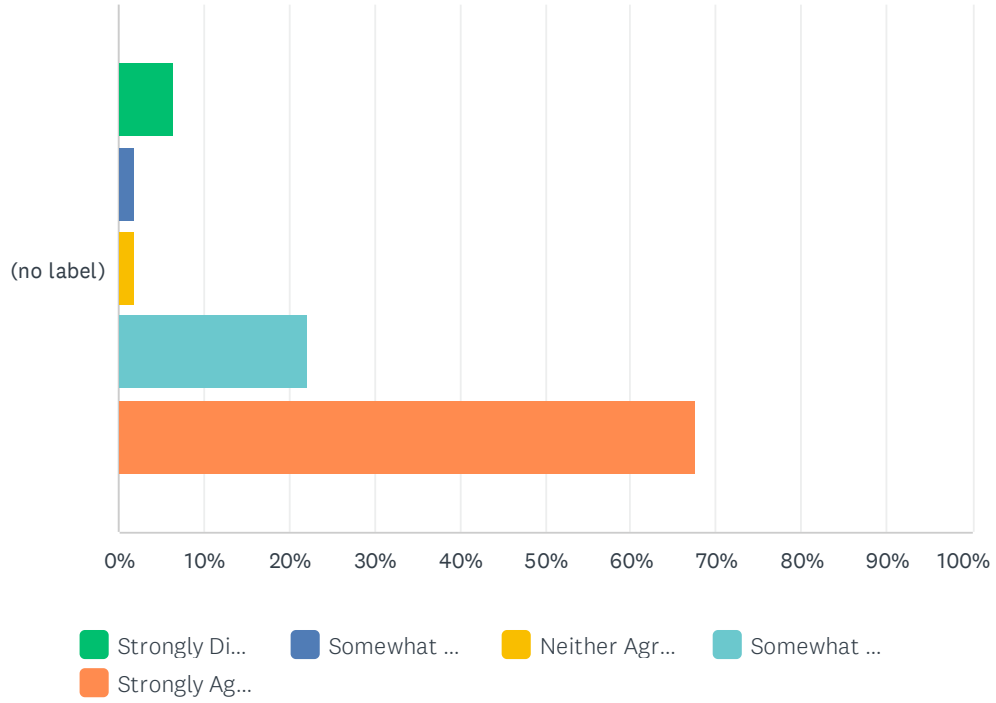
Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
None of the above	3.70%	4
Building permit fee waiver	53.70%	58
Insurance premium discount	79.63%	86
Mortgage discount	42.59%	46
Property tax break or incentive	81.48%	88
Low interest loan	31.48%	34
Free government technical assistance	46.30%	50
Technical assistance during a retrofitting process	37.04%	40
Grant funding	63.89%	69
Other (please specify)	3.70%	4
Total Respondents: 108		

Q12 Please indicate how you feel about the following statement:"I think it is important to provide education and programs that promote community members to take action to reduce their exposure and risks to natural hazards."

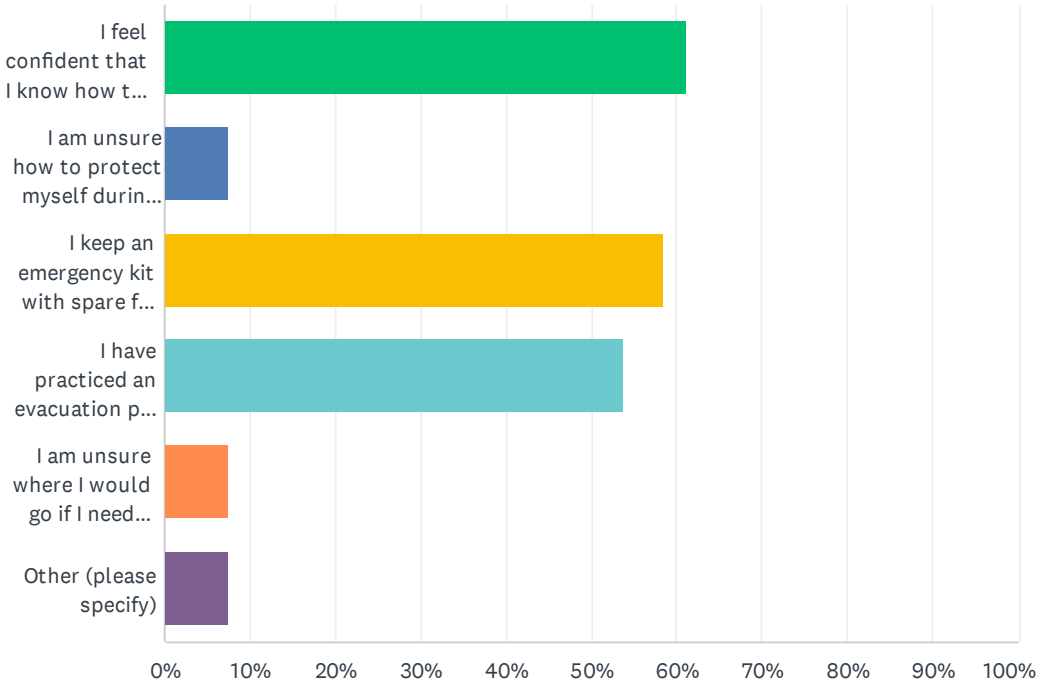
Answered: 108 Skipped: 0



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	6.48% 7	1.85% 2	1.85% 2	22.22% 24	67.59% 73	108	4.43

Q13 If a natural disaster such as a major wildfire were to strike tomorrow... (Check all that apply)

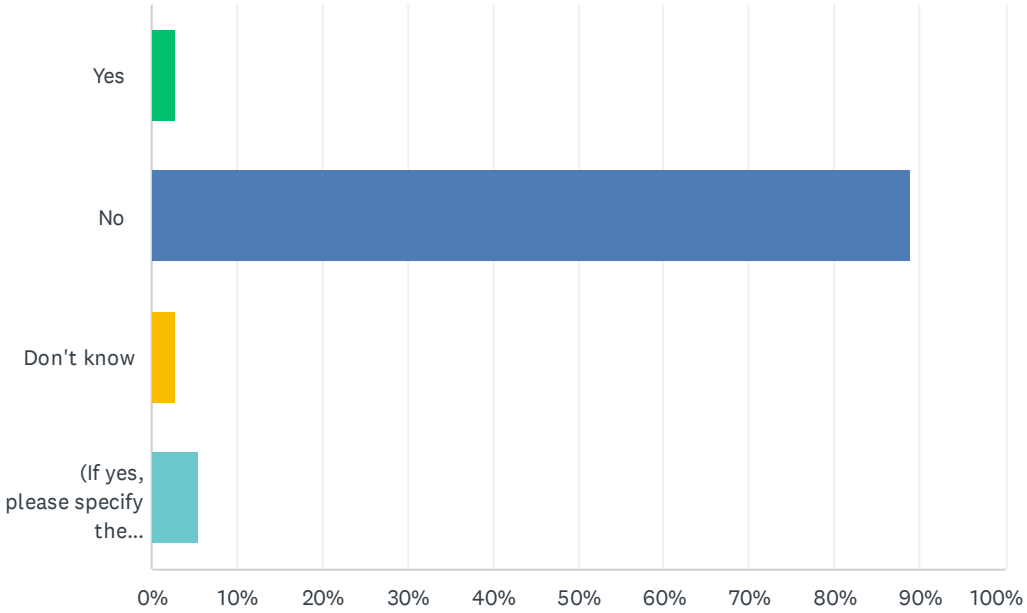
Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
I feel confident that I know how to protect myself during a major wildfire or other disaster	61.11%	66
I am unsure how to protect myself during a major wildfire or other disaster	7.41%	8
I keep an emergency kit with spare food and water for myself and my family	58.33%	63
I have practiced an evacuation plan and/or know where I and my family would go if we needed to evacuate our home	53.70%	58
I am unsure where I would go if I needed to evacuate my home	7.41%	8
Other (please specify)	7.41%	8
Total Respondents: 108		

Q14 Does your street (or another nearby street) typically flood during rain events?

Answered: 108 Skipped: 0



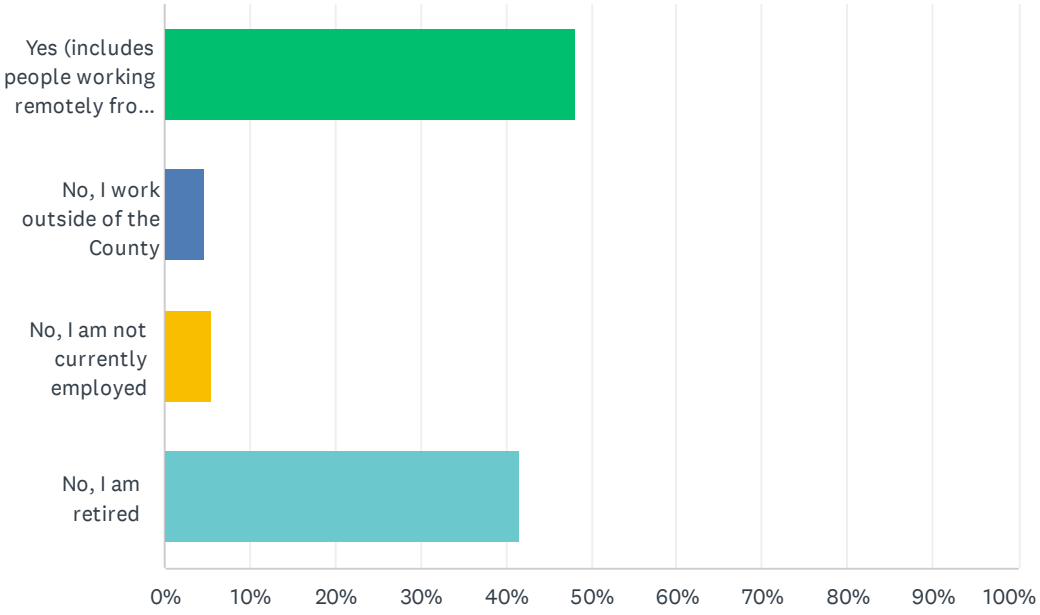
ANSWER CHOICES	RESPONSES	
Yes	2.78%	3
No	88.89%	96
Don't know	2.78%	3
(If yes, please specify the intersection or street name that typically experiences flooding during rain events)	5.56%	6
TOTAL		108

Q15 What is the zip code where you live?

Answered: 108 Skipped: 0

Q16 Do you work in Nevada County?

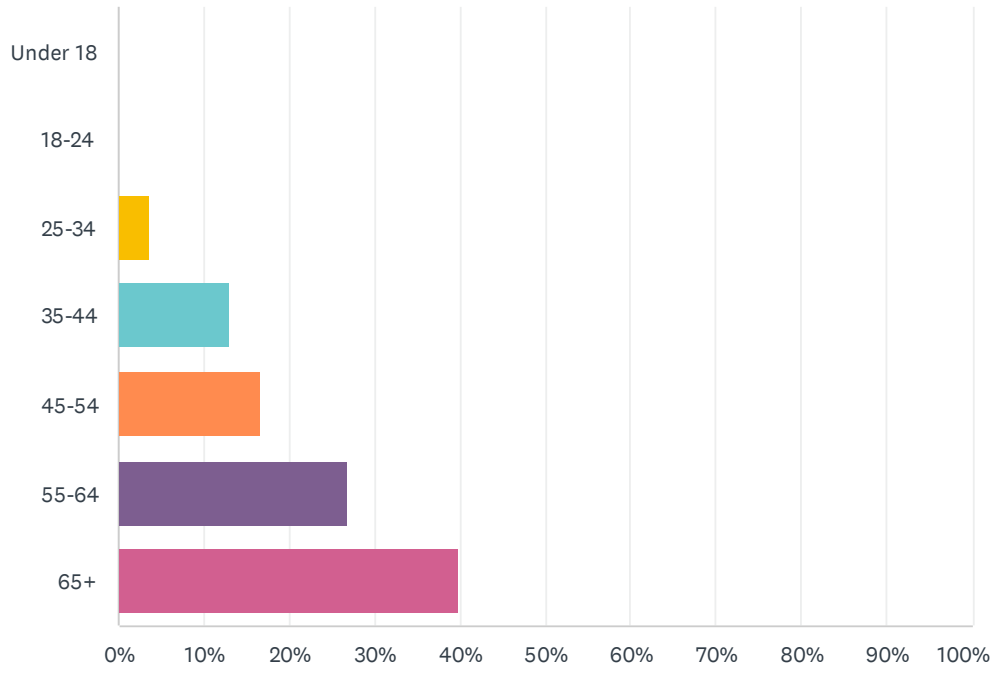
Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes (includes people working remotely from home)	48.15%	52
No, I work outside of the County	4.63%	5
No, I am not currently employed	5.56%	6
No, I am retired	41.67%	45
TOTAL		108

Q17 Please indicate your age range:

Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
Under 18	0.00%	0
18-24	0.00%	0
25-34	3.70%	4
35-44	12.96%	14
45-54	16.67%	18
55-64	26.85%	29
65+	39.81%	43
TOTAL		108

Q18 Please indicate the primary language spoken in your household.

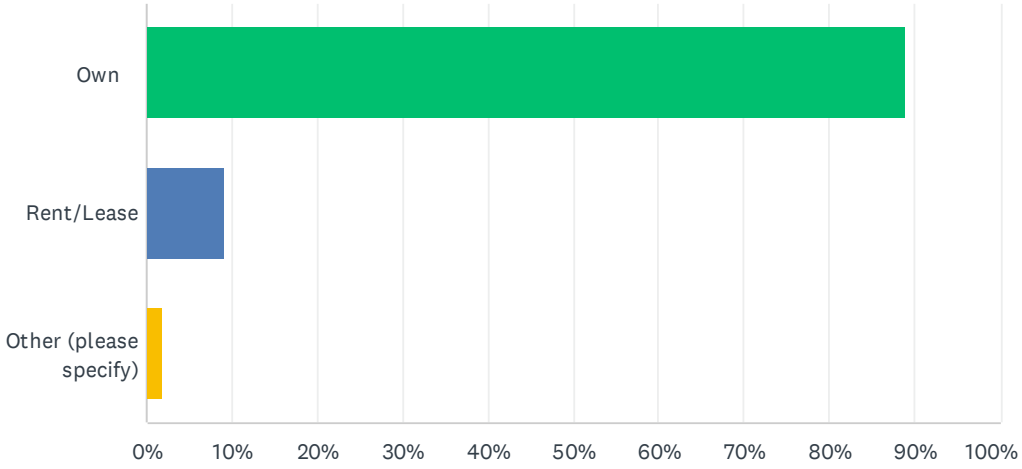
Answered: 108 Skipped: 0


English
Spanish
Arabic
Armenian
Chinese (Cantonese)
Chinese (Mandarin)
Farsi
French
Greek
Hebrew
Hindi
Japanese
Korean
Persian
Russian
Tagalog
Vietnamese
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
English	98.15%	106
Spanish	0.00%	0
Arabic	0.00%	0
Armenian	0.00%	0
Chinese (Cantonese)	0.00%	0
Chinese (Mandarin)	0.00%	0
Farsi	0.00%	0
French	0.00%	0
Greek	0.00%	0
Hebrew	0.00%	0
Hindi	0.00%	0
Japanese	0.00%	0
Korean	0.00%	0
Persian	0.00%	0
Russian	0.00%	0
Tagalog	0.00%	0
Vietnamese	0.00%	0
Other (please specify)	1.85%	2
TOTAL		108

Q19 Do you own or rent your home?

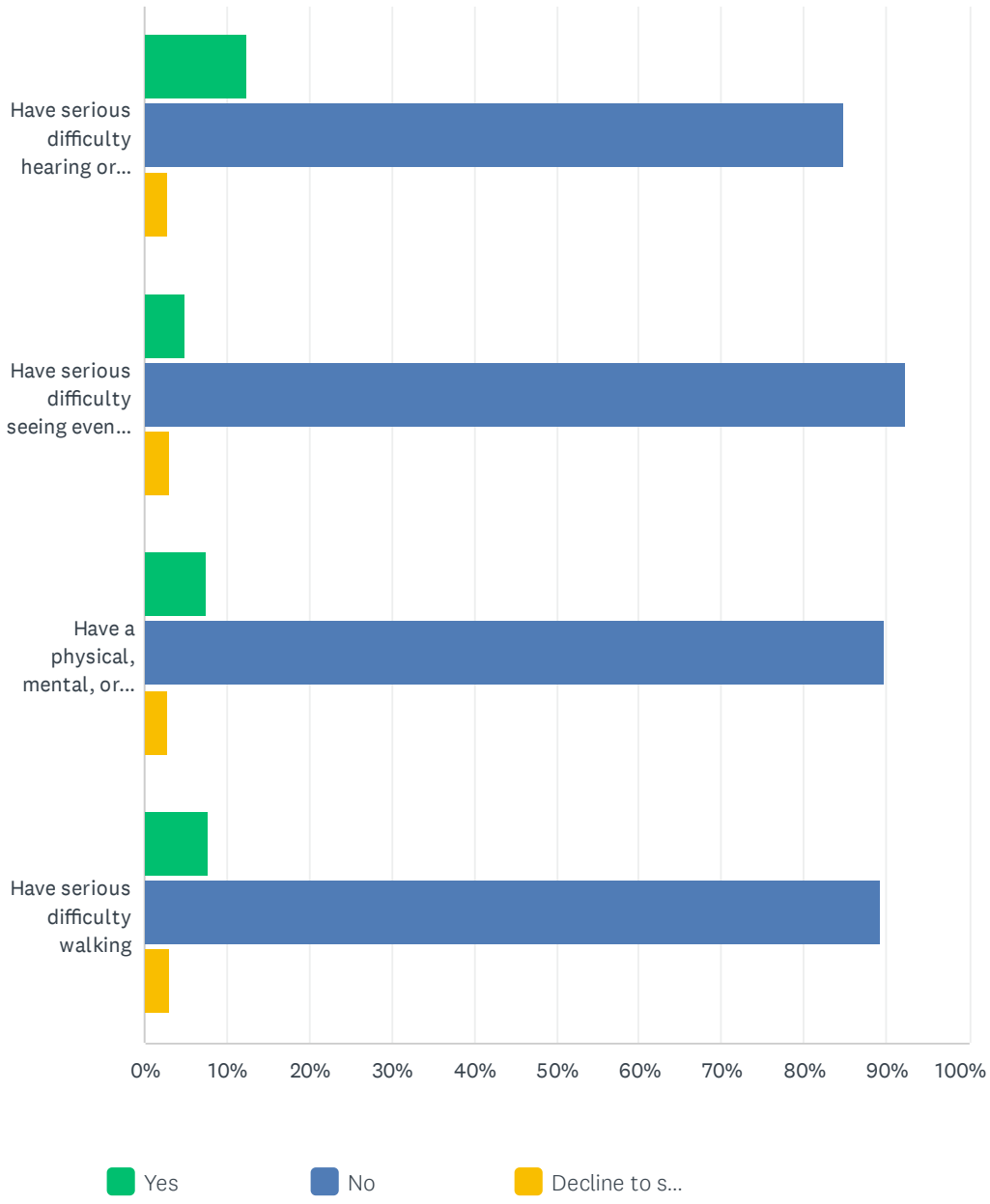
Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
Own	88.89%	96
Rent/Lease	9.26%	10
Other (please specify)	1.85%	2
TOTAL		108

