LAKE VALLEY FIRE PROTECTION DISTRICT

LOCAL HAZARD MITIGATION PLAN

2020

"Hazard mitigation is the development and implementation of actions intended to diminish or eliminate losses sustained as a result of a natural, human caused or technological hazard."

Lake Valley Fire Protection District
Local Hazard Mitigation Plan

Developed in compliance with the Disaster Mitigation Act of 2000
by the Lake Valley Fire Protection District

with professional planning services provided by:

NCE (Nichols Consulting Engineers, Chtd.)

Reno, Nevada

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Acronyms

Cal Fire	California Department of Forestry and Fire Protection
CalOES	California Governor's Office of Emergency Services
Caltrans	California Department of Transportation
CTC	California Tahoe Conservancy
District's	Lake Valley Fire Protection District's
DMA	Disaster Mitigation Act of 2000
EDC	El Dorado County
EDC LHMP	El Dorado County Local Hazard Mitigation Plan
EMCC	Emergency Management Community Council
FEMA	Federal Emergency Management Agency
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
LHMP	Local Hazard Mitigation Plan
LTB CWPP	2015 Lake Tahoe Basin Community Wildfire Protection Plan
LTBMU	Lake Tahoe Basin Management Unit
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
SNPLMA	Southern Nevada Public Lands Management Act
SRA	State Responsibility Areas
STPUD	South Tahoe Public Utility District
Tahoe RCD	Tahoe Resource Conservation District
TRPA	Tahoe Regional Planning Agency
TTD	Tahoe Transportation District
USGS	U.S. Geological Survey

Lake Valley Fire Protection District

1. Introduction

This Local Hazard Mitigation Plan (LHMP) details the Lake Valley Fire Protection District's (District's) commitment to reduce the potential risks and impacts of natural hazards. The LHMP serves to help protect the District's assets, and communities by improving disaster preparedness and increasing resiliency. It also serves as a guide for the District's decision makers as they commit resources to reducing the effects of potential hazards.

This LHMP covers the entire area within the District boundary which is defined by Federal Emergency Management Agency (FEMA) as the planning area. This is a comprehensive, long-term plan focused on identifying mitigation strategies, local policies and actions that can be implemented to reduce specifically identified risks and future losses to our constituents.

This LHMP is organized as follows:

- Section 1: Introduction
- Section 2: Planning Process
- Section 3: Risk Assessment
- Section 4: Hazard Mitigation Strategy
- Section 5: Plan Adoption
- Appendices

1.1 District

The District is a special district that was formed in 1947 to provide fire protection along California's south shore of Lake Tahoe. The area of the District is approximately 83 square miles in size, located approximately 200 miles northeast of San Francisco, California and about 58 miles southwest of Reno, Nevada in the Sierra Nevada Mountain Range. The District provides fire, rescue, and emergency medical services to the community of Meyers, permanent population 12,000, and automatic and mutual aid to neighboring communities. Seasonal tourist fluctuations may swell the population of Meyers to over 50,000.

The District is a paid fire protection district with 24 full-time and 3 apprentice firefighter paramedics. A five-member board of directors governs the District. The Board meets once a month to handle District business and pay District bills. Day to day operations is led by the Fire Chief and three Battalion Chiefs. Below is the District's Mission Statement.

Lake Valley Fire Protection District is committed to providing the highest level of public safety services for our community, its people, and the environment. "Because We Care."

Figure 1 shows the area covered by the District. The Lake Valley Fire protects the community of Meyers within El Dorado County and provides automatic and mutual aid to neighboring communities.

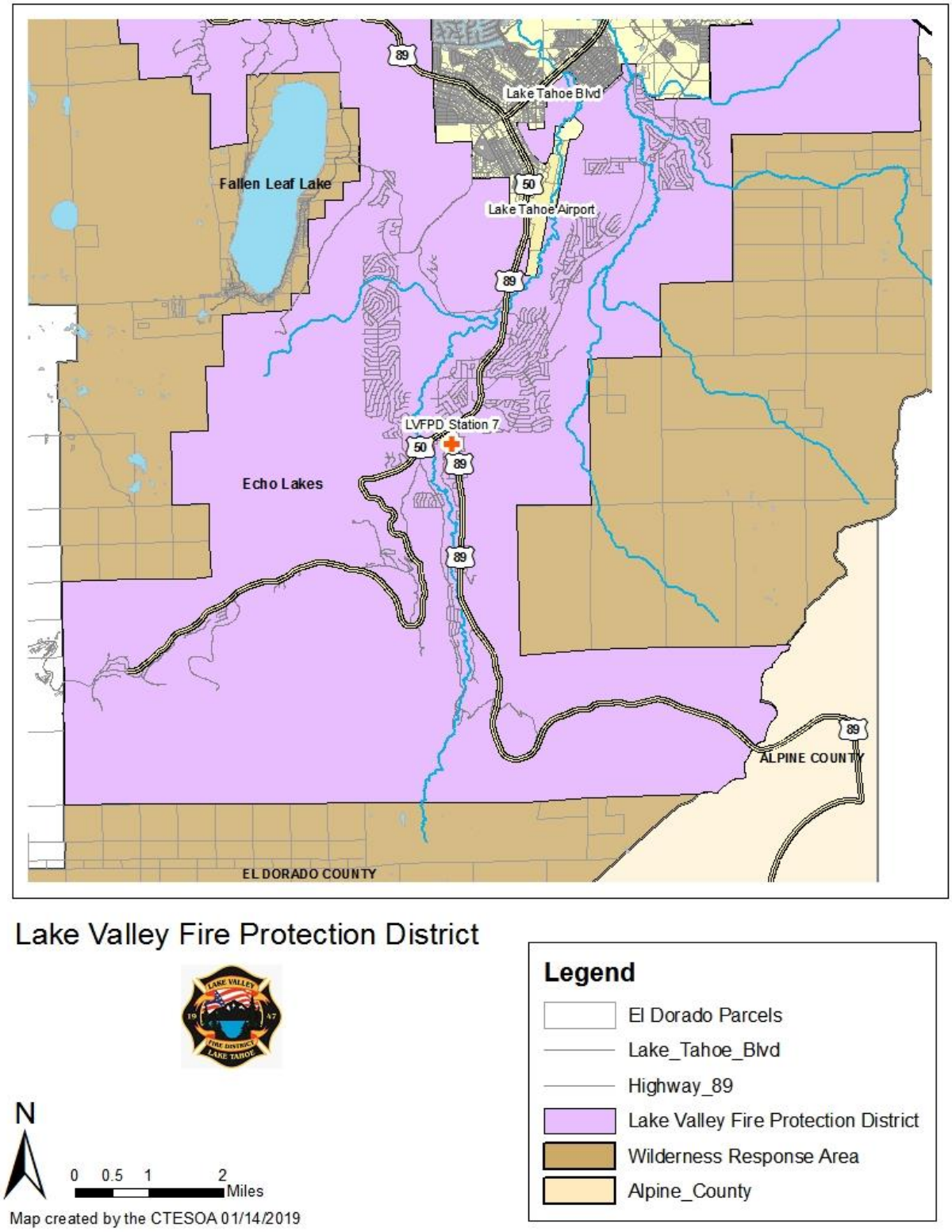


Figure 1: District Jurisdictional Boundaries

Source: Martin Goldberg, Lake Valley Fire Protection District

2. 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:

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

The District recognized the need and importance of a LHMP and was responsible for its update initiation. The plan was funded federally by FEMA-4240-DR-CA, Cal OES PL0112, FEMA 0018, and the Lake Valley Fire Protection District LHMP Agreement #017-91036. The District created a draft of the LHMP and to continue the draft process contracted with NCE in August of 2019 to facilitate and finalize this plan. The planning team participants, their positions, and how they participated in the planning process are shown in Table 1.

Table 1. Planning Team

Name	Position/Title	How Participated
Martin Goldberg	Engineer at the District	Applied for and secured grant funding; drafted the original LHMP; provided new mitigation actions; developed and collaborated with the Hazard Mitigation Planning Committee (HMPC); provided asset tables and hazard identification, vulnerability and capability information; facilitated the public input process; and edited draft and final plan documents.
Sarah Bryan, M.S.	Staff Scientist at NCE	Prepared the 2019 LHMP to meet the Disaster Mitigation Act of 2000 (DMA) requirements as established by federal regulations and following FEMA's planning guidance; identified the data requirements that the HMPC participants could provide and conducted the research and documentation necessary to augment that data; assisted in facilitating the public input process; and produced the draft and final LHMP documents.

Coordination with other community planning efforts is paramount to the successful implementation of this plan. This section provides information on how the District integrated the previously approved

2019 El Dorado County Local Hazard Mitigation Plan into existing planning mechanisms and programs.
Appendix A contains three email survey requests to the HMPC and copies of the surveys used to gain HMPC feedback on the priority hazards, hazard events localized in the District, and mitigation actions and prioritization in the District.

2.1 Community Participation in the Planning Process

The District used the hazardous mitigation plan development process recommended by FEMA in their State and Local Mitigation Planning how-to guide. Planning steps undertaken by the District include:

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

The community of the District participated in the planning steps listed above for the LHMP update through the public review of the draft LHMP and the development of a HMPC.

2.1.1 Public Input

The draft LHMP was made available on the District's website (http://lakevalleyfire.org/) for public review from November 25, 2019 to November 29, 2019. **Appendix B** provides a screen shot of the District's website demonstrating that commenting was available to the public, a table of public comments that acknowledges each response and its incorporation (if possible), and an email request for comments from the Board of Directors.

2.1.2 Hazard Mitigation Planning Committee

The District developed a HMPC as required by FEMA. The HMPC is made up of community members and neighboring jurisdictions of key representatives and stakeholders. The HMPC members and affiliations are listed in Table 2, below, and represent a subgroup of the El Dorado County's LHMP HMPC. The District's HMPC's role was similar to the County's role:

- Met the Disaster Mitigation Act of 2000 (DMA) requirements as established by federal regulations and following FEMA's planning guidance;
- Facilitate the entire planning process;
- Conduct the research and documentation necessary to augment data to fit the needs of the District; and
- Assist in facilitating public input.

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and

- Formally adopt the plan.

For the District's HMPC, "participation" meant the following:

- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on the LHMP process and content;
- Identifying mitigation actions for the LHMP;
- Reviewing and providing comments on the LHMP drafts;
- Informing the public, local officials, and other interested stakeholders about the planning process and providing opportunity for them to comment on the LHMP;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the LHMP by the governing boards.

Table 2. The District's HMPC Members and Affiliations

Member Name	Position	Affiliations
Anne Novotny	Deputy Director of Planning	El Dorado County (EDC) Community Development
Brad Zlendick	Battalion Chief, Operations	Lake Valley Fire Protection District
Brendan Ferry	Planning Manager	EDC Long Range Planning
Danielle Hughes	Capital Program Manager	Tahoe Transportation District
Devin Middlebrook	Sustainability Program Coordinator	Tahoe Regional Planning Agency
Dorian Fougeres	Chief of Natural Resources	California Tahoe Conservancy
Forest Schafer	Program Supervisor/Senior Environmental Scientist	California Tahoe Conservancy
Greg Almos	Community Member	Montgomery Estates Neighborhood
Jim Drennan	Community Member	Tahoe Paradise Neighborhood
Kristine Oase-Guth	MPH	EDC EMS/Preparedness
Martin Goldberg	Engineer	Lake Valley Fire Protection District
Michelle Patterson	EMS and Preparedness Manager	EDC Emergency Medical Services Agency
Nick Haven	Community Member	Black Bart Neighborhood

Member Name	Position	Affiliations
Nicole Cartwright	Executive Director	Tahoe Resource Conservation District
Sarah Bryan	Staff Scientist, Consultant	NCE
Shannon Cotulla	Assistant General Manager	South Tahoe Public Utility District
Todd Crawford	Deputy	EDC Sheriff's Office of Emergency Services
Victoria LaMar-Hass	Senior Emergency Services Coordinator (Lead)	Cal OES, Local Hazard Mitigation Plans

The District and its HMPC members met all of the participation requirements. In most cases one or more representatives for each participating agency responded to emails to help collect data, identify mitigation actions and implementation strategies, and provide data on the LHMP drafts. Table 3 presents the HMPC schedule and activities.

Table 3. The District's HMPC Schedule and Activities

Schedule	Activity
8/24/2019	HMPC Received a Survey to Prioritize Hazards
10/29/2019	HMPC Received a Survey to Document District Specific Hazard Events
11/04/2019	HMPC Received a Survey to Provide Feedback on Mitigation Strategies and Prioritization of Mitigation Strategies
11/25/2019	HMPC Received a Request for Feedback on the Draft LHMP

Appendix A contains the email request sent to the HMPC for each of the activities listed in Table 3.

Based on the risk assessment, the HMPC identified goals and objectives for reducing the County's and District's vulnerability to hazards. The goals and objectives of the District's LHMP are similar to the County's as described in the Executive Summary of the El Dorado County Local Hazard Mitigation Plan.

2.2 Acknowledgement of Key Background Resources

The District would prefer a streamlined, non-redundant format for this document; therefore, we are not providing copies of these background resources in the appendices of this report. As a result, the following is a list of the key background resources that were vital to the creation of this plan.

2009 Lake Valley Fire Protection District (District) Local Hazard Mitigation Plan (LHMP)

Author/Owner: District

Description: This plan, including the planning process, risk assessment, and hazard mitigation strategies, were used as the basis for the creation of this LHMP.

Region IX Local Mitigation Plan Review Tool

Author/Owner: Cal OES

Description: The District utilized feedback from CalOES via the Region IX Local Mitigation Plan Review Tool to ensure that this LHMP meets the requirements of FEMA. As well, conversations with Victoria LaMar-Hass and Kelly Riley, two representativse from CalOES, proved to be vital for the creation of this plan.

Local Mitigation Planning Handbook

Author/Owner: FEMA

Description: The District followed the Local Mitigation Planning Handbook developed by FEMA in March of 2013 as a basis for conducting a risk assessment, developing a mitigation strategy, as well as guidance on the plan development.

The California State Hazard Mitigation Plan (2013 and 2018)

Author/Owner: California Governor's Office of Emergency Services

Description: The California State Hazard Mitigation Plan is the state's hazard mitigation guidance document and provides an updated and comprehensive description of California's historical and current hazard analysis, mitigation strategies, goals, and objectives. More importantly, the State Hazard Mitigation Plan reflects the state's commitment to reduce or eliminate potential risks and impacts of natural and human-caused disasters by making California's families, homes, and communities better prepared and more disaster-resilient. These plans (2013 and 2018) were consulted to evaluate the applicability of new hazards of concerns to the District.

The El Dorado County LHMP

Author/Owner: El Dorado County

Description: Through this plan El Dorado County provided key background on the hazard identification and risk assessment, such as the level of risk at the county level for various natural hazards. The El Dorado County LHMP will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future.

Lake Tahoe Basin Community Wildfire Protection Plan

Author/Owner: The Tahoe Fire and Fuels Team

Description: This plan provided background on mitigation strategies for the District that create fire-adapted communities and restore and maintain fire-resilient landscapes. The strategies within this plan include methods for forest fuel reduction, guidelines for interagency cooperation and community engagement, as well as steps that residents can take to ready themselves, their homes, and their family for the next wildfire event.

2017 Amador El Dorado Unit's Fire Management Plan

Author/Owner: Amador El Dorado Unit

Description: The Amador El Dorado Unit's Fire Management Plan assesses the fire potential within the unit. It identifies strategic opportunities for proactive project-based solutions identified by people who live and work within the fire threat areas as well as engaging the private landowners to take action. This plan coordinates California Department of Forestry and Fire Protection's (Cal Fire) pre-fire activities with adjacent Cal Fire Units, National Forests, and local collaborators. This plan is the foundation for planning, prioritizing, and funding the Unit's projects. This plan provided background and mitigation strategies for the District.

2.3 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.

