Calaveras County Water District
Local Hazard Mitigation Plan

Final Draft | November 2018

Prepared for:
Calaveras County Water District
120 Toma Court
San Andreas, California 95249

Prepared by:
Amec Foster Wheeler
10940 White Rock Road, Suite 190
Rancho Cordova, California 95670

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EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. The Calaveras County Water District developed this Local Hazard Mitigation Plan (LHMP) update to make the County and its residents less vulnerable to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that the District would be eligible for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance Grants, including Pre-Disaster Mitigation and Hazard Mitigation Grant programs.

The plan was originally developed and approved by FEMA in 2006. The plan was then comprehensively updated in 2012. The District followed a planning process in alignment with FEMA guidance during its original development and update, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key District, County, and water agency representatives, and other regional stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the District, assessed the District's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The District is vulnerable to several hazards that are identified, profiled, and analyzed in this 2018 plan update. Floods, wildfires, drought and water supply, and severe weather are among the hazards that can have a significant impact on the County.

Based on the risk assessment, the HMPC identified goals and objectives to reduce the District's vulnerability to hazards. The goals and objectives of the 2018 LHMP update are:

Goal 1 Provide protection of life and public health and safety

- Objective 1.1 Maintain adequate flows in water system for fire protection.
- Objective 1.2 Improve capacity of critical sewer infrastructure to accommodate peak events.
- Objective 1.3 Continue emergency water supply planning during periods of drought and water shortage.

Goal 2 Reduce risk and vulnerability to existing and future facilities from natural hazards

- Objective 2.1 Protect critical facilities from hazard impacts.
- Objective 2.2 Implement mitigation measures for facilities vulnerable to flooding.
- Objective 2.3 Reduce the vulnerability of facilities identified in fire hazard areas.
- Objective 2.4 Coordinate with the County to update and improve risk assessment data and maps.
- Objective 2.5 Integrate natural hazards mitigation into future facilities planning.

Goal 3 Maintain current service levels and prevent loss of services

- Objective 3.1 Protect critical lifeline utilities from hazard impacts.

- Objective 3.2 Enhance and improve interconnections with regional water suppliers to prevent loss of service during drought and other emergencies.
- Objective 3.3 Improve and protect water supply storage capacity.
- Objective 3.4 Improve redundancy at critical facilities.
- Objective 3.5 Increase backup capacities post-disaster to service the community until complete services are restored.

Goal 4 Improve education, awareness, coordination, and communication with District staff, first responders, emergency management planners, public and other stakeholders

- Objective 4.1 Educate public on responsible water use and conservation measures.
- Objective 4.2 Foster partnerships with other water and sewer providers locally and regionally.
- Objective 4.3 Improve emergency planning relative to vulnerable special populations.
- Objective 4.4 Improve coordination with other County departments (such as planning and public health) related to natural hazard planning.
- Objective 4.5 Maintain and enhance participation in multi-agency groups, such as the Multi-Agency Coordinating Group, related to natural hazards and emergencies.
- Objective 4.6 Coordinate with other agencies for disaster training exercises.
- Objective 4.7 Increase use of shared resources.
- Objective 4.8 Make better use of communication and GIS technology.

To meet these identified goals, the plan includes recommendations for 22 mitigation actions, which are summarized in the table that follows. This plan has been formally adopted by the District and will be updated every five years at a minimum.

Table ES.1. Calaveras County Water District Mitigation Actions

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
1. Implement and Expand Fuel Breaks to Reduce Wildfire Hazards at CCWD Properties	New Action	Wildfire	H	X	X	Started
2. Hardening of Water and Wastewater Facilities (and Associated Electrical and SCADA Communication Systems) Against Wildfire and Other Severe Weather Hazards	New Action	Wildfire, Severe Weather: Winter Storms and Extreme Cold, Severe Weather: Heavy Rain and Storms Severe Weather: Wind	H	X	X	Started

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
3. Implement Other Facility Flood Mitigation Projects	2012	Flood	H	X	X	Ongoing
4. Replace Remaining Redwood Water Storage Tanks	2012	Wildfire	H	X		Ongoing
5. Improve grading and drainage of Wastewater Effluent Storage Ponds	2012	Flood	H	X		Ongoing
6. Enhance On-Site Coordination with Cal-Fire during Fire Events	2012	Wildfire	H	X		Ongoing
7. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning	2012	Multi-hazard	H	X	X	Ongoing
8. Implement recommendations in service area master plans related to critical sewer facilities	2012	Flood	H	X	X	Near Completion
9. Implement pipeline improvements identified in water master plans to provide adequate fire flows	2012	Wildfire	H	X	X	Ongoing
10. Strategic Wildfire Protection Improvements in Sheep Ranch and West Point Water Systems	New	Wildfire	H	X	X	Started
11. Evaluate the need for improved redundancy at critical facilities	2012	Multi-hazard	M	X	X	Ongoing
12. Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas	2012	Wildfire, Severe Weather: Heavy Rain and Storms, Severe Weather: Wind	M	X	X	Ongoing
13. White Pines Lake Storage Restoration Project	New Action	Drought and Water Supply, Flooding	M	X	X	Started
14. Merge 2018 LHMP into the next update to the Calaveras County Multi-Jurisdictional Hazard Mitigation Plan	New Action	Multi-Hazard	M	X	X	Deferred
15. Highway 4 Community Emergency Water Supply Feasibility Planning Study	New Action	Drought and Water Supply	M	X	X	Deferred

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
16. Construct Fire Resistant Electrical Control Panels	2012	Wildfire, Severe Weather: Heavy Rain and Storms	M	X		Ongoing
17. Retrofit Manhole Covers	2012	Flood	L	X		Ongoing
18. Review and update a tiered rate structure to encourage responsible water use	2012	Drought	L	X	X	Near Completion
19. Update the National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities as required	2012	Flood	L	X		Ongoing
20. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan	2012	Drought	L	X	X	Ongoing
21. Dam Failure Emergency Planning	2012	Dam Failure	L	X	X	Started
22. Develop mutual aid agreements with other water providers and county agencies for support during emergencies	2012	Multi-hazard	L	X	X	Near Completion

NOTES: Status is defined as follows: started, deferred, ongoing, and near completion. Started means planning and permitting for the mitigation action has been initiated, or that applications for funding have been completed. Deferred refers to mitigation actions where multi-jurisdictional coordination is required for project implementation (e.g. Multi-Hazard Mitigation Plan). Ongoing refers to mitigation actions that were carried forward from the previous LHMP and are underway; it also refers to maintenance actions (e.g. defensible space), or new actions that are identified in related plans (e.g. new flood mitigation projects). Near completion refers to mitigation actions that are almost finished, or where an ordinance, plan, or mutual aid agreement has been adopted, but not yet implemented, executed, or enforced.

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1 INTRODUCTION

1.1 Purpose

Calaveras County Water District (CCWD) prepared this Local Hazard Mitigation Plan (LHMP) update to guide hazard mitigation planning to better protect the people, property, and water and wastewater facilities of CCWD from the effects of hazard events. The plan underwent a comprehensive update in early 2018 building upon the plan that was previously updated in 2012, and originally updated in 2006. This plan demonstrates CCWD's and the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to ensure the District's continued eligibility for certain federal disaster assistance: specifically, grant funds available through the FEMA Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005). An update to this report in 2017 (Natural Hazard Mitigation Saves: 2017 Interim Report) indicates that mitigation grants funded through select federal government agencies, on average, can save the nation $6 in future disaster costs, for every $1 spent on hazard mitigation.

Natural hazards mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Natural hazards mitigation planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented. This plan documents CCWD's natural hazards mitigation planning process, identifies natural hazards and risks within Calaveras County, and identifies the District's hazard mitigation strategy to make the District less vulnerable and more disaster resistant and sustainable. Information in this plan can be used to help guide and coordinate mitigation activities and local land use decisions.

The four goals of CCWD's 2018 Local Hazard Mitigation Plan are to:

1) Provide protection of life and public health and safety
2) Reduce risk and vulnerability to existing and future facilities from hazards
3) Maintain current service levels and prevent loss of services
4) Improve education, awareness, coordination, and communication with District staff, first responders, emergency management planners, public, and other stakeholders

This is a single-jurisdictional plan that covers the water district only. Because CCWD's boundaries are contiguous with Calaveras County boundaries, the planning area is considered Calaveras County. The CCWD Hazard Mitigation Planning Committee (HMPC) addressed only natural hazards; man-made hazards are addressed in their emergency response and related plans.

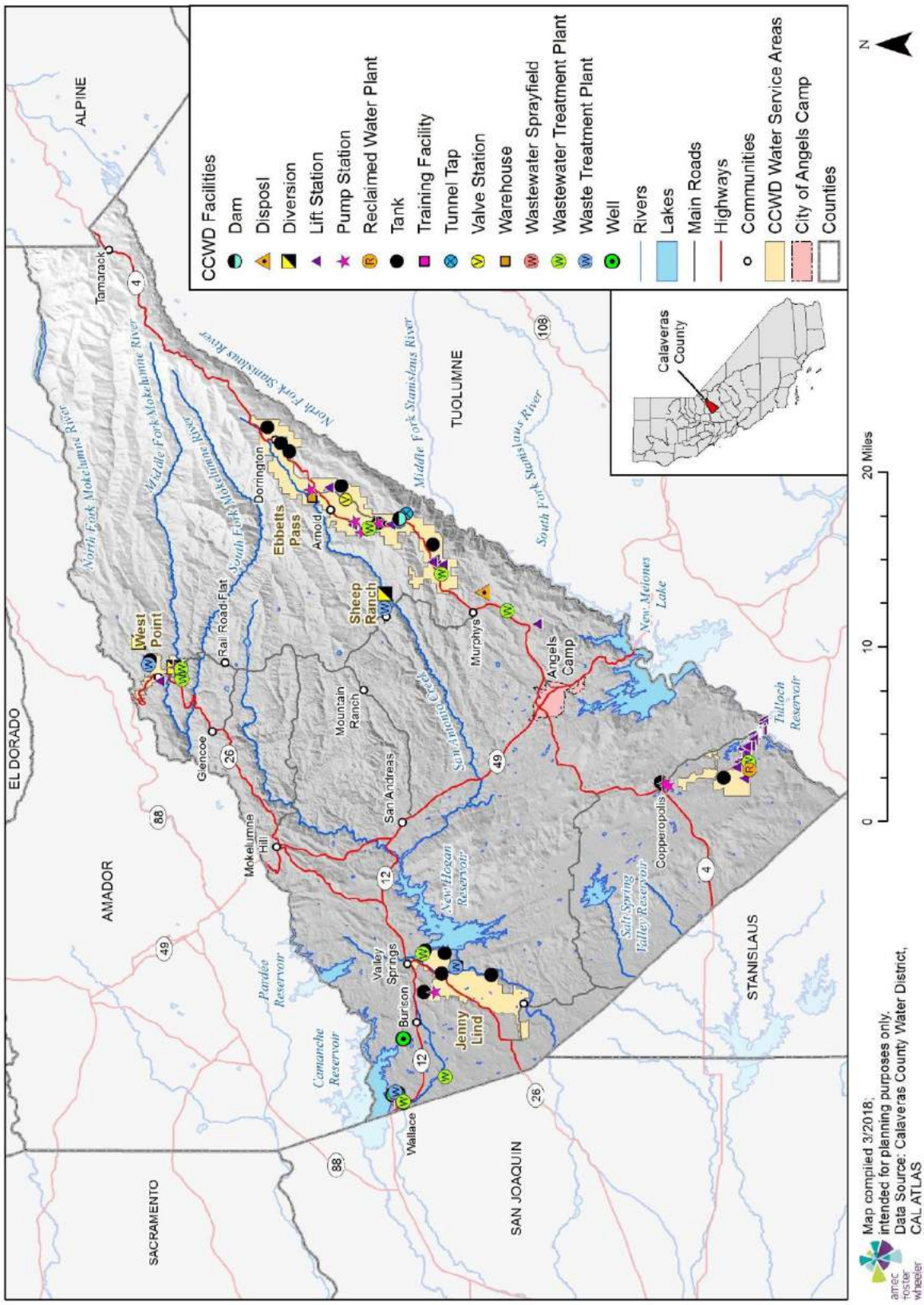
This plan update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This planning effort also follows to FEMA hazard mitigation planning tools: FEMA's 2011 Local Plan Review Guide and the 2013 Local Mitigation Planning Handbook. Because CCWD is subject to many kinds of hazards, access to these programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. CCWD has been affected by hazards in the past and is committed to reducing future hazard impacts and maintaining eligibility for mitigation-related federal funding.

1.3 District Profile

CCWD includes all of Calaveras County in the central Sierra Nevada foothills in the northeastern portion of California. CCWD's boundaries encompass approximately 657,920 acres of land ranging from the San Joaquin Valley to the Sierra Nevada Mountains. See Figure 1.1. It is a rural area with many small communities, some of which are rapidly urbanizing along its western border. San Andreas, the County seat, is approximately 100 miles east of San Francisco and 60 miles southeast of Sacramento. The City of Angels is the only incorporated community in Calaveras County.

Figure 1.1: CCWD Base Map



Population current resides in many of the County's small, historic communities that were established during the Gold Rush period. These residential communities are located along the historic routes of State Highway 49 and 12 and include the unincorporated communities of Mokelumne Hills, San Andreas, Valley Springs. Other residential area are located along State Route 4 and include Copperopolis, Murphys, and Arnold. Other communities include Wallace, Burson int eh western portion of the County, West Point, Wilseyville, and Mountain Ranch in the north-central part of the County, and Avery and Dorrington along Highway 4. From 2007 to 2010, there were a number of residential subdivisions build near Valley Springs, Copperopolis, and along Highway 4, while some residential parcels were developed in the more rural western, southern, and central parts of the county. Also, many new residential projects were proposed and build leading up to the economic crisis of 2007-2008, but never completed. The growth rate has since declined (Calaveras County 2016).

While the previous 1996 General Plan accommodated previous population growth by identifying large areas of land for residential development throughout the western and central portions of the County, and within "community centers" in areas around existing communities, most of these areas have yet to be developed and fully built out. There were six Community Plans adopted during the 2000 to 2010 decade targeted for development: Valley Springs, San Andreas, Mokelumne Hill, Murphys-Douglas Flat, Avery-Hathaway Pines, and Arnold. Two Special Plans were also adopted for Rancho Calaveras and Ebbetts Pass, and in 2004 a Specific Plan was adopted for a large development project in the Copperopolis area: Oak Canyon Ranch. Little development has occurred in these communities compared to the San Joaquin Valley and other adjacent counties.

1.3.1 History and Organization

CCWD was organized in November 1946 under the laws of the State of California as a public agency for developing and administering water resources and wastewater services in Calaveras County. The District owns two hydropower projects: the North Fork Stanislaus Hydroelectric Development Project (FERC 2409), completed in 1990; and the New Hogan Power Project (FERC 2903) on the Calaveras River, completed in 1986.

CCWD is a non-profit governmental agency also known as a "special district", conducting business in the performance of public services for Calaveras County, and is governed by an elected five-member Board of Directors that is elected by qualified voters in the District to four-year terms. The District's service area includes all of Calaveras County, but it is administratively and fiscally independent from the Calaveras County government. CCWD is the largest public water purveyor in the county in terms of service area, number of customers served, and amount of water delivered. As a special district, CCWD's authority includes providing public water service, water supply development and planning, wastewater treatment and disposal, and recycling. CCWD maintains broad general powers over the use of water within its boundaries, including: authority to acquire, control, distribute, store, spread, treat, purify, reclaim, process, and salvage water for beneficial use; providing wastewater service; selling treated or untreated water; acquiring or constructing hydroelectric facilities and selling the power and energy produced to public agencies or public utilities engaged in distributing power; contracting with the United States or other political

subdivisions, public subdivisions, public utilities, or other persons; and, subject to Article XIIIA of the Constitution of the State of California, levying taxes and improvements. CCWD also maintains certain administrative authorities through the adoption and maintenance of its groundwater management plan and monitoring program for the Camanche/Valley Springs area, which is a portion of the DWR Bulletin 118 recognized Eastern San Joaquin Groundwater Subbasin.

The district currently provides water service to approximately 13,000 municipal, residential, and commercial customers through the following six independent water systems located throughout Calaveras County:

- Ebbetts Pass (served by the Stanislaus River)
- Copper Cove/Copperopolis (served by the Stanislaus River)
- Jenny Lind (served by the Calaveras River)
- West Point (served by the Mokelumne River and Bear Creek, a Mokelumne River tributary)
- Wallace (served by the Eastern San Joaquin Groundwater Subbasin)
- Sheep Ranch (served by San Antonia Creek, a tributary of the Calaveras River)

CCWD also provides water and/or wastewater service to approximately 5,000 connections with 12 different service areas throughout Calaveras County.

1.3.2 Topography

Topography varies from ranch land to foothills in the western and southern portions of the county to high mountainous areas typical of the Sierra Nevada in the northern and eastern portions. Elevations range from 200 feet above mean sea level (msl) in the northwestern region of the County to a peak at 8,170 msl above Corral Hollow near Alpine County. Warm, dry summers and temperate winters prevail in the western foothills, with temperatures ranging from the middle 30s°F to the high 90s°F, occasionally exceeding 100°F during the summer. Mild summers and cold winters characterize the mountainous eastern region with temperatures ranging from the low 20s°F to the middle 80s°F. Annual precipitation generally increases with altitude and occurs in the form of rain or snow depending upon the elevation.

1.3.3 Economy

The County's origins and early economic development can be traced to the "gold rush era" of the 1800's when historic placer mining occurred mainly in areas east of the modern-day alignment of Highway 49. Over time, asbestos, gold, industrial minerals, limestone, and sand and gravel became the most active segments of the mineral industry. Tourism and recreation, forest products, mineral resources, and agricultural products now comprise significant elements of the area's economic base. As a result, a variety of land uses are found within CCWD's service area, including residential, forested, industrial, agricultural, and recreational land uses. In the foothills, much of the land is used for cattle ranching, while orchards, vineyards, and row crops are grown at lower elevations. The County's economy is also based on educational services, public administration and

municipalities, and private businesses. Major employers include Calaveras County, the California Department of Forestry and Fire Protection (CalFIRE), Mark Twain St. Joseph's Hospital, and Bret Harte High School (EDD 2018).

Comprehensive economic data for Calaveras County comes from the U.S. Census Bureau, as an excerpt from the American Community Survey. Select estimates of economic characteristics for Calaveras County are shown in Table 1.1.

Table 1.1: Calaveras County Economic Characteristics

Characteristic	Calaveras County
In civilian labor force, total, percent of population age 16 years+	48.4
In civilian labor force, female, percent of population age 16 years+	45.0
Total accommodation and food services sales, 2012 ($1,000)	69,645
Total health care and social assistance receipts/revenue, 2012 ($1,000)	108,936
Total retail sales, 2012 ($1,000) (c)	252,345
Median household income (in 2015 dollars), 2010-2014	53,502
Per capita income in past 12 months (in 2015 dollars), 2010-2014	30,577
Persons in poverty, percent	13.1
Total employer establishments, 2015	894
Total employment 2015	6,108
Total annual payroll ($1,000), 2015	197,487
Total employment, percent change 2014-2015	4.2

Source: U.S. Census Bureau, 2016a. Quick Facts: Calaveras County, California, 2012-2016 American Community Survey 5-Year Estimates

The boom and bust cycles of mining, timber harvesting, and tourism has left many rural communities in the County perennially disadvantaged with median household income well below the state threshold. The median household income for Calaveras County has increased over the past 16 years, from about $41,002 in 1999 to $53,502 in 2015. In comparison with other Sierra Nevada counties, the median household income is average. The County falls significantly short of the state median household income ($63,783), as well as other counties in the Sierra Nevada ($42,401 in Amador County, $50,731 in Tuolumne County, and $62,375 in Alpine County) (US Census 2016b).

More recent data from the California Employment Development Department indicates that, in 2018, there were 21,220 people in the Calaveras County labor force. Of these, 20,380 were employed; 980 were not. The unemployment rate was 4.6 percent.

1.3.4 Population

Calaveras County is the 44th largest county in terms of population in California with approximately 45,670 persons in 2017. Overall, Calaveras County has an older population than the rest of California. Seniors (age 65 and above) account for 18.2 percent of the population. County residents have also completed less formal education than residents of California with 20.2 percent of the population in Calaveras County attaining education levels beyond a high school diploma, compared with 60.8 percent of the population in California (U.S. Census Bureau 2010, 2016b; DOF 2017).

1.4 Plan Organization

The CCWD Local Hazard Mitigation Plan update is organized as follows:

- Executive Summary and Table of Contents
- Chapter 1: Introduction
- Chapter 2: What's New
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Appendices

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2 WHAT'S NEW

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The 2012 Calaveras County Water District (CCWD) Local Hazard Mitigation Plan (LHMP) contained a risk assessment of identified hazards for CCWD and a mitigation strategy to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA, progress has been made by CCWD on implementation of the mitigation strategy. This section of the plan provides an overview of the approach to updating the 2018 LHMP, identifies new analyses and information included in this plan update, and highlights key mitigation successes.

2.1 What's New in the Plan Update

The updated LHMP complies with Federal Emergency Management Agency (FEMA) guidance and California Office of Emergency Services (Cal OES) guidelines for Local Hazard Mitigation Plans. The update also followed the requirements of the Disaster Mitigation Act (DMA) of 2000 and the 2013 Local Hazard Mitigation Planning Handbook.

This LHMP update involved a comprehensive review and update of each section of the 2012 plan and includes an assessment of the success of the District in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2012 plan was carried forward as applicable into this LHMP update.

Also, Section 7.0 Implementation and Maintenance of this plan update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate documentation of continued public involvement;
- Incorporate documentation to update the planning process that may include new or additional stakeholder involvement;
- Incorporate growth and development-related changes to building inventories and District facilities;
- Incorporate new project recommendations or changes in project prioritization; and
- Include a public involvement process to receive comments on the updated plan prior to submitting the updated plan to Cal OES/FEMA.

These requirements and others as detailed throughout this plan were also addressed during the 2018 plan update process.

Plan Section Review and Analysis – 2018 Update

As part of its 2012 mitigation strategy, CCWD recognized that certain data, if available, would enhance the analyses presented in the risk assessment and utilized in the development of the mitigation strategy. This new data and associated analysis provided valuable input for the development of the mitigation strategy presented in Section 5.0 of this plan.

During the 2018 plan update, the HMPC updated each of the sections of the previously approved plan to include new information. Amec Foster Wheeler developed a summary of each section in the plan and guided the HMPC through the elements that needed updating during the kickoff meeting in January and through the third mitigation strategy meeting in March 2018. This included analyzing each section using FEMA's local plan update guidance (2013) to ensure that the plan met the latest requirements. The HMPC and Amec Foster Wheeler determined that nearly every section of the plan would need revision to align the plan with the latest FEMA planning guidance and requirements. A summary of the changes in this plan update is highlighted in the Table 2.1 below.

Table 2.1: CCWD Local Hazard Mitigation Plan Update Highlights

Plan Section	Summary of Plan Review, Analysis, and Updates
1. Introduction	• Updated language to describe purpose and requirements of the CCWD Local Hazard Mitigation Plan Update process • Identified new participating jurisdictions, government agencies, and stakeholders
2. What's New	• Summarized the new and updated highlights from the 2018 planning process
3. Planning Process	• Updated population summary with census and California Department of Finance (DOF) data • Updated economy summary with current economic characteristics and data • Updated historic and cultural resources using local/state/national sources • Updated threatened and endangered (T&E) species list and critical habitat summaries for Calaveras County based on US Fish and Wildlife Information for Planning and Consultation (IPaC) tool • Described and documented the planning process for the update, including coordination among agencies, HMPC meetings, and public outreach • Removed 2012 planning process information and replaced with 2018 planning and outreach information • Described any changes in participation in detail • Described 2018 public participation process • Described updates to the HMPC

Plan Section	Summary of Plan Review, Analysis, and Updates
4. Risk Assessment	• Revisited former hazards list for possible modifications based on new and revised data • Reviewed the 2015 Calaveras County LHMP (including 2016 Revision) and compared hazard priorities • Updated list of disaster declarations to include recent data • Updated tables to include recent National Center for Environmental Information (NCEI) data to supplement SHELDUS data compiled during previous update • Updated past occurrences for each hazard to include recent data • Updated critical facilities identified from the 2012 plan to include new service areas, such as Wallace Community Service District, and other upgraded facilities • Updated growth and development trends to include recent Census information, review recently approved development plans (if any), and other local data sources to assess trends and determine vulnerability changes to CCWD facilities • Updated property values for vulnerability and exposure analysis, using updated facility information from District staff • Incorporated new hazard loss estimates since 2012, as applicable. • Used updated GIS inventory data to assess flooding, tree mortality, and wildfire threat to the District facilities, including recent wildfire events (e.g. Butte Fire) • Updated information regarding specific vulnerabilities to hazards, including maps and tables of specific assets at risk and specific critical facilities at risk • Updated the dam inventory and mapping based on recent (2017) data from the California Department of Water Resources, Division of Dam Safety. This updated data included new hazard classifications for dams that were recently reclassified • Updated all maps from 2012 plan, and added County-specific wildfire history and hazard severity zone maps • Reviewed mitigation capabilities and update to reflect current capabilities • Incorporated information from recent updates to 2015 Urban Water Management Plan (UWMP) and several updated District master plans
5. Mitigation Strategy	• Indicated what projects have been implemented that may reduce previously identified vulnerabilities • Updated based on the results of the updated risk assessment, completed mitigation actions, and implementation obstacles and opportunities since the completion of the 2012 plan • Reviewed and revised goals and objectives based on HMPC input • Included updated information on how actions are prioritized. • Reviewed mitigation actions from the 2012 plan and developed a status report for each; identified if actions have been completed, deleted, ongoing, or deferred/carried forward. • Updated priorities on actions. • Identified examples of successful implementation to highlight positive movement on actions identified in 2012 plan • Identified and detailed new mitigation actions proposed by the HMPC and by the District Board members
6. Plan Adoption	• Plan will be re-adopted as part of the update process
7. Plan Maintenance	• Reviewed and updated procedures for monitoring, evaluating, and updating the plan • Revised to reflect current maintenance methods • Updated the system for monitoring progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance
Appendices	• Updated references • Updated planning process documentation • Updated mitigation alternatives analyzed in the process • Plan Adoption

2.2 2012 Mitigation Strategy Status and Successes

CCWD has been successful in implementing actions identified in the 2012 LHMP mitigation strategy, thus, working diligently towards their meeting their 2012 goals of:

- Reduce risk to existing facilities from natural hazards
- Prevent loss of services
- Protect public health and safety
- Improve education, coordination, and communication with public and stakeholders

Past Mitigation Action Update

The 2012 mitigation strategy contained 20 separate mitigation actions benefiting one or more communities within CCWD. Of these 20 actions, 3 have been completed, 17 are ongoing. Because many of these projects are implemented on an annual or other continuous basis and some of the projects have yet to be funded or have otherwise not been initiated, 17 of the 2012 projects have been identified for inclusion in this plan update. Additionally, six new projects were identified for inclusion in the plan update. Table 2.2 provides a status summary of the mitigation action projects from the 2012 LHMP. Following the table are detailed descriptions of the status of each project.

Table 2.2: CCWD 2012 LHMP Action Status Update

Action	Complete	Ongoing	Not Yet Started	Project in 2012 Update
1. Dam Failure Emergency Planning		X		Y
2. Review and Update Drought Plan	X			N
3. Implement Other Facility Flood Mitigation Projects		X		Y
4. Retrofit Manhole Covers		X		Y
5. Improve grading and drainage of Wastewater Effluent Storage Ponds		X		Y
6. Enhance On-Site Coordination with Cal-FIRE during Fire Events		X		Y
7. Construct Fire Resistant Electrical Control Panels		X		Y
8. Increase District Owned Snow Removal Equipment and/or Snow Plows that can be attached to the District's Truck Fleet		X		Y
9. Replace Remaining Redwood Water Storage Tanks		X		Y
10. Jenny Lind Water Treatment Plant Flood Protection	X			N
11. Big Trees South Zone, Redwood Potable Water Storage Tanks, Wildfire Hazard Mitigation Plan	X			N
12. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning		X		Y
13. Implement recommendations in service area master plans related to critical sewer facilities		X		Y

Action	Complete	Ongoing	Not Yet Started	Project in 2012 Update
14. Implement pipeline improvements identified in water master plans to provide adequate fire flows		X		Y
15. Create and maintain wildfire defensible spaces around facilities identified as high fire hazard areas		X		Y
16.Evaluate the need for improved redundancy at critical facilities		X		Y
17. Review and update tiered rate structure to encourage responsible water use		X		Y
18. Update the National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities as required		X		Y
19. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan		X		Y
20. Develop mutual aid agreements with other water providers and county agencies for support during emergencies		X		Y

1. Dam Failure Emergency Planning

Progress to date: The State of California Division of Safety of Dams (DSOD) recently reclassified two dams under CCWD ownership, pursuant to the provisions contained in Senate Bill 92 (2017): Valley Springs La Contenta Treated Wastewater Storage Pond (High) and West Point Regulating Reservoir (Significant). The District is now required to complete and submit to the state dam inundation mapping and prepare Emergency Action Plans (EAPs) for La Contenta Treated Wastewater Storage Pond before January 1, 2019, and January 1, 2021 for the West Point Regulating Reservoir.

2. Review and Update Drought Plan

Progress to date: As part of the update for the 2015 Urban Water Management Plan (UWMP), the District incorporated a Water Contingency Plan (Chapter 8 of UWMP). The plan addresses water shortages during drought conditions. The District is also evaluating a potential emergency and severe water shortage rate structure for implementation in 2018. As a result, this action is complete.

3. Implement Other Facility Flood Mitigation Projects

Progress to date: The District is currently reviewing alternative mitigation projects at each facility located within a flood zone.

4. Retrofit Manhole Covers

Progress to date: The District is currently determining whether this mitigation action is near completion, or whether additional manholes need to be replaced.

5. Improve grading and drainage of Wastewater Effluent Storage Ponds

Progress to date: Ongoing. The District has been engaged in updating the individual master plans for many of the wastewater service areas that are more than 10 years old, as they were mostly driven by pre-economic downturn housing projections. The four most recent plans included the Copper Cover Water Master Plan (2015), Copper Cove Wastewater Facility Plan (2018), Jenny Lind Water System Master Plan (2018), and the New Hogan/La Contenta Wastewater System Plan (2018). These master plan updates include the review of necessary improvements to wastewater facilities and dedicated infrastructure.

6. Enhance On-Site Coordination with Cal-FIRE during Fire Events

Progress to date: The District continues to be involved with the Multiple Agency Coordination (MAC) Committee and other public safety organizations. The Calaveras County Office of Emergency Services (Calaveras OES) has recently been moved from the Sherriff's Department to the Administrative Office. The first Calaveras OES Emergency Management Coordination meeting under new administration was held on April 18, 2018. Discussions on how to better coordinate with various utilities throughout the County during emergencies and fire events was a topic of concern. This action is still in progress.

7. Construct Fire Resistant Electrical Control Panels

Progress to date: The District has identified several pieces of infrastructure most at risk for damage due to exposure of wildfire danger for upgrade or replacement within the 5-year Capital Improvement Program.

8. Increase District Owned Snow Removal Equipment and/or Snow Plows that can be attached to the District's Truck Fleet

Progress to date: Not complete. The District has not been able to fund the necessary capital outlay necessary within the operational budget to address this action to date.

9. Replace Remaining Redwood Water Storage Tanks

Progress to date: The District recently completed the replacement of three different redwood tanks on multiple sites (see Big Trees south zone project #11) in 2017, utilizing FEMA Hazard Mitigation Program funding. Several redwood storage tanks remain throughout the District's service areas.

10. Jenny Lind Water Treatment Plant Flood Protection

Progress to date: Completed.

11. Big Trees South Zone, Redwood Potable Water Storage Tanks, Wildfire Hazard Mitigation Plan

Progress to date: Completed.

12. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning

Progress to date: On-going. The Draft Calaveras County General Plan is planned for release in late 2018.

13. Implement recommendations in service area master plans related to critical sewer facilities

Progress to date: On-going.

14. Implement pipeline improvements identified in water master plans to provide adequate fire flows

Progress to date: On-going. One project, the Reach 3A Pipeline Replacement Project was completed in 2017. It involved the replacement of 20,000 feet of 12-inch diameter transmission pipeline that runs from the Arnold Cal-FIRE Station along Highway 4 to Blagen Road and the point of termination at the Sawmill Tank above White Pines. High priority projects where inadequate infrastructure to provide necessary fire flows still exist in the Ebbetts Pass, Sheep Ranch, and West Point Service Areas.

15. Create and maintain wildfire defensible spaces around facilities identified as high fire hazard areas

Progress to date: Ongoing

16. Evaluate the need for improved redundancy at critical facilities

Progress to date: On-going.

17. Review and update tiered rate structure to encourage responsible water use

Progress to date: On-going.

18. Update the National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities as required

Progress to date: On-going.

19. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan

Progress to date: On-going.

20. Develop mutual aid agreements with other water providers and county agencies for support during emergencies

Progress to date: The District continues to participate in the MAC Committee and has agreements with other water agencies for mutual aid for both water and wastewater.

3 PLANNING PROCESS

Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and

3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning at Calaveras County Water District

The primary purpose of the Local Hazard Mitigation Plan (LHMP) update is to reduce or eliminate long-term risk to people and property from natural hazards and their effects on the Calaveras County Water District's (CCWD) critical facilities within the Calaveras County, California planning area. In 2017, CCWD recognized the need and importance of the update and reconvened the Hazard Mitigation Planning Committee (HMPC) in early 2018 to facilitate and develop the plan update. CCWD staff, the HMPC, and Amec Foster Wheeler consultant staff were responsible for overseeing the planning process and the development of this LHMP update. The planning update team's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA);
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance;
- Facilitate the entire planning process;
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process;
- Produce the draft and final plan documents; and

Coordinate with the California Office of Emergency Services (CAL OES) and FEMA Region IX plan reviews.

3.2 The 10-Step Planning Process

Amec Foster Wheeler established the planning process for updating the CCWD LHMP using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1) Organize Resources
2) Assess Risks
3) Develop the Mitigation Plan
4) Implement the Plan and Monitor Progress

Into this process, Amec Foster Wheeler integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program; Pre-Disaster Mitigation Program; Community Rating System; Flood Mitigation Assistance Program; Severe Repetitive Loss Program; and new flood control projects authorized by the U.S. Army Corps of Engineers.

In 2013, FEMA released the Local Mitigation Planning Handbook that has become the official guide for local governments to develop, update and implement local mitigation plans. While the requirements under §201.6 have not changed, the Handbook provides guidance to local governments on developing or updating hazard mitigation plans to meet the requirements under the Code of Federal Regulations (CFR) Title 44 – Emergency Management and Assistance §201.6, Local Mitigation Plans for FEMA approval and eligibility to apply for FEMA Hazard Mitigation Assistance grant programs. It also offers practical approaches, tools, worksheets and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook complements and liberally references the Local Mitigation Plan Review Guide (October 1, 2011), which is the official guidance for Federal and State officials responsible for reviewing local mitigation plans in a fair and consistent manner.

Table 3.1 shows how the modified 10-step process fits into FEMA's four-phase process, and how those elements correspond to the tasks in the FEMA Mitigation Planning Handbook.

Table 3.1: Mitigation Planning Processes Used to Update the CCWD LHMP

FEMA's 4-Phase DMA Process	Modified 10-Step CRS Process	FEMA Local Mitigation Planning Handbook Tasks
1) Organize Resources		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1)

FEMA's 4-Phase DMA Process	Modified 10-Step CRS Process	FEMA Local Mitigation Planning Handbook Tasks
		4: Review community capabilities - 44 CFR 201.6 (b)(2) & (3)
2) Assess Risks		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii) & (iii)
201.6(c)(2)(ii)	5) Assess the Risks	
3) Develop the Mitigation Plan		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
4) Implement the Plan and Monitor Progress		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current
		9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

This LHMP update involved a comprehensive review and update of each section of the 2012 plan and includes an assessment of the success of the District in evaluating, monitoring and implementing the mitigation strategy outlined in the initial 2006 plan. The process followed to update the plan is detailed in the above table and the sections that follow, and is a similar process that was used to prepare the 2012 plan. As part of this plan update, all sections of the plan were reviewed and updated to reflect new data, processes, and resulting mitigation strategies. Also, based in part on the issuance of the 2013 Local Mitigation Planning Handbook, the 2018 plan has been reorganized and updated. Only the information and data still valid from the 2012 plan was carried forward as applicable into this LHMP update.

3.2.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

The 2018 planning process and update of the LHMP was formally initiated in December 2017 under the coordination of CCWD as the lead entity. With CCWD's commitment to participate in the DMA planning process, Amec Foster Wheeler worked with the District to establish the framework and organization for development of the plan. Organizational efforts were initiated with the District and a series of emails to inform and educate the previous plan participants, and other governmental jurisdictions and agencies within the County of the purpose and need for updating the 2012 hazard mitigation plan. The initial HMPC meeting was held with District representatives and key community and agency stakeholders to discuss the organizational aspects of this plan update process. Invitations to this kickoff meeting were extended to key CCWD departments, representatives from Calaveras County and the City of Angels, as well as to other federal, state, and local stakeholders, including representatives from the public, that might have an

interest in participating in the planning process. HMPC members of the 2012 plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in Appendix A.

Hazard Mitigation Planning Committee

The HMPC was re-established because of the organizational meetings and other plan coordination efforts. The HMPC, comprising key District, County, and other agency and stakeholder representatives with an interest in hazard mitigation, developed the plan with leadership from CCWD staff and facilitation by Amec Foster Wheeler staff. The following participated on the HMPC:

Calaveras County Water District

- District General Manager
- District Board Members
- District Engineer
- Water Resources Manager
- Operations Manager
- External Affairs Manager
- Engineering Technician

Calaveras County

- Calaveras County Board of Supervisor
- Calaveras County Assistant County Administrative Officer
- Calaveras County Sherriff's Office
- Calaveras County Office of Emergency Services Director
- Calaveras County Agency Administrator, Director of Environmental Health

Other Government and Stakeholder Representatives:

- Utica Water and Power Authority (UWPA)
- California Department of Forestry and Fire Protection (Cal FIRE), Tuolumne-Calaveras Unit
- Murphys Sanitation District (SSD)
- Calaveras Public Utility District (CPUD)
- American Red Cross

A list of participating HMPC representatives is also included in Appendix A. This list includes all HMPC members that attended one or more HMPC meetings detailed in Table 3.1. The District also utilized the support of many other staff to collect and provide requested data and to conduct timely reviews of the draft documents. These names are included on the HMPC list. The above list of HMPC members also includes several other government and stakeholder representatives

that contributed to the planning process. Specific participants from these other agencies are also identified in Appendix A.

Planning Meetings

The planning process officially began with a kick-off meeting held in the CCWD Board Room in San Andreas, on January 18, 2018. The meeting covered the scope of work and an introduction to the DMA requirements. The District was provided with a Data Collection Guide, which included worksheets to facilitate the collection of information necessary to support development of the plan. Using FEMA guidance, Amec Foster Wheeler designed these worksheets to capture information on past hazard events, identify hazards of concern to participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. Copies of Amec Foster Wheeler's Data Collection Guide for this project are included in Appendix A. To facilitate input from other HMPC members, an additional worksheet was developed to capture hazard events since the 2012 plan. Because this is a plan update, another worksheet was developed, the Mitigation Action Status Summary Worksheet, to capture information on the status of mitigation action items included in the 2012 plan. These worksheets are also included in Appendix A. The District and HMPC members completed and returned the worksheets to Amec Foster Wheeler for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, telephone conversations, a project Dropbox folder, and through a District developed webpage dedicated to the plan development process. This website was developed to provide information to the HMPC, the public and all other stakeholders on the LHMP Update. Draft documents were also posted on this website so that the HMPC members and the public could easily access and review them. The LHMP website can be accessed at: http://ccwd.org/public-invited-hazard-mitigation-planning-meeting/. The HMPC met formally three times during the planning process (January 18, 2018, February 15, 2018, and March 15, 2018). The purposes of these meetings are described in Table 3.2. Agendas for each of the meetings are included in Appendix A.

Table 3.2: Schedule of HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1	Kick-off meeting: introduction to DMA, the planning process, and hazard identification	January 18, 2018	CCWD Board Room
HMPC #2	Hazard Identification, Risk Assessment, and Mitigation Goals/Strategy	February 15, 2018	CCWD Board Room
HMPC #3	Development and prioritization of mitigation action recommendations	March 15, 2018	CCWD Board Room

In addition to the formal planning team meetings, District staff met numerous times as a group over the planning period to provide information, discuss project direction, complete worksheets, provide input on plan draft, and to strategize and develop mitigation actions for the plan update.

Planning Step 2: Involve the Public

Involving the public assures support from the community at large and is a part of the planning process. Early discussions with CCWD established the initial plan for public involvement. Public outreach for this plan update began at the beginning of the plan development process with an informational press release to inform the public of the purpose of the DMA and the hazard mitigation planning process for the District. At the planning team kick-off meeting, the HMPC discussed additional strategies for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities for this plan update included an online public survey, keeping all HMPC meetings open to the public, scheduling a public meeting held shortly after the release of the draft plan update, and; and the collection of public and stakeholder comments on the draft plan, which was posted on the District website in April 2018 and available for download at: http://ccwd.org/wp-content/uploads/2013/12/CCWD_LHMP-Public-Review-Draft.pdf.

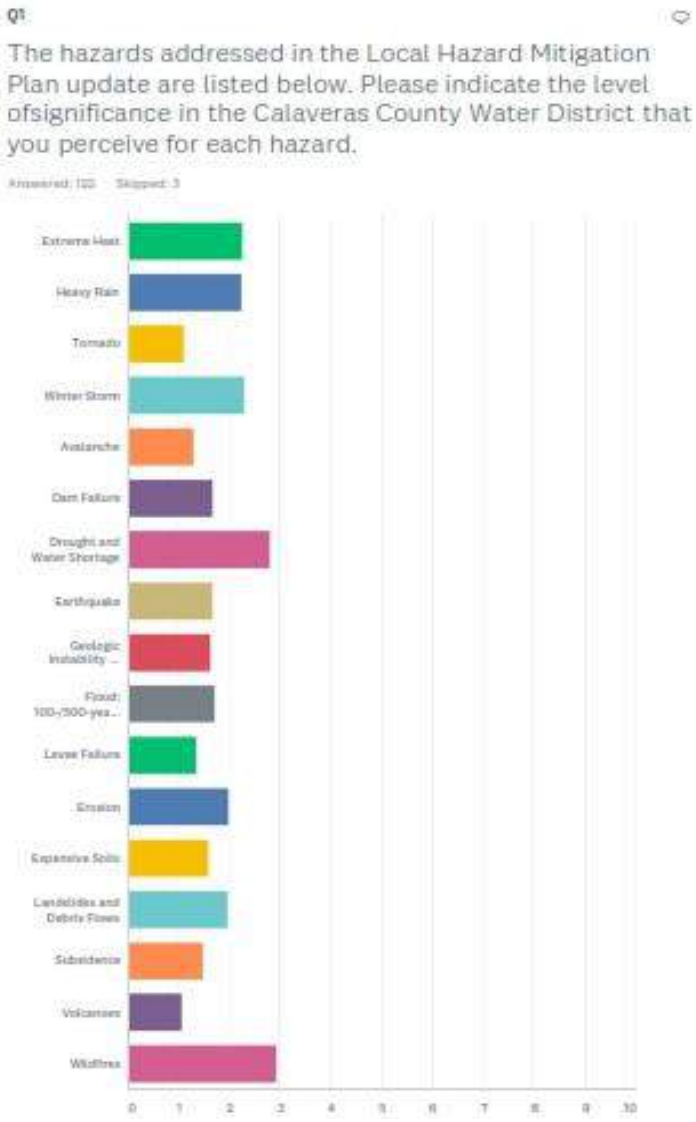
Public Survey

Information on the online public survey was developed as a tool to gather public input on the plan update. The survey provided an opportunity for public input during the planning process, and prior to the finalization of the plan update by ensuring recommended mitigation actions were incorporated into the plan. The survey gathered public feedback on concerns about hazards and input on strategies to reduce their impacts. The survey was released on January 22, 2018 and closed on March 4, 2018 (six-week comment period). The HMPC provided links to a public survey by distributing it using social media, email, and posting the link on the website. The survey was available at: http://ccwd.org/ccwd-seeks-community-input-releases-hazard-mitigation-survey/.

One hundred twenty-five (125) people filled out the survey online. Results showed that the public perceives the most significant hazards to be drought, wildfire, winter storm, heavy rains, and extreme heat. Wildfire fuels treatment projects, hazardous tree removal, assistance with defensible space, and forest health/watershed protection were cited as the most popular mitigation actions. Figure 3.1 shows an example of an online public survey response. A summary of the survey data can be found in Appendix A.

Other information provided to the public included an overview of the mitigation status and successes resulting from implementation of the 2012 plan as well as information on the processes, new risk assessment data, and proposed mitigation strategies for the plan update.

Figure 3.1: Example of Public Survey Response



Source: https://www.surveymonkey.com/results/SM-KG9PBT568/

Public Review Input/Comments on the Draft Plan

There was a 20-day public review period for the Draft LHMP; it started April 20, 2018 and ended May 11, 2018. The CCWD solicited public input on the Draft LHMP during the regular board meeting on April 25, 2018.

Table 3.3. Table 3.3: Schedule of Public and Stakeholder Meetings

Meeting Topic	Meeting Date	Meeting Locations
Public education and feedback Meeting: Presentation on Draft LHMP, risk assessment overview, mitigation project options overview, an update on planning process, and public survey	April 25, 2018	CCWD Board Room

Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan, including the sections that address mitigation goals and strategies. For the 2018 plan update, no written mailed or emailed comments were submitted to the CCWD, and no verbal comments were made during the public meeting. Copies of the public meeting agenda are available here: http://ccwd.org/wp-content/uploads/2013/12/CCWD-April-25-2018-Agenda-Package.pdf. Copies of the public meeting board packet and public comment summary are available here: http://ccwd.org/wp-content/uploads/2013/12/CCWD-May-16-2018-Agenda-Package.pdf.

Table 3.4. Summary of Public Meeting

Meeting Location	Meeting Date	Public Comment
CCWD Board Room	April 25, 2018	None

After the public comment period, one District Board member made a comment on the public review draft plan. The comment specifically requested an additional mitigation action regarding water supply to prevent and respond to wildfire hazards in the communities of Sheep Ranch and West Point. Because the water systems in these two communities were isolated, as evidenced by the recent Butte Fire, there are limitations in these areas that can hamper the ability of first responders to fight wildfires. The Board member (Director Terry Strange) requested specific improvements to the West Point and Sheep Ranch water systems. No other public of District Board member comments were collected. Because of this comment, Chapter 5, Mitigation Strategy was modified by the HMPC to address the comment.

Media Outreach

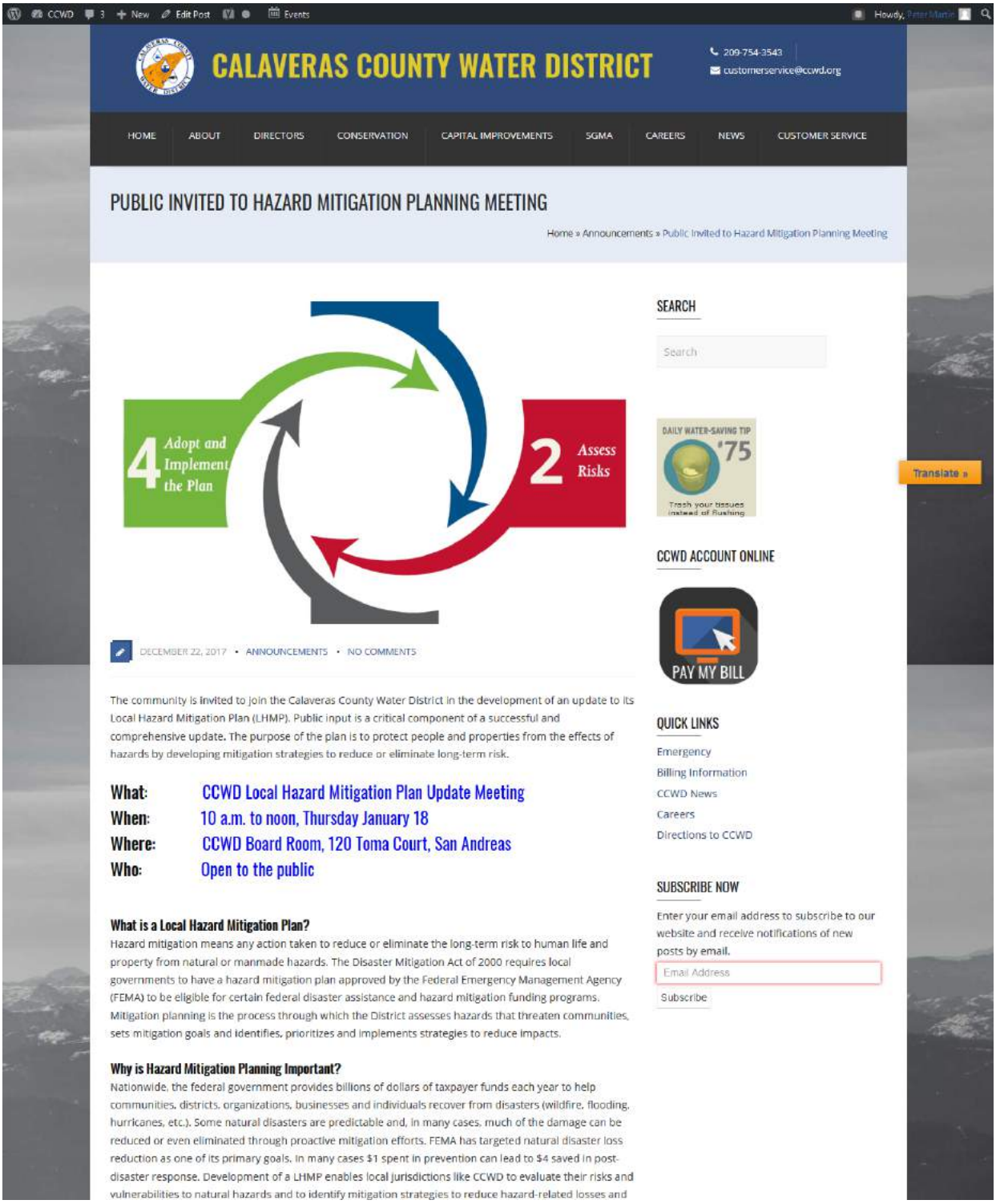
All press releases and website postings are on file with CCWD (see Figure 3. for examples of several press releases published during the update process). Press releases were published on January 18, 2018 to notify the public of the update process and on April 24, 2018 to announce the availability of the draft public review plan. Public meetings were advertised to maximize outreach efforts to both targeted groups and to the public at large. Advertisement mechanisms for these meetings and for involvement in the overall LHMP development process include:

- Providing press releases to local newspapers and radio stations (e.g. https://www.mymotherlode.com/news/local/348693/soliciting-best-ideas-to-mitigate-natural-disaster-impacts.html)

- Posting meeting announcements on CCWD website (see Figures 3.1 and 3.2)
- Personal phone calls

The updated plan is available online on the CCWD website at: http://ccwd.org/about-ccwd/publications/hazard-mitigation-plan/

Figure 3.2: Press Releases for the 2018 Local Hazard Mitigation Plan Update



CALAVERAS COUNTY WATER DISTRICT

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PUBLIC INVITED TO HAZARD MITIGATION PLANNING MEETING

Home » Announcements » Public Invited to Hazard Mitigation Planning Meeting

DECEMBER 22, 2017 • ANNOUNCEMENTS • NO COMMENTS

The community is invited to join the Calaveras County Water District in the development of an update to its Local Hazard Mitigation Plan (LHMP). Public input is a critical component of a successful and comprehensive update. The purpose of the plan is to protect people and properties from the effects of hazards by developing mitigation strategies to reduce or eliminate long-term risk.

What: CCWD Local Hazard Mitigation Plan Update Meeting
When: 10 a.m. to noon, Thursday January 18
Where: CCWD Board Room, 120 Toma Court, San Andreas
Who: Open to the public

What is a Local Hazard Mitigation Plan?
Hazard mitigation means any action taken to reduce or eliminate the long-term risk to human life and property from natural or manmade hazards. The Disaster Mitigation Act of 2000 requires local governments to have a hazard mitigation plan approved by the Federal Emergency Management Agency (FEMA) to be eligible for certain federal disaster assistance and hazard mitigation funding programs. Mitigation planning is the process through which the District assesses hazards that threaten communities, sets mitigation goals and identifies, prioritizes and implements strategies to reduce impacts.

Why is Hazard Mitigation Planning Important?
Nationwide, the federal government provides billions of dollars of taxpayer funds each year to help communities, districts, organizations, businesses and individuals recover from disasters (wildfire, flooding, hurricanes, etc.). Some natural disasters are predictable and, in many cases, much of the damage can be reduced or even eliminated through proactive mitigation efforts. FEMA has targeted natural disaster loss reduction as one of its primary goals. In many cases $1 spent in prevention can lead to $4 saved in post-disaster response. Development of a LHMP enables local jurisdictions like CCWD to evaluate their risks and vulnerabilities to natural hazards and to identify mitigation strategies to reduce hazard-related losses and

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Trash your tissues instead of flushing

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December 22, 2017

Public invited to hazard mitigation planning meeting

The community is invited to join the Calaveras County Water District in the development of an update to its Local Hazard Mitigation Plan (LHMP). Public input is a critical component of a successful and comprehensive update. The purpose of the plan is to protect people and properties from the effects of hazards by developing mitigation strategies to reduce or eliminate long-term risk.

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When: 10 a.m. to noon, Thursday January 18

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Who: Open to the public

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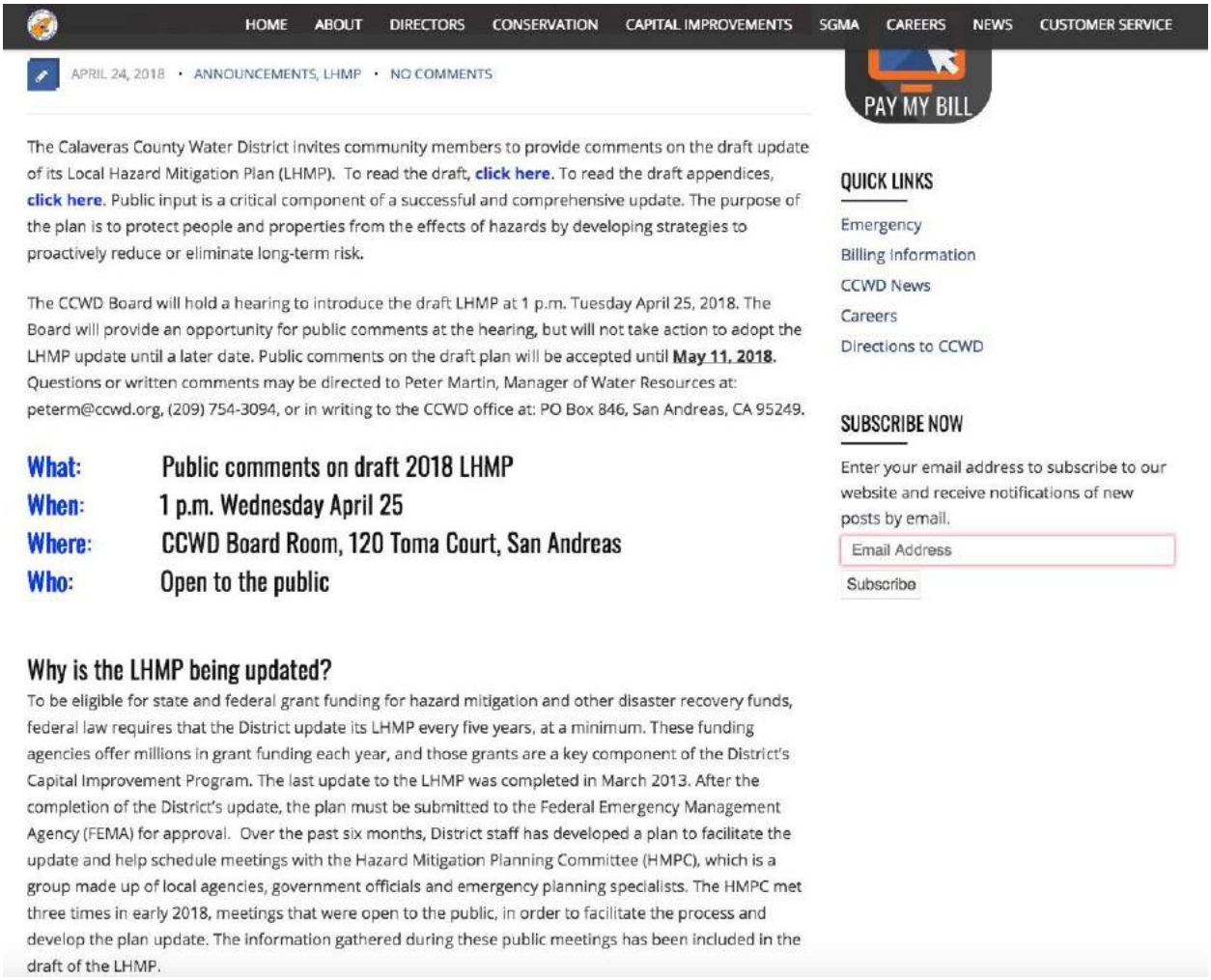
Why is Hazard Mitigation Planning Important?

Nationwide, the federal government provides billions of dollars of taxpayer funds each year to help communities, districts, organizations, businesses and individuals recover from disasters (wildfire, flooding, hurricanes, etc.). Some natural disasters are predictable and, in many cases, much of the damage can be reduced or even eliminated through proactive mitigation efforts. FEMA has targeted natural disaster loss reduction as one of its primary goals. In many cases $1 spent in prevention can lead to $4 saved in post-disaster response. Development of a LHMP enables local jurisdictions like CCWD to evaluate their risks and vulnerabilities to natural hazards and to identify mitigation strategies to reduce hazard-related losses and to make their jurisdiction more disaster resistant.

How Can the Public be Involved?

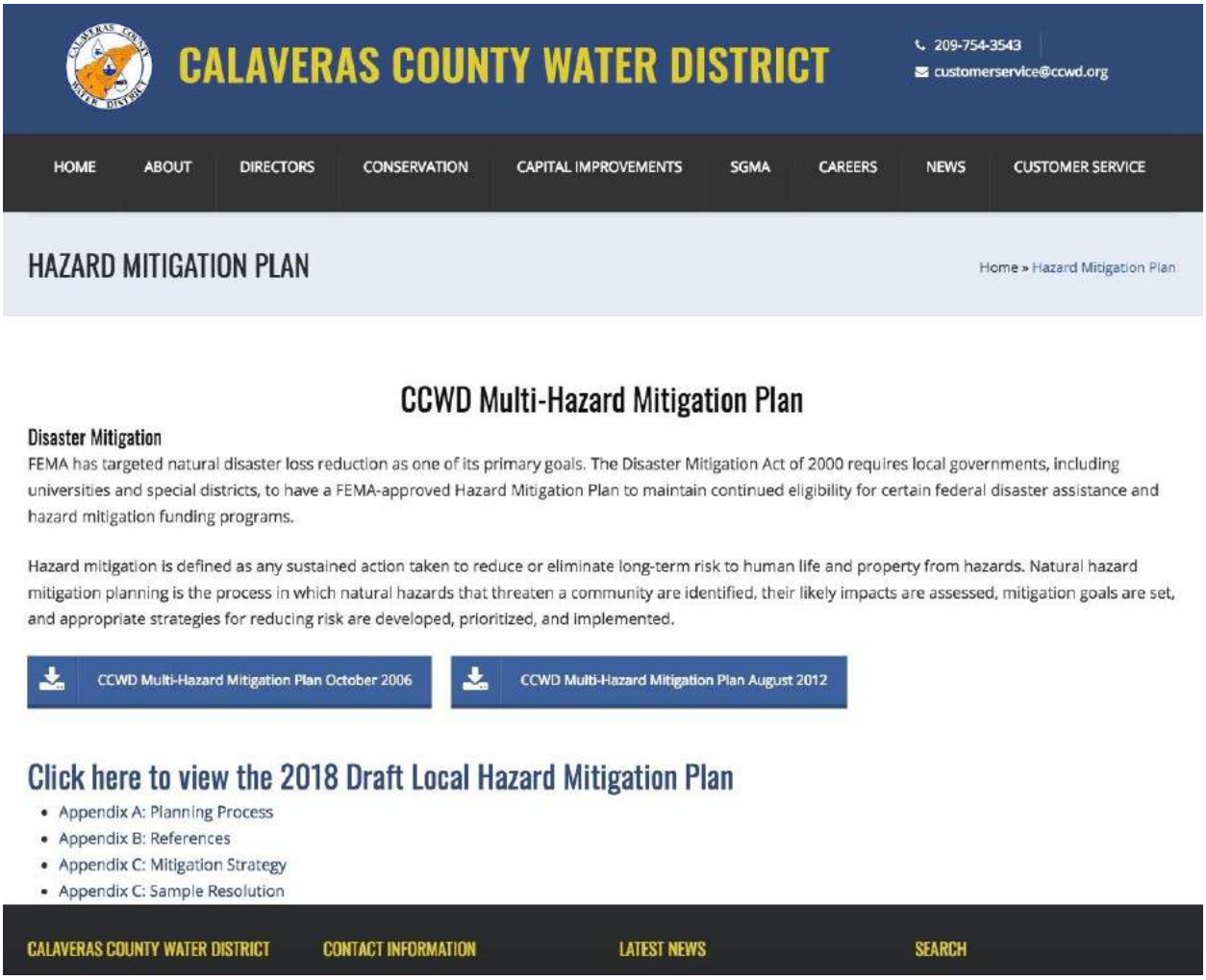
Participation in the LHMP Update process from the public and interested stakeholders is both welcomed and encouraged. Comments and ideas will be received at the January 18 meeting and at future LHMP meetings that will be announced at www.ccwd.org and through local media outlets.



Project Website

At the beginning of the plan update process, the CCWD established a hazard mitigation website. It included information about the purpose of the update process and links to the two previous plan updates. The website was updated throughout the planning process to keep the public informed on milestones and to solicit public input. The CCWD will keep the website and its publications active after the plan is complete to continue to keep the public informed and to track the progress of mitigation actions.

Figure 3.3: CCWD Hazard Mitigation Plan Webpage



Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, their landowner status within District Boundaries, and/or their interest as a neighboring jurisdiction, representatives from the following groups were invited to participate on the HMPC:

- CCWD Staff*
- CCWD Board of Directors*
- Calaveras County Planning Department
- Calaveras County Geographic Information Systems (GIS)
- Calaveras County Sheriff's Office and Emergency Services*
- City of Angels

- California Department of Forestry and Fire Protection (Cal FIRE: Tuolumne-Calaveras Unit)*
- Utica Water and Power Authority*
- Murphys Sanitary District*
- Calaveras Public Utility District*
- Other Public Water and Wastewater Utilities
- American Red Cross*
- US Army Corps of Engineers
- California Governor's Office of Emergency Services
- U.S. Forest Service: Stanislaus National Forest/Calaveras Ranger District

* Participated on HMPC

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. As part of the public review and comment period for the draft plan, key agencies and neighborhood associations were again specifically solicited to provide any final input to the draft plan document. This input was solicited both through membership on the HMPC committee and by direct emails to key groups and associations to review and comment on the plan.

As noted by the asterisks next to the above names, many of these groups found it beneficial to participate on the HMPC. Others assisted in the process by providing data directly as requested in the LHMP Update Guide. Further as part of the both HMPC and public outreach processes, all groups were invited to review and comment on the plan prior to submittal to CA-OES and FEMA.

The HMPC used technical data, reports, and studies from the following agencies and groups:

- CAL OES
- CAL FIRE
- California Department of Finance
- California Department of Water Resources
- California Geological Survey
- California Highway Patrol
- California Register of Historic Places
- FEMA
- Invasive Species Council of California
- Library of Congress
- National Oceanic and Atmospheric Association National Centers for Environmental Information
- National Performance of Dams Program
- National Register of Historic Places
- National Resource Conservation Service

- National Response Center
- National Weather Service
- Spatial Hazard Events and Losses Database for the United States (SHELDUS)
- United States Army Corps of Engineers
- United States Bureau of Land Management
- United States Department of Agriculture
- United States Drought Impact Reporter
- United States Farm Service Agency
- United States Forest Service Stanislaus National Forest
- United States Geological Survey
- Western Regional Climate Center
- Calaveras County Environmental Health Department
- Calaveras County Planning Department

Appendix B References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

Other Community Planning Efforts and Hazard Mitigation Activities

The coordination and synchronization with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other data from neighboring communities and jurisdictions. The following table briefly summarizes how the LHMP update incorporates these plans and reports to ensure this plan update is a "blueprint" for the next update. The information here helps plan users see how past planning studies were used, so they can continue to be used in the future.

Table 3.5 Plan Integration with Other Plans, Studies, and Reports

Plan Name	How Plan is Incorporated in LHMP
Calaveras County General Plan (1996)	• Incorporated relevant hazard information from this plan into the new update • Reviewed the 5-year review planning mechanisms for the County's General Plan to determine if plan updates have occurred, how often, and whether they integrated the County and CCWD LHMP documents. • Attachment A of the General Plan includes the Safety Element Amendment, which amends the plan to include the Local Hazard

	Mitigation Plan. As such, the County adopted, by reference, the 2015 Local Hazard Mitigation Plan, but not the CCWD's 2012 LHMP
Calaveras County Draft General Plan Update Documents (2016)	• Reviewed new goals and policies from 2016 plan and integrated related goals into plan update • Update references associated plans and documents, specifically those that address emergency preparedness and response to floods, fires, geotechnical hazards, and hazardous materials • Summarizes LHMP, Calaveras County EOP, and other emergency operation plans (e.g. Animal Emergency Plan, Mass Fatality Plan) • Update also contains an implementation goal to ensure County planning and public works departments are involved in the LHMP planning process
Calaveras County Community Wildfire Protection Plan (2017)	• Plan notes the critical assets at risk within each Battalion and provides an assessment summary on those assets, fuels, weather, and fire history • References CCWD assets throughout plan, as wildfire prevention efforts rely on District's system of ditches and flumes to transport water. • Provides examples of water use agreements CCWD has in place and implements with local fire districts • Documents several fuel reduction efforts that were initiated by the Fire Safe Council that are like general wildfire hazard mitigation actions drafted for the 2018 LHMP • Includes planning and implementation ideas of successful and ongoing county-wide fuel reduction and public education efforts, including public outreach materials, programs, and on-the-ground fuel reduction projects • 2018 LHMP plan mitigation actions cross reference this plan's projects, priority, and status
Calaveras County Emergency Operations Plan (2015)	• Includes Annex II, which contains the County's 2015 LHMP • Facilitates multi-jurisdictional coordination between County, local governments, and special districts, like CCWD • Strong emphasis on mitigation phase and post-disaster mitigation during recovery is discussed in plan. • Reviewed planning methods for mitigation, such as amending ordinances, initiating structural retrofits, assessing tax abatements, assessing land use patterns, and emphasizing public education • Reviewed duties of CCWD in Multi-Agency Coordinating Group (MAC)
Calaveras County Evacuation Plan	• Reviewed plan to confirm whether there have been any updates and whether it incorporated an update related to the 2012 LHMP

Calaveras County Hazard Mitigation Plan (Revised 2016)	• Revised County 2016 LHMP cross references CCWD 2012 LHMP and indicates CCWD participants and important mitigation actions. • Reviewed plan to compare hazard priorities and ratings, and discussed comparisons with HMPC • Integrated updates used in 2016 LHMP for the CCWD 2018 LHMP, including planning, population, economic, and development pattern information obtained from County sources. • Reviewed plan to ensure hazard assessment information noted in the County plan was the same, given each has the same planning area. • Discussed the 2016 LHMP with planning and GIS department staff to confirm whether new GIS data layers where available to use for the 2018 LHMP update
Calaveras County Flood Insurance Study (2010)	• 2010 DFIRMS are effective and were used for the 2018 LHMP update, however, updates to DFIRMS are in the process of being completed by FEMA • Reviewed DFIRMs and base flood elevations (BFE) for critical assets identified within flood hazard zones
Tuolumne-Calaveras Unit (TCU) Strategic Fire Plan (2018)	• Reviewed to ensure planning consistency with hazard mitigation actions outlined in plan • Discussed with CalFIRE HMPC representative during workshops to ensure 2018 LHMP update actions are consistent and supportive of TCU Strategic Fire Plan mitigation actions • Reviewed TCU Strategic Fire Plan goals, which focus on continued assessment of values at risk, partnering and collaborating opportunities, public outreach, integration with stakeholders, continued evaluation of mitigation strategy, and adoption of site-specific plans for post-fire recovery.
California State Multi-Hazard Mitigation Plan (2013)	• Reviewed information on climate change and hazard assessment data to ensure consistency with plan update. • Incorporated disaster declaration data into plan update
California State Draft Multi-Hazard Mitigation Plan (2018)	• Reviewed draft plan to ensure planning consistency with statewide hazard mitigation plan and local plans; also reviewed goals for consistency of hazard mitigation actions that relate to specific priority hazards in Calaveras County
California State Drought Contingency Plan (2016)	• Reviewed the state's strategies and actions to prepare for and respond to future droughts and other water shortage events • As a water district, the CCWD reviewed the plans goals related to adequate water supply, species protection, water management.
California Water Plan (2013 Update)	• Reviewed 5-year update to plan to integrate information on water supply trends in California that also occur in Calaveras County (similar information was integrated from the 2015 UWMP) • Reviewed general integrated water management toolbox strategies to: reduce water demand, increase water supply, improve water quality, practice resource stewardship, and improve flood management

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. The plan update also relied on various federal and state economic and population databases, FEMA mitigation planning guides, and other environmental information sources. More details on the incorporation of existing plans, studies, reports, and technical information, including a summary of the applicable policies, regulations, plans, and programs that were used for the LHMP update are included in Chapter 4, Risk Assessment.

3.2.2 Phase 2: Assess Risks

Planning Steps 4: Identify the Hazards

Amec Foster Wheeler led the HMPC to review the list of hazards identified in the 2012 plan and document, and profiled all the hazards that have, or could have, an impact the planning area, including documenting recent drought, flood, wildfire, and winter storm events. Data collection worksheets were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. The profile of each of these hazards was then updated in 2018 with information from the HMPC and additional sources. Web sources, existing reports and plans, and existing GIS layers were used to compile information about past hazard events and determine the location, previous occurrences, probability of future occurrences, and magnitude/severity of each hazard. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities where data permitted. Planning Step 5: Assess the Risks

After updating the profiles of the hazards that could affect the District, the HMPC collected information to describe the likely impacts of future hazard events. This step included two parts: a vulnerability assessment and a capability assessment.

Vulnerability Assessment—The District updated their assets at risk to natural hazards. These assets included total number and value of structures; critical facilities and infrastructure; natural, historic, and cultural assets; and economic assets. The HMPC also analyzed development trends in hazard areas.

Capability Assessment— The HMPC conducted a capability assessment update to review and document the planning area's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. This addressed FEMA planning task 4: Review community capabilities - 44 CFR 201.6 (b)(2) & (3).

Results of the risk assessment were presented and comments discussed at the second HMPC meeting in February 2018. A more detailed description of the risk assessment process and the results are included in Chapter 4 Risk Assessment.