Q20 Do you, or anyone in your household:

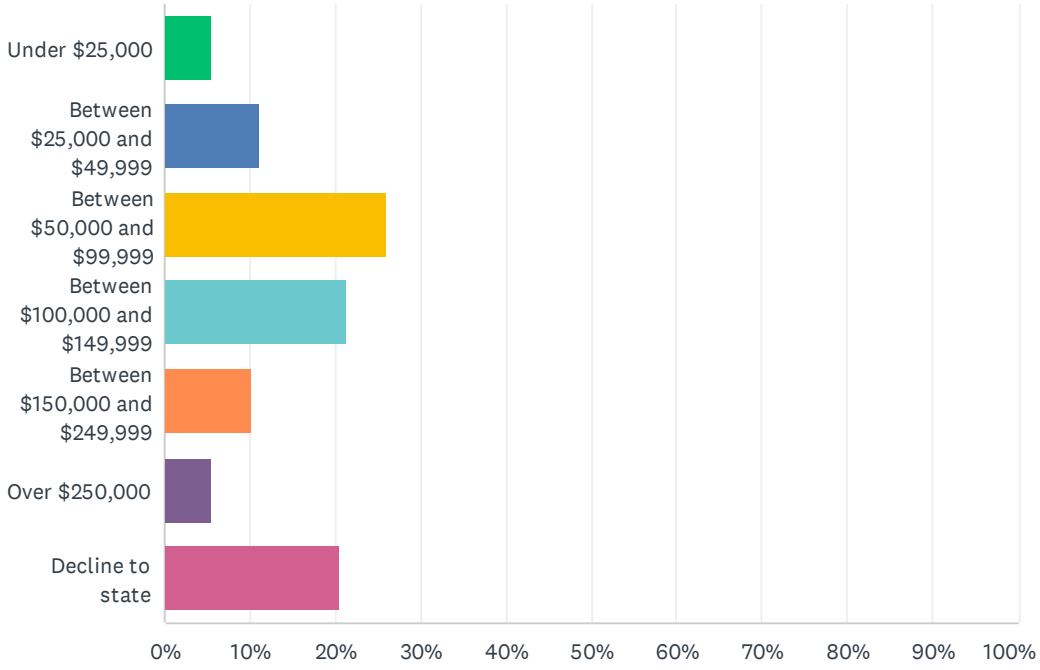
Answered: 107 Skipped: 1



	YES	NO	DECLINE TO STATE	TOTAL
Have serious difficulty hearing or identify as deaf	12.26% 13	84.91% 90	2.83% 3	106
Have serious difficulty seeing even when wearing glasses or identify as blind	4.81% 5	92.31% 96	2.88% 3	104
Have a physical, mental, or emotional condition that makes it difficult to concentrate, remember, or make decisions	7.48% 8	89.72% 96	2.80% 3	107
Have serious difficulty walking	7.69% 8	89.42% 93	2.88% 3	104

Q21 What is your annual (gross) household income?

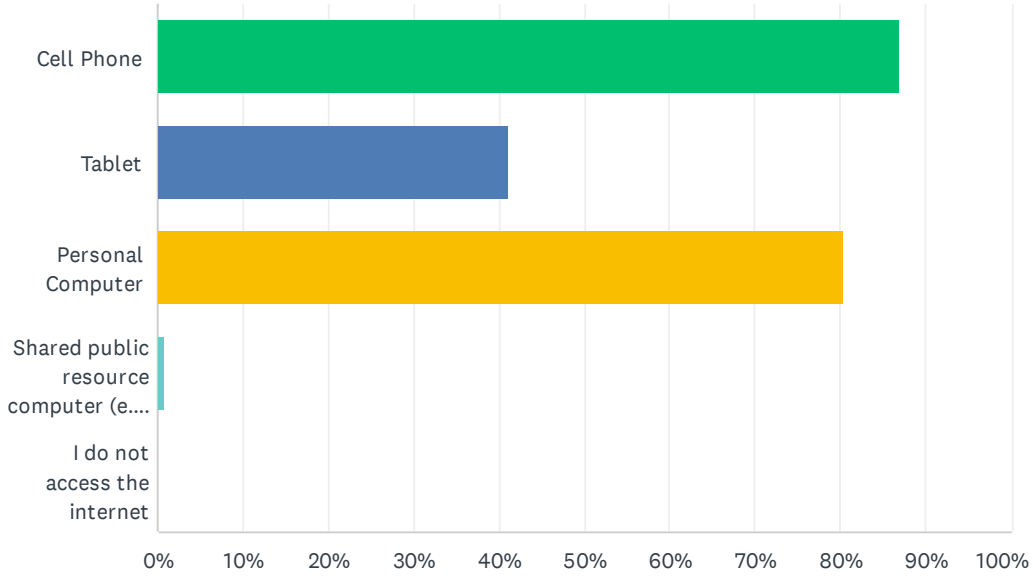
Answered: 108 Skipped: 0



ANSWER CHOICES	RESPONSES	
Under $25,000	5.56%	6
Between $25,000 and $49,999	11.11%	12
Between $50,000 and $99,999	25.93%	28
Between $100,000 and $149,999	21.30%	23
Between $150,000 and $249,999	10.19%	11
Over $250,000	5.56%	6
Decline to state	20.37%	22
TOTAL		108

Q22 How do you typically access the internet? (Check all that apply)

Answered: 107 Skipped: 1



ANSWER CHOICES	RESPONSES	
Cell Phone	86.92%	93
Tablet	41.12%	44
Personal Computer	80.37%	86
Shared public resource computer (e.g., library)	0.93%	1
I do not access the internet	0.00%	0
Total Respondents: 107		

Q23 If you have any questions or additional information you would like to share regarding local hazards and disasters, we invite you to provide your information on this page. This survey and your comments are completely confidential.

Answered: 28 Skipped: 80

Q24 If you would like to stay up to date on future hazard mitigation and/or emergency management efforts in the County, we invite you to provide your email address.

Answered: 37 Skipped: 71

RESULTS OF THE STAKEHOLDER SURVEY

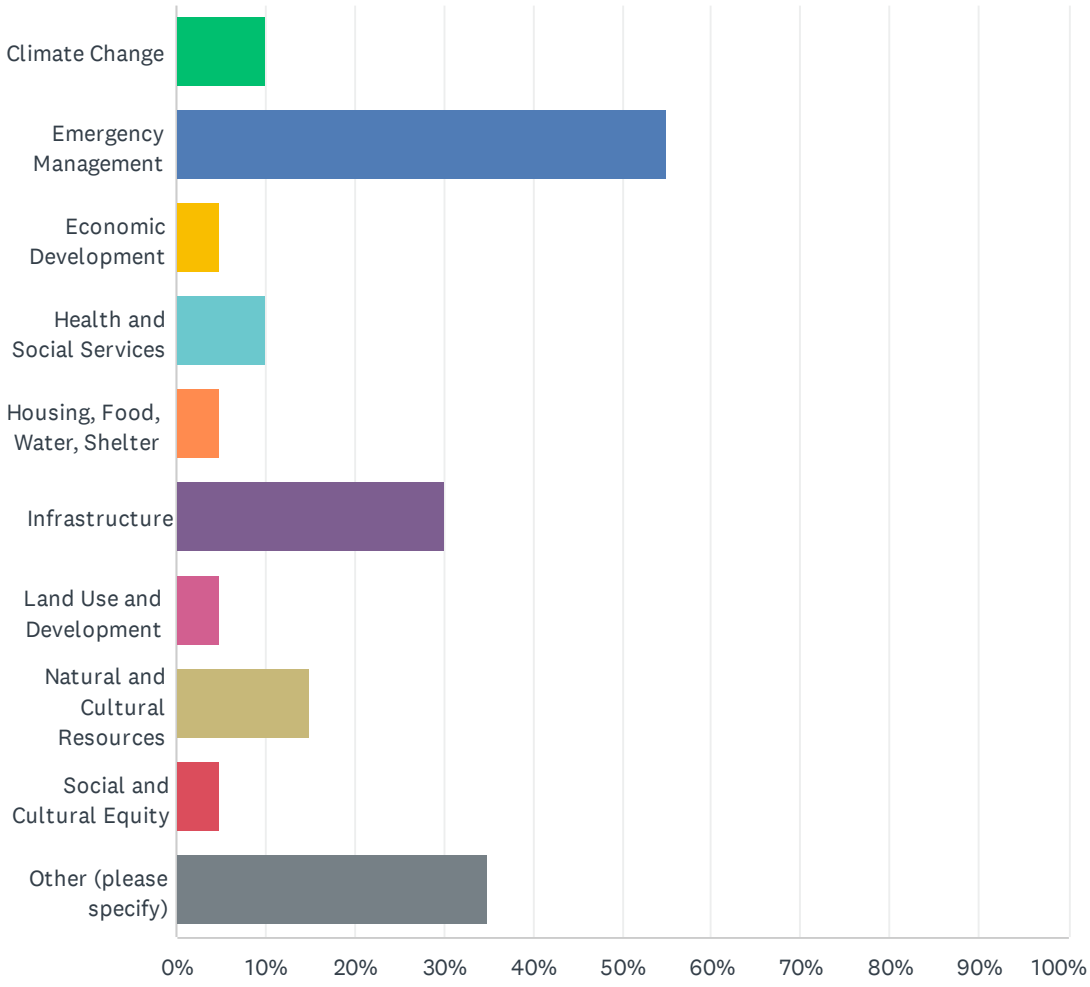
Q1 Contact Information

Answered: 20 Skipped: 0

ANSWER CHOICES	RESPONSES
Name	100.00%
Department/Agency/Organization	95.00%
Primary Responsibility	90.00%
Phone Number	100.00%
Email Address	100.00%

Q2 Which of the following sectors and areas of expertise do you represent? Mark all that apply.

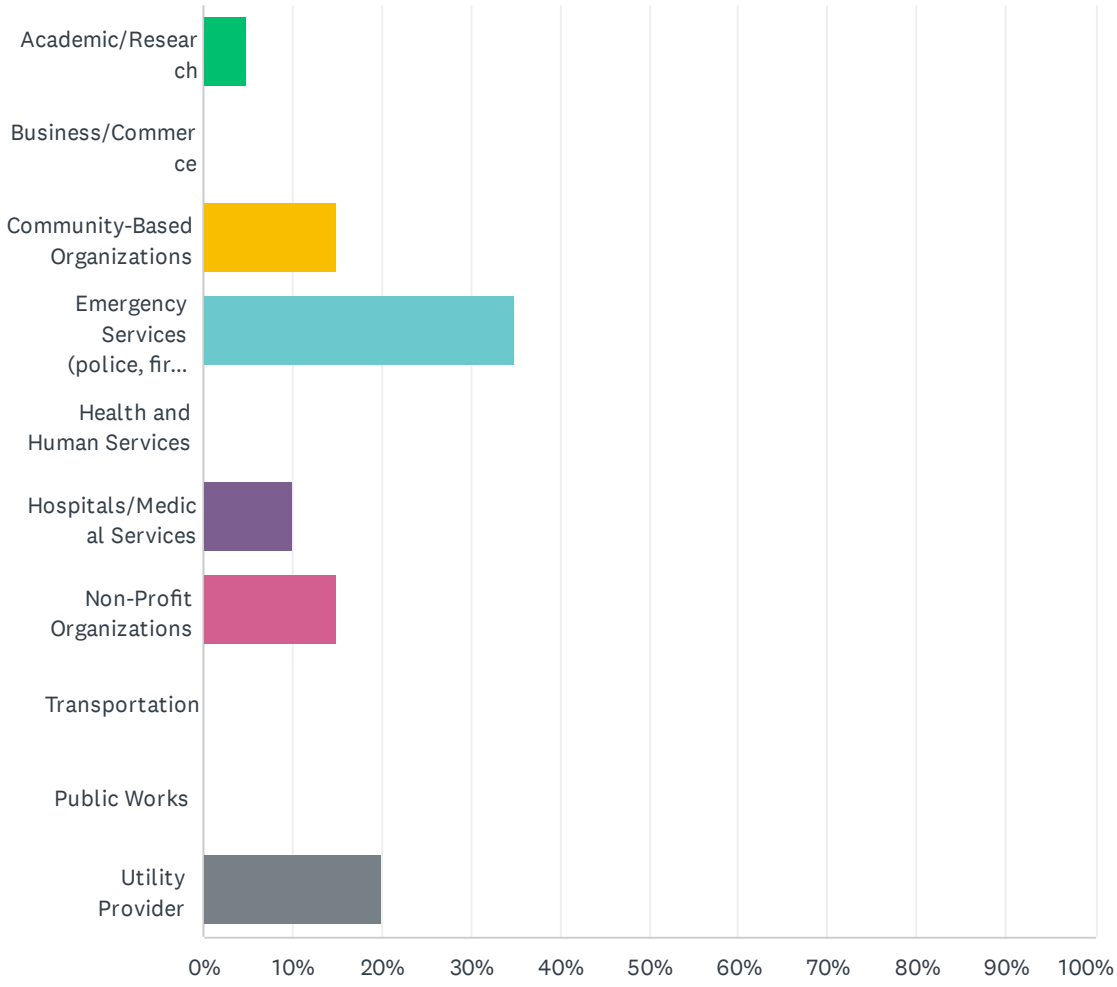
Answered: 20 Skipped: 0



ANSWER CHOICES	RESPONSES
Climate Change	10.00%
Emergency Management	55.00%
Economic Development	5.00%
Health and Social Services	10.00%
Housing, Food, Water, Shelter	5.00%
Infrastructure	30.00%
Land Use and Development	5.00%
Natural and Cultural Resources	15.00%
Social and Cultural Equity	5.00%
Other (please specify)	35.00%
Total Respondents: 20	

Q3 What category does your facility/operation/service fall under?

Answered: 20 Skipped: 0



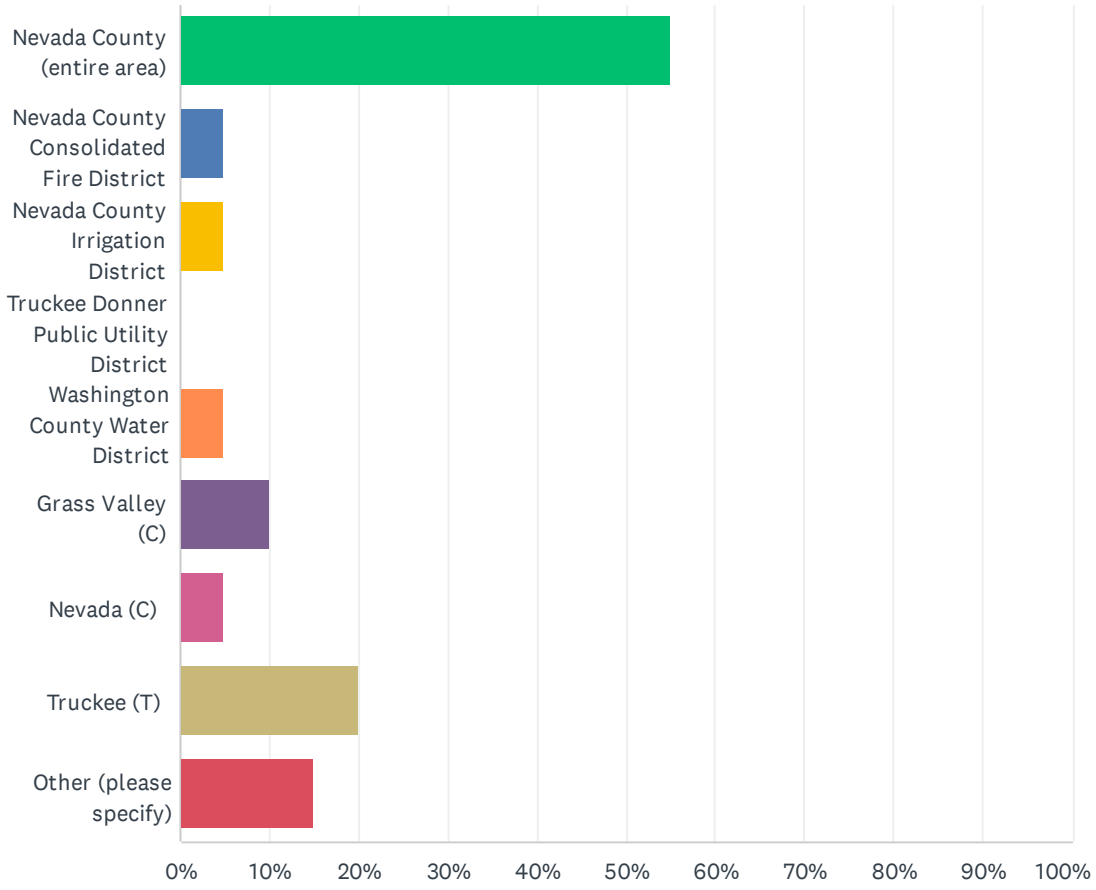
ANSWER CHOICES	RESPONSES
Academic/Research	5.00%
Business/Commerce	0.00%
Community-Based Organizations	15.00%
Emergency Services (police, fire, EMS)	35.00%
Health and Human Services	0.00%
Hospitals/Medical Services	10.00%
Non-Profit Organizations	15.00%
Transportation	0.00%
Public Works	0.00%
Utility Provider	20.00%
TOTAL	

Q4 Based on the above category, please provide additional description ai information as to what your organization does or offers (please explain)

Answered: 19 Skipped: 1

Q5 Please identify the location of your facility(ies) and/ or primary servic area. You may choose more than one if your service area covers multipl communities, or “Nevada County (entire area)” if your service area is county-wide:

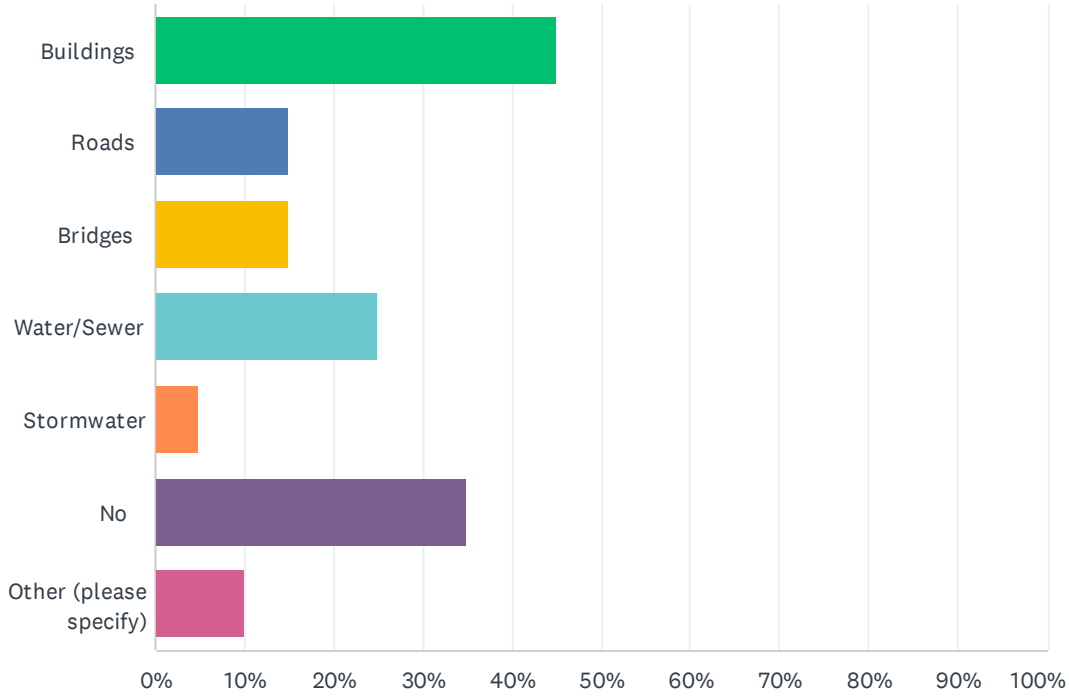
Answered: 20 Skipped: 0



ANSWER CHOICES	RESPONSES
Nevada County (entire area)	55.00%
Nevada County Consolidated Fire District	5.00%
Nevada County Irrigation District	5.00%
Truckee Donner Public Utility District	0.00%
Washington County Water District	5.00%
Grass Valley (C)	10.00%
Nevada (C)	5.00%
Truckee (T)	20.00%
Other (please specify)	15.00%
Total Respondents: 20	

Q6 Does your organization maintain or manage any of the following withi your designated service area? If not, answer “No” at the bottom, otherwis check all that apply.