When the LHMP is updated, the District will assess how the LHMP maintenance process worked and identify whether changes to the process are needed. Taking into consideration future updates, adjustments to the method and schedule for maintaining the LHMP may be necessary to ensure its value for comprehensive risk reduction.

As the mitigation plan evolves through updates, the LHMP maintenance process serves as the basis for the next update, and the process of updating the LHMP shall provide the District with an opportunity to document progress in achieving mitigation goals. When the District prepares a LHMP update, the mitigation planning regulations at 44 CFR Part 201 requires that the plan discusses how the community was kept involved during the plan maintenance process over the previous five years.

This section includes the following three subsections:

1. Monitoring, Evaluating, and Updating the Plan;
2. Incorporation into Existing Planning Mechanisms; and
3. Continued Public Involvement

2.3.1 Monitoring, Evaluating, and Updating the Plan

The District's Battalion Chief/ Fire Marshal shall be responsible for updating the LHMP within five years from the date of FEMA approval. As recommended, the LHMP will be reviewed and updated on

an annual basis or after a hazard occurrence to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. Monitoring, evaluation, and updating activities should take place continuously within the five-year timeframe. Monitoring will include periodic reports by those involved in implementing projects or activities, site visits, phone calls, and meetings conducted by the person responsible for overseeing the LHMP, or the preparation of annual reports that capture the highlights of the previously mentioned activities.

The evaluation *should* assess, among other things, whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude, and/or type of risks have changed.
- The current resources are appropriate for implementing the LHMP.
- There are implementation problems, such as technical, political, legal, or coordination issues with other agencies.
- The outcomes have occurred as expected (a demonstration of progress).
- The agencies and other partners participated as originally proposed.

2.3.2 Incorporation into Existing Planning Mechanisms

The District will incorporate mitigation strategies, including the goals and objectives, and mitigation actions *into* other planning mechanisms. Information contained in this plan, including hazard identification and risk assessment, will be integrated into other planning mechanisms. Although the District does not have a comprehensive plan, capital improvement plans or other long-range plan, the District does plan to develop a strategic plan. Where appropriate, mitigation actions will be incorporated into the strategic plan.

2.3.3 Continued Public Involvement

The District is committed to continued public involvement. For both the LHMP evaluation and update, a public hearing will be held at a regularly scheduled Board meeting. The hearing will be publicized, and the public will be asked for comments concerning the LHMP. With constant and concerned review, the District LHMP will continue to develop as an outstanding planning tool, helping the citizens create a safer place to live, work, and play.

2.3.4 Regulatory Mitigation Capabilities

Regulatory mitigation capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. These capabilities are shown in Table 4.

Table 4. Regulatory Mitigation Programs and Policies

Program or Policy	Comments
Lake Valley Fire Protection District	Special districts are independent, special purpose governmental units that exist separately from local governments such as county, municipal, and township governments, with substantial administrative, fiscal independence, and authority.
County of El Dorado Adopted General Plan	This plan is the main document that provides information on the progress and changes of the district. This can include details on new and future improvements, policy changes, and new construction. This plan helps supports the District in implementing mitigation actions and goals.
2019 California Building Code	The California Building Standards Code is the building code for California, and Title 24 of the California Code of Regulations are California conditions and standards passed by the California legislature that address concerns specific to California. The District has adopted the California Building Standards Code for all new construction and remodels. The 2019 California Building Standards Code supports hazard mitigation implementation.
Tahoe Regional Planning Agency (TRPA) Regional Plan	The Regional Plan is a regulatory framework that includes several initiatives and documents. The Plan emphasizes an improvement in the quality of development in the Region and in the quality of the natural environment. The TRPA Regional Plan supports hazard mitigation implementation.
The Fire Protection District Law (Health & Safety Code §13800, et seq.)	The source of statutory authority for more than 380 fire protection districts in California, including the LVFPD. The law gives the LVFPD the authority to implement hazard mitigation.
Public Resource Code 4291	A person who owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining a mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or land that is covered with flammable material, shall at all times maintain defensible. The law gives the LVFPD the authority to implement hazard mitigation.
Southern Nevada Public Lands Management Act (SNPLMA)	The SNPLMA became law in October 1998. It allows the Bureau of Land Management to sell public land within a specific boundary around Las Vegas, Nevada and provides funding for Lake Tahoe restoration projects.

CA Proposition 1	Proposition 1 protects California's rivers, lakes and streams from pollution and contamination, provides restoration funding for fish and wildlife resources, and funds projects in California.
California Climate Investments Fire Prevention Grant	Through the California Climate Investments Fire Prevention Grant Program, Cal Fire aims to reduce the risk of wildland fires to habitable structures and communities, while maximizing carbon sequestration in healthy wildland habitat and minimizing the uncontrolled release of emissions emitted by wildfires.
Hazard Mitigation Grant Program (HMGP)	The purpose of HMGP is to help communities implement hazard mitigation measures following a Presidential Major Disaster Declaration in the areas of the state, tribe, or territory requested by the Governor or Tribal Executive.
California Disaster Assistance Act	The California Disaster Assistance Act authorizes the Director of the California Governor's Office of Emergency Services (Cal OES) to administer a disaster assistance program that provides financial assistance from the state for costs incurred by local governments as a result of a disaster event. Funding for the repair, restoration, or replacement of public real property damaged or destroyed by a disaster is made available when the Director concurs with a local emergency proclamation requesting state disaster assistance.

2.3.5 Administrative/Technical Mitigation Capabilities

Administrative and technical mitigation capabilities are the personnel resources currently available to support reductions in hazard impacts or that could be used to implement hazard mitigation activities. These capabilities are shown in Table 5.

Table 5. Personnel Resources Available for Mitigation

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	No	El Dorado County Planning Department
Professional trained in construction practices related to buildings and/or infrastructure	Yes	Battalion Chief / Fire Marshal
Planner/engineer/scientist with an understanding of natural hazards	No	El Dorado County Planning
Personnel skilled in GIS	Yes	Fire Engineer
Full time building official	No	El Dorado County Building Department
Emergency manager	Yes	Fire Chief / Operations Chief
Grant writer	Yes	Fire Engineer

2.3.6 Fiscal Mitigation Capabilities

Fiscal mitigation capabilities are the financial resources currently in use or accessible to reduce hazard impacts or that could be used to implement hazard mitigation activities. These capabilities are shown in Table 6.

Table 6. Financial Resources Accessible for Mitigation

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
State and Federal grants and loans	Yes	
Capital improvements project funding	Yes	
Authority to levy a special tax for a specific purpose	Yes	66% voter approval required
Authority to impose a service charge or fee	Yes	
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	50% plus one approval required
Incur debt through revenue bonds	Yes	50% plus one approval required
Incur debt through private activities	Yes	

3. 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.

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 District's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. Data collected through this process has been incorporated into the following sections of this section:

Section 3.1: Hazard Identification identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.

Section 3.2: Identified Assets and Potential Losses discusses particular critical facilities and other community assets identified by the District's planning team as important to protect in the event of a disaster.

Section 3.3: Vulnerability Assessment describes natural hazards, their location, extent, previous occurrences, the likelihood of future occurrences, the impacts to the community, and the vulnerability. This LHMP update involved a comprehensive review and update of each section of the risk assessment. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Where data from existing studies and reports was used, the source is referenced throughout this risk assessment. The District utilized the process recommended by Cal OES to develop this LHMP. As with El Dorado County LHMP development, the District's HMPC reviewed Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLEE) criterion for identified hazards, vulnerabilities, and mitigation strategies.

3.1 Hazards Identification: Natural Hazards Specific to the District

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 hazards that affect the District were identified and the HMPC was surveyed to gain knowledge on each hazard's frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table 7). There were 10 responses to the survey. If six or more of respondents had the same response, that response was chosen. If there was 40-50% representation in a category than that category was presented, and if there was no majority in a category all values chosen were represented. The survey data is available upon request. The medium and high significance hazards are described further in Section 3.3. The low significance hazards may be possible, but the likelihood and magnitude are so minimal that the HMPC decided not to provide a detailed vulnerability assessment.

Table 7. HMPC Hazard Identification Table

Hazards	Geographic Extent	Probability of Future Occurrence	Magnitude/Severity	Significance
Category 1: Avalanche and Debris Flows	Significant; Limited	Occasional	Negligible; Limited	Medium; High
Category 2: Dam Failure	Limited	Occasional	Negligible; Limited	Low
Category 3: Drought/Extreme Heat/Tree Mortality	Significant; Extensive	Likely	Limited	Medium; High
Category 4: Earthquake and Seiche Wave	Significant	Occasional	Negligible; Limited; Critical	Low; Medium
Category 5: Floods	Significant	Occasional; Likely	Limited	Medium
Category 6: Severe Storms	Significant; Extensive	Likely	Limited; Critical	High
Category 7: Wildfire	Extensive; Catastrophic	Likely	Critical	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area shutdown of facilities for more than 30 days; and/or multiple deaths
Extensive: 50-100% of planning area
Catastrophic: More than 50% of property severely damaged

Probability of Future Occurrences
Occasional: Occurs every set number of years
Likely: Between 10 and 100% chance of facilities closed for more than a week; and/or injuries/illnesses treatable will occur in the next year, or has a recurrence not result in permanent disability interval of 10 years or less
Highly Likely: Near 100% chance of a permanent disability occurrence in the next year or every year

Magnitude/Severity
Negligible: Less than 10% of property severely damaged
Limited: 10-25% of property severely damaged;
Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result

Significance
Low: minimal potential impact in the next 100 years, or has a recurrence interval
Medium: moderate potential impact of greater than every 100 years
High: widespread potential impact

3.2 Identified Assets and Potential Losses

Assets Belonging to the District

This section considers the District's assets at risk, specifically critical facilities and infrastructure. Table 8 lists particular critical facilities and other community assets identified by the District's planning team as important to protect in the event of a disaster. Insured replacement cost values for structures and contents are as follows:

Table 8. The District's Critical Facilities, Infrastructure, and Other District Assets

Critical Facilities and Assets	Appraised Value	Estimated Replacement Cost
Fire Station #7 (Headquarters)	Total for all Structures: $2,500,000	
Fire Station #6		
Fire Station #5		
Land	$300,000	
Office Equipment		$120,000
Operating Equipment		$500,000
Apparatus		$3,750,000
Total Value		$7,170.000

It is important to note that there are no hospitals within the District boundaries. This becomes a significant vulnerability when the highways become impassable due to flooding, rock/mudslides, avalanches, and interstate closures.

Assets within the Community

The District is divided into nine communities (each with its own neighborhoods) to assess wildland fire impacts and other hazards within the District. The communities are:

- Christmas Valley
  - South Upper Truckee Neighborhood
  - Kekin/Henderson-Tahoe Paradise #60 Neighborhood
  - Highway 89 South Neighborhood
  - Grass Lakes Road Neighborhood
- Meyers
  - Upper Apache/Mandan Neighborhood
  - Lower Apache Neighborhood

    - Elks Club/Skyline Neighborhood
- Pioneer
    - Gleneagles/Wintoon/Jicarilla Neighborhood
- Montgomery Estates
    - Golden Bear Neighborhood
    - Cattlemans Neighborhood
    - Black Bart Neighborhood
    - Marshall/Sierra House Neighborhood
    - Cold Creek Neighborhood
- Sawmill/Highway 50
    - Echo View Estates Neighborhood
    - Sawmill Road Neighborhood
- North Upper Truckee
    - Chiappa Neighborhood
    - North Upper Truckee/Lake Tahoe Blvd. Neighborhood
    - Angora Highlands Neighborhood
- Heavenly Valley
- Echo Summit
- Highway 89 North/Emerald Bay
    - Camp Richardson Area Neighborhood
    - Spring Creek Neighborhood
    - Cascade Lake Neighborhood
    - Cascade Properties Neighborhood

According to Zillow, the present value of houses in South Lake Tahoe is $442,500 with the median price per foot of $334. Based on previous costs of $200,000 to 350,000 per structure, a loss 254 structures in North Upper Truckee as witnessed by the Angora Fire in 2007 would have a financial impact on the community of approximately $72,390,000. Another way to consider financial impact in 2007 would be to consider an average 2000 square foot home and reconstruction costs of $241.80 per square foot in the Tahoe Basin, the property damage would be over $123 million without considering home contents or the miles of infrastructure for power lines that would need to be replaced by Liberty Utilities.

Finally, there is damage to the local tourist-dependent economy. The Angora Fire caused a 25% decrease in hotel occupancies that lasted through the busy tourist season according to a news article in the LA Times. This impact was communicated directly by John Koster, Regional President for Harrah's Resorts and a member of the Tahoe Basin Fire Commission appointed by Nevada Governor Jim Gibbons.

3.3 Vulnerability Assessment

This section provides the vulnerability assessment for the hazards identified above in Table 4 as medium or high significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below. In general, the most vulnerable structures are those located within the floodplain, in the wildland urban interface, other priority hazard areas, unreinforced masonry buildings, and buildings built prior to the introduction of modern building codes. Where specific hazards vary across the District, additional information can be found in the El Dorado County LHMP.

An estimate of the vulnerability of the planning area 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:

- **Negligible** — Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Limited** — 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.
- **Critical** — 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.

Category 1 Avalanche and Debris Flows

Avalanche

Type: 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 vast majority of avalanches occur during or shortly after storms.

Location/Impact: The greatest impact that avalanches create within the District are to transportation infrastructure. Two state highways pass through the District, Highway 50 over Echo Summit and Highway 89.

- Highway 50 over Echo Summit is closed intermittently during the winter months, in part because of avalanche danger. Their closure limits the travel options of residents and places increased importance on Nevada State Route 207 and Highway 50 to Carson City, which is maintained as a year-round highway. Highway 50 thus is the community of Meyers only east to west travel corridor during the winter months and its importance to transportation cannot be underestimated. Figure 2 identifies the known avalanche zones within the District.

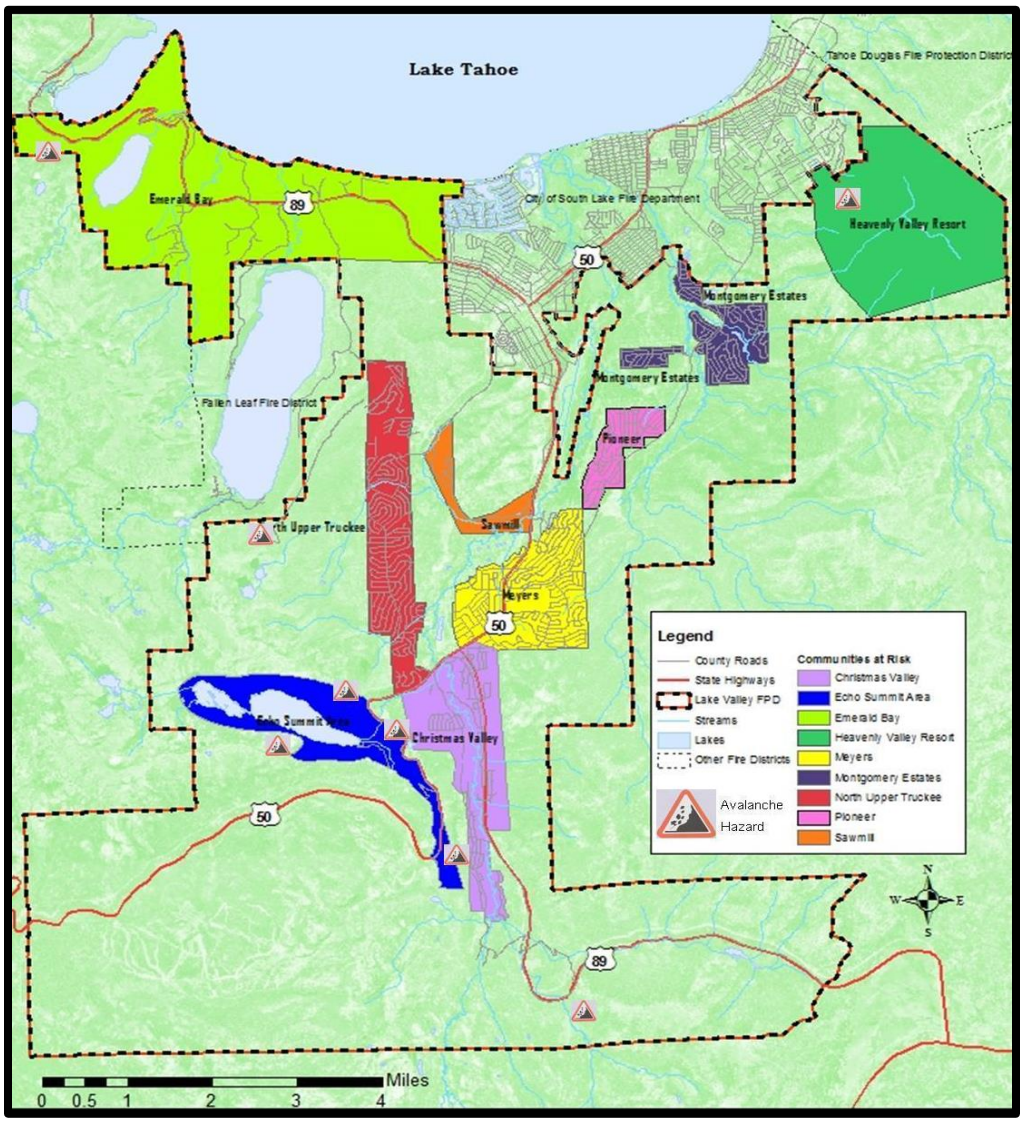


Figure 2: Avalanche Hazard Map for the District

Source: Martin Goldberg, Lake Valley Fire Protection District

Problems can arise in backcountry areas where avalanche control measures are not in place. Here, out-of-bounds downhill skiers, cross country skiers, and snowmobile riders can trigger avalanches. Thus, avalanches are natural hazards that still pose a threat to life and property. Away from areas that have developed and maintain avalanche control methods, the people are still very vulnerable to avalanche danger. Other problems associated with avalanches are loss of electricity due to power lines being disabled by avalanche and localized damage to the environment within the avalanche path.