3.2.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6: Set Goals

Amec Foster Wheeler facilitated brainstorming and discussion sessions with the HMPC during the third HMPC meeting. The purpose of these discussions was to describe the purpose and process of developing planning goals and objectives, review a comprehensive range of mitigation alternatives, and discuss a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and strategy is in Appendix C.

Planning Step 7: Review Possible Activities

Amec Foster Wheeler facilitated a discussion at the third HMPC meeting to review the alternatives for mitigating hazards. This included a brainstorming session with the HMPC to identify a comprehensive range of mitigation actions for each identified hazard, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. Specifics on the process and the results of this collaborative process are captured in Chapter 5 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, Amec Foster Wheeler produced a complete first draft of the plan. This complete draft LHMP update was provided to the District and shared electronically with the HMPC for review and comment. Other agencies were invited to comment on the draft. HMPC and agency comments were integrated into the second public review draft, which was advertised and distributed to collect public input and comments. Amec Foster Wheeler integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the California Office of Emergency Services (Cal OES) and FEMA Region IX to review and approve, contingent upon final adoption by the District Board.

3.2.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan was adopted by the District Board of Directors using the sample resolution contained in Appendix D.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, the HMPC's efforts have been directed at researching data, coordinating

input from participating entities, and updating and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as hazard(s) addressed, lead manager and priority, and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within or bordering the CCWD planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in the District and is addressed further in Chapter 7. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 7.

Implementation and Maintenance Process: 2012

The 2012 CCWD Local Hazard Mitigation Plan included a process for implementation and maintenance. This process as set forth in the 2012 plan was generally followed with some variation as further described.

The maintenance process called for an annual review by the CCWD Hazard Mitigation Coordinating Committee, with a 5-year written update to be submitted to Cal EMA (now Cal OES) and FEMA Region IX. Although a formal Mitigation Coordinating Committee (MCC) was not established, and an annual review was not conducted in a formalized process, the eight objectives of the MCC were accomplished through various other venues and means. These eight objectives are as follows:

- Act as a forum for hazard mitigation issues
- Disseminate hazard mitigation ideas and activities to all participants
- Pursue the implementation of high priority, low or no cost recommended actions
- Keep the concept of mitigation in the forefront of CCWD decision-making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability
- Maintain vigilant monitoring of multi-objective, cost-share opportunities to assist the community in implementing the plan's recommended actions
- Monitor and assist in the implementation and updating of the plan
- Report on plan progress and recommended changes to the Board of Directors
- Inform and solicit input from the public

Following 2012 plan adoption by the Board of Directors, the reviews and coordination were conducted on a more informal basis through emails, telephone conversations, and through attendance at various District, stakeholder, and other agency meetings. CCWD made a commitment to plan implementation through their collaboration with other local, state, and federal mitigation partners. For example, the District worked with the County as the new Reverse 911 program was put into place. They also worked closely with County OES, Cal FIRE, and others during severe weather events to ensure continued operation of facilities and services.

Their focus on implementation and maintenance of their 2012 plan is evident in that of the 20 mitigation actions included in the 2012 mitigation strategy, 2 have been completed and 18 are ongoing. Chapter 2 provides more detail on the implementation of their 2012 mitigation strategy.

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4 RISK ASSESSMENT

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

1) Identify Hazards;
2) Profile Hazard Events;
3) Inventory Assets; and
4) Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter: Section 4.1: Hazard Identification: Natural Hazards identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration. Section 4.2: Hazard Profiles discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences. Section 4.3: Vulnerability Assessment assesses the planning areas' exposure to natural hazards; considering assets at risk, critical facilities, and future development trends. Section 4.4: Capability Assessment inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of the Calaveras County Water District (CCWD) jurisdictional area, often referred to in this document as CCWD's planning area.

This LHMP update involved a comprehensive review and update of each section of the 2012 risk assessment. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Refinements, changes, and new methodologies used in the development

of this risk assessment update are summarized in Chapter 2 What's New and detailed in this Risk Assessment portion of the plan.

4.1 Hazard Identification: Natural Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The CCWD HMPC conducted a hazard identification study to determine the hazards that threaten the planning area. This section details the methodology and results of this effort.

4.1.1 Methodology and Results

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect CCWD. Hazards data from the California Emergency Management Agency (CAL EMA), FEMA, the National Oceanic and Atmospheric Administration (NOAA), the Spatial Hazards Events and Losses Database for the United States (SHELDUS), and many other sources were examined to assess the significance of these hazards to the planning area. Significance of each identified hazard was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage. The natural hazards evaluated as part of this plan include those that have occurred historically and/or have the potential to cause significant human and/or monetary losses in the future.

The following hazards in 0, listed alphabetically were identified and investigated for this plan update. As a starting point, the updated 2013 California State Hazard Mitigation Plan was consulted to evaluate the applicability of new hazards of concern to the State to the planning area (The 2018 California SHMP Public Review Draft became available as this 2018 Public Review Draft went into production). Building upon this effort, hazards from the past plan were also identified, and comments explain how hazards were updated from the previous plan. All hazards from the 2012 plan were profiled in this plan, and additional hazards were added. This is shown in 0.

Table 4.1: Hazard Identification and Comparison

2018 Hazards	2012 Hazards	Comment
Avalanche	Avalanche	Similar analysis was performed
Dam Failure	Dam Failure	Similar analysis was performed
Drought and Water Shortage	Drought and Water Shortage	Similar analysis was performed
Earthquake	Earthquake	Similar analysis was performed
Flood: 100/500 year	Flood: 100/500 year	Newer data set used
Levee Failure	Levee Failure	Similar analysis was performed
Severe Weather: Extreme Heat	Severe Weather: Extreme Heat	Similar analysis was performed

2018 Hazards	2012 Hazards	Comment
Severe Weather: Heavy Rain, Thunderstorms, Lightning, Hail	Severe Weather: Heavy Rain, Thunderstorms, Lightning, Hail	Similar analysis was performed
Severe Weather: Tornadoes	Severe Weather: Tornadoes	Similar analysis was performed
Severe Weather: Wind	Severe Weather: Wind	Similar analysis was performed
Severe Weather: Winter Storms and Extreme Cold	Severe Weather: Winter Storms and Extreme Cold	Similar analysis was performed
Soil Hazards: Erosion	Soil Hazards: Erosion	Soil hazards are profiled individually in this plan
Soil Hazards: Expansive Soils	Soil Hazards: Expansive Soils	Soil hazards are profiled individually in this plan
Soil Hazards: Landslide and Debris Flow	Soil Hazards: Landslide and Debris Flow	Soil hazards are profiled individually in this plan
Soil Hazards: Subsidence	Soil Hazards: Subsidence	Soil hazards are profiled individually in this plan
Volcano	Volcanoes	Similar analysis was performed
Wildfire	Wildfires	Newer data set used for fire threat; additional data set on fire history

The worksheet below was completed by the HMPC to identify, profile, and rate the significance of identified hazards. Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment. Since the 2012 Plan, the following hazards significance levels were discussed in detail: Drought and Water Shortage (Medium), Extreme Heat (Low), and Soil Hazards: Landslides and Debris Flows (Low). 0 in Section 4.2.19 Natural Hazards Summary gives more detail about these significant hazards.

Table 4.2: CCWD Hazard Identification Worksheet

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/ Severity	Significance
Avalanche	Limited	Unlikely	Negligible	Low
Dam Failure	Significant	Unlikely	Critical	Medium
Drought and Water Shortage	Extensive	Likely	Critical	Medium
Earthquake	Significant	Unlikely	Critical	Low
Flood 100/500 year	Significant	Occasional	Critical	Medium
Flood: Localized Stormwater Flooding	Extensive	Highly Likely	Critical	High
Levee Failure	Limited	Unlikely	Negligible	Low
Severe Weather: Extreme Heat	Significant	Highly Likely	Limited	Low
Severe Weather: Heavy Rains and Storms	Catastrophic	Highly Likely	Critical	High
Severe Weather: Tornadoes	Limited	Occasional	Negligible	Low
Severe Weather: Winter Storms and Extreme Cold	Significant	Highly Likely	Critical	High
Severe Weather: Wind	Limited	Highly Likely	Limited	Medium
Soil Hazard: Erosion	Limited	Highly Likely	Limited	Low
Soil Hazard: Expansive Soils	Limited	Likely	Limited	Low
Soil Hazards: Landslides and Debris Flows	Limited	Likely	Limited	Low[1]
Soil Hazard: Subsidence	Limited	Occasional	Limited	Low
Volcano	Extensive	Unlikely	Critical	Low
Wildfire	Significant	Likely	Critical	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Probability of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Notes: [1] – The HMPC did identify that the area specifically above and below the Collierville Tunnel (Tunnel Tap) as a soil hazard: landslide and debris flow hazard. Because this hazard area is geographically specific, and does not apply to the entire county or the rest of the District's facilities, it was not re-classified as a priority hazard.
Source: Amec Foster Wheeler Data Collection Guide

4.1.2 Disaster Declaration History

One method to identify hazards based upon past occurrence is to look at what events triggered federal and/or state disaster declarations within the planning area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government's capacity is exceeded, a federal disaster declaration may be issued allowing for the provision of federal disaster assistance.

Calaveras County has experienced 13 federal and 16 state declarations since 1950. Five of the federal declarations and eight of the state declarations were associated with flood events. Of the 7 remaining federal declarations, 4 were related to fire, 2 were related to severe storm, and 2 were related to severe storms and flooding. Of the 6 remaining state disasters, 3 were related to fire, 3 were related to drought, and 2 were related to severe storms. There have been 16 USDA Secretarial Disaster Designations in Calaveras County related to agricultural losses from natural hazards. A summation of federal and state disaster declarations is shown in 0.

Table 4.3: Calaveras County Federal and State Disaster Declaration History

Hazard Type	Disaster Name	Disaster Number	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Costs
Flood	Floods	CDO 50-01	11/21/50	–	9	–	$32.2 million
Flood	Floods	DR-47	12/22/55	12/23/55	74	–	$200.0 million
Flood	Storm/Flood Damage	DR-82	04/02/58	04/04/58	13	several	$24.0 million
Flood	1969 Storms	DR-253	02/08/69	01/26/69	47	161	$300.0 million
Drought	Drought	N/A	02/09/76	–	–	–	$2.7 billion
Flood	1980 April Storms	80-01 – 80-25	4/1/1980	–	–	–	–
Flood	Heavy Rains and Flooding	DC 82-03	4/1/1982	–	–	–	–
Severe Storm	Storms	DR-758	02/20/86	02/18/86	13	67	$407.5 million
Fire	Wildfire	N/A	07/21/88	–	–	–	–
Fire	Fountain	DR-958	08/02/92	08/29/92	–	8	$54.0 million
Severe Storm/ Flood	Late Winter Storms	DR-1044	–	01/10/95	17	–	$1.1 billion
Flood	1997 January Flood	DR-1155	1/2/97-1/31/97	1/4/1997	8	–	$194 million
Flood	January 1997 Floods	–	01/03/97	–	8	–	$1.8 billion

Hazard Type	Disaster Name	Disaster Number	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Costs
Flood	El Nino	DR-1203	–	02/02/98	17	–	$550.0 million
Fire	Wildfire	–	09/10/01	–	–	–	$6.7 million
Fire	Calaveras Complex	FM-2540	–	8/8/2004	–	–	$4.6 million
Fire	Pattison Fire	FM-2553	–	9/4/2004	–	–	$3.6 million
Severe Storm/ Flood	Severe Storms, Flooding, Landslides, Mudslides	DR-1646	–	06/05/06	–	–	–
Drought	Central Valley Drought	-	6/12/2008	–	–	–	–
Flood, debris, and mud flows	2010 Severe Winter Storm	DR-1884	1/27/2010	3/8/2010	2	--	$37,065,584
Storms	November Storms	GP 2010-14	11/30/2010; 12/09/2010	--	--	--	$160,280
Drought	California Drought	GP 2014-13	1/17/2014	--	--	--	--
Wildfire	Butte Fire	DR-4240		9/22/2015	--	--	--

Source: Cal OES, FEMA

4.2 Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The hazards identified in Section 4.1 Hazard Identification Natural Hazards, are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified for each of the priority hazards.

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to CCWD. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.
- **Past Occurrences**—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near CCWD service areas and infrastructure is also included here. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.
- **Frequency/Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of experiencing a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:
  - **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year
  - **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less
  - **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years
  - **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.
- **Climate Change –** Sierra Nevada ecosystems, including those within Calaveras County account for 65 percent of California's water supply and serve the County and California's water needs. This section contains a qualitative discussion on the probable effects of climate change (if applicable) for the hazard of concern. The discussion relies on information from the 2009 California Climate Adaptation Strategy (CAS), 2014 Safeguarding California: Reducing

Climate Risk (update to the 2009 Plan), the Implementation Action Plan, and the most recent update "Safeguarding California Plan: 2018 Update – California's Climate Adaptation Strategy. The discussion also integrates climate hazard information from Cal-Adapt, a website that gathers data on how climate change might affect California at the local level based on the State's scientific and research community (CEC 2018). Cal-Adapt was developed based on key recommendations from the 2009 California CAS, and it uses information from the University of California Berkeley's Geospatial Innovation Facility (GIF) with oversight from the California Energy Commission (CEC) and Public Interest Energy Research (PIER) Program. Some sections also reference general data and articles from University of California-Davis climate science research.

Section 4.2.19 Natural Hazards Summary provides an initial assessment of the profiles and assigns a level of significance or priority to each hazard. Those hazards determined to be of medium or high significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Those hazards that occur infrequently or have little or no impact on the planning area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damage. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the planning area, enabling CCWD to focus resources where they are most needed.

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Hazard Identification. Given that most disasters affect the planning area are directly or indirectly related to severe weather events, this section begins with a discussion on severe weather hazards, and the individual hazard profiles follow alphabetically.

4.2.1 Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in Calaveras County and therefore CCWD's service areas as localized storms that bring heavy rain, hail, lightning, and sometimes strong winds.

The National Oceanic and Atmospheric Administration's National Center Environmental Information (NCEI) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). It should be noted that for many of the hazard events, data is reported using zones as a scale of analysis. These zones are often expansive and cover multiple counties. This database contains a list of severe weather events that occurred in the past 50 years in Calaveras County. 0 summarizes these events.

Table 4.4: NCEI Severe Weather Reports for Calaveras County, 1950 – 2014*

		Deaths	Injuries	Property Damage	Crop Damage
Avalanche	1	**0**	**# of Events**	**Deaths**	$0
Blizzard	1	0	0	$50,000	$0
Cold/Wind Chill	1	0	0	$0	$0
Dense Fog	7	1	9	$150,000	$0
Dust Storm	1	0	0	$100,000	$0
Flood	15	2	4	$389,330,000	$0
Heat	3	9	0	$0	$0
Heavy Rain	1	0	0	$0	$0
Heavy Snow	22	3	2	$200,000	$0
High Wind	54	5	12	$406,000	$0
Strong Wind	8	0	0	$5,000	$0
Tornado	1	0	0	$0	$0
Wildfire	1	0	0	$0	$0
Winter Storm	24	2	1	$125,000	$0
Winter Weather	2	14	0	$0	$0
Total	142	36	28	$390,366,000	$0

Source: NCEI
*Note: Losses reflect totals for all impacted areas, which may include multiple counties

In addition to the numbers generated by the NCEI search, the National Weather Service database supplied *Storm Data* information. Hail, tornado, and wind events were calculated and the counts and impacts are displayed in Table 4.5 below.

Table 4.5: NOAA Storm Prediction Center Events, 1950 - 2016

Type	# of Events	Deaths	Injuries	Property Damage	Crop Damage
Hail	2	0	0	$0	$0
Tornado	1	0	0	$0	$0
Wind	0	0	0	$0	$0
Total	**3**	**0**	**0**	**$0**	**$0**

Source: NOAA Storm Prediction Center

The HMPC supplemented NCEI and NOAA results with data from SHELDUS (Spatial Hazard Events and Losses Database for the United States). SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-2008, which was based on the data set for the previous plan update. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCEI). The database includes every loss causing and/or deadly event between 1960 through 1979 and from 1995

onward. Between 1980 and 1995, SHELDUS reflects only events that caused at least one fatality or more than $50,000 in property or crop damages. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). From 1995 to 2012 all events that were reported by the NCEI with a specific dollar amount are included in SHELDUS. SHELDUS was originally a free resource but changed to a fee-based database circa 2013. The NCEI database was used as the primary resource for the 2018 update.

SHELDUS contains information of 104 severe weather events that occurred in Calaveras County between 1960 and 2012. These events are shown and summarized in Table 4.6.

Table 4.6: SHELDUS Severe Weather Report for Calaveras County 1960-2012

Type	# of Events	Injuries	Deaths	Property Damage	Crop Damage
Flooding	7	0	0.17	$473,337.66	$709,090.91
Flooding - Severe Storm/Thunder Storm	1	0	0	$86,206.90	$0
Flooding - Severe Storm/Thunder Storm - Wind	1	0	0	$0	$11,241,379.31
Flooding - Wind - Winter Weather	1	0	0	$1,315.79	$0
Flooding - Winter Weather	2	0	0	$20,718.82	$0
Fog	3	0.5	0.5	$160,000	$0
Hail - Severe Storm/Thunder Storm - Wind - Winter Weather	1	0.02	0.03	$86.21	$0
Heat	3	1.23	0.2	$0	$14,705.88
Landslide – Winter Weather	1	0	0	$2,778.78	$0
Lightning	3	0	0	$1,250.01	$0
Lightning - Severe Storm/Thunder Storm	2	0	0	$261.36	$113.64
Lightning - Wind - Winter Weather	1	0	0	$14.71	$14,705.88
Severe Storm/Thunder Storm	12	0.23	0.98	$892,323.87	$18,814.66
Severe Storm/Thunder Storm – Wind	9	0.5	0.52	$129,466.67	$1,257.18
Severe Storm/Thunder Storm - Wind - Winter Weather	4	0.07	0.6	$1,690,435.14	$175,287.36
Severe Storm/Thunder Storm - Winter Weather	1	0	0	$1,470.59	$0
Wildfire	2	0.11	0	$290,000	$0
Wind	22	0.5	0.27	$1,167,970.91	$7,201.09
Wind - Winter Weather	2	0.43	0.07	$2,988.72	$0
Winter Weather	26	2.76	0.29	$233,547.91	$8,905,032.50
Total	**104**	**6.35**	**3.63**	**$5,154,174.05**	**$21,087,588.41**

Source: SHELDUS

*Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may be not specific to Calaveras County

1 -- The HMPC noted that this event covered many areas in California. Actual wildfire damages in the County were minimal.

The NCEI and SHELDUS tables above summarize severe weather events that occurred in Calaveras County. Only a few of the events resulted in state and federal disaster declarations. Also, different data sources capture different events during the same time, and often display different information specific to the same events. While the HMPC recognizes these inconsistencies, they see the value this data provides in depicting the "bigger picture" of the County's hazard environment.

As previously mentioned, most all of Calaveras County's state and federal disaster declarations have been a result of severe weather, as well as flooding and wildfire events. For this plan, severe weather is discussed in the following subsections:

- Extreme Heat
- Heavy Rains and Storms
- Tornado
- Wind
- Winter Storms and Extreme Cold

4.2.2 Severe Weather: Extreme Heat

Hazard/Problem Description

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornados, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails.

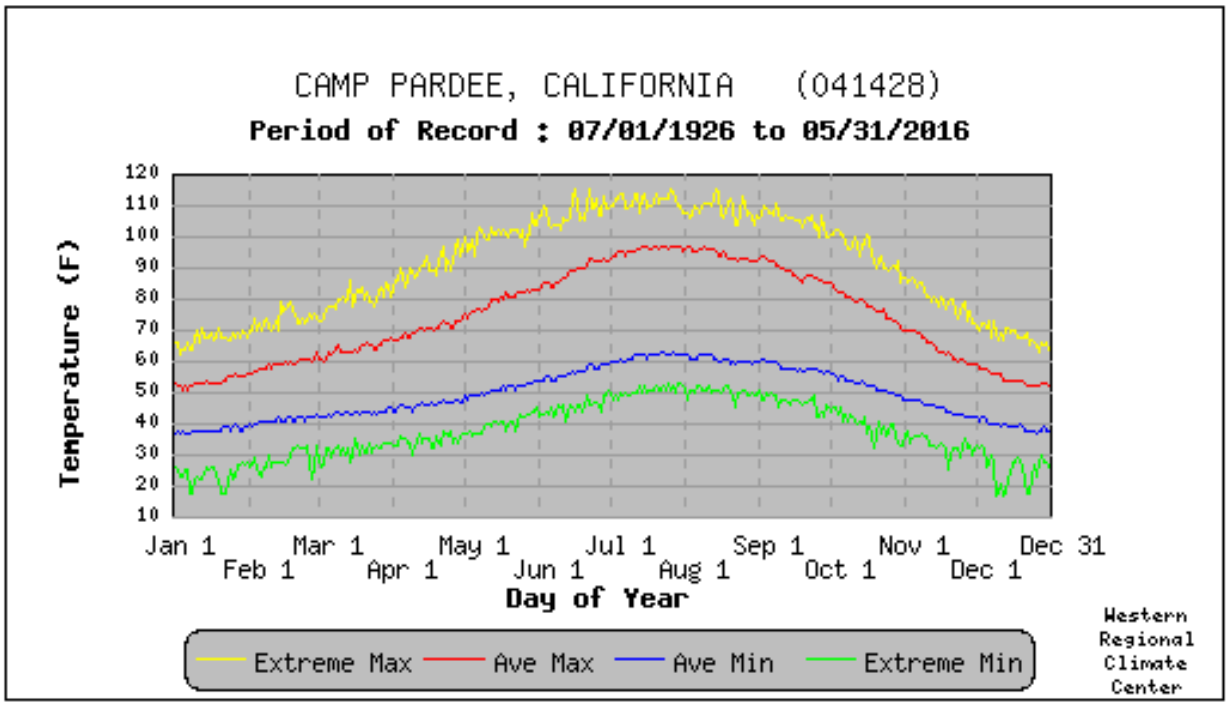
Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Heat waves do not cause damage or elicit the immediate response of floods, fires, earthquakes, or other more

"typical" disaster scenarios. While heat waves are obviously less dramatic, they are potentially deadlier. According to the 2013 California State Hazard Mitigation Plan, the worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths. The July 2006 heat wave in California caused the deaths of about 650 people over a 13-day period (CalEPA 2013). And, according to SHELDUS, approximately 47 heat events occurred in California between 1960 and 2008 (CalOES 2013).

Figure 4.1 and Figure 4.2 show average and extreme temperatures from the Camp Pardee weather station in the northwest part of the county and the Calaveras Big Trees weather station in the southeast part of the County. The highest temperature on record at Camp Pardee is 115°F recorded on July 26, 1931. On average, there were 85.5 days annually with a high temperature at or above 90°F; more than half of these occurred in July and August. At Camp Pardee, temperatures of 102°F or above are on record for every month May through October.

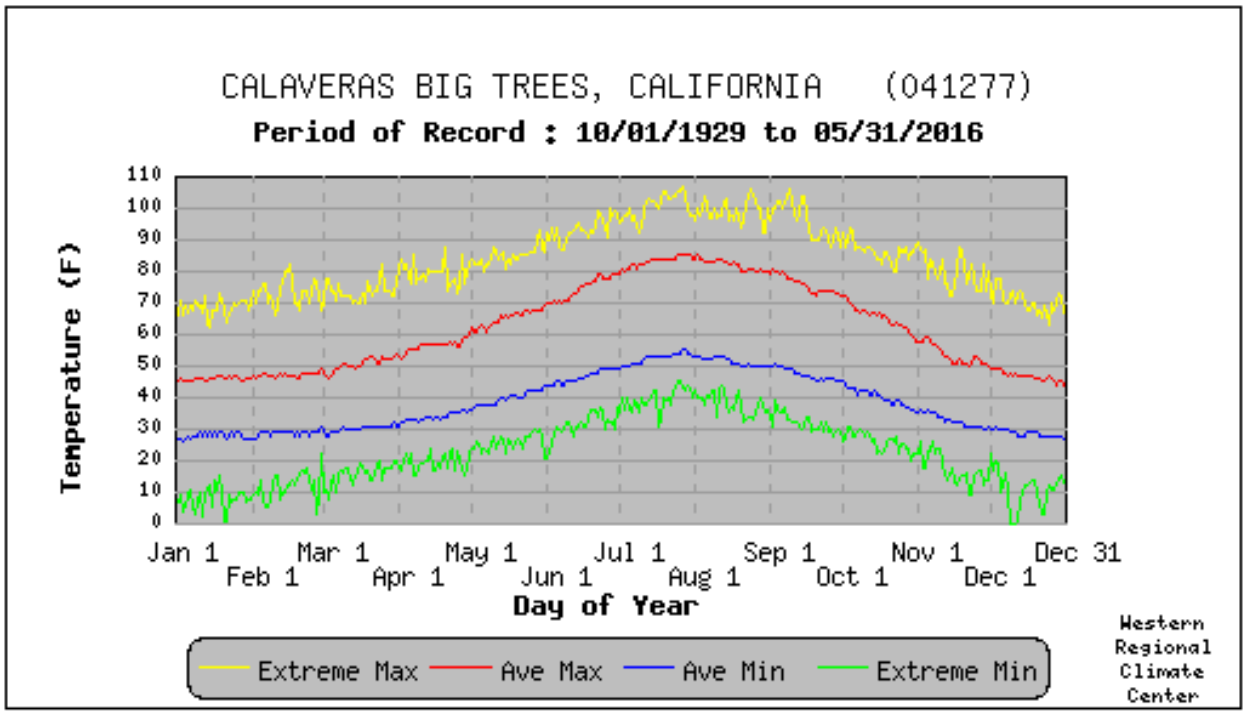
At the Calaveras Big Trees station, the highest recorded temperature on record is 107°F on July 27, 1933. On average, there are 11.4 days annually that are above 90°F; most occurring in July and August.

Figure 4.1: Daily Temperature Averages and Extremes, Camp Pardee, 1926 to 2016



Source: Western Regional Climate Center, www.wrcc.dri.edu/CLIMATEDATA.html

Figure 4.2: Daily Temperature Averages and Extremes, Calaveras Big Trees, 1929 - 2016



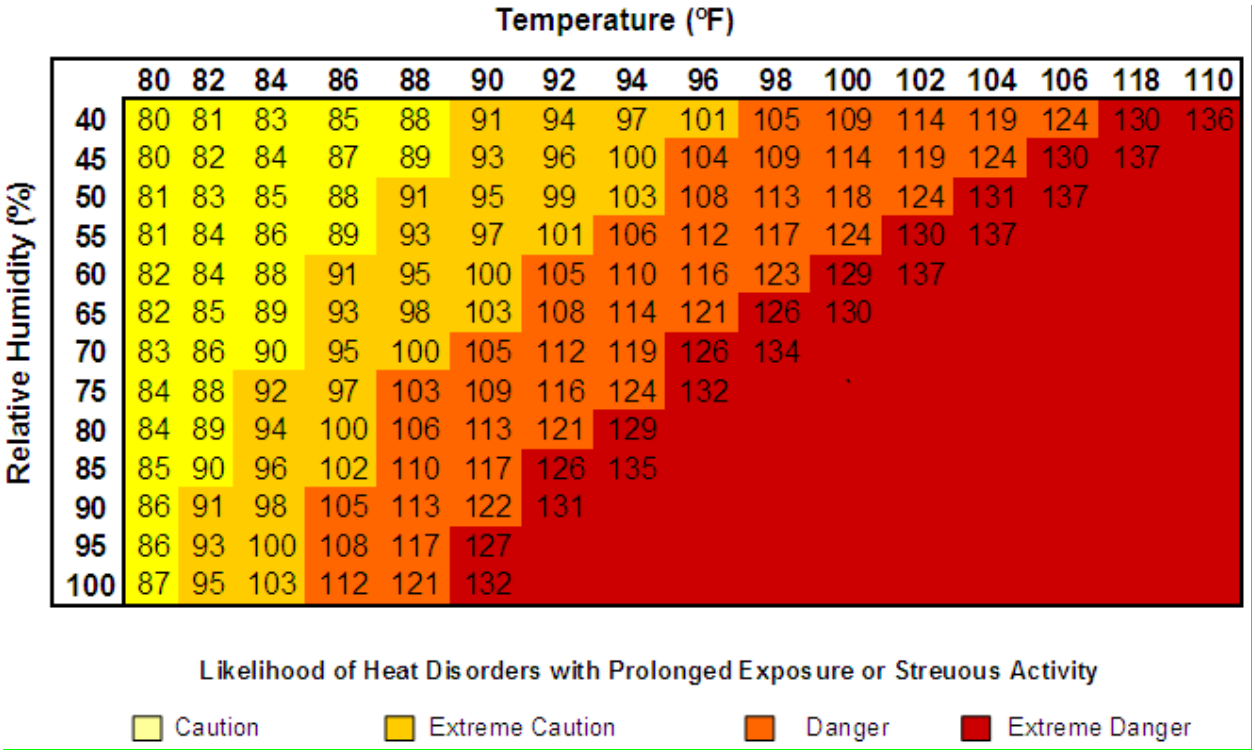
Source: Western Regional Climate Center, www.wrcc.dri.edu/CLIMATEDATA.html

In July 2006, the National Weather Service Forecast Station in Sacramento reported 11 consecutive days of temperatures over 100°F. In Stockton, California, approximately 30 miles from Calaveras County, temperatures reached 115°F on July 23, 2006. The U.S. Department of Agriculture (USDA) declared 16 California counties, including Calaveras, as primary natural disaster areas due to the record-setting heat wave that occurred July 1-31, 2006. The declaration made farmers in the county eligible for low-interest emergency loans from USDA's Farm Service Agency.

Figure 4.3 and Figure 4.4 show the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes it feel. As relative humidity increases, the air seems warmer than it is because the body is less able to cool itself via evaporation of perspiration. As the HI rises, so do health risks.

- When the HI is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90°-105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.
- When it is 105°-129°F, sunstroke, heat cramps or heat exhaustion is likely, and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke are extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 4.3: Heat Index



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	118	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Source: National Weather Service
Note: Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Figure 4.4: Possible Heat Disorders by Heat Index Level

Heat Index	Category	Possible heat disorders for people in high risk groups
130°F or higher	Extreme Danger	Heatstroke risk extremely high with continued exposure.
105° - 129°F	Danger	Sunstroke, Heat Cramps and Heat Exhaustion likely, Heatstroke possible with prolonged exposure and/or physical activity.
90° - 105°F	*Extreme Caution*	*Sunstroke, Heat Cramps and Heat Exhaustion possible with prolonged exposure and or physical activity.*
80° - 90 °F	Caution	Fatigue possible with prolonged exposure and/or physical activity.

Source: National Weather Service

The NWS has in place a system to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days. The NWS office in Sacramento can issue the following heat-related advisory as conditions warrant.

- **Excessive Heat Outlook**: are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to Heat Index forecast map for the contiguous United States those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.
- **Excessive Heat Watch**: is issued when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A Watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. A Watch provides enough lead time so those who need to prepare can do so, such as cities that have excessive heat event mitigation plans.
- **Excessive Heat Warning/Advisory**: are issued when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

Past Occurrences

The NCEI data shown in Table 4.7 lists two extreme heat incidents in the County since 1993.

Table 4.7: NCEI Extreme Heat Events in Calaveras County, 1993 to 2014

Hazard Type	Date	Deaths	Injuries	Property Damage	Crop Damage
Heat	8/15/1996	4	0	$0	$0
Heat	8/2/1997	5	0	$0	$0
Total		**9**	**0**	**$0**	**$0**

Source: NCEI

SHELDUS shows three events that affected the County and the District since 1960. These are shown in Table 4.8.

Table 4.8: SHELDUS Extreme Heat Events in Calaveras County, 1960 to 2012

Hazard Begin Date	Hazard End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
6/13/1961	6/17/1961	Heat	0	0	$0.00	$14,705.88	Heat
8/13/1992	8/20/1992	Heat	1.03	0	$0.00	$0.00	Heat Wave
5/14/2008	5/14/2008	Heat	0.2	0.2	$0.00	$0.00	Heat
Totals			1.23	0.2	$0.00	$14,705.88	

Source: SHELDUS

Likelihood of Future Occurrences

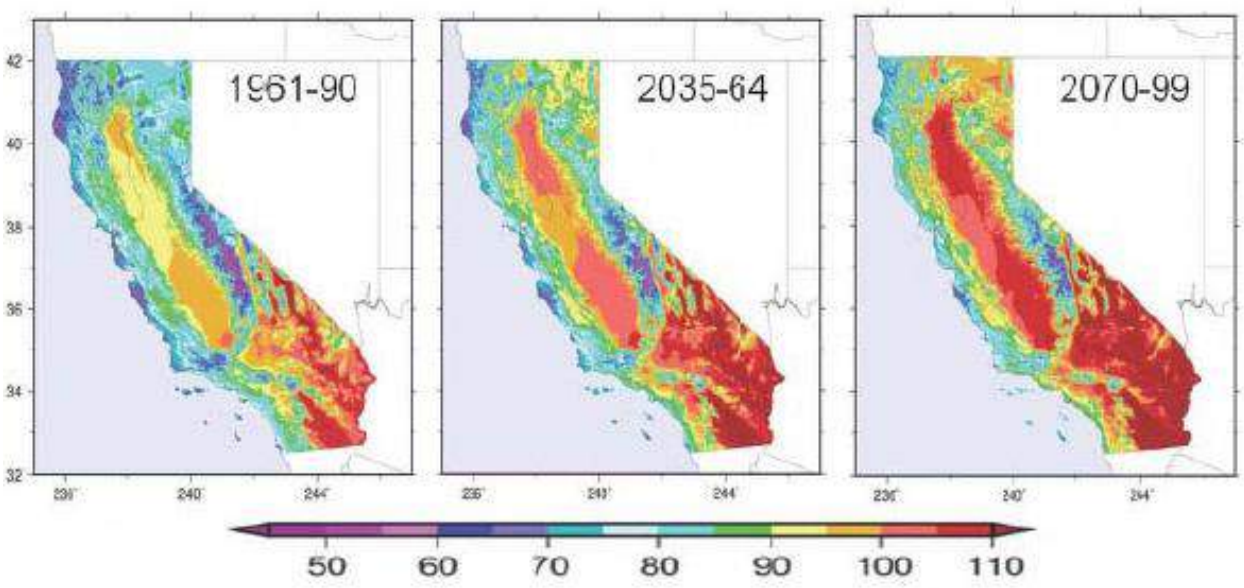
Highly Likely— Although not documented in the NCEI and SHELDUS databases, extreme heat events occur annually in Calaveras County. Extreme heat is less likely in eastern portions of the

county at higher elevations, than in the western portion. Temperatures at or above 90°F are common most summer days in the western part of the County. Electrical systems in District facilities can be vulnerable to extreme heat events.

Climate Change

The California Climate Adaptation Strategy (CAS), citing a California Energy Commission study, states that "over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined." This study shows that California is getting warmer, leading to an increased frequency, magnitude, and duration of heat waves, also illustrated in Figure 4.5. These factors may lead to increased mortality from excessive heat.

Figure 4.5: California Historical and Projected Temperature Increases - 1961 to 2099



Source: Dan Cayan; California Climate Adaptation Strategy

As temperatures increase, California and Calaveras County will face increased risk of death from dehydration, heat stroke, heat exhaustion, heart attack, stroke and respiratory distress caused by extreme heat. According to the CAS report and the 2010 State of California Hazard Mitigation Plan, by 2100, hotter temperatures are expected throughout the state, with projected increases of 3-5.5°F (under a lower emissions scenario) to 8-10.5°F (under a higher emissions scenario). These changes could lead to an increase in deaths related to extreme heat in Calaveras County.

Higher temperatures have also been shown to impact ecosystems in many ways, but specifically through species migration and shifts in population ranges (i.e. shirt to higher elevations and cooler temperatures); spread of pathogens and parasites; increase in invasive species; and a loss of biodiversity. According to the 2013 Indicators of Climate Change in California Report, observations of these types of changes have been observed in the Sierra Nevada Mountains. For

instance, in the Sierra Nevada, scientists predict tree growth may decrease by 19% by 2100 (e.g. white pine decline), due primarily to higher temperatures and less water (CAS 2014).

4.2.3 Severe Weather: Heavy Rain and Storms

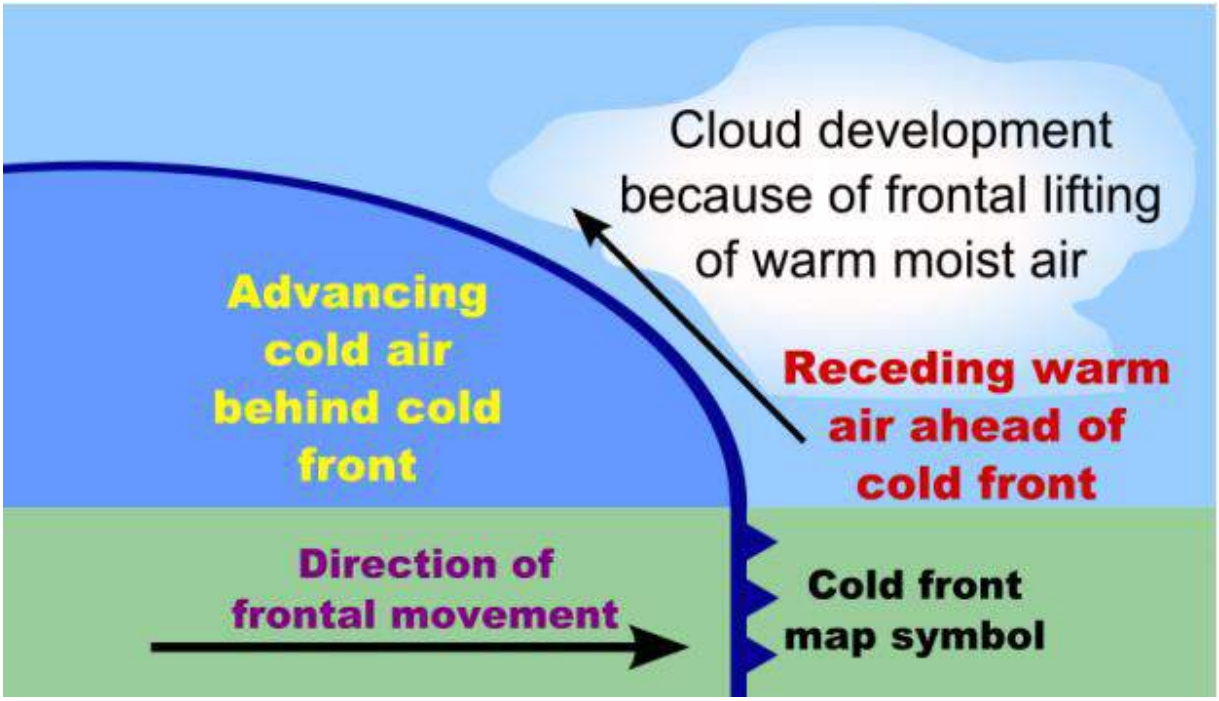
Hazard/Problem Description

Storms in Calaveras County are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds more than 50 knots (57.5 mph), or a tornado. Heavy precipitation in Calaveras County falls mainly in the fall, winter, and spring months.

Heavy Rain and Thunderstorms

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms, as shown in Figure 4.6.

Figure 4.6: Formation of a Thunderstorm



Source: NASA

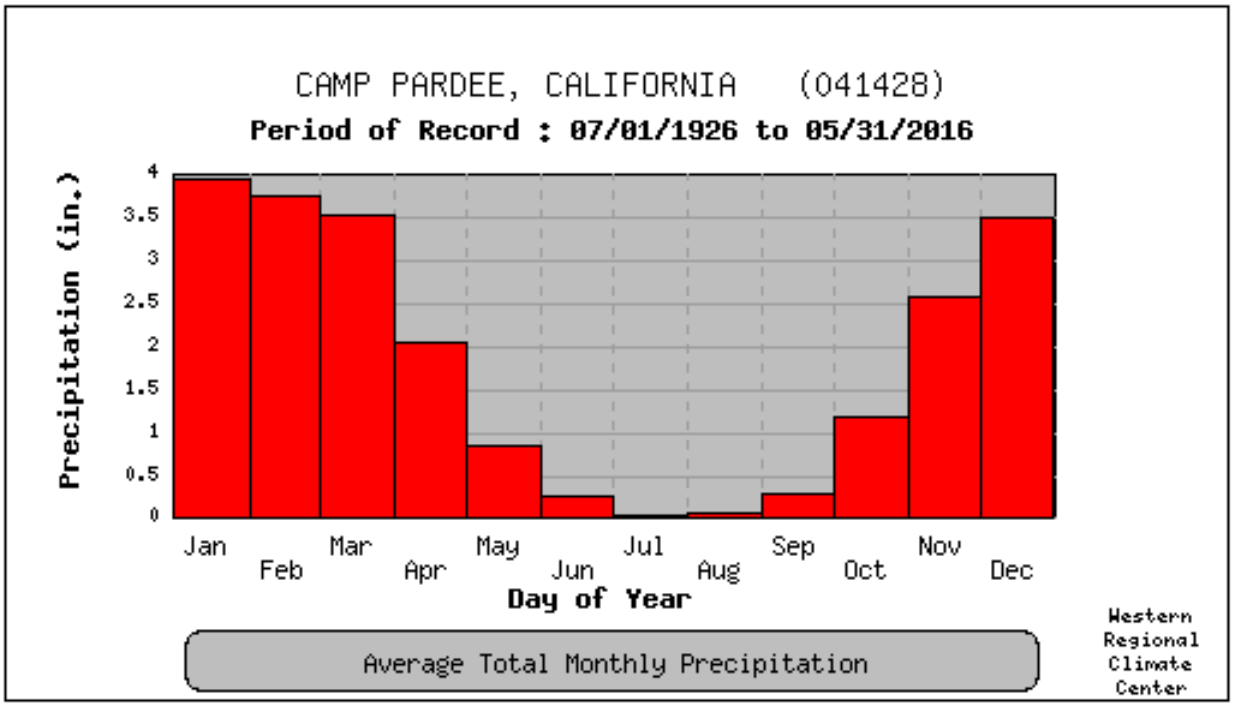
According to the HMPC, short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues. With the increased growth of the area, the lack of adequate drainage systems has become an increasingly important issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees.

Information from the Camp Pardee and the Calaveras Big Trees weather stations in Calaveras County are summarized below. Figure 4.7 through Figure 4.10 show average and extreme precipitation from the Camp Pardee weather station in the northwest part of the county and the Calaveras Big Trees weather station in the southeast part of the county.

Camp Pardee Weather Station, Period of Record 1926 to 2011

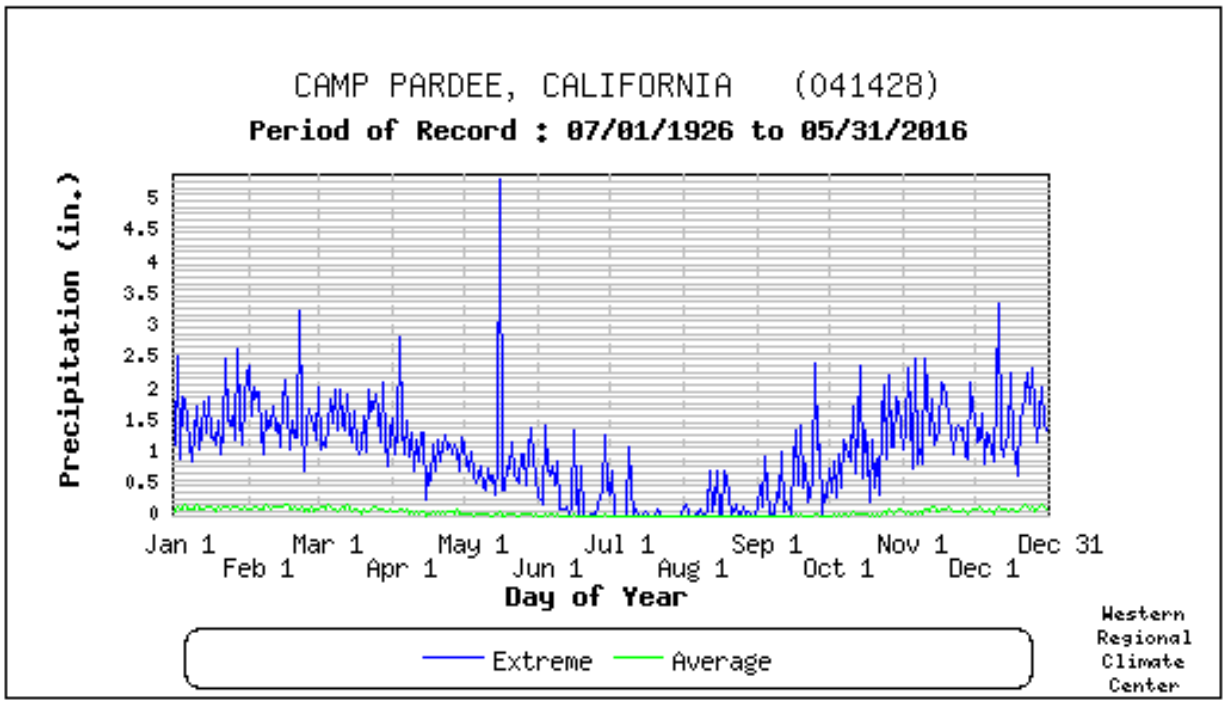
Average annual precipitation at the Camp Pardee Station is 21.5 inches per year. The highest recorded annual precipitation is 44.9 inches in 1983. The lowest recorded annual precipitation was 7.1 inches in 1976.

Figure 4.7: Camp Pardee Monthly Average Total Precipitation, 1929 to 2016



Source: Western Regional Climate Center

Figure 4.8: Camp Pardee Daily Precipitation Average and Extremes, 1929 to 2016

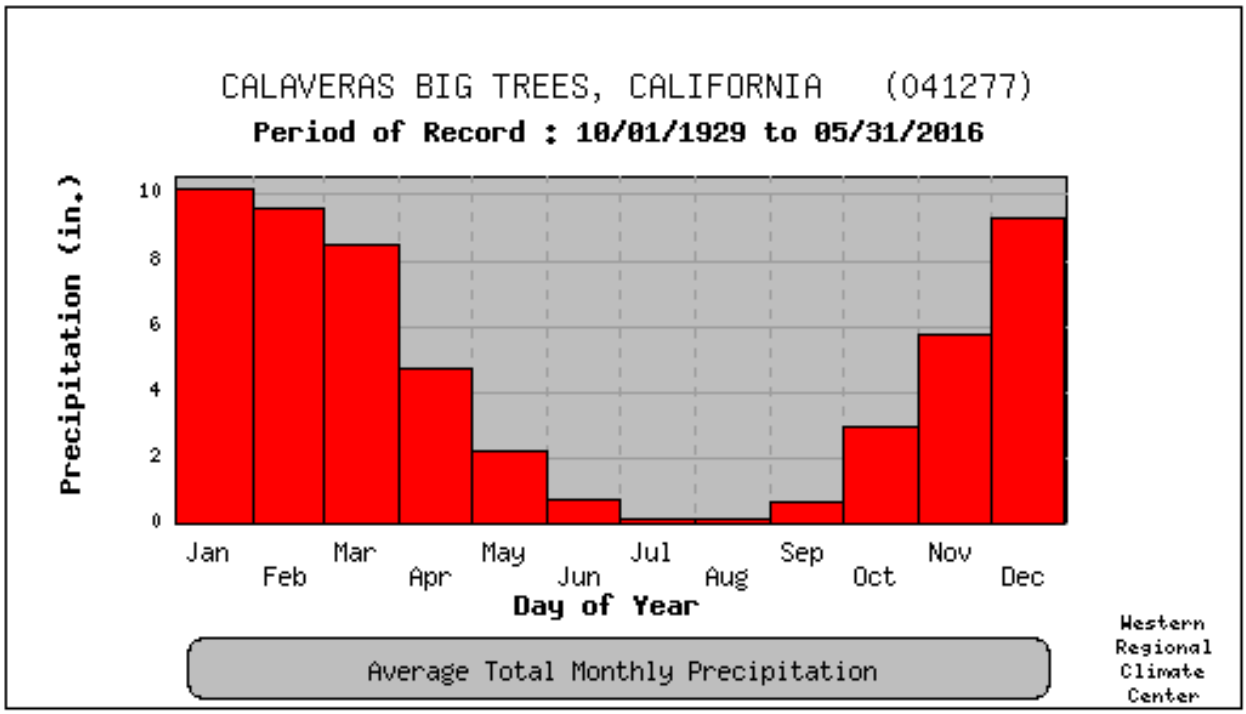


Source: Western Regional Climate Center

Calaveras Big Trees Weather Station, Period of Record 1929 to 2016

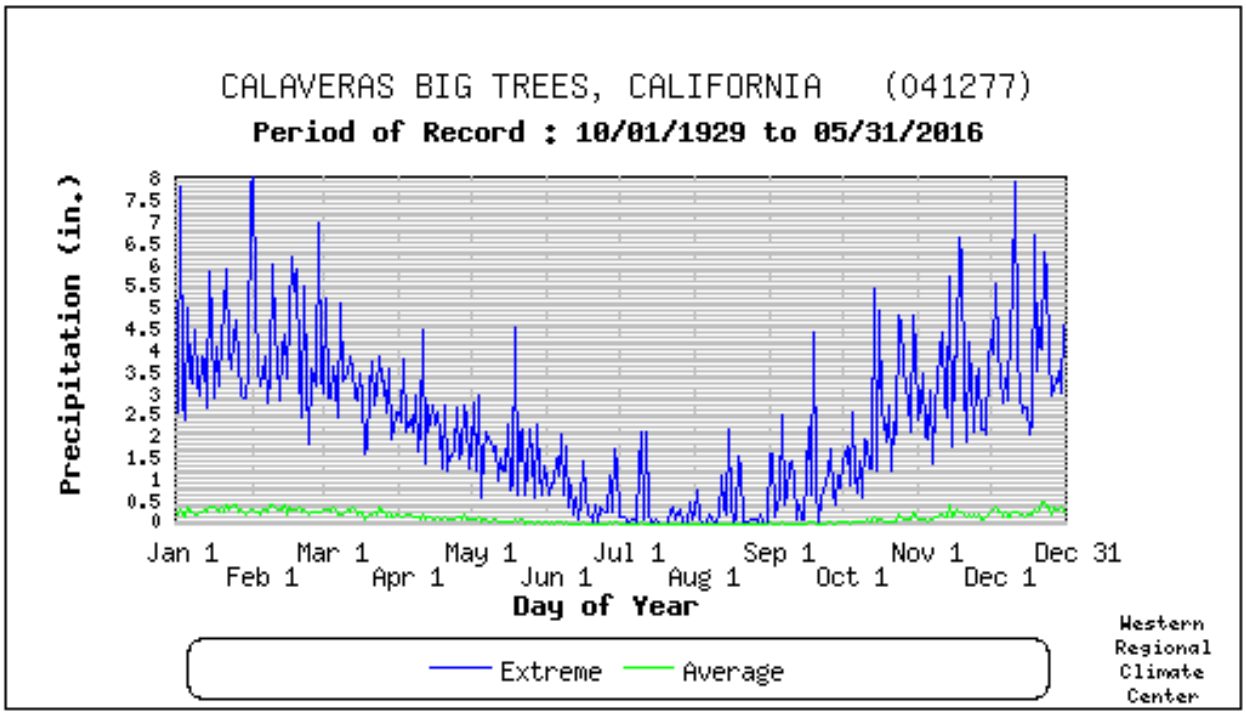
Average annual precipitation at the Calaveras Big Trees Station is 54.3 inches per year. The highest recorded annual precipitation is 109.1 inches in 1983. The lowest recorded annual precipitation was 8.1 inches in 1976.

Figure 4.9: Calaveras Big Trees Monthly Average Total Precipitation, 1929 - 2016



Source: Western Regional Climate Center

Figure 4.10: Calaveras Big Trees Daily Precipitation Average and Extremes, 1929 - 2016



Source: Western Regional Climate Center

Hail

Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within Calaveras County. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.9 below indicates the hailstone measurements utilized by the NWS.

Table 4.9: Hailstone Measurements

Average Diameter	Corresponding Household Object
0.25 inch	Pea
0.5 inch	Marble/Mothball
0.75 inch	Dime/Penny
0.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.50 inch	Softball

Source: National Weather Service

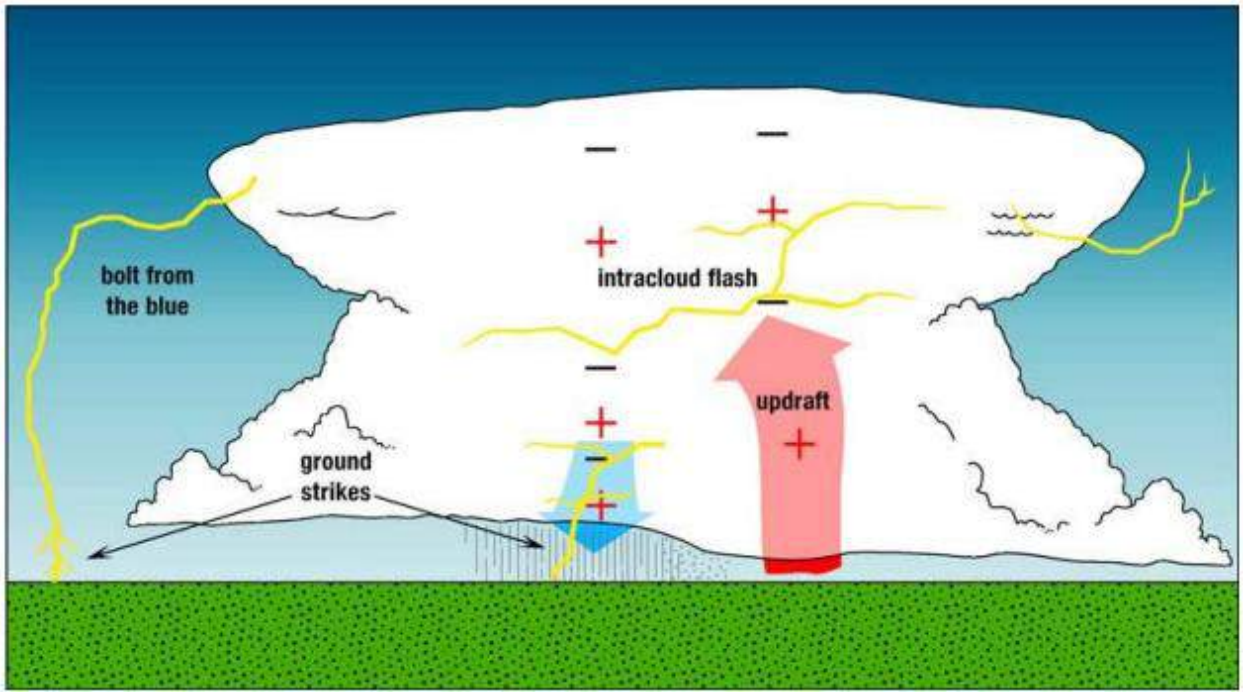
Lightning

Lightning is defined by the NWS as any and all various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is less common. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of lashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead of or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage. Figure 4.11 illustrates cloud to ground lightning.

Figure 4.11: Cloud to Ground Lightning



Source: National Weather Service

Winds

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Winds in Calaveras County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). These winds can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

Tornadoes (see Section 4.2.4 Tornado) and funnel clouds can also occur during these types of storms.

Past Occurrences

Heavy rains and severe storms occur in the planning area primarily during the late fall, winter, and spring (i.e., November through April). Damaging winds often accompany winter storm systems moving through the area. Although heavy rains are a frequent occurrence, thunderstorms, lightning, and hail in Calaveras County are fewer in number and usually occur in the late fall or in the spring. Specific events were detailed by the NCEI database (see Figure 4.10) and the SHELDUS database (see Table 4.11). Hail, wind, and tornado events from 1950 to 2016 are illustrated in Figure 4.12.

Figure 4.12: Hail, Wind, and Tornado Events: 1950 – 2016

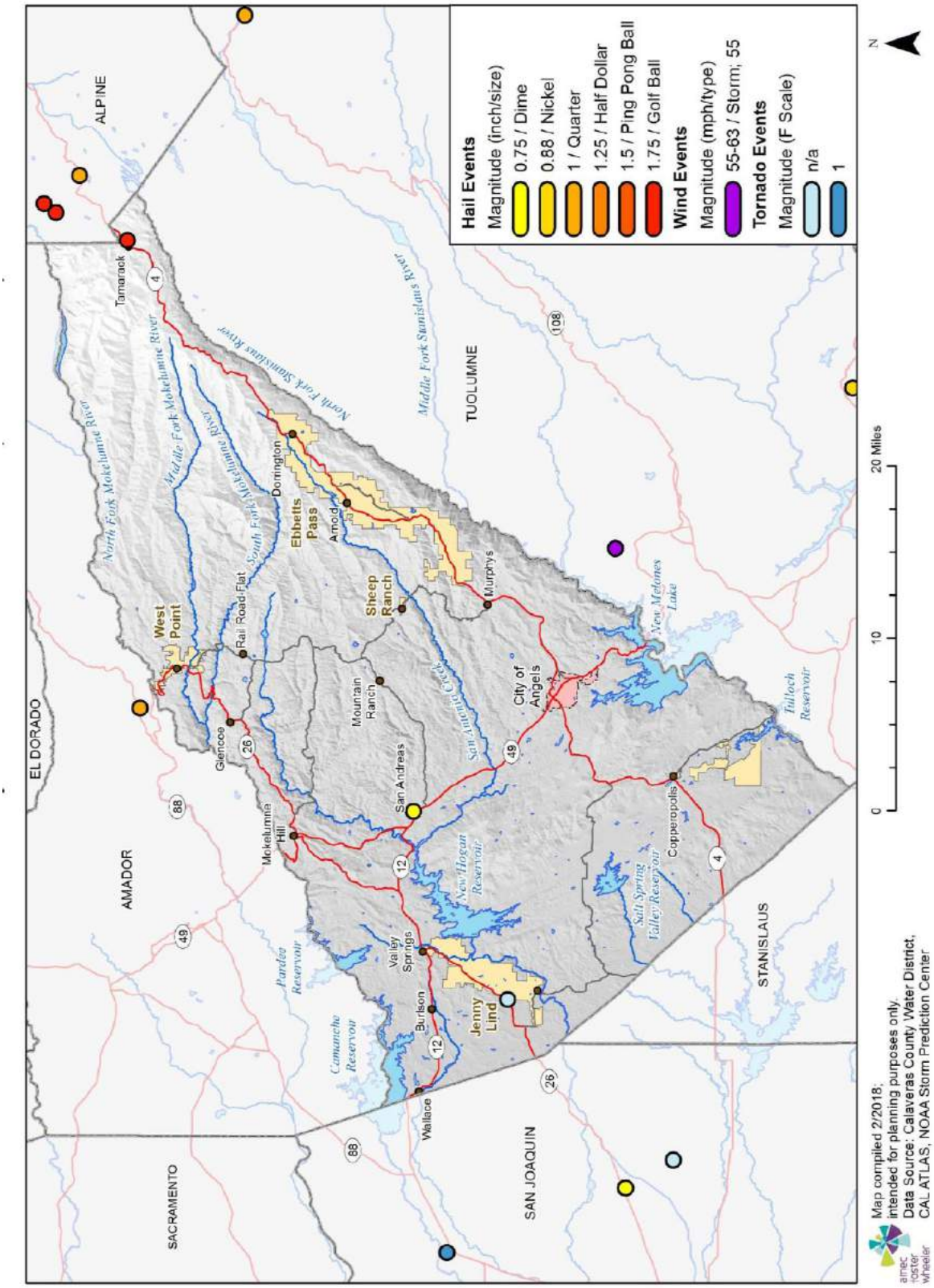


Table 4.10: NCEI Incidences of Hail, Heavy Rain, and Lightning in Calaveras County from 1993 – 2018

Hail	Heavy Rain	Lightning
2	5	1

Source: NCEI 2018

Table 4.11: SHELDUS Incidences of Hail, Heavy Rain, and Lightning in Calaveras County from 1960 – 2012

Hail	Heavy Rain	Lightning
1	11	6

Source: SHELDUS 2012

Likelihood of Future Occurrences

Highly Likely – Although not well documented in the NCEI and SHELDUS databases, severe weather, including heavy rain, thunderstorms, hail, lightning, and wind is a well-documented occurrence that will continue to occur in Calaveras County.

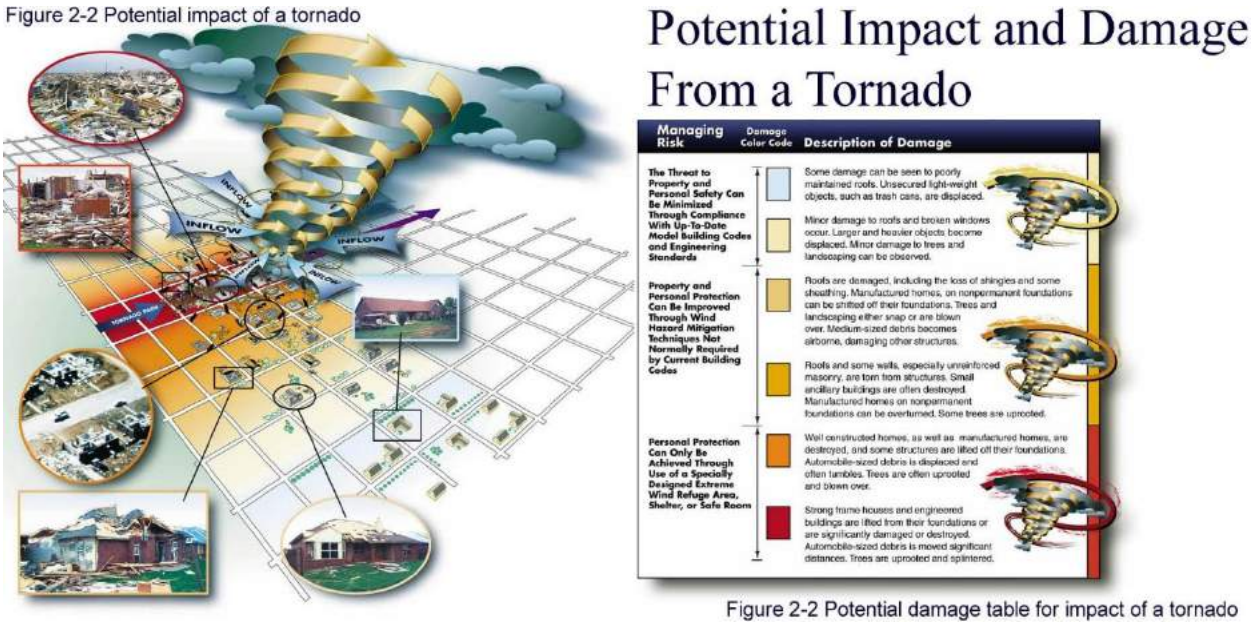
Climate Change

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is unlikely that hail will become more common in the County. The amount of lightning is not projected to change. Overall, there will be a continued risk from intense rainfall events that can generate more frequent and more extensive rainfall and in turn more runoff and flooding (CAS 2009).

4.2.4 Severe Weather: Tornado

Tornadoes are another severe weather hazard that may occur in Calaveras County, primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300-mile-wide hurricanes. Figure 4.13 illustrates the potential impact and damage from a tornado.

Figure 4.13: Potential Impact and Damage from a Tornado



Source: FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4.12 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4.12 and Table 4.13 show the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4.12: Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

Table 4.13: Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

According to the National Weather Service Sacramento Office, compared to the area east of the Rocky Mountains, tornado occurrence over the western United States is much less frequent. However, climatological studies reveal certain subregions throughout the west where there is a significant increase in tornado occurrence. Two of the regions are in California: the Los Angeles area, and the Central Valley of California comprising the Sacramento and San Joaquin Valleys. Comparative climatological studies show that most California tornadoes are relatively weak (F0 or F1 intensity) and have relatively short path lengths, with median values 0.62 miles (1.0 km) long and 43 yards (39.3 m) wide compared to 4 miles (6.4 km) long and 170 yards (155.4 m) for Iowa tornadoes. Also, most California tornadoes occur during the cool season and primarily between 1 PM and 3 PM local time.

Past Occurrences

One tornado was recorded in Calaveras County near Angels Camp during the period from 1950-2006. It occurred on July 29, 1980 and rated an F0 on the Fujita Scale, which is the lowest rating and is given to tornadoes with wind speeds of 40-72 mph. No property or crop damages, injuries, or deaths were reported.

Likelihood of Future Occurrences

Occasional—One tornado occurred in Calaveras County over 62 years (1950-2011) of record keeping which equates to one tornado every 62 years, on average, and a 1.6 percent chance of a tornado occurring in any given year. The actual risk to CCWD is dependent on the nature and location of any given tornado.

Climate Change

According to the CAS, climate change may increase the likelihood of a tornado occurrence in the County, although tornadoes would still be very rare.

4.2.5 Severe Weather: Wind

Hazard/Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms. Straight-line winds may also exacerbate existing weather conditions by increasing the effect on temperature and decreasing visibility due to the movement of particulate matters through the air, as in dust and snow storms. The winds may also exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of existing fires. These winds may damage crops, push automobiles off roads, damage roofs and structures, overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars, and cause secondary damage due to flying debris. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire.

In Calaveras County, high winds, sometimes accompanying severe thunderstorms but often not, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in Calaveras County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph, which represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms.

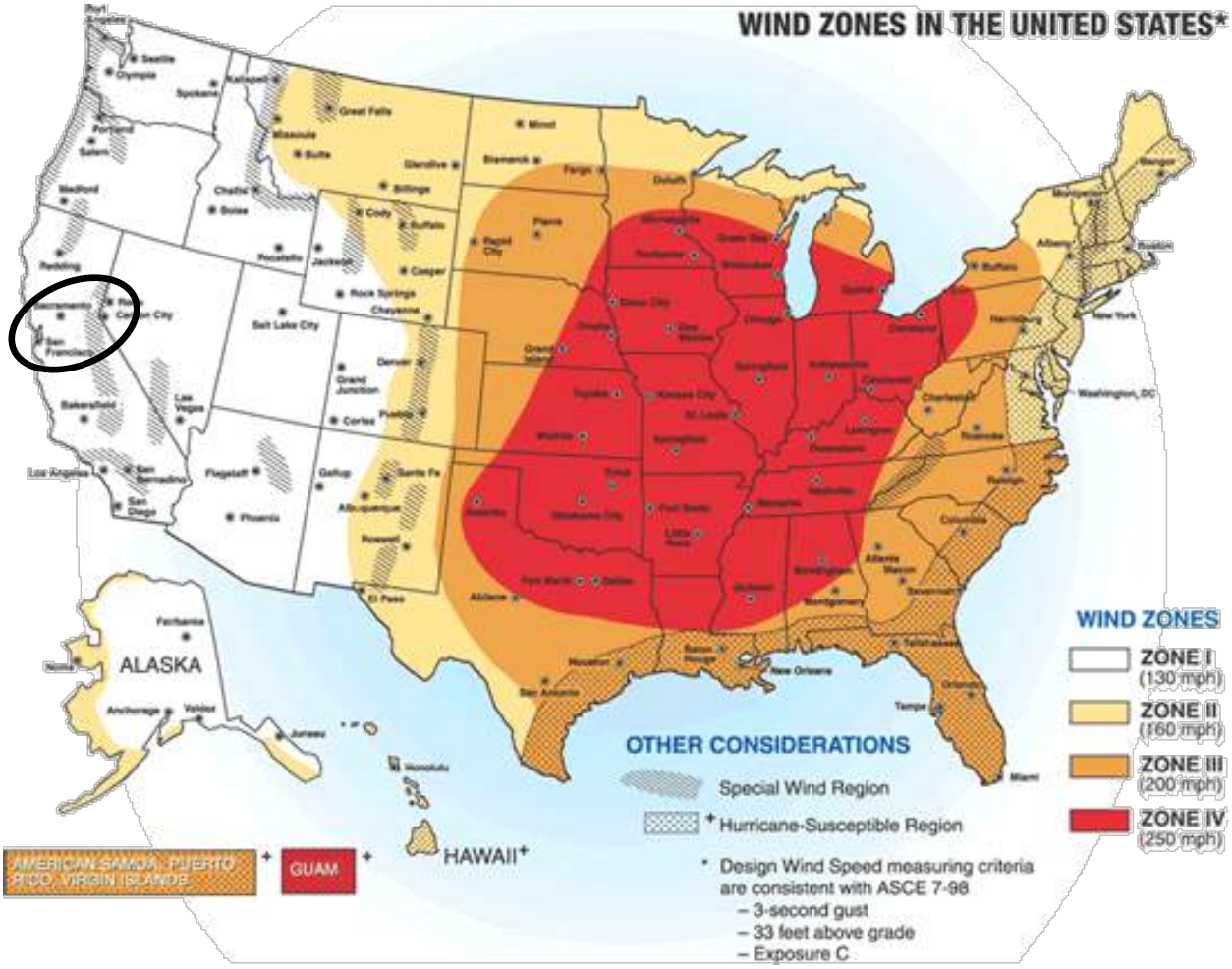
While not as common in Calaveras County, other types of winds include funnel clouds, tornadoes, and dust devils. A funnel cloud is made up of condensed water droplets associated with a rotating column of air that extends from the base of a cloud but does not reach the ground. Like straight-line winds, they are usually associated with thunderstorms. If a funnel cloud touches the ground it becomes a tornado. Tornadoes can reach speeds of up to 300 mph and are the most powerful storms that exist. Unlike funnel clouds and tornadoes, dust devils are not associated with

thunderstorms. They form under clear skies in which the sun has strongly heated the ground and are usually harmless, but at times they can be large enough to threaten people and property.

Severe windstorms are usually forecast 8-24 hours in advance and sometimes longer. The typical duration of windstorms is approximately 8-36 hours and peak winds are usually sustained for less than 8 to 12 hours.

Figure 4.14 depicts wind zones for the United States. The map denotes that portions of Calaveras County fall into the Special Wind Region.

Figure 4.14: Wind Zones in the United States



Source: Federal Emergency Management Agency

Past Occurrences

According to the NCEI, most high wind events occur between November and March. Although summer winds are a frequent occurrence, with afternoon winds of 10 to 20 mph being common, it is the winds experienced during the winter storms that result in the most wind-related damage. Severe wind events create the most problem when trees fall on power lines, knocking out power

and often making it difficult to reach District facilities. Based on SHELDUS data from 1960 to 2012, Calaveras County has experienced numerous high wind events. A description of major high wind events in Calaveras County is shown in Table 4.14.