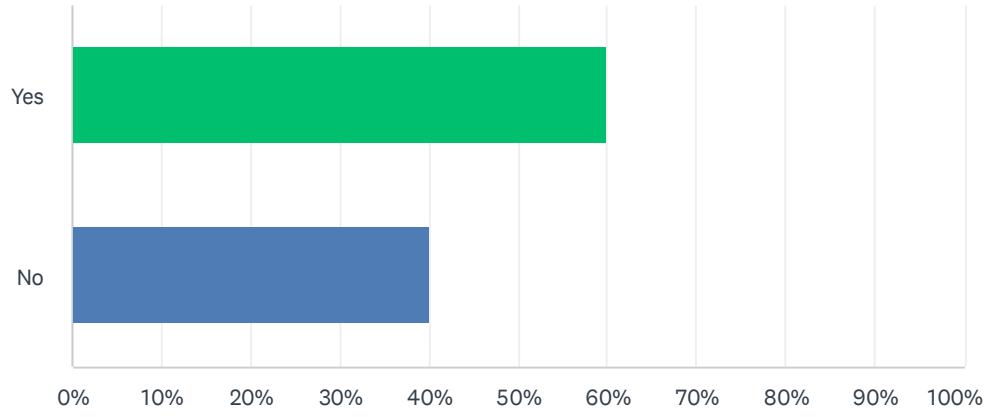
Answered: 20 Skipped: 0



ANSWER CHOICES	RESPONSES
Buildings	45.00%
Roads	15.00%
Bridges	15.00%
Water/Sewer	25.00%
Stormwater	5.00%
No	35.00%
Other (please specify)	10.00%
Total Respondents: 20	

Q7 Does your organization work with or help support socially vulnerable populations that may be at higher risk for hazard impacts? Socially vulnerable populations may be considered "socially vulnerable" because a variety of factors like socioeconomic status, household composition, minority status, limited proficiency to read or speak English, housing type and transportation.

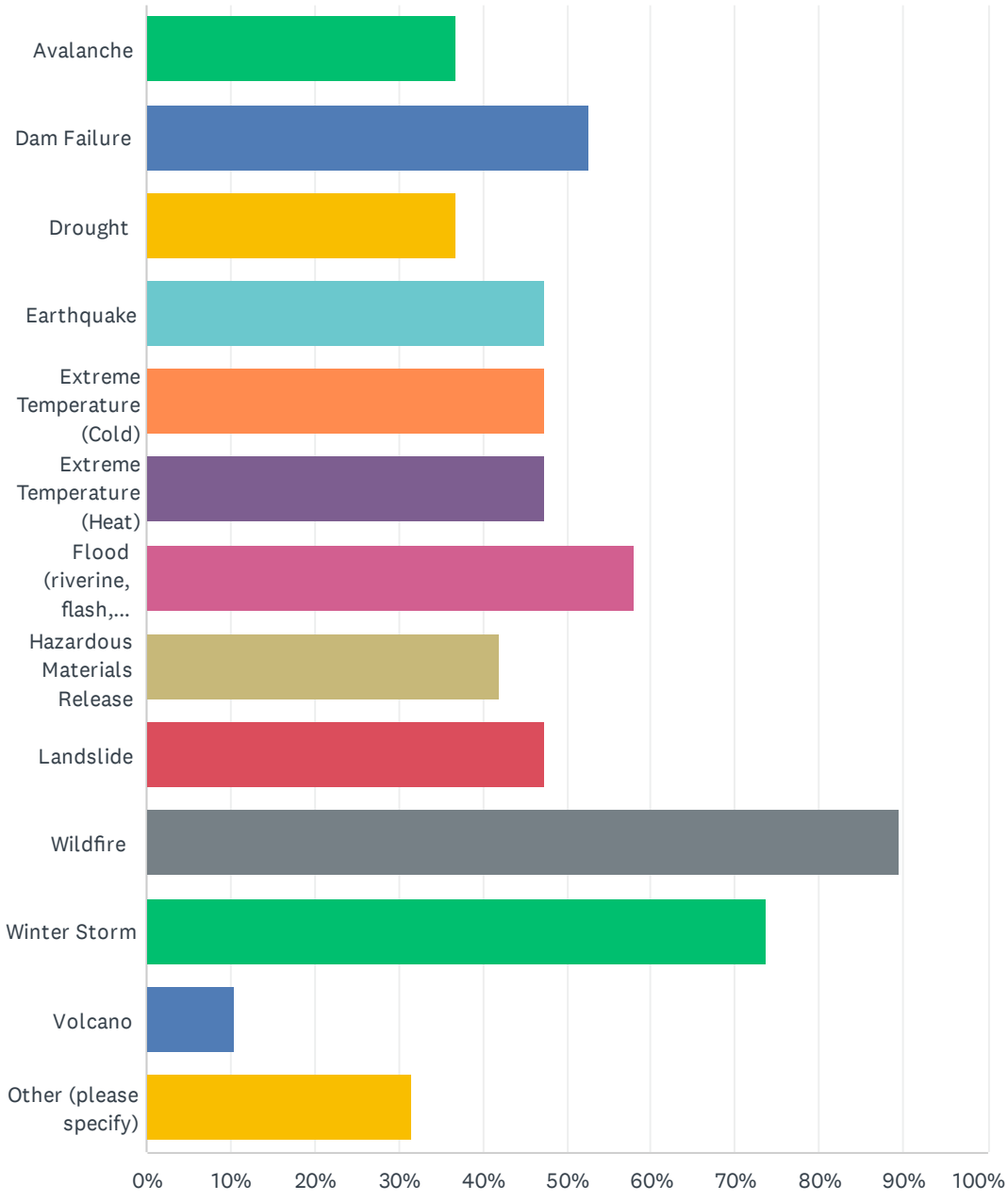
Answered: 20 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	60.00%
No	40.00%
TOTAL	

Q8 For which hazard(s) do you feel that you or your organization have a special interest and/or expertise? Check all that apply.

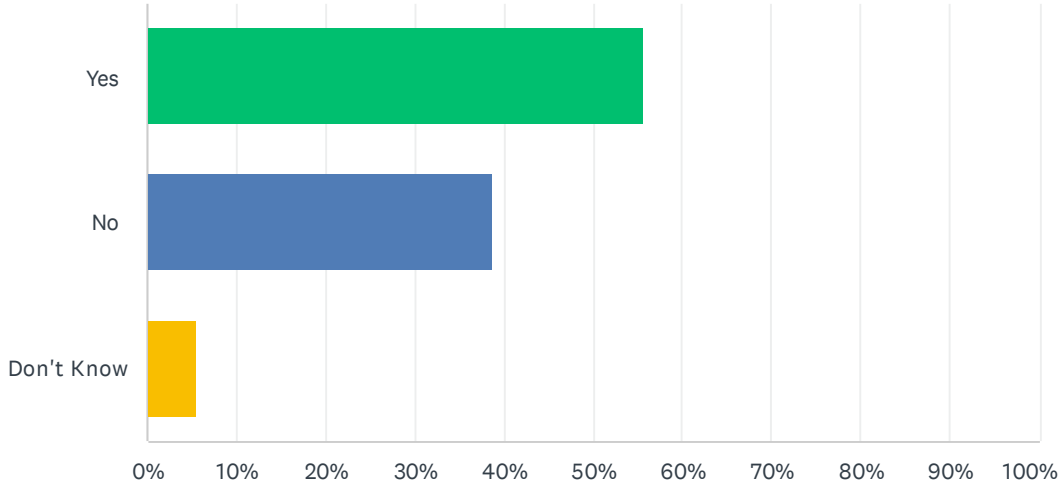
Answered: 19 Skipped: 1



ANSWER CHOICES	RESPONSES
Avalanche	36.84%
Dam Failure	52.63%
Drought	36.84%
Earthquake	47.37%
Extreme Temperature (Cold)	47.37%
Extreme Temperature (Heat)	47.37%
Flood (riverine, flash, urban/stormwater)	57.89%
Hazardous Materials Release	42.11%
Landslide	47.37%
Wildfire	89.47%
Winter Storm	73.68%
Volcano	10.53%
Other (please specify)	31.58%
Total Respondents: 19	

Q9 Looking back at previous hazard events, have buildings/facilities/structures you have worked in and/ or are responsible for been impacted by a hazard (ex. damage/closures/etc.)?

Answered: 18 Skipped: 2



ANSWER CHOICES	RESPONSES
Yes	55.56%
No	38.89%
Don't Know	5.56%
TOTAL	

Q10 If you answered “Yes” to the above question, please describe the event that caused or is causing (if recurring) damage and loss of service property. If quantifiable data is available, please provide that as well (number of damaged structures, monetary loss, etc.) (please explain)

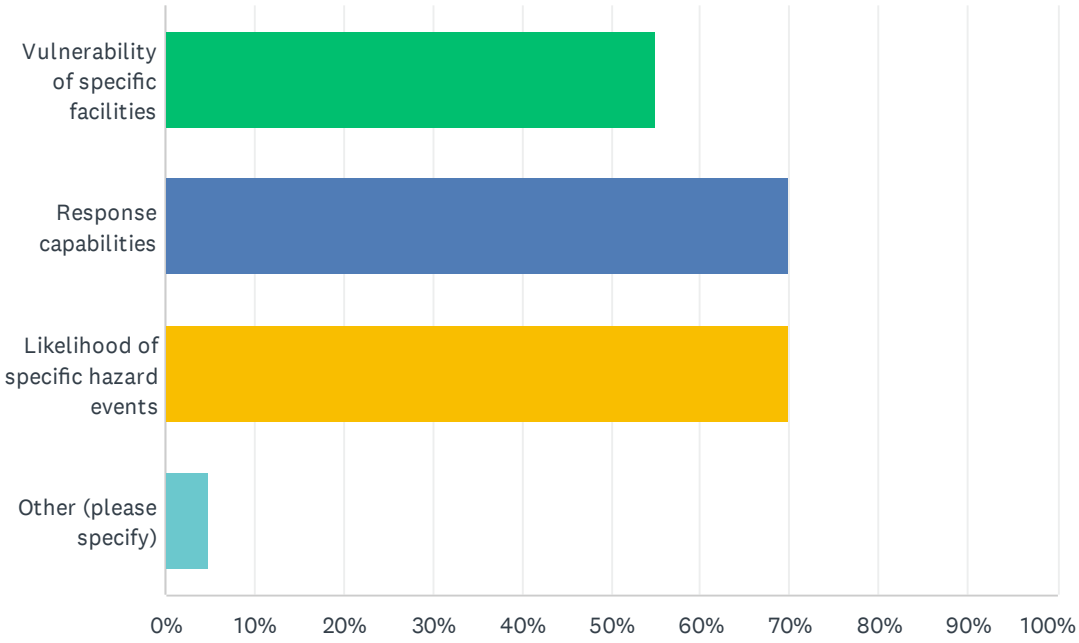
Answered: 13 Skipped: 7

Q11 Looking at where your facilities or services are located in Nevada County, what areas do you believe to be the most vulnerable to hazards? What are these hazards? (please explain).

Answered: 18 Skipped: 2

Q12 What are your agency's primary concerns regarding hazards?

Answered: 20 Skipped: 0



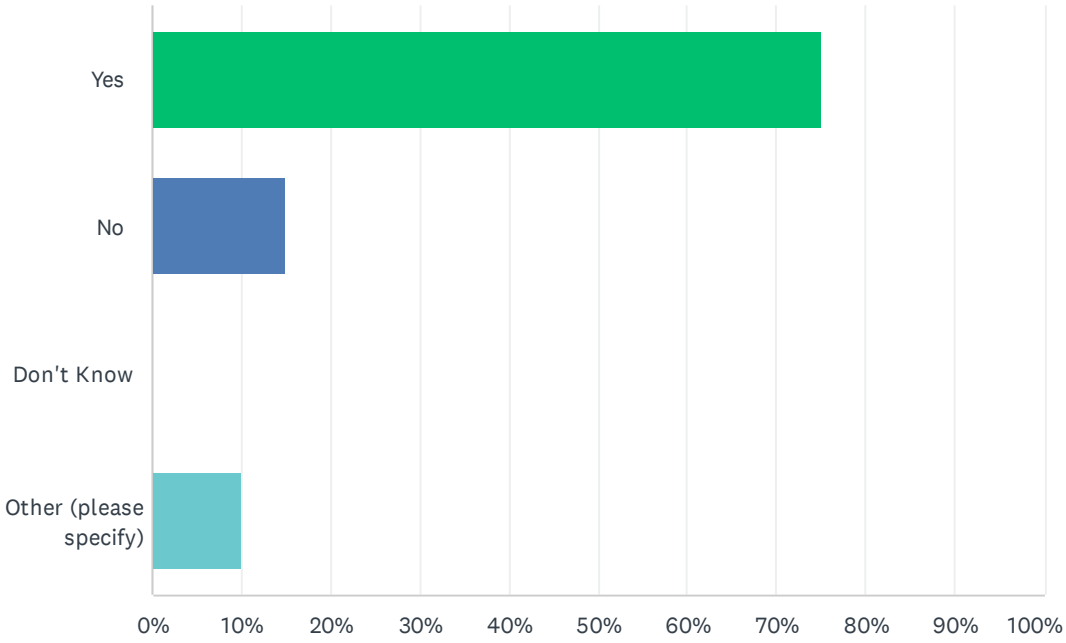
ANSWER CHOICES	RESPONSES
Vulnerability of specific facilities	55.00%
Response capabilities	70.00%
Likelihood of specific hazard events	70.00%
Other (please specify)	5.00%
Total Respondents: 20	

Q13 What challenges or barriers to reducing vulnerability in Nevada County do you see?

Answered: 17 Skipped: 3

Q14 Does your agency own or lease facilities?

Answered: 20 Skipped: 0



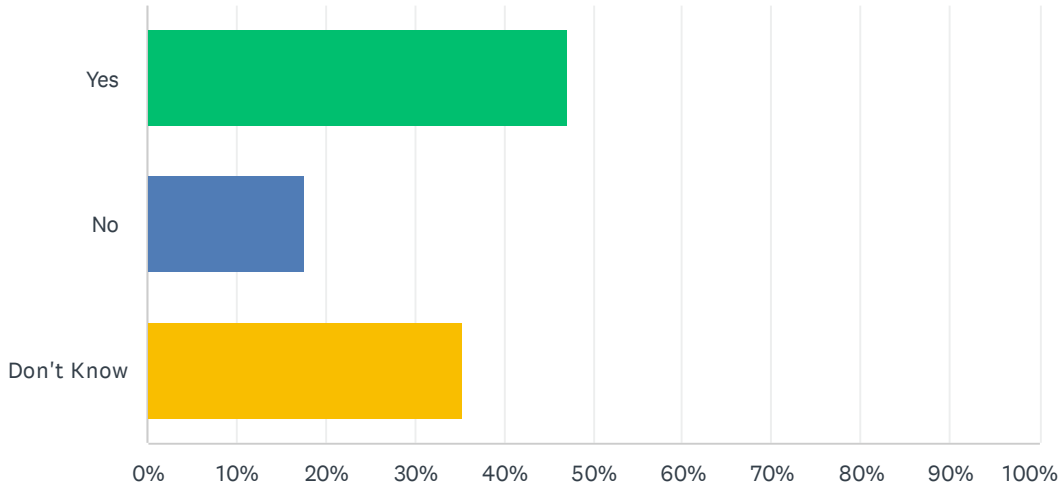
ANSWER CHOICES	RESPONSES
Yes	75.00%
No	15.00%
Don't Know	0.00%
Other (please specify)	10.00%
TOTAL	

Q15 Of those facilities that your agency owns or leases, are any viewed a critical facilities or community lifelines?

Answered: 18 Skipped: 2

Q16 Are your facilities susceptible to impacts from hazards, such as you fire department being in a flood prone area?