The California Department of Transportation, the US Forest Service, and the National Weather Service have avalanche danger forecasting capabilities which they utilize to inform the public of any avalanche hazards. The Sierra Avalanche Center paired with the Tahoe National Forest to provide two full-time Forest Service Avalanche Forecasters through the winter. Information is available on the web

at www.sierraavalanchecenter.org. Regardless, no absolutely successful method has been found to keep individuals out of avalanche danger zones, even when it is extremely unwise to be present.

Extent: Avalanches are most likely to run either during or immediately after a storm where there has been significant snowfall. The 24-hours following a heavy snowstorm are the most critical. The extra weight of new snow alone can cause a slab to break off and fall down the slope. Snowfall amounts of one foot or more (frequent in mountainous areas) create the most hazardous situations, producing avalanches that are often large enough to block highways and cause major destruction. Snow amounts of six to twelve inches pose some threat, particularly to skiers and recreationists. Snow amounts less than six inches seldom produce avalanches.

Previous Occurrences: The Sierra Avalanche Center has recorded the following avalanche events in El Dorado County. Table 9 provides an overview of avalanche events and their locations.

Table 9. El Dorado County Avalanche Events

Year	Avalanche Location
2010	Becker Peak
2010	Ralston
2010	Mini Halls Chute – Indian Cliff Chutes
2010	Angora Peak
2011	Ralston Peak
2012	Echo Peak
2016	Tallac Corkscrew bowl
2017	Porcupine Ridge
2019	Flagpole Peak
2019	Echo Peak
2019	Meyers

Source: Sierra Avalanche Center, https://www.sierraavalanchecenter.org/incidents-map-archive

The National Climatic Data Center (NCDC) contains seven records of avalanches that occurred within the Greater Lake Tahoe Area between 7/1/2009 and 12/31/2017.

The HMPC noted the following avalanche that occurred within the District boundaries.

- 2/7/2017-2/17/2017 - An avalanche at Fallen Leaf Lake in the Stanford Camp area knocked out power and blocked road access for the South Tahoe Public Utility District backup power

generator. As the cables were buried, the generator still functioned and provided power to sewer lift stations.

Probability of Future Occurrences: Occasional — Injuries and loss of life from an avalanche are usually due to people recreating in remote areas at the wrong time. Given the topography and amount of snow falling on an annual basis in the District, avalanches and resulting damages, including injuries and loss of life, will continue to occur.

Vulnerability: Negligible/Limited — 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. Avalanche hazards exist in the District where combinations of the above criteria occur.

Conclusion: Avalanches are likely future events that will pose as a threat to people recreating in remote areas. Education and awareness are the best methods available to ensure the safety of those at risk.

Landslide (Debris Flow)

Type: According to the California Geological Survey, debris flows refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris flow, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Debris flows may be triggered by both natural and human-induced changes in the environment that result in slope instability.

Impact/Location: Debris flows that may occur within the District would most likely be experienced as part of a larger, more widespread natural hazard event. Debris flows could take place as a result of severe storms, floods, and earthquakes. They could also happen as an aftermath to wildland fires. If electrical lines are compromised within the slide, electrical power can be lost. The length of time power is interrupted is a direct result of the size of the slide and its impact upon the power lines and electrical infrastructure. Water lines and other buried facilities can be put in danger or lost to a landslide as well. When roads are compromised by debris flows, motorist safety, including emergency personnel, is threatened and travel time is lengthened.

Debris flows can threaten the stability and safety of homes in two ways.

- If the slope fails above a home, the foundation and the structure itself can be threatened. The weight of the slide, the water, earth, and vegetation that has become mobile, can slam into a house, knock the structure from its foundation and perhaps even destroy the house.
- If the home sits on a bench cut into a hillside, the potential for a landslide is again introduced. Construction of a home on a graded or altered slope can have devastating effects. Changing of the slope face, the additional weight of the home and associated materials, plus the added water of sprinkler systems and septic tanks, make a formerly stable slope unstable. Add a

severe storm with substantial rainfall and the home and the artificial slope it sits upon can be victimized by debris flows.

Landslide hazard in the District can be considered a year-round phenomenon. The District's high-relief and high-altitude landscape promote the wearing away of the landscape via both physical and chemical weathering mechanisms. In general, higher slopes equate to higher landslide potential. Therefore, individuals should be alert in high-relief areas to the threat to debris flows at all times of the year.

Extent: Figures 3 shows where the potential landslide areas are within the District and 4 was developed for the 2013 State of California Multi-Hazard Mitigation Plan. Figure 3, and Figure 4 indicate that most areas throughout the District are at low to moderate risk for debris flows and an area in the eastern portion of the County is at high risk for debris flows.

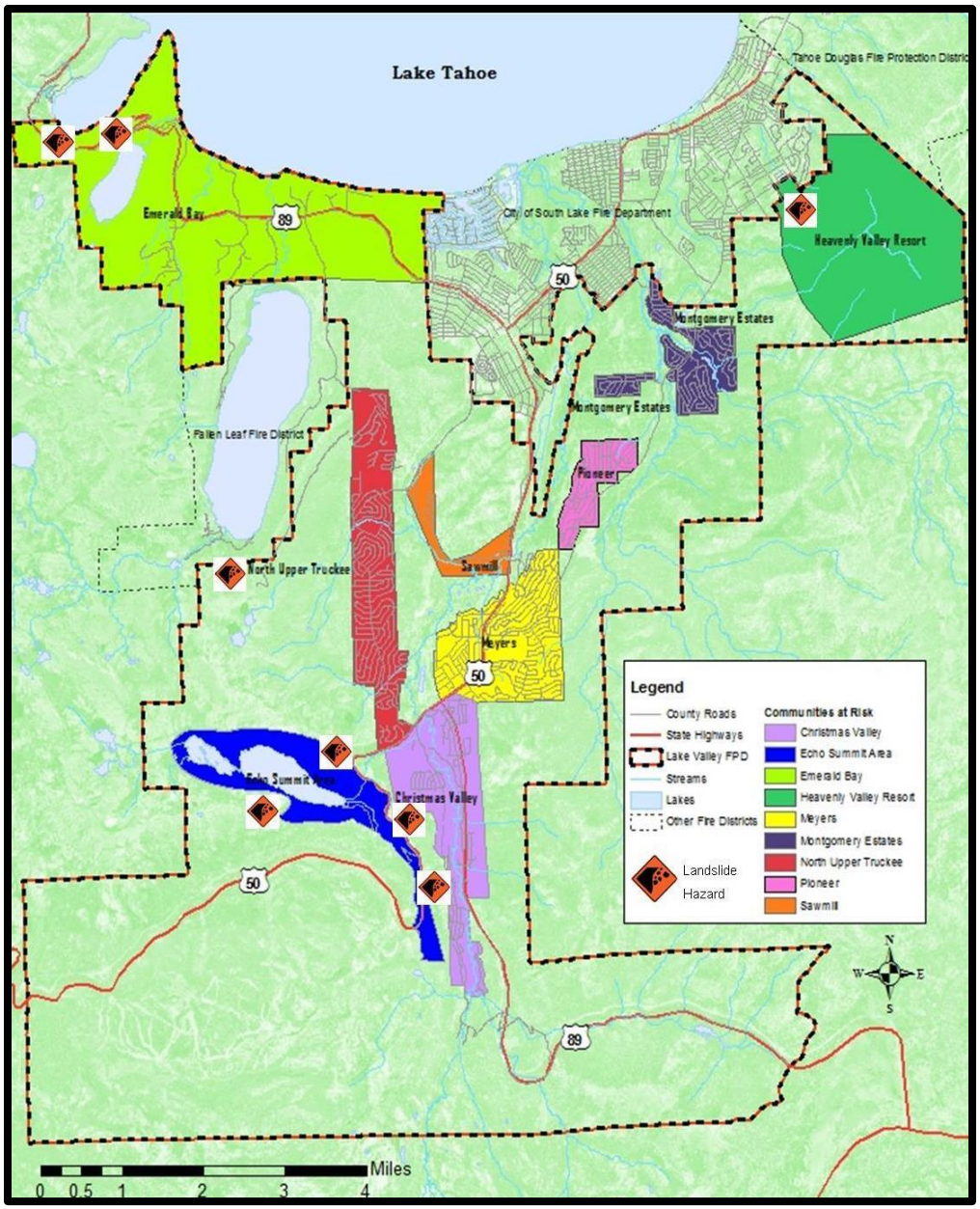


Figure 3: Potential Landslide Areas Within the District

Source: Martin Goldberg, Lake Valley Fire Protection District

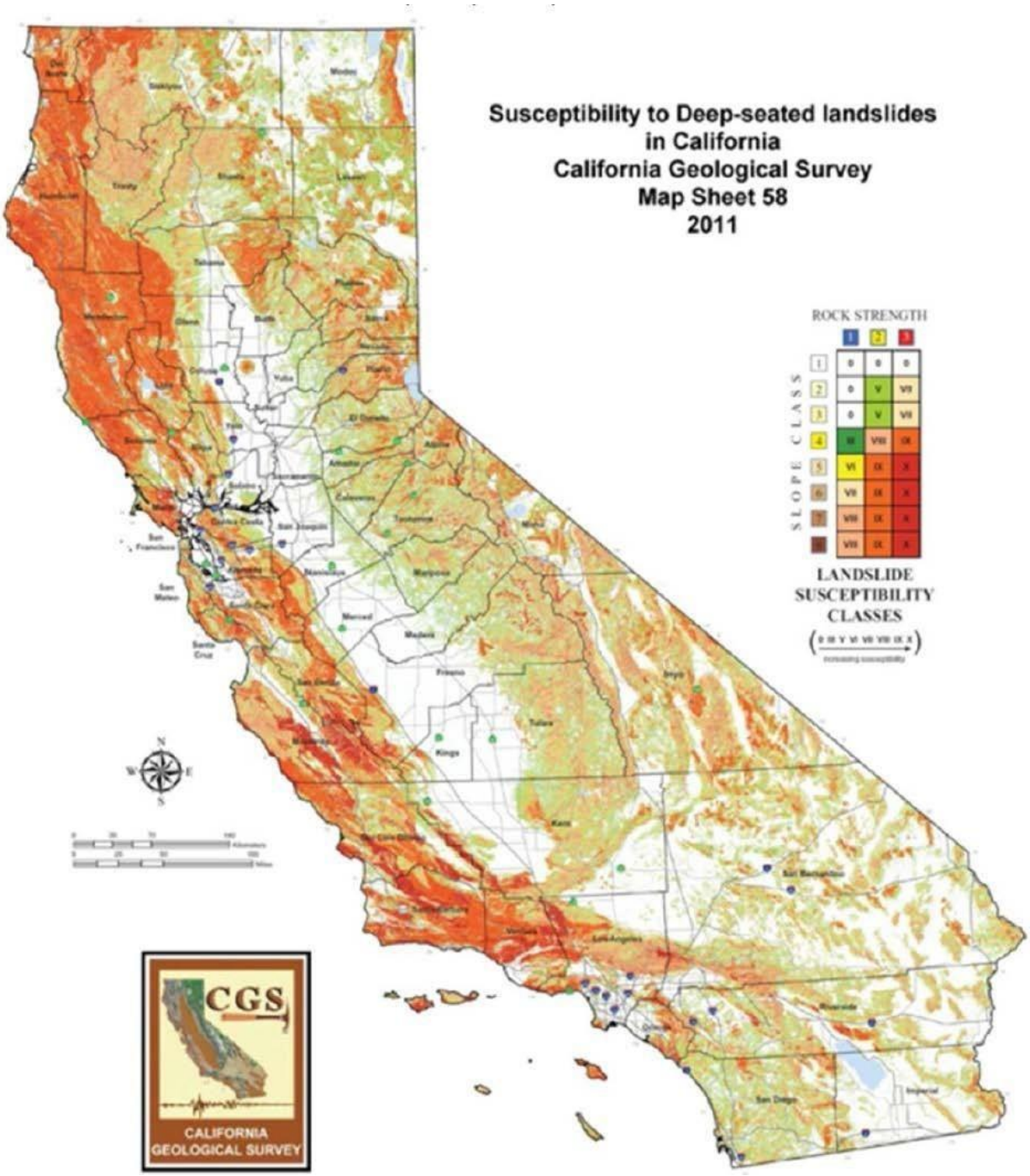


Figure 4: Debris Flow Risk Zones

Source: 2013 State of California Multi-Hazard Mitigation Plan

Previous Occurrences:

The largest landslide to occur in the District occurred in 1955 in Emerald Bay as a result of widening the highway.

NCDC Events

The NCDC contains two records of debris flows that occurred within the Greater Lake Tahoe Area (Table 10).

Table 10. Debris Flow Events in Greater Lake Tahoe Area 1/11/1993 to 12/31/2014

Date	Event	Deaths (direct)	Injuries (direct)	Property Damage	Crop Damage	Injuries (indirect)	Deaths (indirect)
2/23/1998	Debris Flow	0	0	$0	$0	0	0
12/2/2012	Debris Flow	0	0	$0	$0	0	0
TOTAL		**0**	**0**	**$0**	**$0**	**0**	**0**

- 2/23/1998 - Mudslide near Echo Summit closed U.S. 50 for four hours. A few cars were covered, but no injuries nor damage were reported.
- 12/2/2012 - A warm and moist flow off the Pacific Ocean brought strong winds, heavy rain, and high elevation snow (mostly above 7,000-7,500 feet) in the Sierra on December 2nd and 3rd. A widespread 2 to 5 inches of precipitation fell over eastern California. The heavy rain brought localized areas of debris flows and flooded roads as well as minor flooding (little or no damage) along the Susan River in and near Susanville. The California Highway Patrol reported boulders on Highway 89 near Emerald Bay State Park. An estimated 2 to 3 inches of precipitation was reported (SNOTEL/RAWS observations), mostly within the previous 12 hours.

HMPC Knowledge

The HMPC noted no notable debris flows that occurred within the District boundaries.