Table 4.14: SHELDUS Events with High Winds in Calaveras County 1960 to 2012

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
3/1/1995	3/31/1995	Flooding - Severe Storm/Thunder Storm - Wind	0	0	$0.00	$11,241,379.31	Flood, Rain, Winds
12/10/1992	12/11/1992	Flooding - Wind - Winter Weather	0	0	$1,315.79	$0.00	Winter Storm, High Wind, Flash Flood
3/2/1962	3/6/1962	Hail - Severe Storm/Thunder Storm - Wind - Winter Weather	0.02	0.03	$86.21	$0.00	Wind, Rain, Snow, Glaze, and Hail
4/22/1961	4/24/1961	Lightning - Wind - Winter Weather	0	0	$14.71	$14,705.88	Frost, Wind, Lightning
2/1/1960	2/1/1960	Severe Storm/Thunder Storm - Wind	0.03	0.09	$1,470.59	$0.00	Wind, Rain
2/7/1960	2/9/1960	Severe Storm/Thunder Storm - Wind	0.06	0.06	$10,416.67	$10.42	Rain, Wind
2/7/1962	2/26/1962	Severe Storm/Thunder Storm - Wind	0.26	0.35	$86,206.90	$0.00	Wind and Rain
10/11/1963	10/11/1963	Severe Storm/Thunder Storm - Wind	0	0	$14.71	$14.71	Rain and Wind
12/28/1965	12/30/1965	Severe Storm/Thunder Storm - Wind	0	0	$862.07	$0.00	Rain and Wind
1/20/1967	1/31/1967	Severe Storm/Thunder Storm - Wind	0.07	0.02	$8,620.69	$86.21	Rain and Wind
1/8/1970	1/26/1970	Severe Storm/Thunder Storm - Wind	0	0	$10,416.70	$0.00	Rain and Wind
1/9/1980	1/13/1980	Severe Storm/Thunder Storm - Wind	0	0	$1,041.67	$1,041.67	High Winds/Heavy Rain
2/26/1983	2/27/1983	Severe Storm/Thunder Storm - Wind	0.08	0	$10,416.67	$104.17	Heavy Rain, Wind

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
3/12/1967	3/13/1967	Severe Storm/Thunder Storm - Wind - Winter Weather	0	0	$862.07	$0.00	Snow, Wind, Rain
12/12/1967	12/15/1967	Severe Storm/Thunder Storm - Wind - Winter Weather	0	0.03	$8,620.69	$8,620.69	Wind, Rain, Snow, and Cold
2/20/1969	2/25/1969	Severe Storm/Thunder Storm - Wind - Winter Weather	0.07	0.57	$1,666,666.67	$166,666.67	Wind, Rain, Snow
12/23/1979	12/24/1979	Severe Storm/Thunder Storm - Wind - Winter Weather	0	0	$14,285.71	$0.00	Rain, Snow, Wind
10/9/1960	10/9/1960	Wind	0.02	0.03	$86.21	$0.00	Wind
10/16/1960	10/16/1960	Wind	0	0	$1,136.36	$0.00	Wind
3/16/1961	3/17/1961	Wind	0	0	$862.09	$0.00	Wind
10/7/1961	10/8/1961	Wind	0	0.03	$862.07	$0.00	Wind
10/28/1961	10/29/1961	Wind	0	0	$113.64	$0.00	Wind
9/16/1965	9/17/1965	Wind	0	0	$14,705.88	$1,470.59	North Wind
1/15/1966	1/17/1966	Wind	0	0.05	$11,363.64	$113.64	High Wind
12/22/1982	12/22/1982	Wind	0.21	0.06	$1,041,666.67	$104.17	Wind
1/26/1984	1/27/1984	Wind	0.13	0.07	$3,333.33	$333.33	Wind
2/2/1984	2/2/1984	Wind	0.07	0	$357.14	$0.00	High Wind
8/26/1984	8/26/1984	Wind	0.07	0	$357.14	$357.14	High Winds
10/15/1984	10/15/1984	Wind	0	0	$5,555.56	$0.00	Wind
2/17/1988	2/17/1988	Wind	0	0.03	$8,620.69	$0.00	Wind
2/7/1998	2/7/1998	Wind	0	0	$17,647.06	$0.00	High Wind
6/16/1998	6/16/1998	Wind	0	0	$1,000.00	$0.00	High Wind
10/16/1998	10/16/1998	Wind	0	0	$9,090.91	$0.00	High Wind
11/7/1998	11/7/1998	Wind	0	0	$41,176.47	$0.00	High Wind
4/3/1999	4/3/1999	Wind	0	0	$1,333.33	$2,600.00	High Wind
4/22/1999	4/23/1999	Wind	0	0	$1,538.46	$0.00	High Wind
2/11/2000	2/14/2000	Wind	0	0	$555.56	$2,222.22	High Wind
10/21/2000	10/23/2000	Wind	0	0	$1,739.13	$0.00	High Wind
1/4/2008	1/4/2008	Wind	0	0	$4,869.57	$0.00	High Wind
12/3/1983	12/4/1983	Wind - Winter Weather	0.43	0.07	$357.14	$0.00	Heavy Snow, Wind

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
12/8/1992	12/9/1992	Wind - Winter Weather	0	0	$2,631.58	$0.00	Winter Storm, High Wind
Total			**1.52**	**1.49**	**$2,992,278.15**	**$11,439,830.82**	

Source: SHELDUS

Likelihood of Future Occurrences

Highly Likely—High wind events occur annually in the District.

Climate Change

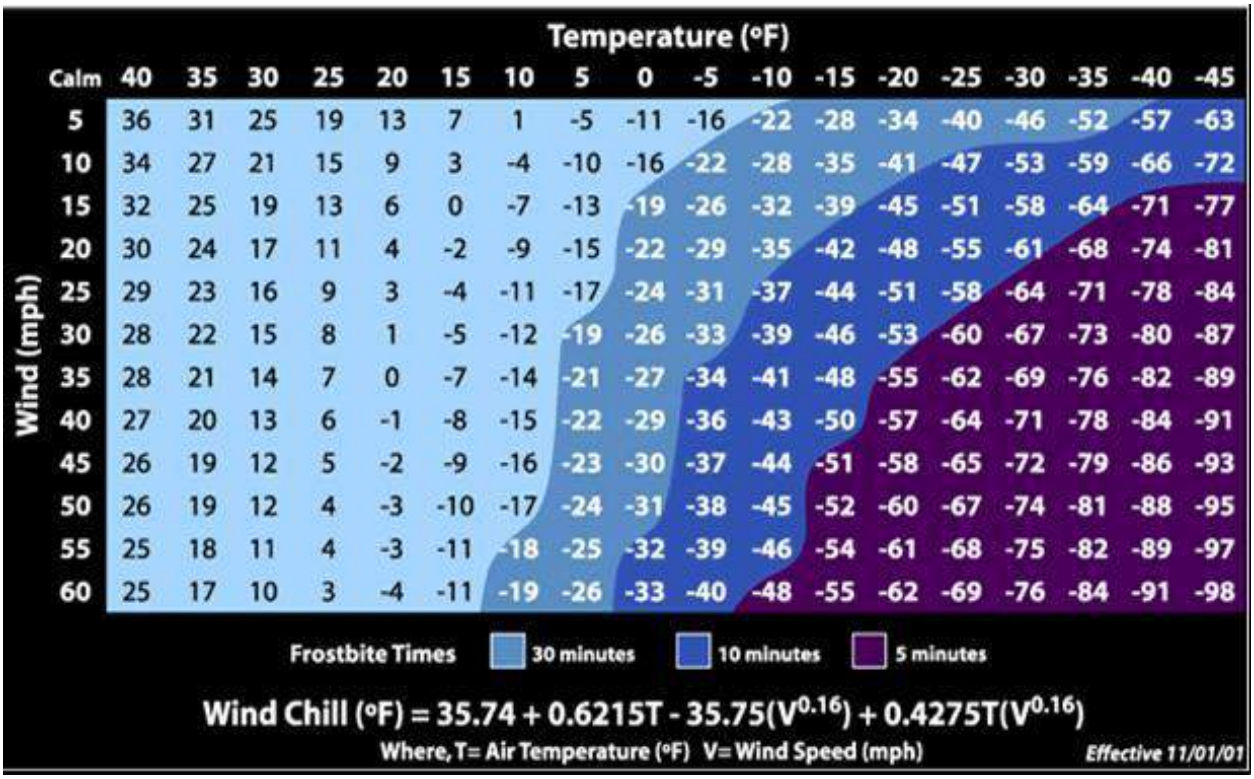
Climate change may increase the number of days with high winds in the County due to changes and increases in temperatures, which can create more energy in the atmosphere.

4.2.6 Severe Weather: Winter Storms and Extreme Cold

Extreme cold often accompanies snow and winter storms or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. Extreme cold can also affect the crops grown in Calaveras County.

In 2001, the NWS implemented an updated Wind Chill Temperature index, which is reproduced below in Figure 4.15. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.15: Wind Chill Temperature Chart



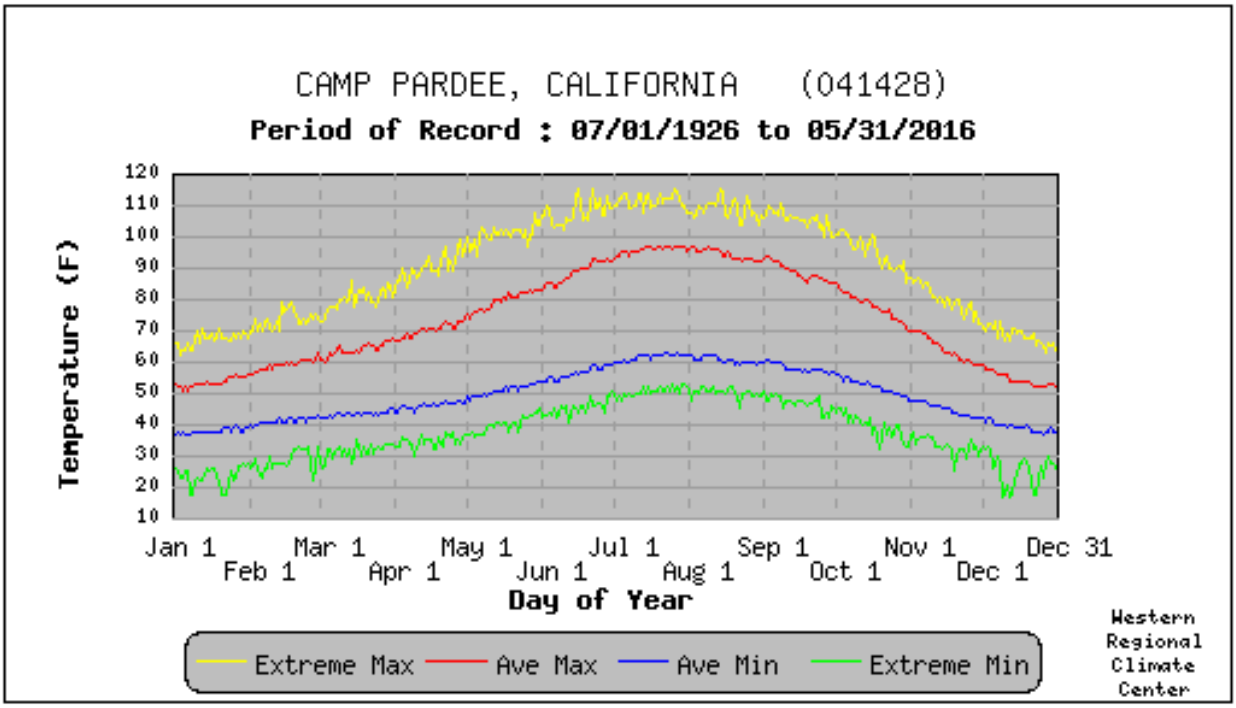
Source: National Weather Service

Information from the two representative weather stations introduced in Section 4.2.2 is summarized below and in Figure 4.16 and Figure 4.17.

In Calaveras County, monthly average minimum temperatures from November through April range from the upper 30s to the upper 50s. The lowest temperature on record at Camp Pardee is 17°F recorded on December 12, 1932. On average, there were 11.3 days annually with a low temperature below 32°F; more than half of these occurred in December and January. At Camp Pardee, temperatures of 32°F or below are on record for every month October through April.

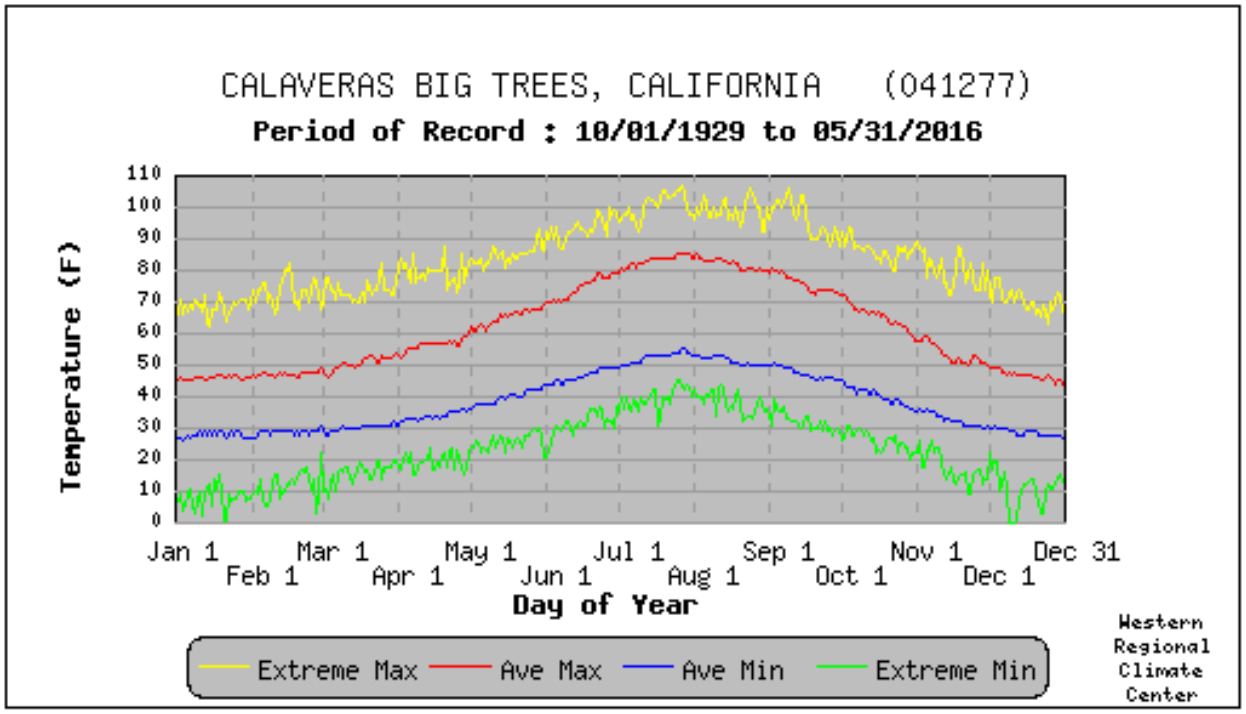
At the Calaveras Big Trees station, the lowest recorded temperature on record is -4°F on February 3, 1932. On average, there are 11.7 days annually that are below 32°F; most occurring in December and January.

Figure 4.16: Daily Temperature Averages and Extremes, Camp Pardee, 1926 - 2016



Source: Western Regional Climate Center, www.wrcc.dri.edu/CLIMATEDATA.html

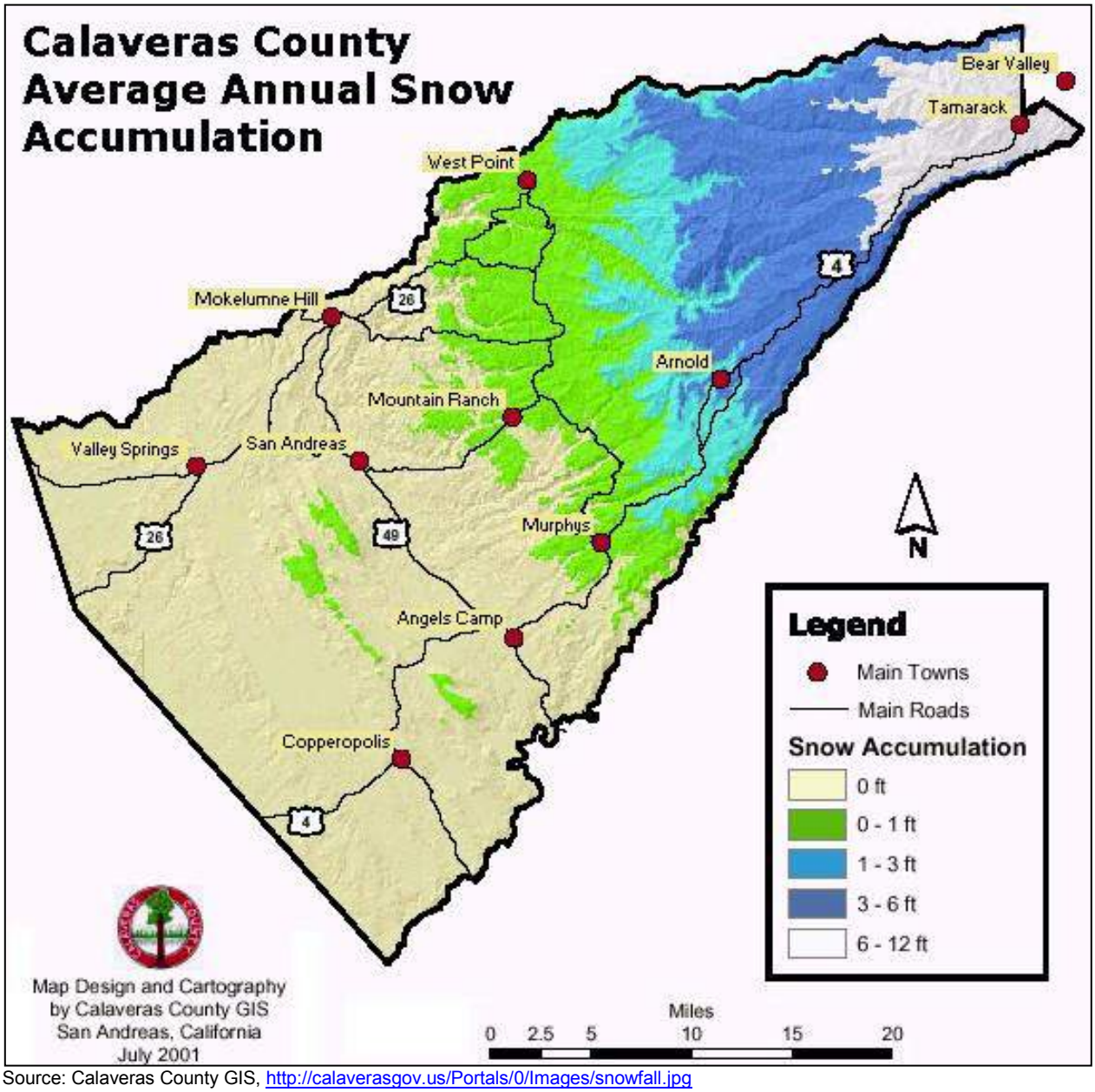
Figure 4.17: Daily Temperature Averages and Extremes, Calaveras Big Trees, 1929 - 2016



Source: Western Regional Climate Center, www.wrcc.dri.edu/CLIMATEDATA.html

Snow accounts for much of the precipitation in the higher elevations in the eastern part of Calaveras County. Snowfall in the Sierra Nevada Mountains increases with elevation. The lower foothills rarely receive any measurable snow. Middle elevations receive a mix of snow and rain during the winter. Above 6,000 feet, the majority of precipitation falls as snow. It is not unusual, in some locations, to have ten feet of snow on the ground for extended periods. Figure 4.18 shows the average annual snow accumulation in Calaveras County.

Figure 4.18: Average Annual Snow Accumulation in Calaveras County



Source: Calaveras County GIS, http://calaverasgov.us/Portals/0/Images/snowfall.jpg

Past Occurrences

NCEI data recorded 28 extreme cold incidents for Calaveras County since 1993. These events are shown in the table below.

Based on SHELDUS data from 1960 to 2010, Calaveras County has experienced numerous winter weather (including blizzard, cold/wind chill, extreme cold/wind chill, frost/freeze, heavy snow, winter snow) events. Also, according the NCEI data, 201 events were reported from 2007 through 2017 for three zones that intersect with Calaveras County: Northern San Joaquin Valley, Motherlode, and West Slope Northern Sierra Nevada. Of the 201 events, two deaths were reported, in addition to approximately $525,000 in property damage and $20,000 in crop damage. description of major winter weather and freeze events in Calaveras County is shown in Table 4.15.

Table 4.15: SHELDUS Winter Weather Events for Calaveras County 1960 to 2017

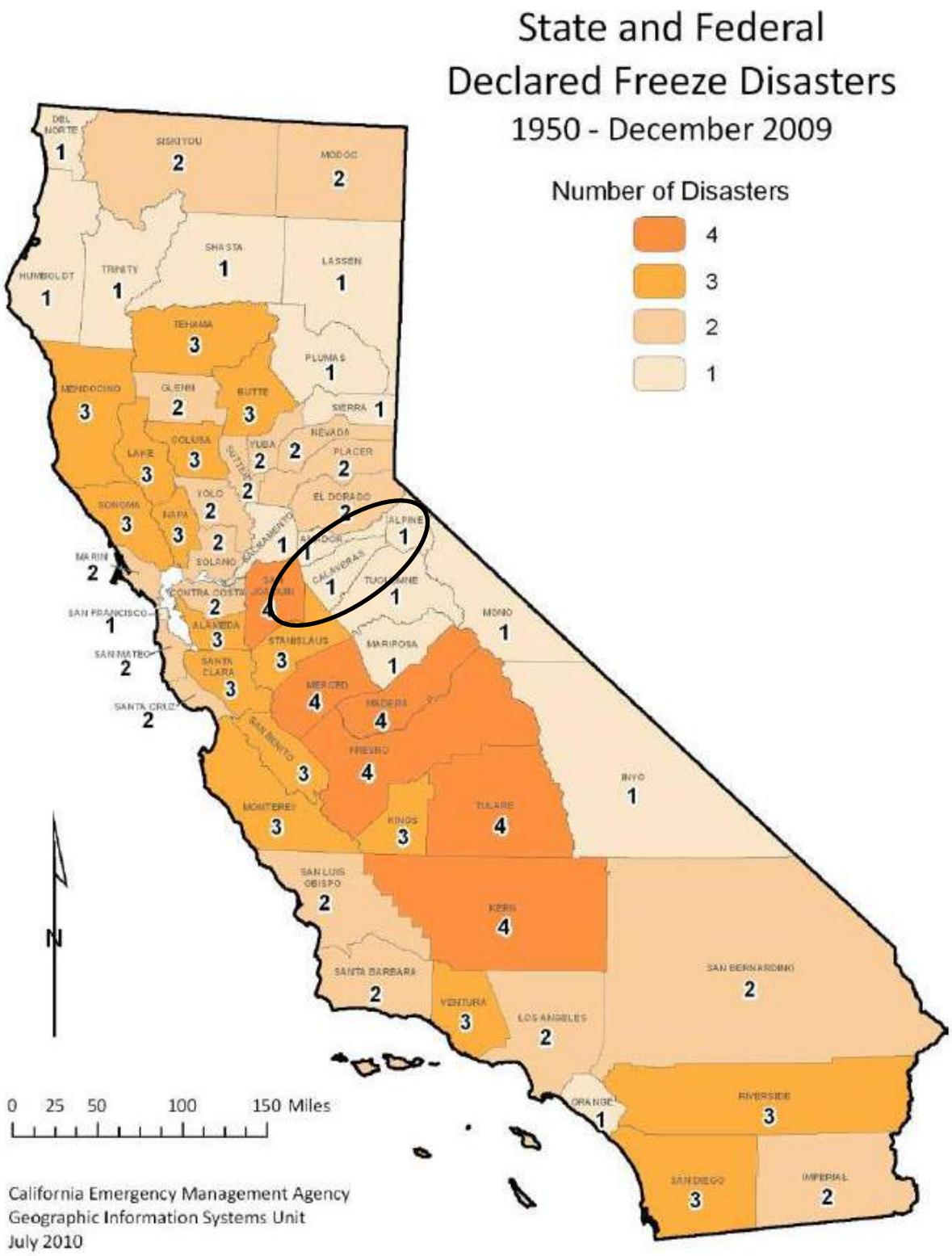
Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
1/20/1962	1/21/1962	Winter Weather	0.86	0.12	$8,620.69	$0.00	WINTER STORM
4/27/1970	4/29/1970	Winter Weather	0	0	$0.00	$11,627.91	FREEZE
1/27/1981	1/29/1981	Winter Weather	0	0	$1,041.67	$0.00	Winter Storm
12/22/1982	12/22/1982	Winter Weather	1	0	$2,941.18	$0.00	Snow
1/26/1983	1/26/1983	Winter Weather	0.09	0	$4,545.45	$0.00	Snow
11/23/1983	11/23/1983	Winter Weather	0.14	0	$357.14	$0.00	Snow
12/23/1983	12/24/1983	Winter Weather	0.07	0	$357.14	$0.00	Heavy Snow
2/5/1989	2/5/1989	Winter Weather	0	0	$0.00	$128,205.13	Record Cold
2/15/1990	2/17/1990	Winter Weather	0	0	$2,631.58	$0.00	Winter Storm
2/15/1990	2/15/1990	Winter Weather	0	0	$0.00	$3,333.33	Freeze
12/20/1990	12/25/1990	Winter Weather	0	0.05	$86,206.90	$8,620,689.66	Cold Wave
2/5/1992	2/16/1992	Winter Weather	0.22	0.05	$0.00	$0.00	Winter Storm
2/9/1992	2/11/1992	Winter Weather	0	0	$892.86	$0.00	Winter Storm
12/6/1992	12/7/1992	Winter Weather	0.13	0	$1,562.50	$0.00	Winter Storm
12/17/1992	12/17/1992	Winter Weather	0	0	$3,846.15	$0.00	Winter Storm

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
12/31/1992	1/1/1993	Winter Weather	0	0	$27,777.78	$0.00	Winter Storm
2/17/1993	2/21/1993	Winter Weather	0.11	0	$2,631.58	$0.00	Winter Storm
12/11/1993	12/11/1993	Winter Weather	0	0	$3,448.28	$0.00	Winter Storm
1/23/1994	1/24/1994	Winter Weather	0	0	$1,851.85	$0.00	Heavy Snow
2/6/1994	2/8/1994	Winter Weather	0	0	$3,333.33	$0.00	Winter Storm
2/16/1994	2/21/1994	Winter Weather	0	0	$1,282.05	$0.00	Winter Storm
12/20/1996	12/20/1996	Winter Weather	0.14	0.07	$0.00	$0.00	Heavy Snow
12/5/1998	12/6/1998	Winter Weather	0	0	$20,000.00	$0.00	Winter Storm
12/19/1998	12/29/1998	Winter Weather	0	0	$0.00	$141,176.47	Extreme Cold
4/8/2005	4/10/2005	Winter Weather	0	0	$3,076.92	$0.00	Winter Storm
1/14/2007	1/15/2007	Winter Weather	0	0	$57,142.86	$0.00	Frost/Freeze
Total			**2.76**	**0.29**	**$233,547.91**	**$8,905,032.50**	

Source: SHELDUS

Figure 4.19 shows disaster declarations due to freeze in the County. The greatest concentrations are in the Central Valley. The disaster declaration for Calaveras County was issued in 1969.

Figure 4.19: State and Federal Declared Freeze Disasters from 1950 to 2009



Source: CalEMA

Likelihood of Future Occurrences

Highly Likely—36 winter weather and frost/freeze events occurred in Calaveras County (e.g. Northern San Joaquin Valley, Motherlode, and West Slope Northern Sierra zones) over the past 67 years (1960-2017) of record keeping which equates to one event every 1.4 years, on average, and a 63 percent chance of extreme cold occurring in any given year. In other words, winter storm events occur annually.

Climate Change

The frequency of severe weather events has increased steadily over the last century, as seen by the increase in weather-related disasters since the 1960s. The probability of severe weather events also increases in a warmer climate (e.g. changes in intensity, duration, and frequency of storm events) (EPA 2016). However, freezing spells are an event that may become less frequent in California as climate temperatures increase; if emissions increase, freezing events could occur only once per decade in large portion of the state by the second half of the 21st century. According to a California Natural Resources Report in 2009, it was determined that while fewer freezing spells would decrease cold related health effects, too few freezes could lead to increased incidence of disease as vectors and pathogens do not die off.

4.2.7 Avalanche

Hazard/Problem Description

Avalanches occur when loading of new snow increases stress at a rate faster than strength develops, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The majority of avalanches occur during or shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers, who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement creates avalanches. Areas prone to avalanche hazards include hard to access areas deep in the backcountry within Calaveras County, and may be most common in areas along Highway 4 near Ebbetts Pass. Avalanche hazards exist in eastern Calaveras County where combinations of the above criteria occur.

Past Occurrences

Historically, avalanches occur in California between the months of December and March, following snowstorms. Although avalanches have occurred on slopes of many angles, they most often occur on slopes ranging between 30 degrees and 45 degrees. Therefore, ski resorts, residences, roads, businesses, and other structures and activities in these areas are vulnerable.

The NCEI and SHELDUS show no past occurrences of avalanche in the County; most of the events listed in the NCEI database occurred near Lake Tahoe and Donner Pass (i.e. Interstate 80). The HMPC noted that no avalanches have affected the District.

Likelihood of Future Occurrence

Unlikely – there have been no previous occurrences of avalanche in the District.

Climate Change

According to the CAS, climate change may exacerbate avalanche hazards in the County. Avalanches stemming from a weather pattern of heavy snow falls followed by a thaw cycle may increase, which is a likely pattern expected with global warming. Avalanches are most likely to occur along Highway 4 near Ebbetts Pass.

4.2.8 Dam Failure

Hazard/Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can also result from any one or a combination of the following causes:

- Earthquake;
- Inadequate spillway capacity resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity;
- Improper design;
- Improper maintenance;
- Negligent operation; and/or
- Failure of upstream dams on the same waterway.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health

concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach; a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

Dams and reservoirs have been built throughout California to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as recreational facilities. The storage capacities of these reservoirs range from a few thousand acre-feet to five million acre-feet. The water from these reservoirs eventually makes its way to the Pacific Ocean by way of several river systems.

The California Department of Water Resources (DWR) Division of Safety of Dams (DSOD) assigns hazard ratings to large dams within the State. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in three categories that identify the potential hazard to life and property:

- **High hazard** indicates that a failure would most probably result in the loss of life
- **Significant hazard** indicates that a failure could result in appreciable property damage
- **Low hazard** indicates that failure would result in only minimal property damage and loss of life is unlikely

Dam locations of high, significant, and low hazard dams in or near Calaveras County are shown in 9. Details of high and significant dams inside the County are shown in 6. The DSOD recently reclassified two of the dams in the County that are owned by the District since the previous plan update: Valley Springs La Contenta Treated Wastewater Storage Pond, which was constructed in the early 2000's (High Hazard) and West Point Regulating Reservoir, which was constructed in 1965 (Significant Hazard) (DWR 2017).

Figure 4.20: Dams in or Near Calaveras County

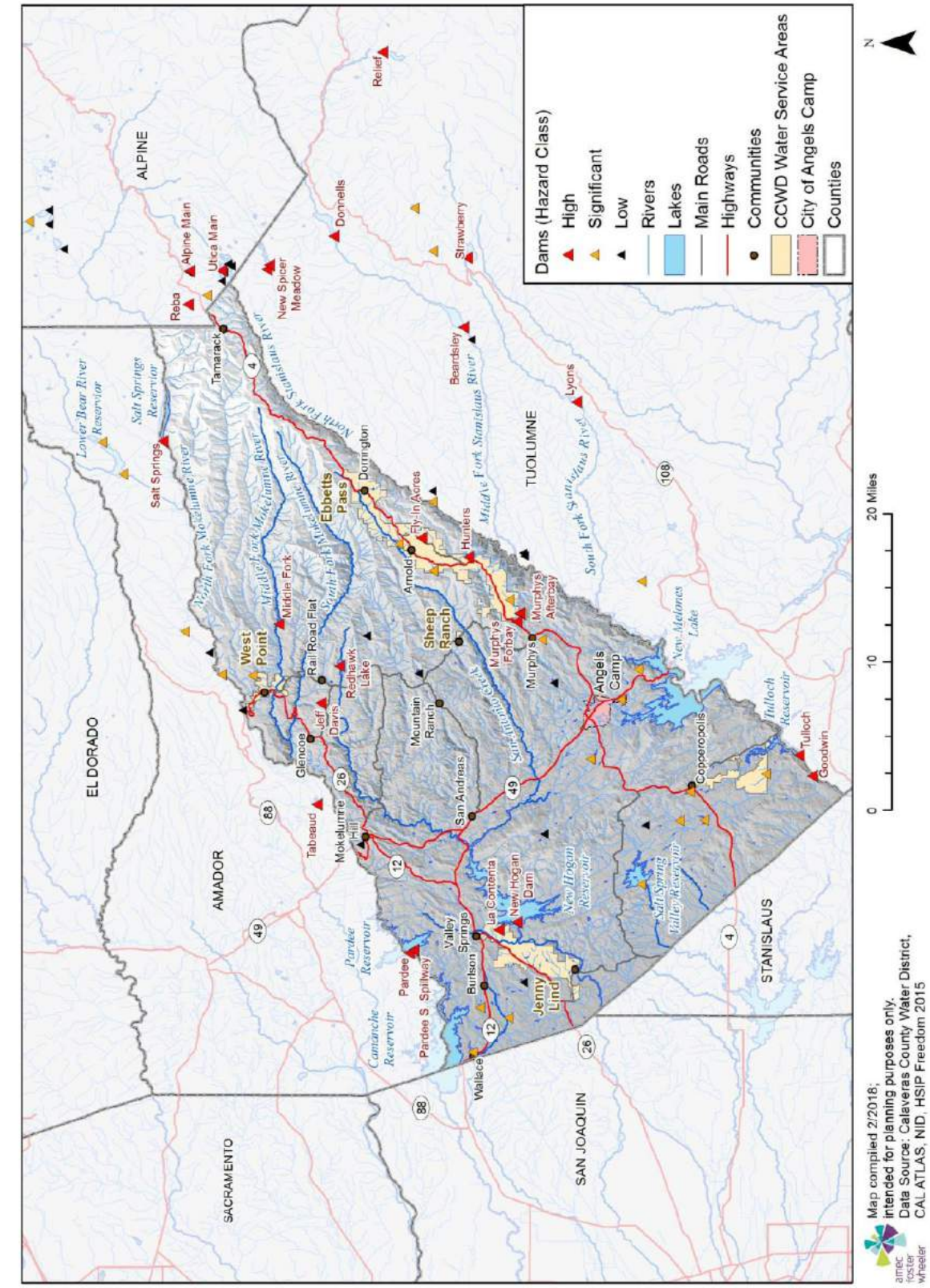


Table 4.16: High (H) and Significant (S) Hazard Dams in Calaveras County

Dam Name	Hazard Class	River	County	Nearest City/Distance	Max Storage (acre-feet)	Dam Height	Dam Owner
CPUD Middle Fork	H	Middle Fork Mokelumne River	Calaveras	West Point/ 5 miles	2,525	102	Calaveras Public Utility District
Fly-In-Acres	H	Moran Creek	Calaveras	Avery/ 4 miles	108	41	Blue Lakes Springs Homeowners
Goodwin	H	Stanislaus River	Calaveras	Knights Ferry/ 4 miles	1,893	101	Tri-Dam Project
Hunters	H	Mill Creek	Calaveras	Arnold/ 4 miles	260	59	Utica Power Authority
Jackson Creek Spillway[5]	H	Mokelumne River	Amador, Calaveras	Buena Vista/ 4 miles	198,000	37	East Bay Municipal Utility District
Jeff Davis	H	Tributary of Wet Gulch Creek	Calaveras	Glencoe/ 3 miles	2,200	114	Calaveras Public Utility District
La Contenta	H	Tributary of Cosgrove Spring	Calaveras	Rancho Calaveras/ 2 miles	239	43	Calaveras County Water District
Murphys Afterbay	H	Angels Creek	Calaveras	Murphys/ 1 mile	31	43	Utica Power Authority
Murphys Forebay South	H	Angels Creek	Calaveras	Murphys/ 1 mile	60	27	Utica Power Authority
Murphys Forebay West[3]	H	Angels Creek	Calaveras	Murphys/ 1 mile	60	67	Utica Power Authority
New Hogan Dam[6]	H	Calaveras River	Calaveras	Jenny Lind/ 4 miles	317,100	155	Cespk
Pardee[7]	H	Mokelumne River	Amador, Calaveras	Clements/ 20 miles	198,000	352	East Bay Municipal Utility District
Pardee South Spillway[7]	H	Mokelumne River	Amador, Calaveras	Clements/ 20 miles	198,000	10	East Bay Municipal Utility District
Redhawk Lake	H	North Fork Calaveras River	Calaveras	San Andreas/ 15 miles	3,160	33	Calaveras Public Utility District
Tulloch	H	Stanislaus River	Calaveras	Knights Ferry / 4 miles	68,400	205	South San Joaquin Irrigation District
Andrew Cademartori	S	Seasonal Stream	Calaveras	Murphys/ 1 mile	171	80	Union Public Utility District
Cherokee	S	Cherokee Creek	Calaveras	San Andreas/ 10 miles	1,120	44	WA Spence Et Ux
Copper Cove[8]	S	Tributary of Little Johns Creek	Calaveras	Knights Ferry/ 8 miles	-	42	Calaveras County Water District
Copperopolis	S	Penney Creek	Calaveras	Copperopolis/ 0.5 miles	320	33	Jon & Angelita Janofsky

Dam Name	Hazard Class	River	County	Nearest City/Distance	Max Storage (acre-feet)	Dam Height	Dam Owner
Ferrario	S	Tributary of Bear Creek	Calaveras	Wallace/ 3.5 miles	384	25	Robert & Lynn Wilson
Flowers	S	Little Johns Cr	Calaveras	Oakdale/ 26 miles	1,164	41	Oak Canyon Ranch, LLC
Forest Meadows[1]	S	Angels Creek	Calaveras	Murphys/ 1.5 miles	143	60	Sierra Golf Management
Hein[9]	S	Tributary of Bear Creek	Calaveras	Wallace/ 3.8 miles	285	16	Naki Corporation
Holman	S	Tributary of Angels Creek	Calaveras		317	101	City of Angels
Mckays Point Diversion[2]	S	North Fork Stanislaus River	Tuolumne, Calaveras	Murphys/ 8 miles	2,930	242	Calaveras County Water District
Murphys Wastewater	S	Offstream	Calaveras	Arab/ 6 miles	185	24	Murphys Sanitary District
Ross[4]	S	Calaveras	Calaveras		85	44	Utica Water and Power Authority
Salt Springs Valley	S	Rock Creek	Calaveras	Milton/ 5 miles	16,250	47	Rock Creek Water District
Skyrocket	S	Little John Creek	Calaveras	Telegraph City/ 5 miles	1,895	44	Meridian Gold Company
Stevenot	S	Tributary of Carson Creek	Calaveras	Angels City/ 3 miles	187	70	Sutton Enterprises
Tanner	S	Cowell Creek	Calaveras	Sheep Ranch/ 6 miles	214	35	Lake Mont Pines Homeowners
Tiger Creek Afterbay[10]	S	North Fork Mokelumne River	Amador, Calaveras	Pioneer/ 5 miles	2,607	120	Pacific Gas and Electric Company
Wallace	S	Tributary of Bear Creek	Calaveras	Wallace/ 0.3 miles	700	29	Wallace Community Services District (now CCWD)
West Point Regulating	S	Ruse Creek	Calaveras	West Point/ 1.5 miles	86	36	Calaveras County Water District
White Pines	S	San Antonio Creek	Calaveras	Fourth Crossing/ 22 miles	562	35	Calaveras County Water District

NOTES: There were several differences between the HSIP Freedom and DWR data; these differences are noted below.
1 – Forest Meadows Dam is listed as a Low Hazard Dam by the DWR
2 – McKays Point Diversion is listed as Extremely High by the DWR.
3 – The DWR data does not list the Murphys Forebay West Facility.
4 – Ross Dam is not included in the DWR data.
5 – Jackson Creek Spillway is not included in the DWR data.
6 – New Hogan Dam is not included in the DWR data.
7 -- Pardee Dam and Spillway is not included in the DWR data.
8 – Copper Cove is classified as a low hazard dam in the DWR data.
9 – Hein Dam is classified as a low hazard dam in the DWR data.
10 – Tiger Creek Afterbay is not included in the DWR data.

Source: HSIP Freedom 2015; DWR 2017

There are dams located outside of Calaveras County that may potentially affect the County. Details of high and significant hazard dams outside the County that may affect the County are shown in Table 4.17.

Table 4.17: High and Significant Hazard Dams That May Affect Calaveras County

Name	Hazard	County Name	Owner	River	Near City	EAP
Beardsley	H	Tuolumne	South San Joaquin and Oakdale Irrigation District	Middle Fork Stanislaus River	Sonora	Y
Donnells	H	Tuolumne	South San Joaquin and Oakdale Irrigation District	Middle Fork Stanislaus River	Sonora	Y
Lyons	H	Tuolumne	Pacific Gas and Electric	South Fork Stanislaus River	Long Barn	Y
New Spicer Meadow	H	Tuolumne	Calaveras County Water District	Highland Creek	Big Meadow	Y
Reba	H	Alpine	Lake Alpine Water Company	Bloods Creek Tributary	Lombardi	Y
Salt Springs	H	Amador/ Calaveras	Pacific Gas and Electric	North Fork Mokelumne River	Pioneer	Y
Tabeaud	H	Amador	Pacific Gas and Electric	South Fork Jackson Creek - Tributary	Jackson	Y
Alpine Auxiliary No. 2	S	Alpine	Northern California Power Authority	Silver Creek	Bear Valley	Y
Alpine Auxiliary No. 3	S	Alpine	Northern California Power Authority	Silver Creek	Bear Valley	Y
Alpine Auxiliary No. 4	S	Alpine	Northern California Power Authority	Silver Creek	Bear Valley	Y
Alpine Main	S	Alpine	Northern California Power Authority	Silver Creek	Bear Valley	Y
Bear River	S	Amador	Pac Gas and Electric	Bear River		Y
Leland Meadows	S	Tuolumne	Leland Meadows Water District	Leland Creek	Cow Creek	Y
Lower Bear	S	Amador	Pacific Gas and Electric	Bear River	Pioneer	Y
New Spicer Meadow	S	Tuolumne	Calaveras County Water District	Highland Creek	Arnold	Y

Name	Hazard	County Name	Owner	River	Near City	EAP
Tiger Cr Regulator	S	Amador	Pac Gas and Electric	Tiger Creek	Clements	Y
Upper Bear	S	Amador	Pacific Gas and Electric	Bear River	Pioneer	Y
Upper Blue Lake	S	Alpine	Pacific Gas and Electric	Blue Creek	Kirkwood	Y
Utica Auxiliary No. 2	S	Alpine/ Tuolumne	Northern California Power Authority	North Fork Stanislaus - Tributary	Bear Valley	Y
Utica Auxiliary No. 3	S	Alpine/ Tuolumne	Northern California Power Authority	North Fork Stanislaus - Tributary	Bear Valley	Y
Utica Auxiliary No. 4	S	Alpine/ Tuolumne	Northern California Power Authority	North Fork Stanislaus - Tributary	Bear Valley	Y
Utica Auxiliary No. 5	S	Alpine/ Tuolumne	Northern California Power Authority	North Fork Stanislaus - Tributary	Bear Valley	Y
Utica Main	S	Alpine/ Tuolumne	Northern California Power Authority	North Fork Stanislaus - Tributary	Bear Valley	Y

Source: Cal OES

The catastrophic failure of any of the County's large dams including New Melones, Hogan, Tulloch, Hunters, McKays, Spicer, Camanche, and Pardee Dams could result in property damage and loss of life. Foremost, are injuries, loss of life, limited transportations routes and a decrease in vital utilities. Additionally, because of Calaveras County's strong agricultural influences significant downstream property damage and the loss of domestic and farm production animals will be a major concern.

Previous Occurrences

There is a history of dam failure in Calaveras County. In 1895, the Angels Dam collapsed, resulting in one fatality. The cause cited for the failure was flooding that undermined the poorly constructed dam foundation. In 1997, the Don Pedro Dam in neighboring Tuolumne County overtopped, resulting in flooding across a 300 square-mile area that included parts of Calaveras County. Also, in April of 2006, flooding caused significant damage and threat of failure to a small dam at Peachtree Pond near Valley Springs. According to the HMPC, other dams and diversion infrastructure (e.g. culverts) have come close to uncontrolled release: Hogan Dam came close to an uncontrolled release on the spillway in 2006 and some high surface water runoffs that have resulted in damage near White Pines Lake (e.g. road damage, reduced pool volume).

Probability of Future Occurrence

Occasional—With only a single previous occurrence, probability of future occurrence is difficult to accurately estimate for dam failure. Because dam failure is a manmade hazard, the methodology

for calculating probability based on past occurrences does not necessarily reflect the actual risk of future occurrence. Another way to estimate future occurrence is to consider the probability of other hazards that are considered causes or contributing factors of dam failure. These include flooding and earthquake, which are classified as likely and unlikely respectively. Based on historical conditions and input from the HMPC, a primary concern of the planning area is not just a dam failure, but heavy rains and flooding causing flood control gates to be opened, resulting in uncontrolled releases that could cause substantial damage in the County.

Climate Change

Increases and changes in regional precipitation and temperature patterns, particularly snowmelt timing that now occurs earlier in the mid-elevations could cause increased potential for dam failure and uncontrolled releases in the County. Studies also suggest that climate change leads to earlier surface water runoff timing due to warmer temperatures, which cause more precipitation as rain instead of snow and snow to melt earlier (Hall 2017). These changes in runoff timing are important because the Sierra Nevada snowpack acts as part of California's water storage system. If the runoff occurs sooner, this presents a challenge for water management for the District, as it relates to dam failure and uncontrolled releases, but also for water storage.

4.2.9 Drought and Water Shortage

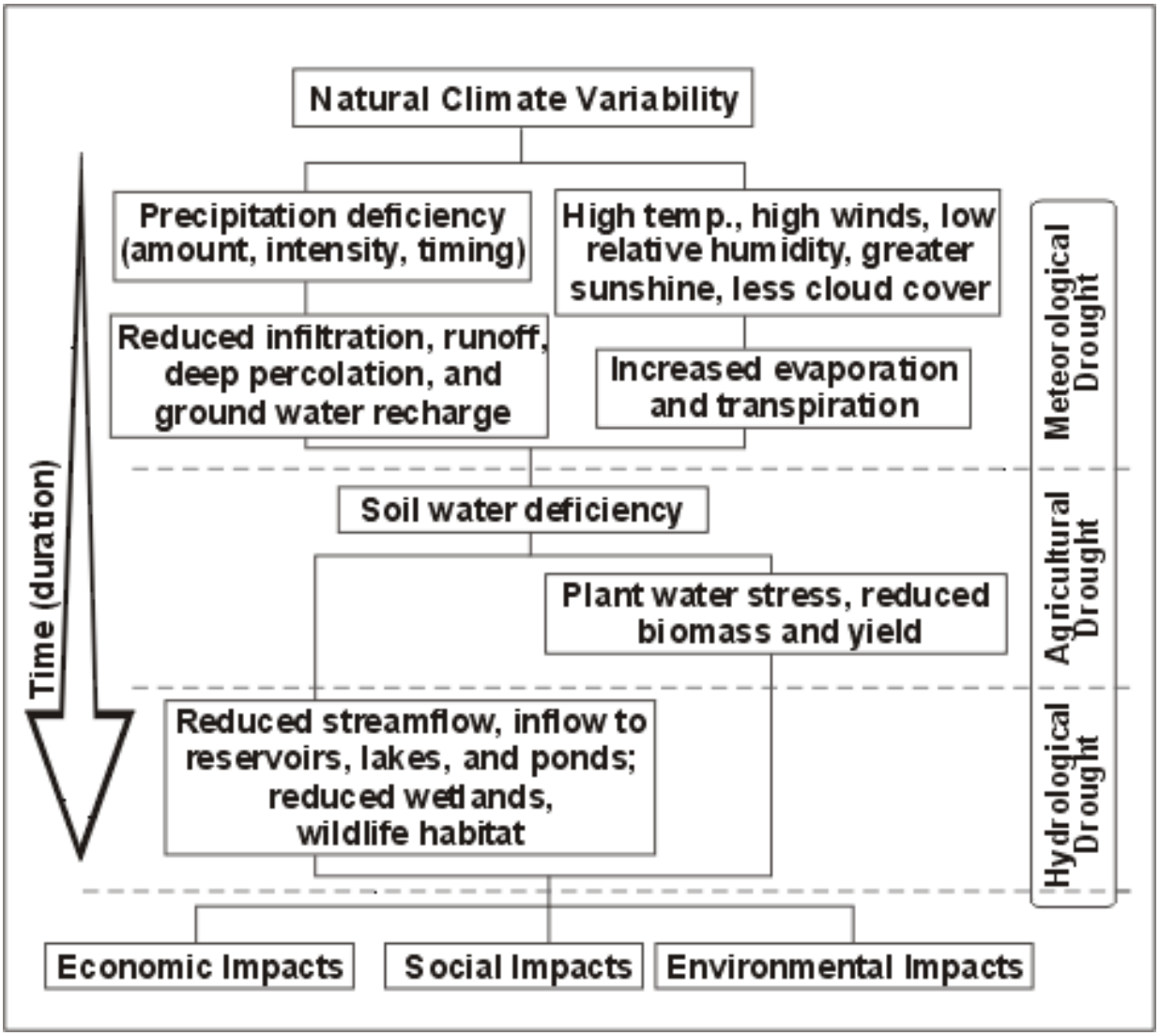
Hazard/Problem Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Drought is a complex issue involving (see Figure 4.21) many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological** drought is usually defined by a period of below average water supply.
- **Agricultural** drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological** drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic** drought occurs when there are impacts to health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

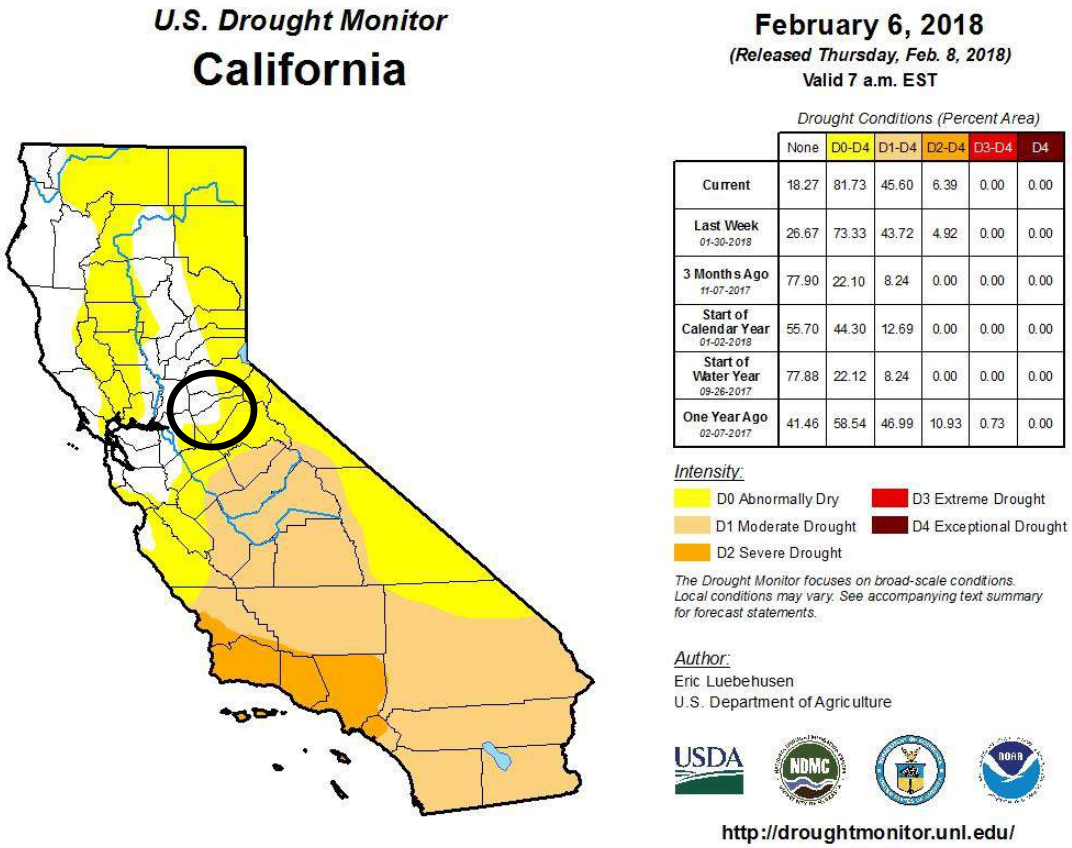
Figure 4.21: Causes and Impacts of Drought



Source: National Drought Mitigation Center

Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA's Climate Prediction Center, the NDMC, and the USDA's Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the drought conditions in California and the planning area can be found in Figure 4.22. As shown in this figure, portions of Calaveras County have experienced abnormally dry conditions within the last year.

Figure 4.22: Current Drought Status in Calaveras County



Source: US Drought Monitor

The California Department of Water Resources (DWR) says the following about drought:

> *One dry year does not normally constitute a drought in California. California's extensive system of water supply infrastructure—its reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.*

The drought issue in California is further compounded by water rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California is part of this issue.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the planning area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

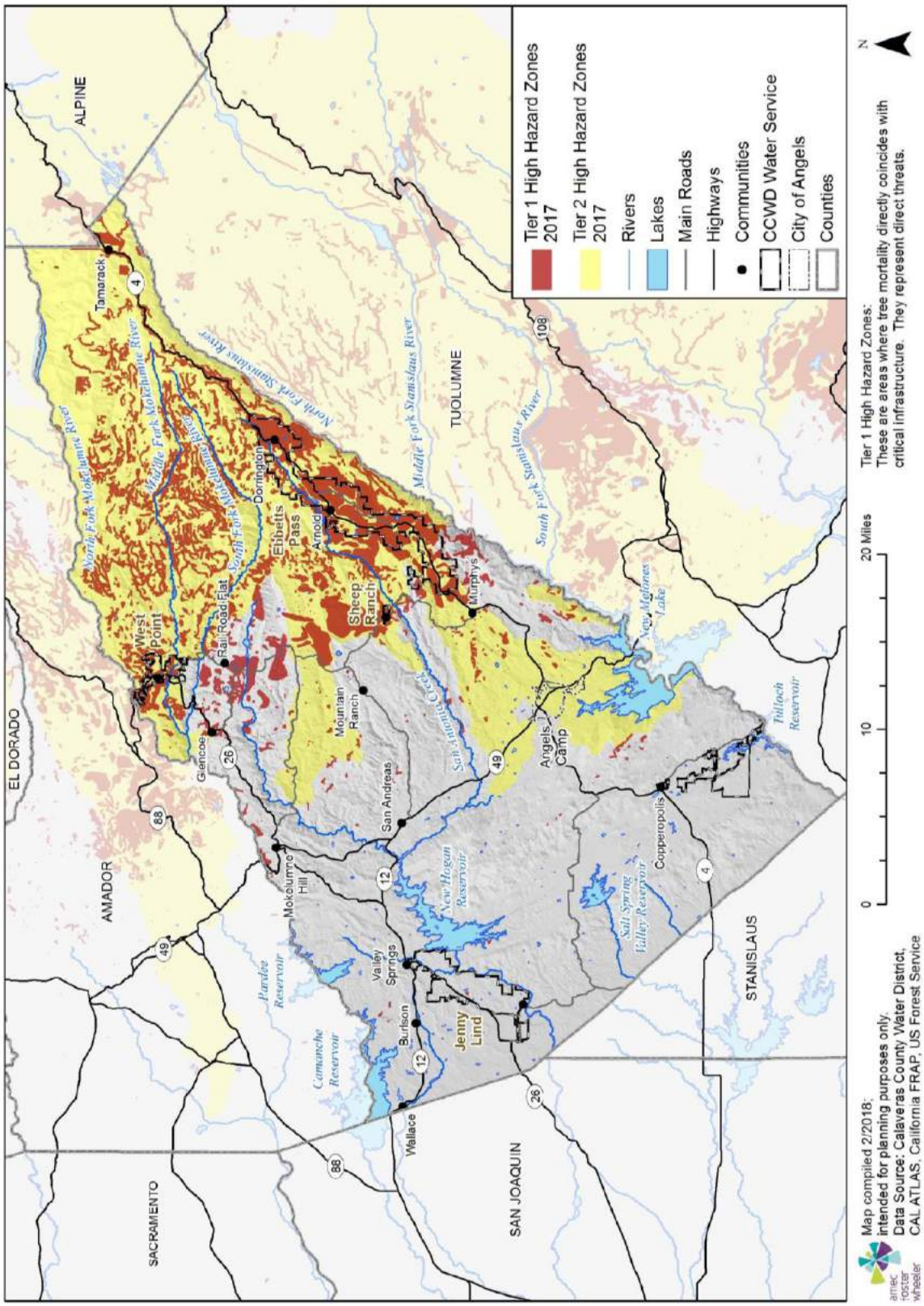
Drought can have secondary impacts. For example, drought is a major determinant of wildfire hazard, in that it creates greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes. Drought is also an economic hazard. Significant economic impacts on California's agriculture industry can occur because of short- and long-term drought conditions; these include hardships to farmers, farm workers, packers, and shippers of agricultural products. In some cases, droughts can also cause significant increases in food prices to the consumer due to shortages. Drought can also result in lack of water and subsequent feed available to grazing livestock, potentially leading to risk of livestock death and resulting in losses to the State's and Calaveras County's agricultural economy.

Tree Mortality

In recent years, due to the multi-year drought throughout the planning area and state-wide, a vast number of trees have been (and continue to be) impacted in Calaveras County. Standing dead trees could fall and pose a risk to people, buildings, power lines, roads and other infrastructure. In addition, drought-impacted trees become susceptible to diseases and insect infestations (i.e. bark beetle) further adding to the risk of tree mortality and related potential impacts.

The location, extent, and probability of occurrence for tree mortality can be viewed as sub-set to the drought hazard. Those areas of the natural environment susceptible to drought comprise a larger area, since tree mortality is related to other sub-factors specific to the species impacted such as tree age and soil composition. Figure 4.23 illustrates the extent of impact of drought and tree mortality in Calaveras County. The Tier 1 High Hazard Zones (as indicated in red) depict areas where tree mortality directly coincides with critical infrastructure.

Figure 4.23: Drought Related Tree Mortality in Calaveras County



Past Occurrences

Historically, California has experienced multiple severe droughts. According to the DWR, droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large northern California reservoirs. Table 4.18 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, and2007-09 droughts, but it does not depict information on the 2011-2017 drought, California's most recent multi-year drought. From December 2011 to March 2017, California experienced one of the worst multi-year droughts on record. The driest single year of California's measured hydrologic record was 1977 and the driest period on record spanned from late 2012 to 2014. Figure 4.24 depicts California's Multi-Year Historical Dry Periods, 1850-2000.

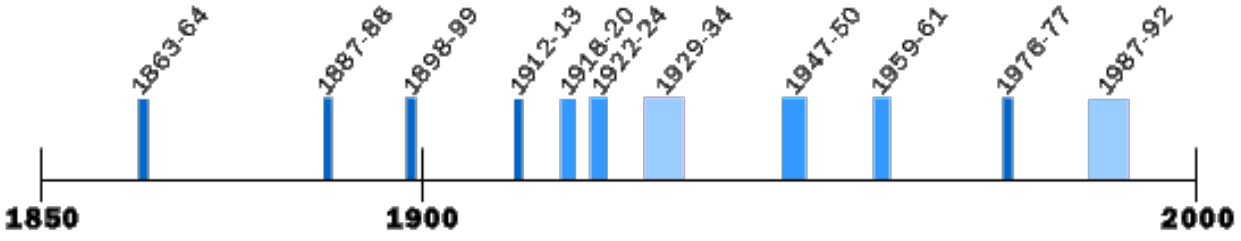
Table 4.18: Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf*/yr)	(percent Average 1901-96)	(maf*/yr)	(percent Average 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47
2007-09	11.2	64	3.7	3.

Source: California's Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources. Available at: http://www.water.ca.gov/drought/docs/DroughtReport2010.pdf
*maf=million acre feet

Since 2000 and the prior 2007-09 statewide drought, the water years of 2012-14 were California's driest three consecutive years in terms of statewide precipitation, and the drought continued through 2016 (DWR 2015). The 2012-14 period marked the second time a statewide proclamation of emergency was issued for drought (DWR 2015).

Figure 4.24: California's Multi-Year Historical Dry Periods, 1850-2000



Source: California Department of Water Resources, www.water.ca.gov/
Notes: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

According to the State of California Hazard Mitigation Plan, Calaveras County has experienced two droughts that resulted in a state disaster declaration. This can be seen in Figure 4.24 above.

Since the 2013 State Plan, a drought emergency for the State of California was issued by Governor Brown. On January 17, 2014 the governor declared a State of Emergency for drought throughout California. This declaration came on the heels of a report that stated that California had the least amount of rainfall in its 163-year history. Californians were asked to voluntarily reduce their water consumption by 20 percent. The declaration also:

- Directed state agencies, led by Cal DWR, to execute a statewide campaign to encourage and promote water conservation, with a goal of reducing water usage by 20 percent.
- Required the Department of Forestry and Fire Protection to hire additional seasonal firefighters.
- Urged cities and water districts to update their water management and drought plans.
- Ordered all state agencies to conserve water, including placing a moratorium on new, nonessential landscaping at public buildings and along highways.
- Required state officials to speed approval for voluntary water sales and transfers between willing districts.
- Ordered Cal DWR to accelerate spending on water supply and conservation projects that can break ground this year.

Drought conditions worsened through 2014 and into 2015. On April 1, 2015, following the lowest snowpack ever recorded, Governor Brown announced actions that will save water, increase enforcement to prevent wasteful water use, streamline the State's drought response, and invest in new technologies that will make California more drought resilient. The governor directed the State Water Resources Control Board to implement mandatory water reductions in cities and towns across California to reduce water usage by 25 percent. This savings amounts to approximately 1.5 million acre-feet of water through the end of 2015. To save more water now, the order also sought to:

- Replace 50 million square feet of lawns throughout the state with drought tolerant landscaping in partnership with local governments;
- Direct the creation of a temporary, statewide consumer rebate program to replace old appliances with more water and energy efficient models;
- Require campuses, golf courses, cemeteries and other large landscapes to make significant cuts in water use; and
- Prohibit new homes and developments from irrigating with potable water unless water-efficient drip irrigation systems are used, and ban watering of ornamental grass on public street medians.
- The County participates in Stage 3 water emergency protocols. Irrigation districts have but back to 1/3 of the use. UPUD has in place a water reduction plan that goes above and beyond the restriction requirements. This also creates the issue of reduced revenues due to use limitations.

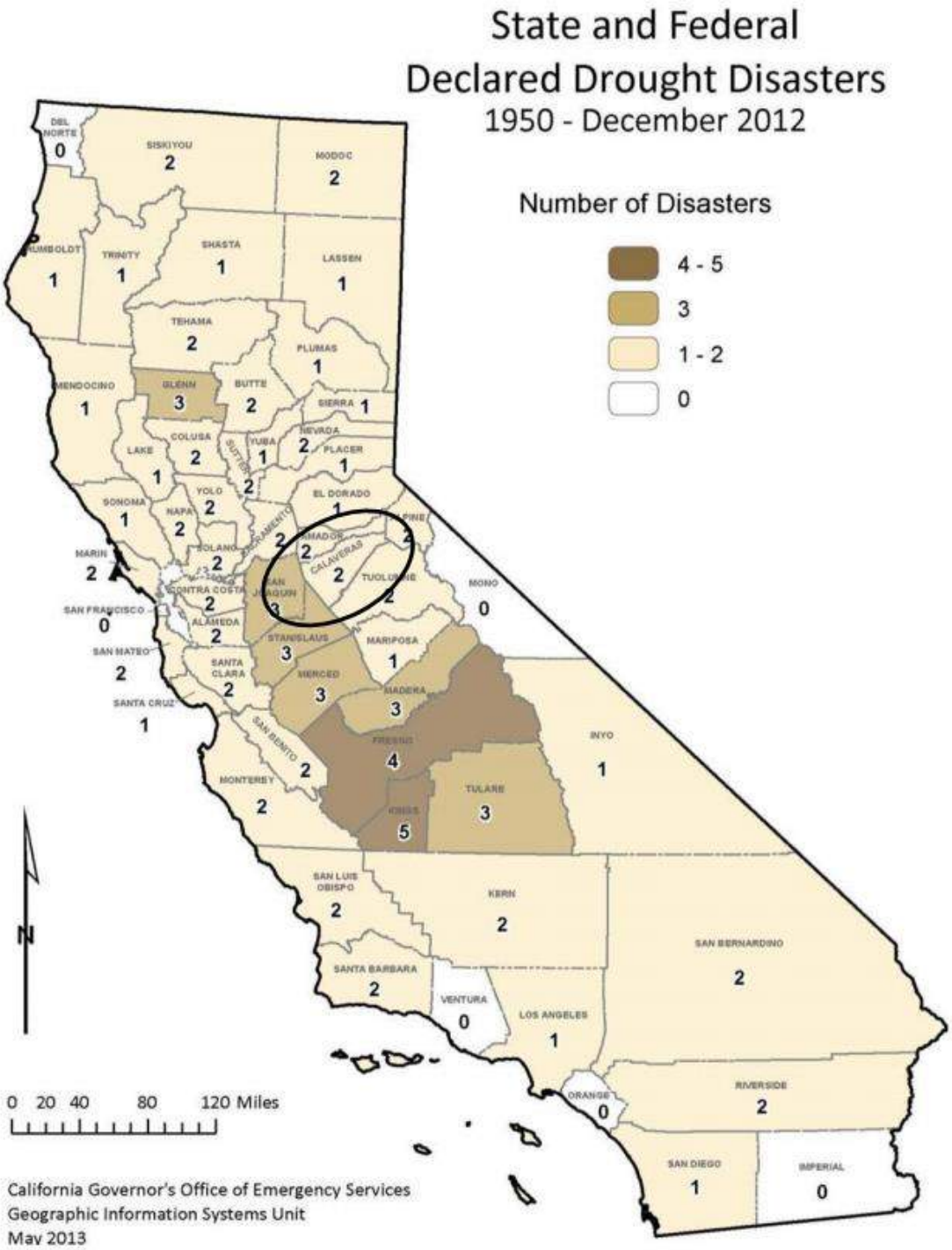
Data compiled by the USDA displays state and county records of disaster declarations made by the US Secretary of Agriculture. Table 4.19 below identifies the declarations related to Calaveras from 2008-2017. Figure 4.25 shows declared drought declarations in California since 2012.

Table 4.19: Calaveras County Secretarial Disaster Designations

Disaster Designation	Designation Date	Disaster Type	Primary or Contiguous County
S3351	9/22/2012	Drought	Contiguous
S3379	9/5/2012	Drought	Contiguous
S3452	12/29/2012	Drought	Contiguous
S3547	7/3/2013	Drought	Contiguous
S3558	7/31/2013	Drought	Primary
S3569	8/21/2013	Drought	Contiguous
M4158	12/13/2013	Drought	Contiguous
S3626	1/15/2014	Drought	Primary
S3743	9/17/2014	Drought	Primary
S3784	2/4/2015	Drought	Primary
S3952	02/17/2016	Drought	Primary

Source: USDA

Figure 4.25: Declared Drought Disasters in Calaveras County



Water Shortage

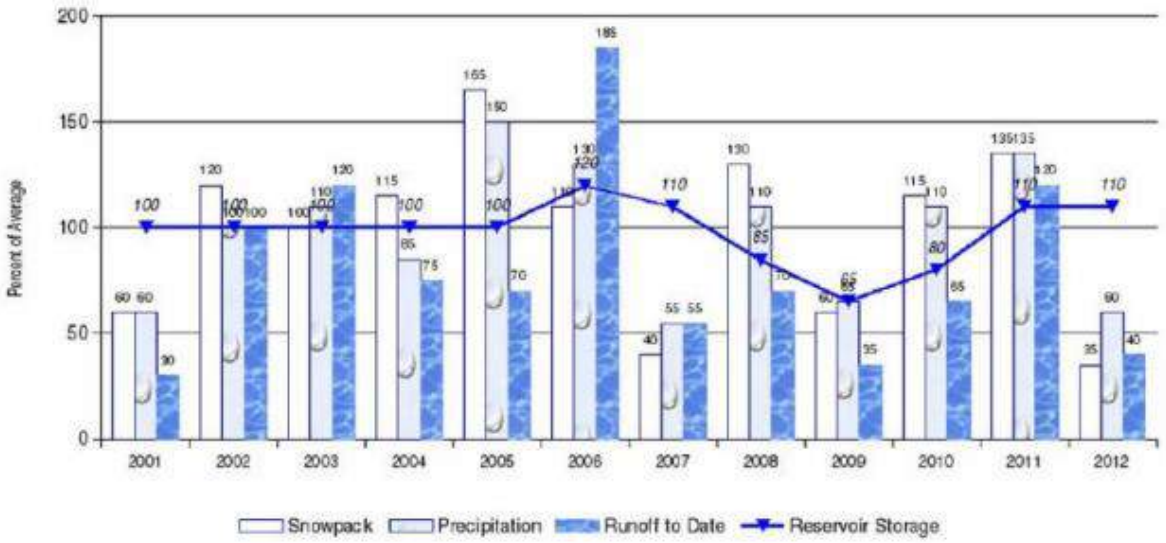
Figure 4.26 illustrates a graph from the 2013 State of California Hazard Mitigation Plan that shows several indicators commonly used to evaluate water conditions in California. The percent of average values are determined by measurements made in each of the ten major hydrologic regions. The chart describes water conditions in California between 2001 and 2012, illustrating the cyclical nature of weather patterns in Calaveras County. Snow pack and precipitation was increasing from 2001-2005 and 2007-2012, with lows in both 2007 and 2012. Runoff was at the highest levels in 2005, exceeding reservoir storage in 2003, 2005, and 2011. Since 2012, snowpack levels in California have dropped dramatically except for the 2016-2017 water year. 2015 estimates place snowpack at 5 percent of normal levels (CAS 2018). Snowpack measurements have been kept in California since 1950 and nothing in the historic record comes close 2015's severely depleted level. The previous record for the lowest snowpack level in California, 25 percent of normal, was set both in 1976-77 and 2013-2014. According to DWR, in "normal" years, the snowpack supplies about 30 percent of California's water needs.

With a reduction in water, water supply issues base on water rights becomes more evident. Some agricultural uses, such as grapes and walnuts, are severely impacted through limited water supply.

Drought and water supply issues will continue to be a concern to the planning area. Irrigation of agricultural lands along the County's western slope will also continue to be a concern in the planning area. California Title 22 Code of Regulations (CFR) allows for reclaimed water to be applied to vineyards and other agriculture areas; however, transporting reclaimed water from a facility to a field is challenging and can be expensive.

The District's 2015 Urban Water Management Plan (UWMP) also addresses drought and water shortage and outlines the District's commitment to reducing the per capita demand of its water customers. To address drought conditions and water supply shortage scenarios, the UWMP outlines the District's multiple water supply sources and water conservation programs (CCWD 2015). The UWMP also determines potential shortages that could occur during a severe drought event, and in some scenarios, considers state-mandated water use restrictions. New regulations also required multiple year drought shortage planning scenarios to be included in CCWD's 2015 UWMP. Additionally, the UWMP includes a comprehensive water shortage contingency plan (CCWD 2015), which was ultimately adopted by CCWD' Board of Directors Ordinance 2016-01 on June 22, 2016. By this ordinance, the District revised the water shortage contingency plan to include five stages of water conservation measures tied to tiered levels of water use reductions to further meet statewide drought planning requirements.

Figure 4.26: Water Supply Conditions, 2001 to 2012



Source: 2013 State of California Hazard Mitigation Plan

Likelihood of Future Occurrences

Drought

Likely—Historical drought data for Calaveras County indicate there have been 5 significant droughts in the last 86 years. This equates to a drought every 17.2 years on average or a 5.8 percent chance of a drought in any given year.

Water Shortage

Likely— Recent historical data for water shortage indicates that Calaveras County is at risk to both short and prolonged periods of water shortage. Based on this it is likely that water shortages will affect the District and the County.

Climate Change

Studies show that drought conditions in California are likely to become more frequent and persistent over the next century due to climate change. The recent drought conditions over the past decade underscore the need to closely understand and examine water supply and distribution, management, conservation, and use policies. According to the CAS, climate change is likely to significantly diminish California's future water supply and the state must change its water management, as climate change will create greater competition for limited water supplies. These water management concerns could also impact the District.