Answered: 17 Skipped: 3



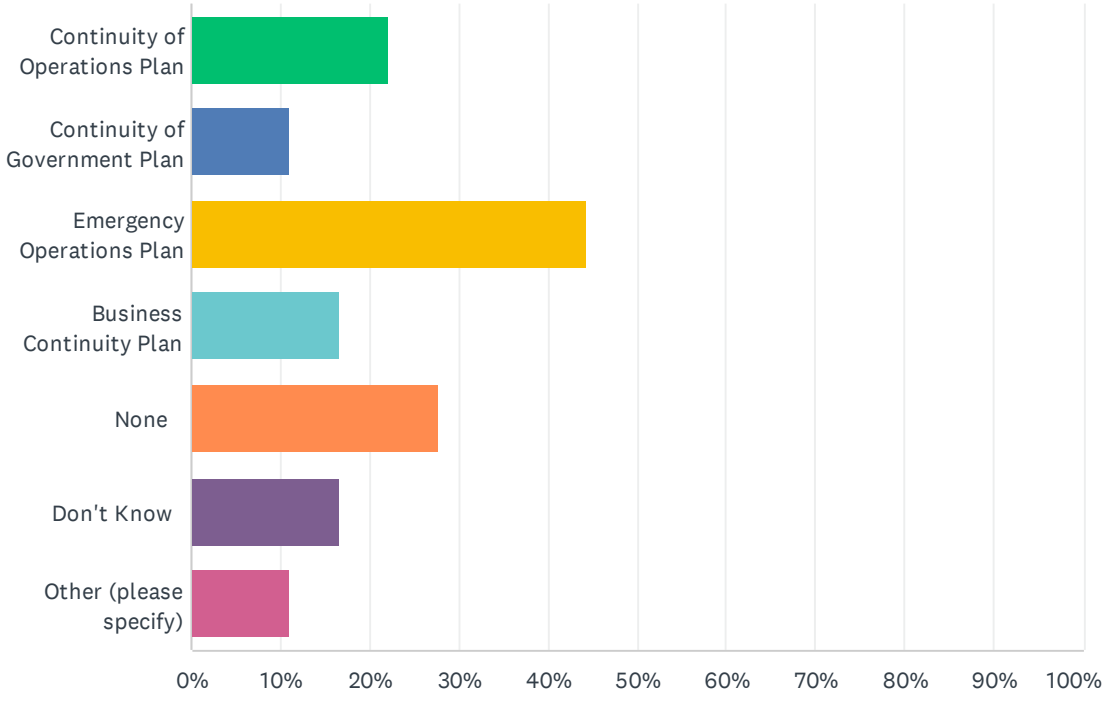
ANSWER CHOICES	RESPONSES
Yes	47.06%
No	17.65%
Don't Know	35.29%
TOTAL	

Q17 What support does your organization need from Nevada County to help reduce vulnerabilities to your facilities?

Answered: 14 Skipped: 6

Q18 Is your organization covered by any of the following plans? Check a that apply

Answered: 18 Skipped: 2



ANSWER CHOICES	RESPONSES
Continuity of Operations Plan	22.22%
Continuity of Government Plan	11.11%
Emergency Operations Plan	44.44%
Business Continuity Plan	16.67%
None	27.78%
Don't Know	16.67%
Other (please specify)	11.11%
Total Respondents: 18	

Q19 What capabilities does your agency have to help address hazards?

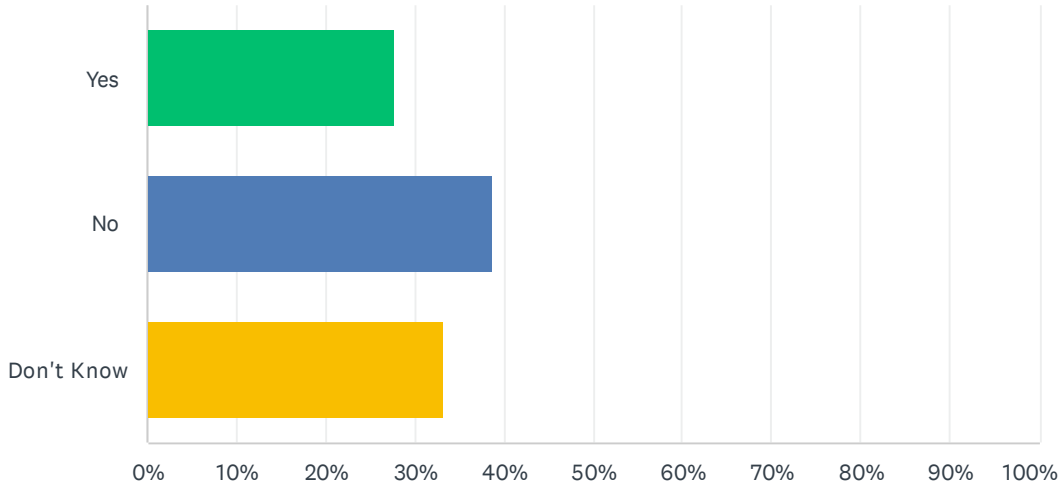
Answered: 17 Skipped: 3

Q20 What plans or studies has your agency developed that relate to hazards, the climate, new or existing facilities, vulnerable populations, o other areas related to hazard mitigation?

Answered: 17 Skipped: 3

Q21 Is your agency currently involved in conducting any studies or developing any programs which would further support Nevada County's hazard mitigation program? Studies can include hazard-specific information, data gathering which supports risk assessments, including economic data, or statistical data of other types.

Answered: 18 Skipped: 2



ANSWER CHOICES	RESPONSES
Yes	27.78%
No	38.89%
Don't Know	33.33%
TOTAL	

Q22 Does your agency currently have any mitigation projects or activitie underway? If so, please describe.

Answered: 14 Skipped: 6

Q23 Please provide a list of projects or programs that your facility or organization would like to complete in order to reduce your vulnerability t damages and losses, including loss of operation/service, to hazard event

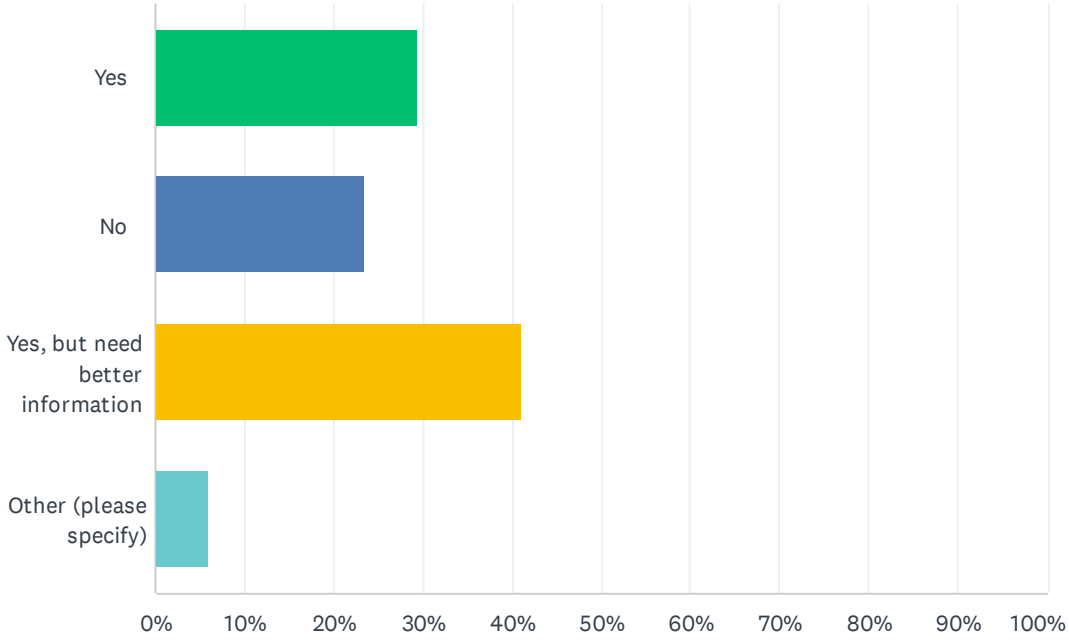
Answered: 13 Skipped: 7

Q24 Please list any projects or programs that you have recently implemented that you believe will reduce your facility's/organization's vulnerability, damage, and losses (including loss of operation/service) du to hazard events.

Answered: 10 Skipped: 10

Q25 Are you aware of the number and location of vulnerable populations your community/operating area?

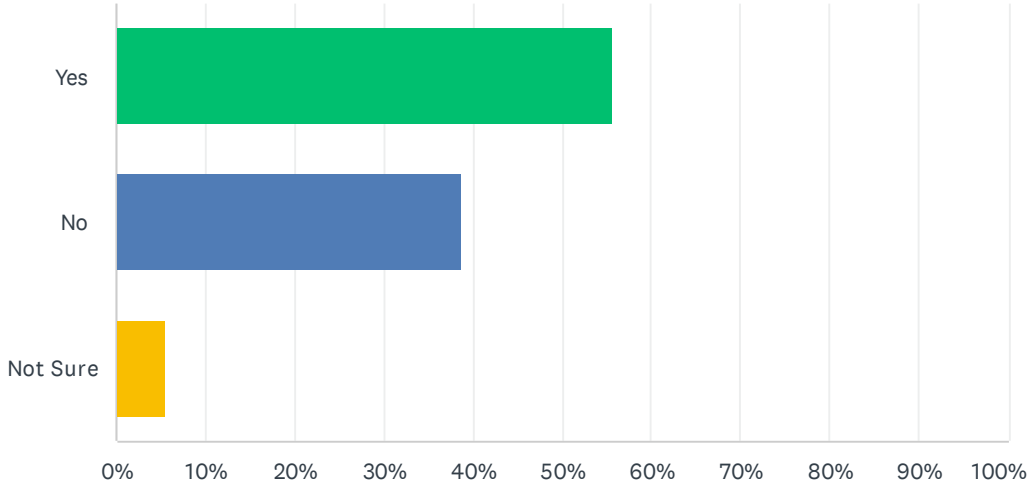
Answered: 17 Skipped: 3



ANSWER CHOICES	RESPONSES
Yes	29.41%
No	23.53%
Yes, but need better information	41.18%
Other (please specify)	5.88%
TOTAL	

Q26 Does your agency provide assistance to any socially vulnerable or underserved populations in Nevada County?

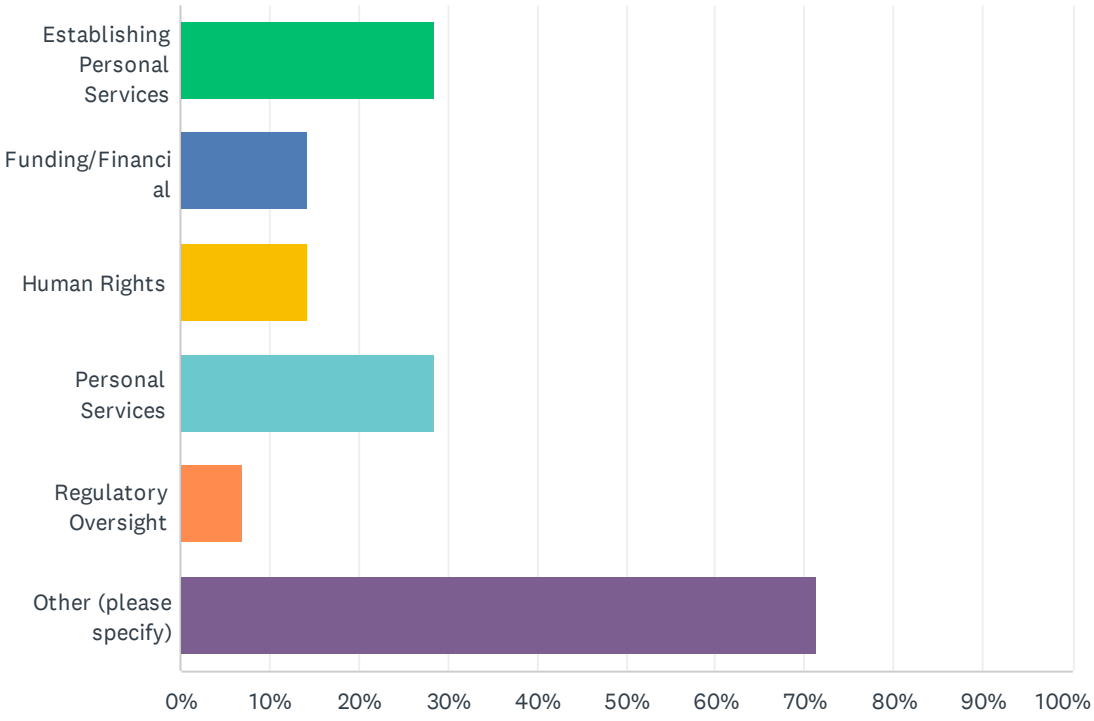
Answered: 18 Skipped: 2



ANSWER CHOICES	RESPONSES
Yes	55.56%
No	38.89%
Not Sure	5.56%
TOTAL	

Q27 If yes, what types of services do you provide?

Answered: 14 Skipped: 6



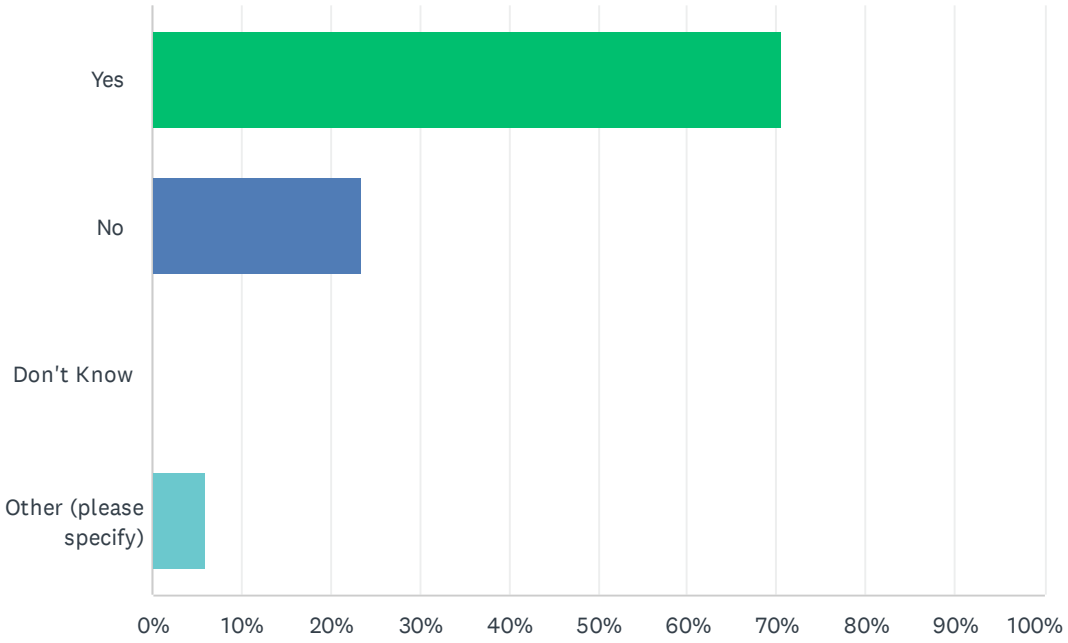
ANSWER CHOICES	RESPONSES
Establishing Personal Services	28.57%
Funding/Financial	14.29%
Human Rights	14.29%
Personal Services	28.57%
Regulatory Oversight	7.14%
Other (please specify)	71.43%
Total Respondents: 14	

Q28 Please provide a list of the populations or communities served by yo agency.

Answered: 14 Skipped: 6

Q29 Do you provide these services during times of disaster?

Answered: 17 Skipped: 3



ANSWER CHOICES	RESPONSES
Yes	70.59%
No	23.53%
Don't Know	0.00%
Other (please specify)	5.88%
TOTAL	

Q30 What barriers and community characteristics exist within Nevada County that may create additional vulnerabilities to hazards? This may include but is not limited to access to transportation, broadband access economic disadvantages, physical health (chronic diseases), limited physical mobility, age (older adults and children), and rural communities

Answered: 14 Skipped: 6

Q31 Do you have any questions or comments for Nevada County?

Answered: 4 Skipped: 16

RESULTS OF THE NEIGHBORING COMMUNITY SURVEY

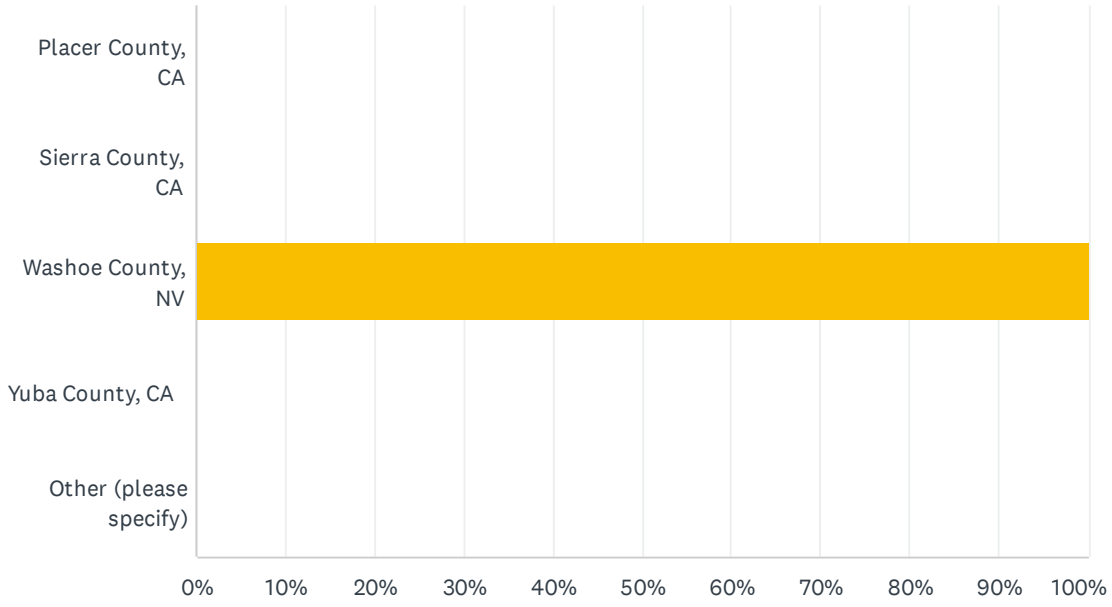
Q1 Contact Information

Answered: 1 Skipped: 0

ANSWER CHOICES	RESPONSES
Name	100.00%
Department/Agency	100.00%
Address	0.00%
Address 2	0.00%
County/City/Town	100.00%
State/Province	0.00%
ZIP/Postal Code	0.00%
Country	0.00%
Email Address	100.00%
Phone Number	100.00%

Q2 Please indicate the county your organization represents.

Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Placer County, CA	0.00%
Sierra County, CA	0.00%
Washoe County, NV	100.00%
Yuba County, CA	0.00%
Other (please specify)	0.00%
TOTAL	

Q3 Do you have any shared service agreements or mutual aid agreemen in place with Nevada County or any Nevada jurisdictions for the followinc

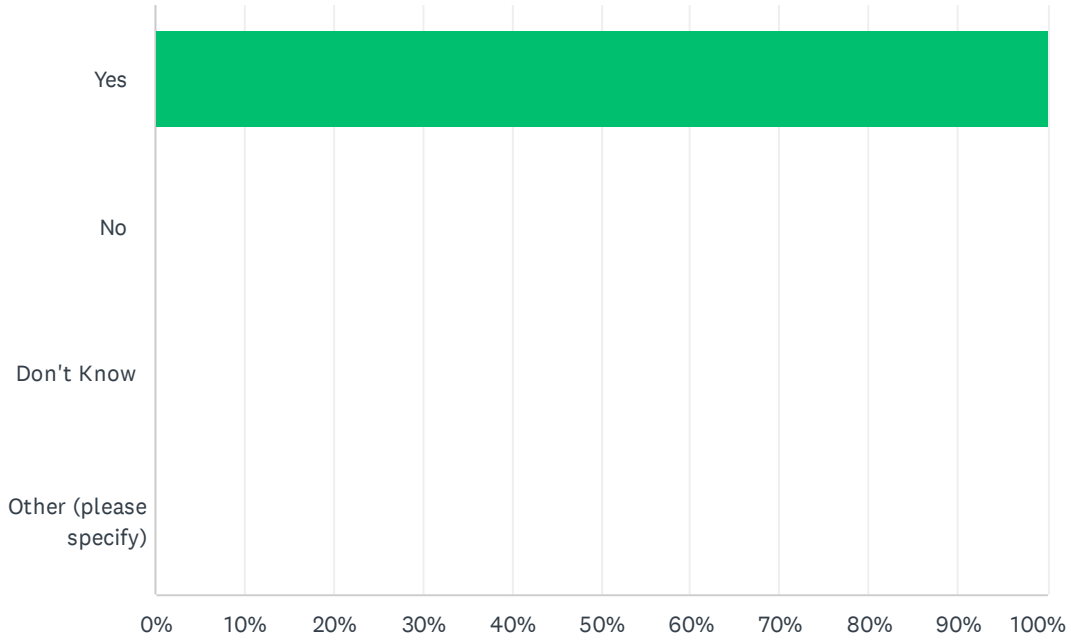
Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES
Equipment and staff for debris cleanup and removal	0.00%
Emergency staff for evacuations/disaster response	0.00%
Damage assessments	0.00%
Sheltering	0.00%
Other	0.00%
If you checked any of the above, please explain.	0.00%
Total Respondents: 0	

Q4 Do you include Nevada County or any Nevada jurisdictions in your community's comprehensive emergency operations planning, such as by participating on a planning team, or providing resources during an emergency?

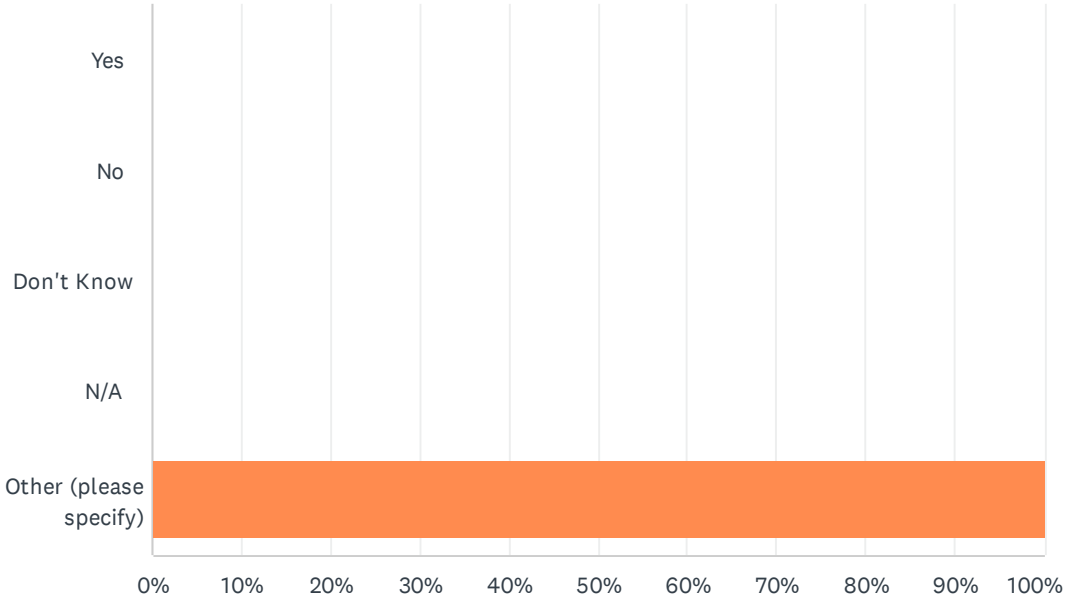
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	100.00%
No	0.00%
Don't Know	0.00%
Other (please specify)	0.00%
TOTAL	

Q5 Does your community participate in Nevada County's comprehensiv emergency operations planning, such as by participating on a planning team, or providing resources during an emergency?

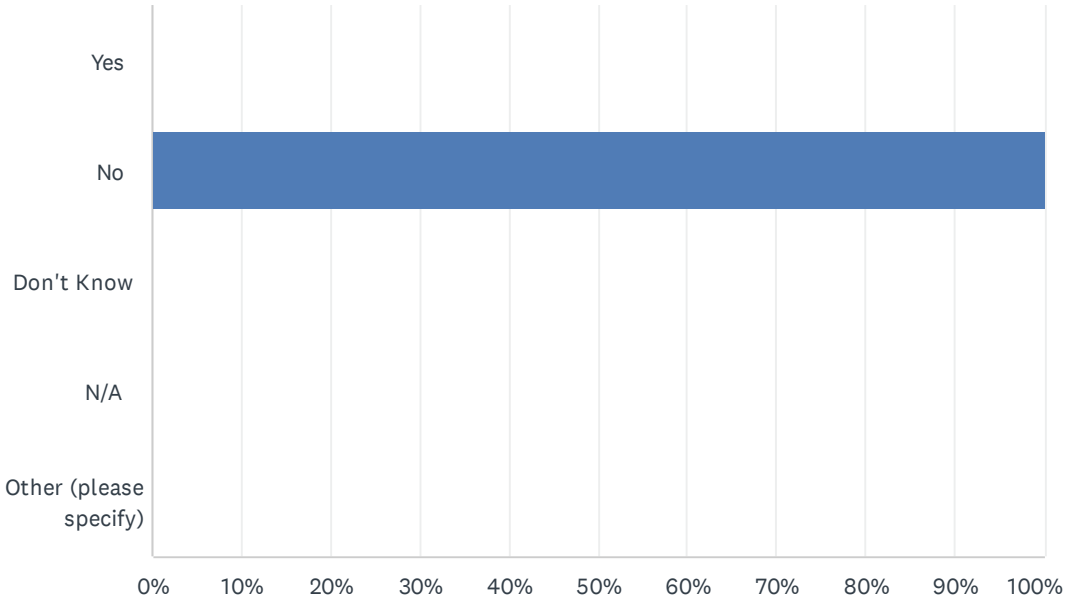
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
Other (please specify)	100.00%
TOTAL	

Q6 Do you include Nevada County or any Nevada jurisdictions in your community's Continuity of Operations planning, such as by participating o a planning team, providing resources during an emergency, or carrying o some of your community's essential functions for a period of time?

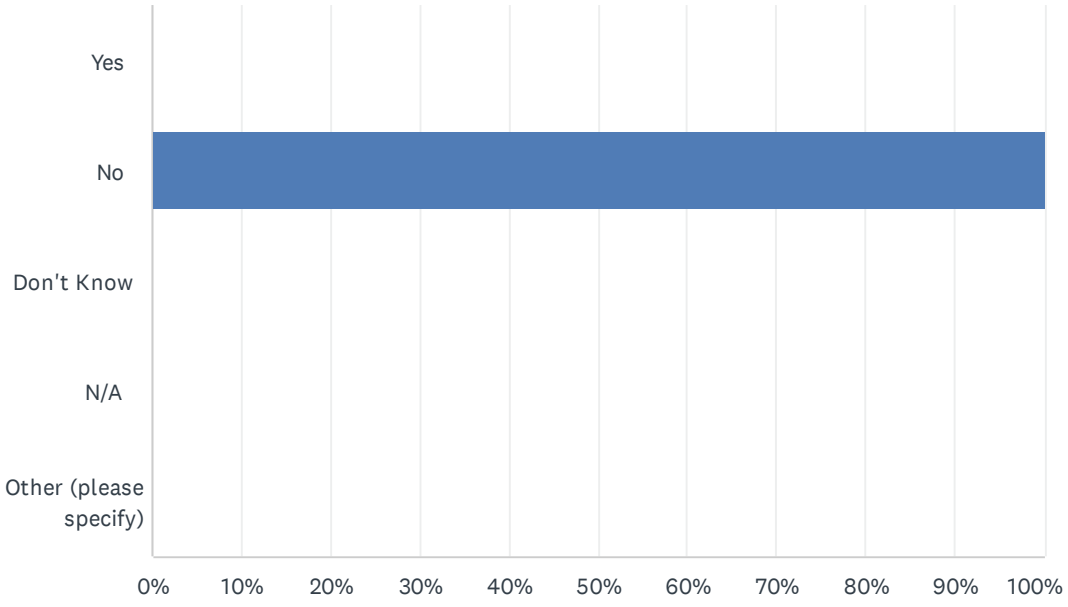
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	100.00%
Don't Know	0.00%
N/A	0.00%
Other (please specify)	0.00%
TOTAL	

Q7 Does your community participate in Nevada County or any Nevada jurisdiction's Continuity of Operations planning, such as by participating c a planning team, providing resources during an emergency, or carrying o some of Nevada County's essential functions for a period of time?

Answered: 1 Skipped: 0



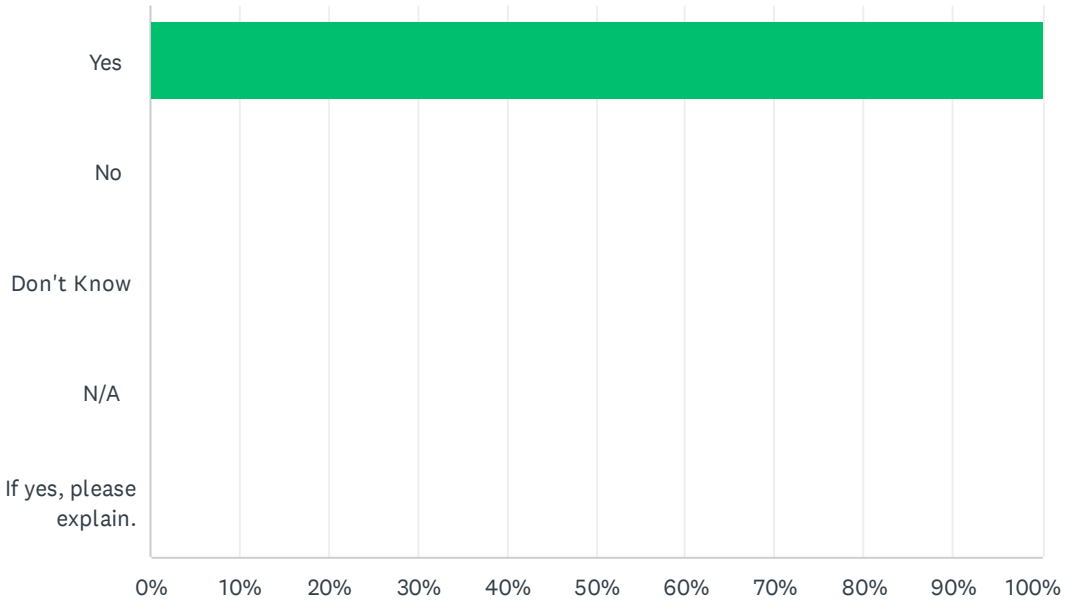
ANSWER CHOICES	RESPONSES
Yes	0.00%
No	100.00%
Don't Know	0.00%
N/A	0.00%
Other (please specify)	0.00%
TOTAL	

Q8 Thinking about emergency operations and disaster response, please explain how these actions are communicated between your community and Nevada County.

Answered: 1 Skipped: 0

Q9 Does your community have access to contact information for Nevad County's emergency operation centers?

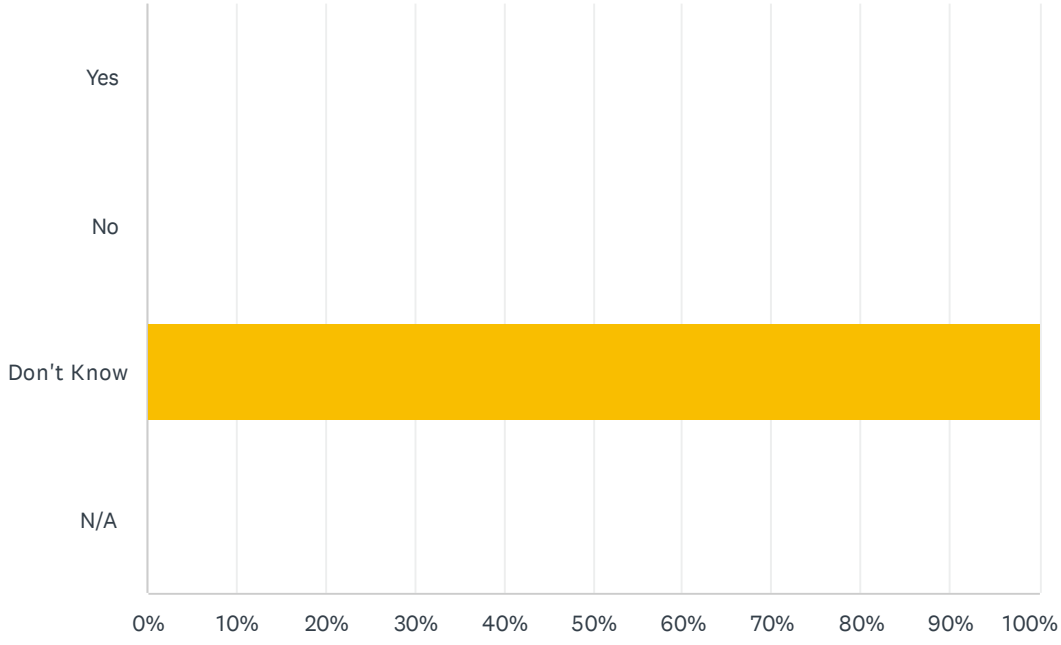
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	100.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	0.00%
TOTAL	

Q10 Does your community share risk and vulnerability assessments (e.g flood mapping, GIS, Hazus, etc.) with Nevada County?

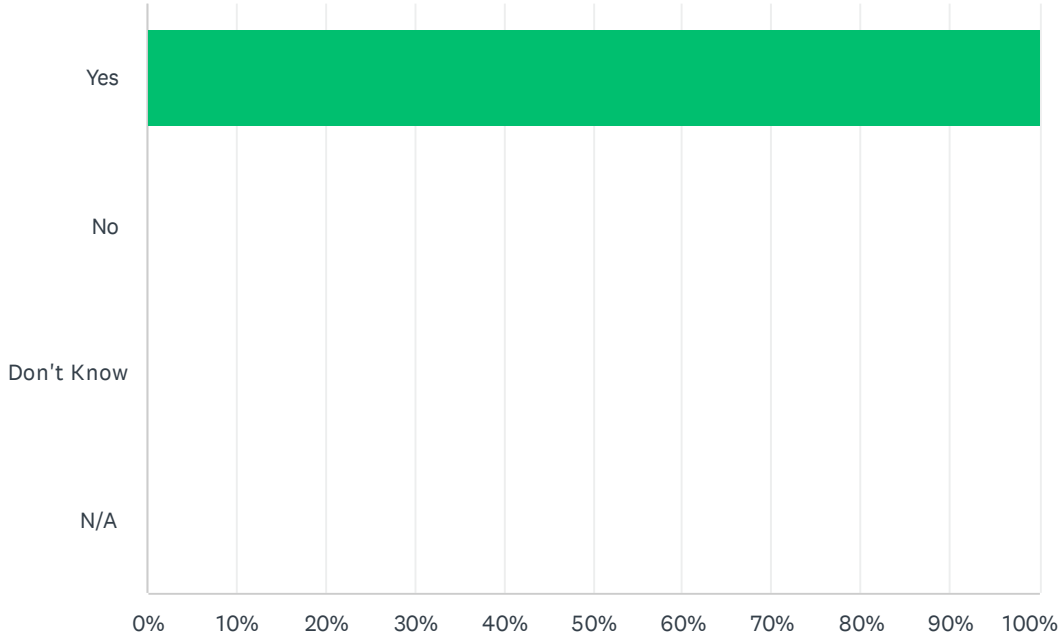
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	100.00%
N/A	0.00%
TOTAL	

Q11 Is information regarding mitigation shared during the planning and implementation phases of the projects?

Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	100.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
TOTAL	

Q12 Please describe any situations or hazards that are of concern to bot your community and Nevada County. For example, would flooding along particular waterway impact both jurisdictions, or are there any facilities o infrastructure that would affect both jurisdictions if it/they failed?

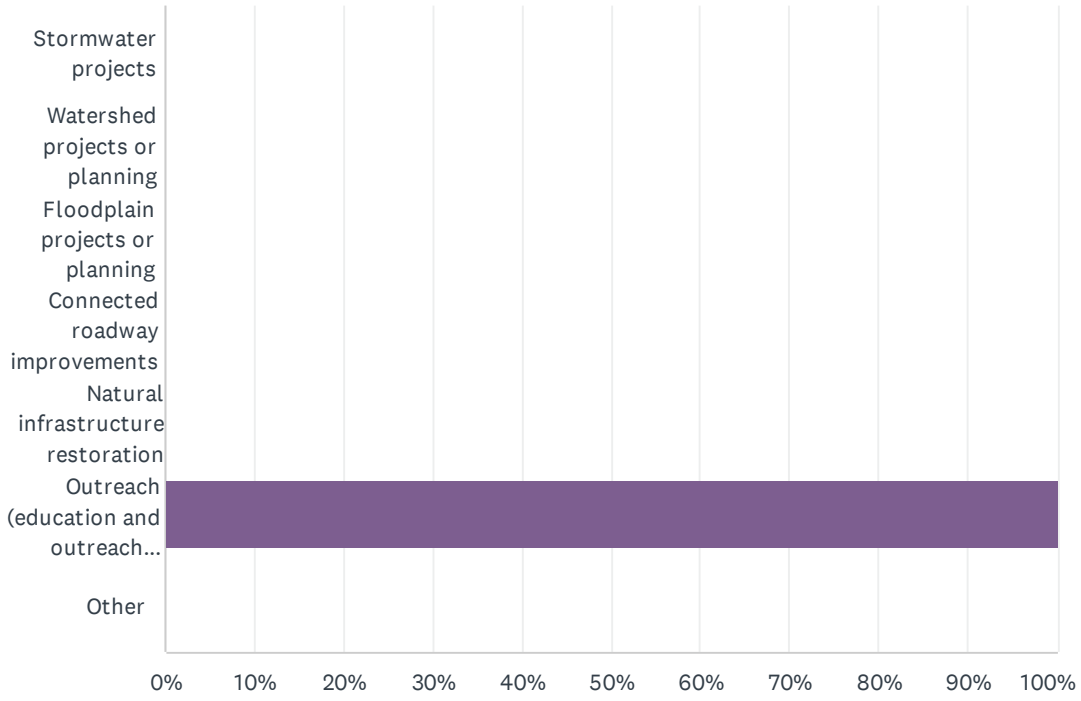
Answered: 1 Skipped: 0

Q13 Please explain how information is shared between your jurisdiction and Nevada County and any Nevada jurisdictions regarding mitigation projects.