Probability of Future Occurrence: Occasional — Based on data provided by the NCDC, minor debris flows have occurred in the past in the greater Lake Tahoe area and probably in the District over the last several hundred years, as evidenced by past deposits exposed in erosion gullies. Given the nature of localized problems identified within the District, minor debris flows will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

Vulnerability: Negligible/Limited — The susceptibility of an area to debris flows depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas. Debris flows often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Debris flows can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas, and can cause injuries and death.

Conclusion: Debris flows are potential future events that will pose as a low level threat to people in the District. Given the nature of localized problems identified within the District, minor debris flows will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

Category 2 Dam Failure

There have been no NCDC dam failure events in the District. The HMPC did not consider this a medium nor high risk, therefore it is not described in this section.

Category 3 Drought/Tree Mortality/Extreme Heat

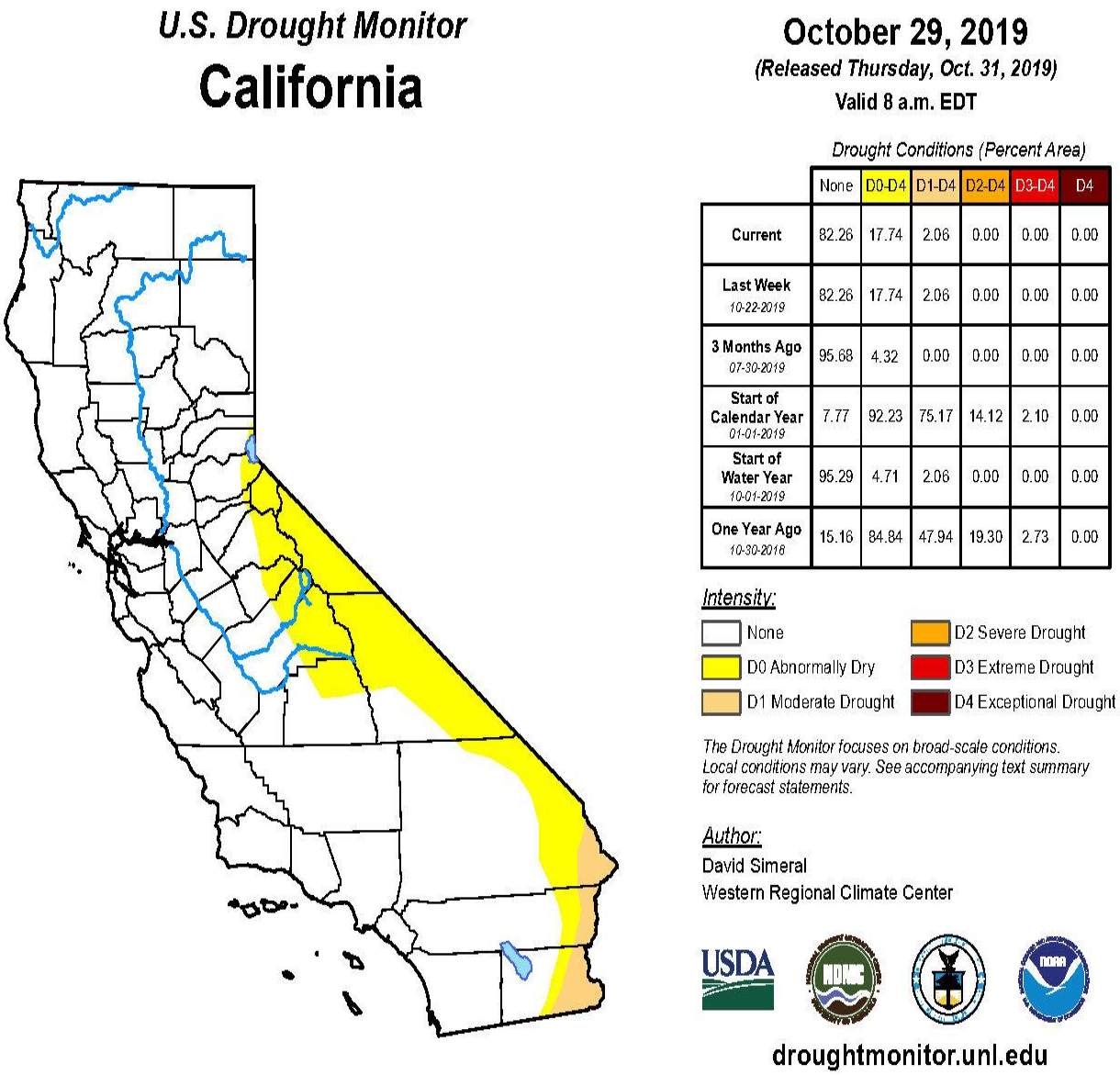
Type: Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

According to the 2018 California Hazard Mitigation Plan, tree mortality can create dangerous conditions for people who work in, live in, and/or visit affected areas. During water deficit periods, trees become suitable host material for bark beetles. High tree density exacerbates stress on individual trees. In particularly dry areas, trees are dying solely from drought conditions regardless of tree competition; however, tree mortality is largely due to drought conditions coupled with high tree density and/or bark beetles.

In California, drought is a recurring event and a catalyst for thousands of acres of stressed trees, bark beetle outbreaks, and extremely high levels of tree mortality. The trees that die due to bark beetles and drought create an increased fuel load in the forest. This fuel load creates a high risk for wildfire. In addition, the dead trees also create a hazard due to their likelihood of falling.

The NCDC defines extreme heat as summertime temperatures that are more humid and hotter than average. These conditions can lead to heat-related illnesses, such as heat exhaustion or heat stroke, which can cause damage to the brain and other vital organs.

Location\Extent\Impact: Below Figure's 5 and 6 depict the location, extent, and impact of drought and tree mortality. An equivalent reference for heat was not found.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	82.26	17.74	2.06	0.00	0.00	0.00
Last Week 10-22-2019	82.26	17.74	2.06	0.00	0.00	0.00
3 Months Ago 07-30-2019	95.68	4.32	0.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2019	7.77	92.23	75.17	14.12	2.10	0.00
Start of Water Year 10-01-2019	95.29	4.71	2.06	0.00	0.00	0.00
One Year Ago 10-30-2018	15.16	84.84	47.94	19.30	2.73	0.00

Figure 5: U.S. Drought Monitor for California

Source: National Drought Mitigation Center at https://droughtmonitor.unl.edu/data/pdf/current/current_ca_trd.pdf

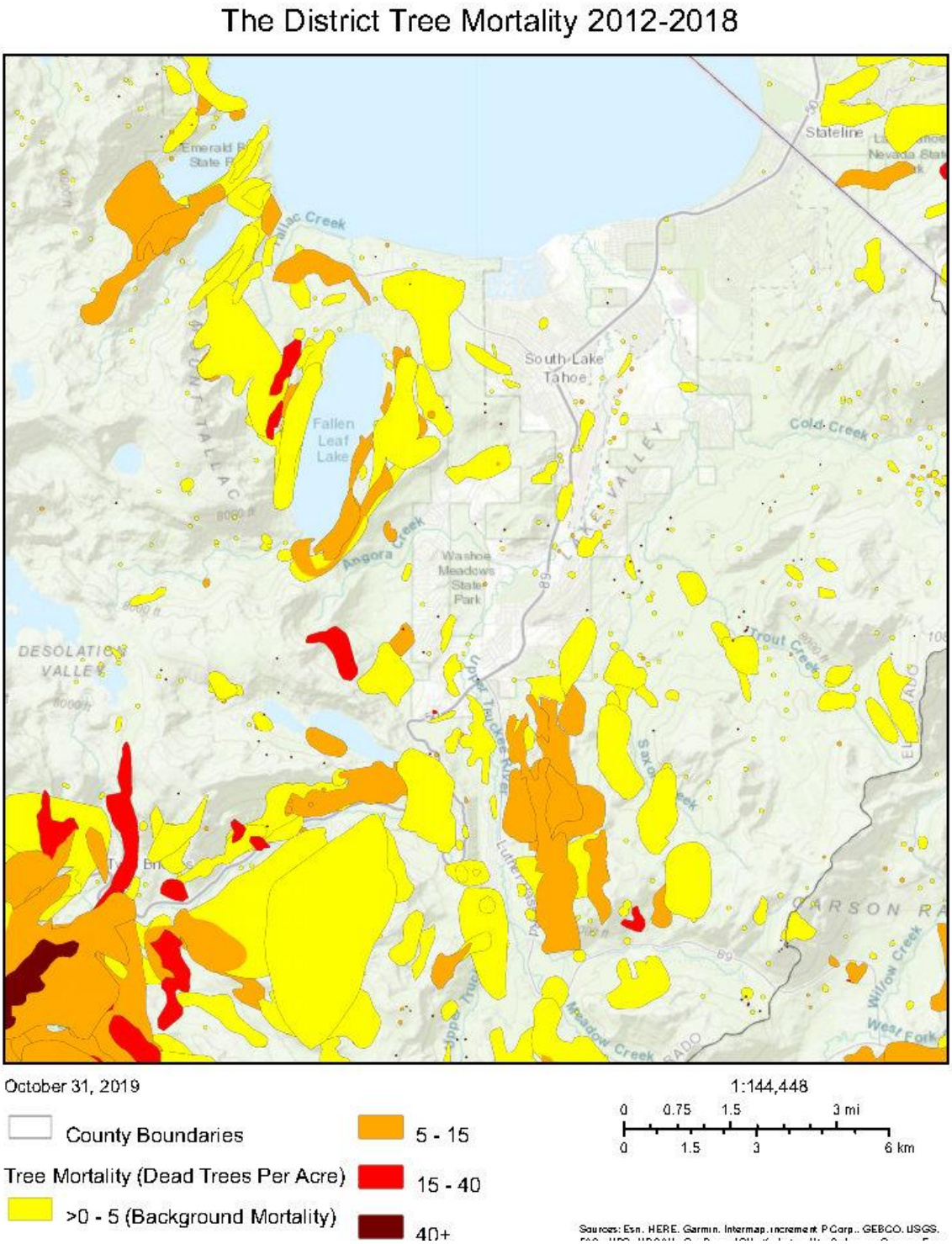


Figure 6: Tree Mortality in the District

Source: Tree Mortality Viewer at http://egis.fire.ca.gov/TreeMortalityViewer/

Previous Occurrences:

Disaster Declaration History

There has been one disaster declaration related to tree mortality in El Dorado County. There have been several state disasters related to drought and water shortage in El Dorado County issued between 2012 and 2018. FEMA does not track disaster declarations for extreme heat.

NCDC Events

There have been no NCDC drought events and no NCDC extreme heat events in the Greater Lake Tahoe Area between 2009-2017. Tree mortality is not tracked through NCDC.

HMPC Knowledge

The HMPC did not note any drought, extreme heat, nor tree mortality that occurred within the District boundaries.

Probability of Future Occurrence: Drought/Extreme Heat: Likely - Historical drought data for El Dorado County indicate there have been significant droughts in the last several decades. Based on this data and given the multi-year length of droughts, the HMPC determined that future drought occurrence in the District is likely.

Tree Mortality: Likely – Cal Fire identified El Dorado County as a high hazard zone, which includes the District.

Impacts/Vulnerabilities: Each of these conditions can occur throughout the District and vulnerability is limited due to minimal potential impact.

Drought/Heat: Due to the drought, tree mortality levels have substantially increased in forests in California over the past several years. An estimated 29 million trees covering three million acres died in 2015 alone. From 2010 through the fall of 2017, approximately 129 million trees died on 8.9 million acres.

Tree Mortality: High levels of tree mortality increase fuel loads, create hazardous conditions for wildland firefighting personnel, decrease production rates of fireline construction, pose risk of injury from falling branches or trees, and create financial burdens for property owners. Most notable is the high number of hazard trees in or around roads, trails and power lines, administrative sites, campgrounds and communities. Hazard trees require felling and removal to ensure public safety, which may limit access to public lands. Some areas may see a reduction in tourism due to the impact of tree mortality on aesthetics. Additionally, mitigation of hazard trees might alter employee responsibilities and planned forest management activities. Data collected by State and Federal agencies demonstrates that drought conditions and bark beetle infestation has killed over 102 million trees in the State of California and that tens of millions more are likely to die over the next five to six years. Surveys conducted by the U.S. Forest Service in May estimate that new mortality (between October 2015 and May 2016) in El Dorado County has affected an estimated 177,000 conifer trees. In total, it is estimated by the National Forest Service that El Dorado County has 512,000 dead trees,

according to a 2016 overflight of the County. Many of these trees are located in the El Dorado National Forest or on private land. However, some of these trees endanger County infrastructure (e.g. County roads and County buildings).

Conclusion: Drought, extreme heat, and tree mortality are key impacts to understand as climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. In addition, changes in seasonal patterns of temperature and precipitation can allow pest populations, such as bark beetles, to increase with limited population reductions in the winter. Potential repeated and increasingly severe drought events in the future, as well as increases in pest populations stemming from climate change, may result in additional tree mortality and associated hazards. Climate scientists studying temperature have found that across the planet, temperatures are generally rising and this change is projected to go hand-in-hand with an increase in frequency and intensity of severe weather events such as heat waves.

Category 4 Earthquake and Seiche Waves

Type:

Earthquake: The District is considered to be part of the Basin and Range province of the western United States. Here the Earth's crust has been stretched up to 100% of its original width. The entire region has been subjected to extension that thinned and cracked the crust as it was pulled apart, creating large faults. Earthquakes occur as part of these huge faulted mountain ranges. The Genoa Fault, which extends along the eastern front of the Carson Range south of Carson City, Nevada into the southern reaches of El Dorado, has been identified as responsible for two large earthquakes measuring in the magnitude seven (7) range during the past 1,000 years. An earthquake can trigger other natural hazard events including Seiche's.

Seiches: Seiches are oscillations in enclosed bodies of water caused by or causing seismic waves. They can occur very far from the source of an earthquake. A seiche occurred in Lake Union and Lake Washington in 1964 following the large Alaskan earthquake. The long, large waves beat boats against docks, damaging many of them. Long period movement of water can also be produced in lakes and reservoirs by large, usually distant, earthquakes, and sometimes by strong winds.

Location/Previous Occurrences:

Earthquake: Earthquakes are naturally occurring events that will eventually and inevitably occur in this region of the world. Major quakes on seismic faults that run beneath Lake Tahoe have ruptured the earth's crust roughly every 3,000 years or so. Scientists are unsure when the last big one hit. Scientist do predict a major earthquake somewhere in California within the next 30 years. The combination of plate tectonics and associated mountain building geology essentially guarantees an earthquake as a result of the periodic release of tectonic stresses. The District's mountainous terrain lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

Seiche: In the late nineteenth century a Swiss professor, F.A. Forel made a systematic study of this type of a water wave, which he called a seiche. Seiches are described as "a standing wave in a closed body of water such as a lake or bay". Lakes in seismically active areas, such as Lake Tahoe in

California/Nevada, are significantly at risk from seiches. Geological evidence indicates that the shores of Lake Tahoe may have been hit by seiches and tsunamis as much as 10 m (33 feet) high in prehistoric times, and local researchers have called for the risk to be factored into emergency plans for the region (Figure 7).