According to the 2015 UWMP and recent 2017 Mokelumne River Long-Term Water Needs Study, specific studies on the Calaveras and Mokelumne River watersheds indicate that changes in

climate in these areas can modify the timing, amount, and form of precipitation, as well as water demands and the quality of surface runoff (CCWD 2015). For example, the 2017 study modelled the reduced availability of water supplies for the District from the Mokelumne River (CCWD 2017). Generally, water demand varies based on precipitation and temperature and changes in these patterns due to climate change could result in increased evaporation that leads to drier soils and a longer growing season, resulting in increased water demand. Therefore, climate change could impact District water supplies by changing the levels of water demand, impacting reservoir water quality and storage capacity, and stressing conveyance systems and treatment plants (CCWD 2015).

4.2.10 Earthquake

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Table 4.20). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.20: Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors; by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.

MMI	Felt Intensity
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

California is seismically active because it sits on the boundary between two of the earth's tectonic plates. Most of the state - everything east of the San Andreas Fault - is on the North American Plate. The cities of Monterey, Santa Barbara, Los Angeles, and San Diego are on the Pacific Plate, which is constantly moving northwest past the North American Plate. The relative rate of movement is about two inches per year. The San Andreas Fault is considered the boundary between the two plates, although some of the motion is taken up on faults as far away as central Utah.

Earthquake Hazards

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction. This section briefly discusses issues related to types of seismic hazards.

Ground Shaking

Ground shaking is motion that occurs because of energy released during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. Damage to structures from this vibration, or ground shaking, is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion. Much of the County is located on alluvium which increases the amplitude of the earthquake wave. Ground motion lasts longer and waves are amplified on loose, water-saturated materials than on solid rock. As a result, structures located on alluvium typically suffer greater damage than those located on solid rock.

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry) are the most susceptible to the type of structural failure that causes injury or death.

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include, but are not limited to: building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained ground shaking.

Liquefaction Potential

Liquefaction, known as a secondary effect of a major earthquake, is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. In other words, soils lose their shear strength and flow or behave as liquid. Areas most prone to liquefaction are those that are water saturated (e.g. where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. Liquefaction also generally occurs in soft, unconsolidated sedimentary soils. In addition to soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction.

In California, liquefaction has occurred during and after major earthquakes and has caused severe damage to structures on level ground from settling. The 1989 Loma Prieta earthquake caused this type of damage in San Francisco on bay-filled areas, even though the epicenter of the earthquake was several miles away.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly

compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to ground shaking is not available.

Other Hazards

Earthquakes can also cause seiches, landslides, and dam failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other factors that could cause flooding. Earthquakes may cause landslides (discussed in Section 4.2.12), particularly during the wet season, in areas of high water or saturated soils. Finally, earthquakes can cause dams to fail (see Section 4.2.7 Dam Failure).

Faults

A fault is defined as "a fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another." There are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant.

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of sidewalks and foundations even without perceptible ground shaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

Calaveras County is in the Sierra Block, an area of historically low seismic activity that is within Seismic Risk Zone 3 and roughly 100 miles east of the seismically active San Francisco Bay area. Identified locations of potential fault activity are near Valley Springs, Mokelumne Hill, and Copperopolis. These faults are part of the Melones-Bear Mountain-Foothills Fault System, which crosses the western portion of the county, but the level of seismic activity associated with this system is unknown.

Potential active faults in the Valley Springs/Mokelumne Hill area are the following:

- Youngs Creek
- Waters Peak
- Poorman Gulch
- Haupt Creek

Potentially active faults in the Copperopolis area are the following:

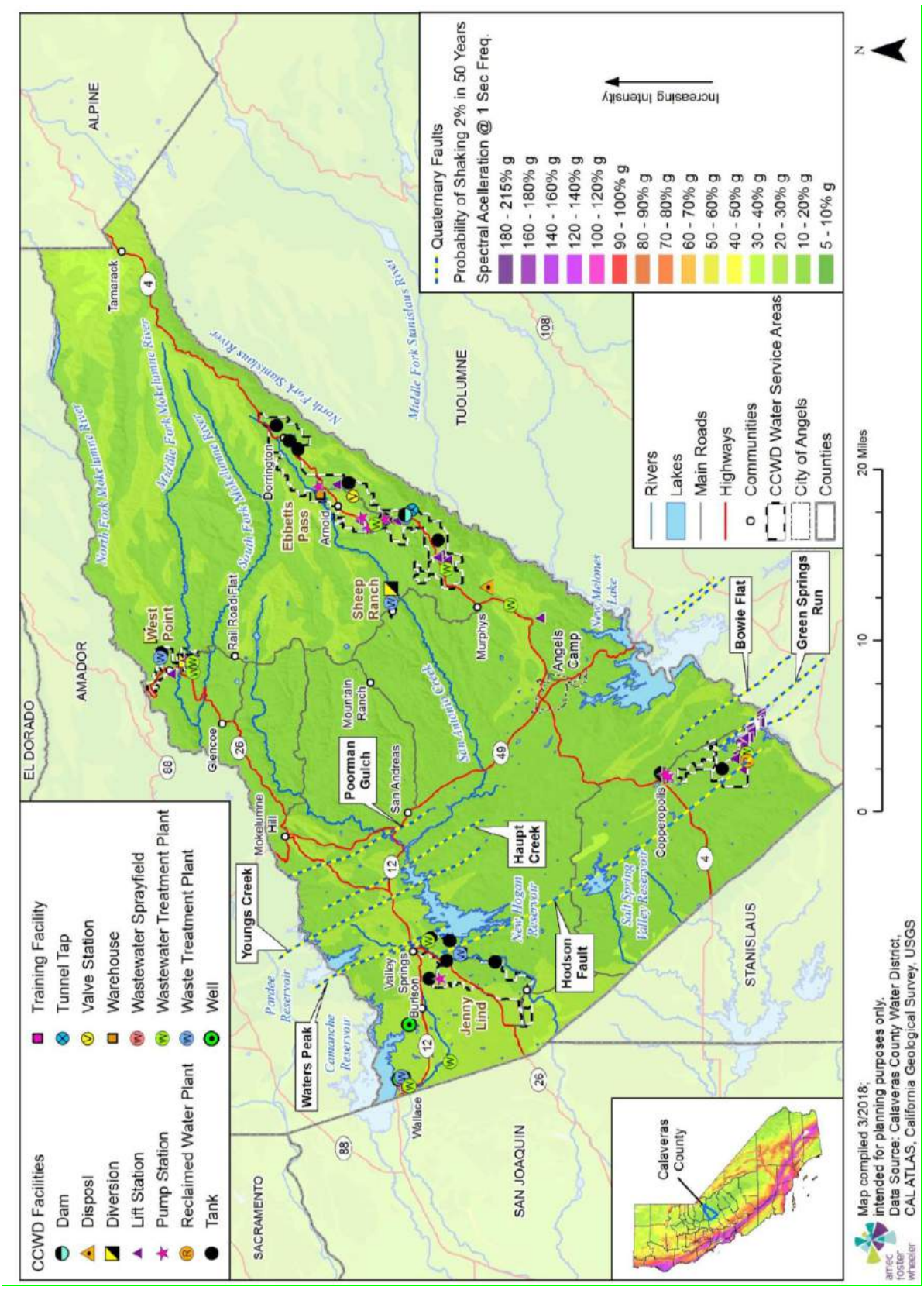
- Bowie Flat

- Green Springs Run
- Rawhide Flat East
- Rawhide Flat West

According to the County's General Plan Update (Safety Element), the County's other potentially active faults include the Bear Mountain and Melones Fault Zones, part of the Foothills Fault System, which pass through the western County near Valley Springs, and Mokelumne Hill and south of Copperopolis. And, according to the HMPC and the California Division of Mines and Geology County Report No. 2 (1962), another potentially active and local fault includes the Hodson Fault zone, which runs near Salt Spring Valley in the eastern portion of Calaveras County has also been known as a potentially active fault (CDMG 1962).

The closest major fault is the Sierra Frontal Fault System along the eastern edge of the Sierra Nevada Range, which includes the Carson Valley fault, located 25 miles northeast of the county. More distant faults located generally to the south across the Central Valley region with the potential to cause ground shaking include the Ortigalita fault, Central Valley Coast Range blind thrust fault, Calaveras fault (Hollister vicinity), Greenville fault, and San Andreas fault. Figure 4.27 below shows the location of faults and ground shaking potential for the region that includes Calaveras County.

Figure 4.27: Ground Shaking and Active Faults in the District



The Emergency Operations Plan (EOP) noted that there are faults that do not traverse the County that may cause shaking effects to occur inside the County. The following is a breakdown of where these faults are located and what kind of hazardous potential they may present to Calaveras County.

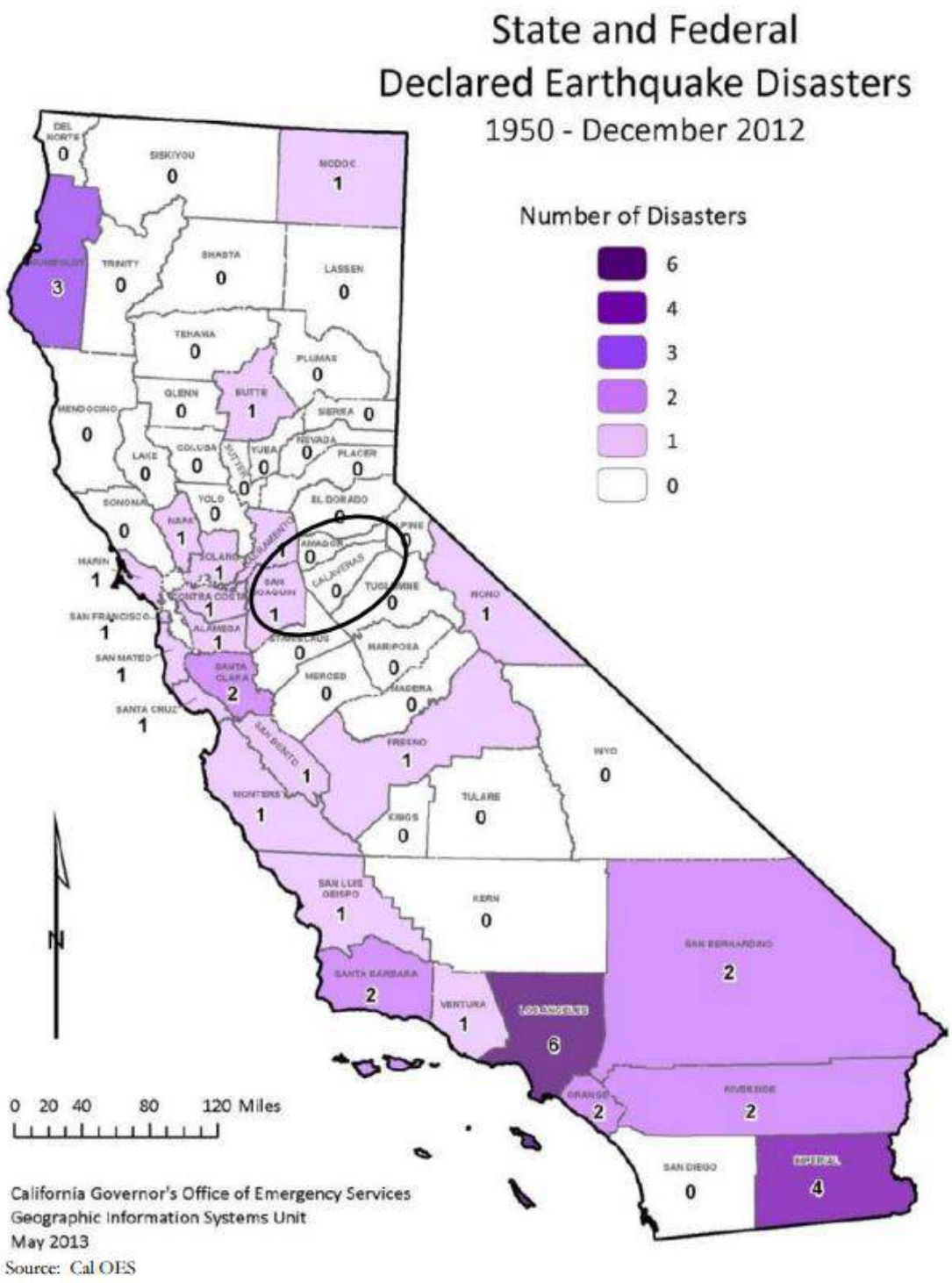
- The Ortigalita Fault, which has been zoned by the State Geologist under the Alquist-Priolo Earthquake Fault Zoning Act, is located in the western portion of Merced County, approximately 13 miles west of Los Banos. The maximum earthquake magnitude measured with the magnitude (Mw) scale on this fault was 7.9 Mw.
- The Central Valley Coast Range Blind Thrust Fault is located parallel to Interstate-5 along the topographic break in slope between the Diablo Range and the San Joaquin Valley. This fault system is seismogenically active, but is not completely mappable at the surface. It increases the design earthquake ground motion for Gustine, Santa Nella, and Los Banos. This fault is the cause of the 1983 Coalinga Earthquake. The maximum earthquake magnitude measured on this fault was 6.8 Mw.
- The Calaveras Fault is an active fault located in the vicinity of Hollister. It is 16 miles west of Pacheco Pass and it lies outside of Merced County. The maximum earthquake magnitude measured on this fault was 6.2 Mw.
- The Greenville Fault is another fault outside of Merced County. It lies approximately 30 miles northwest of Pacheco Pass. This active fault crosses near Livermore and has a maximum earthquake magnitude measurement of 6.9 Mw.
- The San Andreas Fault is the largest and most active fault in California and is located about 24 miles west of Pacheco Pass. Earthquakes on this fault will be the source of long duration but distant ground motion felt within Calaveras County. The maximum earthquake magnitude measured on this fault was a 7.9 Mw.
- The Bear Mountain Fault is also near Merced County. This fault zone is located about 10 miles east of the Merced County line and about 30 miles from Calaveras County along the foothills of the Sierra Nevada. This fault is not an active fault and is not modeled as seismogenically active for purposes of regional earthquake ground motion.

While there is no record of any seismic activity originating in the County, the County has been shaken by earthquakes originating elsewhere. Calaveras County has been very fortunate in the past that is it has not suffered any substantial damage or loss of life from earthquakes. The possibility of future earthquakes of equal or greater magnitude than those from previous years could cause a great many casualties and extensive property damage in the County. This could be aggravated by aftershocks and by secondary effects of fire, landslides, and dam failures.

Past Occurrences

According to Cal OES, there has never been a state disaster declaration (Figure 4.28) for an earthquake in Calaveras County or in any of the surrounding counties, and there is no record of damaging earthquakes. However, the Calaveras County General Plan (1996) does note that ground shaking has been felt in the past, notably during the Mono Lake earthquake in October 1990.

Figure 4.28: State and Federal Declared Earthquake Disasters



In addition, the USGS Earthquake Database contains data on earthquakes in the Calaveras County area. Table 4.21 shows the approximate distances earthquakes can be felt away from the epicenter. According to the table, a magnitude 5.0 earthquake could be felt up to 90 miles away. The USGS

database was searched for magnitude 5.0 or greater on the Richter Scale within 90 miles of the City of Angels Camp in Calaveras County. The search parameters and results are shown in Table 4.22. No specific damage reports within the County were available.

Table 4.21: Approximate Relationships between Earthquake Magnitude and Intensity

Richter Scale Magnitude	Maximum Expected Intensity (MM)*	Distance Felt (miles)
2.0 - 2.9	I – II	0
3.0 - 3.9	II – III	10
4.0 - 4.9	IV – V	50
5.0 - 5.9	VI – VII	90
6.0 - 6.9	VII – VIII	135
7.0 - 7.9	IX – X	240
8.0 - 8.9	XI – XII	365

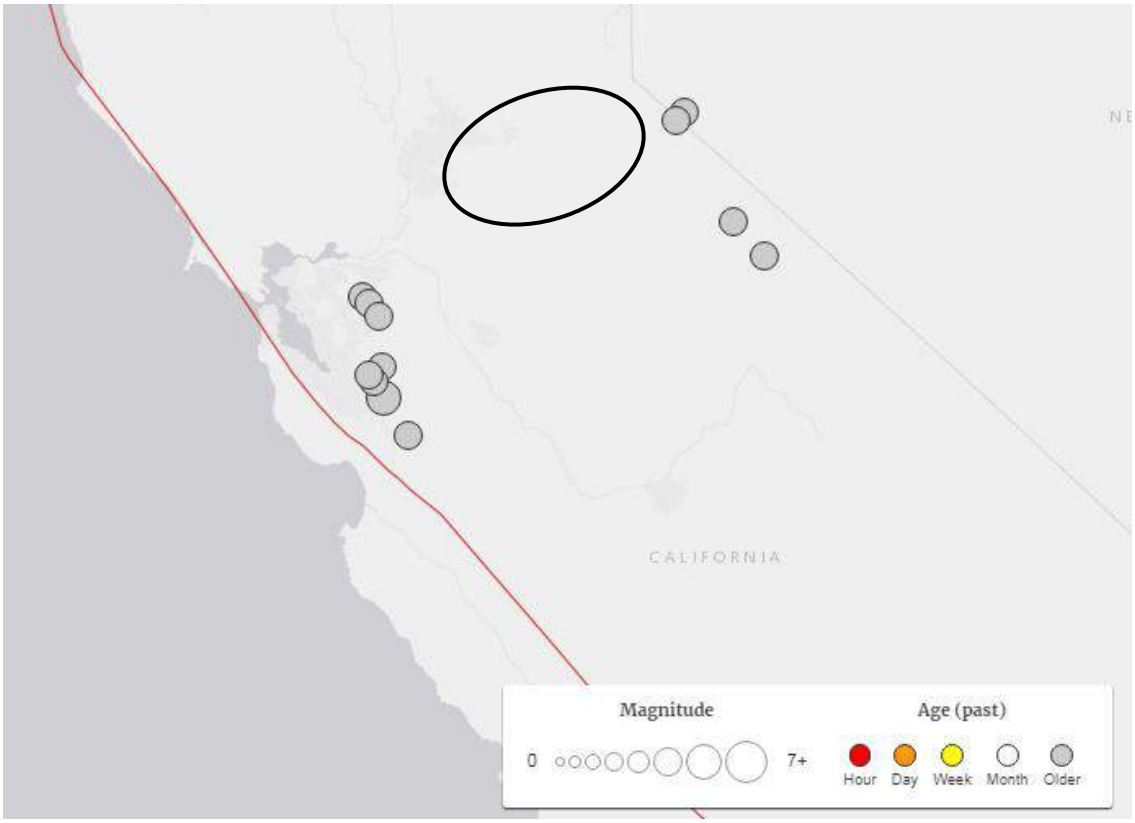
*Modified Mercalli Intensity Scale.
Source: United States Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.

Table 4.22: Magnitude 5.0 Earthquakes within 90 Miles of Calaveras County*

Date	Magnitude	Distance from Calaveras County
9/4/1978	5.2	62 miles
8/6/1979	5.7	78 miles
10/7/1979	5.2	63 miles
1/24/1980	5.8	68 miles
1/27/1980	5.8	67 miles
11/28/1980	5.2	82 miles
1/71983	5.4	88 miles
4/24/1984	6.2	79 miles
1/241985	5.3	90 miles
3/311986	5.7	72 miles
6/13/1988	5.4	79 miles
10/24/1990	5.7	72 miles
1/16/1993	5.3	84 miles
9/12/1994	6.1	68 miles
9/12/1994	5.4	60 miles
12/22/1995	5.2	69 miles
12/23/1995	5.2	71 miles
12/28/1995	5.5	70 miles
10/31/2007	5.6	78 miles

Source: USGS
*Search dates 1973- February 12, 2018

Figure 4.29: USGS Search Results Magnitude 5.0 Earthquakes within 90 Miles of Calaveras County*



Source: USGS
*Search dates 1973- February 12, 2018
Black circle denotes planning area

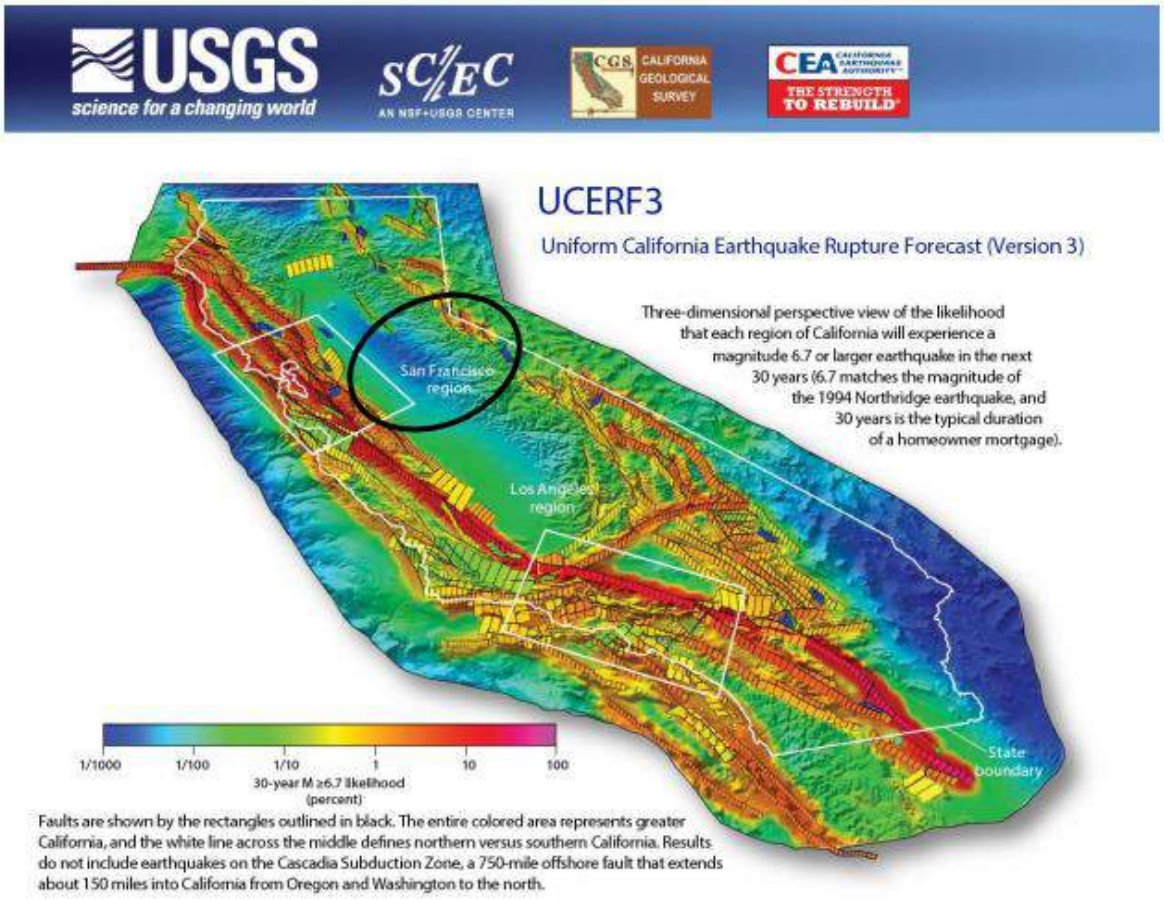
Likelihood of Future Occurrences

Occasional/Unlikely – The State of California Multi-Hazard Mitigation Plan ranks the earthquake hazard for the majority of Calaveras County at its lowest earthquake risk. The California Geological Survey's probabilistic seismic assessment for Calaveras County estimates that peak ground acceleration could reach or exceed 0.1 to 0.2 g (intensity value I on the Modified Mercalli Intensity Scale, see Table 4.20) with a 0.21 percent chance of being exceeded each year. Thus, based on patterns of previous occurrences, probability of ground shaking is occasional, with a 1-10 percent chance of occurrence in the next year. The probability of a large, damaging earthquake is unlikely, with less than a 1 percent chance of occurrence in next 100 years. In sum, the likelihood of future occurrence of minor earthquakes is occasional, and the likelihood of future occurrence of major earthquake is unlikely.

In 2014, the United States Geological Survey (USGS) and the California Geological Survey (CGS) released the time-dependent version of the Uniform California Earthquake Rupture Forecast (UCERF II) model. These were the first statewide peer reviewed forecasts and Next Generation

Attenuation (NGA) ground motion prediction efforts undertaken. The UCERF II results have helped to reduce the uncertainty in estimated 30-year probabilities of strong ground motions in California. The UCERF map is shown in Figure 4.30 and indicates that Calaveras County has a lower risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

Figure 4.30: Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



Source: United States Geological Survey Open File Report 2015-3009

4.2.11 Flood: 100-/500-year and Flood: Localized Stormwater Flooding

Hazard/Problem Description

100-/500-year Flood

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. According to Cal DWR, flooding is the rising and overflowing of a body of water onto normally dry land. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water

can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utilities lines and interrupt services. Standing water can cause damage to crops, road, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts from any type of flooding.

There are three types of flood events in the Calaveras County area: riverine, flash, and urban stormwater. Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reaches.

- **Riverine flooding** is the most common type of flood event and occurs when a watercourse exceeds its "bank-full" capacity. Riverine flooding generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. The duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. The warning time associated with slow rise floods assists in life and property protection.
- **Flash flood** describes localized floods of great volume and short duration. In contrast to riverine flooding, this type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour.
- **Stormwater/Urban flood** events have increased as land has been converted from fields or woodlands to roads and parking lots and lost its ability to absorb rainfall. Urbanization increases runoff by two to six times that of natural terrain.

Other types of floods include general rain floods, thunderstorm floods, snowmelt and rain on snow floods, dam failure floods, and local drainage floods. This last type of flooding is discussed in greater detail in Section **Error! Reference source not found.**.

Volume, onset, and duration characteristics for different types of floods are described below:

- **Snowmelt**—Flooding is characterized by moderate peak flows, large volume of runoff, moderate speed of onset, long duration, and marked daily fluctuation of flow.
- **Rain in a general storm system**—Flooding is characterized by high peak flows and moderate speed of onset and duration of flood flows.

- **Rain in a localized intense thunderstorm**—Flooding is characterized by high peak flows, relatively sudden onset, short duration of flow, and smaller volumes of runoff.

The potential for flooding can change and increase through various land use changes and changes to land surface, resulting in a change to the floodplain. Environmental changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity

Health Hazards from Flooding

According to FEMA, certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e. coli and other disease-causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

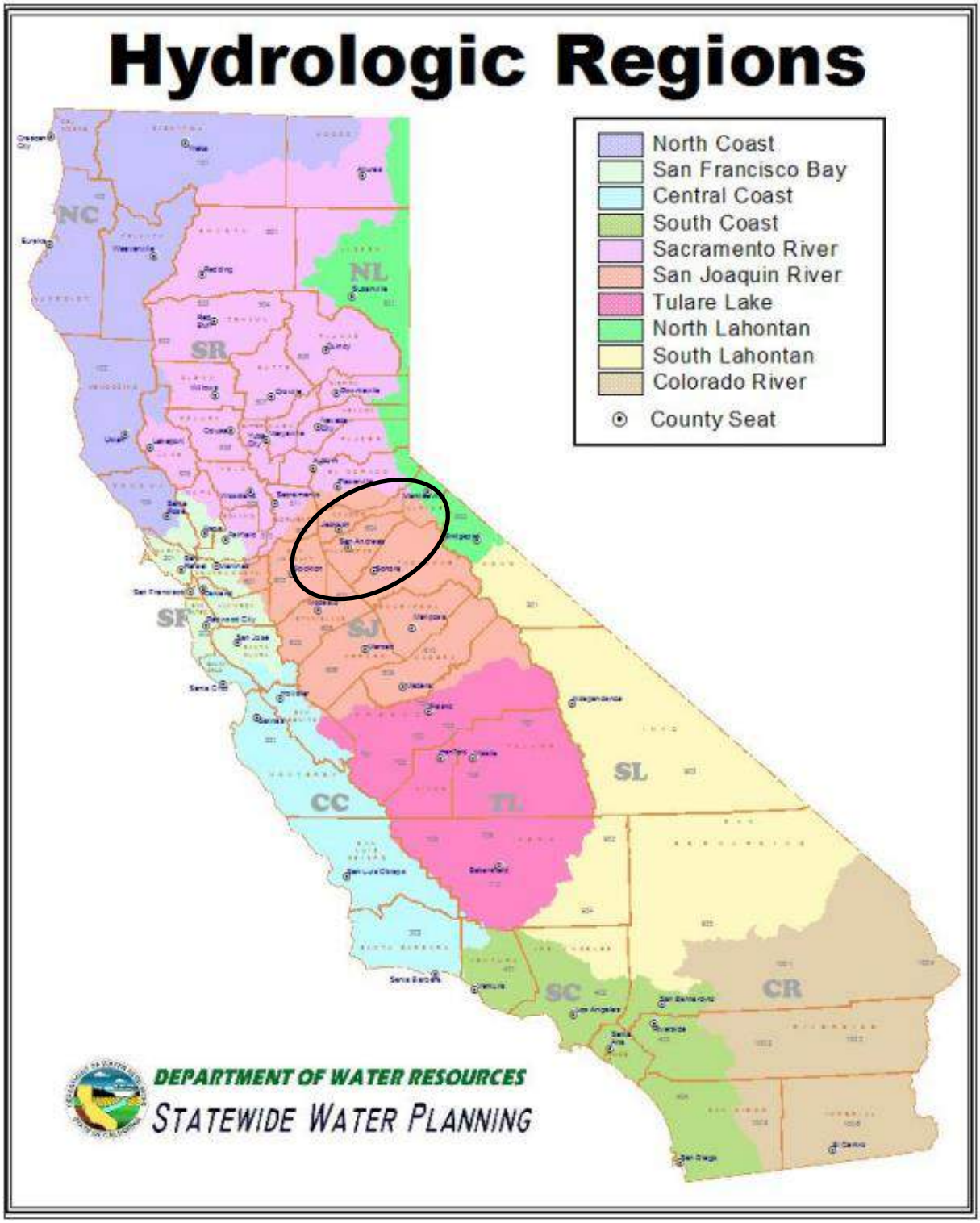
Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If a water system loses pressure, a boil order may be issued to protect people and animals from contaminated water. The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Major Sources of Flooding

California is divided into 10 hydrologic regions, and CCWD is in the San Joaquin region, which encompasses the middle portion of the Central Valley bounded by the Sierra Nevada Mountains, the Coast Range, the divide between the American and Consumnes river watersheds, and the

divide between the San Joaquin and Kings River watersheds. The region also includes portions of the Sacramento-San Joaquin Delta. Although predominantly agricultural, this region has experienced increased urbanization in recent years and is subject to flooding from winter storm events and snowmelt. A map of the California's hydrological regions is provided below in Figure 4.31.

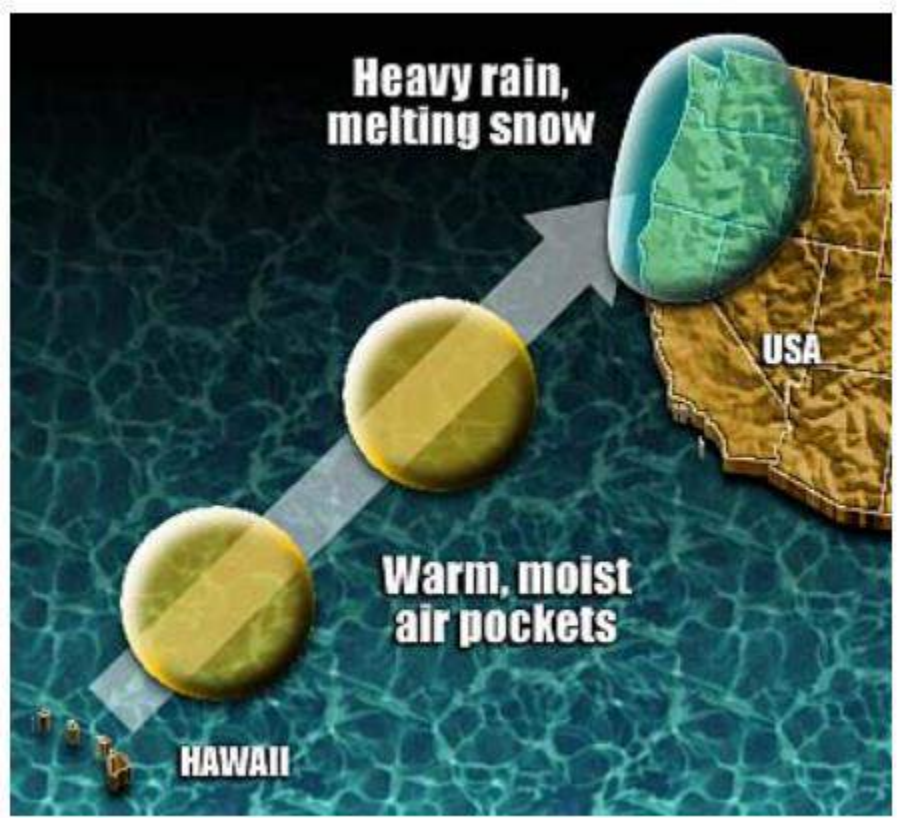
Figure 4.31: California Hydrologic Regions



Calaveras County encompasses multiple rivers, streams, creeks, and associated watersheds. The County is situated in a region that dramatically drops in elevation from the eastern portion (Sierra Nevada) to the western portion, where excess rain on snow can contribute to downstream flooding. Damaging floods in Calaveras County occur primarily in the developed areas of the county. Flood flows generally follow defined stream channels, drainages, and watersheds. A weather pattern called the "Pineapple Express" contributes to the flooding potential of the area.

Pineapple express brings warm air, rain to West. A relatively common weather pattern brings southwest winds to the Pacific Northwest or California, along with warm, moist air. The moisture sometimes produces many days of heavy rain, which can cause extensive flooding. The warm air also can melt the snow pack in the mountains, which further aggravates the flooding potential. In the colder parts of the year, the warm air can be cooled enough to produce heavy, upslope snow as it rises into the higher elevations of the Sierra Nevada or Cascades. Forecasters and others on the West Coast often refer to this warm, moist air as the "Pineapple Express" because it comes from around Hawaii where pineapples are grown. This weather pattern is shown in Figure 4.32.

Figure 4.32: Pineapple Express Weather Pattern



Source: USA TODAY research by Chad Palmer. http://www.usatoday.com/weatherwpinappl.htm

In Calaveras County, flooding may occur from heavy rainfall on saturated soils, rapid snowmelt, or a combination of these factors. Riverine flooding along the main channels of the Mokelumne and Stanislaus Rivers, mid-elevation tributaries of the Mokelumne, and the upper reaches of the Calaveras usually results from heavy snowmelt in combination with heavy rainfall. In the western portion of the county, the sources of flooding are heavy rainfall associated with repeated winter storms and a saturated soil mantle. Summer thunderstorms can also lead to flooding (Calaveras County General Plan 1996). Flooding sources that could affect the District are shown in Table 4.23.

Table 4.23: Major Sources of Flooding in the Calaveras County Water District

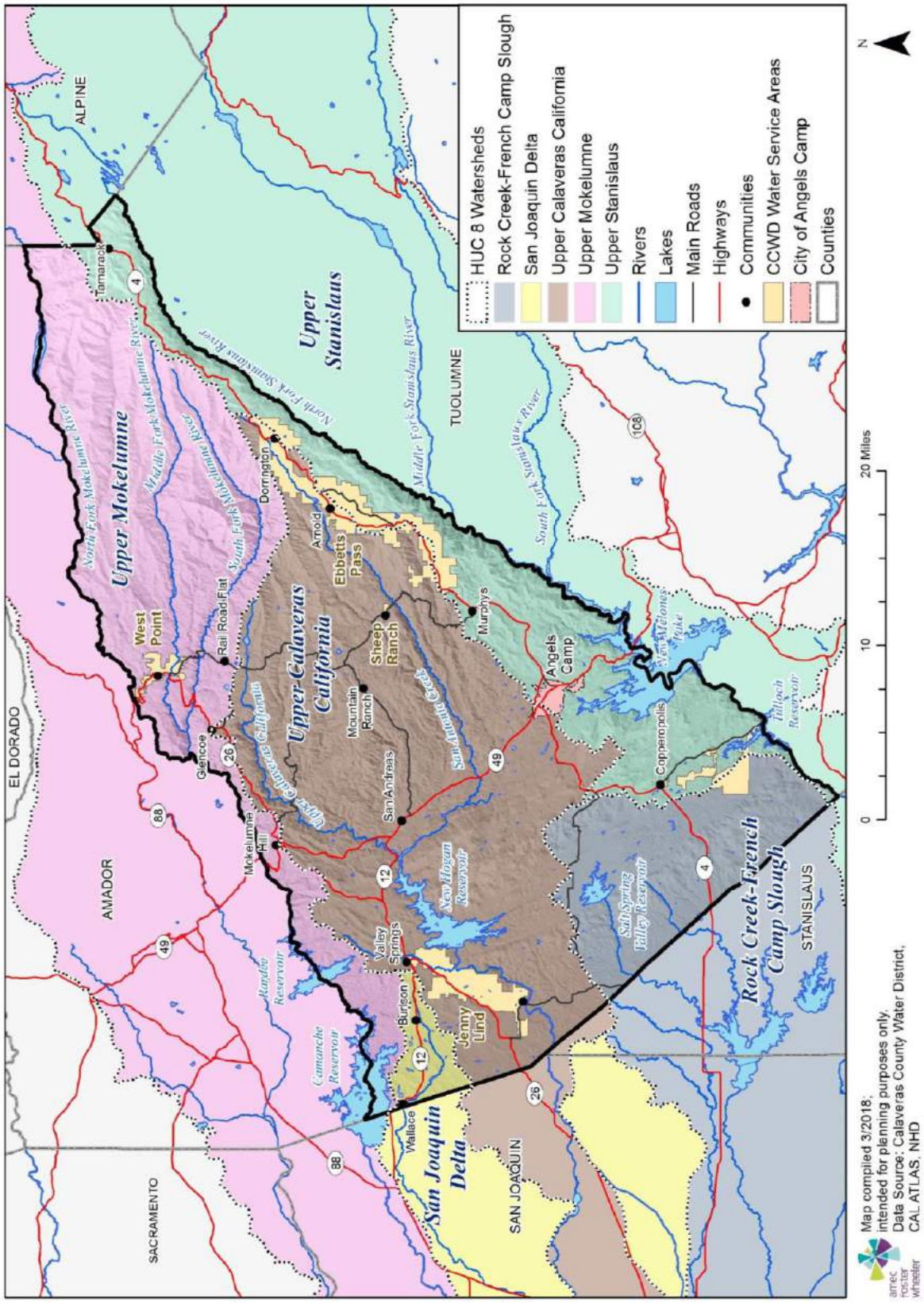
Service Area	FEMA Flood Zone	Flooding Sources
Copper Cove/Copperopolis	Zone A	Stanislaus River, unnamed tributaries
Ebbetts Pass	Zones A, Zone AE	Big Trees Creek, Mill Creek, Moran Creek San Antonio Creek, San Domingo Creek, unnamed tributaries
Jenny Lind	Zones A, Zone AE	Calaveras River, Cosgrove Creek, Indian Creek, Spring Valley Creek, unnamed tributaries
Sheep Ranch	Zone A	Unnamed tributaries
Wallace	Zone A; 0.2 Percent Annual Chance Flood Hazard	Camacnche Reservoir, Pardee Reservoir, North Fork Mokelumne River, Unnamed tributaries
West Point	Zone A	Middle Fork Mokelumne River, unnamed tributaries

Source: FEMA

According to mapping done by the California Department of Conservation, Calaveras County intersects many watersheds. There are numerous small creeks that are tributaries to the major waterways. Waterways and watersheds in the County are shown in Figure 4.33. The five primary watersheds in the County are:

- Upper Calaveras California
- Upper Stanislaus River
- Upper Mokelumne River
- Rock Creek-French Camp Slough
- San Joaquin Delta

Figure 4.33: Waterways and Watersheds in Calaveras County



Although predominantly agricultural, this region has experienced increased urbanization in recent years and is subject to flooding from winter storm events and snowmelt. The western quarter of Calaveras County contains the majority of the properties and facilities that could be impacted by flooding.

In Calaveras County, the Flood Insurance Study (FIS) reports that flooding may occur from heavy rainfall on saturated soils, rapid snowmelt, or a combination of these factors. Riverine flooding along the main channels of the Mokelumne and Stanislaus Rivers, mid-elevation tributaries of the Mokelumne, and the upper reaches of the Calaveras usually results from heavy snowmelt in combination with heavy rainfall. In the western portion of the county, the sources of flooding are heavy rainfall associated with repeated winter storms and a saturated soil mantle.

Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping and associated products is provided in the following paragraphs.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Calaveras County FISs are dated December 17, 2010.

Digital Flood Insurance Rate Maps (DFIRM) and National Flood Hazard Layers

As part of its Map Modernization program, FEMA is converting paper FIRMS to digital FIRMs, DFIRMS. These digital maps:

- Incorporate the latest updates (Letter of Map Revision (LOMRs), which are FEMA's modification to an effective FIRM, or Flood Boundary and Floodway Map, or both and Letter of Map Amendments (LOMAs), which are official amendments, by letter, to an effective NFIP map;
- Utilize community supplied data;
- Verify the currency of the floodplains and refit them to community supplied basemaps;
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications; and
- Solicit community participation.

DFIRMs for Calaveras County were released December 17, 2010 and are used for this plan's flood hazard analysis. The National Flood Hazard Layers for the County with the latest LOMRs were updated on August 2, 2017. The DFIRMS data layers for Calaveras County are shown in Figure 4.34 through Figure 4.36; which include zoomed in versions of the eastern and western portions of the County.

Figure 4.34: Calaveras County FEMA Flood Hazards

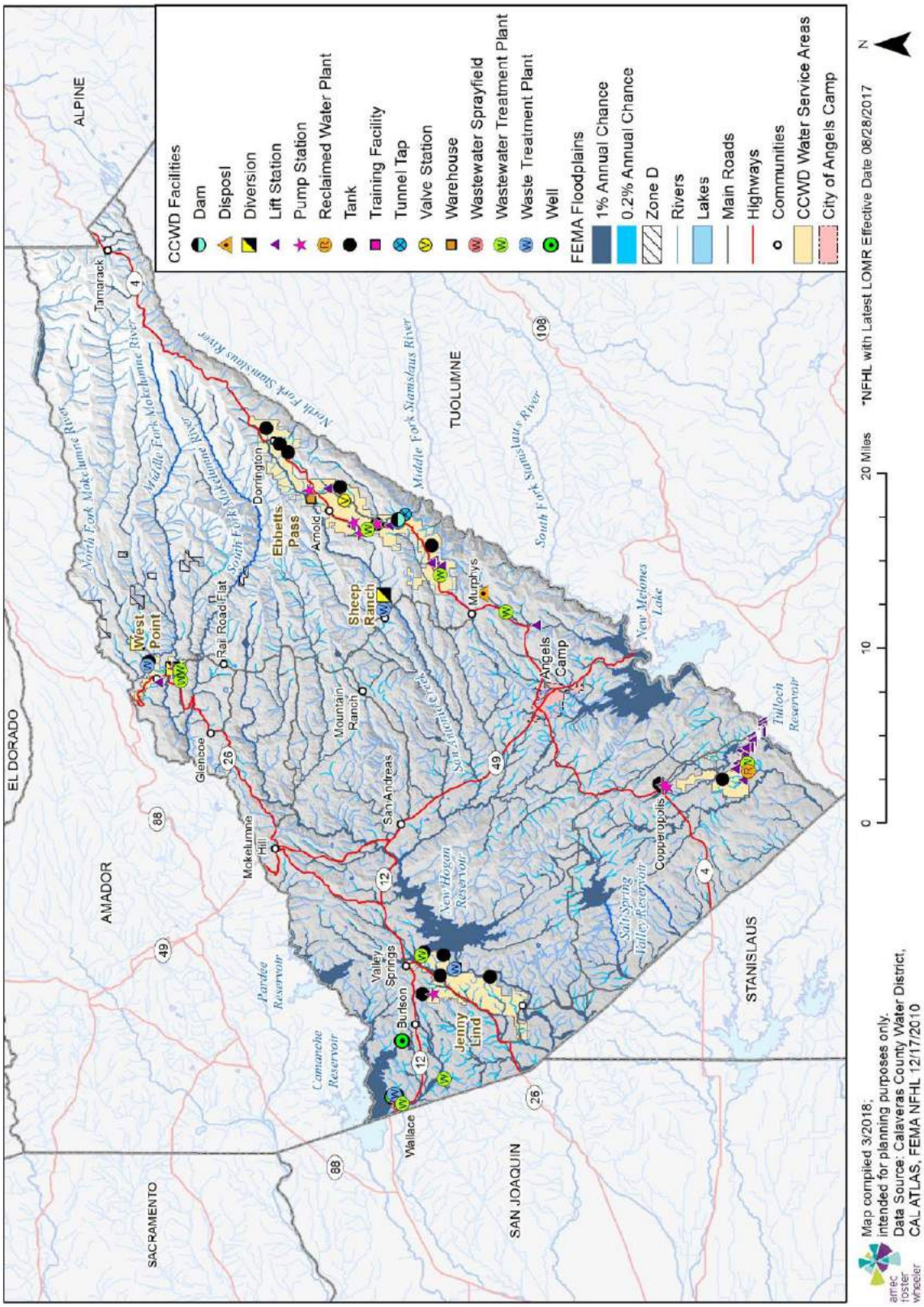


Figure 4.35: East Calaveras County FEMA Flood Hazards

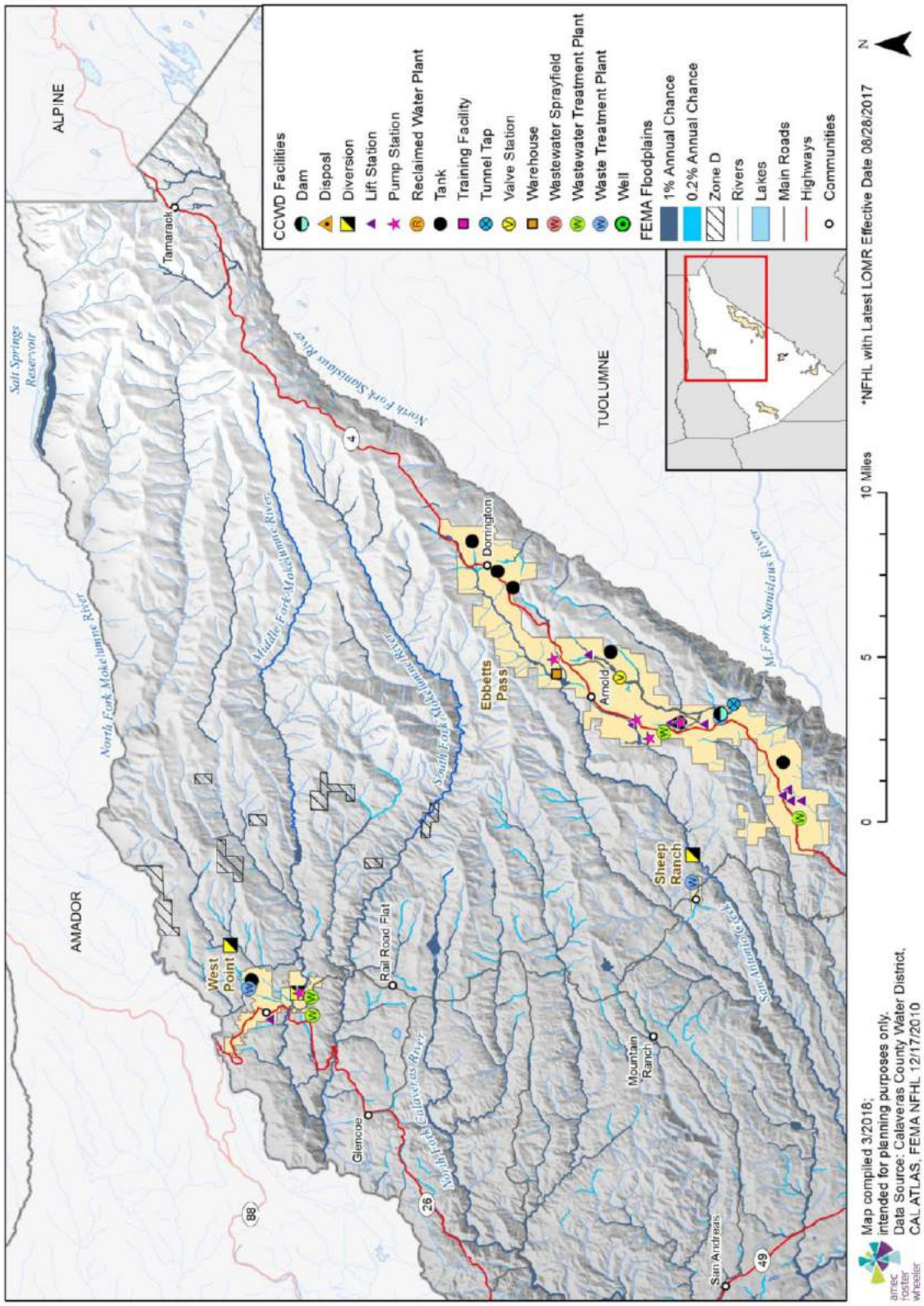
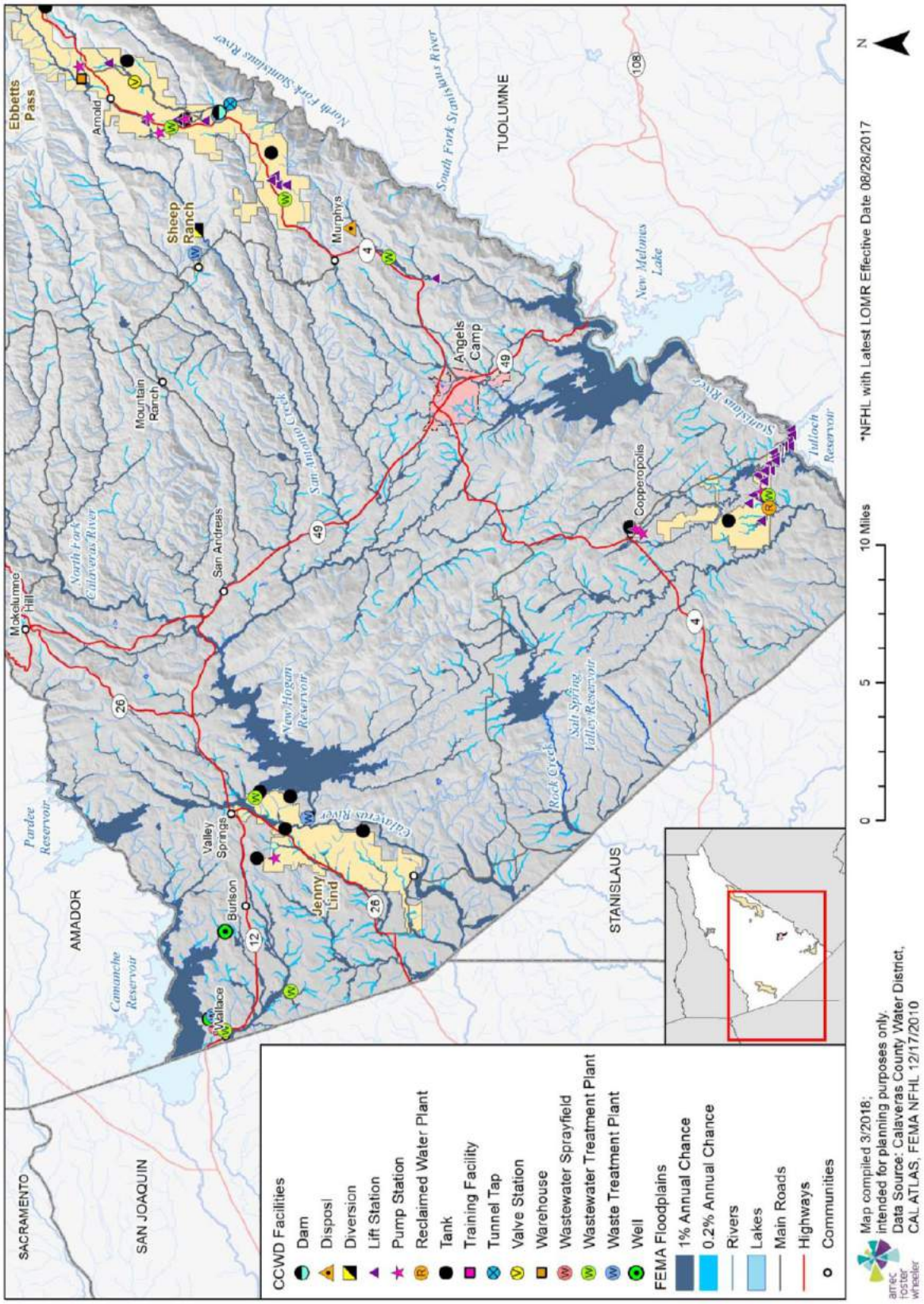


Figure 4.36: West Calaveras County FEMA Flood Hazards



Department of Water Resource (DWR) Floodplain Mapping

Also, to be considered when evaluating the flood risks in Butte County are various floodplain maps developed by the California Department of Water Resources (DWR) for various areas throughout California, including Calaveras County.

DWR Best Available Maps

The Best Available Maps were developed pursuant to Senate Bill 5 which requires DWR to develop preliminary maps for the 100- and 200-year floodplains located within the Sacramento-San Joaquin Valley watershed. These maps were developed by DWR to better reflect the most accurate information about the flooding potential in a community and were designed to provide a better understanding of the true risk of flooding to public safety and property. SB 5 requires that these preliminary maps be provided as best available information on flood protection to cities and counties in the watershed for: 1) areas protected by State-Federal project levees, and 2) areas outside the protection of project levees.

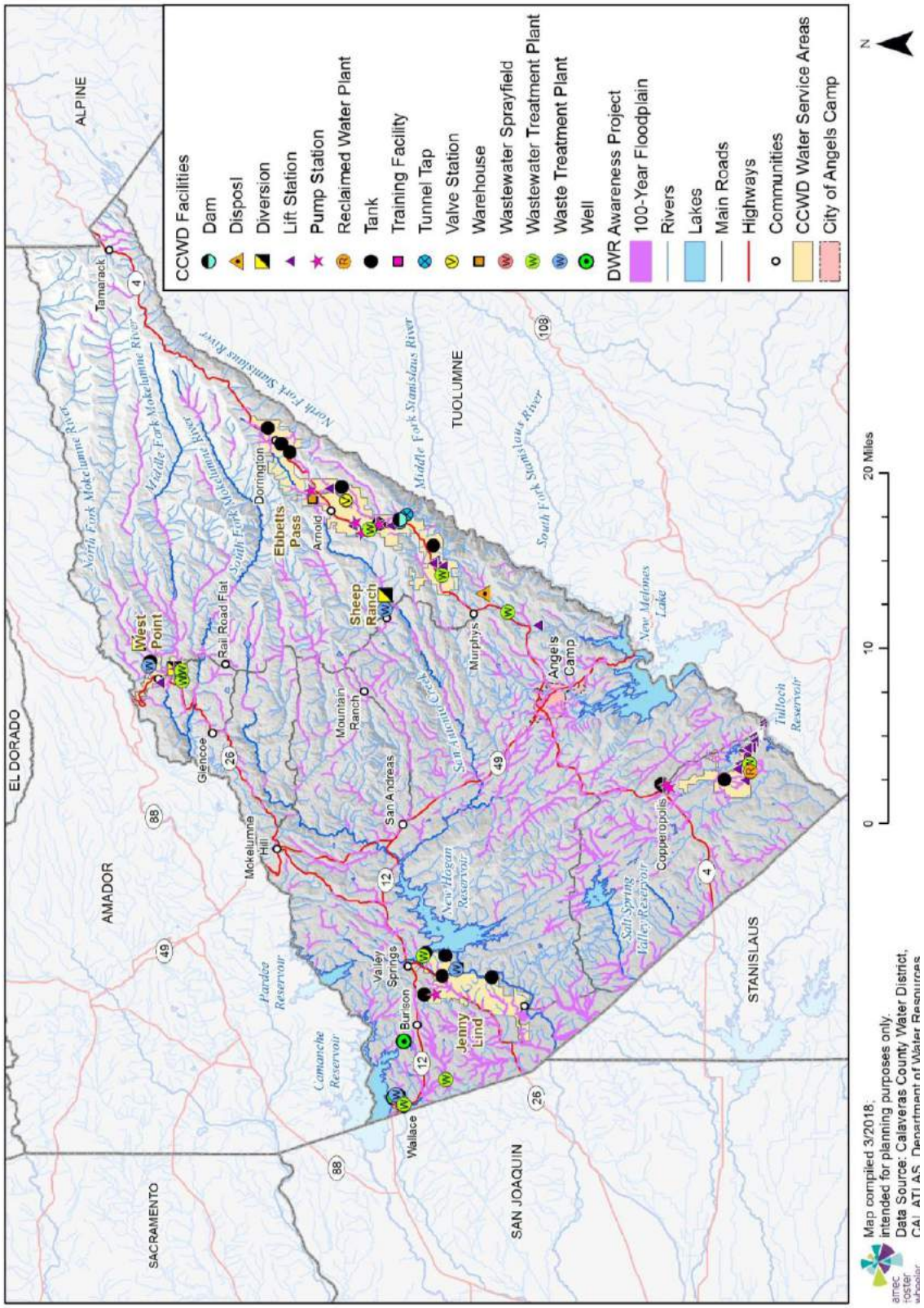
The new maps, compiled using information from state, local and federal agencies, have no regulatory status for floodplain development and are for information only. They do not replace existing FEMA regulatory floodplain maps (i.e., FIRMs and DFIRMs) and therefore do not make any changes in federal flood insurance requirements for homes and businesses. However, city and county governments will be able to use the maps to identify areas that warrant further study and to help make informed floodplain management and land use decisions. The floodplains shown on these maps delineate areas with potential exposure to flooding for two different storm events: one with storm flows that have a 1 percent chance of being equaled or exceeded in any year (100-year) and one with storm flows that have a 0.5 percent chance of being equaled or exceeded in any year (200-year).

These advisory maps will help communities begin early planning activities to meet SB 5 requirements calling for a minimum of 200-year protection for new development in urban and urbanizing areas. These "best available" floodplain maps can be accessed online at: http://gis.bam.water.ca.gov/bam/.

DWR Awareness Floodplain Maps

The Flood Awareness Maps, developed under the Flood Awareness Mapping Project, are designed to identify all pertinent flood hazard areas by 2015 for areas that are not mapped under the FEMA NFIP and to provide the community and residents an additional tool in understanding potential flood hazards currently not mapped as a regulated floodplain. The awareness maps identify the 100-year flood hazard areas using approximate assessment procedures. As seen in Figure 4.37, the floodplains are shown on these maps simply as flood prone areas without specific depths and other flood hazard data. The DWR Awareness BAM layers are near the eastern edge of Calaveras County.

Figure 4.37: Calaveras County DWR Awareness Project



Levee Flood Protection Zones (LFPZ) Maps

LFPZ maps represent floodplain areas protected by Central Valley State-Federal Project Levees. Under Water Code Section 9110(b), "LFPZ" means the area, as determined by the Central Valley Flood Protection Board or DWR, that is protected by a project levee. These maps were developed based on the best available information as required by Assembly Bill 156. This Bill requires DWR to prepare LFPZ maps to identify the areas where flood levels would be more than three feet deep if a project levee were to fail. DWR delineated the LFPZs by estimating the maximum area that may be flooded if a project levee fails with flows at maximum capacity that may reasonably be conveyed. DWR is using information from several sources, including FEMA floodplain maps, FEMA Q3 data, USACE's 2002 Sacramento and San Joaquin River Basins Comprehensive Study, and local project levee studies. Using this data, DWR is implementing a multi-year program to evaluate and delineate detailed floodplains for areas protected by project levees. This effort includes new topography, hydrology, hydraulic models, and floodplain maps. This information will be used to update the initial LFPZ maps. LPFZ maps can be accessed at: http://gis.lfpz.water.ca.gov/lfpz/.

Localized Stormwater Flooding

Localized, stormwater flooding also occurs throughout the County. Urban storm drainpipes and pump stations have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms occur over areas of development.

According to the County, numerous parcels and roads throughout the County not included in the FEMA 100- and 500-year floodplains are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, mudslides, debris areas, and downed trees. The frequency and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. Also, according to the HMPC there are numerous areas where District facilities have been subject to flooding during heavy rain events. The most recent flood events occurred in 2017 and localized flooding washed out a road and exposed District water and sewer pipelines at White Pines Reservoir near Arnold. As a result, the District has been evaluating more frequent flood intervals near this facility. And, according to the UWMP began addressing increased variability and flooding resulting from larger precipitation events and those impacts on supply reliability (CCWD 2015). The Jenny Lind Water Treatment Plant (which was pointed out in the previous LHMP of 2006 and 2012) and all Wastewater Treatment Plant Effluent Ponds are at risk to localized flooding.

Past Occurrences

This section deals with past occurrences of both 100-/500-year flooding and localized flooding. The state and federal declarations for storms and flooding were in 1950, 1955, 1958, 1969, 1980, 1982, 1995, 1997, 1998, 2006, and 2010.

The NCEI database tracks flooding for Calaveras County. Entries into the NCDC database since 1993 for Calaveras County are shown in Table 4.24.

Table 4.24: NCEI Flooding Events for Calaveras County 1993 to 2014

Hazard Type	Date	Injuries*	Fatalities*	Property Damage*	Crop Damage*
Flood	1/23/1996	0	0	$1,000,000	$0
Flood	1/24/1996	0	0	$0	$0
Flood	1/27/1996	0	0	$0	$0
Flood	2/3/1996	2	0	$0	$0
Flood	2/18/1996	0	0	$0	$0
Flood	5/16/1996	0	0	$5,000,000	$0
Flood	12/7/1996	0	0	$7,000,000	$0
Flood	12/12/1996	0	0	$0	$0
Flood	12/22/1996	0	0	$10,000	$0
Flood	12/29/1996	0	0	$20,000	$0
Flood	12/30/1996	0	1	$0	$0
Flood	12/31/1996	0	0	$0	$0
Flood	1/1/1997	2	0	$376,300,000	$0
Flood	1/3/1997	0	1	$0	$0
Flood	9/25/1997	0	0	$0	$0
Totals		4	2	$389,330,000	$0

Source: NCEI

*Injuries, fatalities, and damage figures are for the event as a whole, and not solely for Calaveras County

Based on SHELDUS data from 1960 to 2012, Calaveras County has experienced numerous flood events. A description of flood events in Calaveras County is shown in Table 4.25.

Table 4.25: SHELDUS Winter Weather Events for Calaveras County 1960 to 2010

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
2/17/1986	2/18/1986	Flooding	0	0	$50,000	$0	Flash Flooding
12/22/1996	12/23/1996	Flooding	0	0	$2,000	$0	Floods
2/2/1998	2/28/1998	Flooding	0	0	$390,909	$709,090	Flood
2/3/1998	2/21/1998	Flooding	0	0.17	$0	$0	Flood
2/9/1999	2/9/1999	Flooding	0	0	$20,000	$0	Floods
1/23/2000	1/24/2000	Flooding	0	0	$4,000.00	$0	Flood
2/11/2000	2/14/2000	Flooding	0	0	$6,428	$0	Flood
1/16/1973	1/16/1973	Flooding - Severe Storm/Thunder Storm	0	0	$86,206	$0	Heavy Rains, Floods
3/1/1995	3/31/1995	Flooding - Severe Storm/Thunder Storm - Wind	0	0	$0	$11,241,379	Flood, Rain, Winds

Hazard Begin Date	Hazard End Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
12/10/1992	12/11/1992	Flooding - Wind - Winter Weather	0	0	$1,315	$0	Winter Storm, High Wind, Flash Flood
2/11/1992	2/13/1992	Flooding - Winter Weather	0	0	$11,627	$0	Winter Storm, Flash Flood
2/14/1992	2/16/1992	Flooding - Winter Weather	0	0	$9,090	$0	Winter Storm, Flash Flood
2/9/2017	2/10/2017	Flooding	0	0	$7,000,100	$0	Winter Storm, Flash Flood, Heavy Snow
Total			**0**	**0.17**	**$7,581,679**	**$11,950,470**	

Source: SHELDUS

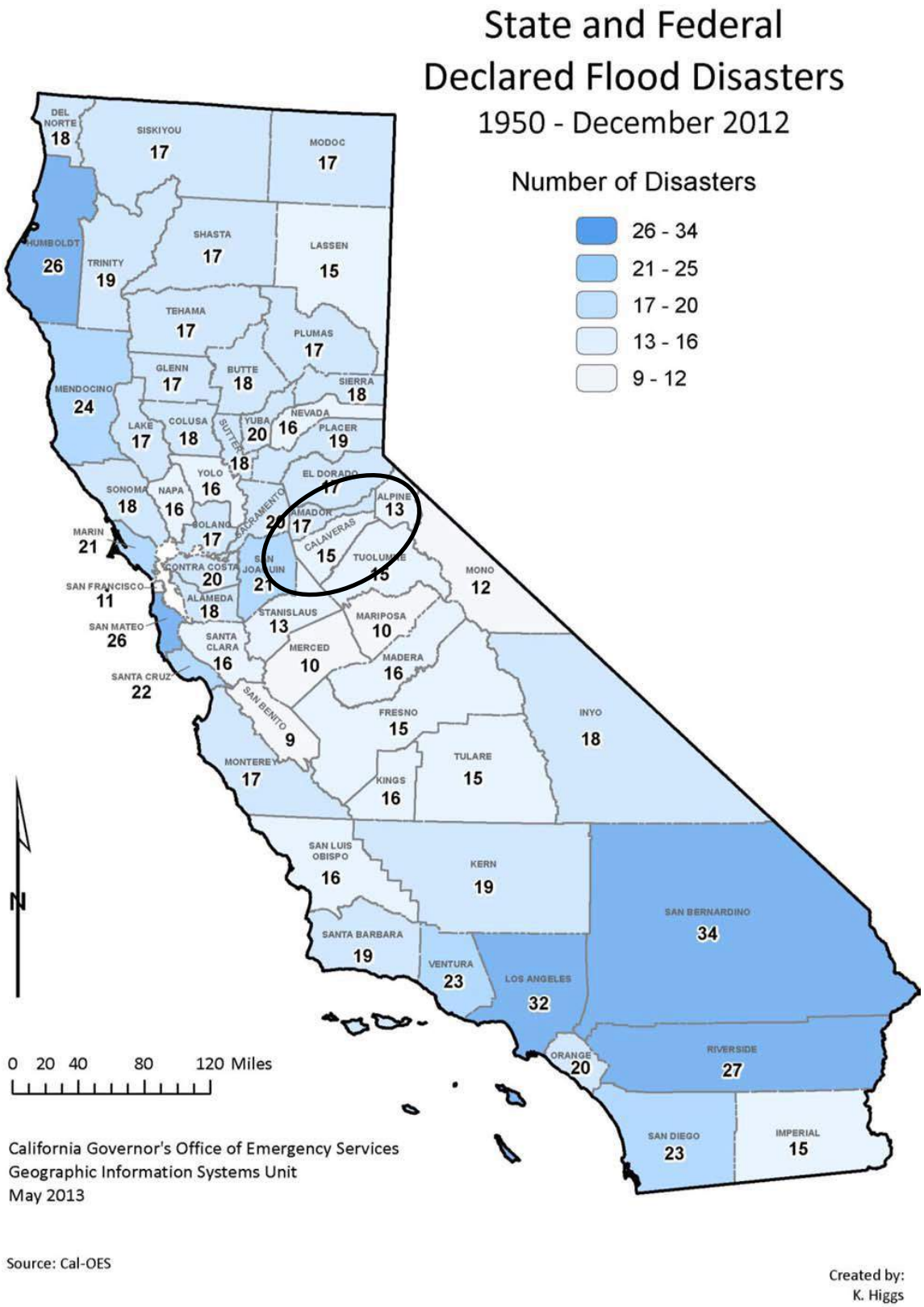
Details on recent floods from the NCEI are provided below:

- **January 1997**: Heavy rains caused a mudslide along Highway 4 in Calaveras County and led to overtopping of Don Pedro Dam in Tuolumne County, resulting in 300 square miles of land flooded and 23,000 homes and 2,000 businesses damaged or destroyed.
- **January 12, 1998**: Heavy rains from a strong Pacific storm caused widespread but minor flooding across the Sacramento and Northern San Joaquin Valleys and nearby foothills. Hundreds of traffic accidents occurred on the highways and city streets throughout the region.
- **February 9, 1999**: A flash flood near Valley Springs in Calaveras County occurred when Cosgrove Creek left its banks and flooded four homes and a low-lying golf course. The flood threatened sewage treatment ponds, temporarily closed Highway 26, and caused $20,000 in property damage.
- **January 10, 2001**: Automated rain gages throughout Tuolumne and Calaveras counties commonly measured two to three inches of rain in 24 hours. The Gianelli gage measured 3.36 inches.
- **April 2006**: In June 2006, FEMA designated 17 counties in northern California eligible for public assistance for severe storms and flooding, including Calaveras County. From April 2-6, 2006, Calaveras received 6.8 inches of rain, 168 percent the average amount for the month of April (National Weather Service 2006). Approximately 35 acres of farmland, several homes, and a mobile home park were flooded and many people evacuated. The flood also overflowed sewage treatment plants.
- February 2017: In February 2017, a series of storms resulted in a range of significant weather impacts to northern California. The first storm was a wet and warm storm, followed by a second

less wet, but colder storm with snow at lower elevations. Both storms involved strong and damaging winds and widespread heavy rain that resulted in flooding of small streams and rivers, and extremely wet conditions that involved flood control releases. At higher elevations, snow accumulation was significant, and there were numerous downed trees. Many roads were also shut down due to mudslides, heavy snow, flooding, and washouts near West Point. The east and west bound lanes of State Route 26 were closed from Iris Way to the North Fork Mokelumne River Bridge due to flooding and slope failure.

According to the 2013 State of California Hazard Mitigation Plan, Calaveras County has experienced 15 flood disasters that have resulted in state disaster declarations. This information is illustrated in Figure 4.38. The 2018 California State Hazard Mitigation Plan Public Review Draft became available as this plan update went into production.

Figure 4.38: Calaveras County Flood Declarations from 1950 to 2012



According to the HMPC, Cosgrove Creek floods every few years. This occurs most often when significant periods of rain are followed by thunderstorms. However, the 2006 flooding occurred after several days of steady rain. Many homes and a highway are in the creek's floodplain. The other recent events followed the 2017 snow/rain/wind storms.

Likelihood of Future Occurrence

100-500-year Flood

Occasional— The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation (or depth) that has a 1- percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. In short, the 100-year flood is the flood that has a one percent chance in any given year of being equaled or exceeded.

Localized Stormwater Flooding

Highly Likely—With respect to the localized, stormwater flood issues, the potential for flooding may increase as storm water is channelized due to land development. Such changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. Urban storm drainage systems have a finite capacity. When rainfall exceeds this capacity or systems clog, water accumulates in the street until it reaches a level of overland release. With increasing urbanization of the Calaveras County planning area, combined with older infrastructure, this type of flooding will continue to occur during heavy rains.