Answered: 1 Skipped: 0

Q14 Are you aware of any projects for the following that requires cross-collaboration between jurisdictional boundaries?

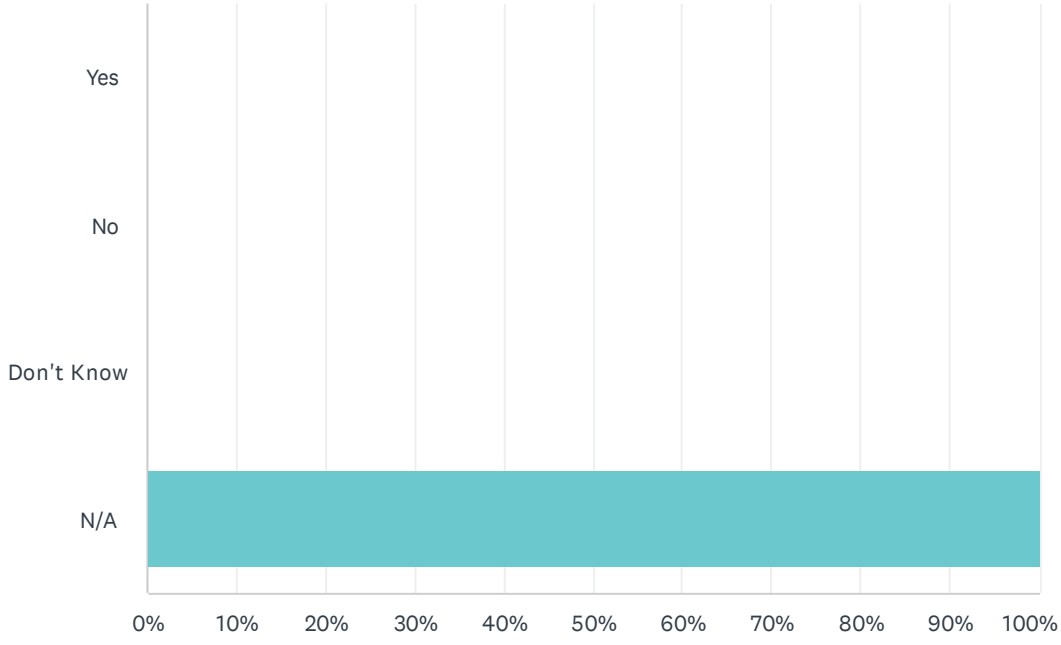
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Stormwater projects	0.00%
Watershed projects or planning	0.00%
Floodplain projects or planning	0.00%
Connected roadway improvements	0.00%
Natural infrastructure restoration	0.00%
Outreach (education and outreach campaigns, programs for public information, etc.)	100.00%
Other	0.00%
Total Respondents: 1	

Q15 Has your jurisdiction and Nevada County or any Nevada jurisdiction collaborated on grant applications?

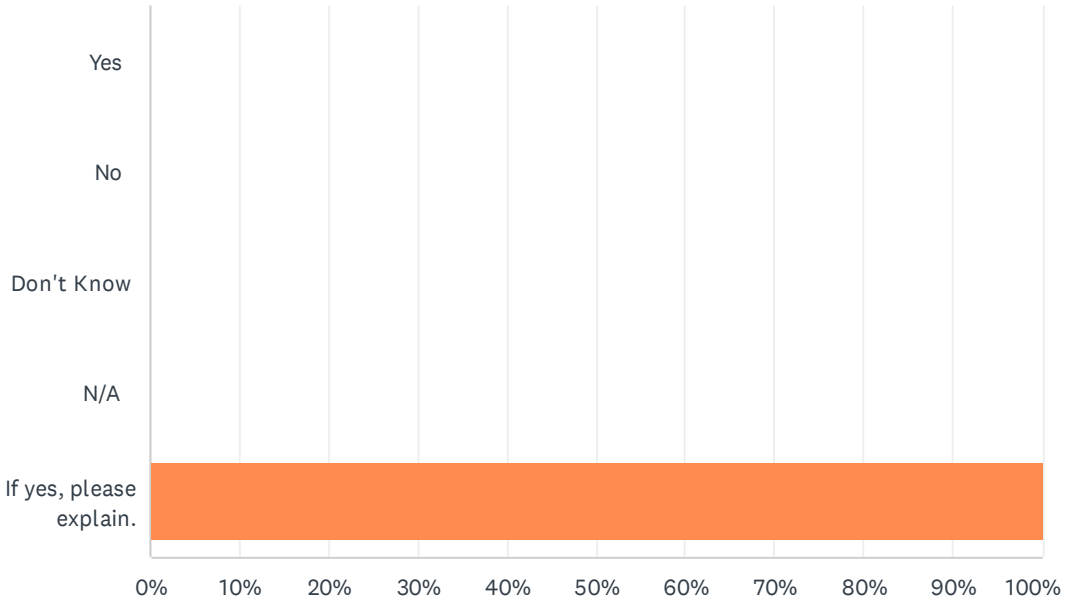
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	100.00%
TOTAL	

Q16 Are you aware of any organizations that carry out education and outreach regarding hazards in both your community and Nevada County

Answered: 1 Skipped: 0



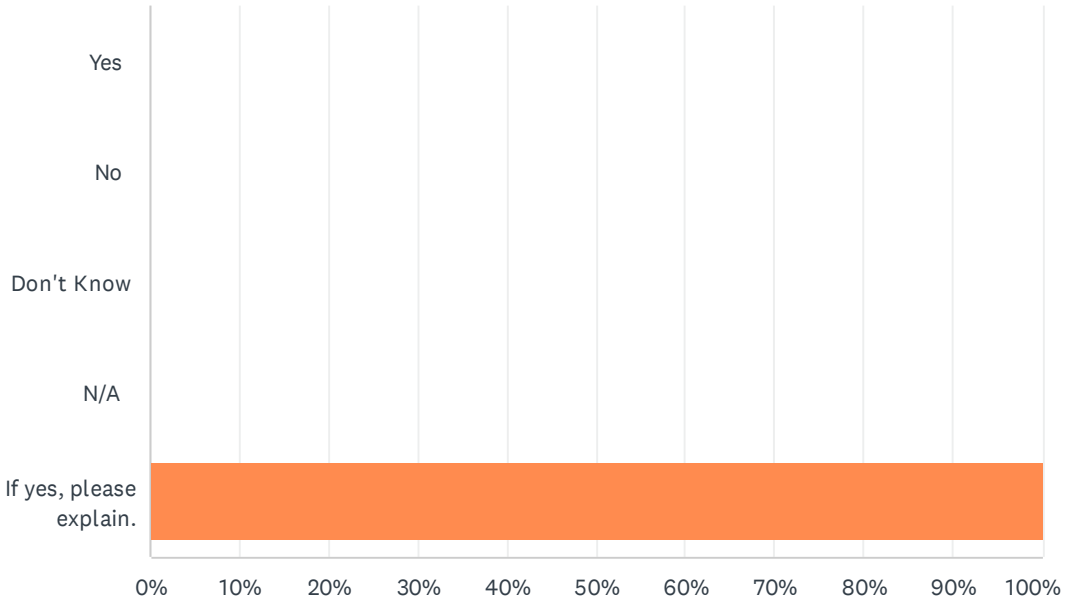
ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	100.00%
TOTAL	

Q17 What are opportunities or ideas to optimize cooperation with Nevad County on emergency management operations and hazard mitigation projects?

Answered: 1 Skipped: 0

Q18 Do you collaborate with Nevada County or any Nevada jurisdictions on establishing evacuation routes and alternate evacuation routes?

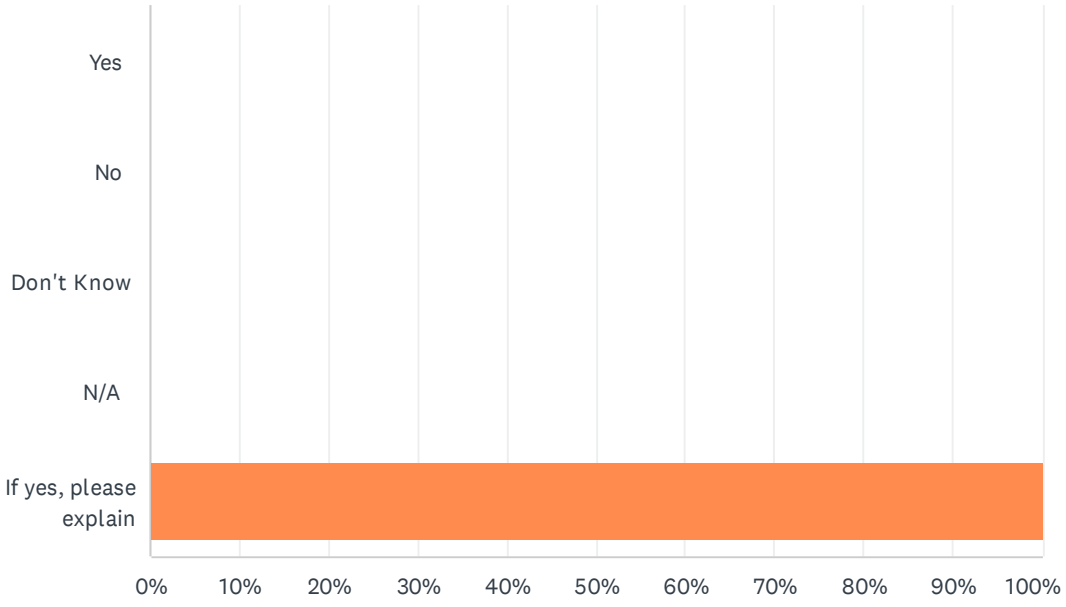
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	100.00%
TOTAL	

Q19 Do you and Nevada County or any Nevada County jurisdictions consult with one another before making evacuation decisions that would impact one another (recommending evacuation routes into neighboring jurisdictions)?

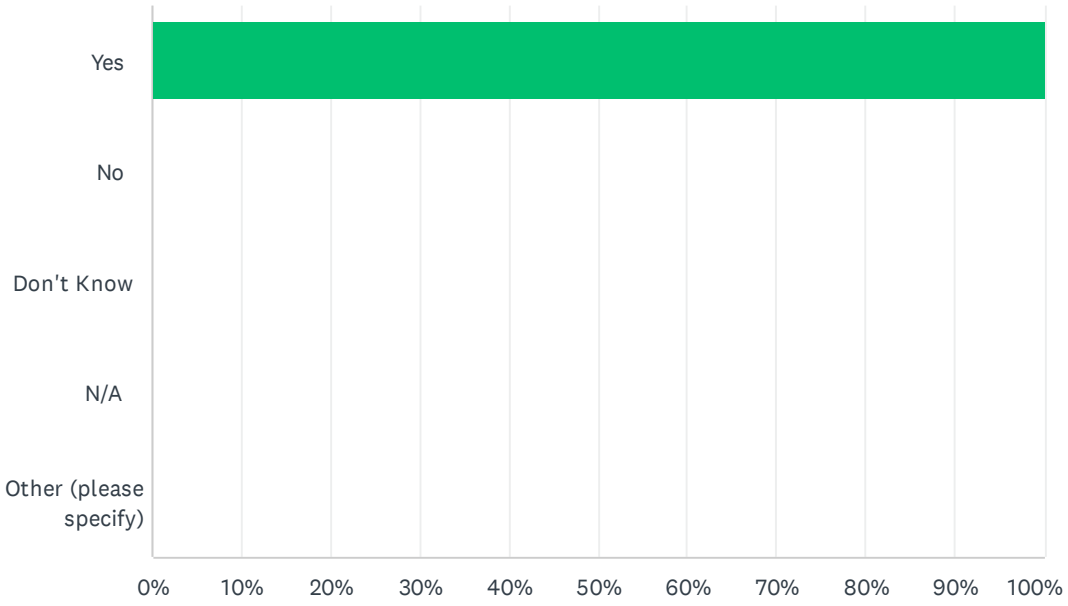
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain	100.00%
TOTAL	

Q20 Are evacuation routes maintained to the same level of protection across jurisdictional lines?

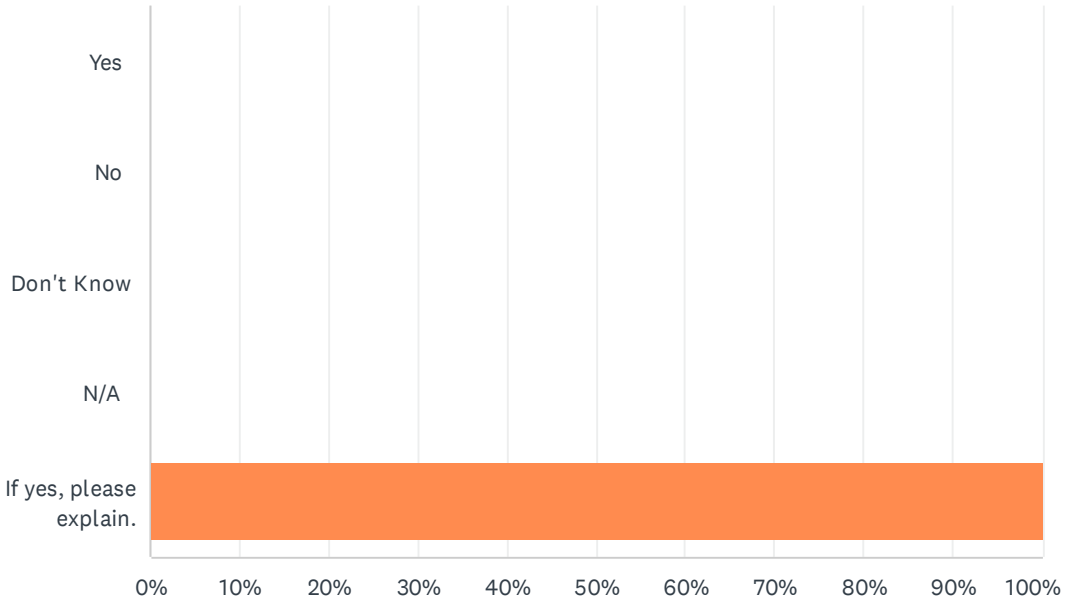
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	100.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
Other (please specify)	0.00%
TOTAL	

Q21 Do you collaborate with Nevada County or any Nevada jurisdictions on establishing shelters?

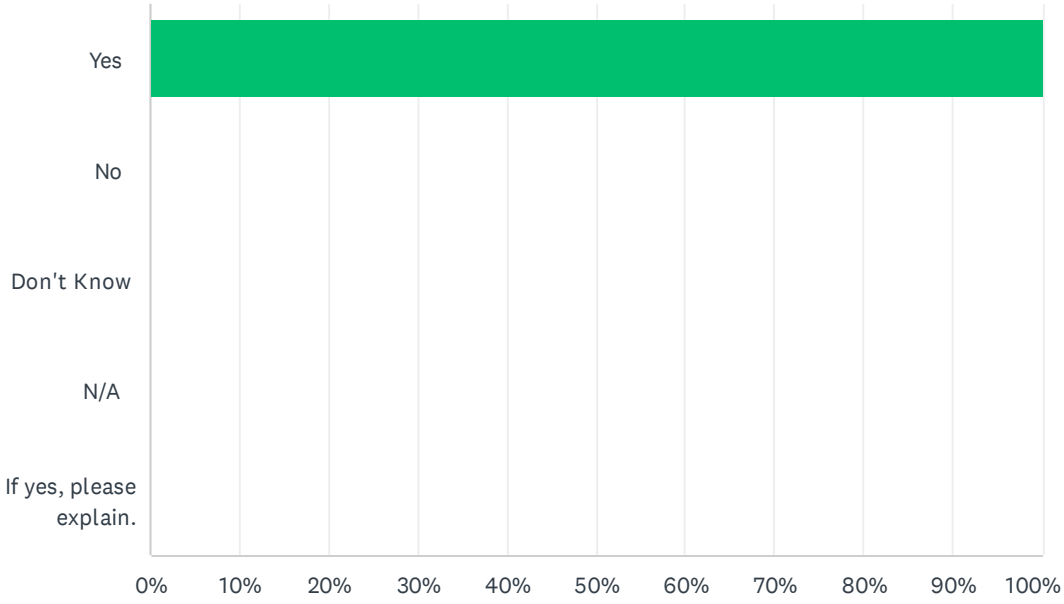
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	100.00%
TOTAL	

Q22 Do you and Nevada County or any Nevada jurisdictions consult wit one another before making sheltering decisions that would impact one another (recommending shelters in neighboring communities)?

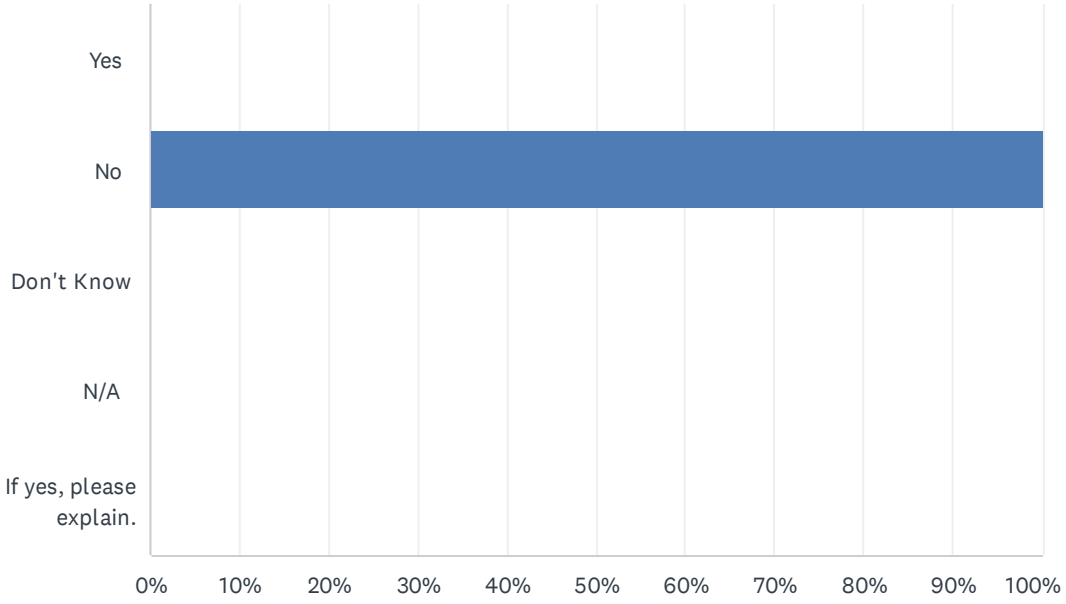
Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	100.00%
No	0.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	0.00%
TOTAL	

Q23 Do you and Nevada County share any spaces suitable for temporar housing? This includes locations suitable to place temporary housing uni to house residents displaced by a disaster.

Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00%
No	100.00%
Don't Know	0.00%
N/A	0.00%
If yes, please explain.	0.00%
TOTAL	

Q24 Do you have any relevant questions or comments for Nevada County?

Answered: 1 Skipped: 0

APPENDIX D: Plan Maintenance Tools

The FEMA 386-4 guidance worksheets are available to assist with progress reporting. These worksheets are provided below for ease of access to the HMP Coordinator and Planning Partn Increase ability to respond to or be prepared for hazard events.

Worksheet #1 Progress Report step 2

Progress Report Period: _____ (date) to _____ (date)

Project Title: _____ Project ID#: _____

Responsible Agency: _____

Address: _____

City/County: _____

Contact Person: _____ Title: _____

Phone #(s): _____ email address: _____

List Supporting Agencies and Contacts:

_____

_____

_____

Total Project Cost: _____

Anticipated Cost Overrun/Underrun: _____

Date of Project Approval: _____ Start date of the project: _____

Anticipated completion date: _____

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase): _____

_____

_____

Milestones	Complete	Projected Date of Completion

Plan Goal(s)/Objective(s) Addressed:

Goal: _____

Objective: _____

Indicator of Success (e.g., losses avoided as a result of the acquisition program):

In most cases, you will list losses avoided as the indicator. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.

_____

_____

Status (Please check pertinent information and provide explanations for items with an asterisk. For completed or canceled projects, see Worksheet #2 — to complete a project evaluation):

Project Status

☐ Project on schedule

☐ Project completed

☐ Project delayed*

*explain: _____

_____

☐ Project canceled

Project Cost Status

☐ Cost unchanged

☐ Cost overrun*

*explain: _____

_____

☐ Cost underrun*

*explain: _____

_____

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

_____

_____

_____

_____

B. What obstacles, problems, or delays did you encounter, if any?

_____

_____

_____

C. How was each problem resolved?

_____

_____

_____

Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

Other comments:

Worksheet #2 Evaluate Your Planning Team step 3

When gearing up for the plan evaluation, the planning team should reassess its composition and ask the following questions:	YES	NO
Have there been local staffing changes that would warrant inviting different members to the planning team?		
Comments/Proposed Action:		
Are there organizations that have been invaluable to the planning process or to project implementation that should be represented on the planning team?		
Comments/Proposed Action:		
Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the planning team?		
Comments/Proposed Action:		
Are there procedures (e.g., signing of MOAs, commenting on submitted progress reports, distributing meeting minutes, etc.) that can be done more efficiently?		
Comments/Proposed Action:		
Are there ways to gain more diverse and widespread cooperation?		
Comments/Proposed Action:		
Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?		
Comments/Proposed Action:		

If the planning team determines the answer to any of these questions is "yes," some changes may be necessary.

Worksheet #3 Evaluate Your Project Results step 3

page 1 of 2

Project Name and Number: _____

Project Budget: _____

Project Description: _____

Associated Goal and Objective(s): _____

Indicator of Success (e.g., losses avoided): _____

Insert location map.
Include before and after photos if appropriate.

Was the action implemented? ☐ YES ☐ NO

IF NO

Why not?	YES	NO
Was there political support for the action?	☐	☐
Were enough funds available?	☐	☐
Were workloads equitably or realistically distributed?	☐	☐
Was new information discovered about the risks or community that made implementation difficult or no longer sensible?	☐	☐
Was the estimated time of implementation reasonable?	☐	☐
Were sufficient resources (for example staff and technical assistance) available?	☐	☐

IF YES

What were the results of the implemented action? _____

page 2 of 2

	YES	NO
Were the outcomes as expected? If No, please explain:		
Did the results achieve the goal and objective(s)? Explain how:		
Was the action cost-effective? Explain how or how not:		
What were the losses avoided after having completed the project?		
If it was a structural project, how did it change the hazard profile?		
Additional comments or other outcomes:		

Date: _____

Prepared by: _____

Worksheet #4 Revisit Your Risk Assessment step 4

Risk Assessment Steps	Questions	YES	NO	COMMENTS
Identify hazards	Are there new hazards that can affect your community?			
Profile hazard events	Are new historical records available?			
	Are additional maps or new hazard studies available?			
	Have chances of future events (along with their magnitude, extent, etc.) changed?			
	Have recent and future development in the community been checked for their effect on hazard areas?			
Inventory assets	Have inventories of existing structures in hazard areas been updated?			
	Is future land development accounted for in the inventories?			
	Are there any new special high-risk populations?			
Estimate losses	Have loss estimates been updated to account for recent changes?			

If you answered "Yes" to any of the above questions, review your data and update your risk assessment information accordingly.

Worksheet #5 Revise the Plan step 4

page 1 of 4

Prepare to update the plan.

When preparing to update the plan:	*Check the box when addressed:*
1. Gather information, including project evaluation worksheets, progress reports, studies, related plans, etc.	
Comments:	
2. Reconvene the planning team, making changes to the team composition as necessary (see results from Worksheet #2).	
Comments:	

Consider the results of the evaluation and new strategies for the future.

When examining the community consider:	*Check the box when addressed:*
1. The results of the planning and outreach efforts.	
Comments:	
2. The results of the mitigation efforts.	
Comments:	

3. Shifts in development trends.	
Comments:	
4. Areas affected by recent disasters.	
Comments:	
5. The recent magnitude, location, and type of the most recent hazard or disaster.	
Comments:	
6. New studies or technologies.	
Comments:	
7. Changes in local, state, or federal laws, policies, plans, priorities, or funding.	
Comments:	

8. Changes in the socioeconomic fabric of the community.	
Comments:	
9. Other changing conditions.	
Comments:	

Incorporate your findings into the plan.

When examining the plan consider:	*Check the box when addressed:*
1. Revisit the risk assessment. *(See Worksheet #4)*	
Comments:	
2. Update your goals and strategies.	
Comments:	
3. Recalculate benefit-cost analyses of projects to prioritize action items.	
Comments:	

APPENDIX E: Definitions of Terms and Acronyms

0.2 percent-annual-chance flood—The flood that has a 0.2 percent chance of being equaled or exceeded in any given year; often referred to as the 500-year flood

1 percent-annual-chance flood—The flood that has a 1 percent chance of being equaled or exceeded in any given year; often referred to as the 100-year flood

AB—Assembly Bill

asset—Any manufactured or natural feature that has value, including people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks

base flood—The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1 percent-annual-chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

basin—The area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds."

benefit/cost analysis—A systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

benefit—A net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

BRIC—Building Resilient Infrastructure and Communities

CAL FIRE—California Department of Forestry and Fire Protection

Cal OES—California Governor's Office of Emergency Services

Caltrans—California Department of Transportation

capability assessment—An analysis of a community's capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out.

CARB—California Air Resources Board

CCR—California Code of Regulations

CDBG-DR—Community Development Block Grant Disaster Recovery grants

CDC—Centers for Disease Control and Prevention

CFR—Code of Federal Regulations

CGS—California Geological Survey

climate change—A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

community lifeline—The most fundamental services in the community that, when stabilized, enable all other aspects of society to function

Community Rating System (CRS)—A voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

critical asset—Any entity or location—physical or virtual—whose compromise would have a profound and negative effect on critical infrastructure, cause mass casualty, or have a profound and negative symbolic or psychological impact.

critical facilities—Physical facilities and infrastructure that are critical to the health and welfare of the population. Such facilities are a type of community lifeline. They become especially important after any hazard event occurs.

CRS—Community Rating System

dam failure—An uncontrolled release of impounded water due to a partial or complete breach in a dam (or levee) that impacts its integrity.

dam—Any artificial barrier or controlling mechanism that can or does impound or divert water.

debris flow—Dense mixtures of water-saturated debris that move down-valley, looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

DFIRM—Digital Flood Insurance Rate Map

Disaster Mitigation Act (DMA; Public Law 106-390)—The latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving certain federal financial assistance.

DMA —Disaster Mitigation Act

drought—The cumulative impacts of long periods of dry weather. These can include deficiencies in surface and subsurface water supplies and general impacts on health, well-being, and quality of life.

DSOD—Division of Safety of Dams (California)

DTSC—Department of Toxic Substances Control

DWR—Department of Water Resources (California)

EAP—Emergency action plan

earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

emergency action plan—A formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency.

EOC—emergency operations center

EPA—U.S. Environmental Protection Agency

epicenter—The point on the earth's surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

extreme heat—Temperatures that hover 10 ºF or more above the average high temperature for a region and last for several days.

fault—A fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other.

federal disaster declaration—Declarations for events that cause more damage than state and local governments and resources can handle without federal government assistance. A federal disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, to help disaster victims, businesses, and public entities.

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

fire behavior—the physical characteristics of a fire and is a function of the interaction between the fuel

characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

FIRM—Flood Insurance Rate Map

flash flood—A flood that occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM)—The official maps on which the Federal Emergency Management Agency delineate the Special Flood Hazard Area.

floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

floodway—area within a floodplain that is reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

FMA—Flood Mitigation Assistance grant program

FRA—Federal Responsibility Area (for firefighting)

frequency—How often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

FZ—forecast zone

geographic information system (GIS)—A computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

g—gravity (%g, percent acceleration force of gravity)

GIS—Geographic Information System

goal—A general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

greenhouse gases—Methane, nitrous oxide and other gases that trap heat and warm the Earth, as a greenhouse traps heat from the sun.

ground shaking—The result of rapid ground acceleration caused by seismic waves passing beneath buildings, roads, and other structures.

Hazard Mitigation Grant Program (HMGP)—Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

hazard—A source of potential danger or adverse condition that could harm people and/or cause property damage.

hazardous material—A substance or combination of substances (biological, chemical, radiological, and/or physical) that, because of its quantity, concentration, or physical, chemical or infectious characteristics, has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazus—A GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards.

HHPD—high hazard potential dam

high-hazard potential dam—Dams that can cause loss of human life from the failure or improper operation of the dam.

HMA—Hazard Mitigation Assistance (federal grant program)

HMGP—Hazard Mitigation Grant program

HMP—hazard mitigation plan

hydrological drought—Deficiencies in surface and subsurface water supplies.

hypocenter—The region underground where an earthquake's energy originates

IFTDSS— Interagency Fuel Treatment Decision Support System

impact—the consequences or effects of a hazard, often expressed in value of loss or damage incurred.

intensity—The measure of the effects of a hazard.

interface area—An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

inventory—The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs, and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

IPCC—Intergovernmental Panel on Climate Change

landslide—The movement of masses of loosened rock and soil down a hillside or slope. Slope failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

local government—Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

LRA—Local Responsibility Area (for firefighting)

magnitude—The measure of the strength of an earthquake.

mitigation actions—Specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

mitigation—A preventive action taken in advance of an event to reduce or eliminate risk to life or property.

MM—Modified Mercalli Scale

Mw—Moment Magnitude Scale

NCEI—National Centers for Environmental Information

NEHRP—National Earthquake Hazard Reduction Program

NFIP—National Flood Insurance Program

NDMC—National Drought Mitigation Center

NOAA—National Oceanic and Atmospheric Administration

NWS—National Weather Service

Objective—a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

OES—Office of Emergency Services (Nevada County)

PDM—Pre-Disaster Mitigation Grant Program

peak ground acceleration (PGA)—A measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

PGA—peak ground acceleration

preparedness—Actions that strengthen the capability of government, people, and communities to respond to disasters.

probability of occurrence—A statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

repetitive loss property—Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced—Four or more paid flood losses in excess of $1000.00; or two paid flood losses in excess of $1000.00 within any 10-year period since 1978; or three or more paid losses that equal or exceed the current value of the insured property.

residual risk—The risk that remains after controls are accounted for.

return period—The average number of years between occurrences of a hazard (equal to the inverse of the annual likelihood of occurrence).

riparian area—The area along the banks of a natural watercourse.

risk assessment—The process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards

risk ranking—Process to score and rank hazards based on the probability that they will occur and the consequence they will have if they do.

risk—The likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

riverine—Of or produced by a river. Riverine floodplains have readily identifiable channels.

Robert T. Stafford Act—The statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs (Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107). Signed into law November 23, 1988; amended by the Disaster Relief Act of 1974 (Public Law 93-288).

SFHA—Special Flood Hazard Area

significant-hazard dam—Dams that can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns, but not necessarily loss of life.

special flood hazard area—The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

SRA—State Responsibility Area (for firefighting)

stakeholder—business leaders, civic groups, academia, non-profit organizations, major employers, managers of community lifelines, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

steep slope—generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

TRI—Toxics Release Inventory

USACE—U.S. Army Corps of Engineers

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USGS—U.S. Geological Survey

vulnerability—the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

watershed—An area that drains downgradient from areas of higher land to areas of lower land to the lowest point.

wildfire—Fires that result in uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. Because of their distance from firefighting resources, they can be difficult to contain and can cause a great deal of destruction.

WUI—wildland/urban interface

zoning ordinance—Ordinance that designates allowable land use and intensities for a local jurisdiction.

APPENDIX F: Catalogs of Mitigation Best Practices

The tables on the following pages present catalogs of hazard mitigation alternatives that offer a broad range of alternatives to be considered for use in the planning area. The catalogs are lists of what could be considered to reduce risk from natural hazards in the planning area. They include practices that would mitigate current risk from hazards or help reduce new risk resulting from climate change. Catalogs are adapted from mitigation ideas presented in *Mitigation Ideas; A Resource for Reducing Risk to Natural Hazards* (FEMA 2013c). One catalog was developed for each natural hazard of concern evaluated in this plan.

The catalogs present alternatives that are categorized in two ways:

- Who would have responsibility for implementation:
  - Individuals (personal scale)
  - Businesses (organizational scale)
  - Government (government scale)
- What the alternative would do:
  - Reduce the probability of hazard events
  - Limit risk to people or structures
  - Increase ability to respond to or be prepared for hazard

Hazard mitigation actions recommended in this plan were selected from an analysis of the best practices presented in the catalogs. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process and are consistent with the established goals and objectives. Actions were selected from the catalogs based on an analysis of the Planning Partners' ability to implement them.

ALTERNATIVES TO MITIGATE THE AVALANCHE HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Avoid avalanche areas ❖ Monitor avalanche reports before any winter-related outdoor activities • **Increase ability to respond to or be prepared for hazard:** ❖ Take safety courses ❖ Have proper equipment to support rescue, mitigate head injuries, and create air pockets (avalanche beacon, portable shovel, avalanche probe in backpack, helmet, and avalanche airbags)	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ None • **Increase ability to respond to or be prepared for hazard:** ❖ None	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Controlled avalanches as necessary (i.e., triggering an avalanche through detonation ❖ Install static defense structures in avalanche areas ❖ Identify and map avalanche paths and avalanche areas in the State ❖ Construct snow sheds over highways and railroads that cross potential avalanche paths ❖ Have proper equipment to support rescue (avalanche beacon, portable shovel, avalanche probe in backpack, helmet, and avalanche airbags) • **Increase ability to respond to or be prepared for hazard:** ❖ Identify and map avalanche paths and avalanche areas in the State

Nature-based opportunities

- ❖ *Restrict or prohibit new development downslope of areas susceptible to avalanche and preserve these areas for open space/recreational uses*
- ❖ *Preserve forest ecosystems in avalanche-prone areas to provide a resistance buffer area to absorb impacts from avalanches*

ALTERNATIVES TO MITIGATE THE DAM FAILURE HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Relocate out of dam failure inundation areas. ❖ Elevate home to appropriate levels. • **Increase ability to respond to or be prepared for hazard:** ❖ Learn about risk reduction for the dam failure hazard. ❖ Learn the evacuation routes for a dam failure. ❖ Educate yourself on early warning systems. ❖ Know evacuation routes ❖ Educate yourself on where the inundation areas are and if you are located within them.	• **Reduce the probability of hazard events:** ❖ Remove dams. ❖ Harden dams. • **Limit risk to people or structures:** ❖ Replace earthen dams with hardened structures. ❖ Flood-proof facilities in dam failure inundation areas. • **Increase ability to respond to or be prepared for hazard:** ❖ Educate employees on the probable effects of a dam failure. ❖ Develop a continuity of operations plan.	• **Reduce the probability of hazard events:** ❖ Remove dams. ❖ Harden dams. • **Limit risk to people or structures:** ❖ Replace earthen dams with hardened structures ❖ Relocate community lifelines out of dam failure inundation areas. ❖ Consider open space land use in designated dam failure inundation areas. ❖ Adopt higher floodplain standards in mapped dam failure inundation areas. ❖ Retrofit community lifelines in dam failure inundation areas. • **Increase ability to respond to or be prepared for hazard:** ❖ Map dam failure inundation areas. ❖ Enhance emergency operations plan to include a dam failure component. ❖ Institute monthly communications checks with dam operators. ❖ Inform the public on risk reduction techniques* ❖ Adopt real-estate disclosure requirements for the sale of property located in dam failure inundation areas. ❖ Consider the probable effects of climate in assessing the risk associated with dam failure. ❖ Establish early warning capability downstream of listed high hazard dams.* ❖ Consider the residual risk associated with protection provided by dams in future land use decisions. ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Restore and reconnect floodplains that intersect dam failure inundation areas that have been degraded by development and structural flood control.*
- ❖ *Use soft approaches for stream bank restoration and hardening. Soft approaches can include but are not limited to the introduction of large woody debris into a system.*
- ❖ *Set back levees on systems that rely on levee protection to allow the river channel to meander, which reduces erosion and scour potential.*
- ❖ *Acquire property within dam failure inundation areas, remove or relocate structures, and preserve these areas as open space in perpetuity.*
- ❖ *Preserve floodplain storage capacity by limiting or prohibiting the use of fill within the floodplain.*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE DROUGHT HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ Recycle gray water • **Limit risk to people or structures:** ❖ Drought-resistant native landscapes ❖ Reduce water system losses ❖ Modify plumbing systems (through water saving kits) • **Increase ability to respond to or be prepared for hazard:** ❖ Practice active water conservation ❖ Increased access to water testing* ❖ For homes with on-site water systems: increase storage and utilize rainwater catchment	• **Reduce the probability of hazard events:** ❖ Recycle gray water • **Limit risk to people or structures:** ❖ Support alternative irrigation techniques to reduce water use and use climate-sensitive water supplies ❖ Drought-resistant landscapes ❖ Reduce private water system losses ❖ For businesses with on-site water systems, increase storage and utilize rainwater catchment • **Increase ability to respond to or be prepared for hazard:** ❖ Practice active water conservation ❖ Participate in the Integrated Regional Water Management Program	• **Reduce the probability of hazard events:** ❖ Groundwater recharge through stormwater management • **Limit risk to people or structures:** ❖ Identify and create groundwater backup sources ❖ Water use conflict regulations ❖ Reduce water system losses ❖ Distribute water saving kits* • **Increase ability to respond to or be prepared for hazard:** ❖ Public education on drought resistance* ❖ Encourage water recycling ❖ Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers ❖ Develop drought contingency plan ❖ Develop criteria “triggers” for drought-related actions ❖ Improve accuracy of water supply forecasts ❖ Modify rate structure to influence active water conservation techniques ❖ Consider the probable impacts of climate change on the risk associated with the drought hazard ❖ Support, participate in and advocate for funding for the Integrated Regional Water Management Program ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Promote and use reclaimed water supplies*
- ❖ *Increase capacity for stored surface water to create habitats and ecosystems for aquatic species.*
- ❖ *Promote and use active groundwater recharge*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE EARTHQUAKE HAZARD