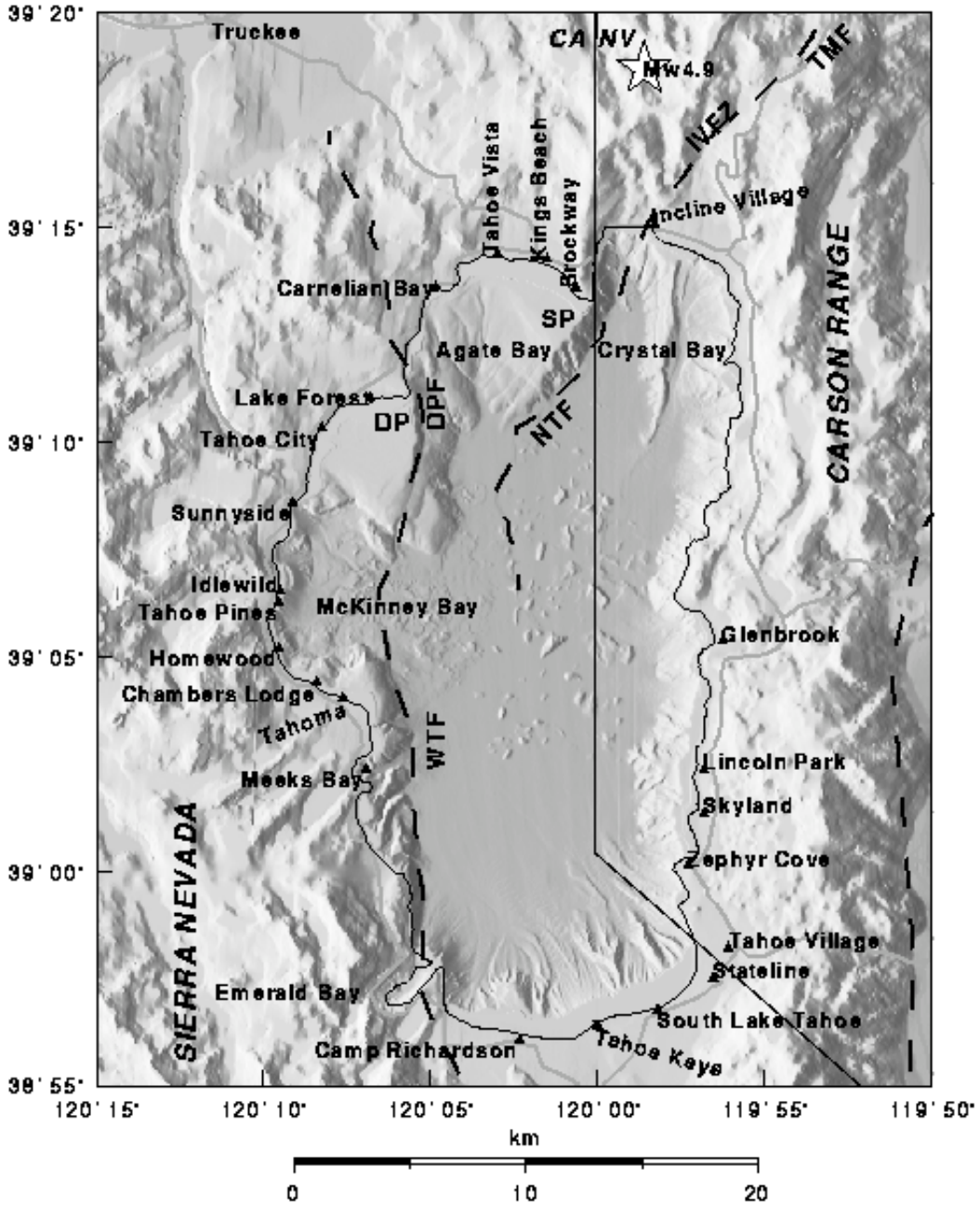


Figure 7: Lake Tahoe Basin Topography

Source: The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Nevada Seismological Laboratory; University of Nevada; (University of Nevada 2000 study)

Extent:

Earthquake: Below is Figure 8 that demonstrates the range in strength of earthquakes.

Richter Scale of Earthquake Energy:

Each level is 10 time stronger than the previous level

	Description	Occurrence	In Population	Movement
1	Small	Daily	Every minute	Small
2	Small	Daily	Every hour	Small
3	Small	Daily	Every day	Small
4	Small	Daily	Every week	Moderate sudden
5	Moderate	Monthly	Every 10 years	Strong Sudden
6	Moderate	Monthly	Every 30 years	Strong Sudden
7	Major	Monthly	Every 50 years	Severe Sudden
8	Great	Yearly	Every 100 years	Very Severe
9	Great	Yearly	Every 300 years	Very Severe
10	Super	Rarely	Every 1.000 years	Extreme

Figure 8: Richter Scale

Source: sms-tsunami-warning.com, 2017

Seiche: Figure 9 below shows three potential vertical displacement (uplift or subsidence) scenarios that could be caused by magnitude 7+ earthquakes along the three discrete fault systems in the Lake Tahoe region. These scenarios were done prior to the 2006 findings of the Stateline fault that traverses Lake Tahoe. It was not included in these scenarios.

Scenario A represents an earthquake event along the North Tahoe-Incline Village Fault Zone (NT-IVFZ). This scenario projects significant subsidence (0.5-4.0 meters) to the east of the fault in the vicinity of Incline Village and across Crystal Bay and moderate uplift (0.25-1.0 meter) to the west and away from the lake. Shoreline areas near the fault rupture would be inundated due to permanent ground subsidence. Other shoreline areas would be temporarily inundated by tsunami and seiche waves. Seiche wave heights could exceed 3 meters within shallow bays and shores between Incline Village and Carnelian Bay and exceed 6 meters at some locations in the South Lake area.

Scenario B represents an earthquake event along the West Tahoe-Dollar Point Fault Zone (WTFZ). This scenario projects significant subsidence (0.5-4.0 meters) across the lake bottom to the east of the fault and moderate uplift (0.25-1.0 meter) to the west across McKinney Bay and away from the lake. Scenario B projects a similar pattern of seiche wave heights as Scenario A except that wave heights in some areas could be as high as 10 meters.

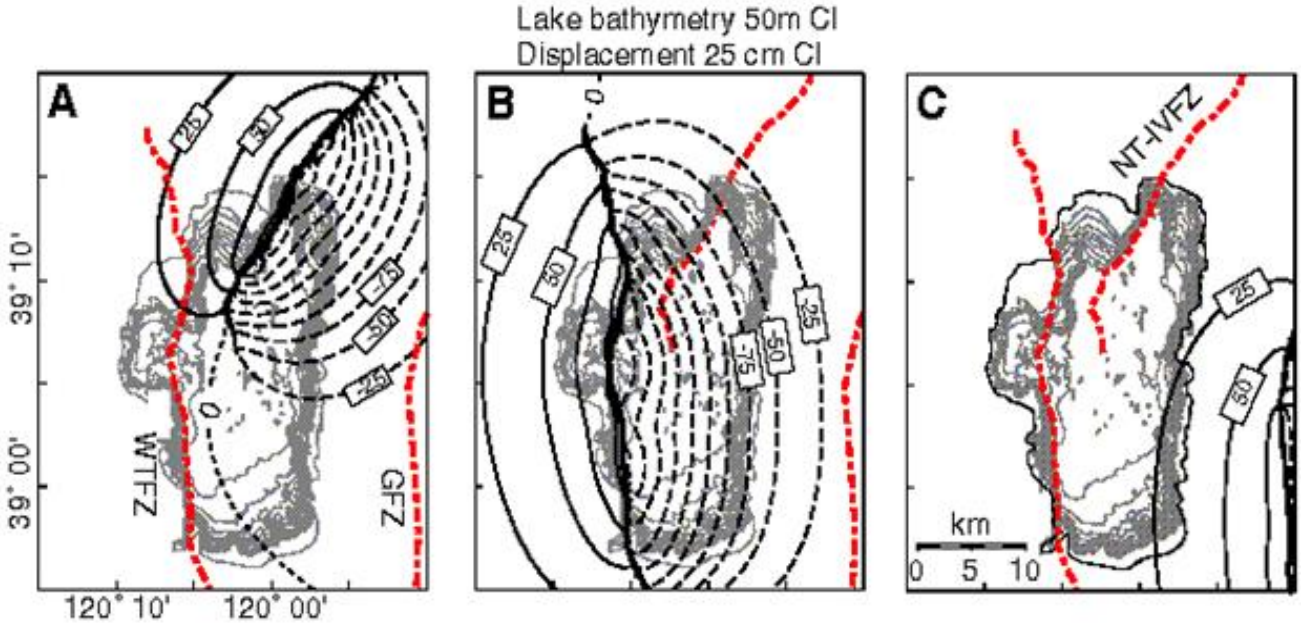


Figure 2. Contours of vertical component ground and lake bottom displacements for scenarios "A", "B" and "C". The dashed contours represent subsidence and solid uplift. The contour interval is 25 cm and only the first few contours are labeled. The thick dash-dotted lines are the three fault traces used in the scenarios: North Tahoe-Incline Village fault zone (NT-IVFZ), West Tahoe-Dollar Point fault zone (WTF) and Genoa fault zone (GFZ). All of the scenarios are Mw 7+ normal faulting earthquakes with a maximum slip of 4 meters tapered to zero at the ends of the fault with a trapazoid function.

Figure 9: Contours of Vertical Component Ground and Lake Bottom Displacements

Source: The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Nevada Seismological Laboratory; University of Nevada; (University of Nevada 2000 study)

<u>Previous Occurrences:</u>

NCDC Events

The NCDC does not track earthquakes nor seiche events.

U.S. Geological Survey (USGS) Events

The USGS National Earthquake Information Center database contains data on earthquakes in the District. The USGS database was searched for magnitude 5.0 or greater on the Richter Scale within the

approximate boundaries of the District. Between the years of 2000 and October of 2019, there were no earthquakes within the District.

HMPC Knowledge

The HMPC did not note any earthquakes or seiches that occurred within the District boundaries.

Other Historic Knowledge

Historically, major earthquakes have not been an issue for the District. In 1955, a debris flow occurred in Emerald Bay leading to seiche activity. Evidence of the debris flow can still be seen on the hillside near Emerald Bay. There have been no occurrences of major seiche activity at Lake Tahoe in recent years. University of Nevada geologists have found deposits that extend for 10 miles along the McKinney Bay shore from Sunnyside through Tahoma. These deposits indicate a tsunami or seiche with 30-foot-high waves occurred approximately 7,000 years ago.
Research performed by the Scripps Institute of Oceanography in 2005 using acoustic trenching to research the lake's topography indicates that McKinney Bay was formed when a massive landslide slipped into Lake Tahoe which likely caused major seiche activity at that time. Research from the University of Nevada shows evidence of a massive landslide that tumbled from Homewood on the Nevada side.

Probability of Future Occurrences:

Earthquakes**:** Occasional — No major earthquakes have been recorded within the District; although the District has felt ground shaking from earthquakes with epicenters located elsewhere. Based on historical data and the location of the District relative to active and potentially active faults, the District may experience a significantly damaging earthquake occasionally.

Seiche: Occasional — There have been no occurrences of major seiche activity at Lake Tahoe in recent years. Based on past occurrences, the likelihood of future occurrence in the near future is unlikely. However, given the evidence of past historical events and the location of faults within the Tahoe area, a future seiche event at Lake Tahoe is a possibility. There is a low risk associated with this natural hazard because there is very little development within the District that sits on or near Lake Tahoe.

Impacts:

An earthquake can be the direct cause of debris flows, avalanches, and dam failure due to seismic shaking of the ground and fracturing that might accompany any shaking. Fallen power lines can ignite or gas lines can be ruptured resulting in wildland fire and power outages. Damage to transportation, such as road closures and/or structural damage from fissuring, subsidence, or upheaval of the paved surface. Bridges can also be structurally compromised. Communication infrastructure can be damaged, such as telephone poles can be knocked over and telephone service lost. Likewise, internet and computer capabilities can be interrupted causing difficulties in exchange of information potentially critical in post-disaster response. A breach of Echo dam, the only dam within the District, would result in water rushing down naturally created rivers to Lake Tahoe. Echo dam controls water flow from

Echo Lake to Lake Tahoe and the result of a dam failure at Echo Lake would have some minor impacts.
A seiche wave can crisscross Lake Tahoe, reach heights of 30 feet or more, and persist for hours. Shoreline areas near a fault rupture could be inundated due to permanent ground subsidence.
Vulnerability: The vulnerability of the District to earthquakes and seiches varies from negligible to critical as the potential destructiveness of these hazards is high, yet the probability is significantly lower.

Earthquakes: Estimated recurrence rate of an earthquake in the Lake Tahoe area faults of the size necessary to generate a seiche is estimated at once every 1,100 years. With regards to seiche threats, Lake Tahoe could experience a seiche as it did in prehistoric times. In those years, there was no development near the waterfront as there is now. As a result, since the seiche threat was not recognized until recently, most of the structures located near the water were probably not engineered to withstand them.

Seiches: Several factors could influence the size, shape, volume, and potential destructiveness of a seiche generated by local faults. First, since Lake Tahoe is deep, there are large volumes of water to displace. Therefore, a resulting seiche would be faster and have greater volume than those generated in the shallow water. Second, Lake Tahoe steeply, sloping bed tends to increase the chance that a seiche will break on the shore, thus potentially enhancing a seiche's destructiveness. All major roads that provide ingress and egress to the Tahoe Basin circumnavigate the lake and would be affected if not rendered impassable. Finally, the shape of Lake Tahoe could increase damage by funneling waves together, increasing wave height. The net result is unclear, as the depth versus shape relationship of Lake Tahoe is relatively unknown.

Conclusion: Earthquakes and seiches have not been a frequent historical hazard for the District. Despite this low occurrence, the potential threat to property and life could be high if an earthquake and/or seiche did affect the District.

Category 5 Floods

Type: Flooding is the rising and overflowing of a body of water onto normally dry land. Riverine flooding, defined as when a watercourse exceeds its “bank-full” capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems. Flooding from failure of one or more upstream dams is also a concern to the District. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives.

Location: Flooding can happen throughout the District. Figure 10 depicts the Upper Truckee Watershed which can experience riverine flooding and/or localized flooding. This happens primarily in the winter and spring months when river systems swell with heavy rainfall and snowmelt runoff. Figure 11 represents the flood and inundation areas in El Dorado County.

Figure 10: Upper Truckee Watershed Map

Source: San Francisco Estuary Institute https://www.sfei.org/projects/tahoe-wramp-demonstration-mapping-standards

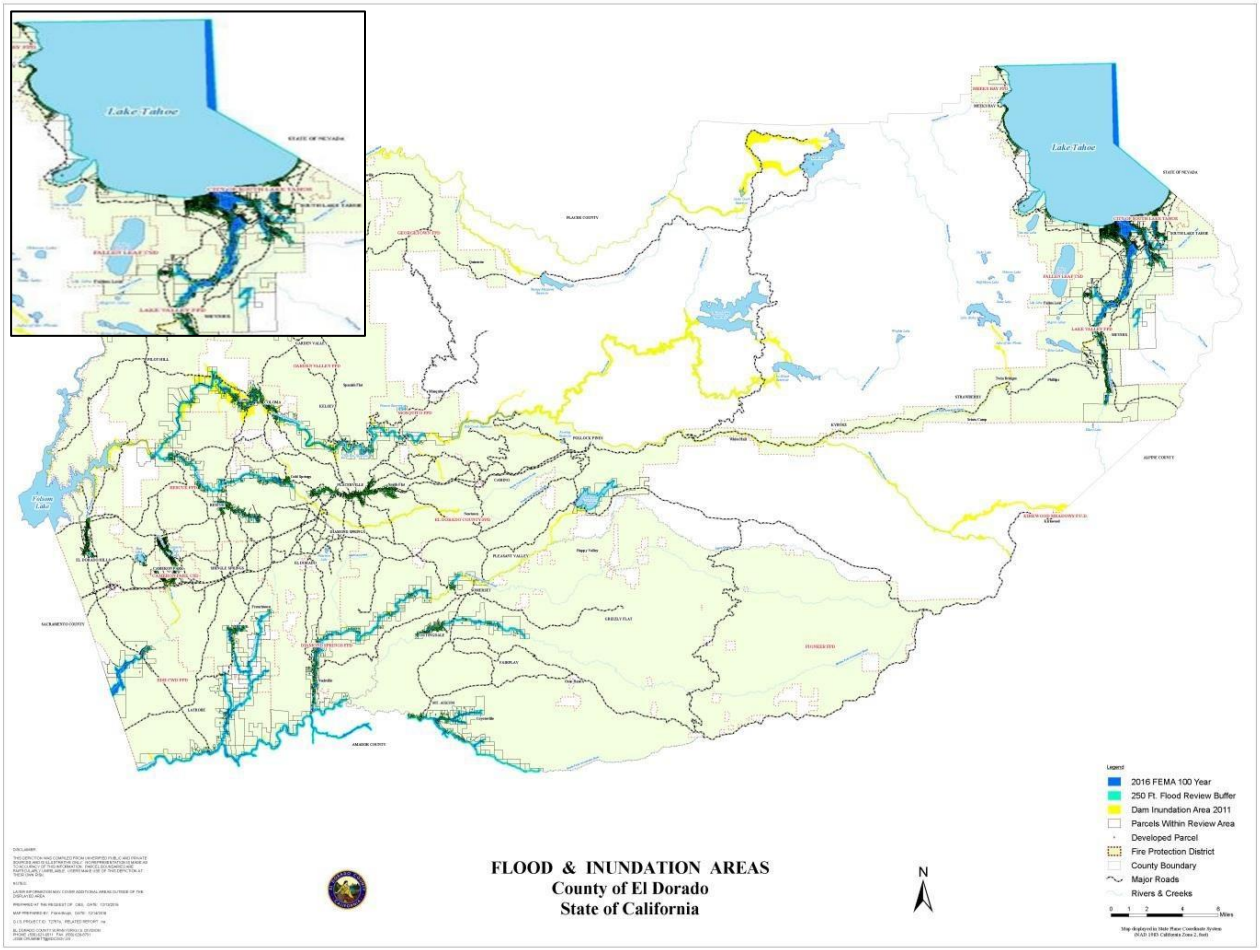


Figure 11: Flood and Inundation Areas in El Dorado County

Source: Flood & Inundation Areas, County of El Dorado, Revised 12-14-16 by EDC GIS, Project ID# Gl0072757A (https://edcapps.edcgov.us/maplibrary/html/gi0072757a.html)

<u>Previous Occurrences:</u>

NCDC Events

The NCDC tracks flooding events for El Dorado County. The database contains 92 severe weather events that occurred in the Greater Lake Tahoe Area between July 1, 2009, and December 31, 2017, but none are flooding events.