Climate Change

Climate change may affect flooding in the County. While average annual rainfall may increase or decrease slightly, the intensity of the individual rainfall events is likely to increase during the 21st century. Also, as mentioned in Section 4.2.8 Dams, over the next century snowmelt and surface water runoff is expected to occur earlier, and the overall duration of snowmelt runoff, typically from April through July is expected to decline (CAS 2018)

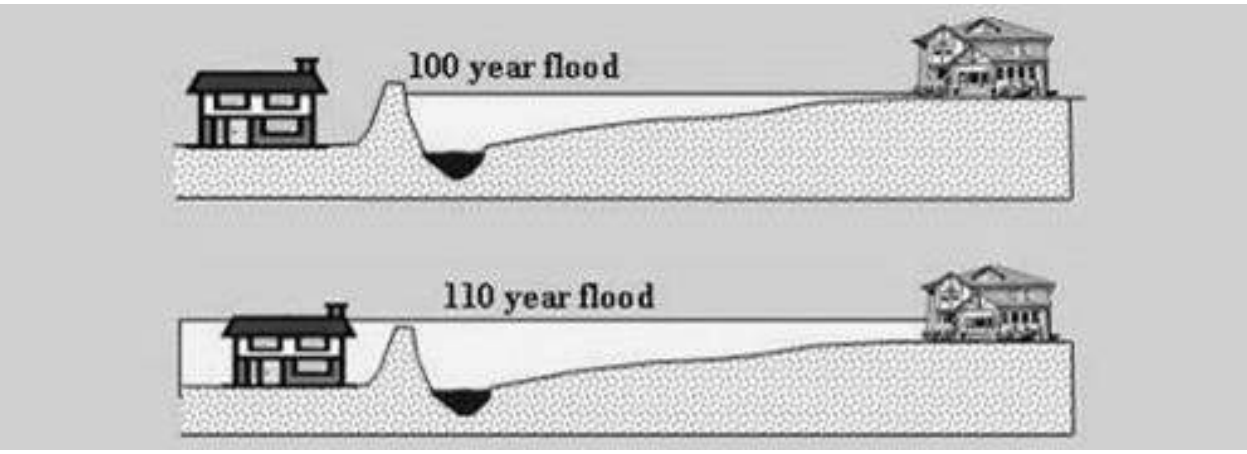
4.2.12 Levee Failure

Hazard/Problem Description

A levee is a raised area that runs along the banks of a river or canal. Levees reinforce the banks and help prevent flooding. By confining the flow, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the river bank, raising the level of the land around the river. To construct a man-made levee, workers pile dirt or concrete along the river banks, creating an embankment. This embankment is flat at the top, and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structure behind them. Overtopping failure occurs when the flood water level rises above the crest of a levee. The representation of the failure modes and the evaluation of the probability of levee failures for each mode are discussed in the remaining sections. Figure 4.39 illustrates flooding from levee overtopping.

Figure 4.39: Flooding from Levee Overtopping



Source: Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.
http://www.floods.org/ace-files/leveesafety/lss_levee_history_galloway.ppt

In the December 16, 2010 Flood Insurance Study, it was noted that no protecting levees exist within Calaveras County. The National Levee Database also noted that there are no protecting levees existing within the County. The FIS did note the following about the Cosgrove Creek Levee:

> Grading Plans for the Cosgrove Creek project were designed to meet the Project Study criteria. The first phase constructed a levee along Cosgrove Creek to provide flood protection. Permits and Streambed Alterations were based on construction of the actual levee. The second phase of construction performed was to mass grade the subdivision site surrounding the levee. Essentially, the mass grading filled all of the area behind the levee, in affect keying to the levee and making the project a "fill" project for lot flood protection rather than a "levee" project for lot flood protection.

Past Occurrences

There have been no past occurrences of levee failure.

Likelihood of Future Occurrences

Unlikely – Given that there are no levees protecting areas of the County, levee failure is unlikely.

Climate Change

According to the CAS, increased precipitation in Calaveras County could result in the possible overtopping of levees. While the FIS noted there were no protecting levees in the County that are certified against a 100-year flood, the Cosgrove Creek project may be affected even though it has been recognized as a fill project. Also, according to the 2015 UWMP, climate change impacts to water supply and demand in the Stanislaus, Calaveras, and Mokelumne Watersheds include increased variability and flooding resulting from larger precipitation events (CCWD 2015). Further, decreased water supply and snowpack in the Sierra Nevada mountains could shift the timing of seasonal runoff.

4.2.13 Soil Hazards: Erosion

Hazard/Problem Description

Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil material and structure, placement, and the general level of human activity. Soil containing high amounts of sand and silt can be easily eroded while clay soils are less susceptible. Calaveras County contains a wide range of soils that have varying levels of susceptibility to erosion, ranging from slight to extremely high.

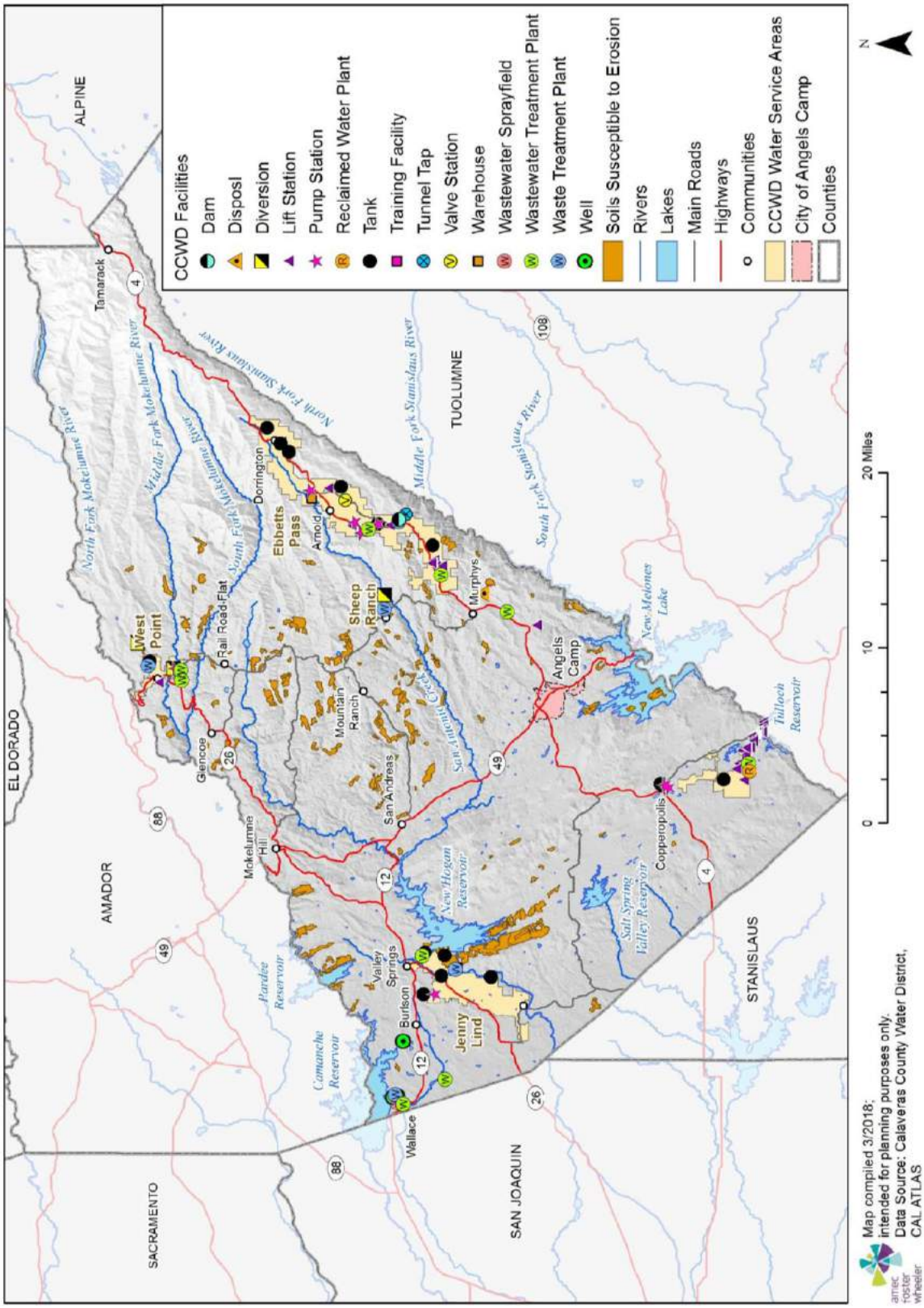
Table 4.26 identifies the soil groups with moderate to high erosion hazard. The erosion potential map shown on Figure 4.40 identifies the areas with soils and slope characteristics that have high and moderate erosion potential.

Table 4.26: Soils Groups with Moderate to High Erosion Potential

Soils Group	Description
Group 6	Acid, rocky, or stony soil over slate rock. Erosion hazard is moderate to severe.
Group 7	Moderately course, acid soils over weathered granite. Natural drainage is good. Erosion hazard is moderate to high.
Group 8	Moderately deep, well-drained, acid soils. Natural drainage is good, but erosion hazard is moderate to high.
Group 9	Rocky outcroppings, where the soil mantle is less than 2 inches thick. Erosion hazard is very high.

Source: Crawford Multari & Starr, 1993.

Figure 4.40: Erosion Potential in Calaveras County



Past Occurrences

Erosion is an ongoing problem that continually happens in Calaveras County. Much of the total land area of Calaveras County has soils classified as highly susceptible to erosion. These areas were identified based on characteristics of relatively low soil stability and steepness of slope. During heavy storms, erosion leads to turbidity and can silt up raw water diversions for the District's water treatment plants.

Likelihood of Future Occurrences

Highly Likely—Given the large area of the County at risk to erosion, and the constant wind and water erosion throughout the County, the likelihood of future occurrences is highly likely. Currently the only effects are water quality due to erosion into the reservoirs and silting up the raw water intakes.

Climate Change

Climate change may result in higher erosion potential due to faster and more frequent storm events, although these effects may vary across the County and in areas where District facilities are located given the range of soils types.

4.2.14 Soil Hazards: Expansive Soils

Hazard/Problem Description

Expansive soils are characterized by a high clay content, which swells with increased moisture content and contracts during dry periods. This change in volume, usually associated with seasonal changes, can damage building foundations, roads, and concrete pavement. On slopes, it can bury or break utility lines. Expansive soil types are also known to be associated with landslide risk and rockfall, as increased volume of expansive soil layers on slopes can create ground shifts and down-slope movement of materials. Onset of soil expansion tends to follow the seasons, with expansion occurring in the wetter months of the year and contraction over the summer. In regard to warning time, maps showing the location of expansive soils are available to guide future building and development on the potential presence of this hazard.

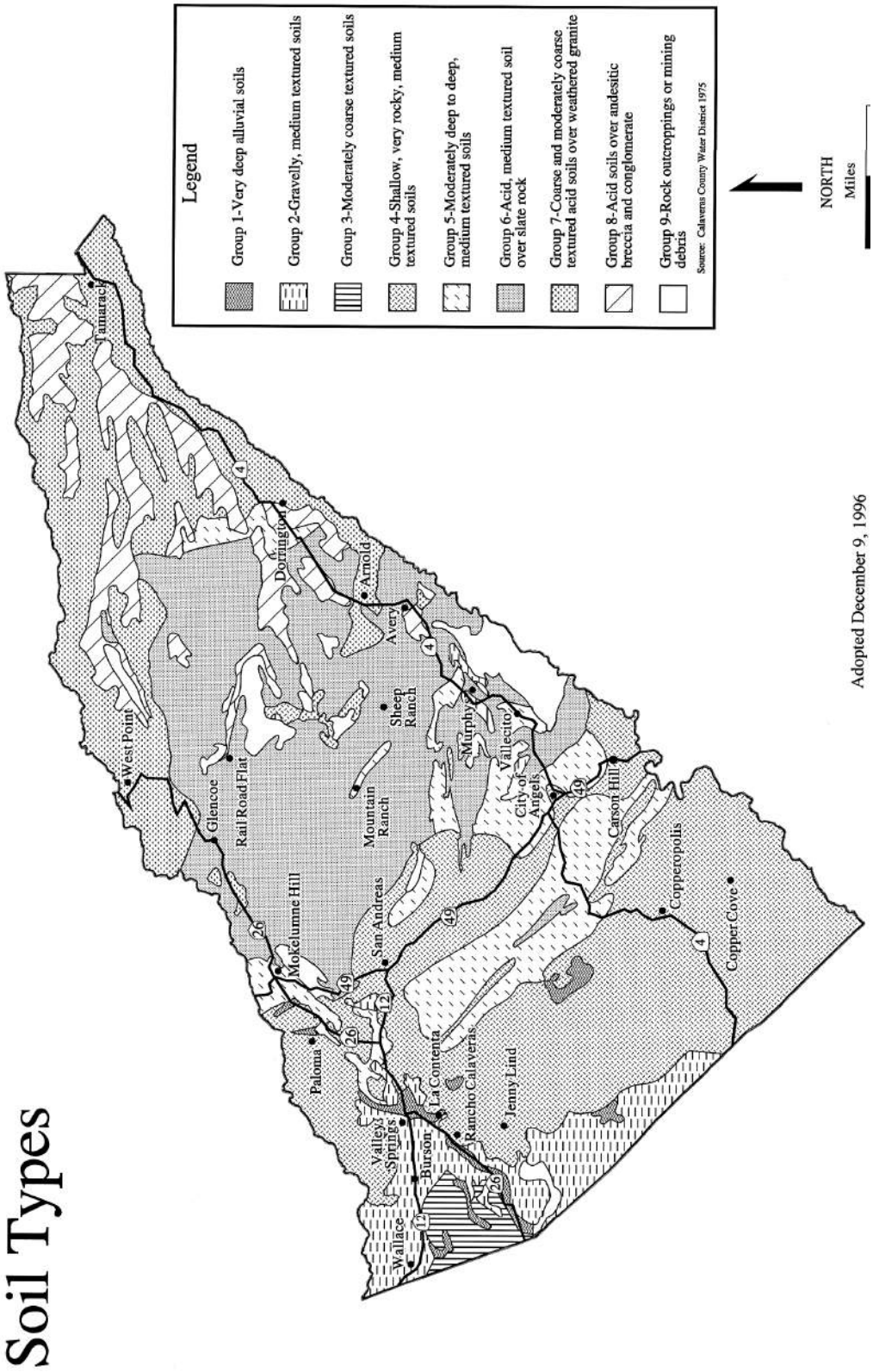
The specific soil groups with moderate to high shrink-swell potential are listed in Table 4.27. The location of each soils group can be found on Figure 4.41.

Table 4.27: Soils Groups with Moderate to High Shrink-Swell Potential

Soils Group	Description
Group 1	Very deep alluvial soils, moderately good drainage and slight to moderate erosion hazard. Shrink-swell behavior is moderate.
Group 2	Shallow, well-drained gravelly soils with finer subsoils, good natural drainage and a slight to moderate erosion hazard. Shrink-swell behavior is moderate.
Group 5	Deep to shallow, well-drained, slightly acid, and rocky soils. Drainage is good with slight to moderate erosion hazard. Shrink-swell behavior is high.
Group 6	Acid, rocky, or stony soil over slate rock. Erosion hazard is moderate to severe. Shrink-swell behavior is moderate.

Source: Crawford Multari & Starr, 1993.

Figure 4.41: Soil Types in Calaveras County



Source: Calaveras County General Plan 1993

In general, expansive soils are most likely to occur in the central part of the county north of Mountain Ranch.

Past Occurrences

The HMPC reported that expansive soils have caused problems to building foundations and roads in the County but no specific data on past damages was known.

Likelihood of Future Occurrences

Likely—Based on the number of vulnerable structures and infrastructure that are located in areas known for having expansive soils, it is likely that this hazard will continue to occur in the future. Although this hazard is widespread across the County, it is unlikely to cause loss of life. The HMPC had little information concerning this hazard and past impacts besides it causing some damage to shallow building foundations and pavement. Certain standard building practices can be used to mitigate damage caused by expansive soils.

4.2.15 Soil Hazards: Landslides and Debris Flows

Hazard/Problem Description

A landslide is a general term for a variety of mass-movement processes that generate a down-slope movement of mud, soil, rock, and/or vegetation. For the purposes of this plan, the term landslide includes mudslides, debris flows, and rockfalls that tend to occur suddenly, whereas erosion is a similar process that tends to occur on smaller scales and more gradually.

Natural conditions that contribute to landslide and erosion are the following:

- Degree of slope
- Water (heavy rain, river flows, or wave action)
- Unconsolidated soil or soft rock and sediments
- Lack of vegetation (no stabilizing root structure)
- Previous wildfires and other forest disturbances
- Road building, excavation and grading
- Earthquake

In addition, many human activities tend to make the earth materials less stable and, thus, increase the chance of ground movement. Human activities contribute to soil instability through grading of steep slopes or overloading them with artificial fill, by extensive irrigation, construction of impermeable surfaces, excessive groundwater withdrawal, and removal of stabilizing vegetation.

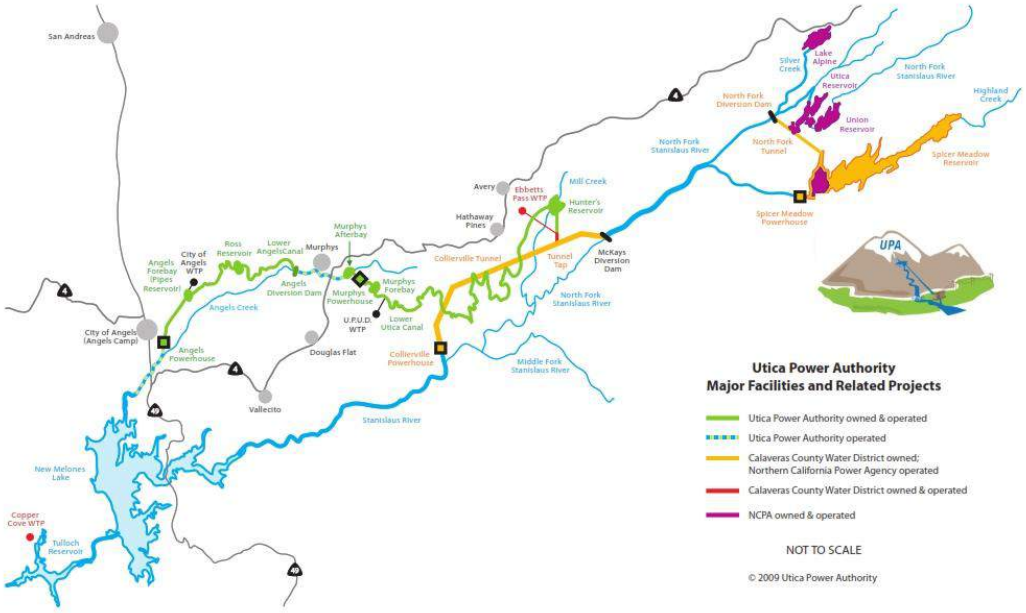
Another hazard related to landslide and erosion is the fall of a detached mass of rock from a cliff or down a very steep slope (rockfall). Weathering and decomposition of geological materials produce conditions favorable to rockfalls. Other causes include ice wedging, root growth, or

ground shaking (earthquake). Destructive landslides and rockfalls usually occur very suddenly with little or no warning time and are short in duration. A more gradual phenomenon is erosion, which can occur over periods of years and is generally viewed as a long-term problem as differentiated from other more sudden and catastrophic natural hazards.

Based on analysis of areas with both highly erosive soils and steep slopes, locations near Jenny Lind and Ebbetts Pass are at greatest risk from landslide and erosion impacts. The western edge of New Hogan Reservoir and southwest of Ebbetts Pass contain significant areas of soils classified as having severe erosion potential, which could lead to possible landslide. Another known area of elevated risk of land movement is near Murphys above McKays Reservoir.

Additionally, the HMPC identified the area above and below the Collierville Tunnel Tap between McKays Diversion Dam to the west and near Hunter's Reservoir and Ebbetts Pass WTP to the east is an area characterized by erosive soils and steep slopes that is also known to be susceptible to localized landslides and instability. The HMPC noted that as the sole source of water for the City of Angels Camp and Murphys, the Collierville Tunnel Tap was identified as critical facility that needed to be evaluated and mitigated for hazards. For example, the Collierville Tunnel Tap is susceptible to potential landslides or slope instability based on where the flume may be damaged: if there is damage below, the Tunnel Tap loses pressure, and if it is damaged above, the Tunnel Tap does not have water. Figure 4.42 illustrates the Collierville Tunnel, and the area known as the Tunnel Tap.

Figure 4.42: Other Major Water Facilities and Related Projects in Calaveras County



Source: Utica Water and Power Authority (UWPA) 2009

Areas with slopes greater than 50 percent have extreme susceptibility to landslide and erosion. Areas of concern are those that include high elevations and steep ravines and gulches associated with river and stream channels. Generally, areas of steeper slopes and increased landslide/erosion risk are located in the more mountainous eastern portion of the county. Over two percent of the total land area of Calaveras County (14,574 acres) has soils classified as highly susceptible to landslide. These areas were identified based on characteristics of relatively low soil stability and steepness of slope. These are shown on Figure 4.40 in the Section 4.2.13 Erosion.

Previous Occurrences

A landslide was a factor in the most recent federal disaster declaration for Calaveras County in 2006. No details were available from the NCEI, SHELDUS, or from the HMPC. Also, a large mudslide occurred in the Stanislaus National Forest near Highway 4 in January 1997. Known as the Sourgrass Slide, no damage occurred to District facilities. Other landslide incidents of varying degrees of magnitude tend to occur in places throughout the county several times in a given year, but in most cases, do not cause significant damage or public safety risk.

Probability of Future Occurrences

Likely—Landslides in the form of debris flow, or mudslides, have occurred in the past in Calaveras County. Rockfalls and landslides occur more frequently in spring months, when high levels of precipitation and runoff combine with saturated soils and/or repeated freezing and thawing, which leads to general slope instability. Landslides often can occur as a result of other hazard events, such as floods, wildfires, or earthquakes.

Climate Change

According to the CAS, increased precipitation may result from climate change. Increased precipitation may make areas in the County more vulnerable to landslide hazards.

4.2.16 Soil Hazards: Subsidence

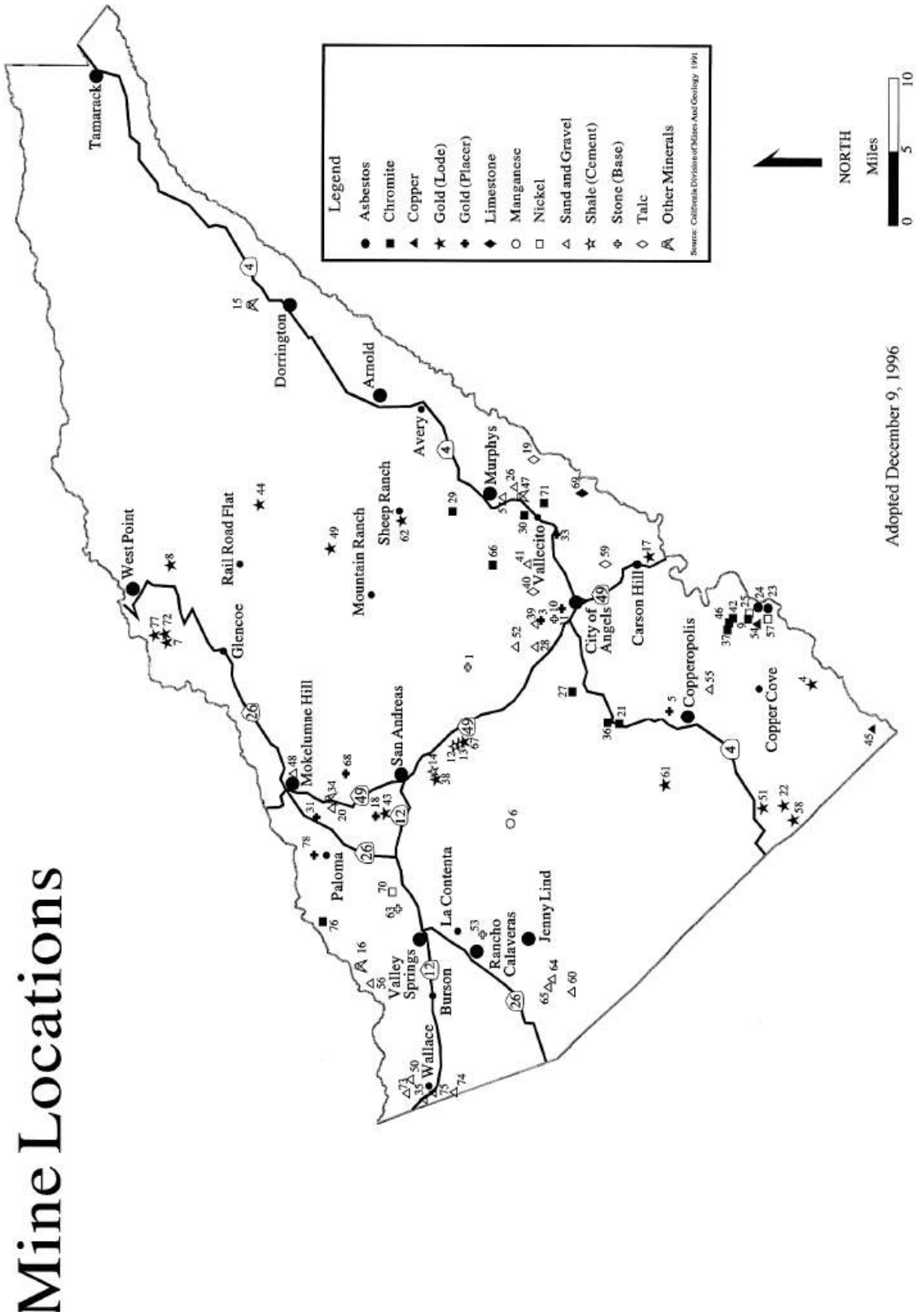
Hazard/Problem Description

Subsidence is the sinking of the land over manmade or natural underground voids. Subsidence can result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate the natural processes of subsidence. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper use of land subject to ground subsidence can be

excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

In the County, land subsidence can occur in areas where development takes place above or near abandoned mines. These mine locations are shown in Figure 4.43.

Figure 4.43: Mine Locations in the County



Past Occurrences

Records of previous subsidence occurrences are difficult to track, as there are no coordinating or monitoring agencies for this hazard. No previous occurrences were recorded by members of the planning team.

Likelihood of Future Occurrence

Occasional—Calculating the probability of future occurrence of subsidence is difficult given the limited information regarding past events. The planning area does contain abandoned mines. It is usually very difficult to accurately predict the exact location or time of any future subsidence from this cause because of the many variables. Given this, the probability of future occurrence is occasional.

Climate Change

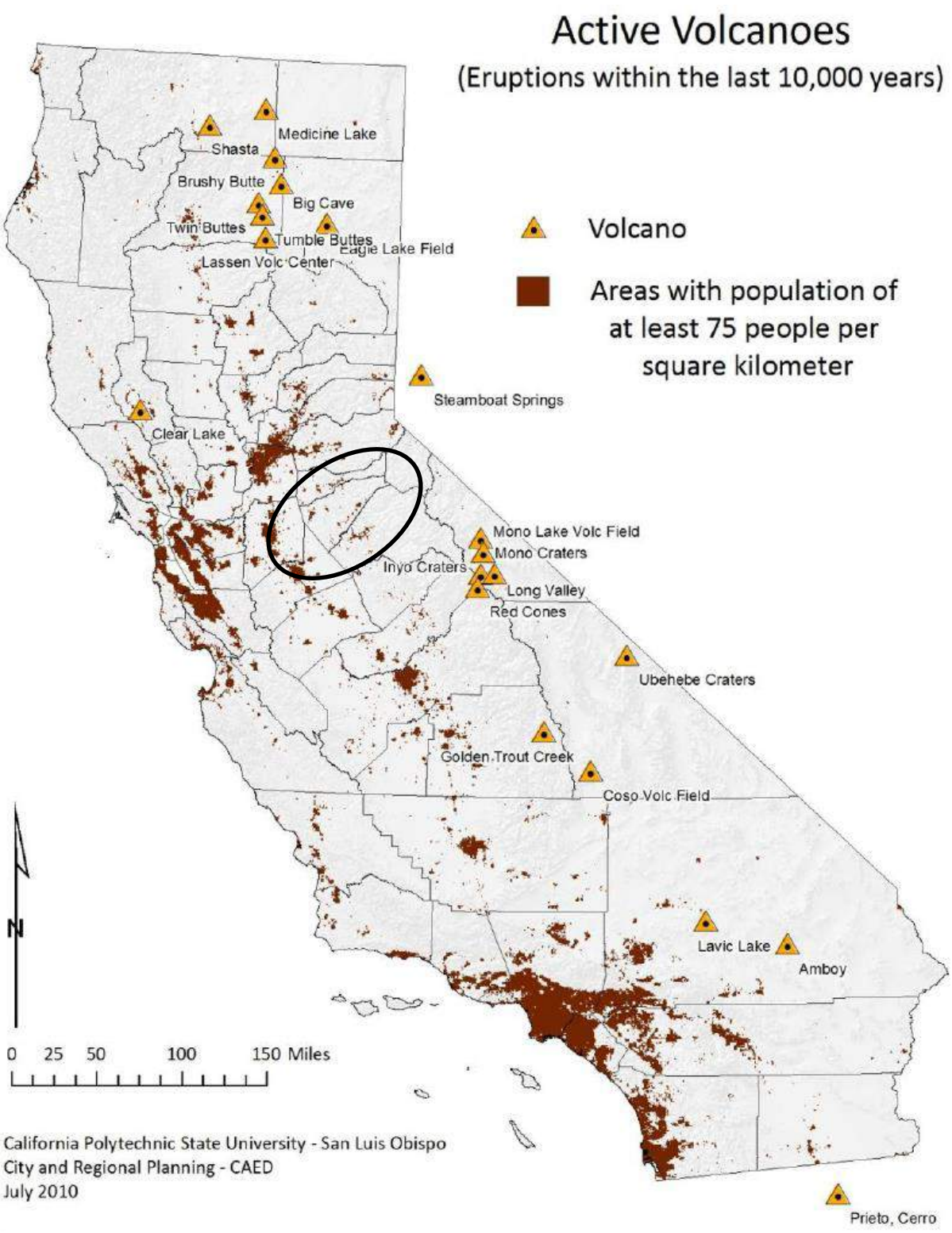
Given soil subsidence may occur in areas where there may be fluctuations in the level of groundwater caused by pumping, climate change may exacerbate potential soil subsidence near the far western edge of Calaveras County within the San Joaquin Valley Groundwater Basin where recent groundwater overdraft has been a concern.

4.2.17 Volcanoes

Hazard/Problem Description

The California State Hazard Mitigation Plan identifies volcanoes as one of the hazards that can adversely impact the State. However, there have been few losses in California from volcanic eruptions. Of the approximately 20 volcanoes in the State, only a few are active and pose a threat. Of these, Long Valley Caldera and Lassen Peak are the closest to Calaveras County. The Long Valley area is considered to be an active volcanic region of California and includes features such as the Mono-Inyo Craters, Long Valley Caldera, and numerous active and potential faults. Figure 4.44 shows volcanoes in or near California and the location of the Lassen Peak and the Long Valley area relative to Calaveras County.

Figure 4.44: Active Volcanoes in California and in the Calaveras County Area

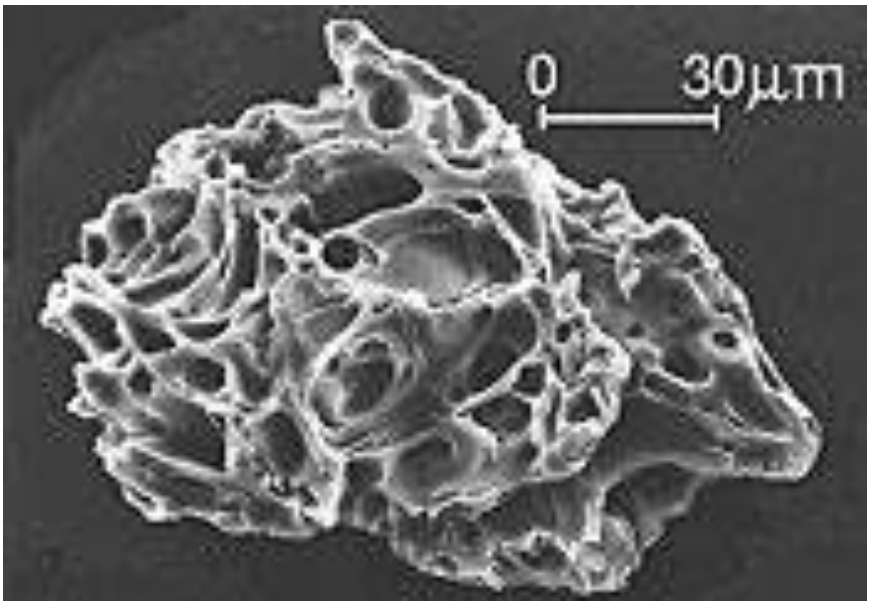


Source: 2010 State of California Hazard Mitigation Plan

Steam blasts commonly produce large pits or craters. Explosive eruptions, which may create fiery flows of hot ash (pyroclastic flows), are usually followed by the pushing up of a lava dome. Some less violent eruptions only produce lava flows.

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS notes specific characteristics of volcanic ash. Volcanic ash is composed of small jagged pieces of rocks, minerals, and volcanic glass the size of sand and silt, as shown in Figure 4.45. Very small ash particles can be less than 0.001 millimeters across. Volcanic ash is not the product of combustion, like the soft fluffy material created by burning wood, leaves, or paper. Volcanic ash is hard, does not dissolve in water, is extremely abrasive and mildly corrosive, and conducts electricity when wet.

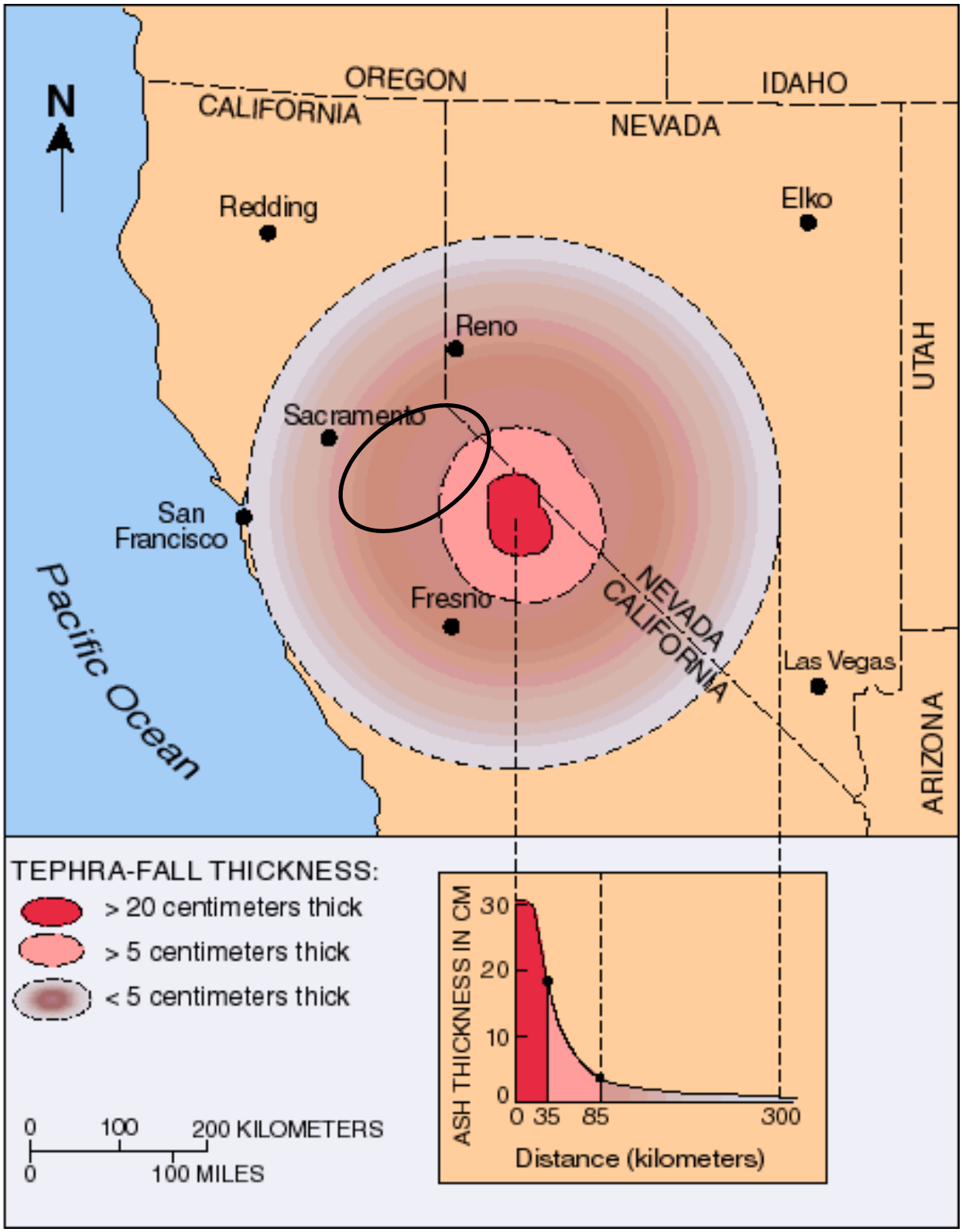
Figure 4.45: Ash Particle from 1980 Mt. St Helens Eruption Magnified 200 Times



Source: US Geological Survey: Volcanic Ash: Effect & Mitigation Strategies. http://volcanoes.usgs.gov/ash/properties.html.

Volcanic ash is formed during explosive volcanic eruptions. Explosive eruptions occur when gases dissolved in molten rock (magma) expand and escape violently into the air, and when water is heated by magma and abruptly flashes into steam. The force of the escaping gas violently shatters solid rocks. Expanding gas also shreds magma and blasts it into the air, where it solidifies into fragments of volcanic rock and glass. Once in the air, wind can blow the tiny ash particles tens to thousands of miles away from the volcano. Figure 4.46 is a volcanic hazard's ash dispersion map for the Long Valley Caldera, which could possible affect Calaveras County.

Figure 4.46: Volcanic Hazards Ash Dispersion Map for the Long Valley Caldera



Source: US Geological Survey

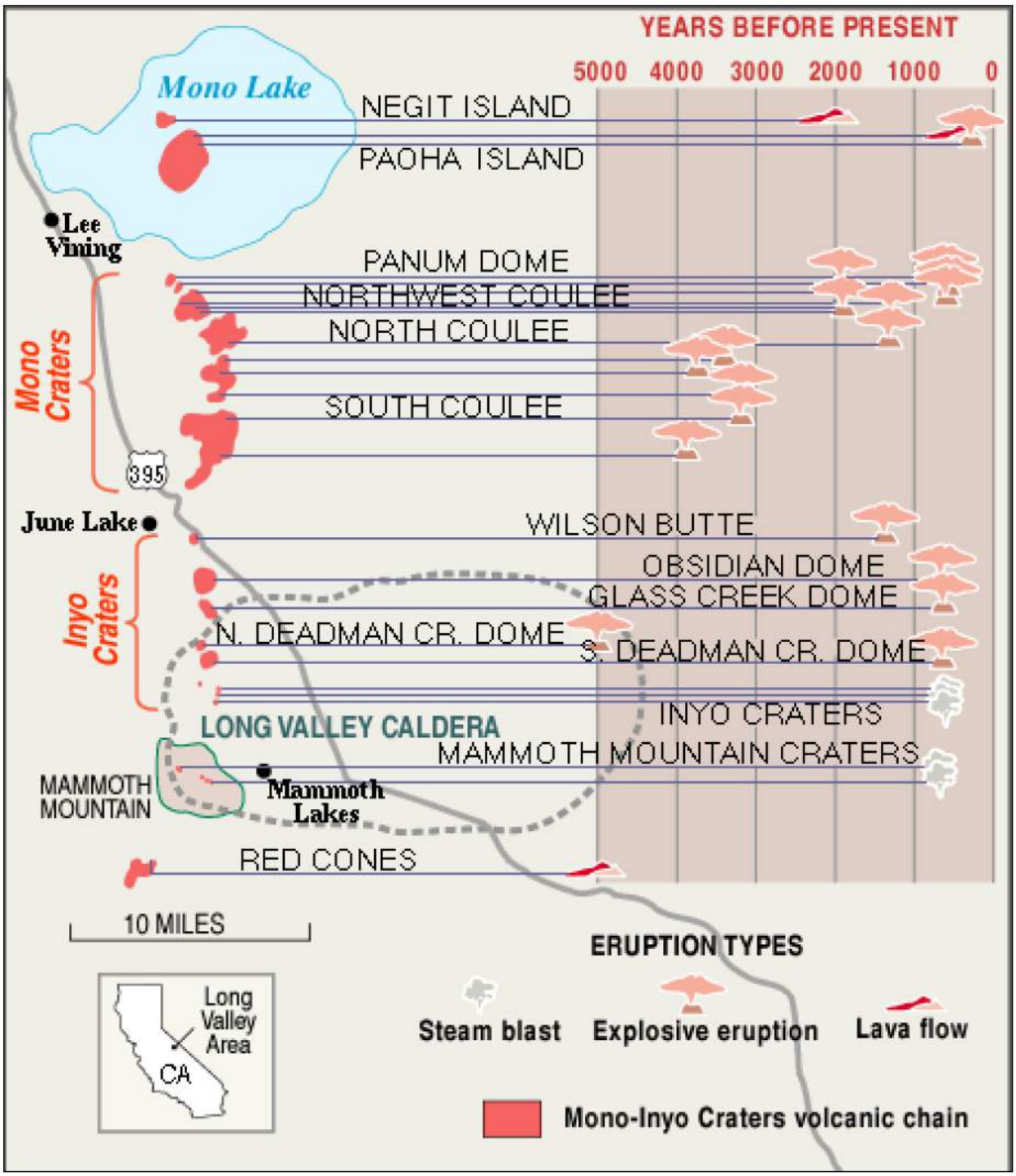
As shown in the inset on the lower right side of Figure 4.46, the average grain-size of rock fragments and volcanic ash erupted from an exploding volcanic vent varies greatly among different eruptions and during a single explosive eruption that lasts hours to days. Heavier, large-sized rock fragments typically fall back to the ground on or close to the volcano and progressively smaller and lighter fragments are blown farther from the volcano by wind. Volcanic ash, the smallest particles (2 mm in diameter or smaller), can travel hundreds to thousands of kilometers downwind from a volcano depending on wind speed, volume of ash erupted, and height of the eruption column.

The size of ash particles that fall to the ground generally decreases exponentially with increasing distance from a volcano. Also, the range in grain size of volcanic ash typically diminishes downwind from a volcano (becoming progressively smaller). At specific locations, however, the distribution of ash particle sizes can vary widely. Based on Figure 4.46, the US Geological Survey estimated that ash of up to 2" or more could fall in areas of Calaveras County.

Past Occurrences

During the past 1,000 years there have been at least 12 volcanic eruptions in the Long Valley area. This activity is likely to continue long into the future. The Long Valley Caldera and Mono-Inyo Craters volcanic chain has a long history of geologic activity that includes both earthquakes and volcanic eruptions. Volcanoes in the Mono-Inyo Craters volcanic chain have erupted often over the past 40,000 years. As shown in Figure 4.47, over the past 5,000 years, small to moderate eruptions have occurred at various sites along the Mono-Inyo Craters volcanic chain at intervals ranging from 250 to 700 years.

Figure 4.47: Volcanic Activity in the Mono-Inyo Craters Volcano Chain in the Past 5,000 Years



Source: U.S. Geological Survey, http://pubs.usgs.gov/fs/fs073-97/eruptions.html

As recently as 1980 four large earthquakes (greater than magnitude 6 on the Richter Scale) and numerous relatively shallow earthquakes occurred in the area. Since then, earthquakes and

associated uplift and deformation in the Mammoth Lakes Caldera have continued. Because such activities are common precursors of volcanic eruptions, the U.S. Geological Survey closely monitors the unrest in the region. There are no records of past impacts from volcanic eruptions to the planning area.

Likelihood of Future Occurrences

Unlikely—According to the U.S. Geological Survey, the pattern of volcanic activity over the past 5,000 years suggests that the next eruption in the Long Valley area will most likely happen somewhere along the Mono-Inyo volcanic chain. However, the probability of such an eruption occurring in any given year is less than 1 percent. The next eruption will most likely be small and similar to previous eruptions along the Mono-Inyo volcanic chain during the past 5,000 years (see Figure 4.47 above). According to the State Multi-Hazard Mitigation Plan, only Medicine Lake, Mount Shasta, Lassen Peak, and the Long Valley Caldera are considered active and pose a threat of future activity. However, due to the location of the planning area relative to the active volcanoes, the State Plan does not consider Calaveras County to be vulnerable to eruption and/or ash from these volcanoes.

Climate Change

Climate change is unlikely to affect volcanic eruptions. However, volcanoes have the potential to impact climate, as they release large amounts of greenhouse gases, such as water vapor and carbon dioxide.

4.2.18 Wildfires

Hazard/Problem Description

Wildland fire is an ongoing concern for Calaveras County. Generally, the fire season extends from early spring through late fall of each year during the hotter, dryer months. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds.

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire suppression practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland urban interface (WUI) areas, significant wildfires can also occur in heavily populated areas. The wildland urban interface is a general term that applies to development adjacent to landscapes that support wildland fire. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them.

WUI fires are the most damaging. WUI fires occur where the natural and urban development intersect. Even relatively small acreage fires may result in disastrous damages. WUI fires occur where the natural forested landscape and urban-built environment meet or intermix. The damages

are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

The pattern of increased damages is directly related to increased urban spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. WUI fires can occur where there is a distinct boundary between the built and natural areas or where development or infrastructure has encroached or is intermixed in the natural area. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets.

According to the 2016-2017 Calaveras County Community Wildlife Protection Plan (CWPP), wildfire is an ongoing threat and major concern for Calaveras County. Generally, the fire season extends from early spring to late fall. Fire conditions arise from a combination of hot weather, an accumulation of vegetation, and low moisture content in the air. These conditions, when combined with high winds and years of drought increase the potential for a wildfire to occur. Urban wildfires often occur in those areas where development has expanded into the rural areas. A fire along this urban/rural interface can result in major losses of property and structures. Generally, there are three major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, and weather:

- **Fuel**—Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Manmade structures are also considered a fuel source, including homes and associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. In addition, "ladder fuels" can spread a ground fire up through brush and into trees, leading to a devastating crown fire that burns in the upper canopy and cannot be controlled. The volume of available fuel is described in terms of fuel loading.
- **Topography**—An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather**—Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater the wind, the faster a fire will spread and the more intense it will be. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, which are often

terrain that is difficult for firefighters to reach. Drought conditions contribute to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses could also result. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Consequently, wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types.

Generally, wildfire risk is highest across a broad section of the central and eastern sections of the planning area. According to the 2016-2017 CWPP areas of very high or high wildfire threat constitute at least 85 percent of the county (see Figure 4.48 and Figure 4.49) According to the Unit Strategic Fire Plan for Tuolumne – Calaveras Counties, Battalions 1 through 4, all of which are located in Calaveras County each have a history of fire spread (CalFIRE 2017). Figure 4.46 shows the federal, state, and local responsibility areas in the County. Fire Responsibility Areas in Calaveras County. Figure 4.50 and Figure 4.51 shows the fire hazard severity zones (FHSZs) in the eastern and western portions of the County.

Figure 4.48: Federal, State, and Local Responsibility Areas in Calaveras County

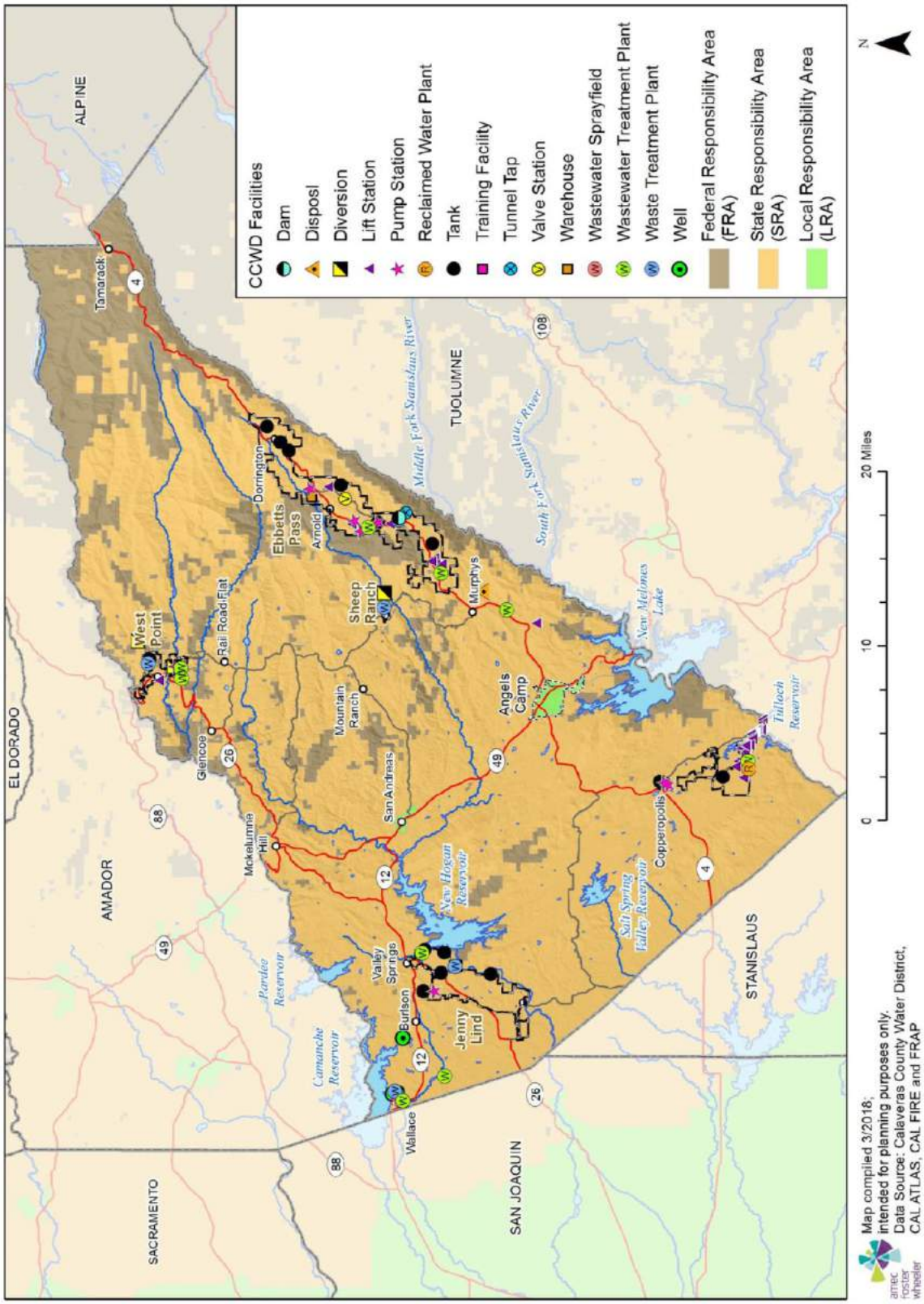


Figure 4.49: Eastern Calaveras County Wildfire Severity

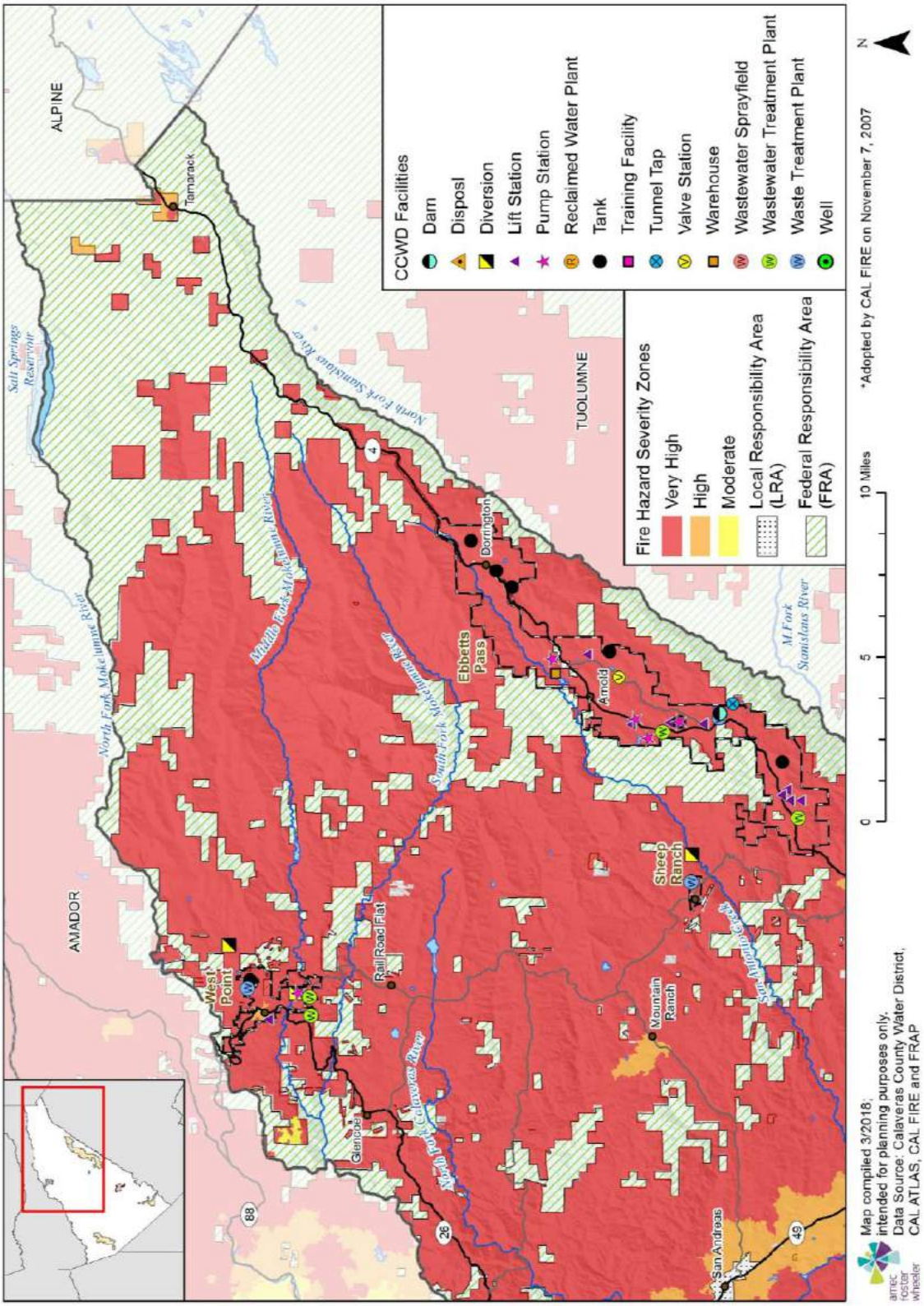
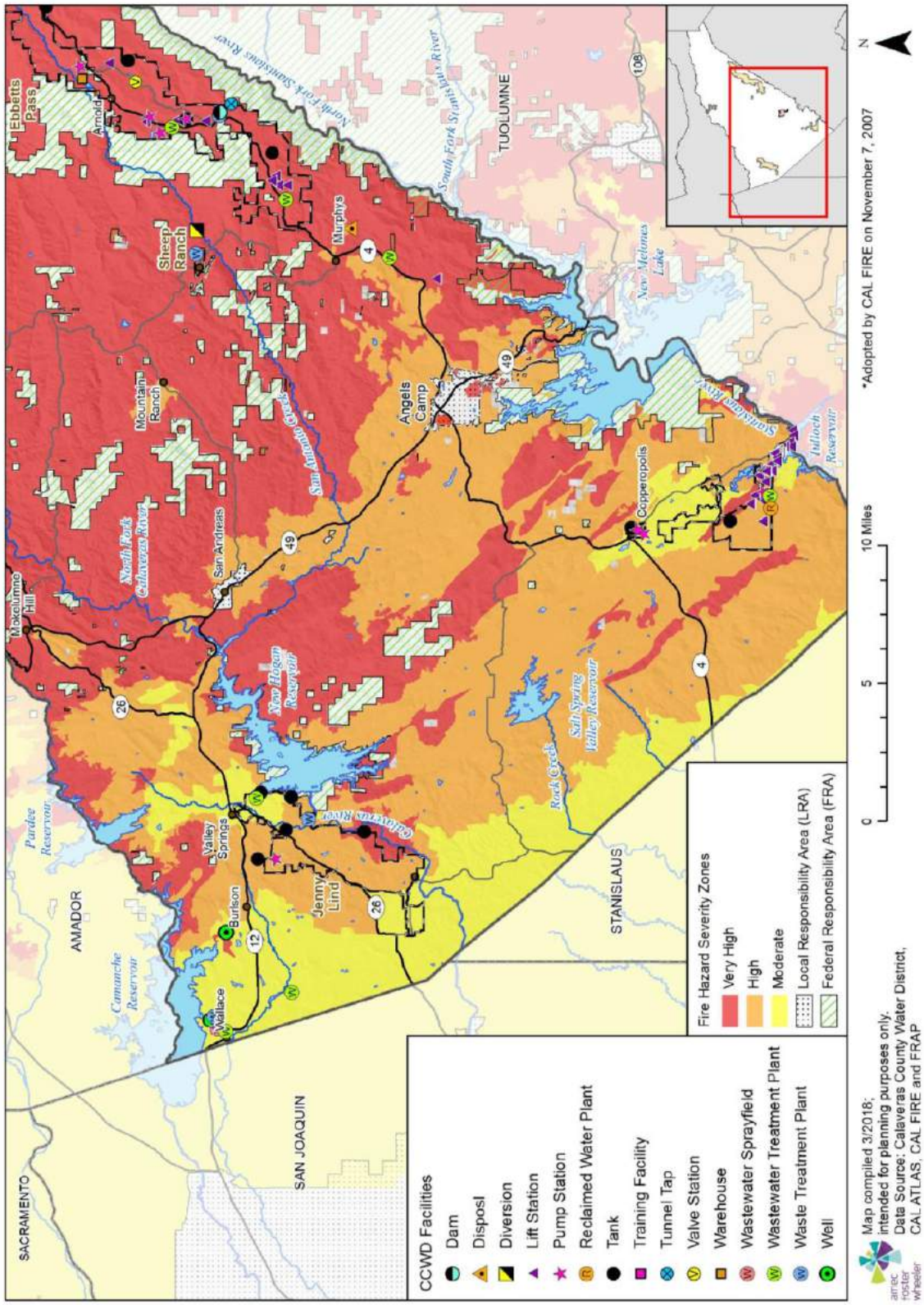


Figure 4.50: Western Calaveras County Wildfire Severity



According to the Tuolumne-Calaveras Unit Pre-Fire Management Plan completed in 2011 by the Tuolumne-Calaveras Unit of the California Department of Forestry and Fire Protection, the environment in Calaveras County is conducive to large, damaging fires. All fuel types in the county are ranked as moderate to very high fire hazard. Table 4.28 shows the location and fire hazard rating of fuel models in Calaveras County.

Table 4.28: Location and Hazard Ranking of Fuel Models in Calaveras County

Fuel Model	Fire Hazard Ranking	Location in Calaveras County
Grass	Moderate to High	West of Highway 49 in the lower foothills. Moderate to high fuel hazard ranking depends on slope.
Woodland	High to Very High	Scattered between 800 to 4,000 feet in elevation; fuel hazard ranking depends on slope.
Brush	Very High	Larger blocks in the 800 to 4,000-foot elevation in less inhabited areas of the county. Areas near New Hogan, Bear Mountain, and New Melones have large concentrations of brush as well as areas north of San Andreas.
Brush/Hardwood	High	Areas with a mixture of live oak, black oak, manzanita, and chamise between 1,000 to 4,000 feet in elevation. Large blocks occur east of Highway 49.
Heavy Timber	Very High	Consists of larger, denser dead fuels on the ground. Primarily found above 3,500 feet and in scattered blocks between Arnold and West Point.

Source: California Department of Forestry; Tuolumne-Calaveras Unit Pre-Fire Management Plan, 2011

The grasslands of the rolling western plains routinely experience extreme summer heat, and significant wind events during the spring and fall months. In these areas motorized fire equipment can be fully utilized to great success. The brush fields common throughout the central portions of the County lay over broad expanses of steep hillsides and atop narrow ridgelines between the deepening river canyons. Routine summer temperatures can be extreme, while the topography makes access increasingly difficult for motorized firefighting equipment. The brush transitions into the mixed oak and conifer zones as the elevation increases and the canyon depth and width increase significantly.

Over 38 percent of the CAL FIRE protected lands are covered with these high hazard brush and timber fuels. This mid-elevation area also experiences high summer temperatures, and is most affected by the normal diurnal winds associated with the canyon-dominated topography. The higher elevation zone features dense stands of conifer timber much of which exhibits large accumulations of ground and ladder fuels. While routinely temperatures are moderated due to the elevation, wind events in the fall contribute to potentially challenging fire conditions. Historically, severe fire weather occurs throughout the Unit on 35 percent of days during the fire season. The convergence of significant fire weather conditions, a wide variety of topography and a broad spectrum of fuels has resulted in a long history of large damaging fires within the County. Fire weather is sampled daily during the wildfire season at stations throughout California to create critical fire weather frequency, which is classified in three categories. Calaveras County is rated in the highest frequency class.

Warning times are usually adequate to ensure public safety, provided that evacuation recommendations and orders are heeded in a timely manner. While in most cases wildfires are contained within a week or two of outbreak, in certain cases, they have been known to burn for months, or until they are completely extinguished by fall rains.

Past Occurrences

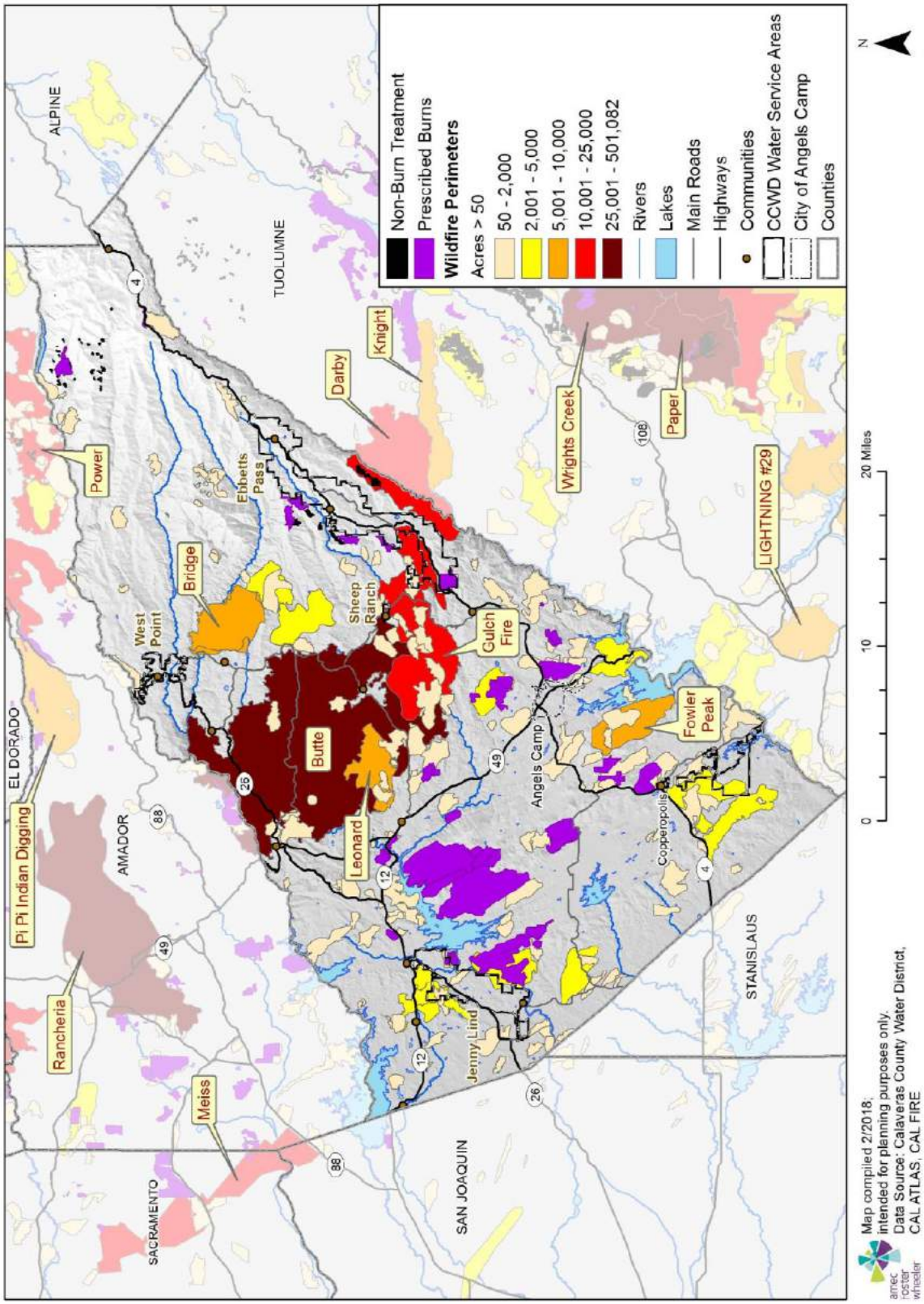
Wildfires of varying scales occur on an annual basis in Calaveras County. Calaveras County has received state disaster declarations for wildfires in 1988, 1992, and 2001 and a federal declaration (DR-958) in 1992, 2 in 2004 (FM 2540 and FM 2553), and 1 in 2015 (FM-5111). A map of past burn areas is shown in Figure 4.51. A summary table of fires in Calaveras County since 1917 is shown in Table 4.29. Detailed tables of wildfire are shown in Appendix E.

Table 4.29: Wildfire History (1908 – 2016) in Calaveras County by Cause and Size

Cause	50 to 100 acres	100-500 acres	>500 acres	Total
Arson	-	1	1	2
Campfire	-	-	-	-
Debris	-	-	-	-
Equipment Use	3	6	4	13
Lightning	19	14	3	36
Miscellaneous	-	-	-	-
Playing with Fire	2	8	8	18
Power Line	-	-	-	-
Railroad	2	5	1	8
Smoking	-	-	-	-
Prescribed	9	30	13	52
Unknown/Unidentified	4	50	52	106
Vehicle	-	-	-	-
Total	**39**	**114**	**82**	**235**

Source: Cal FIRE FRAP dataset

Figure 4.51: Calaveras County Wildfire History, 1908 - 2016



The following summarizes major wildfires in Calaveras County since 1979:

- June 6, 1979 Fowler Peak – This fire burned 5,237 acres Calaveras County. The fire's cause was unknown. Damage estimates, injuries, and deaths were unavailable
- August 1992 Old Gulch fire/Shasta fires (DR-958)—Damage was estimated at $54 million across Calaveras and Shasta Counties. Eight people were injured.
- August 1996 Keystone fire—7,000 acres burned within the California Department of Forestry Tuolumne-Calaveras Unit (TCU). 20 homes were destroyed and 7 damaged by this lightning-caused fire.
- July 19, 1988 Bridge Fire – This fire burned almost 7,000 acres Calaveras County. The fire was attributed to arson and was finally extinguished on July 26, 1988. Damage estimates, injuries, and deaths were unavailable.
- September 1999 Winton Incident fire—120 acres burned near West Point. Two homes, two outbuildings, and two vehicles were destroyed. Total costs, including firefighting, totaled $740,000.
- 2001 Darby Fire—30,137 acres burned in the TCU. State fire disaster declaration.
- 2002 Sourgrass Fire—884 acres burned in the TCU.
- 2003 fire season—884 acres burned in the Tuolumne-Calaveras Unit (TCU).
- 2004 Armstrong Fires—7,796 acres burned in 380 separate fires, totaling over $10 million in damage. 26 homes were destroyed. The majority of acreage burned and property damage were due to three fires, the Copperopolis fire (3,844 acres burned, 1 home destroyed), the Armstrong Complex (963 acres burned, 3 homes destroyed), and the Pattison fire (2,676 acres burned, 17 homes destroyed). These occurrences were mostly human-caused, including fires started by vehicle/equipment misuse and arson.
- September 2015 Butte Fire – burned 70,868 acres, making it the largest fire (in terms of acreage) in Calaveras County since 1908. Caused by a lightning strike, the fire resulted in a federal declaration (FM-5111) and $3.1million dollars was made available in Public Assistance Grants, in addition to $273,418 in Emergency Work funds.

Figure 4.52 through Figure 4.56 show the effects of wildfire at a landscape level on community safety, ecosystem health, erosion, water quality, and water supply. These maps are the result of the 2010 California Forest and Range Assessment. The assessment conducted a simple risk analysis on various input assets that could be impacted by wildfire threat (CalFIRE 2010).