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ None **Limit risk to people or structures:** ❖ Locate outside of hazard area (off soft soils) ❖ Apply engineering solutions to reduce the hazard ❖ Retrofit structure (anchor house structure to foundation) ❖ Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) ❖ Build to higher design **Increase ability to respond to or be prepared for the hazard:** ❖ Practice drop, cover, and hold ❖ Develop household mitigation plan, such as a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event ❖ Keep cash reserves for reconstruction ❖ Become informed on the hazard and risk reduction alternatives available. ❖ Develop a post-disaster action plan for your household	**Reduce the probability of hazard events:** ❖ None **Limit risk to people or structures:** ❖ Locate or relocate mission-critical functions outside hazard area ❖ Apply engineering solutions that minimize or eliminate the hazard ❖ Build redundancy for critical functions and facilities ❖ Retrofit critical buildings and areas housing mission-critical functions **Increase ability to respond to or be prepared for hazard:** ❖ Adopt higher standard for new construction; consider "performance-based design" when building new structures ❖ Keep cash reserves for reconstruction ❖ Inform your employees on the possible effects of earthquake and how to deal with them at your work facility.* ❖ Develop a continuity of operations plan	**Reduce the probability of hazard events:** ❖ None **Limit risk to people or structures:** ❖ Locate community lifelines or functions outside hazard area ❖ Apply engineering solutions that minimize or eliminate the hazard ❖ Harden infrastructure ❖ Provide redundancy for critical functions ❖ Adopt higher regulatory standards **Increase ability to respond to or be prepared for hazard:** ❖ Provide better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (e.g., tax incentives, information) ❖ Include retrofitting and replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components such as pipe, power line, and road repair materials ❖ Develop and adopt a continuity of operations plan ❖ Initiate triggers guiding improvements (such as <50% substantial damage or improvements) ❖ Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. ❖ Develop a post-disaster action plan that includes grant funding and debris removal components. ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ *None identified*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE EXTREME COLD HAZARD

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ None **Limit risk to people or structures:** ❖ Insulate residential and non-residential structures to provide greater thermal efficiency and reduce heat loss ❖ Provide redundant heat and power ❖ Ensure natural gas input/release valves do not get covered in snow and ice, leading to freezing **Increase ability to respond to or be prepared for hazard:** ❖ Prepare emergency food and supplies to be self-sufficient for at least 72 hours in the event of severe winter weather ❖ Obtain an emergency generator	**Reduce the probability of hazard events:** ❖ None **Limit risk to people or structures:** ❖ None ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines to meet performance expectations **Increase ability to respond to or be prepared for hazard:** ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources ❖ Provide warming centers for employees*	**Reduce the probability of hazard events:** ❖ None **Limit risk to people or structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Provide backup power sources at vital critical facilities **Increase ability to respond to or be prepared for hazard:** ❖ Enhance public awareness. campaigns to address issues of warnings and actions to take during extreme cold events* ❖ Use the best available technology to enhance the warning systems for all severe weather events* ❖ Coordinate severe weather warning capabilities and the dissemination of warning amongst agencies with the highest degree of capability ❖ Provide NOAA weather radios to the public* ❖ Retrofit above-ground utilities to underground facilities if appropriate ❖ Create a salt reserve or research alternates to stretch salt reserve ❖ Evaluate and revise, as needed, building codes to address and mitigate extreme cold and freeze impacts on residents ❖ Establish warming centers* ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

❖ *Where available, take advantage of geothermal resources for heating assets subject to extreme cold or freeze.*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE EXTREME HEAT HAZARD

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Plant trees to create shade in urban areas ❖ Remove concrete and other hard surfaces and replace them with native vegetation **Limit risk to people or structures:** ❖ Insulate residential and non-residential structures to provide greater thermal efficiency ❖ Provide redundant power sources ❖ Get air conditioning installed ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) **Increase ability to respond to or be prepared for hazard:** ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio ❖ Obtain an emergency generator or community microgrid	**Reduce the probability of hazard events:** ❖ Plant trees in urban areas experiencing urban heat island effects or with below average tree canopy coverage* ❖ Remove concrete and other hard surfaces and replace them with native vegetation **Limit risk to people or structures:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines meet resiliency expectations against all-hazard impacts ❖ Install tree wire ❖ Provide cooling centers for employees* ❖ Install "cool roofs" and "green roofs." **Increase ability to respond to or be prepared for hazard:** ❖ Create redundancy in power supply ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources	**Reduce the probability of hazard events:** ❖ Plant trees in urban areas experiencing urban heat island effects or with below average tree canopy coverage* ❖ Remove concrete and other hard surfaces and replace them with native vegetation* **Limit risk to people or structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Install "cool roofs," "green roofs," and other green infrastructure ❖ Use the best available technology to enhance warning systems for all severe weather events* **Increase ability to respond to or be prepared for hazard:** ❖ Increase communication alternatives* ❖ Enhance public awareness campaigns on actions to take during extreme heat events* ❖ Coordinate severe weather warning capabilities and the dissemination of warning among agencies with the highest degree of capability* ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public* ❖ Review and update heat response plan in light of climate change projections ❖ Promote programs that support community-scale microgrids ❖ Evaluate and revise, as needed, building codes to address and mitigate extreme heat impacts on residents ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Green roofs can be up to 40 °F cooler than typical roofs and reduce community temperatures by up to 5 °F. They can reduce building air conditioning costs by up to 75 percent. Green roofs provide benefits up to $14 more per square foot than traditional roofs*
- ❖ *Trees can lower surface temperatures by providing shade and through evapotranspiration, which can reduce peak local summer temperatures by 2 ºF to 9° F. Shady areas can be between 20 ºF and 45 °F cooler than sunny areas, providing safe resting places outside.*
- ❖ *The Planting of native plants—including along parking lots, streets, and in yards—can provide cooling effects. Vertical gardens, also referred to as green or living walls, involve planting on walls to provide shade for buildings. This helps to cool the building and surrounding area*
- ❖ *Convert built environments to natural environments such as forests, wetlands, and vegetation to aid in lowering temperatures. Natural environments provide more shade, moisture, and evaporation to help reduce temperatures. These systems sequester carbon, helping to minimize future warming*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE FLOOD HAZARD

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Clear storm drains and culverts ❖ Use green infrastructure **Limit risk to people or structures:** ❖ Locate outside of hazard area ❖ Elevate utilities above base flood elevation ❖ Use low-impact development techniques ❖ Raise structures above base flood elevation ❖ Elevate items within house above base flood elevation ❖ Build new homes above base flood elevation ❖ Flood-proof structures	**Reduce the probability of hazard events:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques **Limit risk to people or structures:** ❖ Locate community lifelines or functions outside hazard area ❖ Use low-impact development techniques ❖ Build redundancy for critical functions or retrofit critical buildings ❖ Provide flood-proofing when new critical infrastructure must be located in floodplains	**Reduce the probability of hazard events:** ❖ Maintain drainage system ❖ Institute low-impact development techniques on property ❖ Dredging, levee construction, and providing regional retention areas ❖ Structural flood control, levees, channelization, or revetments. ❖ Stormwater management regulations and master planning ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff **Limit risk to people or structures:** ❖ Locate or relocate community lifelines outside of hazard area* ❖ Acquire or relocate identified repetitive loss properties ❖ Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. ❖ Adopt land development criteria such as planned unit developments, density transfers, clustering ❖ Institute low-impact development techniques on property ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff ❖ Harden infrastructure, bridge replacement program ❖ Provide redundancy for critical functions and infrastructure ❖ Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. ❖ Stormwater management regulations and master planning. ❖ Adopt “no-adverse impact” floodplain management policies that strive to not increase the flood risk on downstream communities.* ❖ Expand the Stormwater Capture Parks Program to collect rainwater and urban runoff. ❖ Create Tree Canopy neighborhoods to reduce stormwater runoff by catching rainfall on branches and leaves and increasing evapotranspiration.

Personal Scale	Organizational Scale	Government Scale
Increase ability to respond to or be prepared for hazard: ❖ Buy flood insurance ❖ Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event	**Increase ability to respond to or be prepared for hazard:** ❖ Keep cash reserves for reconstruction ❖ Support and implement hazard disclosure for sale of property in risk zones. ❖ Solicit cost-sharing through partnerships with others on projects with multiple benefits.	**Increase ability to respond to or be prepared for hazard:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) ❖ Incorporate retrofitting or replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Maintain and collect data to define vulnerability and potential impacts ❖ Train emergency responders ❖ Create an elevation inventory of structures in the floodplain ❖ Develop and implement a public information strategy* ❖ Charge a hazard mitigation fee ❖ Integrate floodplain management policies into other planning mechanisms within the planning area. ❖ Consider the probable effects of climate change on the risk associated with the flood hazard ❖ Consider the residual risk associated with structural flood control in future land use decisions ❖ Enforce National Flood Insurance Program ❖ Adopt a Stormwater Management Master Plan ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Restore and reconnect floodplains that have been degraded by development and structural flood control.*
- ❖ *Use soft approaches for stream bank restoration and hardening (e.g., introducing large woody debris into a system).*
- ❖ *Set back levees on systems that rely on levee protection to allow the river channel to meander, which reduces erosion and scour potential.*
- ❖ *Acquire property within the floodplain, remove or relocate structures, and preserve these areas as open space in perpetuity.*
- ❖ *Preserve floodplain storage capacity by limiting or prohibiting the use of fill in the floodplain.*
- ❖ *Incorporate green infrastructure into stormwater management facilities*
- ❖ *Protect and/or restore riparian buffers*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE HAZARDOUS MATERIALS HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ Identify and eliminate sources of potential hazardous material spills • **Limit risk to people or structures:** ❖ Increase distance between hazardous material sites and development • **Increase ability to respond to or be prepared for hazard:** ❖ Personal planning for potential events	• **Reduce the probability of hazard events:** ❖ Identify and eliminate sources of potential hazardous material spills • **Limit risk to people or structures:** ❖ Increase inspection of hazardous material facilities and transport vehicles ❖ Ensure each facility has Safety Data Sheets for all hazardous materials on-site and staff know the location ❖ Educate staff on the correct way to handle hazardous materials ❖ Determine if high-risk chemical facilities are covered by Chemical Facility Anti-Terrorism Standards • **Increase ability to respond to or be prepared for hazard:** ❖ Conduct training for response	• **Reduce the probability of hazard events:** ❖ Identify and eliminate sources of potential hazardous material spills • **Limit risk to people or structures:** ❖ Increase inspection of hazardous material facilities and transport vehicles • **Increase ability to respond to or be prepared for hazard:** ❖ Conduct training for response ❖ Public outreach and education

Nature-based opportunities

❖ *None identified*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE LANDSLIDE HAZARD

Personal Scale	Organizational Scale	Government Scale
Reduce the probability of hazard events: ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Minimize vegetation removal and the addition of impervious surfaces. ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to people or structures:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) ❖ Retrofit home **Increase ability to respond to or be prepared for hazard:** ❖ Institute warning system, and develop evacuation plan* ❖ Keep cash reserves for reconstruction ❖ Educate yourself on risk reduction techniques for landslide hazards	**Reduce the probability of hazard events:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to people or structures:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) ❖ Retrofit at-risk facilities **Increase ability to respond to or be prepared for hazard:** ❖ Institute warning system, and develop evacuation plan* ❖ Keep cash reserves for reconstruction ❖ Develop a continuity of operations plan ❖ Educate employees on the potential vulnerability to landslide hazards and emergency response protocol.	**Reduce the probability of hazard events:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Apply engineering solutions that minimize/eliminate the hazard **Limit risk to people or structures:** ❖ Acquire properties in high-risk landslide areas. ❖ Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas. ❖ Adopt higher regulatory standards for new development within unstable slope areas. ❖ Armor/retrofit critical infrastructure against landslides. **Increase ability to respond to or be prepared for hazard:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas: better land controls, tax incentives, information ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Educate the public on the landslide hazard and appropriate risk reduction alternatives.* ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Replace or restore native vegetation known to stabilize steep slope areas.*
- ❖ *Soil bioengineering can be used to mitigate risk in larger areas that have a potential for shallow, slow-moving landslides or areas abandoned after past landslides that show signs of reactivation and have a high landslide hazard potential*
- ❖ *Hybrid solutions refer to conventional engineering solutions that are combined with nature-based solutions using appropriate vegetation.*

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE VOLCANO HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Locate outside of hazard area • **Increase ability to respond to or be prepared for hazard:** ❖ Develop and practice a household evacuation plan	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Locate outside of hazard area ❖ Protect corporate critical facilities from potential impacts of severe ash fall (air filtration capability) • **Increase ability to respond to or be prepared for hazard:** ❖ Develop and practice a corporate evacuation plan ❖ Inform employees through corporate sponsored outreach	• **Reduce the probability of hazard events:** ❖ Limited success has been experienced with lava flow diversion structures • **Limit risk to people or structures:** ❖ Locate outside of hazard area ❖ Protect critical facilities and utilities from potential problems associated with ash fall ❖ Build redundancy for critical facilities and functions • **Increase ability to respond to or be prepared for hazard:** ❖ Public outreach, awareness ❖ Tap into state volcano warning system to provide early warning to residents of potential ash fall problems

Nature-based opportunities

❖ *Volcanic ash could be used to supply nutrients and reduce carbon dioxide from the atmosphere*

ALTERNATIVES TO MITIGATE THE WILDFIRE HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry overgrown underbrush and diseased trees • **Limit risk to people or structures:** ❖ Create and maintain defensible space around structures ❖ Locate outside of hazard area ❖ Mow regularly ❖ Create and maintain defensible space around structures and provide water on site ❖ Use fire-retardant building materials ❖ Create defensible spaces around home • **Increase ability to respond to or be prepared for hazard:** ❖ Employ techniques from the National Fire Protection Association's Firewise Communities program to safeguard home ❖ Identify alternative water supplies for fire fighting ❖ Install/replace roofing material with non-combustible roofing materials.	• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees • **Limit risk to people or structures:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area ❖ Create and maintain defensible space around structures and infrastructure and provide water on site ❖ Use fire-retardant building materials ❖ Use fire-resistant plantings in buffer areas of high wildland/urban interface fire threat. • **Increase ability to respond to or be prepared for hazard:** ❖ Support Firewise community initiatives.* ❖ Create /establish stored water supplies to be utilized for firefighting.	• **Reduce the probability of hazard events:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees ❖ Implement best management practices on public lands. ❖ Remove invasive non-native hazardous fuels in riparian areas and restore native habitat • **Limit risk to people or structures:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area ❖ Enhance building code to include use of fire resistant materials in high hazard area. ❖ Ensure compliance with State Minimum Fire Safe Regulations ❖ Create and maintain defensible space around structures and infrastructure ❖ Use fire-retardant building materials ❖ Use fire-resistant plantings in buffer areas of high wildland/urban interface fire threat. ❖ Consider higher regulatory standards (such as Class A roofing) ❖ Establish biomass reclamation activities • **Increase ability to respond to or be prepared for hazard:** ❖ More public outreach and education efforts* ❖ Possible weapons of mass destruction funds available to enhance fire capability in high-risk areas ❖ Identify fire response and alternative evacuation routes* ❖ Seek alternative water supplies* ❖ Manage fuel load through thinning and brush removal ❖ Use academia to study impacts/solutions to wildland/urban interface fire risk ❖ Establish/maintain mutual aid agreements between fire service agencies. ❖ Create/implement fire plans ❖ Consider the probable impacts of climate change on the risk associated with the wildland/urban interface fire hazard in future land use decisions ❖ Develop non-English and culturally sensitive educational materials.*

Nature-based opportunities

- ❖ *Manage invasive species (i.e., Pampas Grass) that are susceptible to increased wildfire risk.*
- ❖ *Create riparian corridors in wildfire hazard areas as fire breaks*
- ❖ *Incorporate nature-based wildfire risk reduction buffers into existing ecosystem-friendly land uses (e.g., green space, trails, or community parklands)*

- *Implement and fund ecological thinning and prescribed fire and cultural fire and, where appropriate, manage wildfire for resource benefit*
- *Fund and implement ecological restoration programs to convert exotic grasslands to native scrub and chaparral and control invasive species*

---

* Actions that benefit socially vulnerable populations

ALTERNATIVES TO MITIGATE THE WINTER STORM HAZARD

Personal Scale	Organizational Scale	Government Scale
• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Insulate residential and non-residential structures ❖ Provide redundant heat and power ❖ Plant appropriate trees near home and power lines (“Right tree, right place” National Arbor Day Foundation Program) • **Increase ability to respond to or be prepared for hazard:** ❖ Trim or remove trees that could affect power lines ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio ❖ Obtain an emergency generator	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines to meet performance expectations ❖ Install tree wire • **Increase ability to respond to or be prepared for hazard:** ❖ Trim or remove trees that could affect power lines ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources	• **Reduce the probability of hazard events:** ❖ None • **Limit risk to people or structures:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Designate snow routes and strengthen critical roads and bridges ❖ Use the best available technology to enhance the warning systems for all severe weather events* • **Increase ability to respond to or be prepared for hazard:** ❖ Support programs such as “Tree Watch” that proactively manage problem areas through the use of selective removal of hazardous trees, tree replacement, etc. ❖ Establish and enforce building codes that require all roofs to withstand snow loads ❖ Increase communication alternatives* ❖ Enhance public awareness campaigns to address actions to take during severe weather events* ❖ Coordinate severe weather warning capabilities and the dissemination of warning among agencies with the most capability* ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public* ❖ Consider the probable impacts of climate change on risk associated with the winter weather hazard ❖ Evaluate and revise, as needed, building codes to address severe weather impacts on residents

Nature-based opportunities

❖ *None identified*

* Actions that benefit socially vulnerable populations