HMPC Knowledge

Historically, portions of the District have always been at risk to flooding because of its high annual percentage of rainfall, heavy snowfall in the winter, and the number of watercourses that traverse the District. Flooding events have caused severe damage in all portions of the District. Existing watershed reports confirm that under existing conditions, flooding will continue to occur.

Localized stormwater flooding also continues to be a problem throughout the District. The HMPC provided additional information on the following historical flood events.

- 12/31/2005 - 1/1/2006 – A series of warm winter storms brought heavy rain, mudslides, flooding, and high winds to Northern California. Localized flooding was reported across El Dorado County. US Highway 50 between Sacramento and South Lake Tahoe was closed in both directions for multiple days due to a massive mudslide.
- 2/7/2017 - 2/17/2017 - Atmospheric river events caused localized flooding to the South Tahoe Public Utility District service area, including Meyers. This created surface water inflow into the sewer system and required significant mobilization of staff. The flooding resulted in damage to facilities, and loss of power supply required utilization of backup generators. Three sewer spills occurred, 2,700 gallons adjacent to an elementary school and into a waterway, 100 gallons into a stream, and 20 gallons into Fallen Leaf Lake.

Extent/Probability of Future Occurrence: Flooding ranges from occasional to likely depending on the type of flood.

100-Year Flood: Occasional - The 100-year flood has a 1-percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time.

500-Year Flood: Occasional - The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year.

Localized Flooding*:* Likely - Based on historical data, localized flooding events occur frequently during periods of heavy rains.

Impacts: History clearly highlights floods as one of the most frequent natural hazards impacting the District. Flooding has caused a closure of major roads in the District in 2019 and caused damage to several homes, as well as traffic jams and delays in response times by emergency responders. Substantial damage to structures, landscapes, and utilities as well as life safety issues can arise during flooding events.

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. Floodwaters can transport large objects downstream which can damage or remove stationary structures, such as dam spillways. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Utility lines to break and interrupt services. Standing water can cause damage to crops, roads, 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.

Health hazards during a flood include heart attacks or electrocution due to electrical equipment short outs. As well, 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. Floodwaters also saturate

the ground, which leads to infiltration into sanitary sewer lines. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes, that can be a breeding ground for bacteria such as E. coli and other disease-causing agents. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. Long-term psychological impact of having been through a flood and the cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Vulnerability: Limited — Based on the risk assessment, it is evident that floods will continue to have potentially harmful economic impacts to certain areas of the District. However, many of the floods in the District are minor, localized flood events that are often more of a nuisance than a disaster.

Conclusion: The District has and always will remain at risk to flooding because of its high annual percentage of rainfall, heavy snowfall in the winter, and the number of watercourses that traverse the District. However, the vulnerability is limited as flooding is often minor and localized.

FEMA NFIP Program

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). Lake Valley Fire Protection District is a special District and is therefore not eligible to participate in the NFIP program. As such, we do not have Severe Repetitive Loss Properties. This information as it relates to the overall County can be found in the El Dorado County LHMP.

Category 6 Severe Storms

Type/Location: Severe storms are generally defined as any destructive weather event, but usually occur in all areas of the District. Severe storms form from heavy rain, hail, snow, lightning, and strong winds. While storms may be localized, they can be extensive in their damage and impact. The climate of the District is inherently conducive to severe storm weather events and severe weather events can happen at any time of the year.

Extent:

Severe Winter Storm

During the winter months, the District can experience strong winter storms. Four climatic factors together work to create a higher than average potential for severe winter storms: high altitude, orographic (mountain) barriers, prevailing storm tracks, and air masses.

- The District's location in a basin along the crest of the Sierra Nevada naturally gives the area a high average elevation. Elevation ranges from about 6,240 feet to over 7,440 feet, with most of the District being in excess of 6,300 feet.
- The District is located along the crest of the Sierra Nevada mountain range. The mountain range acts as a barrier to approaching air masses which approach the mountains from the west. The mountains act as a lifting mechanism as air masses migrate over them, increasing the chance for precipitation.
- The winter storm track for the District funnels storm systems from a semi-permanent low-

pressure system in the Gulf of Alaska southward to the California coast following the Westerlies, a global atmospheric wind pattern that provides a relatively consistent westerly flow of air throughout most of the year.

- Air masses typical of the District are classified as marine polar. The District's proximity to the Pacific Ocean, in conjunction with the aforementioned storm track, brings cold and moist marine polar air masses over the city throughout much of the year, especially during the winter months.

Putting all four of these climatic variables together equals a higher than average potential for severe winter weather events. An example of a severe winter weather event in the District is the winter storm of December 2004. In a three-day span, five to six feet of snow fell in many areas within the District accompanied by "ferocious" winds. At higher elevations within the District, as much as ten feet of snow was reported to have fallen. The combination of heavy snows and strong winds knocked out power. Many residents of the county went without power for several days. County offices and local schools were shut down. Every resident of the District was in some way adversely affected by this severe weather event.

Severe Windstorm

In any season, the mountainous landscape promotes the formation of wind, often winds at very high speed. Windstorms can affect all areas of the city during any month of the year. During the December 2004 storm, wind speeds in excess of 80 miles per hour were recorded at Heavenly Ski Resort and over the western rim of the Tahoe basin.

Severe Rain or Thunderstorm

During the summer months, climatic factors combine to promote the development of thunderstorms. As heated air from lower elevations rises and rapidly cools, intense thunderstorm cells can develop in South Lake Tahoe's high elevation landscape. These thunderstorms often have hail as large as golf balls. Rainfall amounts may cause flooding or cause a dam breach. Section II Category 4 – Earthquake discusses dams within the District and dam failure in detail. Rainfall accumulations often exceed the areas design storm of 0.7 inches per hour. The design storm is a 20-year one-hour storm. Local streets may experience flooding; however, no major flood damage has occurred in the District.

<u>Previous Occurrences:</u>

NCDC Events

The NCDC data recorded 17 high wind and strong wind events for the Greater Lake Tahoe Area since July of 2009. Table 11 includes a summary of these specific events and below is a detailed description of two such events.

Table 11. NCDC Severe Weather Events in Greater Lake Tahoe Area 7/1/2009 -12/31/2017

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Hail	0	0	0	0	0	$0	$0
Heavy Rain	0	0	0	0	0	$0	$0
High Wind	11	0	0	0	0	$200,000	$0
Strong Wind	6	1		0	0	$245,000	$0
Thunderstorm Wind	0	0	0	0	0	$0	$0
Tornado	0	0	0	0	0	$0	$0
Total	**17**	**1**	**0**	**0**	**0**	**$445,000**	**$0**

Source: NCDC
https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Tornado&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2004&endDate_mm=06&endDate_dd=30&endDate_yyyy=2018&county=EL%2BDORADO%3A17&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA

- 8/18/2010 – South-southwest to southwest winds on Lake Tahoe were sustained between 20 to 25 mph from late morning to early evening on the 18th. The winds (and waves it generated) were sufficient to sink 3 boats. Damages of $100,000 were reported.
- 7/8/2015 – Persistent moderate to high atmospheric moisture combined with daytime heating to produce thunderstorms (many with heavy rainfall) early in the month. Two photographs indicated a waterspout on Lake Tahoe. Eyewitnesses noted that the waterspout started near the mouth of Emerald Bay and moved quickly southeast towards Tahoe Keys. The waterspout dissipated before reaching land.

Impacts: The effects of severe weather events such as snowstorms, thunderstorms, and windstorms are likely to exhibit certain similarities, such as downed trees and fallen power lines. Electrical power outages happen with most extreme weather event. The interruption of power causes many problems, including loss of electricity affecting the heating of homes, heating of water, pumping of water, refrigeration, lighting, computing, and loss of communication systems like television and the internet. Additionally, businesses lose the use of cash registers, gasoline pumps, restaurant kitchen appliances, and the like. Transportation around the community of Meyers can be affected too, with road closures

interrupting movement. Possible damages also include damages to homes, businesses, and government buildings, fatalities are uncommon but can occur on occasion, and localized flooding may occur, especially during rain on snow events.

Probability of Future Occurrence: Likely – Based on NCDC database, 17 wind incidents over an 8-year period (2009-2017) equates to over two severe storm events every year and a 100 percent chance of a severe storm in any given year. Severe weather is a well-documented seasonal occurrence that will continue to occur annually in the District. The topography and climate of District makes it more vulnerable to severe thunderstorms.

Vulnerability: Severe storm events can happen in all parts of Lake Tahoe at any time of the year. The degree of regularity is greater during various seasons for the different storm types, but the overall threat of a severe storm event is a relative constant over the calendar year. One of the largest storms on record according to National Oceanic and Atmospheric Administration Satellite and Information Service occurred on December 29, 1996. Heavy rains combined with melting snow caused widespread urban and small stream flooding in the greater Lake Tahoe area during the afternoon. In South Lake Tahoe, water was flooding streets, homes, and businesses. Minor flooding occurred in the District. A second large storm was recorded on December 31, 2005. Localized flooding was reported in areas south of Lake Tahoe. Sierra Pacific Power Company reported that at least eight power poles were knocked down, most likely due to the saturated ground. Power lines were also downed when trees fell on them. Around 4,000 people were left without power south of Lake Tahoe. This was the all-time record flood on Trout Creek in South Lake Tahoe and Tahoe Valley, flooding U.S. Highway 50. Due to the regularity of severe weather in the District, essential services and the community at large is well prepared.

Conclusion: Of all natural hazards, the severe storm event has the greatest probability of occurrence in the District. The entire District is subject to severe storm events, and these events can occur during any time of the year. When severe storm events do occur, they have the potential to significantly impact the community, presenting a genuine threat to the lives of our residents and the personal and real property of citizens, triggering the prospect for considerable economic loss.

Category 7 Wildfire

Type: California is recognized as one of the most fire-prone and consequently fire-adapted landscapes in the world. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural and aboriginal ignition sources, has created conditions for extensive wildfires. Wildland fire is an ongoing concern for the District. Generally, the fire season extends from early spring through late fall of each year during the hotter, drier months.

Location/Extent: Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, an accumulation of vegetation, and high winds. The threat of wildland fire increases as winter snowpack melts, summer temperatures rise, and forest fuels become dry and susceptible to fire. The summer months of June, July, August, and September are traditionally the wildland fire season in the District. Fire season can extend later into the year until appreciable precipitation arrives in the fall.

Despite having a sound community wildfire protection plan in place, which identifies communities with the greatest threat and fuel reduction strategies to reduce the threat, wildland fire remains as the greatest concern to the District. According to the National Fire Danger Rating System wildland fire severity classifications for El Dorado County, many areas of the county that presently contain or are planned to contain residential development have moderate or high wildland fire hazard ratings. The Cal Fire also has a fire rating system called the Fire Hazard Severity Classification System which considers quantity of flammable vegetation within a critiCal Fire area, weather, and slope. As displayed in Figure 12 below the entire District is rated as "very high severity."

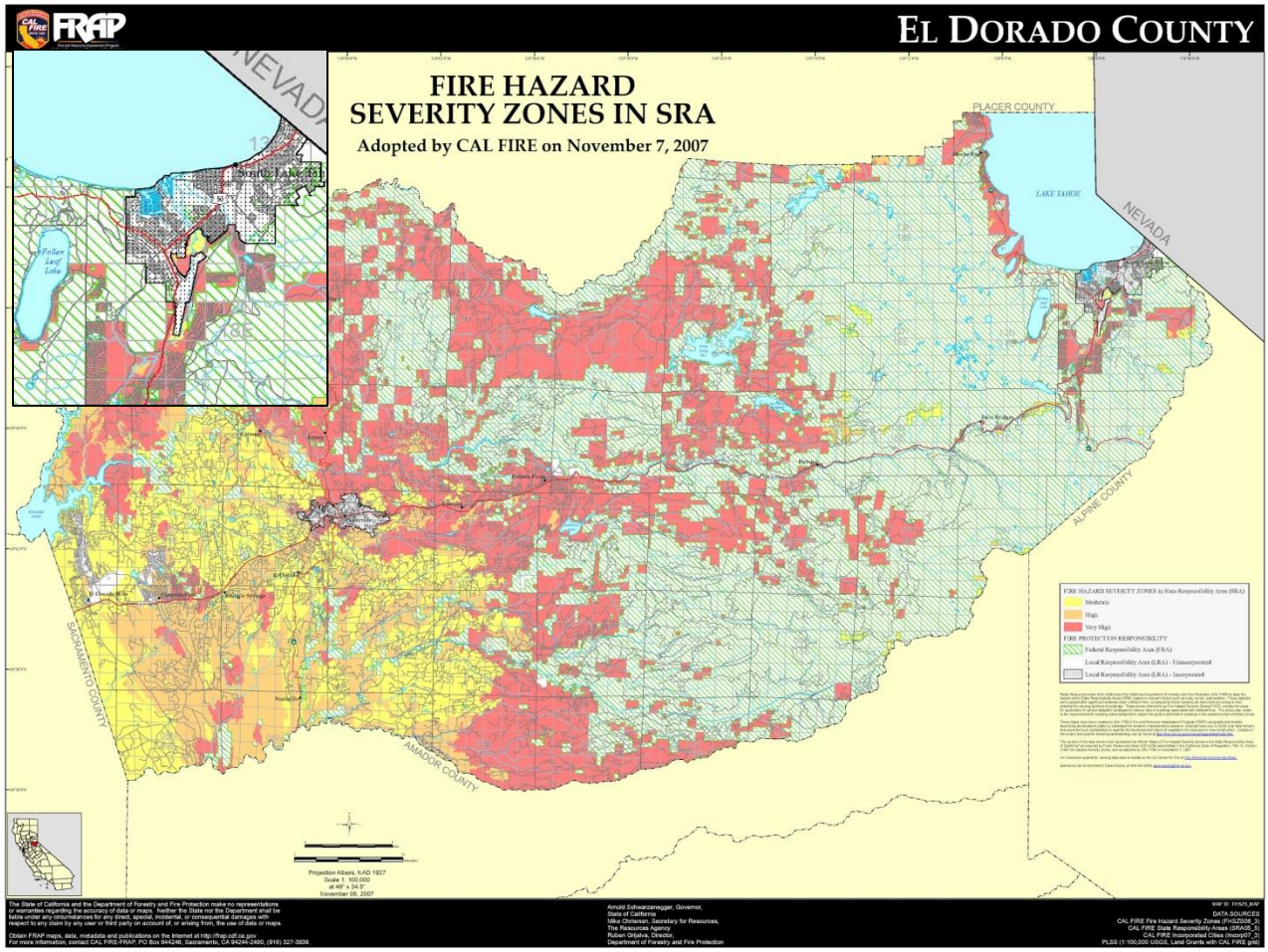


Figure 12: Fire Hazard Severity Zones in SRA for El Dorado County

Source: https://frap.fire.ca.gov/media/6197/fhszs_map9.pdf

Previous Occurrences:

NCDC Events

The NCDC data recorded one wildfire event in the Greater Lake Tahoe Area from 2009 until 2017.