Figure 4.52: Fire Priority Landscape – Community Safety

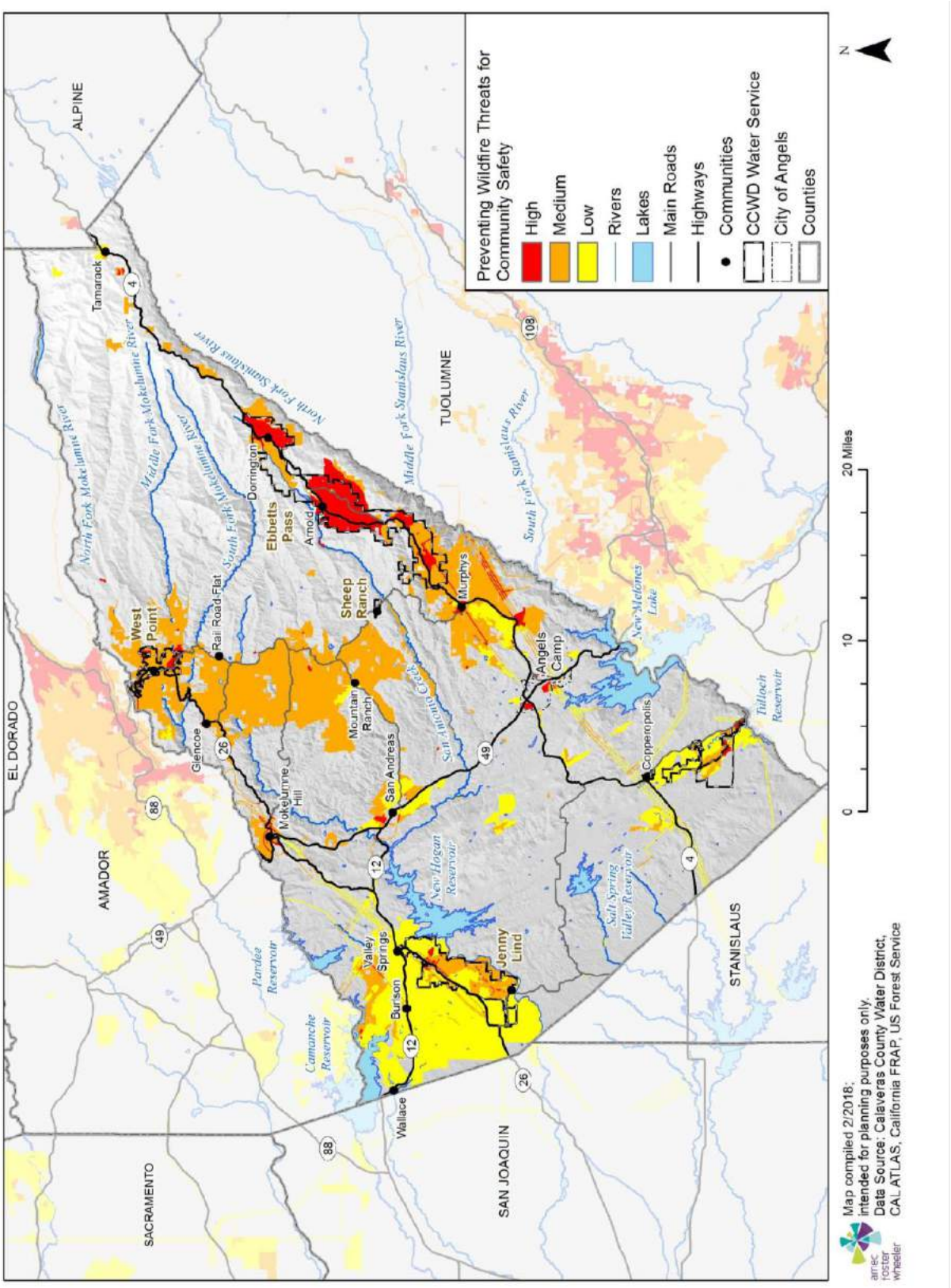


Figure 4.53: Fire Priority Landscape – Ecosystem Health

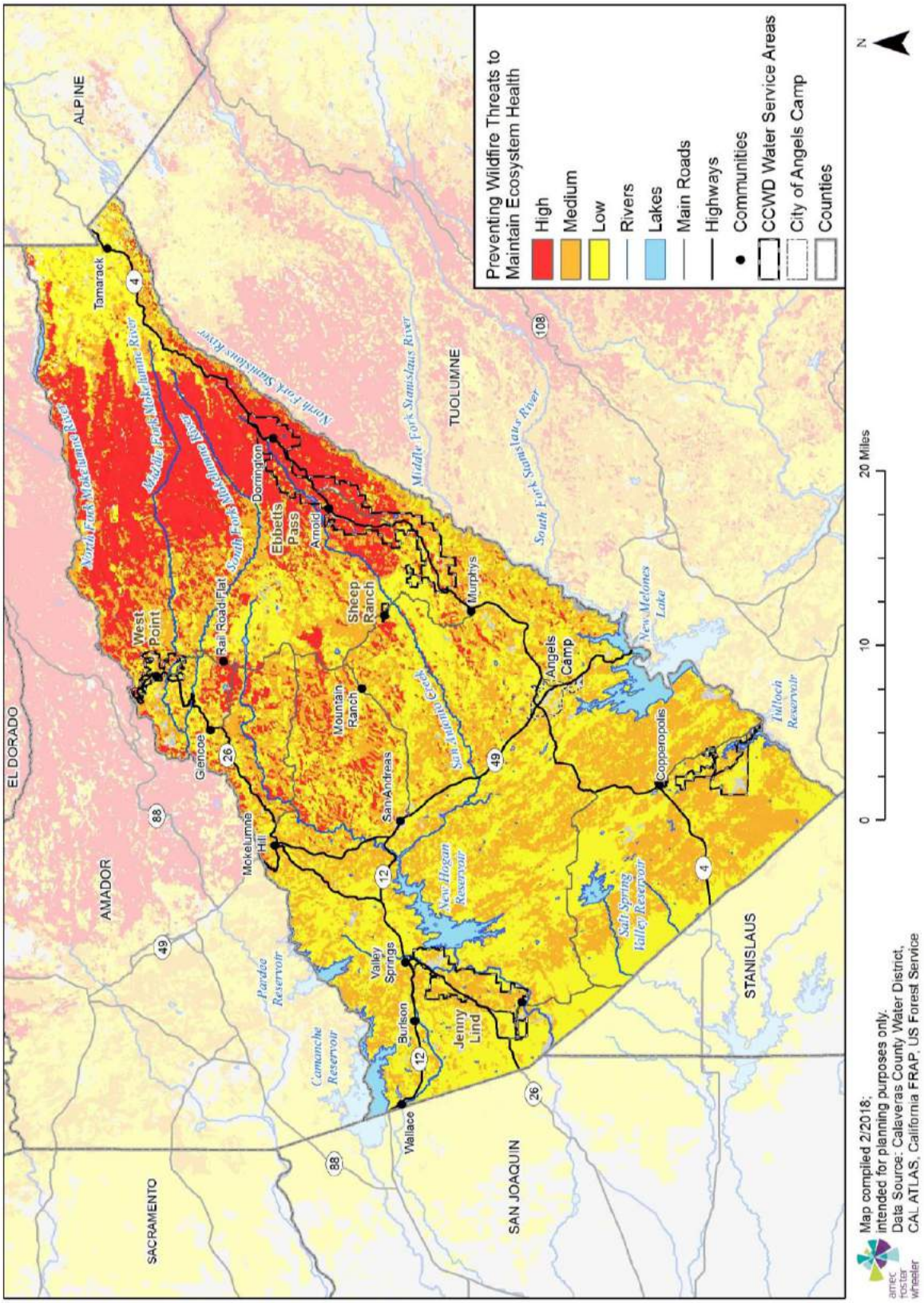


Figure 4.54: Fire Priority Landscape – Post-Fire Erosion

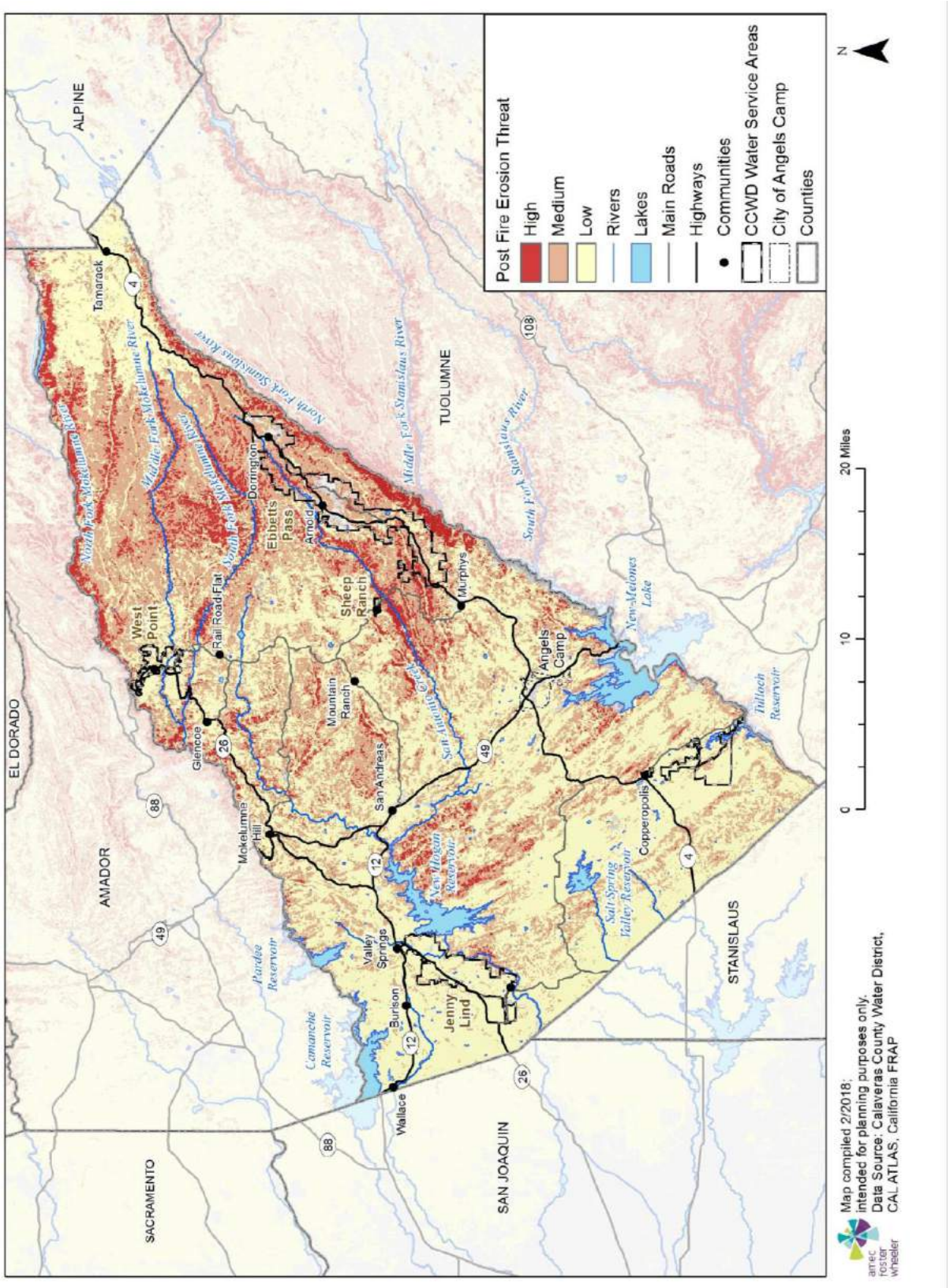


Figure 4.55: Fire Priority Landscape – Water Quality

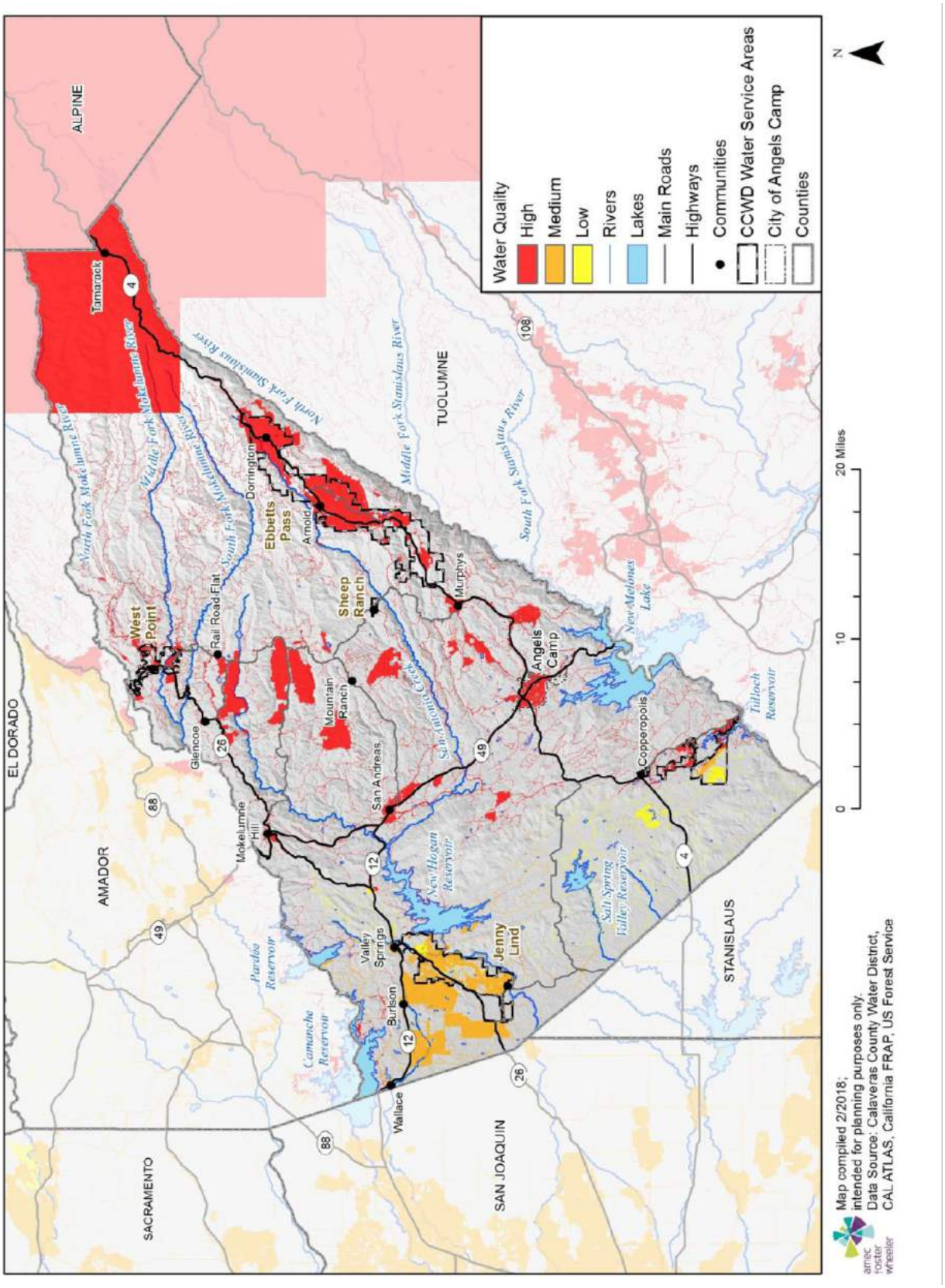
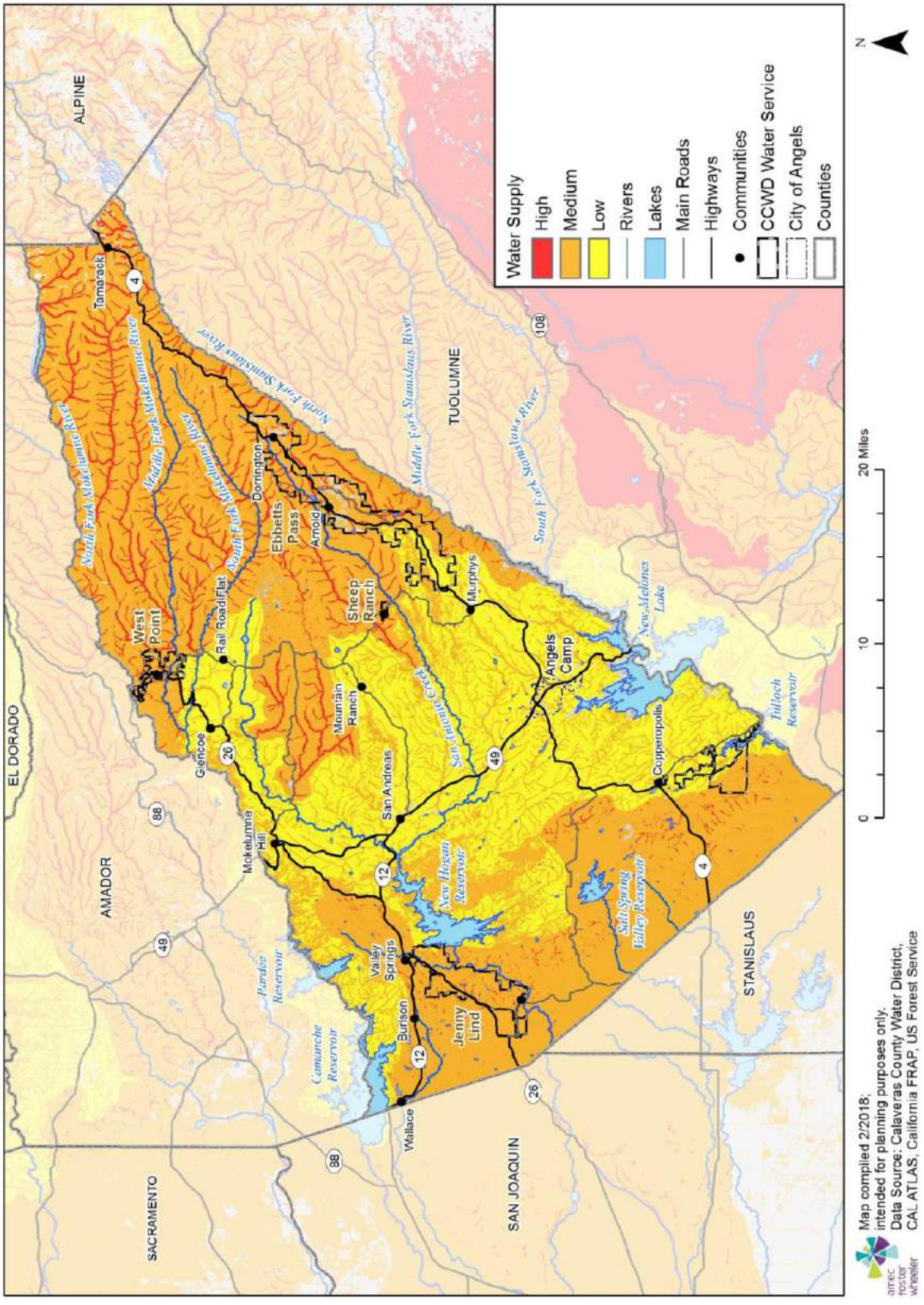


Figure 4.56: Fire Priority Landscape – Water Supply



Likelihood of Future Occurrence

Highly Likely—The season when wildfire is most likely to occur generally runs from late June through October. This is due to hot, dry conditions during this time of year and an increase in population throughout the county in the summer months as vacation homes are visited and seasonal workers converge on the area. According to the 2017 Tuolumne Calaveras Unit (TCU) Strategic Fire Plan, daily severe fire weather conditions are present for approximately 35 percent of the fire season. The 4th of July and Labor Day holiday weekends are specific times when probability is higher than average. The 2017 TCU Strategic Fire Plan indicated the TCU featured a wide range of challenging topography, fuels, and weather that greatly influence wildland fires. It also has a long history of large damaging fires (CalFIRE 2017).

Climate Change

According to the CAS, warmer temperatures can exacerbate drought conditions. Drought conditions often kill trees and shrubs within the understory of a forest, which can serve as fuel for wildfires. Warmer temperatures could increase the number of wildfires and pest outbreaks, such as the western pine beetle infestation.

4.2.19 Natural Hazard Summary

Table 4.30 summarizes the results of the hazard identification and hazard profile for CCWD based on the hazard identification data and input from the HMPC. For each hazard profiled in Section 4.2, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for CCWD.

Table 4.30: Hazard Identification/Profile Summary and Determination of Priority Hazard: CCWD

Hazard	Likelihood of Future Occurrence	Priority Hazard
Avalanche	Unlikely	N
Dam Failure	Occasional	Y
Drought and Water Shortage	Likely	Y
Earthquake	Occasional	N
Flood: 100-/500-year	Occasional	Y
Flood: Localized Stormwater Flooding	Likely	Y
Levee Failure	Unlikely	N
Severe Weather: Extreme Heat	Highly Likely	N
Severe Weather: Heavy Rains and Storms	Highly Likely	Y
Severe Weather: Tornadoes	Occasional	N
Severe Weather: Wind	Highly Likely	Y

Hazard	Likelihood of Future Occurrence	Priority Hazard
Severe Weather: Winter Storms and Extreme Cold	Likely	Y
Soil Hazards: Erosion	Highly Likely	N
Soil Hazards: Expansive Soils	Likely	N
Soil Hazards: Landslide, Debris Flows	Likely	Y
Soil Hazards: Subsidence	Occasional	N
Volcano	Unlikely	N
Wildfire	Highly Likely	Y

4.3 Vulnerability Assessment

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

With CCWD's hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each priority hazard would have on the District. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses.

This vulnerability assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and parcel data);

- Statewide GIS datasets from other agencies, such as FEMA, USGS, CAL EMA, CGS, Cal Atlas, and others to support mitigation planning;
- CAL FIRE GIS datasets;
- CCWD Staff
- Calaveras County Staff
- Utica Water and Power Authority (UWPA) Staff
- Written descriptions of inventory and risks provided by participating jurisdictions;
- Existing plans and studies; and
- Personal interviews with planning team members and staff from the County and participating jurisdictions (Calaveras County OES, etc.).

4.3.1 Calaveras County Water District's Vulnerability and Assets at Risk

As a starting point for analyzing the planning area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster was to occur in the planning area, this section describes significant assets at risk in the planning area. Data used in this baseline assessment included:

- Total CCWD assets at risk;
- Cultural, historical, and natural resources; and
- Growth and development trends.

Total Values at Risk

The HMPC used the most recent infrastructure valuation provided by CCWD for fiscal year 2018 to determine values for CCWD's assets. Table 4.31 shows the total values of CCWD capital assets by service area. Land values have been purposely excluded because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value.

Table 4.31: Summary of CCWD Asset Values by Service Area

Service Area	Facility Count	Replacement Value
Copper Cove/Copperopolis	35	$15,839,633
Ebbetts Pass	33	$24,091,311
Jenny Lind	7	$12,487,458
Sheep Ranch	1	$750,000
Wallace	4	$2,130,993
West Point	5	$3,270,704
Unincorporated County	18	$11,528,988

Service Area	Facility Count	Replacement Value
Total	104	$70,073,984

Source: CCWD 2018

Detailed Asset Inventory

CCWD provides a critical lifeline utility, water, to thousands of people in Calaveras County. As such, all facilities owned by CCWD are considered critical facilities. These facilities are listed in Table 4.32 and shown in Figure 4.57. There are 104 facilities owned by CCWD, as shown in Table 4.32; however, only 90 of these facilities have GIS information, which was used for this plan update. The facilities not evaluated in the vulnerability assessment include: Lift Station #42 – Conner Estates, Lift Station #14 – Calypso Bay, Lift Station #2 – Saddle Creek, Lift Station #3 – Saddle Creek, Lift Station #41 – Conner Estates, CC "B" Steel Tanks, Arnold Lift Station #2, Arnold Lift Station #3, Sequoia Woods Lift Station, JL Water Pressure System Tank, Lift Station #22 – Upper Cross Country, Six-Mile Village Lift Station, Sheep Ranch Pump Station, EP Big Trees 8 Redwood Tank, and EP Timber Trails Redwood Tank. These facilities are also noted with an asterisk in Table 4.32 below.

Table 4.32: Detailed Facilities in the Calaveras County Water District by Service Area

Service Area	Facility Type	Facility Name	Replacement Value
Copper Cove/Copperopolis	Lift-Station	LS # 42, Conner Estates*	$29,625
Copper Cove/Copperopolis	Lift-Station	LS #1, Poker Flat	$62,971
Copper Cove/Copperopolis	Lift-Station	LS #1, Saddle Creek	$465,468
Copper Cove/Copperopolis	Lift-Station	LS #10, Poker Flat	$26,560
Copper Cove/Copperopolis	Lift-Station	LS #13, Poker Flat	$58,767
Copper Cove/Copperopolis	Lift-Station	LS #14, Calypso Bay LS*	$58,203
Copper Cove/Copperopolis	Lift-Station	LS #15, Copper Cove	$216,203
Copper Cove/Copperopolis	Lift-Station	LS #16, Copper Cove	$215,538
Copper Cove/Copperopolis	Lift-Station	LS #17, Copper Cove	$27,688
Copper Cove/Copperopolis	Lift-Station	LS #18, Copper Cove	$226,258
Copper Cove/Copperopolis	Lift-Station	LS #19, Copper Cove	$90,073
Copper Cove/Copperopolis	Lift-Station	LS #2, Poker Flat	$75,305
Copper Cove/Copperopolis	Lift-Station	LS #2, Saddle Creek*	$152,330
Copper Cove/Copperopolis	Lift-Station	LS #3, Poker Flat	$64,864
Copper Cove/Copperopolis	Lift-Station	LS #3, Saddle Creek*	$141,314
Copper Cove/Copperopolis	Lift-Station	LS #4, Poker Flat	$64,864
Copper Cove/Copperopolis	Lift-Station	LS #40, Conner's Main	$425,112
Copper Cove/Copperopolis	Lift-Station	LS #41, Conner Estates*	$40,114
Copper Cove/Copperopolis	Lift-Station	LS #43, Conner Estates	$62,540
Copper Cove/Copperopolis	Lift-Station	LS #44, Conner Estates	$62,540
Copper Cove/Copperopolis	Lift-Station	LS #45, Conner Estates	$62,540

Service Area	Facility Type	Facility Name	Replacement Value
Copper Cove/Copperopolis	Lift-Station	LS #5, Poker Flat	$337,558
Copper Cove/Copperopolis	Lift-Station	LS #6, Poker Flat	$60,607
Copper Cove/Copperopolis	Lift-Station	LS #7, Poker Flat	$38,967
Copper Cove/Copperopolis	Lift-Station	LS #8, Poker Flat	$52,128
Copper Cove/Copperopolis	Lift-Station	LS #9, Poker Flat	$103,891
Copper Cove/Copperopolis	Lift-Station	LS#11, Poker Flat	$21,248
Copper Cove/Copperopolis	Lift-Station	LS#12, Poker Flat	$125,399
Copper Cove/Copperopolis	Lift-Station	LS#20, Copper Cove	$88,890
Copper Cove/Copperopolis	Pump-Station	Copperopolis PS	$175,000
Copper Cove/Copperopolis	Tanks	CC "B" Steel Tanks*	$1,500,000
Copper Cove/Copperopolis	Tanks	CC "C" Steel Tanks	$1,450,000
Copper Cove/Copperopolis	WTP	Copper Cove Water Treatment Plant[1]	$4,460,598
Copper Cove/Copperopolis	WWRF	Copper Cove Wastewater Reclamation Facility	$2,065,930
Copper Cove/Copperopolis	WWTP	Copper Cove Wastewater Treatment Plant[1]	$2,730,540
Copper Cove/Copperopolis Subtotal			$15,839,633
Ebbetts Pass	Lift-Station	Arnold Lift Station #2*	$107,176
Ebbetts Pass	Lift-Station	Arnold Lift Station #3*	$138,228
Ebbetts Pass	Lift-Station	Arnold LS #1, Cedar Ridge	$110,102
Ebbetts Pass	Lift-Station	Avery Middle School Lift Station	$120,576
Ebbetts Pass	Lift-Station	Forest Meadows Lakeside LS	$63,144
Ebbetts Pass	Lift-Station	Forest Meadows Lift Station	$500,000
Ebbetts Pass	Lift-Station	Forest Meadows Lift Station Azaleia Ct.	$42,469
Ebbetts Pass	Lift-Station	Larkspur LS	$175,000
Ebbetts Pass	Lift-Station	Mt. Retreat LS	$100,117
Ebbetts Pass	Lift-Station	Sequoia Woods LS*	$40151
Ebbetts Pass	Pump-Station	Dorrington PS	$192,770
Ebbetts Pass	Pump-Station	Lakemont PS	$161,500
Ebbetts Pass	Pump-Station	Meadowmont Pump Statio	$1,156,975
Ebbetts Pass	Pump-Station	Sawmill Pump Station, Ebbetts Pass	$299,858
Ebbetts Pass	Pump-Station	Timber Trails Pump Station	$47,333
Ebbetts Pass	Tanks	Ebbetts Pass Surge Tank	$680,420
Ebbetts Pass	Tanks	EP Avery Steel Tank	$1,375,000
Ebbetts Pass	Tanks	EP Big Trees 1 Steel Tank	$224,947
Ebbetts Pass	Tanks	EP Big Trees 3 Redwood Tank	$200,000
Ebbetts Pass	Tanks	EP Big Trees 4 & 5 Redwood Tank	$400,000
Ebbetts Pass	Tanks	EP Big Trees 60k Steel Tank	$350,000
Ebbetts Pass	Tanks	EP FM#1 Redwood Tank	$498,783
Ebbetts Pass	Tanks	EP FM#2 Steel Tank	$968,000

Service Area	Facility Type	Facility Name	Replacement Value
Ebbetts Pass	Tanks	EP Meadowmont 13 Redwood Tank	$1,104,354
Ebbetts Pass	Tanks	EP Meadowmont Steel Tank	$496,305
Ebbetts Pass	Tanks	EP Sawmill Steel Tank	$3,000,000
Ebbetts Pass	Valve Station	Moran Valve Station	$25,103
Ebbetts Pass	WTP	Ebbetts Pass Hunters Water Treatment Plant	$5,500,000
Ebbetts Pass	WWTP	Arnold Wastewater Treatment Plant	$2,230,000
Ebbetts Pass	WWTP	Country Houses Sewer Treatment System	$138,000
Ebbetts Pass	WWTP	Forest Meadows Wastewater Treatment Plant	$2,600,000
Ebbetts Pass	WWTP	Sequoia Woods Sewer Treatment System	$200,000
Ebbetts Pass	Maintenance Facility	White Pines Warehouse	$845,000
Ebbetts Pass Subtotal			$24,091,311
Jenny Lind	Lift-Station	LC Huckleberry Lift Station	$500,000
Jenny Lind	Lift-Station	LC Hwy 26 Lift Station	$37,558
Jenny Lind	Tanks	JL "A" Steel Tank	$1,997,164
Jenny Lind	Tanks	JL "E" Steel Tank	$1,200,000
Jenny Lind	Tanks	JL Water Pressure System (D Tank)*	$50,000
Jenny Lind	WTP	Jenny Lind Water Treatment Plant[2]	$6,454,000
Jenny Lind	WWTP	La Contenta Wastewater Treatment Plant	$2,248,736
Jenny Lind Subtotal			$12,487,458
Sheep Ranch	WTP	Sheep Ranch Water Treatment Plant	$750,000
Wallace	WTP	Wallace Lake Water Treatment Plant[3]	$1,483,897
Wallace	Wells	Wallace Lake Wells 2&3[4]	$124,764
Wallace	WWTP	Wallace Wastewater Treatment Plant[5]	$458,363
Wallace	Lift-Station	Wallace Sewer Lift Station	$63,969
West Point	Lift-Station	West Point LS	$121,512
West Point	Pump-Station	WP Middle Fork Pump Station	$166,626
West Point	WTP	West Point Water Treatment Plant	$2,186,712
West Point	WWTP	West Point Wastewater Treatment Plant	$558,235
West Point	WWTP	Wilseyville Wastewater Treatment Plant	$237,619
West Point Subtotal			$6,151,697
Unincorporated County	Diversions	Sheep Ranch Diversion	$200,000
Unincorporated County	Diversions	WP Bear Creek Diversion	$56,650
Unincorporated County	Lift-Station	Lift Station #21, Lower X Country	$1,450,000
Unincorporated County	Lift-Station	LS #22, Upper Cross Country*	$600,000

Service Area	Facility Type	Facility Name	Replacement Value
Unincorporated County	Lift-Station	Six Mile Village Sewer Lift Station*	$95,000
Unincorporated County	Lift-Station	Vallecito Sewer Main Lift Station	$175,000
Unincorporated County	Pump-Station	602 Pump Station	$88,828
Unincorporated County	Pump-Station	Sheep Ranch Pump Station*	$49,919
Unincorporated County	Tanks	CC Copperopolis Steel Tank	$1,200,000
Unincorporated County	Tanks	EP Big Trees 8 Redwood Tank*	$200,000
Unincorporated County	Tanks	EP Pinebrook Steel Tank	$892,650
Unincorporated County	Tanks	EP Timber Trails Redwood Tank*	$178,305
Unincorporated County	Tanks	JL "602" Elevated Steel Tank	$1,612,718
Unincorporated County	Tanks	JL "B" Steel Tank	$1,600,000
Unincorporated County	Tanks	JL "F" Steel Tank	$1,600,000
Unincorporated County	Tanks	WP Bummerville Steel Tank	$200,000
Unincorporated County	WWTP	Indian Rock Vineyards Sewer Treatment Plant	$17,024
Unincorporated County	WWTP	Southworth Wastewater Treatment Plant	$164,551
Unincorporated County	WWTP	Vallecito Wastewater Treatment Plant	$1,165,367
Unincorporated County Subtotal			$11,546,012
Total			**$70,099,087**

NOTES:
WTP - Water Treatment Plant
WWTP - Waste Water Treatment Plant
WWRF - Waste Water Reclamation Facility

* - An asterisk indicates GIS information was missing for these District facilities. Therefore, the vulnerability assessment did not evaluate if they are within hazard prone areas.

[1] – The Copper Cover Water/Wastewater and Reclamation facilities are each on the same property; however, there are only data points for the Water/Wastewater facilities and the Reclamation facility.

[2] – The Jenny Lind WTP includes the training facility.

[3] – There are two additional tanks at Wallace WTP: an elevated, steel-welded tank and ground, steel-welded tank.

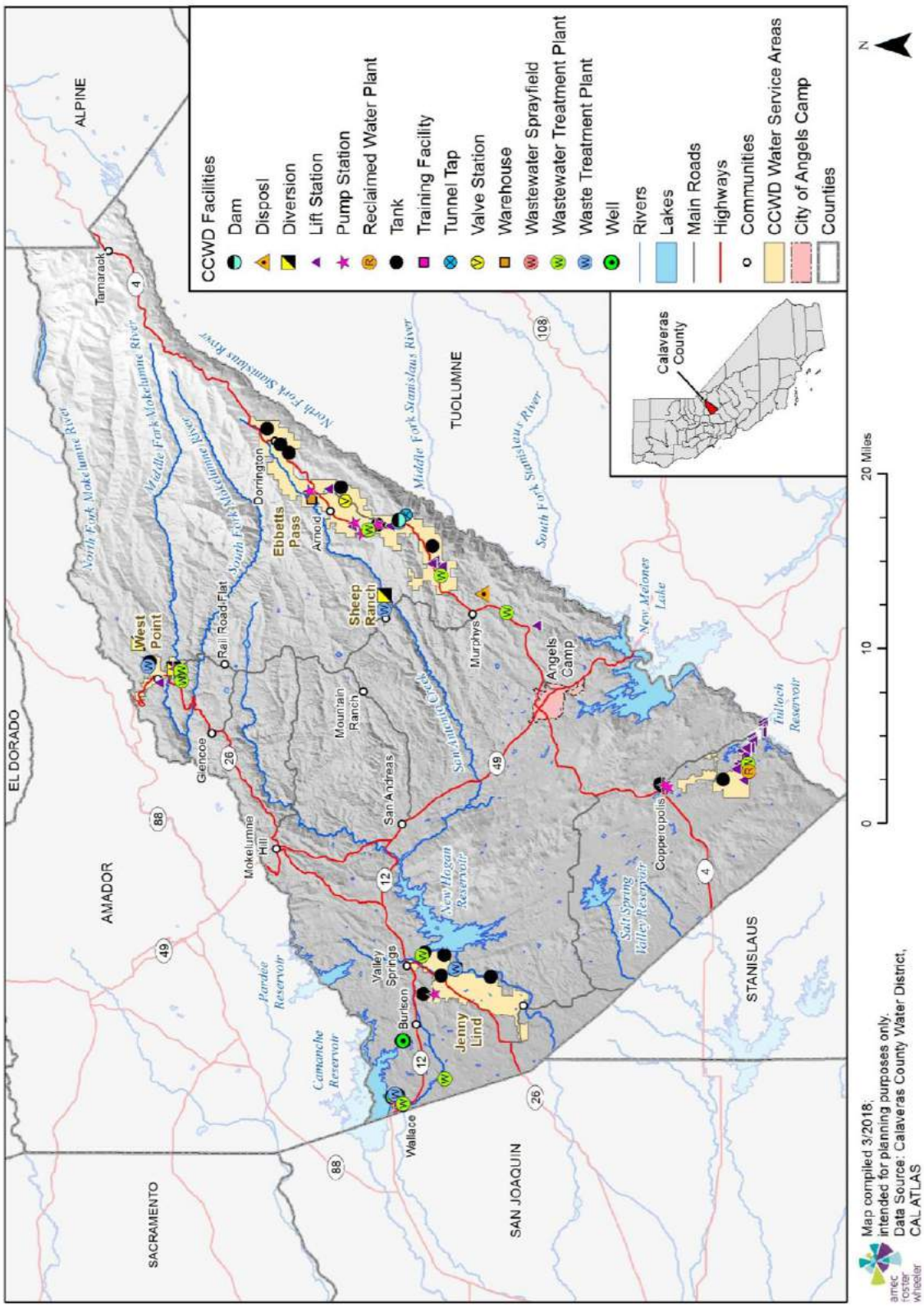
[4] – There are two separate GIS data points for the water supply wells in Wallace.

[5] – The Wallace WWTP includes a pump station and a wastewater sprayfield.

There are three additional facilities in the GIS data that are not included in here: Hunters Dam, North Fork Tunnel Tap, and the Lancha Plan Well. Replacement value information was not available for these facilities.

Source: CCWD 2018

Figure 4.57: Calaveras County Water District Critical Facilities



Lifeline utility systems for water and wastewater are critical facilities, so on this basis, all CCWD's facilities are critical. In addition, the HMPC identified their own critical facilities – those that are essential to maintaining their operations. HMPC participants also identified critical facilities owned by CCWD, but operated by other water and power utilities (i.e., UWPA). Standby power is necessary for critical facilities in the event of a power outage, which can be the result of many natural hazard events, such as severe weather, earthquake, or wildfire. CCWD has emergency generation capabilities at all its critical facilities.

Populations Affected

CCWD does not have exact numbers of population served but uses a general rule of thumb of 2.75 persons per water connection in Jenny Lind and Copper Cove and 2.5 persons per water connection in Ebbetts Pass and West Point. The persons per connection data is based on the 2010 U.S. Census for Calaveras County and California Department of Finance (DOF) data (45,168 total population in 2017) (US Census 2010; DOF 2017). Table 4.33 shows the estimated number of customers served by each water service and wastewater area of CCWD in 2018.

Table 4.33: CCWD Critical Facilities and Populations Served

Water System	**Population Served**
Copper Cove	4,416
West Point	988
Ebbetts Pass	5,368
Jenny Lind	9,592
Sheep Ranch	93
Wallace	241
Wastewater System	**Population Served**
Copper Cove	4,518
West Point	423
Forest Meadows	1,319
Vallecito	699
Arnold	1,412
La Contenta	2,911
Wallace	241

Source: CCWD 2015 (based on 2015 UWMP Update/CCWD Customer Service Data
NOTES: An analysis in Appendix C of the CCWD 2015 UWMP Update showed that within the Ebbetts Pass Service Area only 43% are permanent residences, with the remainder being second homes. Assuming 100% occupancy during peak recreational season, the population estimates are much larger – 12,484.

Table 4.34 provides information on the District's water systems, sources, and the number of municipal connections as of 2015.

Table 4.34: CCWD Public Water System Municipal Connections

Public Water System	Source	Number of Municipal Connections (2015)	Volume of Water Supplied (2015) (Acre-Feet)
Sheep Ranch	Calaveras River	51	8
Jenny Lind	Calaveras River	3,756	4,177
West Point	Mokelumne River	582	167
Cooper Cove	Stanislaus River	2,556	1,931
Ebbetts Pass Improvement District	Stanislaus River	6,027	954
Wallace Community Services District	Groundwater	103	43
Total		**13,075**	**7,280**

Source: CCWD 2015

Culture, Historical, and Natural Resources

Assessing the vulnerability of CCWD and the County it serves to disaster also involves inventorying the natural, historic, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant more protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

Calaveras County has a variety of natural resource assets that to a large extent serve as the basis for the county's economy and quality of life. These assets include water, critical species, and wildlife and plant habitat. Natural resource assets are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as attenuates and stores floodwaters.

Critical Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and

threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

There are 16 federal endangered, threatened, or candidate species in Calaveras County. These species are listed in Table 4.35.

Table 4.35: Calaveras County Critical Species

Latin Name	Common Name	Status
Listed Endangered or Threatened Species and/or Habitat		
Mammals		
Vulpes macrostis mutica	San Joaquin Kit Fox	E
Reptiles		
Thamnophis gigas	giant garter snake	T
Amphibians		
Rana aurora draytonii	California red-legged frog	T
Ambystoma californiense	California tiger salamander	T
Rana sierra	Sierra Nevada Yellow-legged Frog	E
Bufo canorus	Yosemite toad	C
Fishes		
Hypomesus transpacificus	Delta Smelt	T
Insects		
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	T
Crustaceans		
Branchinecta conservation	Conservancy Fairy Shrimp	E
Branchinecta lynchi	Vernal Pool Fairy Shrimp	T
Lepidurus packardi	vernal pool tadpole shrimp	E
Flowering Plants		
Brodiaea pallida	Chinese Camp brodiaea	T
Neostapfia colusana	Colusa Grass	T
Pseudobahia bahiifolia	Hartweg's Golden Sunburst	E
Arctostaphylos myrtifolia	Ione manzanita	T
Verbena californica	Red Hills Vervain	T
Critical Habitats		
Rana draytonii	California Red-legged Frog	Final
Ambystoma californiense	California Tiger Salamander	Final
Rana sierra	Sierra Nevada Yellow-legged Frog	Final

Source: US Fish and Wildlife Service, Information for Planning and Consultation (IPaC). Available at: https://ecos.fws.gov/ipac/
Key:
(E) Endangered - Listed as being in danger of extinction.
(T) Threatened - Listed as likely to become endangered within the foreseeable future.
(C) Candidate - Candidate to become a proposed species.
(Final) Critical Habitat designated for this species was finalized.

Wildlife and Plant Habitat

The majority of Calaveras County is undeveloped and contains natural habitat areas for a variety of species unique to the eastern San Joaquin Valley and foothills of the Sierra Nevada. Of the approximate 663,453 acres in the County there are approximately 12 major land use types including: drainages (0.01%), seasonal wetlands (0.01%), coniferous forests (31.7%), chaparral (11.5%), montane hardwood (12%), riparian woodland (0.03%), valley oak woodland (0.04%), foothill woodland (18%), anthropogenic (0.3%), non-native annual grassland (23%), urban (1.1%), and lakes and rivers (2.1%) (Calaveras County 2016).

Critical habitat for the California Red-legged Frog is located in the northwestern portion of the county within the Youngs and Spring Valley Creek drainages east of Valley Springs and north of New Hogan Reservoir. Critical habitat areas for the California tiger Salamander is in the western portions of the county near the San Joaquin Valley, west of Rancho Calaveras and along the edge of the county line west of Milton Road. Critical habitat areas for the Sierra Nevada Yellow-legged Frog occurs in a small section of the southwest edge of the county within the Silver Creek and North Fork Stanislaus River drainages. There are also several other locations throughout the county where species with special or protected status have been identified. Ione chaparral and big tree forest are two vegetation communities with particular importance for biodiversity and the habitat of sensitive species.

Historic and Cultural Assets

Calaveras County has numerous historically significant structures, including buildings, residences, and landmarks. Table 4.36 lists sites and buildings from the National Register of Historic Places (NRHP) and from the California Department of Parks and Recreation Office of Historic Preservation (OHP) for Calaveras County. The National Register of Historic Places is the nation's official list of cultural resources worthy of preservation. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service.

Table 4.36: Calaveras County Properties on the National Register of Historic Places

Site/Building	National Register	State Landmark	California Register	Point of Interest	Address	Town
Altaville				√	Town of Altaville	Altaville
Altaville Grammar School	√				125 N. Main Street	Altaville
Angels Camp		√			City of Angels Camp	Angels Camp
Angels Hotel	√	√			Main Street at Birds Way	Angels Camp
Avery Hotel-Halfway House				√		Avery

Site/Building	National Register	State Landmark	California Register	Point of Interest	Address	Town
Birthplace of Archie Stevenot		√				Angels Camp
Calaveras County Bank aka Calaveras Meat Market	√				1239 Main Street	Angels Camp
Calaveras County Courthouse	√				Main Street	San Andreas
Calaveritas		√				San Andreas
California Caverns at Cave City		√				San Andreas
Camanche		√				Burson
Camp Seco		√				Camp Seco
Carson Hill		√				Angels Camp
Chili Gulch		√				Mokelumne HIll
Choy, Sam, Brick Store (Angels Camp Jail)	√				Bird Way	Angels Camp
Congressional Church		√				Mokelumne Hill
Copperopolis		√				Copperopolis
Copperopolis Armory	√				695 Main Street	Copperopolis
Courthouse of Calaveras County, 1852-1866 and Ledger Hotel		√			Main Street	Mokelumne Hill
Copperopolis Congregational Church aka Copperopolis Community Center	√				411 Main Street	Copperopolis
Dorrington Hotel and Restaurant				√		Dorrington
Double Springs		√				Valley Springs
Douglas Flat		√				Douglas Flat
Douglas Flat School					Northeast of Vallecito on SR 4	Douglas Flat
El Dorado		√				Mountain Ranch
Fourth Crossing		√				San Andreas
Glencoe Mosquito Gulch		√				Glencoe
Honigsberger Store aka Calaveras Copper Mining Company Warehouse	√				665 Main Street	Copperopolis

Site/Building	National Register	State Landmark	California Register	Point of Interest	Address	Town
I.O.O.F. Hall		√			Center Street	Mokelumne Hill
Jenny Lind		√				Valley Springs
Jesus Maria		√				Mokelumne Hill
Mercer Caverns				√		Murphys
Milton		√				Milton
Mitchler Hotel		√				Murphys
Mokelumne Hill		√				Mokelumne Hill
Murphys Grammar School	√				Jones Street	Murphys
Murphys Historic District		√			Sheep Ranch Road, Main, Church, Jones, Algiers Streets, Big Trees Road, and Angels Creek	Murphys
Murphys Hotel aka Mitchler Hotel	√				Main and Algiers Streets	Murphys
O'byrne Ferry		√				Copperopolis
Old Mining Camp of Brownsville		√				Murphys
Paloma		√				Mokelumne Hill
Peter L. Traver Building		√				Murphys
Pioneer Cemetery		√				San Andreas
Prince-Garibardi Building		√				Altaville
Railroad Flat		√				Railroad Flat
Red Brick Grammar School		√				Altaville
Reed's Store aka Copperopolis Copper Mining Company Office	√				679 Main Street	Copperopolis
Robinson's Ferry		√				Angels Camp
San Andreas District		√				San Andreas
Sandy Gulch		√				West Point
Stone Corral		√				Valley Springs
Synder, John J., House aka. Snyder House					247 W. St. Charles Street	San Andreas

Site/Building	National Register	State Landmark	California Register	Point of Interest	Address	Town
Telegraph City Site, Napoleon and Quail Hill Mines				√		Copperopolis
Thorn House	√					San Andreas
Utica Mansion aka Charles D. Lane Mansion					1103 Bush Street	Angels Camp
Vallecito		√				Vallecito
Vallecito Bell Monument		√				Vallecito
Valley Springs District		√				Valley Springs
Thorn House					87 E. St. Charles Street	San Andreas
West Point		√				West Point

Source: National Register of Historic Places 2018. Available at: https://npgallery.nps.gov/NRHP/ ; CA OHP 2018. Available at: http://ohp.parks.ca.gov/ListedResources/?view=county&criteria=5

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, if the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations.

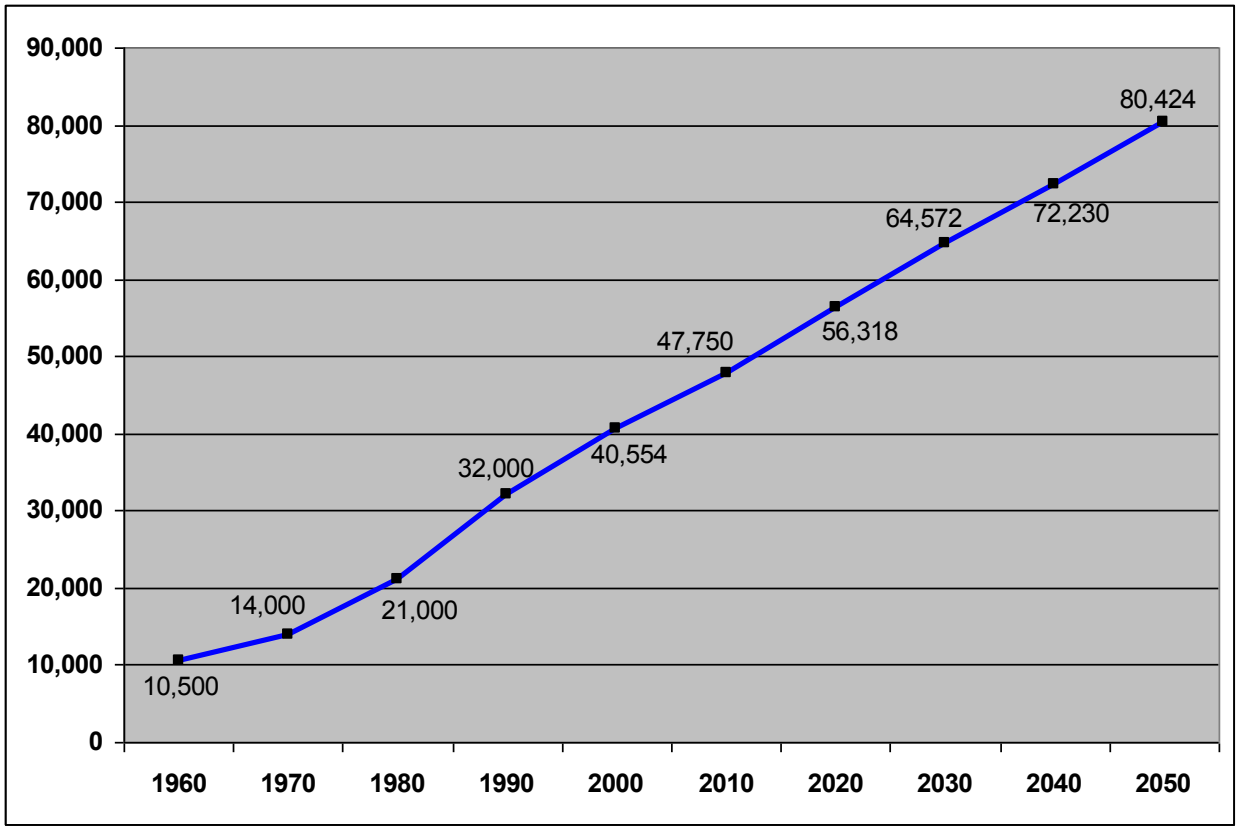
Growth and Development Trends

Based on projections from the California Department of Finance (DOF), population grew steadily over the previous five decades, and this growth is expected to continue. In 2010, Calaveras is ranked 44th out of 58 California Counties by population size; however, it grew rapidly in the 1970s and 1980s. Between 1970 and 1980, the average annual growth rate (AAGR) for Calaveras County was 4.3 percent. Between 1980 and 1990, the County added residents even more quickly (an average of 4.4 percent per year). From 1990 to 2000, growth slowed to an AAGR of 2.4 percent. For the most recent period from 2000 to 2010, the population AAGR was 1.2 percent, much slower than the rate of growth seen in previous decades. Most recent population estimates also indicate that from 2008 to 2016, the County experienced a slow in growth (DOF 2018).

Past Development

Information from the Calaveras County Housing Element and the California DOF were used to understand growth and development trends in the County. Figure 4.58 represents past and future population trends based on projections from the DOF. Based on the data, in 2014 the population was 45,010, and in 2016 the population decreased 44,747, a 0.58 percent decline. As of 2017, the current population of Calaveras County is 45,168, a 0.93 percent decrease from the previous year.

Figure 4.58: Calaveras County Historic Population and Future Growth Projections



Source: California DOF 2018

Population is scattered in Calaveras County, but higher populations reside in the upper Highway 4 corridor from Murphys to Big Tree Village, from Valley Springs to Jenny Lind, and in the Copperopolis area. Other population centers include Angels Camp, San Andreas, Mokelumne Hill, Mountain Ranch, and West Point. Due to the recreational opportunities in the region, many vacation homes exist in the county. Population increases during summer months when seasonal residents, tourists, and workers are in the area. Table 4.37 shows the population trends from 1920 through 2010.

Table 4.37: Calaveras County Historical Population Trends

Year	Population	Change	AAGR
1920	6,183	-	-
1930	6,008	-173	-0.3%
1940	8,221	2,213	3.2%
1950	9,902	1,681	1.9%
1960	10,289	387	0.4%
1970	13,585	3,296	2.8%
1980	20,710	7,125	4.3%

Year	Population	Change	AAGR
1990	31,998	11,288	4.4%
2000	40,554	8,556	2.4%
2010	45,578	5,024	1.2%

Source: Calaveras County Draft General Plan Housing Element 2014-2022

Future Development

The California DOF produces population projections for all counties in California, including Calaveras County. These projections were included in the 2014-2022 Calaveras County Housing Element. Table 4.38 shows the DOF population estimate in 2014, 2015, and 2017 and the projected population estimates through 2035, as well as the AAGR for each time period. As shown in the table, Calaveras County's population is projected to increase from 44,650 in 2014 to 54,912 in 2035. Growth rates in the region appear to be declining.

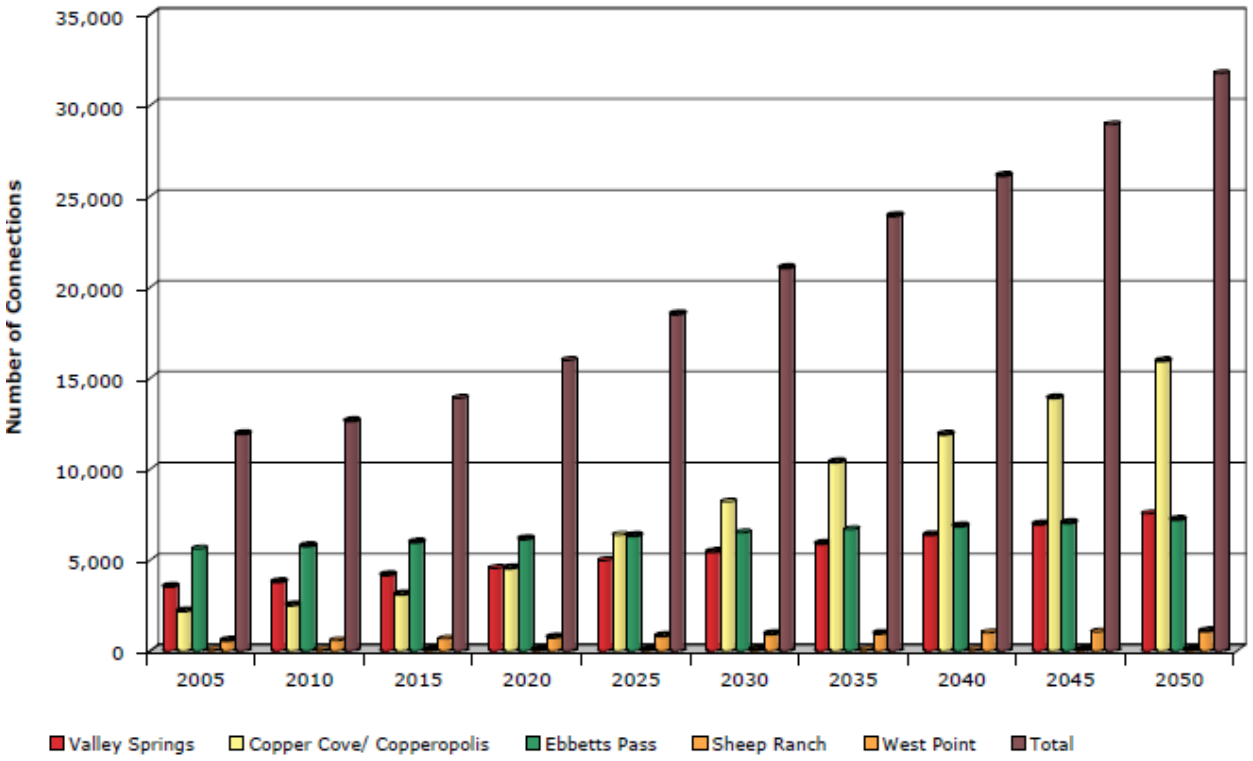
Table 4.38: Current and Projected Population

Year	Population*	AAGR
2014	44,650	-0.7%
2015**	45,923	0.1%
2017	44,747	0.2%
2020	48,957	1.3%
2025	51,415	1.0%
2030	53,317	0.7%
2035	54,912	0.6%

Sources: 2014 Data from DOF Table E-1 City/County Population Estimates w/Annual Percentage Change; January 1, 2013 and 2014. Data for 2015-2035 DOF Report P-1 (Total Population) State and County Population Projects July 1, 2010-2060 (5-year increments); 12/15/2014; 2017 Data from DOF Table E-6 Population Estimates and Components of Change by County – July 1, 2010-2017.
*Includes City of Angels Camp
**Projections commencing in 2015 for DOF Report P-1 are based on a DOF 2010 County and State population estimate of 45,654 and 37,341,978 respectively (and not on 2014 estimates).

The District recently completed updating its database to identify customers by class. Past customer class designations have not been itemized in its planning efforts because of the relatively small volume of water used among the various sectors other than single-family residential. Total projected connections by service area (without customer class designations) are graphically illustrated in Figure 4.59 below.

Figure 4.59: CCWD Potable Water Projected Connections



Source: Calaveras County Water District Urban Water Management Plan, June 2011

The main source of economic growth expected in Calaveras County, and in nearby foothills counties, in the next few decades is residential development. Much of the growth will be from those working in Stockton, Modesto, and other areas within commuting distance and from the retirement community as they relocate away from employment centers. Future development information was provided by the County. Details related to the growth areas is detailed in the Table 4.39 below.

Table 4.39: Calaveras Development Areas

Development	# of Units	# of Parcels	Project Date	Acres
Calaveras River Estates	2	2	2006	494
Copper Town Square Condominiums	28	28	-	27
Del Verde Subdivision	1	1	2005	40
Forest meadows	837	835	-	853
Hogan Oaks 1 +	1	1	2002	37
Hogan Oaks 2	1	1	2011	45
Las Tres Marias	1	1	2004	79
Mission Ranch	2	2	2006	81
Murphys Rocky Hill	2	2	2007	47

Development	# of Units	# of Parcels	Project Date	Acres
Novogradac	2	2	2003	14
Oak Canyon Ranch	19	17	2000	3,242
Old Golden Oaks	1	1	2006	28
Papais	4	4	2014	37
Sawmill Lake	9	9	-	254
Stamper Ranch	1	1	2003	133
Tuscany Hills	1	1	2001	1,096
Valley Springs Estates	1	1	1989	31
Vineyard Estates	1	1	2008	40
Vosti Properties	1	1	-	30
Total	**915**	**911**		**6,609**

Source: Calaveras County GIS

According to Calaveras County and the information in Table 4.39, future growth and development is expected to occur in the following communities/subdivisions: Calaveras River Estates, Copper Town Square Condominiums, Del Verde Subdivision, Forest Meadows, Hogan Oaks, Les Tres Marias, Mission Ranch, Murphys Rocky Hill, Novogradac, Oak Canyon Ranch, Old Golden Oaks, Papais, Sawmill Lake, Stamper Ranch, Tuscany Hills, Valley Springs Estates, Vineyard Estates, and Vosti Properties.

There has not been a significant amount of re-development within Calaveras County because of its rural nature and agricultural economy. All new development must follow the guidance of the Comprehensive Plan and must comply with all floodplain management regulations, land use regulations, and building codes.

There are currently no plans to expand CCWD facilities. However, in 2014, the Wallace Community Service District (WCSD) was annexed into CCWD's service area, which included water and wastewater systems.

4.3.2 CCWD Vulnerability to Specific Hazards

The Disaster Mitigation Act regulations require that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the hazards identified as a priority hazard in Section 4.2.19 Natural Hazards Summary. The priority hazards evaluated further as part of this vulnerability assessment include:

- Dam Failure
- Drought and Water Shortage
- Flood: 100-/500-year
- Flood: Localized Flooding
- Severe Weather: Heavy Rains and Storms

- Severe Weather: Wind
- Severe Weather: Winter Weather and Freeze
- Wildfire

An estimate of the vulnerability of the County to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected regarding the hazard area, such as the location of CCWD facilities, historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

The HMPC identified three hazards in the planning area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These three hazards are dam failure, flood, and wildfire. For dam failure, flood, and wildfire, the HMPC inventoried the following, to the extent possible, to quantify vulnerability in identified hazard areas:

- General hazard-related impacts
- Values at risk
- Overall community at risk
- Development trends within the identified hazard area

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analysis are discussed in more general terms.

Dam Failure Vulnerability Assessment

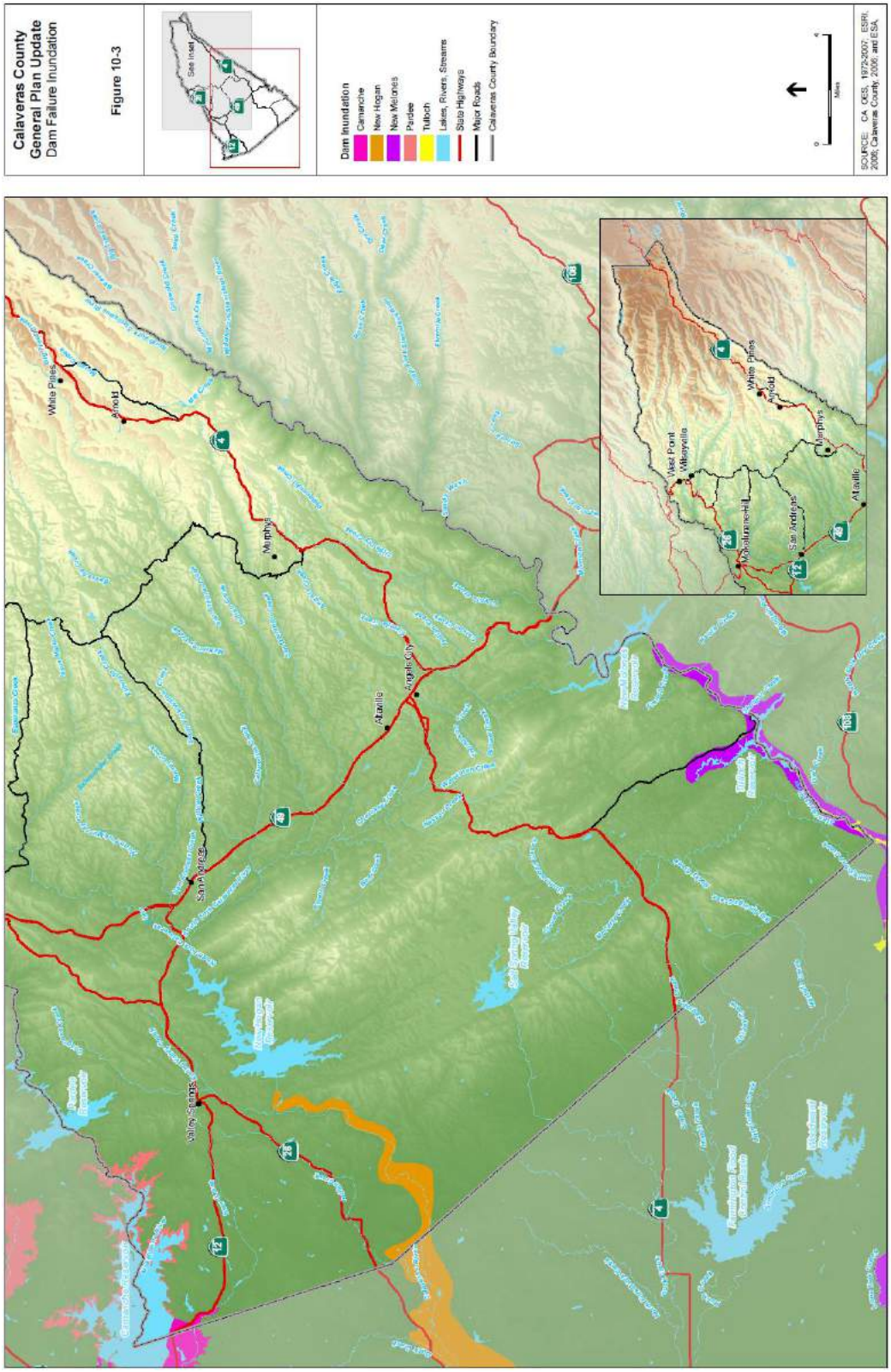
Likelihood of Future Occurrence—Unlikely
Vulnerability—High

Calaveras County's three major river systems (Mokelumne, Calaveras, and Stanislaus) have dams and large reservoirs. Dams are used for downstream flood control, water storage and hydroelectric generation. Dam failure can occur independently from flooding events discussed above. Dam failure can occur from earthquakes, internal erosion caused by embankment and foundation leakage, and from inadequate spillway capacity that can lead to overtopping of the dam and erosion. The California Department of Water Resources, DOSD states that the potential for the catastrophic failure of a properly designed and constructed dam is minimal.

Assets at Risk

The County's larger dams and reservoirs are located in the western portion of the County. Several smaller dams are found throughout the County; however, the dam inundation threats for these dams have less of a threat than from the larger dams in the western portion of the County. Figure 4.60 shows that the areas with the greatest dam failure inundation threat are found downstream of the larger reservoirs in the County: Pardee, Camanche, New Hogan, New Melones, and Tulloch.

Figure 4.60: Dam Inundation Zones in Calaveras County



Source: Calaveras County General Plan Baseline Report, 2008

Should a dam fail, many District assets would be at risk to the resulting flooding. Dam inundation analysis was not performed for this plan due to privacy issues of dam inundations.

Future Development

Areas slated for future development should consider potential impacts from dam failure risk upstream. In addition to the inundation zones depicted in Figure 4.60, a dam failure event would likely follow some existing FEMA mapped floodplains, which contains development restrictions for areas in the 1% annual chance floodplain, but it could exceed those floodplains. It should be noted that development below a low hazard dam could increase its hazard rating.

Water District Assets

According to the National Inventory of Dams (2016), the Calaveras County Water District is the owner of the following 10 dams:

- New Spicer Meadow* (H) - Highland Creek/Big Meadow
- New Spicer Meadow* (H) - Highland Creek/Dorrington
- La Contenta (H)
- Mckays Point Diversion* (Extremely High)
- West Point Regulating (S)
- White Pines (L)
- Copper Cove (L)
- North Fork Diversion* (L)
- Ross (L)
- Beaver Creek Diversion* (L)

* Indicates dams located either completely or partially outside of Calaveras County

Of the ten dams owned by the Water District, four are rated as high hazard (included Mckays Point Diversion rated as Extremely High), one as significant hazard, and five as low hazard. Beyond the immediate implications of response, a dam failure event would have longer term impacts on the County's hydroelectric power capabilities, as well as agricultural output. Five dams owned by the District are utilized for water supply purposes. New Spicer Meadow, North Fork Diversion, Beaver Creek Diversion, Ross, and McKays Point Diversion are responsible for hydroelectric water supplies, White Pines is linked to recreation waters sources, and La Contenta, West Point Regulating, and Copper Cove are essential for irrigation (Corps 2016).

Drought and Water Storage Vulnerability Assessment

Likelihood of Future Occurrence—Likely
Vulnerability—High to Extremely High

Drought impacts to the District vary but are usually related to the reduction in flow in addition to water supply issues. CCWD's majority source of water supply is surface water, which is particularly vulnerable to seasonal and climatic shortage. Historically, CCWD has met a significant portion of the water needs of Calaveras County with surface water from the Mokelumne, Calaveras, and Stanislaus Rivers. CCWD has significant access to surface water from these rivers. The District does possess pre- and post-1914 water rights and agreements to assure a long-term water supply for uses within the county. CCWD has experienced periods when supplies were reduced and responded by passing resolutions specific to the service area prohibiting certain uses of water. The state has recently required similar mandates for reduced water use.

The earliest action on record by CCWD was a declared water shortage in the West Point and Copper Cove service areas in 1961, but there are no records of the amount of water supply reduction nor the cause of the shortage. In the statewide 1976-1977 drought, the District restricted water use in the Copperopolis and Ebbetts Pass service areas, though the amount of reduction is unknown. CCWD adopted Ordinance 77-1 Prohibiting Nonessential Uses of Water to respond to water shortage emergencies.

In the 1987-1994, multi-county drought, water storage in New Hogan Reservoir was greatly diminished, falling below the minimum pool level, leading to poor quality, silty water and additional water treatment costs. Voluntary reduction measures in the Jenny Lind service area were adequate to respond to the shortage. Additional water storage at New Melones Reservoir, completed in 1979, and New Spicer Meadow Reservoir in 1990, prevented the Copperopolis and Ebbetts Pass service areas from being affected by this drought. Construction of an intertie linking the community of West Point with the Wilseyville service area, and an agreement for purchasing supplemental water with Calaveras Public Utility District using the Middle Fork of the Mokelumne River as a backup water supply source to the primary Bear Creek water source, helped ensure adequate water supply to the communities of West Point, Wilseyville, and Bummerville. In the community of Sheep Ranch, the normal San Antonio Creek water source was supplemented by releases from the Ebbetts Pass water system.

In November 2009, the Water Conservation Bill of 2009 (SB X7-7) was passed. This bill included elements of the 20x2020 Water Conservation Plan which was designed to reduce the statewide per capita urban water use by 20 percent over an established baseline by the year 2020. The Water Conservation Bill of 2009 requires urban water suppliers to report in their UWMPs base daily per capita water use (baseline), an urban water use target, an interim urban water use target, and compliance daily per capita water use. This enables water agencies and DWR to track progress towards decreasing daily per capita urban water use throughout the state. Beginning in 2016, retail water suppliers, such as the District are required to comply with the conservation requirements in SB X7-7 to be eligible for State water grants and loans (CCWD 2015).

Based on historical information, the occurrence of drought in California, including Calaveras County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period

between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of the County to drought is countywide, but impacts may vary by area and include reduction in water supply, agricultural losses, and an increase in dry fuels. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Table 4.40 shows how drought and water shortage effected Calaveras County between 2008 and 2018. The most prevalent impact of drought was in the water supply & quality category, with 787 reported impacts representing 28% of the total.

Table 4.40: Calaveras County Drought Impacts, 2008 – 2018

Category	Impact Counts
Agriculture	353
Energy	11
Plants & Wildlife	282
Society & Public Health	378
Water Supply & Quality	787
Business & Industry	98
Fire	191
Relief, Response, & Restrictions	552
Tourism & Recreation	114
Total	2,766

Source: Drought Impact Reporter

Losses/Assets at Risk

Drought is different than many other hazard events as it is a slow onset event unlikely to damage buildings or facilities. However, as a water district, drought can be one of the most detrimental hazards to CCWD and one requiring the most substantive planning as local conditions change and grow. Potential costs to droughts are difficult to assess. In the past, CCWD has borne cost themselves and not implemented any sort of surcharge to customers. Extreme heat in July 2006 led to water distribution problems similar to conditions that might occur during a drought event, including increased power and treatment expense and reduced consumptive revenue.

A limited analysis was conducted nearly a decade ago to determine the financial impacts to the District during water shortages and subsequent analysis have been integrated into the District's Water Contingency Plan (part of the 2015 UWMP). The analysis examines the primary impacts on a gross basis from instituting the various stages of a water conservation program. The net reduction in revenues for 20 percent, 30 percent, and 50 percent demand reduction is shown in Table 4.41. The District calculates net revenue based on consumptive revenue minus power and chemical costs.

Table 4.41: Net Revenue Impacts from Demand Reductions (2002 Dollars)

Demand type	Anticipated revenue
Normal	$747,300
20 percent reduction	$597,840
35 percent reduction	$485,745
50 percent reduction	$373,650

Source: 2011 Calaveras County Water District Urban Water Management Plan

The District's revenues are tied to water use; therefore, as water shortage and conservation measures are implemented the District has experienced revenue impacts. For instance, because of reduced demands due to the recent drought, the District experienced significant financial impacts during 2014-2015, as shown in Table 4.42.

Table 4.42: District Water Revenue from Demand Reduction

Fiscal Year	Water Revenues (Consumption)	% Change from Prior Year
2011-2012	$1,234,693	--
2012-2013	$1,469,339	19%
2013-2014	$1,358,779	-8%
2014-2015	$909,763	-33%

Source: 2015 Calaveras County Water District Urban Water Management Plan

There are many methods available to offset the projected reduced revenue impacts from conservation measures, including modifications to the drought rate structure. The District could consider a drought rate pricing structure during shortages that increase the unit rate for all customers by a common factor assuming an equitable apportionment per person by connection. For example, the District initiated a cost of service study that was anticipated to begin at the end of 2016 to identify an appropriate drought rate structure. If approved, the District may include the recommended drought rate structure during periods where state-mandated conservation measures are in place. Further, the District is contemplating a rate structure to incentivize conservation by putting more emphasis on the "tiered" levels of consumption, with no water being included in the base or standby rate. As of April 2018, the drought rate structure, or new water rates are currently under consideration by the District and a "Proposition 218" required notice has been sent out to customer explaining the proposed rate structures. In addition, the District maintains an emergency reserve to assist in cash flow during water shortages if necessary. If additional funds are still required, the District will consider utilizing operating reserves to meet the remaining revenue shortfalls. In June 2016, The District adopted Ordinance 2016-01 implementing an updated water shortage contingency plan from the 2015 UWMP and any prescribed water conservation regulations mandated by the state. This includes broad authorities for levying fines and enforcement measures for non-compliance with the ordinance or the provisions contained in the five stages of action in a water shortage scenario.