- 7/10/2017 Farad Fire – The Farad Fire burned 747 acres in the steep terrain on the north and west side of Interstate 80 about 1 mile west of the California-Nevada state line, mostly on the

10th and 11th. The incident caused periodic closures of Interstate 80 on the 10th into the afternoon of the 11th due to firefighting activities. A few power poles were damaged near Interstate 80. As the burn was in steep terrain with narrow canyons, it likely contributed to mudslides and debris flows which affected Interstate 80 in August.

HMPC Knowledge

The HMPC also provided the following information on historiCal Fires in the District.

- 7/3/2002 Gondola Fire – The Gondola Fire burned more than 670 acres was caused by carelessly discarded smoking material. The suppression cost close to $3 million, but fortunately no injuries or damage to structures were reported. Nearly 1,700 personnel, mainly hand crews from the greater Northern California and Nevada areas and Oregon, battled the blaze.
- 8/19/2002 Showers Fire – The Showers Fire started when a small plane went down near Elbert Lake near Meiss Meadow, killing a couple from Lafayette, CA. The blaze burned 294 acres and is estimated to have cost the U.S. Forest Service $1.75 million.
- 6/24/2007 Angora Fire – The Angora Fire (in the Lake Tahoe Basin) burned 3,100 acres of forest and wooded subdivisions and destroyed more than 250 homes as well as 75 commercial and other structures.
- 10/14/2016 Emerald Fire – The Emerald Fire started October 14, near the Cascade Lake area and Emerald Bay off Highway 89. Wind gusts and sustained wind contributed to the spread of this fire.

Figure 13 to the right is a complete history of wildland fires in the Lake Tahoe Basin from 1973 through 2014. As shown in the figure, wildland fires are a common occurrence on the south end of Lake Tahoe in the District.

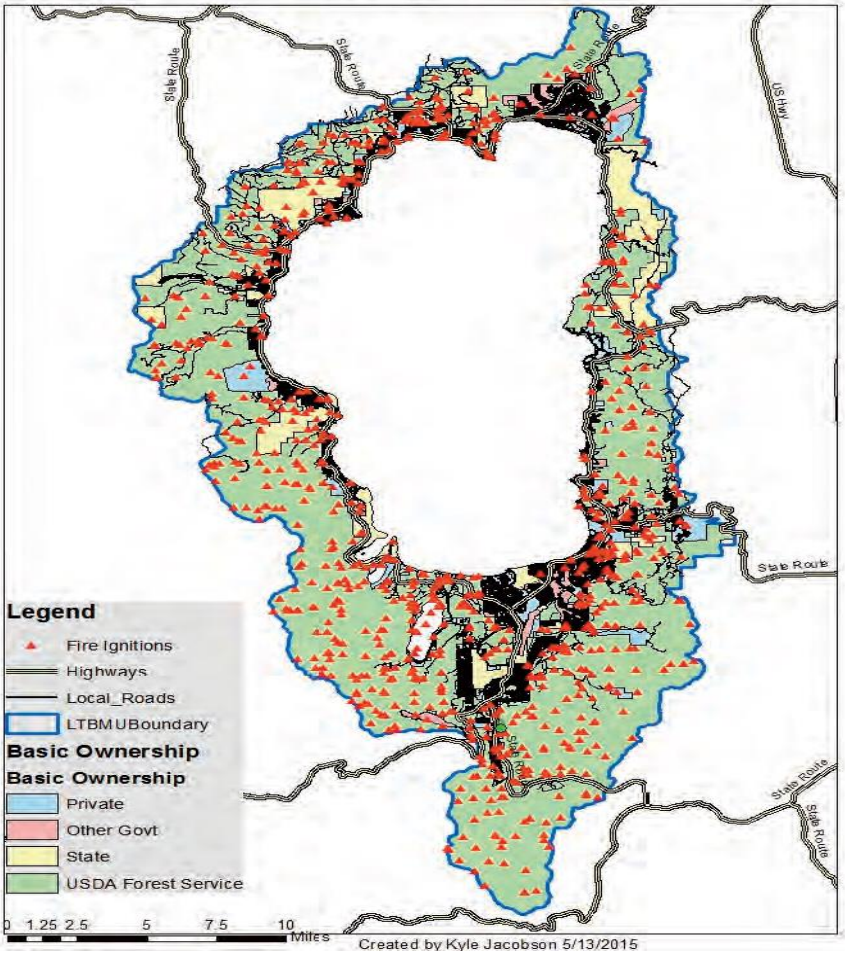


Figure 13: Lake Tahoe Basin Ignitions from 1973 through 2014

Source: Martin Goldberg, Lake Valley Fire Protection District

Probability of Future Occurrence: Likely – There is scientific certainty that the risk of catastrophic loss due to wildfire in the Tahoe Basin has increased significantly over the last couple of decades. It is also true that small lots averaging ¼ acre in size and dense construction in the Tahoe Basin increases the risk to many homes from even small fires. There is not a reliable estimate for the frequency of the fire events but is a high degree of probability that a fire in the wildland urban interface will occur at some time in the near future. Wildland fires are naturally occurring hazard events that have and will happen again in the District. The probability and risk of a wildland fire is seasonal in nature, with the greatest potential for a wildland fire being during the dry months of summer and early fall. Many variables combine to dictate the severity of risk for wildland fire occurrence. With these factors considered, there is a high probability of a wildland fire within the District, and a high risk associated with this natural hazard.

Impacts: 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, debris flows, and erosion during the rainy season.

Vulnerability: Critical - Depending on the size and location of the fire, transportation and communication infrastructure could be seriously affected. As witnessed by the Angora Fire, electrical power poles and transmission lines could be lost to flames. Underground utilities could be damaged, including transmission cables, gas pipelines, and water delivery systems. Roads could be closed for an extended length of time, or open on a reduced access schedule. Loss of power also complicates daily routines. Lack of electricity and/or natural gas can make cooking, cleaning, and heating impossible for many. More catastrophic is the potential loss of homes, structures, and lives if a wildland fire enters a home site. This becomes more and more a possibility as homes are built in the District.

Conclusion: Wildland fires will inevitably happen in the future. The areas dry summer climate enables an annual seasonal threat to wildland fire, a threat that is periodically realized in potentially devastating fashion. Citizens have an opportunity to minimize the threat of wildland fire by creating defensible space around structures, which includes appropriate landscaping. Use of fire-resistant roofing assists in protecting structures from wildland fire. Because of resident's ability to be prepared for the possibility of wildland fire, damage to property and the threat to human life is decreased. The District shall maintain services such as chipping, defensible space inspections, tree marking, and clearing the forest of hazardous fuels in our community.

4. Hazards 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.

4.1 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.

The District has identified the hazards that could impact the residents and their property and assessed the risks inherent to each hazard. Mitigating the effects of these natural hazards has been a goal of our residents. Residents have looked for and implemented measures designed to lessen the effects of natural hazards. As an example, the Cold Creek Fire Adapted Community recently facilitated a hazardous fuels reduction program in their neighborhood. Here, a cooperative with the California Tahoe Conservancy was utilized to facilitate community-based wildland fire prevention activities, including a fuel break along the neighborhood and fuel reduction treatments on individual lots.

The goals identified in the District's LHMP are multi-jurisdictional in their scope and intent. The goals of creating and implementing the Local Hazard Mitigation Plan are to:

- Save lives and protect property.
- Reduce impact of future disaster events.
- Enable post-disaster funding.
- Hasten recovery from disasters.
- Demonstrate a dedication to improving the community's safety and well-being.

These goals are applicable to all-natural hazards identified in this LHMP. Although the LHMP goals might appear overly broad in scope, their intent, namely, to reduce the threat of a hazard through mitigation approaches, is still quite clear in definition and vision. From these goals come the objectives of the District's LHMP. The objectives are arranged in a manner that addresses each hazard individually. From the goals, objectives are derived, and from the objectives, actions are formulated.

A final set of objectives addresses mitigation measures that are applicable to all natural hazards identified within the LHMP.

4.2 District's Existing Authorities, Policies, Programs, and Resources

Within the District, the following authorities have a role in Hazard Mitigation and exist with their respective resources and are listed in Table 12.

Table 12. District's Existing Authorities, Policies, Programs, and Resources

Type of Resource	Resource Name	Ability to Support Mitigation	Website
Personnel	Lake Valley Fire Protection District (LVFPD)	The LVFPD is responsible for fire protection services within the unincorporated portion of El Dorado County within the Lake Tahoe Basin. The LVFPD supports implementation of mitigation actions that reduce the risk of wildfire and other environmental hazards. The LVFPD assist homeowners with defensible space inspections, tree marking, and fire adapted community development. Personnel seek funding through the District, SNPLMA, CA Proposition 1, California Climate Investments Fire Prevention Grant, HMGP, and volunteers or nonprofits.	www.lakevalleyfire.net
Plan	Lake Tahoe Basin Community Wildfire Protection Plan (CWPP)	The CWPP was developed under a collaborative framework established by the Wildland Fire Leadership Council and agreed to by state and local government, local Fire agencies, other stakeholders and federal land management agencies managing land in the Tahoe Basin. The CWPP identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment on Federal and non-Federal land that will protect one or more at-risk communities and essential infrastructure and recommends measures to reduce structural ignitability throughout the community. The CWPP addresses issues such as wildfire response, hazard mitigation, community preparedness, and structure protection. The CWPP plan update is scheduled to be completed in 2020 and will include the LHMP.	https://www.tahoelivingwithfire.com/resources/partner-library/
Plan	Lake Tahoe Basin Fuel Reduction and Wildfire Prevention Strategy	Strategies that support mitigation are found in the Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy (2014) and Amendment to Incorporate Landscape Scale Planning (2017). Similar to the CWPP, the Strategy is collaborative effort to address hazardous fuels surrounding the community.	https://www.tahoelivingwithfire.com/resources/partner-library/

Plan and Personnel	The El Dorado County Local Hazard Mitigation Plan (EDC LHMP)	The EDC LHMP helps guide and coordinate mitigation activities and decisions for local land use policy in El Dorado County. The District's mitigation measures will build upon the risks described in the EDC LHMP and serve as an extension to the El Dorado County mitigation measures. The EDC LHMP will be amended to include the District's LHMP. El Dorado County provides mitigation resource through their Sheriff's Department, Public Works, and Environmental Health. The Sheriff's Department conducts emergency preparedness activities for the community. Mitigation activities related to emergency preparedness can be implemented by the Sheriff's Department.	www.edcgov.us
Personnel and Program	Tahoe Resource Conservation District (Tahoe RCD)	The Tahoe RCD assists with mitigation by educating property owners in protecting their homes from wildfire and creating fire adapting communities. Personnel seek funding from SNPLMA, CA Proposition 1, California Climate Investments Fire Prevention Grant, HMGP, and volunteers or nonprofits. The District's LHMP will be referenced and incorporated in future plans and request for funding.	www.tahoercd.org https://fireadaptednetwork.org/member/tahoe-fire-and-fuels-team/
Personnel	California Department of Forestry and Fire Protection (Cal Fire) Amador-El Dorado Unit	Cal Fire assists with mitigation measures related to wildfire suppression and prevention, as well as acting as a liaison between the community and the state. Cal Fire serves as a resource with defensible space inspections, tree marking, and fire adapted community development. Cal Fire also serves as a mitigation resource in the area of drought, extreme heat and tree mortality. Cal Fire's 2017 Unit Strategic Fire Plan Amador-El Dorado Unit Plan serves as a resource, but will not be amended for the incorporation of the District's LHMP.	https://www.fire.ca.gov/units/
Technical Resource	California Office of Emergency Service	This state agency provides guidance for hazard mitigation activities and distributes federal funding for hazard mitigation grants.	www.caloes.ca.gov

Personnel	Lake Tahoe Basin Manageme nt Unit (LTBMU)	LTBMU assist with mitigation measures related to wildfire suppression and prevention, as well as acting as a liaison between the community and the federal government. LTBMU serves as a resource with defensible space inspections and fire adapted community development. LTBMU's Fuel Reduction and Wildfire Prevention Strategy (2014) serves as a resource but will not be amended for the incorporation of the District's LHMP.	https://www.fs.usda.gov/ltbmu
Personnel	Tahoe Regional Planning Agency (TRPA)	The TRPA assist with mitigation measures through it's mandate to protect the environment of the Lake Tahoe Basin through land-use regulations. The TRPA is one of only a few watershed-based regulatory agencies in the United States. The TRPA was formed in 1969 through a bistate compact between California and Nevada which was ratified by the U.S. Congress. The TRPA's bistate compact serves as a resource but will not be amended for the incorporation of the District's LHMP.	www.trpa.org
Personnel	California Tahoe Conservancy (CTC)	The CTC manages thousands of forested acres in the District. The District's LHMP will be referenced and incorporated in future plans and request for funding. CTC assists with mitigation measures related to wildfire prevention, as well as acting as a liaison between the community and the state. CTC serves as a resource in creating defensible space and fire adapted community. CTC also serves as a mitigation resource in the area of drought, extreme heat and tree mortality. CTC specific plans will not be amended for the incorporation of the District's LHMP.	www.tahoe.ca.gov
Personnel	California Department of Transportation (Caltrans)	Caltrans manages several major highways in the District. Caltrans serves as a mitigation resource in the area of severe storms, avalanche, landslides and flooding. Caltrans specific plans will not be amended for the incorporation of the District's LHMP.	www.dot.ca.gov

Personnel	Tahoe Transportation District (TTD)	This agency serves as a resource, but their specific plans will not be amended for the incorporation in the District's LHMP. The Tahoe Transportation Agency manages transportation in the District and the District's LHMP will be referenced and incorporated in future plans and requests for funding by the TTD. TTD will assist in grant applications specific to mitigation in the District.	www.tahoetransportation.org
Plan and Personnel	South Tahoe Public Utility District (STPUD)	STPUD manages the sewer and water system thought out the District. STPUD personnel assist in resource protection as well as life safety in the event of a sewer or water system failure resulting from natural hazards. STPUD is also vital in providing an effective water system for fire control. STPUD will assist in grant request specific to mitigation in the District. District's LHMP will be referenced and incorporated in future plans and requests for funding.	www.stpud.us
Personnel and Technical Resource	Liberty Utilities	Liberty Utilities owns the electricity transmission, distribution systems and services in the District. Liberty Utilities can work with the District to reduce the vulnerability of energy infrastructure to natural hazards. Liberty Utilities is a vital partner in the event of a gas leak and will continue to be a resource for mitigation. This company serves as a resource, but their specific plans will not be amended for the incorporation of the District's LHMP.	www.libertyutilities.com
Personnel and Technical Resource	Southwest Gas	The Southwest Gas owns the natural gas transmission and distribution systems in District. It also provides natural gas service to the community. Southwest Gas can work with the District reduce the vulnerability of energy infrastructure to natural hazards. Southwest Gas is a vital partner in the event of a gas leak and will continue to be a resource for mitigation. This company serves as a resource, but their specific plans will not be amended for the incorporation of the District's LHMP.	www.swgas.com
Technical Resource	Federal Emergency Management Agency (FEMA)	This federal agency provides guidance for hazard mitigation activities and distributes federal funding for hazard mitigation grants.	www.fema.gov

FEMA NFIP Program

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The Lake Valley Fire Protection District is a special District and is therefore not eligible to participate in the NFIP program. As such, this plan does not include a Severe Repetitive Loss Properties.