Tree Mortality

As a related drought impact, tree mortality has resulted in potentially vulnerable critical infrastructure property as these trees become more susceptible to falling with time. Table 4.43 through Table 4.46 show the results of analysis for tree mortality related to the location of critical facilities. There are 17 facilities located within the Tier I boundaries with a total replacement value of $10,192,099 and 16 in Tier II with a total replacement value of $10,576,637. Note, the boundary layers overlap so all Tier I facilities are also included in Tier II. The Ebbetts Pass service area facilities have the most risk, with 15 facilities at risk to tree mortality hazard.

Table 4.43: Tier I and II Tree Mortality Risk to Critical Facilities

Service Area	Facility Type	Facility Name	Tree Mortality	Replacement Value
Ebbetts Pass	Dam	Hunters Dam	Tier 1	NA
Ebbetts Pass	Lift Station	Cedar Ridge Lift Station	Tier 1	NA
Ebbetts Pass	Lift Station	Hwy 4 Lift Station	Tier 1	NA
Ebbetts Pass	Lift Station	Lakeside Lift Station	Tier 1	$63,144
Ebbetts Pass	Lift Station	Larkspur Lift Station	Tier 1	$175,000
Ebbetts Pass	Pump Station	Avery Pump Station	Tier 1	NA
Ebbetts Pass	Pump Station	Lakemont Pump Station	Tier 1	$161,500
Ebbetts Pass	Pump Station	Sawmill Pump Station	Tier 1	$299,858
Ebbetts Pass	Tank	60K Tank	Tier 1	$350,000
Ebbetts Pass	Tank	Avery Tank	Tier 1	$1,375,000
Ebbetts Pass	Tank	Big Trees 1 Tank	Tier 1	$224,947
Ebbetts Pass	Tank	Big Trees 4&5 Tank	Tier 1	$400,000
Ebbetts Pass	Tank	Heather Tank	Tier 1	NA
Ebbetts Pass	Tunnel Tap	North Fork Hydroelectric Tunnel Tap	Tier 1	NA
Ebbetts Pass	Water Treatment Plant	Hunters Water Treatment Plant	Tier 1	$5,500,000
Sheep Ranch	Water Treatment Plant	Sheep Ranch Water Treatment	Tier 1	$750,000
Unincorporated	Tank	Pinebrook Tank	Tier 1	$892,650
Total				*$10,192,099*

Source: CCWD, CalFIRE & FRAP, USFS 2018
NOTE: All the facilities in Tier 1 are also in Tier 2 because the layers overlap.

Table 4.44: Summary of Tier I Tree Mortality Risk to Critical Facilities

Service Area	Facility Type	Count
Ebbetts Pass	Dam	1
	Tunnel Tap	1
	Lift Station	4
	Pump Station	3
	Tank	5
	Water Treatment Plant	1
	Total	**15**
Sheep Ranch	Water Treatment Plant	1
	Total	**1**
Unincorporated County	Tank	1
	Total	**1**
	Grand Total	**15**

Source: Amec Foster Wheeler 2018

Table 4.45: Tier II Tree Mortality Risk to Critical Facilities

Service Area	Facility Type	Facility Name	Service Area	Replacement Value
Ebbetts Pass	Lift Station	Avery Middle School Lift Station	Tier 2	$120,576
Ebbetts Pass	Lift Station	Azalea Lift Station	Tier 2	$42,469
Ebbetts Pass	Lift Station	Lift Station 2	Tier 2	NA
Ebbetts Pass	Lift Station	Mountain Retreat Lift Station	Tier 2	$100,117
Ebbetts Pass	Pump Station	Meadowmont Pump Station	Tier 2	$1,156,975
Ebbetts Pass	Valve Station	Moran Valve Station	Tier 2	NA
Ebbetts Pass	Warehouse	White Pines Barn/Warehouse	Tier 2	$845,000
Ebbetts Pass	Wastewater Treatment Plant	Arnold Wastewater Treatment	Tier 2	$2,230,000
Ebbetts Pass	Wastewater Treatment Plant	Forest Meadows Sewer Treatment	Tier 2	$2,600,000
Sheep Ranch	Diversion	Sheep Ranch Diversion	Tier 2	$750,000
West Point	Diversion	Bear Creek Diversion	Tier 2	$56,650
West Point	Diversion	Middle Fork Mokelumne River Diversion	Tier 2	NA
West Point	Lift Station	West Point Lift Station	Tier 2	$121,512
West Point	Pump Station	Mokelumne River Pump Station	Tier 2	$166,626
West Point	Water Treatment Plant	West Point Water Treatment	Tier 2	$2,186,712
Unincorporated	Tank	Bummerville Tank	Tier 2	$200,000
Total				*$10,576,637*

Table 4.46: Summary of Tier II Tree Mortality Risk to Critical Facilities

Service Area	Facility Type	Count
Ebbetts Pass	Lift Station	4
	Pump Station	1
	Valve Station	1
	Warehouse	1
	Wastewater Treatment Plant	2
	Total	**9**
Unincorporated County	Tank	1
	Total	**1**
West Point	Diversion	2
	Lift Station	1
	Pump Station	1
	Wastewater Treatment Plant	1
	Total	**5**
Sheep Ranch	Diversion	1
	Total	**1**
	Grand Total	**13**

Source: Amec Foster Wheeler 2018

Specific District vulnerabilities to drought and water shortage include the pumps and water treatment plants that are vulnerable due to pumping and treating silty water during times of low flows.

Development

With recent California DOF growth projections more than doubling the Calaveras County population in the western Calaveras County area by 2050, a significant portion of future water demands will be met with a combination of increasing surface water diversions as well as increased groundwater extractions. New water connections are added at a rate from two percent to seven percent, depending on the system. The higher growth rates are in the Arnold and Copper Cove systems. New and proposed development in the Copper Cove/Copperopolis area along with proposed developments in the Camanche/Valley Springs area will require additional water supply projects to meet the increasing demands during average, single-dry, and multiple-dry water years. Projected supply and demand comparison to the year 2025 indicates that water demand is expected to increase the fastest in the areas of Copper Cove and Camanche Springs.

According to the earlier UWMPs (2005 update), small populations and low usage per connection have allowed water supplies to satisfy demand even in periods of drought, such as the driest years of record, 1976-1977 and 1987-1994. Low usage per connection reflects the geography and climate of each system. In general, extensive landscaping, which can account for up to 40-60 percent of a single-family connection usage, is not feasible in many of CCWD's systems. However, recent and proposed growth in certain systems will require existing policies to be reviewed and modified and/or new policies to be developed and implemented to better manage and conserve water supplies. These new and modified polies have been outlined in the 2015 UWMP in the Water

Contingency Plan. Over the past 5 years the District has maintained its water waste prevention ordinance, metered all customers and any new connections are required to be metered upon installation, established conservation pricing, and adjusted rates (three times as of 2015) to respond to changing condition in the service areas, specifically to drought. The District has also participated in a number of public education and outreach activities, including audits and notifying customers when usage trends are higher than normal (CCWD 2015).

Water District Assets

The District has established and used short-term water transfer arrangements to address water supply shortages. Additionally, under drought conditions, rainfall and runoff often decrease while effluent discharges remain the same. This can have impacts on surface water quality. Total dissolved solids may increase (especially with runoff from wildfires), and bacteria levels may become dangerous.

Flood Vulnerability Assessment

Likelihood of Future Occurrence—Occasional
Vulnerability—High

Inundation of the water and wastewater treatment plants could result in costs associated with:

- Facility damage and repair
- Facility downtime and loss of service to customers
- Pumping of floodwaters
- Damage to facility access roads
- Overflow of wastewater storage ponds

Historically, the Calaveras County planning area has always been at risk to flooding during the rainy season from November through April. The most significant risk exists along the Mokelumme and Stanislaus Rivers. Occasionally, extended heavy rains result in floodwaters exceeding normal high-water boundaries, overtopping of rivers and creeks, and flood damage. Winter storms are common in Calaveras County, and the snowmelt flooding has historically caused significant damages. The big damaging floods of 1973, 1995, 1998, 2006, 2010, and 2017 were generally the result of severe rainstorms and flash flooding. Other lesser flooding events have also occurred in other years. In addition to the major rivers, there are many streams, channels, canals, and creeks that serve the drainage needs of the County. There is significant threat of flooding in large areas of the County from several of these streams. Many of these streams are prone to rapid flooding with little notice

A number of wastewater storage facilities do not have sufficient capacity to accommodate the flows being conveyed to the wastewater treatment plant during the 100-year rainfall return interval event. Increasing urbanization has led to increased runoff exacerbating problems with wastewater inflow and infiltration.

Assets at Risk

Methodology

CCWD facility layers were obtained from the previous CCWD plan and were supplemented with new facilities from CCWD that were provided in early 2018, including new facility information for the WCSD. The locational data for the new facility layers was also more accurate and detailed than the previous update data. Only mapped facilities are accounted for in the flood analysis.

CCWD Facility analysis was performed through GIS where facility centroids were intersected with the effective 12/17/2010 DFIRM, but also interested with the NFHL that incorporates the LOMRs (which were updated on 8/28/2017) to show potential risk to each facility.

FEMA DFIRMs had not been updated since the last plan, however the NFHL was used, which included the updated LOMRs that became effective on 8/28/17. As a result, the analysis was updated based on the new GIS NFHL data layer. This methodology represents a more accurate count of facilities in the flood zone with the integration of the LOMRs. The analysis also accounted for tank replacements and the annexation of the WCSD in the analysis. This flood analysis identified five facilities to be at risk to flooding according to the effective DFIRM flood zones with a total replacement value of $549,288 (includes Lift Station 3 – Saddle Creek and West Point River Diversion at Sheep Ranch). This can be seen on Figure 4.61 and Figure 4.62, and detailed in Table 4.48 and Table 4.49. Flood zones affecting the District are shown in Table 4.47.

Table 4.47: Flooding Sources for CCWD Service Areas

Service Area	FEMA Flood Zone	Flooding Sources
Copper Cove/Copperopolis	Zone A	Stanislaus River, no name tributaries
Ebbetts Pass	Zones A, Zone AE	Big Trees Creek, Mill Creek, Moran Creek San Antonio Creek, San Domingo Creek, no name tributaries
Jenny Lind	Zones A, Zone AE	Calaveras River, Cosgrove Creek, Indian Creek, Spring Valley Creek, no name tributaries
Sheep Ranch	Zone A	no name tributaries
West Point	Zone A	Middle Fork Mokelumne River, no name tributaries
Wallace	Zone A	

Source: CCWD, FEMA, NFHL 2010

GIS analysis was used to determine the critical facilities located in flood hazard areas. As seen in Table 4.48 there are five facilities at risk to flooding. Additionally, the flood hazard layers produced by DWR Flood Awareness project were incorporated into analysis, indicating two facilities at risk. In both assessments, Lift Station 3 in Copper Cover/Copperopolis was identified.

Table 4.48: CCWD Assets at Risk to FEMA Flood Hazards

Service Area	Facility Type	Facility Name	FEMA Flood Zone	Flood Source	Replacement Value
Copper Cove/Copperopolis	Lift Station	Lift Station 3	1% Chance	Stanislaus River	141,314
Copper Cove/Copperopolis	Lift Station	Lift Station 10	0.2% Chance	Unnamed tributary	26,560
Wallace	Well	Raw Water Supply Well #3	1% Chance	Unnamed tributary	124,764
West Point	Diversion	Middle Fork Mokelumne River Diversion	1% Chance	Middle Fork Mokelumne	200,000
West Point	Diversion	Bear Creek Diversion	1% Chance	Bear Creek	56,650
Total					*$549,288*

Source: CCWD, FEMA NFHL 2010

Table 4.49: CCWD Assets at Risk to DWR Awareness Flood Hazards

Service Area	Facility Type	Facility Name	Replacement Value
Copper Cove/Copperopolis	Lift Station	Lift Station 10	$26,560
Ebbetts Pass	Valve Station	Moran Valve Station	$25,103
Total			*$51,663*

Source: CCWD, Cal DWR

Figure 4.61: East Calaveras County Water District Facilities in DFIRM Flood Zones

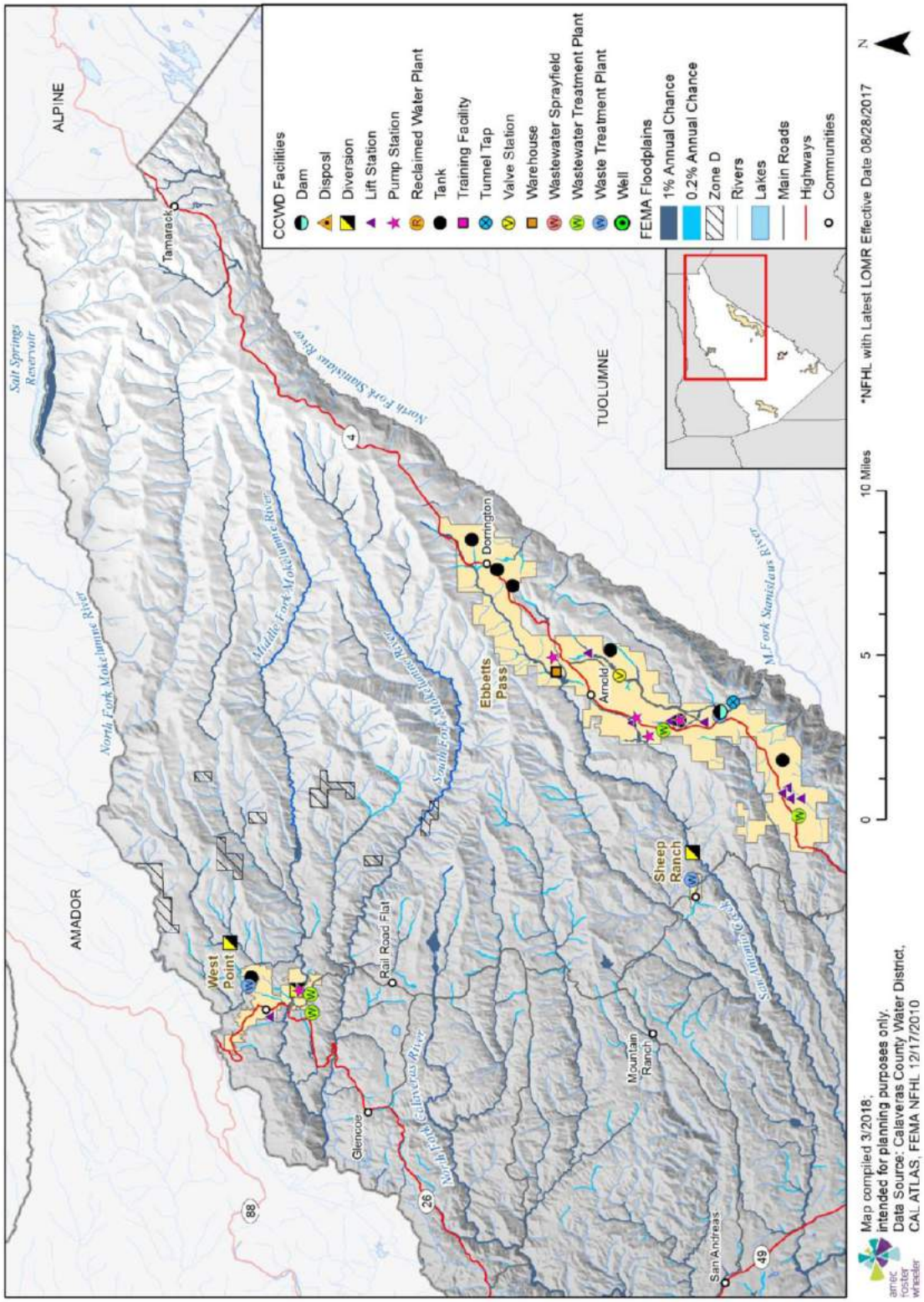


Figure 4.62: West Calaveras County Water District Facilities in DFIRM Flood Zones

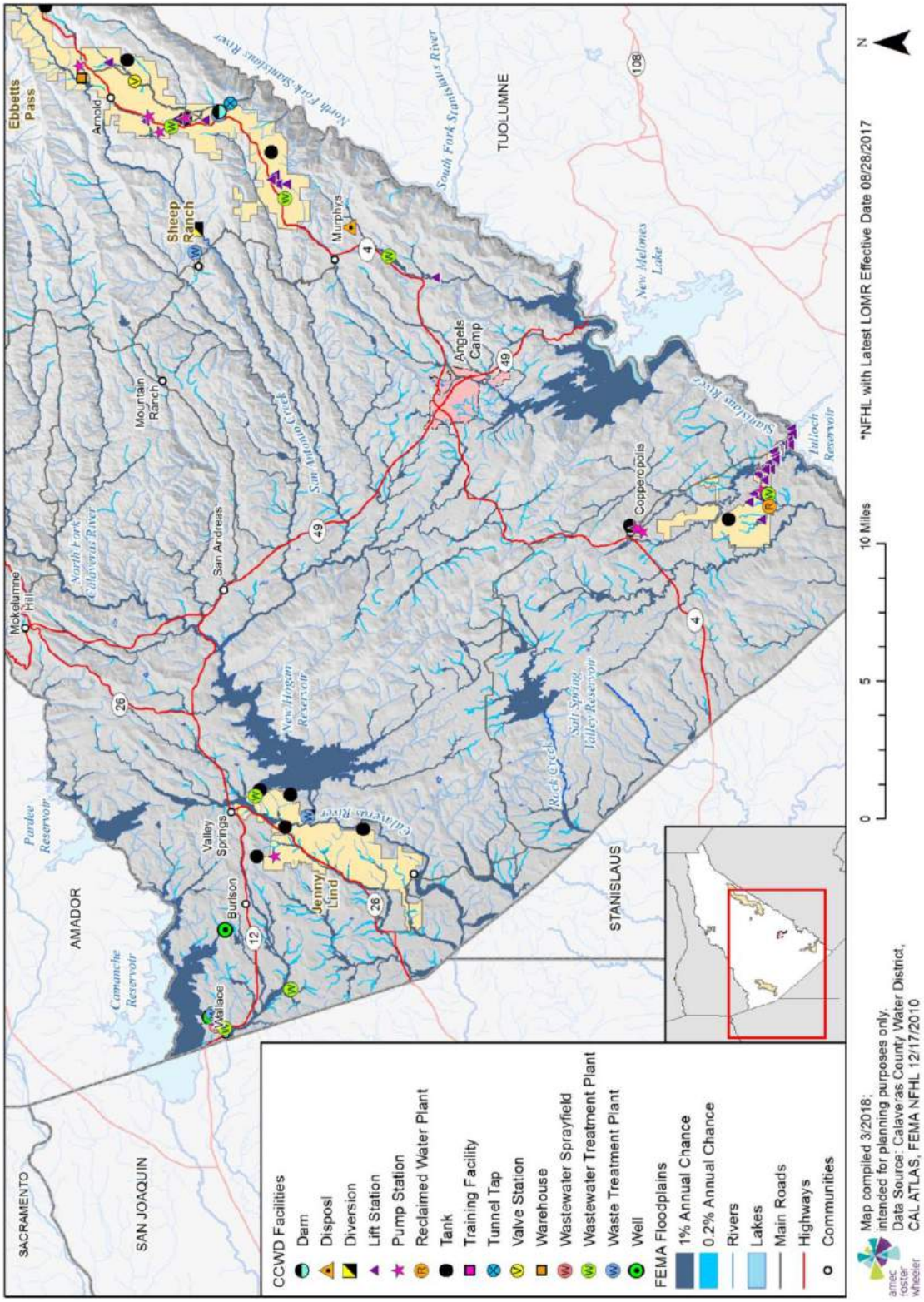


Table 4.50: Calaveras County Facilities at Risk to Flooding

Service Area	Facility Type	Facility Name	Replacement Value	FEMA Flood Zones	Flooding Source
Copper Cove/Copperopolis	Lift-Station	LS #10, Poker Flat	$24,620	Zone A	-
Copper Cove/Copperopolis	Lift-Station	LS #3, Poker Flat	$60,128	Zone A	-
Copper Cove/Copperopolis	WWRF	Cooper Cove Wastewater Reclamation Facility	$1,131,765	Zone A	Unnamed tributary
Copper Cove/Copperopolis	WWTP	Copper Cove Wastewater Treatment Plant	$1,608,306	Zone A	Unnamed tributary
Ebbetts Pass	Lift-Station	Arnold Lift Station #2	$98,214	Zone AE	Unnamed tributary
Ebbetts Pass	Lift-Station	Arnold LS #1, Cedar Ridge	$86,600	Zone A	-
Ebbetts Pass	WWTP	Sequoia Woods Sewer Treatment System	$130,000	Zone A	Morgan Creek
Jenny Lind	Lift-Station	LC Huckleberry Lift Station	$431,425	Zone AE	Cosgrove Creek
Unincorporated County	Lift-Station	Lift Station #21, Lower X Country	$476,898	Zone A	Unnamed tributary
Total			**$4,047,956**		

Sources: CCWD, FEMA, NFHL 2010
Note: Unmapped facilities are not included in this analysis. The HMPC noted that there are no unmapped facilities in the flood zone.
WTP - Water Treatment Plant
WWTP - Waste Water Treatment Plant
WWRF - Waste Water Reclamation Facility

Future Development

There are no planned facilities that will be built in or near the flood zone.

Water District Assets

Flood events pose a threat to District owned facilities or infrastructure located within the floodplains. Additionally, as large volumes of fast moving water overtop riverbanks, erosion can lead to soil destabilization, in addition to increased levels of sediment in the water. The sediments can congest streams and effect water quality and supply sources that the District depends on.

Severe Weather: Wind Vulnerability Assessment

Likelihood of Future Occurrence—Highly Likely
Vulnerability—High

According to historical hazard data, severe weather is an annual occurrence in the communities served by the District. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rains and thunderstorms are the most frequent type of severe

weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage.

Future Development

New District facilities should be built to withstand hail damage, lightning, and thunderstorm winds. While no damages have occurred to District facilities in the past due to lightning, hail, or high wind, it is difficult to quantify damages due to lightning. With development occurring in the region, future losses to new development may occur.

Water District Assets

Wind hazard events do not generally include any unique impacts for CCWD; however, wastewater storage facilities are at risk to overflowing associated with heavy rains. These facilities include Copper Cove WTP, La Contenta WTP, West Point WTP, Forest Meadows WTP.

Severe Weather: Winter Weather and Freeze Vulnerability Assessment

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Medium

Winter storms typically involve snow and ice, occasionally accompanied by high winds, which can cause downed trees and power lines, power outages, accidents, and road closures. Although most facilities are equipped with heaters, freezing pipes is still a concern. In addition, heavy snows can cause interruption in power, requiring facilities to run on generators several days in a row. A significant challenge is getting backup fuel to generators. Past storm events have knocked out power to multiple facilities at the same time. Recent snow events have resulted in 13 to 14 District facilities running on generators for days.

Future Development

Future District facilities that are built to code (for those areas with building codes) should be able to withstand snow loads from severe winter storms. Pipes at risk of freezing should be mitigated be either burying or insulating them from freeze as new facilities are improved or added.

Water District Assets

The primary concern associated with winter weather events is the impacts on infrastructure and essential facilities. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets in the District. The ability for the District to continue to operate during periods of winter storm and freeze is paramount. Although freezes are infrequent, a freeze can affect District facilities. Most facilities are equipped with heaters, but freezing pipes is still a concern. Of greatest concern to the District are severe winter weather events with significant snowfall that makes the roads to District facilities impassible. The District also has limited snow removal equipment in the event of a large snowstorm.

Wildfire

Likelihood of Future Occurrence—Likely
Vulnerability—Extremely High

Wildfires can cause short-term and long-term disruption to CCWD. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact CCWD by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires may result in casualties and can destroy buildings and infrastructure.

The 2001 Darby fire destroyed a flume owned by CCWD, but used by the City of Angels Camp water provider to transport water to Murphys and Angels Camp. This flume was repaired. The Pattison fire in September 2004 destroyed a 150,000-gallon redwood potable water storage tank in the Rancho Calaveras area of the Jenny Lind service area. The cost estimate for the replacement steel tank was $800,000 and funded by CAL EMA. This tank has been installed.

The 2015 Butte fire destroyed 921 structures including 589 homes, 368 outbuildings, and 4 commercial properties. Substantial damage occurred at the Mountain Ranch Community Park/Center. The fire also resulted in direct impacts to municipal water supplies through contamination of ash and debris from the fire, the destruction of aboveground delivery lines, and from impacts related to soil erosion and debris deposits into the waterways (CalFIRE 2018; CNRA 2015). FEMA approved over $8.3 million individual assistance funding and the federal Small Business Administration approved $6.5 million in loans to Butte Fire victims.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. In some cases, the economic impact of this loss of services may be comparable to the economic impact of physical damages or, in some cases, even greater. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services.

Fires can also cause major damage to power plants and power lines needed to distribute electricity to operate facilities. CCWD pump stations have back-up power generators, which also may be destroyed by fire.

The National Fire Plan is a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The National Fire Plan identifies the following 34 “Communities at Risk” in Calaveras County:

Table 4.51: Communities at Risk in Calaveras County

Community	Community	Community
Altaville	Dorrington	Rail Road Flat
Angels Camp	Douglas Flat	San Andreas
Arnold	Forest Meadows	Sandy Gulch
Avery	Ganns	Sheep Ranch
Big Meadow	Glencoe	Sky High
Big Trees	Hathaway Pines	Tamarack
Burson	Jenny Lind	Vallecito
Calaveritas	Milton	Valley Springs
Camp Connell	Mokelumne Hill	Wallace
Campo Seco	Mountain Ranch	West Point
Copperopolis	Murphys	Wilseyville
Cottage Springs	Paloma	

Source: California Fire Alliance

CCWD has facilities near and serves many of these communities; water supply is required for fire protection. The TCU Fire Management Plan identifies watersheds and water utilities as primary assets at risk to wildfire, and CCWD facilities are considered critical assets by the plan.

Assets at Risk

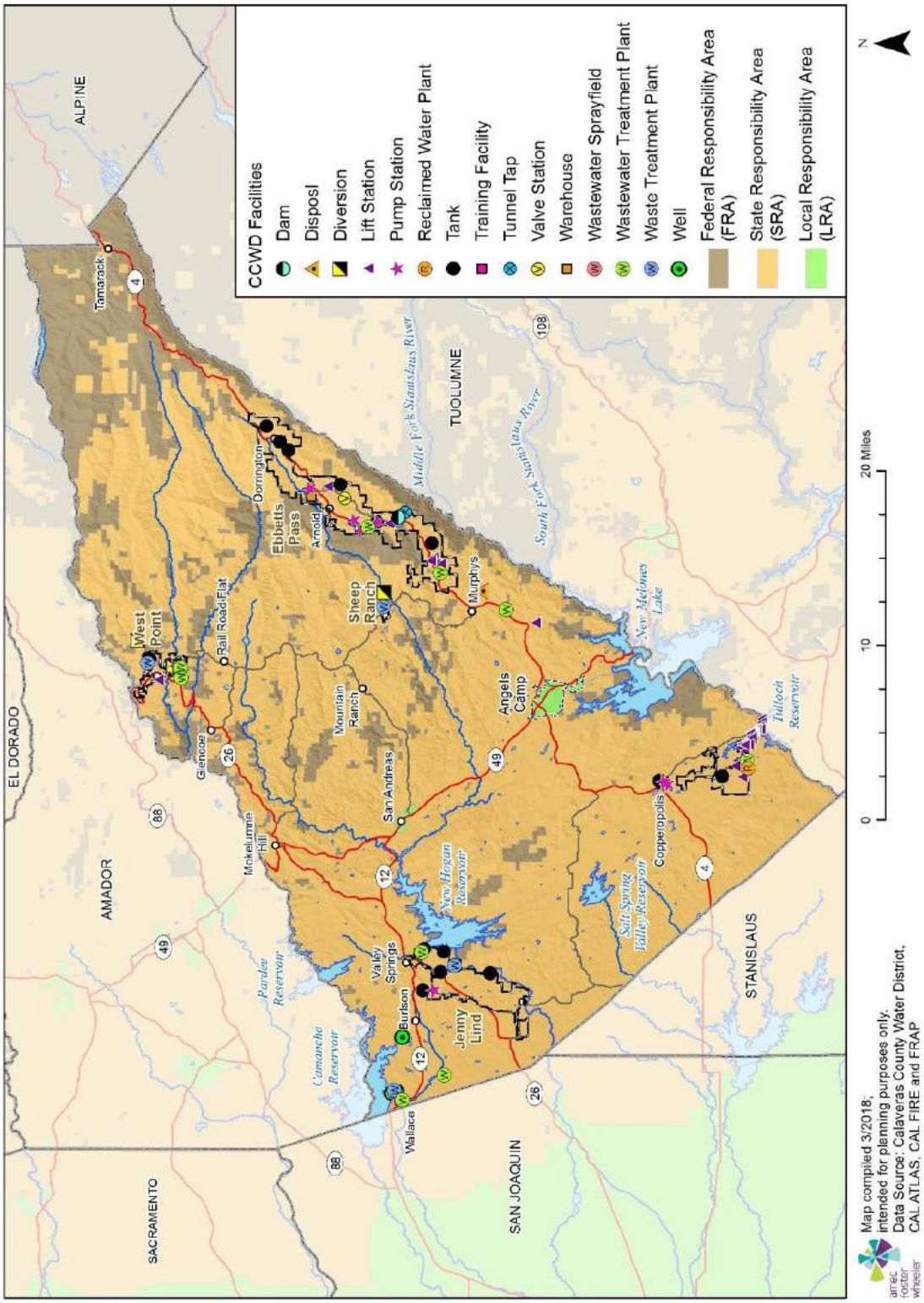
Unincorporated Calaveras County and the City of Angels Camp have mapped fire hazard severity areas (FHSAs). GIS was used to determine the possible impacts of wildfire within the County and how the wildfire risk varies across the planning area.

Methodology

Fire severity layers were obtained from CAL FIRE, three separate layers were used to create complete coverage of fire severity for the County: Local Responsibility Areas (LRA), State Responsibility Areas (SRA), and a draft layer that was used to supplement the limited Federal Responsibility Areas (FRA).

CAL FIRE has a legal responsibility to provide fire protection on all SRA lands, which are defined based on land ownership, population density and land use. CAL FIRE is now also responsible for determining parcels subject to the SRA Fire Prevention Fee under AB X1 29. This dataset (SRA14_2) represents SRA status as of 7/1/14. CAL FIRE's State Responsibility Area layer was used in this analysis to show the District's critical facilities within the Federal Responsibility Area (FRA), SRA, and LRA. The FRA in the County is relatively small. The largest is the SRA, with almost 90 percent of the parcels in the County falling in the SRA. The LRA falls mainly in the City of Angels Camp. These areas are shown on Figure 4.63.

Figure 4.63: Fire Responsibility Areas in Calaveras County



The fire hazard model developed by CAL FIRE considers the wildland fuels. Fuel is that part of the natural vegetation that burns during the wildfire. The model also considers topography, especially the steepness of the slopes. Fires burn faster as they burn up-slope. Weather (temperature, humidity, and wind) has a significant influence on fire behavior. The model recognizes that some areas of California have more frequent and severe wildfires than other areas. Finally, the model considers the production of burning fire brands (embers) how far they move, and how receptive the landing site is to new fires.

CAL FIRE mapped the SRA Fire Hazard Severity Zones (FHSZs), or areas of significant fire hazard, based on fuels, terrain, weather, and other relevant factors. Zones are designated with Very High, High, Moderate, Non-Wildland/Urban and Urban Unzoned hazard classes. The goal of this mapping effort is to create more accurate fire hazard zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The fire hazard zones will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources. Figure 4.64 and Figure 4.65 highlight fire hazard areas throughout the western and eastern portions of Calaveras County.

Figure 4.64: Eastern Calaveras County Fire Severity Zones

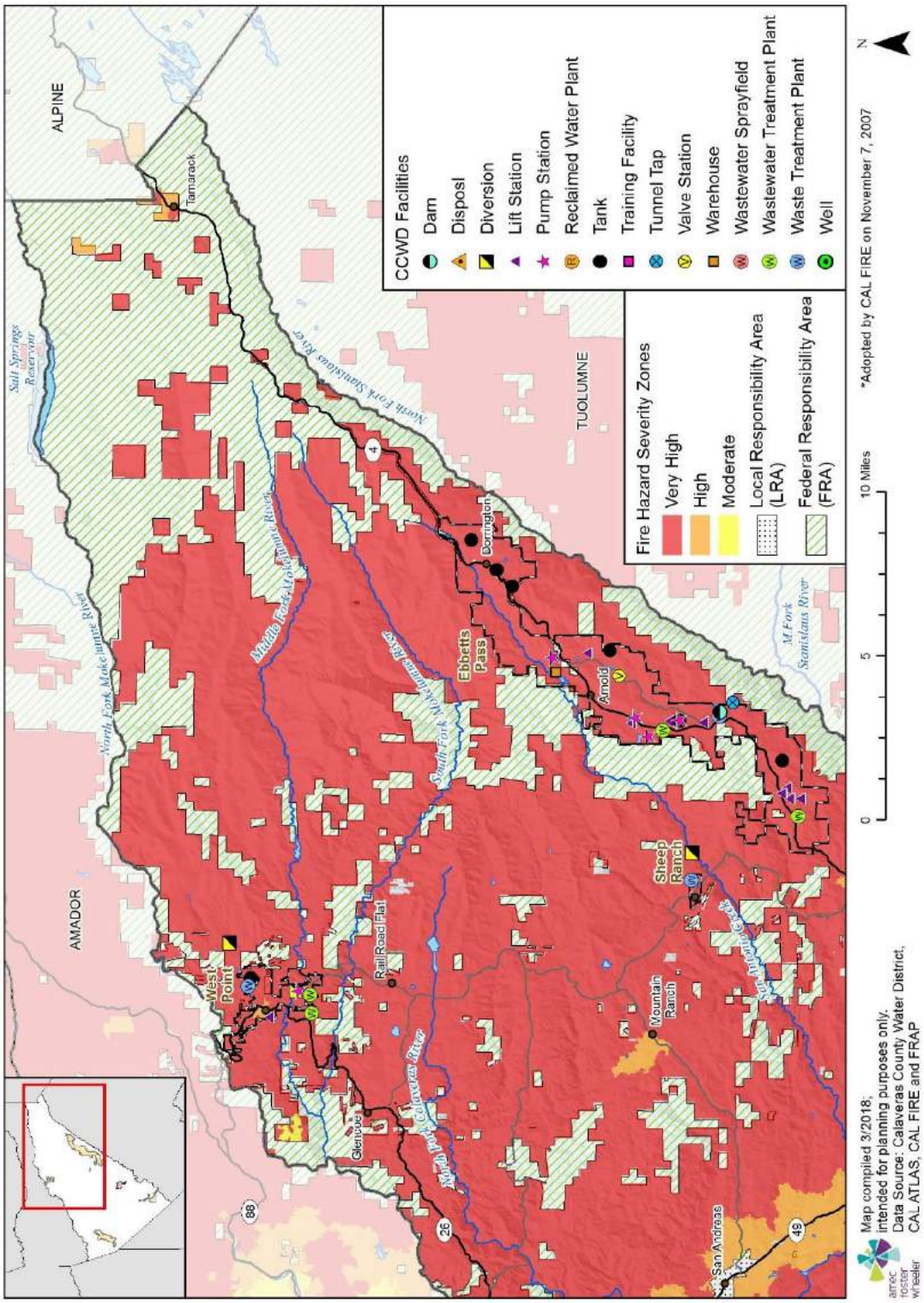


Figure 4.65: Western Calaveras County Fire Severity Zones

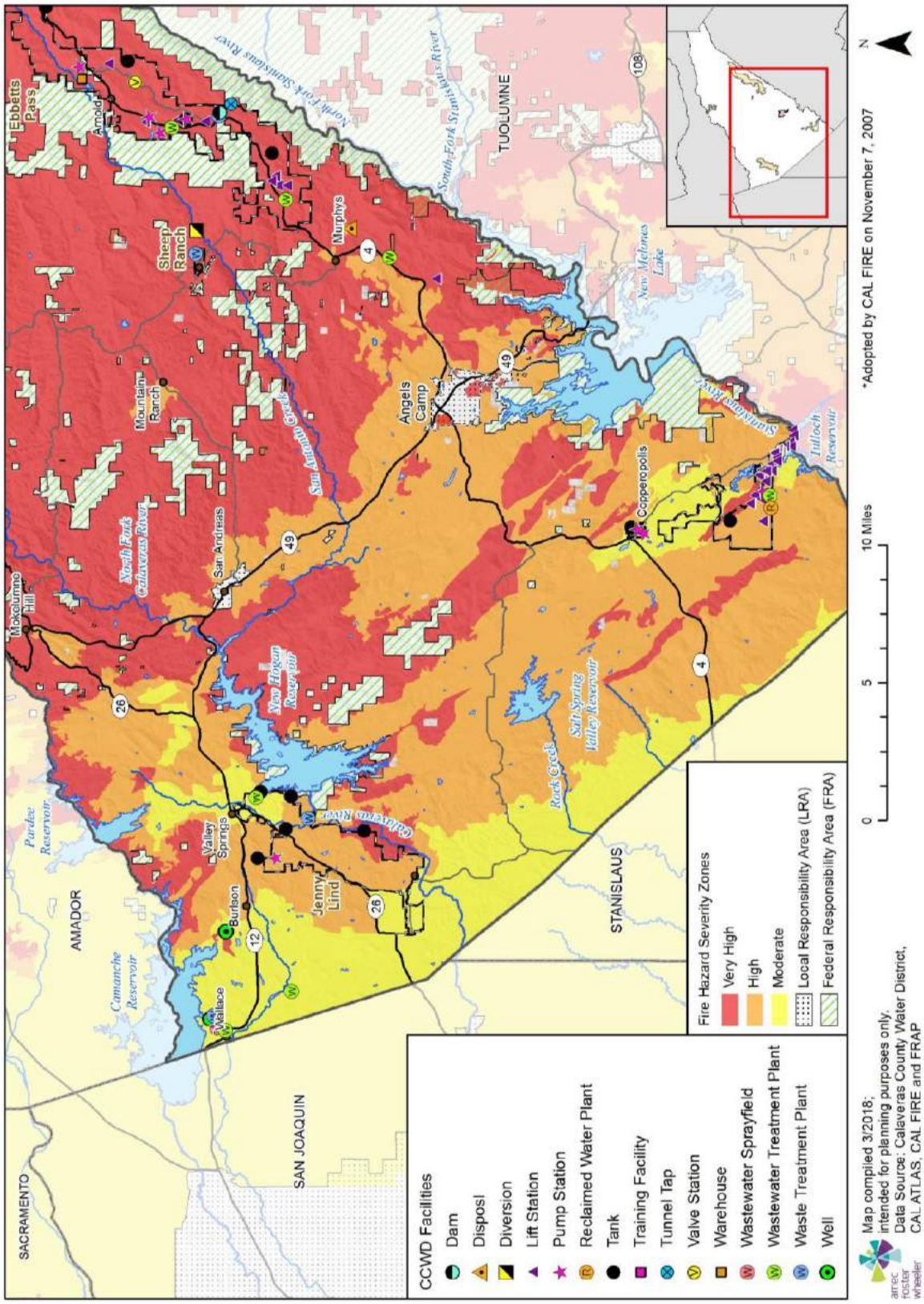


Table 4.52: CCWD Assets at Risk in the Moderate, High, and Very High Fire Zones

Service Area	Facility Type	Facility Name	Fire Severity	Replacement Value
Copper Cove/Copperopolis	Lift Station	Lift Station 16	Very High	$215,538
Copper Cove/Copperopolis	Lift Station	Lift Station 18	Very High	$226,258
Ebbetts Pass	Dam	Hunters Dam	Very High	NA
Ebbetts Pass	Lift Station	Avery Middle School Lift Station	Very High	$120,576
Ebbetts Pass	Lift Station	Azalea Lift Station	Very High	$42,469
Ebbetts Pass	Lift Station	Cedar Ridge Lift Station	Very High	NA
Ebbetts Pass	Lift Station	HWY 4 Lift Station	Very High	NA
Ebbetts Pass	Lift Station	Lakeside Lift Station	Very High	$63,144
Ebbetts Pass	Lift Station	Larkspur Lift Station	Very High	$175,000
Ebbetts Pass	Lift Station	Lift Station 2	Very High	$107,176
Ebbetts Pass	Lift Station	Mountain Retreat Lift Station	Very High	$100,117
Ebbetts Pass	Pump Station	Avery Pump Station	Very High	NA
Ebbetts Pass	Pump Station	Lakemont Pump Station	Very High	$161,500
Ebbetts Pass	Pump Station	Meadowmont Pump Station	Very High	$1,156,975
Ebbetts Pass	Pump Station	Sawmill Pump Station	Very High	$299,858
Ebbetts Pass	Tank	60K Tank	Very High	$350,000
Ebbetts Pass	Tank	Avery Tank	Very High	$1,375,000
Ebbetts Pass	Tank	Big Trees 1 Tank	Very High	$224,947
Ebbetts Pass	Tank	Big Trees 4&5 Tank	Very High	$400,000
Ebbetts Pass	Tank	Heather Tank	Very High	NA
Ebbetts Pass	Valve Station	Moran Valve Station	Very High	NA
Ebbetts Pass	Warehouse	White Pines Barn/Warehouse	Very High	$845,000
Ebbetts Pass	Wastewater Treatment Plant	Arnold Wastewater Treatment	Very High	$2,230,000
Ebbetts Pass	Wastewater Treatment Plant	Forest Meadows Sewer Treatment	Very High	$2,600,000
Ebbetts Pass	Water Treatment Plant	Hunters Water Treatment Plant	Very High	$5,500,000
Sheep Ranch	Diversion	Sheep Ranch Diversion	Very High	NA
Sheep Ranch	Water Treatment Plant	Sheep Ranch Water Treatment	Very High	$750,000
West Point	Diversion	Bear Creek Diversion	Very High	NA
West Point	Diversion	Middle Fork Mokelumne River Diversion	Very High	NA
West Point	Lift Station	West Point Lift Station	Very High	$121,512
West Point	Pump Station	Mokelumne River Pump Station	Very High	$166,626
West Point	Wastewater Treatment Plant	West Point Wastewater Treatment	Very High	$558,235
West Point	Wastewater Treatment Plant	Wilseyville Wastewater Treatment	Very High	$237,619

Service Area	Facility Type	Facility Name	Fire Severity	Replacement Value
West Point	Water Treatment Plant	West Point Water Treatment	Very High	$2,186,712
Unincorporated	Disposal	Indian Rock Disposal	Very High	$17,024
Unincorporated	Lift Station	Vallecito Main Lift Station	Very High	$175,000
Unincorporated	Tank	Bummerville Tank	Very High	$200,000
Unincorporated	Tank	Pinebrook Tank	Very High	$892,650
Unincorporated	Tank	Tank B #	Very High	$1,600,000
Unincorporated	Wastewater Treatment Plant	Vallecito Wastewater Treatment	Very High	$1,165,367
Unincorporated	Well	Lancha Plana Well ##	Very High	NA
Copper Cove/Copperopolis	Lift Station	Connor Main Lift Station #40	High	$425,112
Copper Cove/Copperopolis	Lift Station	Lift Station 1	High	$465,468
Copper Cove/Copperopolis	Lift Station	Lift Station 10	High	$26,560
Copper Cove/Copperopolis	Lift Station	Lift Station 11	High	$21,248
Copper Cove/Copperopolis	Lift Station	Lift Station 12	High	$125,399
Copper Cove/Copperopolis	Lift Station	Lift Station 13	High	$58,767
Copper Cove/Copperopolis	Lift Station	Lift Station 15	High	$216,203
Copper Cove/Copperopolis	Lift Station	Lift Station 17	High	$27,688
Copper Cove/Copperopolis	Lift Station	Lift Station 19	High	$90,073
Copper Cove/Copperopolis	Lift Station	Lift Station 2	High	$75,305
Copper Cove/Copperopolis	Lift Station	Lift Station 20	High	$88,890
Copper Cove/Copperopolis	Lift Station	Lift Station 22	High	NA
Copper Cove/Copperopolis	Lift Station	Lift Station 3	High	$141,314
Copper Cove/Copperopolis	Lift Station	Lift Station 4	High	$64,864
Copper Cove/Copperopolis	Lift Station	Lift Station 43	High	$62,540
Copper Cove/Copperopolis	Lift Station	Lift Station 44	High	$62,540
Copper Cove/Copperopolis	Lift Station	Lift Station 5	High	$337,558
Copper Cove/Copperopolis	Lift Station	Lift Station 6	High	$60,607
Copper Cove/Copperopolis	Lift Station	Lift Station 7	High	$38,967
Copper Cove/Copperopolis	Lift Station	Lift Station 8	High	$52,128
Copper Cove/Copperopolis	Lift Station	Lift Station 9	High	$103,891
Copper Cove/Copperopolis	Lift Station	Poker Flat Lift Station #12	High	$125,399
Copper Cove/Copperopolis	Lift Station	Saddle Creek Lift Station #1	High	$465,468

Service Area	Facility Type	Facility Name	Fire Severity	Replacement Value
Copper Cove/Copperopolis	Pump Station	Copper Cove 3Rd Stage Pump	High	NA
Copper Cove/Copperopolis	Pump Station	Copperopolis PS	High	$175,000
Copper Cove/Copperopolis	Reclaimed Water Plant	Copper Cove Reclaimed Water Plant	High	$2,065,930
Copper Cove/Copperopolis	Tank	Tank C	High	$1,450,000
Copper Cove/Copperopolis	Wastewater Treatment Plant	Copper Cove Water/Sewer	High	$2,730,540
Jenny Lind	Pump Station	Dennis Court Pump Station	High	$NA
Jenny Lind	Tank	Jenny Lind "A" Tank	High	$1,997,164
Jenny Lind	Tank	Tank E/Hogan Lake	High	$1,200,000
Jenny Lind	Training Facility	Jenny Lind Training Facility	High	NA
Jenny Lind	Water Treatment Plant	Jenny Lind Water Treatment	High	$6,454,000
Unincorporated	Tank	Copperopolis Tank	High	$1,200,000
Unincorporated	Tank	Tank 602	High	$1,612,718
Copper Cove/Copperopolis	Lift Station	Lift Station 45	Moderate	NA
Jenny Lind	Wastewater Treatment Plant	La Contenta Wastewater Treatment	Moderate	$2,248,736
Wallace	Pump Station	Sprayfield Pump Station	Moderate	NA
Wallace	Tank	Elevated Tank - Steel Welded	Moderate	NA
Wallace	Tank	Ground Tank - Steel Welded	Moderate	NA
Wallace	Wastewater Sprayfield	Wallace Wastewater Sprayfield	Moderate	NA
Wallace	Wastewater Treatment Plant	Wastewater Plant	Moderate	$458,363
Wallace	Water Treatment Plant	Water Plant	Moderate	$1,483,897
Wallace	Well	Raw Water Supply Well #2	Moderate	$62,382
Wallace	Well	Raw Water Supply Well #3	Moderate	$62,382
Unincorporated	Pump Station	Copperopolis Pump Station	Moderate	$175,000
Unincorporated	Tank	Tank F	Moderate	$1,600,000
Unincorporated	Wastewater Treatment Plant	Southworth Wastewater Plant	Moderate	$164,551
Total				*$52,540,955*

Sources:
CCWD 2018; CalFIRE and FRAP 2017
*WTP - Water Treatment Plant; WWTP - Waste Water Treatment Plant; WWRF - Waste Water Reclamation Facility
Note: Unmapped facilities are not included in this analysis. Includes Lift Station #3 – Saddle Creek values (Copper Cove/Copperopolis).
Additional Note: All Mapped Facilities are in the State Responsibility Areas except for two: EP McKays Point Reservoir & Diversion Dam and EP Timber Trails Redwood Tank. These two facilities are within the Federal Responsibility Area.

In addition to evaluating the extent of fire severity, the Cal Fire FRAP program also focuses on identifying several 'priority landscapes' related to wildfire. By state law (Public Resource Code 4789) CAL FIRE must periodically assess California's forest and rangeland resources. The 2010 assessment presents an analysis of trends, conditions, and the development of priority landscapes.

It is organized around three themes: (1) *Conserve Working Forest and Range Landscapes,* (2) *Protect Forests and Rangelands from Harm,* and (3) *Enhance Public Benefits from Trees, Forests, and Rangelands.* Within these three overarching categories, there are eleven subthemes. For the purpose of this plan update, the four following subthemes have been mapped and can be seen in Figure 4.66, Figure 4.67, Figure 4.68, Figure 4.69, and Figure 4.70.

- Wildfire Threat to Community Safety
- Water Quality
- Water Supply
- Ecosystem Health
- Post-Fire Erosion

Figure 4.66: Calaveras Priority Landscape Preventing Wildfire Threats for Community Safety

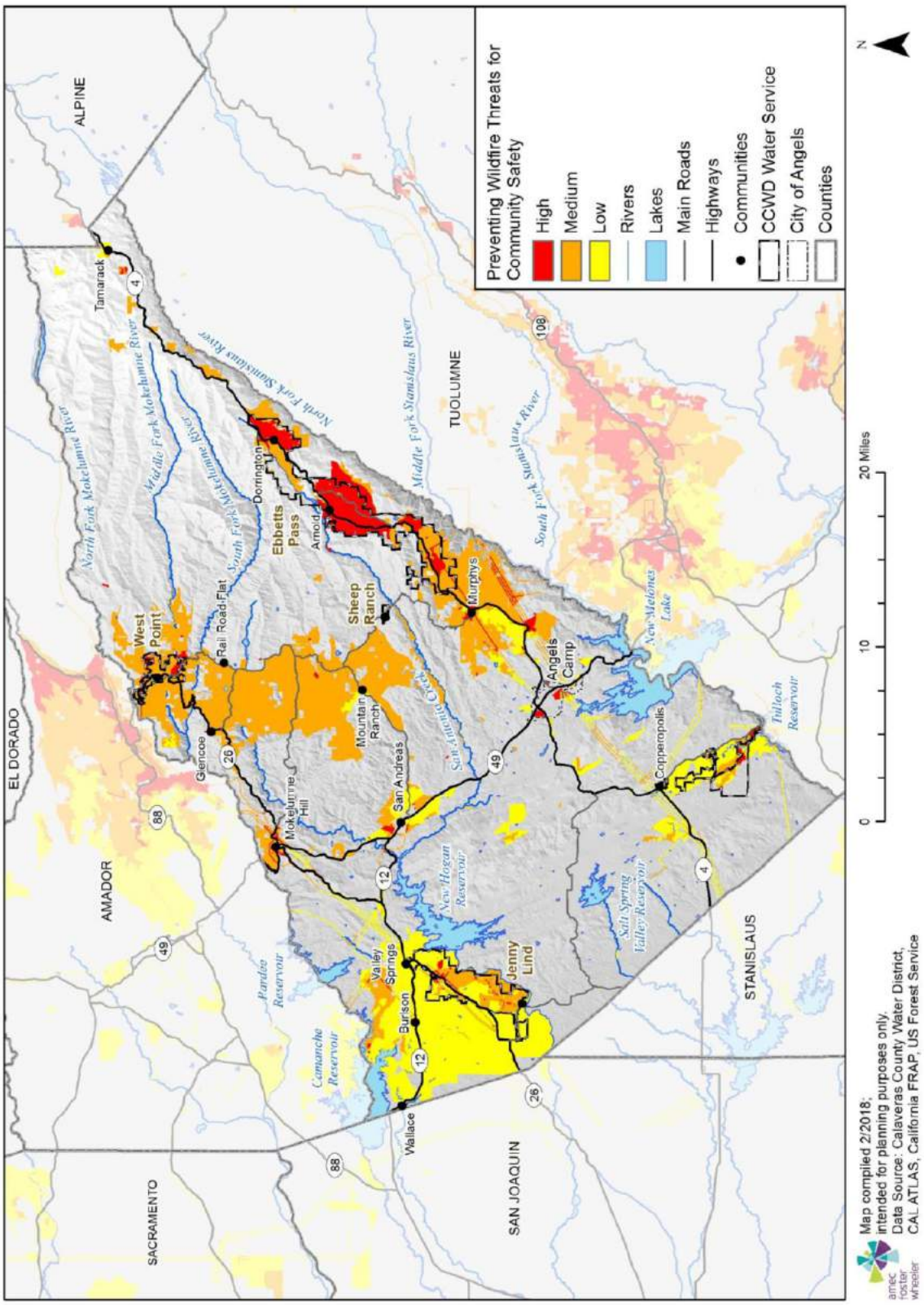


Figure 4.67: Calaveras Priority Landscape Preventing Wildfire Threats for Water Quality

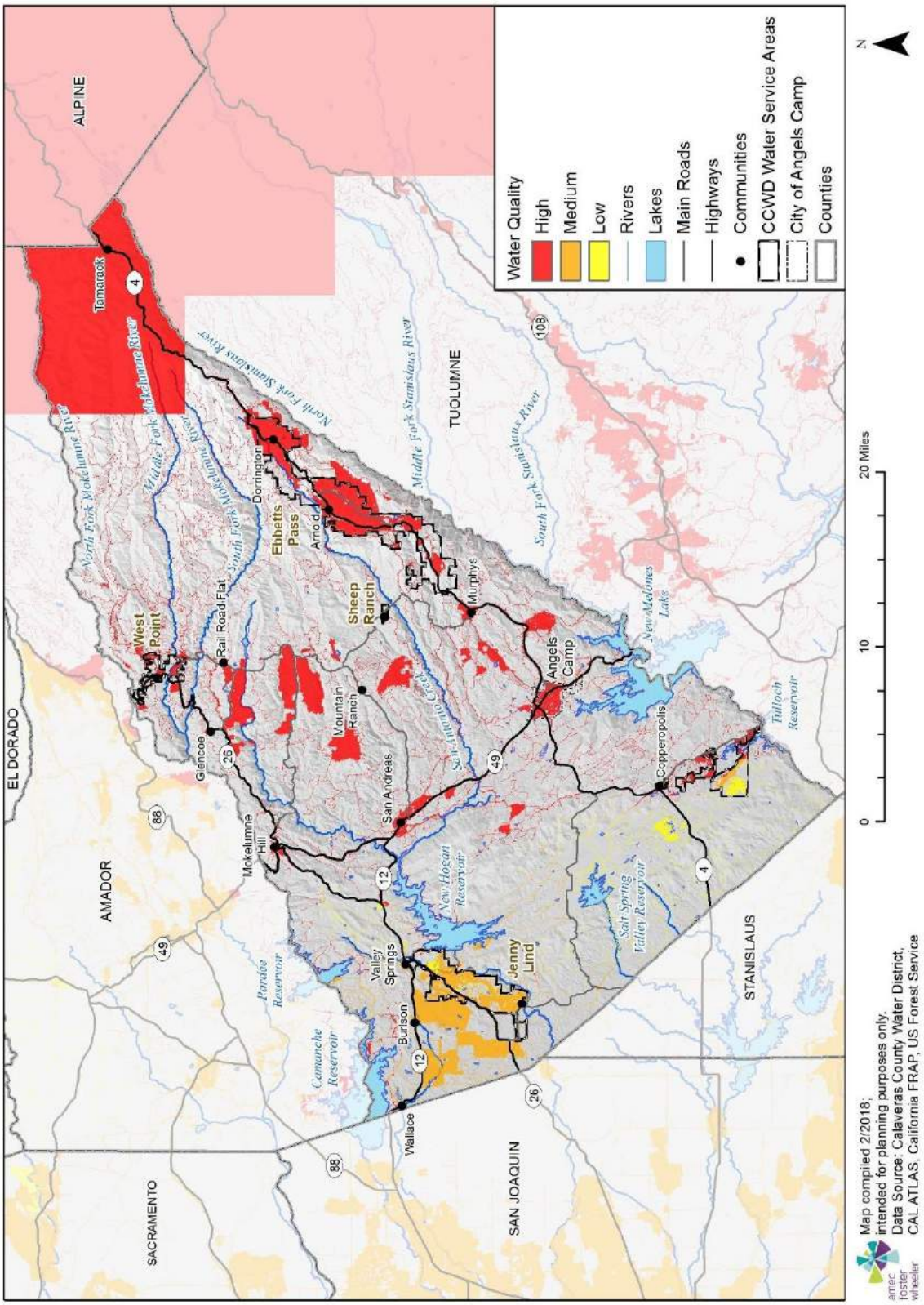


Figure 4.68: Calaveras Priority Landscapes Preventing Wildfire Threat for Water Supply

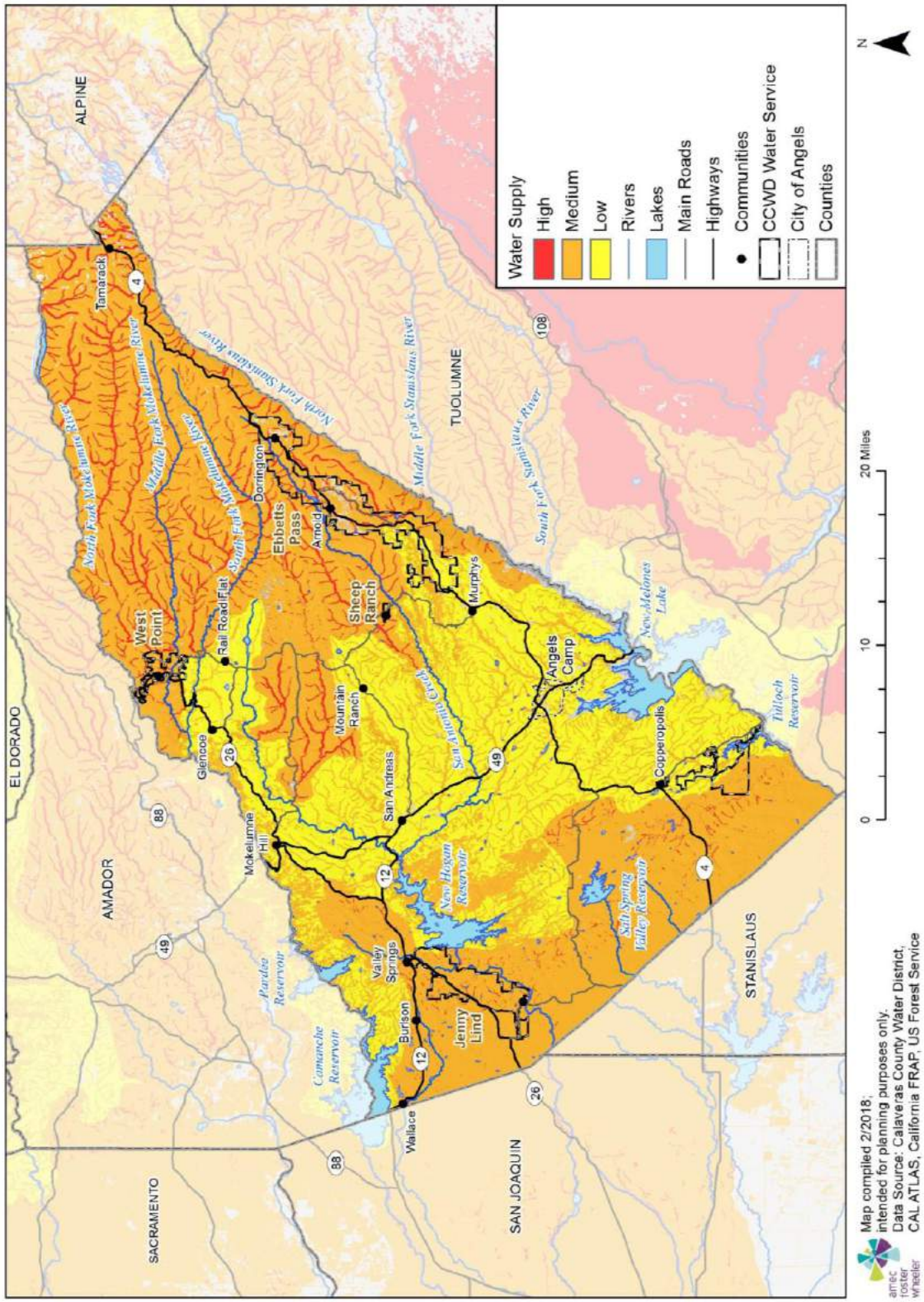


Figure 4.69: Calaveras Priority Landscapes Preventing Wildfire Threat for Ecosystem Health

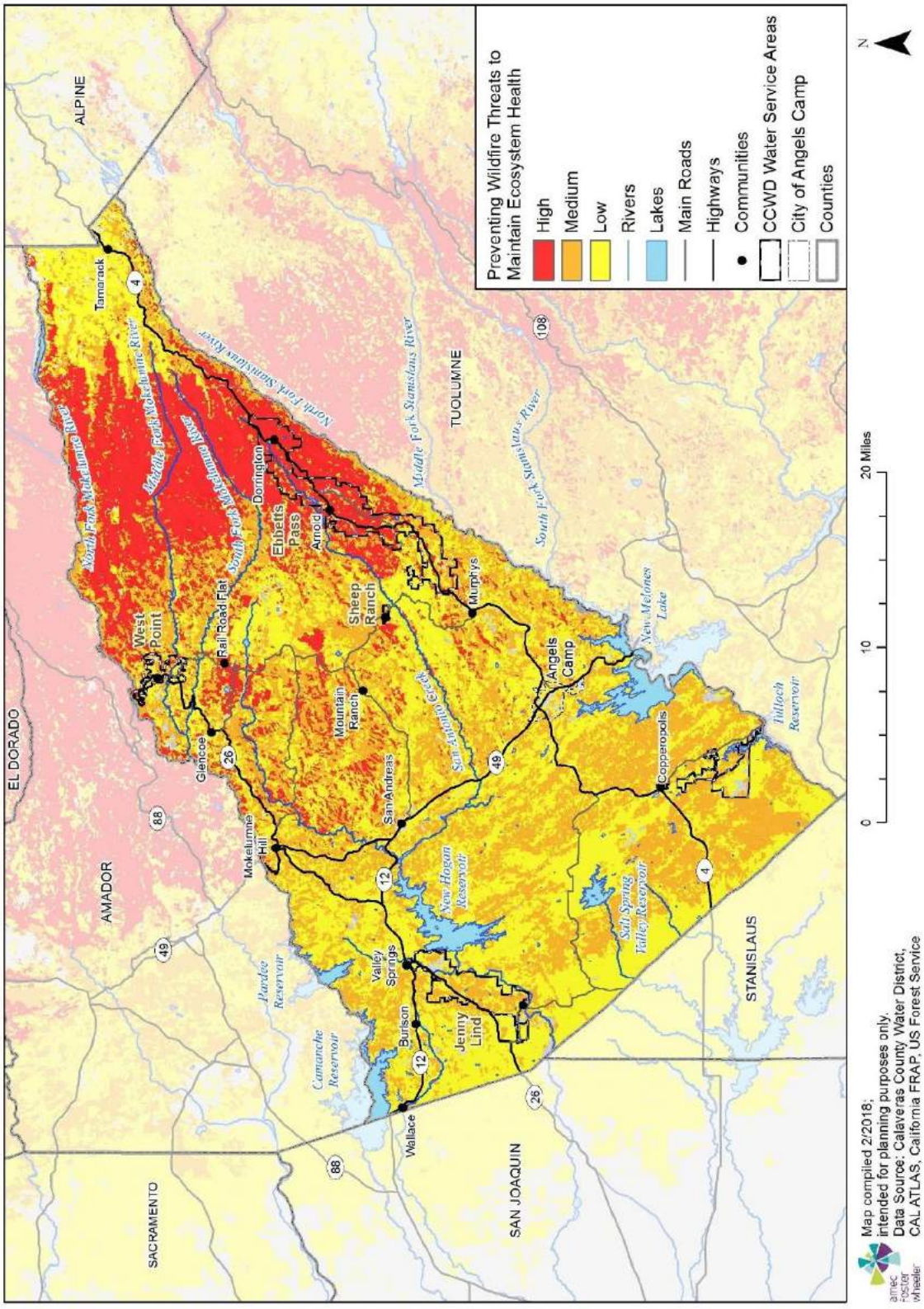
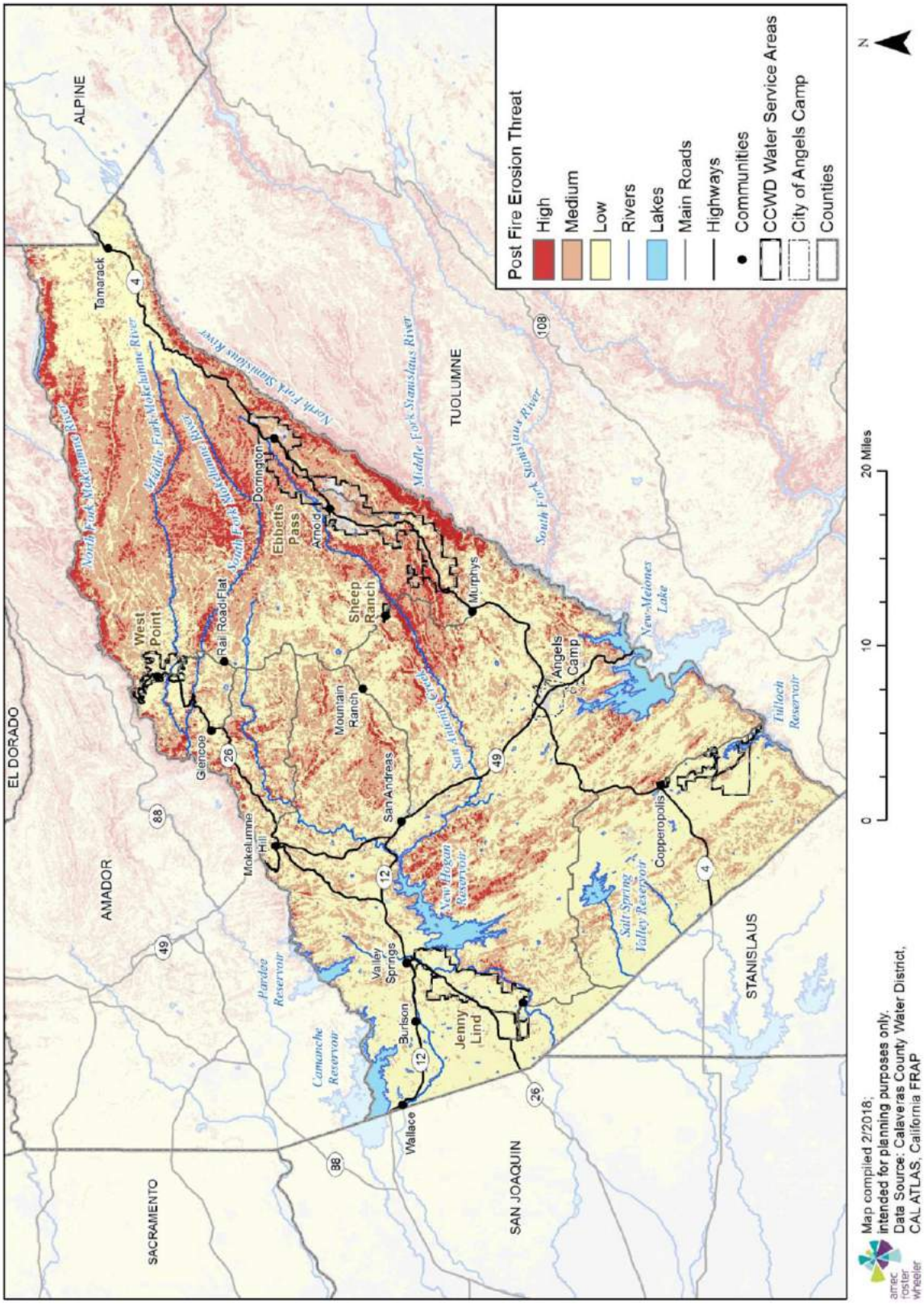


Figure 4.70: Calaveras Priority Landscapes Post-Fire Erosion



Future Development

The primary type of growth occurring in Calaveras County is rural residential development, which is often in the wildland-urban interface. This puts more people and property at risk, adds a new fuel source to vegetative fuels, and increases the fire protection challenges for local governments. The wildfire mitigation practices of surrounding land owners affect the fire risk of CCWD's facilities, and the District emphasizes the importance of education and partnerships regarding this shared responsibility.

Water District Assets

Wildfires can have direct and indirect associated costs to water quality and reliability that may include need for wildfire-related sediment and pollution controls and mitigation, degradation of municipal and hydropower supplies, system repairs, administrative costs, increased operation and maintenance, remediation, and long-term changes in water yield. CCWD's service area master plans identify inadequate fire flows as a current problem, and as growth and water demand increases. This is most immediate problem in the West Point service area, which also has a high fire hazard ranking. The highest priority improvement for the West Point distribution system is to improve fire flows to the commercial district and school, where there have been fire problems in the past. As of the previous plan update, the existing water distribution system did not meet fire flow standards due to inadequate pipe diameter and water pressure concerns related to elevation changes. The next priority is the upper northwest West Point area, which is at a higher elevation and also has low fire flows. As of 2015, the District applied for and was awarded a $1,48 million grant under Proposition 84 for the West Point Water Main and Tank Replacement Project (CCWD 2015). The project (completed in 2013) replaced key elements of the West Point water system. At the same time, the District implemented a Capital Renovation and Replacement Program that identified $15 million in water transmission project needs through 2021. Together, these projects are expected to replace between 15,000 and 20,000 linear feet of transmission pipelines per year (UWMP 2015).

CCWD also upgraded the Wilseyville fire flow pump and power generator, which supplies adequate fire flow to the southeastern area of Wilseyville. The existing redwood tank serving the Bummerville system was also replaced to improve water storage. Also, according to the 2015 UWMP there are plans to extend the treated and raw surface water from the Mokelumne River to the Valley Springs/Wallace area.

The District's Capital Renovation and Replacement Program addresses the systematic reinvestment in pipes, pumps, and facilities to ensure high levels of reliability. There are 19 water projects totaling over $28.3 million in project costs and 13 wastewater projects totaling over $11.3 million in project costs projected to be implemented through 2021(CCWD 2017). Several of these projects include tank replacements, pipeline replacements (to improve flow, pressure and reliability), and water treatment infrastructure improvements.

4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the planning area and described, in general, the vulnerability of the District to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the District's net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the District. First, an inventory of existing mitigation activities was compared to common mitigation activities using a matrix and handouts (e.g. FEMA Mitigation Ideas). The purpose of this effort was to identify policies and programs that were either in place, completed, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses. This step included a review of applicable County policies and plans (e.g. Calaveras County General Plan, CWPP, TCU Fire Plan).

This section presents CCWD's mitigation capabilities and discusses select state and federal mitigation capabilities that are applicable to the District.

Similar to the HMPC's effort to describe hazards, risks, and vulnerability of the District, this mitigation capability assessment describes the District's existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are discussed in Section 4.4.3; and mitigation outreach and partnerships are discussed in Section 4.4.4. A discussion of other mitigation efforts follows in Section 4.4.5.

4.4.1 CCWD's Regulatory Mitigation Capabilities

Table 4.53 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in the District. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.53: CCWD Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
General plan	N	1996 (update in progress)	County has plan. It is currently being updated. It addresses hazards in the following elements: Resource Production, Conservation and Open Space, Safety, and Public Facilities.
Zoning ordinance	N		County has ordinance. It is effective in directing development away from hazardous areas, and it is regularly administered and enforced. .
Subdivision ordinance	N		County has ordinance. It is regularly administered and enforced.
Floodplain ordinance	N		County has ordinance. It is effective in reducing hazard impacts and is regularly enforced for projects.
Other special purpose ordinance (stormwater, steep slope, wildfire)	N		County has ordinances; Chapter 8.08 of Calaveras County Code.
Building code	N	2015	County has code; International Building Code 2015 is used.
Building Code Effectiveness Grading Schedule (BCEGS) Score	N		Not Available
Fire Department ISO rating	Y	2018	Rating:4 (San Andreas Fire Protection District)
Erosion or sediment control program	Y	2007	Calaveras County Stormwater Management Plan (Adopted August 21, 2007))
Stormwater management program	Y	2007	Calaveras County Stormwater Management Plan (Adopted August 21, 2007))
Grading and Drainage Ordinance	Y		Calaveras County Code Title 15. Buildings and Construction Chapter 15.05
Site plan review requirements	N		
Capital Improvements Plan (CIP)	Y	20016-2021	Five Year CIP was done in 2006
Economic development plan			
Local Emergency Operations Plan (EOP)	Y	Sept 2008 (2015 update in progress)	CCWD – Water Treatment Systems and Calaveras County Emergency Operations Plan (2006)

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Community Wildfire Protection Plans	Y	2016-2017	2016-2017 Calaveras County Community Wildfire Protection Plan (CWPP) 2017 Tuolumne-Calaveras Unit (TCU) S Fire Plan
Flood insurance study or other engineering study for streams	Y	2010	2010 DFIRMS are effective. The rate maps are administered and enforced.
Repetitive Loss Plan	N		
Elevation Certificates	Y		Calaveras County does not issue Elevation Certification; property owners must retain a Registered Land Surveyor (RLS) for a Certificate.
Other	N		NA

Calaveras County Water District

Ongoing and Completed Mitigation Programs and Plans

County Water Master Plan, 1996

The water master plan is a countywide plan that guides the development and management of the county's water resources. The plan summarizes the water supplies needed for meeting the county's projected water demands and prioritizes the principal tasks for ensuring highly reliable water supplies. This plan and the Urban Water Management Plan described below provide the framework for drought mitigation and response activities.

Water Reuse Activities

CCWD currently uses reclaimed water for golf courses, but is considering expanding water reuse for agriculture and irrigated pastures. The potential for reclaimed water availability within the County is limited; the County Water Master Plan predicts about 15 percent potential reclaimed water availability over the service area. The greatest opportunity for water reuse is to provide water for agricultural or public activities in areas where water would not be available or is susceptible to drought. The reuse of wastewater produced from growth projected in Copper Cove could provide a reliable water supply for special types of agriculture in that area. There are opportunities for water reuse at other CCWD facilities, as well (CCWD County Water Master Plan 1996).

Urban Water Management Plan, 2015

California's Urban Water Management Act requires water utilities of a specified size to prepare an Urban Water Management Plan (UWMP) to promote water conservation and efficient water

use. The plans should evaluate water supply during normal, single dry, and multiple dry years and be updated every five years. In 2014/2015, CCWD developed a draft update to their 2011 plan. The plan includes water demand management measures currently being implemented or planned, many of which mitigate drought. Measures include demand management measures (e.g. rebates and giveaways), the implementation of the water waste prevention ordinance, water metering, conservation mandates and pricing, and school and public education programs and incentive programs for high-efficiency washing machines and toilets, among others.

Within the water management plan is a Water Shortage Contingency Plan (Chapter 8 of the 2015 UWMP), which plans for water shortage emergency response and a water conservation program with voluntary and mandatory rationing depending on the severity and anticipated duration of the water supply emergency. CCWD has also established and used short-term water transfer arrangement to address water supply shortages.

Mokelumne/Amador/Calaveras Integrated Regional Water Management Plan Update (2013)

This document has been created by agencies and organizations within the Mokelumne, Amador, and Calaveras watershed region to better manage existing resources and plan for future conditions. The integrated regional water management plan reflects the region's diversity and goals for ensuring a reliable water supply, reduction in flood-related impacts, and preservation of water quality and the environment. Since the 2007 update, Propositions 84 and 1E were approved with criteria that DWR must apply in updating statewide standards for Integrated Water Management Plans (IRWMPs). These revised state standards were released in 2010 and finalized by DWR in 2012 and provided guidelines by which the MAC Plan Update was prepared.

Tuolumne-Stanislaus Integrated Regional Water Management Plan Update (2017)

An ongoing IRWMP effort immediately to the south of the MAC IRWMP is the Tuolumne-Stanislaus (T-Stan) IRWMP, formed in 2008 through adoption of a Memorandum of Understanding. The T-Stan IRWMP covers the Tuolumne and Stanislaus Watersheds, including the Highway 4 corridor in Calaveras County and the area served by CCWD in the Lake Tulloch / Copperopolis area, tributary to the Delta. Like the MAC IRWMP, the T-Stan IRWMP was successful in the State's IRWMP Regional Acceptance Program as an accepted geographic region and has been able to secure funding through a Prop 84 planning grant. The IRWMP was last updated in 2017.

System Master Plans

CCWD has recently completed or updated the master plans for individual service systems. These plans describe the existing system, regulations, and current and projected demands, then provide a system evaluation and recommendations for improvements, or capital improvements plans. System master plans were used in this planning project to identify development trends and proposed new facilities. Often the system evaluations reveal vulnerability to natural hazard events, such as insufficient fire flow and have led to capital improvement projects to mitigate those

vulnerabilities. The following master plans have been developed and updated within the last 15 years:

- Copper Cove Water System Water Master Plan Update, 2018
- Copper Cove Wastewater Facility Plan Update, 2018
- Jenny Lind Water System Master Plan, 2018
- Ebbetts Pass Water Master Plan, 2005
- New Hogan/La Contenta Wastewater System, 2018
- Vallecito Wastewater Master Plan, 2005
- West Point Sewer Master Plan, 2005
- West Point Water System Master Plan, 2005
- Arnold Sewer Master Plan, May 2005
- Forest Meadows Wastewater Master Plan, September 2004

Vulnerability Assessments for Jenny Lind, Copper Cove, and Ebbetts Pass

Vulnerability assessments were conducted to comply with the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. The assessments provide a risk assessment to various threats, which are primarily human-induced but address natural disaster at a very general level. System components are also described and security vulnerability self-assessments completed.

Water System Emergency Response Plans for Jenny Lind, Copper Cove, and Ebbetts Pass

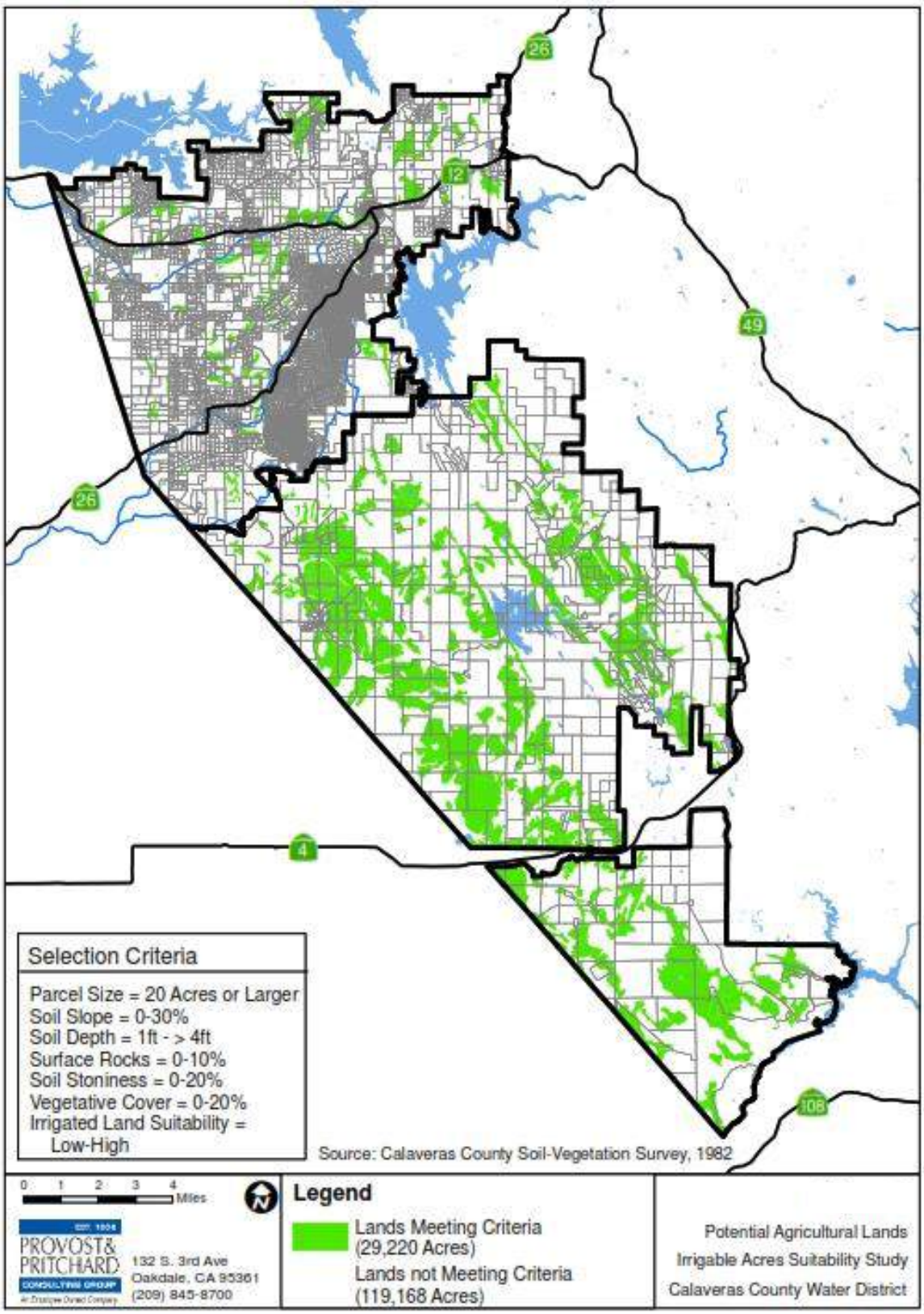
These plans are companion pieces to the vulnerability assessments and were also developed to comply with the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. The purpose of the emergency response plans (ERPs) is to provide CCWD with a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin. The ERPs describe how CCWD will respond to potential threats or actual terrorist scenarios identified in the vulnerability assessment, as well as additional emergency response situations. They identify emergency planning partnerships, mutual aid agreements, and emergency response policies, procedures, and documents. They also include specific action plans that will be used to respond to events and incidents.

Potential Agriculture Areas

The District is engaged in an effort to address raw water and wastewater recycling needs throughout the County. The District is uniquely positioned to potentially develop available water resources and deliver irrigation water that could support agricultural development that would benefit the local and regional economy. In 2011, the District engaged in Phase I of an agricultural study in the form of a technical memorandum completed by Provost and Pritchard Consulting Group. The study divided the western portion of the County into three study areas, focusing on

the Valley Springs Study Area (Valley Springs) in the northwestern portion of the County, the Salt Springs Study Area (Salt Springs) in the central western portion, and the Copperopolis Study Area (Copperopolis) in the southwestern portion of the County. The studies utilized criteria for crop land types and irrigation needs to determine areas of the western portion of the County that have the most agricultural potential (see Figure 4.71 below from the Technical Memorandum) (CCWD 2011). Phase II of the study has not been completed, as the District is waiting for the Natural Resource Conservation Service to release new soil data for this region to further refine the criteria.

Figure 4.71: Potential Agricultural Lands within Calaveras County



Sources: CCWD 2011; Calaveras County Soil-Vegetation Survey 1982

West Point/Wilseyville Water System Improvements

Two major projects were completed to improve the West Point Water System since the previous plan update:

- The U.S. Environmental Protection Agency (EPA) awarded CCWD a State, Tribal, and Assistance Grant to upgrade the West Point community's backup water supply from the Middle Fork Mokelumne River. This high priority project identified the need to update the West Point Water System Master Plan and to secure a more reliable backup water supply to the community, as the West Point is an area identified as at very high fire risk.
- CCWD was awarded funding from the USDA Rural Utility Service and to the Department of Housing and Urban Development Community Development Block Grant Program to replace the water distribution system in West Point/Wilseyville. This was another high priority project that identified the need to update the West Point Water System Master Plan to address insufficient fire flow in the high fire risk area in and around West Point.

- CCWD also replaced four to five miles of the main water pipeline within the system in 2012, which included two new glass-lined water tanks, and a new pump station at the plant. To date, only the system's back-up water filter needs to be upgraded or replaced.

Multi-Agency Coordinating Group

The Multi-Agency Coordinating (MAC) Group is an emergency management team composed of the major jurisdictional representatives in Calaveras County, who are responsible for responding to and managing broad-based emergency events. CCWD serves on MAC as the liaison for all wastewater and utility agencies in the county. Other participants include the following:

- Calaveras County Administration
- Calaveras County OES (acts as the MAC coordinator)
- Calaveras County Sheriff's Office
- Calaveras County Fire Departments
- CalFire
- Pacific Gas & Electric
- CalTrans
- Calaveras County Water District (liaison for all wastewater and utility agencies in the County)
- Angels Camp Police Department
- California Highway Patrol
- U.S. Forest Service
- Calaveras Health and Human Services Agency
- Calaveras County Health Department

Ordinances Supporting Mitigation Efforts

Ordinance No. 77-1 Prohibiting Nonessential Uses of Water

CCWD adopted this ordinance on April 14, 1977, because of a water shortage emergency in the 1976-1977 drought. The ordinance is enforced in the CCWD's improvement districts when an emergency water shortage condition is declared due to drought conditions that prevent the ordinary demands and requirements of water consumers from being satisfied without depleting the water supply of the district that would be needed for human consumption, sanitation, and fire protection. Specific water uses are regulated and prohibited in the ordinance.

Water Waste Ordinance 2010-02

CCWD adopted this ordinance on July 14, 2010 to amend the District Rules and Regulations to prohibit water waste. The ordinance states in Section 16.2.2:

> No person shall use or permit the use of water in the District's service areas in Calaveras County as specified:
>
> **a**. No excessive Water Flow or Run-Off: Any use of water that results in excessive water runoff from the property and/or gutter flooding.
>
> **b**. Limited Washing Down of Hard or Paved Surfaces: Hosing down paved surfaces is only allowed to alleviate health or safety hazards.
>
> **c**. Free Flowing Hoses Prohibited for Any Use: All hoses must have an automatic shutoff device.
>
> **d**. Single-pass Cooling Systems Prohibited: All new water connections are prohibited from having single-pass cooling systems.
>
> **e**. Non-recirculating Washing Systems Prohibited: All new conveyor car wash and commercial laundry systems are prohibited from having nonrecirculating washing systems.
>
> **f**. Re-circulating Water Required for Water Fountains and Decorative Water Features: All pools, spas, fountains, and other water displays must use a recirculation pump and be maintained leak free. "Dump and Fill" maintenance practice for pools is prohibited.

Water Shortage Contingency Plan

The Water Shortage Contingency Plan is an integrated chapter in the 2015 UWMP. The Urban Water Management Planning Act requires that each water supplier provide a Water Shortage Contingency Plan that outlines how the supplier will prepare for and respond to water shortages.

The District's plan addresses the requirement by describing the staged actions it would implement in response to water shortage events that occur over a period of time, such as a drought or interruption in supply due to a catastrophic event.

Federal, State, and Local Existing Policies and Plans

Federal

Safe Drinking Water Act

Under the Safe Drinking Water Act, the U.S. EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. CCWD must meet all existing and proposed regulatory requirements of the Act.

Source Water Assessment Program

Source water protection is a national priority as a result of the 1996 amendments to the Safe Drinking Water Act and provides a comprehensive watershed-based approach to improving and preserving water quality of the public water supply source. States have a great deal of flexibility in how they design their program. California's Source Water Assessment and Protection program allows water utilities to conduct their own assessments to improve and preserve water quality of the public water supply sources and provide information to communities that wish to develop local programs to protect their sources of drinking water. Because of the significant negative effects of wildfires on watersheds, potential wildfire mitigation measures could be linked to source water protection for CCWD.

State

California State Multi-Hazard Mitigation Plan, 2013 (2018 Update is in Progress)

The State Multi-Hazard Mitigation Plan establishes goals and priorities for CalOES to carry out disaster mitigation activities. The plan provides the basis for funding pre-mitigation priorities for projects and consolidates the plans of other state agencies and interagency groups into a comprehensive set of recommendations for California's long-term mitigation strategy. CCWD's multi-hazard mitigation planning process used the State plan for information to conduct their risk assessment, to identify mitigation goals and objectives, and to prioritize potential mitigation projects. The 2018 SMHMP is currently being updated.

California Fire Plan, 2010

The California Fire Plan is the State's road map for reducing the risk of wildfire. The fire plan is a cooperative effort between the State Board of Forestry and Fire Protection and the CDF and places the emphasis on what needs to be done before a fire starts. The current plan was finalized in 2010 and is located at http://cdfdata.fire.ca.gov/fire_er/fpp_planning_cafireplan.

California Water Plan, 2013 Update

The California Water Plan provides a framework for water managers to consider options and make decisions regarding California's water future. The plan presents basic data and information on California's water resources, including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The plan also provides water managers with general guidance on preparing for climate change and sudden changes caused by natural disasters.

California Water Code

Sections of the California Water Code related to CCWD and hazards mitigation are summarized below:

- Water Code 350. Gives the governing body of a public water supply distributor the power to declare a water shortage emergency condition within their area when ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.
- Water Code 8000-8129. Local Flood Control. Empowers counties and local jurisdictions to appropriate and expend money from the general fund for:
  - The construction of works, improvements, levees or check dams to prevent overflow and flooding.
  - The protection and reforestation of watersheds.
  - The conservation of the flood waters.
  - The making of all surveys, maps and plats necessary to carry out any work, construction or improvement authorized by this article.
  - The carrying out of any work, construction or improvement authorized by this article outside the county if the rivers or streams affected flow in or through more than one county.
- Water Code 10910. Requires cities and counties to identify the public water system that will supply water for a new project subject to the California Environmental Quality Act (CEQA). If the city or county is not able to identify any public water system, then they must prepare a water supply assessment. The city or county must request each public water system to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan. If the projected water demand was not accounted for, or there is no urban water management plan, "the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses."

Local

Calaveras County General Plan, 1996

This is the County's long-term, comprehensive plan for the development of the county as required by California law. The plan includes seven elements: land use, transportation, conservation, open space, safety, noise, and housing, and sets goals, policies, implementation measures, and related maps for each. Elements with goals and policies most-related to CCWD include land use, conservation, open space, and safety. Policies more specifically related to CCWD and/or this plan are the following:

- Policy II-3A—Allow for maximum densities in Natural Resource Lands, (which include dam inundation areas, wildlife, botanical, and agricultural preserve)
- Policy II-25C—Encourage all sewer districts in the county to improve and expand sewer systems and services
- Policy IV-9A—Support the development of water projects in the county for domestic and irrigation purposes
- Policy IV-9B—Encourage continued cooperation among water suppliers in meeting the water need for the county as a whole
- PolicyV-9A—Balance water resources development with the preservation of streams and rivers in their natural state
- Policy V-9B—Protect public access to streams and rivers
- Policy VII-1B—Review all proposed building in the county for compliance with current building standards relating to seismic safety and slope stability
- Policy VII-1C—Review proposals to locate dams or other major facilities in the county for geologic and seismic safety
- Policy VII-4A—Review building proposals for flood safety

The General Plan also includes the following individual community plans: Arnold Community Plan, Avery/Hathaway Pines Community Plan, Ebbetts Pass Special Plan, Mokelumne Hill Community Plan, Murphys/Douglas Flat Community Plan, Rancho Calaveras Special Plan, San Andreas Community Plan, and Valley Springs Community Plan. Assessing these individual plans was beyond the scope of this plan.

The Calaveras County Zoning Code includes the Environmental Protection Combining Zone, Chapter 17.58, which designates environmentally sensitive areas for protection of the public health, safety, and welfare. The zone is intended for areas subject to flooding, sensitive archeological areas or environmental habitats, or areas where future construction or subdivision may have a significant effect on the environment.

In 2014, Calaveras County began the update process for their General Plan and many changes are anticipated due to the significant growth in the county in the last 10 years. The update process presents an excellent opportunity for CCWD to be involved in county land use planning and

champion mitigation goal and objectives. The General Plan Update is anticipated to be adopted by the end of 2018.

Calaveras County Hazard Mitigation Plan, 2015 (Amended 2016)

The Calaveras County Local Hazard Mitigation Plan (LHMP) is a county guide to hazard mitigation planning to better protect the people and property of Calaveras County from the effects of hazardous events. This plan demonstrates the communities' commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources.

Calaveras County Mass Fatality Plan

The Calaveras County Mass Fatality Plan is prepared by the County office of Emergency Services. It establishes the policies, responsibilities, and procedures required to serve the needs of Calaveras County populace during incidents that result in significant loss of life. This plan establishes the emergency response organization for mass fatality incidents occurring within Calaveras County. This plan also establishes the operational concepts and procedures.

Calaveras County Terrorism Plan

The Calaveras County Terrorism Plan establishes a concept of operations for Calaveras County consequence management of a Weapons of Mass Destruction (WMD) or terrorist incident. This plan provides the basic field ICS and Emergency Operations Center SEMS (standardized emergency management system) guidance for actions to take for terrorist situations analysis, initial response, extended response, recover, and mitigation (awareness and prevention). This plan provides direction on how to integrate with federal agencies during crisis management.

Calaveras County Emergency Operations Plan (EOP)

This multi-hazard functional plan outlines the functions, responsibilities, and regional risk assessments of Calaveras County for large scale emergencies (i.e. wildland fires, hazardous materials incidents, flooding, dam failure, light airplane crashes, etc.). This Plan sets forth an operating strategy for managing these incidents. The EOP addresses the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies in or affecting the County of Calaveras. The plan establishes a flexible, all hazards, emergency management organization required to facilitate the response to, and provide for short term recovery activities related to any significant emergency or disaster affecting Calaveras County. The plan further identifies the policies, responsibilities and procedures required to protect the health and safety of Calaveras County communities, public and private property and the environmental effects of natural and technological emergencies and disasters. It establishes the operational concepts and procedures associated with Initial Response Operations (field response) to emergencies, the Extended Response Operations (County Emergency Operations Center (EOC) activities) and the recovery process.

Calaveras County Area Plan

The Area Plan, a.k.a. the Calaveras County Operational Area Hazardous Materials Emergency Response Plan, establishes the policies, responsibilities, and procedures required to protect the health and safety of Calaveras County's populace, the environment, and public and private property from the effects of hazardous materials incidents.

Tuolumne-Calaveras Unit Fire Plan, 2017

The TCU of CDF developed this plan which combines all of the TCU's pre-fire components into one document and also serves as the Community Wildfire Protection Plan for all communities in Calaveras County. The plan provides an excellent assessment of wildfire risk and capabilities in the TCU, including GIS analysis and maps. Pre-fire management projects are identified for both the entire unit and for each of the six battalions. The plan also documents the activities of the Calaveras Foothills Fire Safe Council.

The TCU plan identifies watersheds and water utilities as critical assets at risk to wildfire. CCWD should integrate their wildfire mitigation strategy with projects identified in the TCU plan to the extent possible and consider further involvement with the Fire Safe Council in the future.

4.4.2 CCWD's Administrative/Technical Mitigation Capabilities

Table 4.54 identifies the County personnel responsible for activities related to mitigation and loss prevention in the District.

Table 4.54: CCWD Administrative/Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y	CCWD –Engineering Dept./District Engineer	None
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	CCWD – Engineering and Operations Dept./District Engineer	Operations has two construction management positions (Inspectors)
Planner/Engineer/Scientist with an understanding of natural hazards	Y	CCWD – Water Resources Dept./Water Resources Manager	None
Personnel skilled in GIS	Y	CCWD –Engineering Dept./Water Resources Dept./Engineering Technician	Basic/General GIS Support– District is working to improve capabilities
Full time building official	Y	Administrative Services Dept./Human Resources Specialist	None
Floodplain Manager	N		

Personnel Resources	Yes/No	Department/Position	Comments
Emergency Manager	Y	CCWD – Utilities Dept./Emergency Manager	Director of Operations is vacant
Grant writer	Y	CCWD – Water Resources Dept./Water Resources Manager	None
Other personnel	N	CCWD – Engineering Department/Water Resources Dept. /Environmental Specialist	Need Environmental Regulatory Compliance (NEPA/CEQA) and Permitting Specialist
GIS Data – Hazard areas	Y	CCWD – Engineering Department/Water Resources Dept./GIS Specialist	Access to FEMA GIS and ground acceleration data related to seismic activity
GIS Data - Critical facilities	Y	CCWD – Engineering Dept./Engineering Technician	None
GIS Data – Building footprints	N		None
GIS Data – Land use	Y	CCWD – Engineering Dept.	GIS data is provided by County
GIS Data – Links to Assessor's data	Y	CCWD – Engineering Dept./Water Resources Dept.	Assessor data is subject to inaccuracy because it is not in GIS format.
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y	Calaveras County Admin – Multi-Agency Coordinating (MAC) Group	None
Other	N		

CCWD has emergency generation capabilities at all its critical facilities.

4.4.3 CCWD's Fiscal Mitigation Capabilities

Table 4.55 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 4.55: CCWD Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants		
Capital improvements project funding	Y	

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Incur debt through general obligation bonds		
Incur debt through special tax bonds		
Incur debt through private activities	Y	
Withhold spending in hazard prone areas	Y	
Other		

4.4.4 Mitigation Outreach and Partnerships

The District works cooperatively and has many mutual aid agreements in place with various federal, state, and local agencies, groups, and districts. Examples include the U.S. Forest Service, Cal Fire, the California Department of Water Resources, Bureau of Reclamation, National Weather Service, and the State Regional Board.

4.4.5 Other Mitigation Efforts

Calaveras County participates in the annual EAP meetings for dams.

5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the Calaveras County Water District (CCWD) Local Hazard Mitigation Plan. It describes how the CCWD met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the mitigation strategy and action plan for this LHMP update. As part of the plan update process, a comprehensive review and update of the mitigation strategy was conducted by the HMPC. Some of the goals and objectives from the 2012 plan were refined and reaffirmed. The result was a revised set of goals, reorganized to reflect the completion of 2012 actions, the updated risk assessment and the new priorities of this plan update. To support the new LHMP goals, the mitigation actions from 2012 were reviewed and assessed for their value in reducing risk and vulnerability to the planning area from identified hazards and evaluated for their inclusion in this plan update (See Section 2.0 What's New). Section 5.2 below identifies the new goals and objectives of this plan update and Section 5.4 details the new mitigation action plan.

Taking all the above into consideration, the HMPC developed the following umbrella mitigation strategy for this LHMP update:

- Communicate the hazard information collected and analyzed through this planning process as well as HMPC success stories so that District staff and community stakeholders better understand what can happen where and what they can do to minimize loss.
- Implement the action plan recommendations of this plan.
- Use existing rules, regulations, policies, and procedures already in existence.
- Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader support may be garnered.

5.2 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a focused meeting designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the mitigation strategy meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and to develop the mitigation strategy for CCWD.

Goals were defined for this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the District;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

HMPC members were provided with the list of goals from the 2012 plan as well as a list of other sample goals to consider. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was given three index cards and asked to write a goal statement on each. Goal statements were collected from HMPC participants that wanted to revise the existing goals or draft new goals. The statements were then grouped into similar themes and displayed on flip charts on the wall of the Board room. The goal statements were then grouped into similar topics. New goals from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use. Next, the HMPC developed objectives that summarized strategies to achieve each goal.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals and objectives for the 2018 plan update, which provide the direction for reducing future hazard-related losses within the CCWD. These goals are very similar to the 2012 plan goals.

Goal 1 Provide protection of life and public health and safety

- Objective 1.1 Maintain adequate flows in water system for fire protection.
- Objective 1.2 Improve capacity of critical sewer infrastructure to accommodate peak events.
- Objective 1.3 Continue emergency water supply planning during periods of drought and water shortage.

Goal 2 Reduce risk and vulnerability to existing and future facilities from natural hazards

- Objective 2.1 Protect critical facilities from hazard impacts.
- Objective 2.2 Implement mitigation measures for facilities vulnerable to flooding.
- Objective 2.3 Reduce the vulnerability of facilities identified in fire hazard areas.
- Objective 2.4 Coordinate with the County to update and improve risk assessment data and maps.
- Objective 2.5 Integrate natural hazards mitigation into future facilities planning.

Goal 3 Maintain current service levels and prevent loss of services

- Objective 3.1 Protect critical lifeline utilities from hazard impacts.
- Objective 3.2 Enhance and improve interconnections with regional water suppliers to prevent loss of service during drought and other emergencies.
- Objective 3.3 Improve and protect water supply storage capacity.
- Objective 3.4 Improve redundancy at critical facilities.
- Objective 3.5 Increase backup capacities post-disaster to service the community until complete services are restored.

Goal 4 Improve education, awareness, coordination, and communication with District staff, first responders, emergency management planners, public and other stakeholders

- Objective 4.1 Educate public on responsible water use and conservation measures.
- Objective 4.2 Foster partnerships with other water and sewer providers locally and regionally.
- Objective 4.3 Improve emergency planning relative to vulnerable special populations.
- Objective 4.4 Improve coordination with other County departments (such as planning and public health) related to natural hazard planning.
- Objective 4.5 Maintain and enhance participation in multi-agency groups, such as the Multi-Agency Coordinating Group, related to natural hazards and emergencies.
- Objective 4.6 Coordinate with other agencies for disaster training exercises.
- Objective 4.7 Increase use of shared resources.
- Objective 4.8 Make better use of communication and GIS technology.

5.3 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 Identifying Hazards: Natural Hazards was evaluated. Based on the 2018 hazard identification and risk assessment, there are no new priority hazards identified. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

These priority hazards (in alphabetical order) are:

- Dam Failure
- Drought and Water Shortage
- Flood 100/500 year
- Flood: Localized Stormwater Flooding
- Severe Weather: Heavy Rains and Storms (includes hail and lightning hazards)
- Severe Weather: Winter Storms and Extreme Cold
- Severe Weather: Wind
- Wildfire

The HMPC eliminated the hazards identified below from further consideration in the development of mitigation actions because the risk of a hazard event in the CCWD is unlikely or nonexistent, the vulnerability of CCWD is low, or capabilities are already in place to mitigate negative impacts. The eliminated hazards are:

- Avalanche
- Earthquake
- Levee Failure
- Severe Weather: Extreme Heat*
- Severe Weather: Tornadoes
- Soil Hazard: Erosion
- Soil Hazard: Expansive Soils
- Soil Hazards: Landslides and Debris Flows*
- Soil Hazard: Subsidence
- Volcano

The hazards noted with an asterisk were discussed at length among HMPC participants, specifically as to whether they should be reclassified as higher hazards. Because the risk of a

hazard event associated with both extreme heat and landslides and debris flows is low, and the hazards are likely to only occur in certain geographic portions of the County (e.g. western slope/lower elevations, area near Collierville Tunnel), the HMPC eliminated the hazards from further evaluation and concluded the concerns associated with these hazards were better addressed under multi-hazard mitigation actions. It is important to note, however, that all the hazards addressed in this plan are included in the District wide multi-hazard actions identified in the following section.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the NFIP's Community Rating System:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural**: Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services**: Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them

The HMPC was also provided with examples of potential mitigation action alternatives for each of the above categories. The HMPC was instructed to consider both future and existing infrastructure and service areas in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix C Mitigation Strategy provides an overview by CRS mitigation category to assist in the review and identification of possible mitigation activities. Also utilized in the review of possible mitigation measures is FEMA's 2013 publication on Mitigation Ideas, by hazard type. This was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

5.3.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- **S**ocial: Does the measure treat people fairly? (e.g., different groups, different generations)

- **T**echnical: Is the action technically feasible? Does it solve the problem?
- **A**dministrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- **P**olitical: Who are the stakeholders? Will there be adequate political and public support for the project?
- **L**egal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- **E**conomic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **E**nvironmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?
- What will the action cost?
- What is the timing of available funding?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix C.

With these criteria in mind, HMPC members were each given a set of nine colored dots, three each of brown, blue, and green. The dots were assigned brown for high priority (worth five points), blue for medium priority (worth three points), and green for low priority (worth one point). The team was asked to use the dots to prioritize new actions with the above criteria in mind. The point score for each action was totaled. Appendix C contains the total score given to each identified new mitigation action.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.3. Specifically, each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details led to the determination of a High, Medium, or Low priority for each action.

Recognizing the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue:

- Mitigation action strategy development and implementation according to the nature and extent of damages
- Level of protection and benefits each action provides
- Political support
- Cost
- Available funding
- Priority

This process drove the development of a prioritized, updated action plan for CCWD. Cost-effectiveness will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

5.4 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This action plan was developed to present the recommendations developed by the HMPC for how CCWD can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act.

The action plan detailed below contains both new action items developed for this plan update as well as old actions that were yet to be completed from the 2012 plan. Table 5.1 indicates whether the action is new or from the 2012 plan and whether the project status has been started, is ongoing, or deferred. Section 2.2 contains the details for each 2012 mitigation action item.

It is important to note that CCWD has numerous existing, detailed action descriptions, which sometimes include benefit-cost estimates, in other planning documents, such as their Water Supply Master Plan, Integrated Water Management Plans, Service Area Master Plans, and capital improvement budgets and reports. These actions are considered part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The HMPC also realizes that new needs and priorities may arise from a disaster or other circumstances and reserves

the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. CCWD is not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the District to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the CRS mitigation categories and criteria contained in Appendix C.

Table 5.1: CCWD Mitigation Actions

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
1. Implement and Expand Fuel Breaks to Reduce Wildfire Hazards at CCWD Properties	New Action	Wildfire	H	X	X	Started
2. Hardening of Water and Wastewater Facilities (and Associated Electrical and SCADA Communication Systems) Against Wildfire and Other Severe Weather Hazards	New Action	Wildfire, Severe Weather: Winter Storms and Extreme Cold, Severe Weather: Heavy Rain and Storms Severe Weather: Wind	H	X	X	Started
3. Implement Other Facility Flood Mitigation Projects	2012	Flood	H	X	X	Ongoing
4. Replace Remaining Redwood Water Storage Tanks	2012	Wildfire	H	X		Ongoing
5. Improve grading and drainage of Wastewater Effluent Storage Ponds	2012	Flood	H	X		Ongoing
6. Enhance On-Site Coordination with Cal-Fire during Fire Events	2012	Wildfire	H	X		Ongoing
7. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning	2012	Multi-hazard	H	X	X	Ongoing

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
8. Implement recommendations in service area master plans related to critical sewer facilities	2012	Flood	H	X	X	Near Completion
9. Implement pipeline improvements identified in water master plans to provide adequate fire flows	2012	Wildfire	H	X	X	Ongoing
10. Strategic Wildfire Protection Improvements in Sheep Ranch and West Point Water Systems	New	Wildfire	H	X	X	Started
11. Evaluate the need for improved redundancy at critical facilities	2012	Multi-hazard	M	X	X	Ongoing
12. Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas	2012	Wildfire, Severe Weather: Heavy Rain and Storms, Severe Weather: Wind	M	X	X	Ongoing
13. White Pines Lake Storage Restoration Project	New Action	Drought and Water Supply, Flooding	M	X	X	Started
14. Merge 2018 LHMP into the next update to the Calaveras County Multi-Jurisdictional Hazard Mitigation Plan	New Action	Multi-Hazard	M	X	X	Deferred
15. Highway 4 Community Emergency Water Supply Feasibility Planning Study	New Action	Drought and Water Supply	M	X	X	Deferred
16. Construct Fire Resistant Electrical Control Panels	2012	Wildfire, Severe Weather: Heavy Rain and Storms	M	X		Ongoing
17. Retrofit Manhole Covers	2012	Flood	L	X		Ongoing
18. Review and update a tiered rate structure to encourage responsible water use	2012	Drought	L	X	X	Near Completion

Mitigation Action	New Action/ 2012 Action	Hazard Addressed	Priority	Addresses Current Development	Addresses Future Development	Status
19. Update the National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities as required	2012	Flood	L	X		Ongoing
20. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan	2012	Drought	L	X	X	Ongoing
21. Dam Failure Emergency Planning	2012	Dam Failure	L	X	X	Started
22. Develop mutual aid agreements with other water providers and county agencies for support during emergencies	2012	Multi-hazard	L	X	X	Near Completion

Action 1. Implement and Expand Fuel Breaks to Reduce Wildfire Hazards at CCWD Properties

Hazards Addressed: Wildfire

Issue/Background: Throughout Calaveras County, the District's facilities and properties are located within areas of substantial risk of wildfire. This includes areas adjacent to state and federally managed lands. Because the District is a large landowner in the county and is responsible for multiple facilities associated with the protection of human health and safety, it is prudent to implement fuel breaks on District property where feasible. Also, the District would ensure all facilities maintain the recommended 100-foot defensible space to reduce potential for losses during a fire. CDF fire crews or California Conservation Corps crews may be available to complete work.

Further, as CCWD facilities are often adjacent to state and federal manage lands the District should coordinate with state and federal agencies responsible for wildfire prevention activities including fuel breaks and defensible space maintenance. Allowing for these agencies to coordinate and access strategically located CCWD properties to establish fuel breaks is vital to the protection of critical infrastructure and assets.

Other Alternatives: Utilize already constrained budgetary resources to further expand defensible space at CCWD critical facilities.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The District will utilize existing plans and coordination with CalFIRE, Calaveras County Office of Emergency Services, US Bureau of Land Management, and the US Forest Service on fire suppression/mitigation activities.

Responsible Office: CCWD Operations

Priority (H, M, L): High

Cost Estimate: Unknown

Benefits (Losses Avoided): Reduce loss of water and sewer services for major population centers in Calaveras County and maintain lower risk of future damages to critical infrastructure of the District.

Potential Funding:

- Sierra Nevada Conservancy Forestry Management implementation grants
- US Forest Service Non-Federal Lands Hazard-Fuel Reduction funding
- CalFIRE Fuel Reduction Activity Funding
- California Disaster Assistance Act post-fire funding through CalOES
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program

- US. Forest Service Wildland-Urban Interface Grants
- California State Fire Safe Council and Local Fire Safe Council

Schedule: Annually through 2024

Action 2. Hardening of Water and Wastewater Facilities (and Associated Electrical and SCADA Communication Systems) Against Wildfire and Other Severe Weather Hazards

Hazards Addressed: Wildfire, Severe Weather: Winter Weather and Storms (Cold/Freezing Temperatures), Severe Weather: Heavy Rain and Storms (Wind, Lightning, Hail); Severe Weather: Wind

Issue/Background: The District has many pump stations, treatment plants, and other water and sewer facilities critical to maintaining water and sewer service. The subject facilities serve communities at risk to wildfire that are located near the wildland urban interface. In many cases facilities are not constructed of fire resistant materials, lack necessary retrofits and upgrades, have limited defensible space, and are surrounded by vegetation fuels. Damage to these facilities can result in a loss of potable water or sewer service for an extended period. Often electrical, SCADA, radio and communication systems are located outdoors in unprotected electrical panels/enclosures that are highly vulnerable to wildfire. Some facilities also lack recent upgrades to roofs, windows, siding materials, and other building infrastructure, as well as adequate insulation. The mitigation action would involve hardening the facilities against the threat of wildfire and severe weather events related to wind by adding concrete, masonry, steel or other ignition resistant materials. It would involve adding construction materials related to bracing to strengthen external infrastructure and improve insulation (pipe wrapping) to ensure generators operate during winter storms and during power outages. This mitigation action would also involve retrofitting the facilities (specifically buildings) with new construction materials to minimize damage from severe weather, winter storms, hail, and lightning. Specific retrofits may include installing structural bracing, shutters, laminated window panes, and hail-resistant roof coverings and siding.

The following facilities have been identified as being at a high risk:

- Ebbetts Pass Water / Big Trees Pump Stations
- Ebbetts Pass Water / Dorrington Booster Pump Station
- Ebbetts Pass Water / Larkspur Ct. Booster Pump Station
- Forest Meadows / Hwy 4 Sewer Lift Station
- Forest Meadows / Wastewater Treatment Plant
- Arnold Sewer / Lift Stations #1 & #2
- West Point Water / Acorn Ln. Booster Pump Station
- West Point Sewer Lift Station
- Sheep Ranch Water Treatment Plant

Other Alternatives: No Action, Replacement, Relocation, Ignition Resistant Materials, Defensible Space and Fuel Reduction

Existing Planning Mechanism(s) through which Action Will Be Implemented: CCWD Engineering and Field Operations staff will evaluate alternatives and develop a preferred solution

for each different site/facility. The prioritization will be based upon the customers and population served and wildfire recurrence internal. Through a series of multiple projects, the District anticipates a standard design, bidding, and construction process will be used to implement this mitigation action. In most instances, the mitigation projects will incorporate defensible space and vegetation fuels reduction components.

Responsible Office: CCWD Engineering and Field Operations Staff

Priority (H, M, L): High.

For this mitigation action, the District is focused on specific water and wastewater facilities within wildland urban interface serving designated communities at risk. Other facilities located outside the subject areas are considered medium or low risk.

Cost Estimate: $4,000,000

Benefits (Losses Avoided): The benefits are based primarily upon the losses avoided in terms of potable water and sewer service and replacement costs for the damaged facilities.

Potential Funding: The District will apply for funding assistance through the Cal-OES Hazard Mitigation Grant Program to the extent possible. The District expects it will be able to provide matching funds through a portion of its water and wastewater operating revenues that are earmarked for use on capital renovation and replacement projects. The District may look to other funding sources through State programs.

Schedule: 5-years / This mitigation action would be implemented as multiple projects, each capable of being performed and completed within a 36-month timeframe.

Action 3. Implement Other Facility Flood Mitigation Projects

Hazards Addressed: Flood: Localized Stormwater Flooding; Severe Weather: Heavy Rain and Storms

Issue/Background: Prepare alternatives report and select preferred alternatives for each location. Prepare planning documents and implement as required. Identify other facility flood mitigation projects throughout the District and implement as needed.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): High

Cost Estimate: To be determined.

Benefits (Losses Avoided): Increased life safety and property protection and safeguard the potable water supply.

Potential Funding: To be determined.

Schedule: On-going, identification process within the next two years, 2020.

Action 4. Replace Remaining Redwood Water Storage Tanks

Hazards Addressed: Wildfire

Issue/Background: Replace remaining redwood water storage tanks with fire resistant steel tanks in high fire hazard zones where redwood tanks and potable water supply are at significant risk to wildfire and no alternate potable water source is readily available. The following list of existing redwood tanks are identified for mitigation projects:

- Big Trees Tanks 4, 5 and 8, Dorrington, CA (a.k.a. Big Trees North Zone)
- Bummerville Tank, West Point, CA
- Copper Cove Tank 'B', Copperopolis, CA
- Heather Drive Tank, Forest Meadows, CA
- Meadowmont #13, Arnold, CA
- Timber Trails, Avery, CA

Other Alternatives: In addition to defensible space and fuel reduction, the recommended action is to replace the vulnerable redwood tanks with steel tanks of fire resistant materials.

Existing Planning Mechanism(s) through which Action will be Implemented: Planned through various mechanisms including water system master plans, hazard mitigation and grant programs (by CCWD, consultants and government agencies).

Responsible Office: Calaveras County Water District

Priority (H, M, L): High

Cost Estimate: $1,000,000 for Big Trees North Zone (3 tanks); $300,000 Bummerville Tank, $450,000 for Copper Cove Tank 'B'; $450,000 for Heather Drive Tank; and $300,000 for Meadowmont #13, and $300,000 for Timber Trails.

Benefits (Losses Avoided): The primary benefit is safeguarding the potable water supply. Big Trees Village North Zone serves approximately 700 households and an estimated $4 million in avoided damages after mitigation.

Potential Funding: Bummerville Tank replacement is currently funded by a DWR Prop.84 grant. CCWD submitted an application to Cal-EMA for Big Trees North Zone (Tanks 4, 5 and 8). No funding has been identified for the remaining tanks.

Schedule: Bummerville Tank was completed in 2012. The other projects are scheduled to be completed by within the next five years depending on availability of funding.

Action 5. Improve Grading and Drainage of Wastewater Effluent Storage Ponds

Hazards Addressed: Flood: Localized Stormwater Flooding

Issue/Background: CCWD owns and operates 12 sewer facilities that treat wastewater for 50 to 4,000 people depending on the system. Peak wet weather flows can cause inflow and infiltration problems as well as flooding of the effluent ponds, especially during wet winters when excessive winter storage at the wastewater treatment plant(s) can cause dam failures of the treatment ponds.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Create and implement a plan for each facility designed to improve the grading and drainage of the District's wastewater effluent storage ponds.

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): High

Cost Estimate: $5,000,000

Benefits (Losses Avoided): Reduced risk of infiltration of flood waters to the wastewater ponds, which could cause an effluent spill.

Potential Funding: To be determined.

Schedule: Master Plans have recently been updated and CCWD staff will identify critical recommendations regarding sewer facilities.

Action 6. Enhance On-Site Coordination with Cal-Fire during Fire Events

Hazards Addressed: Wildfire

Issue/Background: Contact information through the Multiple Agency Coordination Committee, (aka MAC Group). There may be times during fire emergencies when CCWD's resources are overwhelmed in terms of staff and support. Quick response to emergencies and restoration of services is vital to protect public health and assist with community disaster recovery. This action seeks to establish contact procedures and information through the Multiple Agency Coordination Committee and related public safety organizations.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: To be determined

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): High

Cost Estimate: Unknown

Benefits (Losses Avoided): Enhanced protection of District facilities from wildfire.

Potential Funding:

Schedule: To be completed within 2 years, (2020) and updated as needed.

Action 7. Work with Calaveras County on County General Plan update to integrate Natural Hazards Mitigation Measures in New Development Planning

Hazards Addressed: Multi-Hazard

Issue/Background: Calaveras County is continuing the process to update their General Plan (last version completed in 1996). The District's 1946 charter establishes the boundaries of the entire County to be within CCWD's planning authority for certain activities. Therefore, CCWD's participation and leadership in updating the General Plan is appropriate. CCWD has identified several issues with existing infrastructure placement that can be improved with appropriate planning for future development. Several examples include avoiding floodplain areas and installing underground infrastructure to avoid potential damage from landslides and/or wildfires.

Other Alternatives: No action

Responsible Office: CCWD

Priority (H, M, L): High

Cost Estimate: The cost to the District is approximately $80,000. Future costs are unknown but will be based upon the amount of CCWD staff time necessary to attend meetings, review plan elements, and communicate recommendations in the County's planning process.

Benefits (Losses Avoided): Cost-effective planning with the County will result in the development of more efficient, pragmatic, long-term mitigation solutions.

Potential Funding: General CCWD budget

Schedule: Update will be an ongoing process through at least 2018. CCWD is waiting on the County to complete the update.

Action 8. Implement Recommendations in Service Area Master Plans related to Critical Sewer Facilities

Hazards Addressed: Flood: 100/500 Year; Flood, Localized Stormwater Flooding

Issue/Background: CCWD owns and operates 45 sewer lift stations in their 12 wastewater systems. Many lift stations are located near water bodies used for recreational activities including full-body contact. One example is Lake Tulloch, where CCWD has 30 lift stations within a few feet from the lake. These stations can convey up to 100,000 gallons of raw sewage each day. Heavy rainfall and flooding create inflow/infiltration in the collection system exacerbating the quantity of sewage these stations must pump. It is imperative that the public be protected from overflows from these lift stations. A recent state regulation requires collection system operators to reduce overflows and spills from their systems or face mandatory monetary penalties.

Six of the largest sewer systems master plans have been completed. Computer modeling of collection systems was conducted to determine adequacy for current and future flows. Many were found to be deficient and recommendations were made for the improvements needed to bring them up to capacity.

Other Alternatives: No action

Responsible Office: CCWD Engineering Department

Priority (H, M, L): High

Cost Estimate: $7.9 million

Benefits (Losses Avoided):

- Protect public safety and the environment and access to recreational activities in rivers and lakes
- Avoid mandatory fines due to overflows and spills
- Reduce revenue losses due to closures of recreational areas (not CCWD revenue)

Potential Funding: District revenue from rates, fees, property taxes, interest on investments

- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- U.S. EPA
- USDA Rural Utility Service
- California State Water Resources Control Board Small Community Wastewater Grant
- State revolving fund grants and/or loans

Schedule: Project ongoing, completion within 10 years

Action 9. Implement Pipeline Improvements Identified in Water Master Plans to Provide Adequate Fire Flows

Hazards Addressed: Wildfire

Issue/Background: CCWD owns and operates six potable water systems in the county. Recently, master plans have been prepared for the four largest systems: Copper Cove, Ebbetts Pass, Jenny Lind, and West Point. In each system, the computer models identified zones of inadequate fire flow in the distribution systems. Most of the systems were installed when 500 gallons per minute (gpm) was considered adequate flow. By today's standards that flow is inadequate; today's fire experts recommend at least 1,000 gpm fire flow.

Particularly in the West Point system, but also to smaller degrees in the other three systems, it was found that the system does not even deliver CCWD's own standard of 500 gpm. This lack of fire flow is a threat to the safety of the West Point residents and is also curbing the development of the business section of downtown West Point. County planners will not approve the construction of buildings, residential or commercial, in areas of inadequate fire flows.

Other Alternatives: No action

Responsible Office: CCWD Engineering Department

Priority (H, M, L): High

Cost Estimate: $2.6 million

Benefits (Losses Avoided):

- Ensure adequate fire flow for the protection of lives and property from fire
- Provide for community development
- Protect public health and safety

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- Department of Housing and Urban Development Community Development Block Grant Program (Eminent Threat in West Point)
- USDA Rural Utility Service
- State revolving fund grants and/or loans

Schedule: Project ongoing, completion within 10 years.

Action 10. Strategic Wildfire Protection Improvements in Sheep Ranch and West Point Water Systems

Hazards Addressed: Wildfire

Issue/Background: The isolated water systems in the communities of West Point and Sheep Ranch, two CCWD service areas located in the northern and southern boundaries of the heart of Calaveras County, are strategically positioned to provide public water supplies to combat catastrophic wildfires. However, existing infrastructure is inadequate to store and deliver the quantities of water necessary to support firefighting efforts in large-scale wildfire. As evidence during the recent Butte Fire, these limitations seriously hamper the ability of first responders to fight the fire's progression and protect the community because the water tenders are not able to extract the necessary water from the limited capacity of these systems. Without functioning fire hydrants or available water storage in Sheep Ranch, for example, fire tenders were forced to travel winding, mountain roads to fill their tanks with water from the nearest public water supply miles away. With improvements to CCWD's existing infrastructure at Sheep Ranch, however, ample supplies would be immediately available to fire personnel without the delay and danger experienced today. Likewise, existing infrastructure at West Point cannot deliver sufficient water supplies to meet the needs of first responders battling a ravaging fire. Unfortunately, the limited financial resources of these extremely disadvantaged communities are insufficient to realize these improvements.

Specific improvements include:

- West Point Water System: Replacement of approximately 6,000 linear-feet (lf) of 4 inch and 2,000 lf of 3 inch of raw water transmission pipeline from the Middle Fork Mokelumne River to CCWD's Regulating Reservoir that supplies the West Point water system and increased pumping capacity at the associated intake by installation of a larger pump (700 gallons per minute).

- Sheep Ranch Water System: Improvements to raw water storage, transmission facilities, potable water storage, and distribution facilities, including:

- Replacement of antiquated, leaky pipeline from White Pines Lake to Sheep Ranch diversion.

- Construction of new pump station at diversion point with fire flow pump and backup generator

- Installation of new 250,000-gallon storage tank

- Replacement of existing water distribution system including installation of functioning fire hydrants. (Existing water system, with non-functioning hydrants, cannot meet fire code standards.)

Other Alternatives: No Action, Defensible Space and Fuel Reduction

Existing Planning Mechanism(s) through which Action Will Be Implemented: CCWD Engineering and Field Operations staff will evaluate alternatives and develop a preferred solution for each different site/facility. Through a series of multiple projects, the District anticipates a standard design, bidding, and construction process will be used to implement this mitigation action. In most instances, the mitigation projects will incorporate defensible space and vegetation fuels reduction components.

Responsible Office: CCWD Engineering and Field Operations Staff

Priority (H, M, L): High. In this mitigation action, the District is focused on specific water supply delivery infrastructure in the wildland urban interface serving small, isolated, and disadvantaged communities at risk.

Cost Estimate: $6,500,000 - The West Point Project would be estimated at approximately $2,500,000 according to CCWD's 2018 Draft West Point Water Supply Master Plan. Improvements to the Sheep Ranch Facilities could exceed $4,000,000.

Benefits (Losses Avoided): The benefits are based primarily upon the losses avoided in terms of potential widespread damage to communities and homes in these service areas

Potential Funding: The District will apply for funding assistance through the Cal-OES Hazard Mitigation Grant Program to the extent possible. The District expects it will be able to provide matching funds through a portion of its water and wastewater operating revenues that are earmarked for use on capital renovation and replacement projects. The District may look to other funding sources through State programs including partnering with CalFIRE.

Schedule: 5-10 years / This mitigation action would be implemented as multiple projects, each capable of being performed and completed within a 36-month timeframe.

Action 11. Evaluate the Need for Improved Redundancy at Critical Facilities

Hazards Addressed: Drought and Water Supply

Issue/Background: CCWD owns and operates 6 water and 12 sewer facilities that deliver drinking water and provide fire flow to 100 to 13,000 people and treat wastewater of 50 to 4,000 people, depending on the system. Redundancy of critical processes at these facilities can avoid outages and loss of services during emergencies. The extent of redundancy and need for improvements are currently unknown.

Other Alternatives: In a few systems, water delivery can be provided through interties, but this is limited. The only alternate solution is tracking wastewater to other facilities.

Responsible Office: CCWD Field Operations

Priority (H, M, L): Medium

Cost Estimate: The cost of creating plans will be low. The capital costs related to redundancy is unknown until a study is completed.

Benefits (Losses Avoided):

- Improve reliability of water delivery and sewer conveyance facilities
- Protect public health and safety

Potential Funding: District revenue from rates, fees, property taxes, interest on investments

Schedule: Currently ongoing

Action 12. Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas

Hazards Addressed: Wildfire, Severe Weather: Heavy Rain and Storms (Hail, Lightning, Wind); Severe Weather: Wind

Issue/Background: The risk assessment indicates that much of Calaveras County is at high to very high wildfire risk due to vegetative fuels, topography, and weather. Damaging fires are likely to occur each year. The risk assessment also showed many of CCWD's facilities to be in high fire hazard areas; the operations of these facilities are critical lifeline utilities for the public and critical for fire protection. Maintaining the recommended 100-foot defensible space around facilities will reduce potential for losses during a fire. This defensible space would also limit the spread of wildfires that ignite from lightning strikes and remove trees that could fall and damage structures during wind storms. CDF fire crews or California Conservation Corps crews may be available to complete work.

Other Alternatives: Utilize already constrained budgetary resources to further expand defensible space at CCWD critical facilities.

Responsible Office: CCWD Operations and Administrative Departments

Priority (H, M, L): Medium

Cost Estimate: Staff time to coordinate with CDF and costs of temporary hires

Benefits (Losses Avoided):

- Reduce risk of damage or destruction to facilities due to wildfire
- Reduce risk of loss of services to customers and for fire protection

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- U.S. Forest Service Wildland-Urban Interface grants
- California State Fire Safe Council or local Fire Safe Council
- State revolving fund grants and/or loans

Schedule: Annually.

Action 13. White Pines Lake Storage Restoration Project

Hazards Addressed: Drought and Water Supply, Flood: 100/500 Year and Localized Stormwater Flooding

Issue/Background: In 2017, CCWD completed a bathymetric survey of the White Pines Lake water storage reservoir located in Arnold. White Pines Lake is the sole source of water supply for the community of Sheep Ranch. The bathymetric survey determined that the reservoir had lost 40% of capacity since it was constructed in 1965. Several known events in high flow water years including 1996/97 and 2016/17 have deposited eroded upstream sediments in the reservoir. In 2016/17, an entire road upstream of the reservoir overwhelmed a historical bridge culvert and washed tons of sediment downstream into the District's water supply storage reservoir. The diminished capacity of the reservoir has created water supply issues in prolonged drought, and water was required to be trucked into the community of Sheep Ranch during the droughts in the 2000's. Additionally, the diminished capacity increases the risk of localized flooding near the reservoir during high flow events.

Other Alternatives: One alternative is to abandon the existing diversion at Sheep Ranch (San Antonio Creek – Calaveras River) and move water down from the Ebbetts Pass system via 5 to 6 miles of pipeline. This may not be feasible or cost efficient because of "water age" issues and the small customer base. However, it would provide the customers a more reliable water supply and better fire protection along the pipeline alignment in an area that is highly susceptible to wildfire.

Existing Planning Mechanism(s) through which Action Will Be Implemented: A project to dredge the reservoir is currently included in the 10-year Capital Improvement Plan for the District.

Responsible Office: CCWD Engineering and Water Resources Departments

Priority (H, M, L): Medium

Cost Estimate: $4,000.000

Benefits (Losses Avoided): Limit water supply interruptions for Sheep Ranch, provide a more robust emergency surface water supply for fire suppression supply in an area prone to wildfires, and reduce risk of flooding for homes and District facilities near the lake.

Potential Funding: None

Schedule: 10 Years

Action 14. Merge 2018 CCWD LHMP into next update of Calaveras County Multi-Jurisdictional Hazard Mitigation Plan

Hazards Addressed: Multi-Hazard

Issue/Background: Many other water and wastewater utilities within Calaveras County do not currently have Local Hazard Mitigation Plans in place. Several agencies have participated on the District's Hazard Mitigation Planning Committee (HMPC) and the District feels adjacent facilities operated by other agencies may be better served by a multi-jurisdictional planning effort. Currently, the County has a broad Local Hazard Mitigation Plan used for specific needs. The HMPC identified a multi-jurisdictional plan as a desired effort to be established in the future.

Other Alternatives: Each agency develops their own Local Hazard Mitigation Plan and coordinates as needed.

Existing Planning Mechanism(s) through which Action Will Be Implemented: CCWD has a FEMA mandate to update their Local Hazard Mitigation Plan every five years or sooner. The District could pursue a multi-jurisdictional plan with other utilities and the County.

Responsible Office: CCWD Engineering and Water Resources Departments

Priority (H, M, L): Medium

Cost Estimate: $100,000

Benefits (Losses Avoided): A multi-jurisdictional coordinated plan could better integrate all the critical facilities in the County and prevent loss of life, provide protection of public, health and safety facilities, and enhance emergency planning.

Potential Funding: CalOES/FEMA Hazard Mitigation Grant Program or Pre-Disaster Mitigation Grants - Planning

Schedule: 5 years

Action 15. Highway 4 Community Emergency Alternative Water Supply Feasibility Planning Study

Hazards Addressed: Drought and Water Supply, Multi-Hazard

Issue/Background: The majority of the Stanislaus River water supplies for the communities of Murphys, City of Angels and surrounding vicinities are supplied from a single point of delivery via an underground rock bored tunnel that is part of the North Fork Hydroelectric Project. In the case of an emergency interruption or failure, these communities could be in serious danger due to water shortages for unknown periods of time without an alternative point of delivery. An emergency alternative water supply feasibility planning study for the Highway 4 community would outlined alternative sources of water supply for these communities.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing coordination with other water agencies in the region

Responsible Office: CCWD Engineering and Water Resources Departments, other local agencies

Priority (H, M, L): Medium

Cost Estimate: $300,000

Benefits (Losses Avoided): Feasibility will determine construction projects that may mitigate serious interruptions in water supply for large population centers in the County and protect public health and safety. This could be a multi-jurisdictional project.

Potential Funding: None

Schedule: 2018

Action 16. Construct Fire Resistant Electrical Control Panels

Hazards Addressed: Wildfire, Severe Weather: Heavy Rain and Storms

Issue/Background: The District has several facilities (water treatment plants, pump stations, wastewater facilities and lift stations) that require 24-hour service. Some of these facilities are in high fire severity zones. It is the District's responsibility to keep service operating during all types of weather and hazards. By protection the electrical control panels with fire resistant control panels and lightning protection devices and methods, among other grounding infrastructure, the District can keep services going to our customers.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Identify, prioritize, and construct fire resistant electrical control panels.

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): Medium

Cost Estimate: Not known at this time

Benefits (Losses Avoided): The primary benefits are safeguarding the potable water supply and reducing or eliminating wastewater spills or overflows. Protects public health, safety, and the environment.

Potential Funding: Unknown

Schedule: To be completed within four years, 2022.

Action 17. Retrofit Manhole Covers

Hazards Addressed: Flood: 100/500 Year; Flood: Localized Stormwater Flooding

Issue/Background Reduce the amount of peak wet weather flow entering the District's wastewater conveyance system. I/I flows contribute to sewer system overflows into local homes and region's waterways, negatively impacting public health and the environment. Retrofitting manhole covers would control infiltration and inflow into the manholes, which end up at the wastewater treatment plant(s) where it must be treated like sewage, resulting in high treatment costs. Also, I/I creates overflows of the manholes, where it can get into waterways and homes. The peak wet weather flows also cause problems with winter storage at the wastewater treatment plant(s), which can create dam failures of the treatment ponds.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Create and implement a budget to replace manhole covers on a yearly basis throughout the District over a 10-year period.

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): Low

Cost Estimate: $25,000/year

Benefits (Losses Avoided): Reduced risk to localized flooding to property, as well as increased traffic safety.

Potential Funding: To be determined

Schedule: On-going completed in 4 years 2022

Action 18. Update a Tiered Rate Structure to Encourage Responsible Water Use

Hazards Addressed: Drought and Water Supply

Issue/Background: Based on the mitigation action included in the 2012 plan, CCWD developed a tiered water rate structure. There are many CCWD's residential customers who have extensively landscaped their homes, often creating "mini-ranches" which require significant amounts of water for livestock and orchards. The residential connection is designed for the average single-family home. Customers who use significantly more than the average amount of water to care for extensive landscaping create the need for additional infrastructure to meet demand and fire protection standards, and increase the area's vulnerability to drought.

Other Alternatives: Continue to allow all consumption to be billed at the recently developed tiered rate structure.

Responsible Office: CCWD Administrative Department

Priority (H, M, L): Low

Cost Estimate: Staff time needed to review, update and implement any modifications to the program and changes in billing. The billing program is already setup to handle tiered rates.

Benefits (Losses Avoided):

- Reduce the amount of peak water usage
- Reduce CCWD revenue losses and extra costs during times of drought or other water shortage or distribution problems
- Provide incentives for conservation and responsible water use

Potential Funding: CCWD general budget

Schedule: 2018, implement update over next year, or by 2020.

Action 19. Update the National Pollutant Discharge Elimination System (NPDES) Permits for Wastewater Facilities as Required

Hazards Addressed: Flood: 100/500 Year and Localized Stormwater Flooding

Issue/Background: There are two ways to dispose of treated wastewater effluent - disposal to land (waste discharge requirements (WDR) permit) or discharge to creeks or rivers (NPDES permit). The permits are obtained from the Regional Water Quality Control Board, but each permit type has differing requirements. Until recently, CCWD was not allowed to apply for a water discharge NPDES permit and, thus, was restricted to finding land for storage and disposal under the land application WDR permit. However, costs of land and construction of facilities have skyrocketed in recent years, making land application very costly for small customer-based agencies such as CCWD.

Heavy rainfall and flooding causes high inflow/infiltration, thus exacerbating the amount of sewage to treat, store, and dispose of. CCWD is applying for water discharge NPDES permits when current storage or disposal capacities are reached, to reduce vulnerability during heavy precipitation events and to reduce costs to CCWD and ratepayers.

Other Alternatives: Continue to purchase land and build facilities for storage and disposal

Responsible Office: CCWD Field Operations

Priority (H, M, L): Low

Cost Estimate: Staff time to prepare and coordinate applications. Costs average $16,000 per acre-foot to construct storage and disposal facilities

Benefits (Losses Avoided):

- Reduce sewer overflows or spills
- Avoid mandatory fines due to overflows and spills
- Protect public health and safety and the environment
- Significant potential savings in avoiding land purchases and construction of facilities for storage and disposal.

Potential Funding: CCWD general budget; district revenue from rates, fees, property taxes, interest on investments

Schedule: Annually

Action 20. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan

Hazards Addressed: Drought and Water Supply

Issue/Background: CCWD's County Water Master Plan is 16 years old. There are many strategies recommended in this plan. Some are related to communications between local agencies, whereas others focus on policy issues and feasibility studies. An updated comprehensive analysis is needed to address changing conditions and ensure a high reliability water supply for the future. The updated plan will review the status of accomplished feasibility studies, assess new priorities, include measures to maintain and enhance interagency communications, and incorporate strategies to increase the district's and community's disaster resistance.

Other Alternatives: No action

Responsible Office: CCWD Administrative Department

Priority (H, M, L): Low

Cost Estimate: $50,000 to $100,000

Benefits (Losses Avoided):

- Reduce vulnerability to drought
- Ensure future water supply needs

Potential Funding: Potential funding in future fiscal year's budget starting in July 2018

Schedule: Initiate within 4 years, or by 2022

Action 21. Dam Failure Emergency Planning

Hazards Addressed: Dam Failure

Issue/Background: The State of California Division of Safety of Dams recommend that an emergency action plan (EAP) be developed for dams, which in the event of failure, or uncontrolled release, could endanger downstream life or property. Once developed, the EAP should be regularly updated and exercised.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Participate in Annual Emergency Action Plan Meetings and Exercises and educate District staff on dams of concern to flooding, loss of service

Responsible Office: CCWD Staff

Priority (H, M, L): Low

Cost Estimate: Unknown

Benefits (Losses Avoided):

Potential Funding: None

Schedule: On-going, with updates every 5 years

Action 23. Develop Mutual Aid Agreements with Other Water Providers and County Agencies for Support during Emergencies

Hazards Addressed: Drought and Water Supply

Issue/Background: There may be times during an emergency or disaster when CCWD resources are overwhelmed-in terms of staff and equipment. While CCWD is an active participant in the countywide Multi-Agency Coordinating Committee (MAC) and receives support from them, no formal mutual aid agreements exist with other county or regional water/sewer service providers. Quick response to emergencies and restoration of services is vital to protect public health and allow for community disaster recovery. This action seeks to develop mutual aid agreements with the Tuolumne Utilities District and Amador Water Agency, neighboring countywide agencies, and with WARN, the statewide emergency response network.

Other Alternatives: Continue to respond with existing staff and equipment

Responsible Office: CCWD Field Operations

Priority (H, M, L): Low

Cost Estimate: Staff time

Benefits (Losses Avoided):

- Improve timeliness of restoring services following emergencies, which will allow communities and businesses to recover more quickly
- Protect public health and safety

Potential Funding: General district budget

Schedule: On-going, implement by 2022

6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from the Calaveras County Water District (CCWD), raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. The CCWD Board of Directors has adopted this Local Hazard Mitigation Plan by passing a resolution. A copy of the resolution and the executed copy is included in Appendix D: Adoption Resolution.

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7 PLAN MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

Chapter 3 Planning Process includes information on the implementation and maintenance process since the 2012 plan was adopted. This section includes information on the implementation and maintenance process for this plan update.

7.1 Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the District will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms. The District already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the District and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities. Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the costlier recommended actions.

This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the District will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the HMPC will be tasked with plan implementation and maintenance as the ongoing Hazard Mitigation Coordinating Committee led by CCWD. The committee agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Keep the concept of mitigation in the forefront of CCWD decision-making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Board of Directors; and
- Inform and solicit input from the public.

The committee is an advisory body and will not have any powers over CCWD or its staff. Its primary duty is to see the plan successfully carried out and to report to the District governing board and the community on the status of plan implementation and mitigation opportunities for CCWD. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the CCWD website.

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance Schedule

Plan maintenance implies an ongoing effort to monitor and evaluate the plan's implementation and make updates as progress, roadblocks, or changing circumstances are recognized. To track progress and update the Mitigation Strategy, the Hazard Mitigation Coordinating Committee will revisit the CCWD Local Hazard Mitigation Plan annually and after a hazard event. CCWD Water

Resources Manager is responsible for initiating this review. A five-year written update, as required by FEMA, will be submitted to the state and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame.

7.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

The plan should be changed to reflect projects that have failed or are not considered feasible after a review of consistency with established criteria, timeframe, community priorities, and funding resources. Priorities that were not ranked high but identified as potential mitigation strategies should be reviewed during the monitoring and update of the plan to determine feasibility of future implementation. Updating of the plan will be made through written changes and submissions as the coordinating committee deems appropriate and necessary, and as approved by the CCWD Board of Directors. In keeping with the process of adopting the plan, a public hearing to receive public comment on plan maintenance and updating should be held during any formal plan update process and the final product adopted by the Board of Directors.

7.2.3 Incorporation into Existing Planning Mechanisms

The overall mitigation strategy presented in Section 5 recommends using existing plans and/or programs to implement hazard mitigation, where possible. Based on the capability assessment described previously, the CCWD has and continues to implement programs to reduce losses to life and property from natural hazards. This plan builds upon the momentum developed through previous and related planning and mitigation and recommends implementing projects through the following plans, where possible. If the plan was previously incorporated into an existingplan, it is noted below with an asterisk:

- CCWD Water Master Plan (1996)
- Mokelumne/Amador/Calaveras and Tuolumne-Stanislaus Integrated Regional Water Management Plans (last updated in 2013 and 2017 respectively).
- CCWD Service Area Master Plans (several were updated and integrated 2012 LHMP)*
    - Updated plans cross reference applicable mitigation actions from the LHMP
- CCWD Service Area Vulnerability Assessments and Emergency Response Plans
- Calaveras County General Plan (currently being updated) and Zoning Code*
    - The County General Plan was amended to include the County LHMP and relevant portions of the CCWD LHMP (referenced in the County LHMP)
- Calaveras County General Plan Water Element (Final Water Element Policy Document and Final Supplement were adopted in February 2009).
- Other capital improvement and community plans within the county
- Calaveras County Multi-Hazard Functional Plan
- Calaveras County Multi-Hazard Mitigation Plan (updated on 2015, revised in 2016; integrates CCWD 2012 LHMP)*
    - County General Plan was amended include the County LHMP (https://planning.calaverasgov.us/Portals/Planning/Documents/General%20Plan%201996/General%20Plan%20Elements%201996/SAFETY%20ELEMENT%20-%20Attachment%20A%20-%20Amendment%20text.pdf)
- City of Angels Camp Annex Local Hazard Mitigation Plan (January 2016' integrates CCWD 2012 LHMP)
    - City of Angels Camp Annex was included in County's General Plan Amendment
- Local Fire Safe Plans and Community Wildfire Protection Plans (2016 – 2017 plan references the CCWD, but does not indicate whether or not they were a participating agency)
- Tuolumne-Calaveras Unit 2018 Strategic Fire Plan (integrates District assets and goals)*
    - Cross references the CCWD LHMP and indicates the District was a participating agency
- Other plans and policies outlined in the capability assessment section of this plan

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, as appropriate. Some members are also participating in the Multi-Agency Coordinating (MAC) Group, an emergency management team composed of the major representatives in Calaveras County (Calaveras County, CalFIRE, CalTrans, Angels Camp Police Department). As described in Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and
- Monitoring District and community budget meetings for other program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community. Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC plans to review and identify new options for involving the greater public. The HMPC will develop a plan for public involvement and will be responsible for disseminating information through various channels detailing the plan update process. As part of this effort, a public meeting will be held and public comments will be solicited on the plan update draft.

CALAVERAS COUNTY WATER DISTRICT