REQUIREMENT SECTION 201.6(c)(4)(ii)

If a jurisdiction has not updated its LHMP since the current planning guidance was released in October of 2011, the jurisdiction is not required to address this element in an updated plan. However, the jurisdiction does need to include language either in the LHMP, or on the C6 Section of the Review Tool. Since this plan has not been updated since the 2011 planning requirements were put into place, and this requirements of C6 was not part of the previous planning requirements, the Lake Valley Fire Protection District is unable to provide an update for this section.

REQUIREMENT SECTION 201.6(d)(3))

If a jurisdiction has not updated its LHMP since the current planning guidance was released in October of 2011, the jurisdiction may not have the information in the previous LHMP to update this section. Therefore, the jurisdiction should update this section to the best of their ability to reflect changes for each section within the past 5 years of the date of its current plan submission. Lake Valley Fire protection asserts that this LHMP update reflects changes in development, progress in local mitigation efforts, and changes in priorities with the last 5 years.

4.3 Mitigation Action Plan

The following is a list of objectives developed in conjunction with the overall goals of this LHMP. Within each objective, one or more actions are designed to facilitate the realization of the objective identified. In order to identify and select mitigation actions to support the mitigation goals, each hazard identified was evaluated. Only those hazards that were determined to be a high priority hazard by the District were considered further in the development of hazard-specific mitigation actions.

4.3.1 Wildfire

Objective #1: Minimize the threat to lives, property and the environment posed by wildfire within the District.

Responsibility: District maintains responsibility for the protection of life, property and the environment from fire within its boundaries. District provides this protection through our fire prevention program and by enforcing state and loCal Fire ordinances designed to safeguard our community. The District actively participated in the development of the CWPP. The CWPP mapped and assessed the District's vulnerability and incorporated wildfire mitigation measures in the comprehensive LHMP. Cal Fire maintains responsibility for wildfire prevention and suppression on State Responsibility Areas (SRA). The U.S. Forest Service maintains responsibility for wildfire prevention and suppression on Federal Responsibility Areas.

Action 1.0: A community can protect itself from catastrophic wildfire through knowledge, awareness and actions of its residents regarding infrastructure, buildings, landscaping, and the surrounding ecosystem. A fire adapted community is comprised of informed and prepared citizens collaboratively planning and taking action to safely co-exist with wildland fire. In the District, a fire adapted community must include visitors and second homeowners. Create a fire adapted community.

Timeframe: 7 years

Funding sources: The District, SNPLMA, CA Proposition 1, California Climate Investments Fire Prevention Grant, HMGP, and volunteers or nonprofits.

Administrators: The District, LTBMU, California Tahoe Conservancy (CTC), Cal Fire, private landowners and Tahoe RCD

Responsible agency: The District, LTBMU, CTC, Cal Fire, private landowners and Tahoe RCD

Action 1.1: Create defensible space by removing sufficient dead, dying or suppressed trees and surface material near a structure along with the use of flame-resistant building materials can reduce the ignitability of a structure. Public Resource Code and the California Building Code contain laws requiring compliance. The LTB CWPP recommends enforcement of the laws and inspections for compliance with defensible space laws and building requirements. The LTB CWPP further recommends working with communities and seeking Firewise designation.

Timeframe: No end date

Funding sources: The District, SNPLMA, CA Proposition 1, California Climate Investments Fire Prevention Grant, HMGP, and volunteers or non-profits.

Administrators: The District and Cal Fire

Responsible agency: The District and Cal Fire

Action 1.2: Encourage fire-resistant construction through the use of appropriate building materials. The use of non-combustible materials (i.e., stone, brick, and stucco) helps prevent homes from ignition during a wildfire. Replacing wood shake shingle roofs is one of the most effective retrofits property owners can do to protect their homes. The LTB CWPP recommends improving structure ignitability within the District as a priority. Assist homeowners in replacing wood roofs, siding, windows and vents to reduce structure ignitability.

Timeframe: 10 years

Funding sources: HMGP

Administrators: The District, Cal Fire, Tahoe RCD, Eldorado County Building Department, and individual property owners including the Tahoe Network of Fire Adapted Communities

Responsible agency: The District, Cal Fire, Eldorado County Building Department, and individual property owners

Action 1.3: Effective fire suppression during initial attack keeps fires small. Ninety percent of fires are kept at one-quarter acre or less, and greater than 99% are kept at less than 10 acres. Catastrophic wildfire reduction begins with an appropriate fire department response and infrastructure. Fire department response includes adequate personnel, properly trained and equipped. Proper infrastructure includes water capacity and delivery by the public utility district. Improve suppression capabilities, equipment and infrastructure.

Timeframe: 5 years

Funding sources: District, special tax, Cal Fire, and HMGP

Administrators: District, LTBMU, and Cal Fire

Responsible agency: District, LTBMU, and Cal Fire
Action 1.4: Create fire breaks by removing sufficient dead, dying or suppressed trees and surface material from a forest stand can alter fire behavior. The removal process is referred to as fuel reduction as larger, fire tolerant trees are less susceptible to fire. Reducing surface material in treatment areas minimizes fire flame heights. The LTB CWPP recommends reducing hazardous fuels near structures and identifies several fuel reduction projects. Assist the U.S. Forest Service LTBMU, CTC, State Parks, and private landowners in completing fuel reduction on lands identified in the LTB CWPP.

Timeframe: 10 years

Funding sources: The District, SNPLMA, CA Proposition 1, California Climate Investments Fire Prevention Grant, HMGP, volunteer labor, state and federal landowners, and correctional crews

Administrators: The District, LTBMU, CTC and Cal Fire and private landowners.

Responsible agency: The District, LTBMU, CTC, Cal Fire and private landowners.

Action 1.5: Safe and effective evacuation prevents loss of life in the event of a wildfire. Evacuation requires jurisdictional interoperability, including Nevada agencies. Efforts to evacuate shall include transit system support. Education and training on evacuation routes and use of early warning systems improve emergency evacuations. Develop safe and effective evacuation.

Timeframe: 10 years

Funding sources: The District, LTBMU, CTC, Cal Fire, private landowners and the regional transportation agencies.

Administrator: The District, LTBMU, CTC, Cal Fire, Tahoe Transportation District (TTD), TRPA, Tahoe RCD, Eldorado County, City of South Lake Tahoe, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, and Lake Tahoe Unified School District, United States Coast Guard.

Responsible agency: The District, LTBMU, CTC, Cal Fire, private landowners and the regional transportation agencies.

4.3.2 Severe Storm

Responsibility: El Dorado County and the departments contained therein. Although not directly responsible for, the District does render aid to victims of severe storm and must operate effectively during such events. District is committed to the multi-agency coordination including transportation agencies and visitor authority, and preplanning exercises provided through the EDC's Emergency Management Community Council (EMCC).

Action 2.0: Improve public awareness of severe storms. Inform the public about severe weather impacts. Provide and distribute family and traveler emergency preparedness information about severe weather hazards. Encourage homeowners to install carbon monoxide monitors and alarms. Provide portable generator education.

Timeframe: Continuous on-going
Funding sources: District and El Dorado County

Administrator: District, local radio, newspaper and social media

Responsible agency: District and El Dorado County

Action 2.1: The leading cause of death during winter storms is from automobile or other transportation accidents, so it is important to consider ways to lessen roadway impacts. Plan for and maintain adequate road and debris clearing capabilities.

Timeframe: 5 years

Funding sources: District, special tax, and HMGP

Administrator: District, TTD, TRPA, Caltrans, El Dorado County Public Works, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District.

Responsible agency: District and El Dorado County

Action 2.2: Protect vulnerable populations from the impacts of severe storms. Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages. Coordinate with Barton Memorial Hospital and TTD. Organize outreach to vulnerable populations. Establish evacuation centers with other responsible agencies.

Timeframe: 5 years
Funding sources: District, El Dorado County, and HMGP

Administrator: District, El Dorado County, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, and EMCC.

Responsible agency: District and El Dorado County

Action 2.3: District facilities and critical infrastructure retrofitted to reduce damage from severe storms. Improve roof coverings, anchor roof-mounted heating, ventilation, and snow stabilizing bars. Construct emergency operations center to FEMA 361 standards. Upgrade and maintain emergency communication systems including antennas and radio systems. Construct building or infrastructure necessary to protect emergency equipment.

Timeframe: 5 years

Funding sources: District and HMGP

Administrator: District

Responsible agency: District

4.3.3 Drought/Extreme Heat/Tree Mortality

Responsibility: El Dorado County and the Departments contained therein. Although not directly responsible for, the District does render support to residents affected by drought/extreme heat/tree mortality. CTC and Cal Fire maintain responsibility for forest health and tree vitality on state lands. The U.S. Forest Service maintains responsibility for forest health and tree vitality on federal lands.

Action 3.0: Coordinate with El Dorado County, CTC, Cal Fire and U.S. Forest Service in response to public and private landowners affected by drought/extreme heat/tree mortality.

Timeframe: 5 years

Funding sources: California Disaster Assistance Act Funding, Cal Fire Fire Prevention Fund Grants.

Administrator: District, El Dorado County, CTC, Cal Fire and U.S. Forest Service

Responsible agency: El Dorado County, CTC, Cal Fire and U.S. Forest Service

4.3.4 Avalanches and Landslides

Responsibility: El Dorado County and the departments contained therein. Although not directly responsible for, the District does render aid to victims of avalanches and landslides.

Action 4.0: Coordinate and train with Caltrans, Cal Fire, neighboring fire agencies, Sierra Avalanche Center, and local ski resorts on emergency response.

Timeframe: 5 years

Funding sources: No funding required

Administrator: District, Caltrans, Vail Resorts, Sierra at Tahoe Ski Resort

Responsible agency: El Dorado County, California Department of Transportation, Sierra Avalanche Center, and Vail Resorts

Action 4.1: Immediate response to victims of an avalanche or landslide to save lives. Emergency response equipment is unique and not readily available. Secure emergency response vehicles and equipment for response to an avalanche or landslide. Coordinate with agencies developing avalanche detection and notification systems through seismic sensors and cameras
.
Timeframe: 5 years

Funding sources: District, non-profits, and HMGP

Administrator: District, Caltrans, Vail Resorts, Sierra at Tahoe Ski Resort

Responsible agency: El Dorado County, California Department of Transportation, Sierra Avalanche Center, and Vail Resorts

4.3.5 Floods

Responsibility: El Dorado County and the departments contained therein. Although not directly responsible for, the District does render aid to victims of flooding. The District is committed to the multi-agency coordination and preplanning exercises provided through the EDC's EMCC.

Action 5.0: Rainwater and snowmelt can cause flooding and erosion in developed areas. Complete a stormwater drainage study for known problem areas. Prepare and adopt a flood response plan to protect lives and property.

Timeframe: 2 years

Funding sources: No funding required

Administrator: District and El Dorado County

Responsible agency: District and El Dorado County

Action 5.1: Improve public awareness of flooding. Inform the public about flooding impacts. Provide and distribute family and traveler emergency preparedness information about flooding.

Timeframe: Continuous on-going

Funding sources: District and El Dorado County
Administrator: District, local radio, newspaper and social media

Responsible agency: District and El Dorado County

Action 5.2: Immediate response to victims of flooding to save lives. Emergency response equipment is unique and not readily available. Secure emergency response vehicles and equipment for response to flooding.

Timeframe: 5 years

Funding sources: District, non-profits, and HMGP

Administrator: District, local radio, newspaper and social media

Responsible agency: District and El Dorado County

4.4 Prioritizing Mitigation Measures

The LHMP must include a mitigation strategy that 1) analyzes actions and/or projects considered to reduce the impacts of hazards identified in the risk assessment and 2) identifies the actions and/or projects that each jurisdiction intends to implement.

4.4.1 Benefit-Cost Review

In order to identify which natural hazards pose the greatest threat to the District, FEMA's mitigation action evaluation worksheet was utilized. For this process, each of the mitigation actions were ranked by the HMPC as -1, 0, or 1 using the following scale: 1 = Highly effective and feasible, 0 = neutral, and -1 = ineffective or not feasible for each of the criteria. The criteria included life safety, property protection, technical, political, legal, environmental, social, administrative, local champion, and other community objectives. Each of these scores were averaged per criteria by the committee responses. Then each of the averaged criteria scores were combined per mitigation action and then ranked from highest to lowest in overall effectiveness and feasibility.

The results of the prioritization are included in the Table 10 below. These responses represent the opinions of four individuals that are part of the HMPC. The majority opinion was chosen and when a tie presented itself, the values were both represented and averaged before being combined per mitigation action.

Table 13. Mitigation Action Prioritization

Mitigation Actions	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
Wildfire 1.3	1	1	1	1	1	1	1	1	1	1	10
Wildfire 1.1	1	1	1	1	1	0; 1	1	1	1	1	9.5
Wildfire 1.4	1	1	1	1	0; 1	1	1	1	1	1	9.5
Severe Storm 2.0	1	1	1	1	1	0	1	1	1	1	9
Severe Storm 2.1	1	1	1	1	1	0	1	1	1	1	9
Floods 5.1	1	1	1	1	1	0	1	1	1	1	9
Wildfire 1.0	1	1	1	1	1	0	0	1	1	1	8
Wildfire 1.5	1	1	1	1	0	0	1	1	1	1	8
Severe Storm 2.2	1	0	1	1	1	0	1	1	1	1	8
Severe Storm 2.3	1	1	1	1	1	0	0	1	1	1	8
Drought/Extreme Heat/Tree Mortality 3.0	1	0	1	1	1	0	1	1	1	1	8
Avalanches and Debris Flows 4.0	1	0	1	1	1	0	1	1	1	1	8
Avalanches and Debris Flows 4.1	1	0	1	1	1	0	1	1	1	1	8
Floods 5.0	1	0	1	1	1	0	1	1	1	1	8
Floods 5.2	1	0	1	1	1	0	1	1	1	1	8
Wildfire 1.2	1	1	1	-1	1	1	0	1	1	1	7

4.5 Implementing Mitigation Strategies

Many mitigation measures are pre-existing functional strategies. These actions are included as a means of reinforcing those current hazard mitigation efforts. Many are linked to District and jurisdictionally specific codes and ordinances or to existing plans such the District's Community Wildfire Protection Plan. In all cases, the District's LHMP seeks to function in harmony with, and as an enhancement to pre-existing plans, ordinances, rules and regulations. Generally speaking, the District has little or no funding earmarked for natural hazard mitigation. Thus, the District and plan participants will look to secure federal and state natural hazard mitigation grant funding in an effort toward implementing mitigation strategies. A comprehensive list of federal mitigation programs, activities, and initiatives is available online through FEMA's website. This information can be accessed at http://www.fema.gov/doc/fima/fmpai.

A primary emphasis will be placed upon implementing actions that provide the highest effectiveness and feasibility. Knowing that funding is an ever-present issue, all effort will be given to identify actions most beneficial to the citizens and property within the District. The greatest natural hazard threat to lives and property is wildland fire. Wildland fire is a high scoring natural hazard threat in the Hazard Identification Table. Therefore, it is clearly indicated that mitigation actions focused toward reducing the threat of wildland fire in the District have the greatest cost-to-benefit ratios and will provide the greatest mitigative relief for the residents of the District.

5. 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 LHMP is to secure buy-in from El Dorado County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this LHMP establishes compliance with AB 2140 requiring adoption by reference or incorporation into the safety element of the general plan. The governing board for each participating jurisdiction has adopted this LHMP by passing a resolution. A copy of the generic resolution and the executed copies are included in **Appendix C: Adoption Resolutions**.