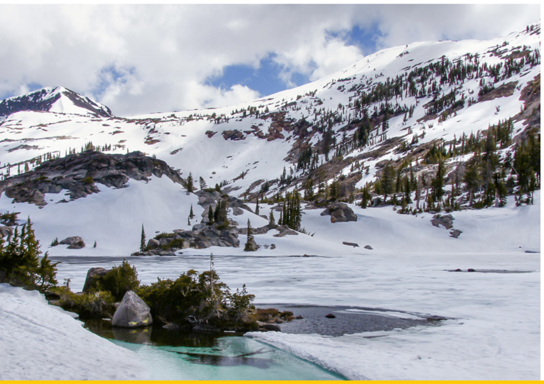

El Dorado County Multi-Jurisdictional Hazard Mitigation Plan

Public Review Draft | April 2024

Prepared for:
El Dorado County Sheriff's Office of Emergency Services
200 Industrial Drive
Placerville, CA 95667

Prepared by:
WSP USA
10940 White Rock Road, Suite 190
Rancho Cordova, CA 96150

EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. El Dorado County (County) developed this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) update to make the County, its four participating jurisdictions, and its residents less vulnerable and more resilient to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that El Dorado County would be eligible for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grant programs.

The County followed a planning process prescribed by FEMA, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key County representatives, four participating jurisdictions including the City of Placerville, the Cameron Park Community Services District (CSD), the County Office of Education (EDCOE), and the Georgetown Divide Public Utility District (GDPUD), and other regional stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The County is vulnerable to several natural hazards that are identified, profiled, and analyzed in this plan. Avalanche, dam failure, debris flows, landslides, drought, water shortages, tree mortality, earthquakes, erosion, extreme heat, floods, seiche (lake tsunami), heavy rain, thunderstorms, hail, lightning, heavy snow, winter storms, tornadoes, high winds, subsidence, and wildfire are among the hazards that can have a significant impact on the County.

Based on the risk assessment review and goal-setting process, the HMPC adopted the following four goals, modified from their previous HMP, which provide the direction for reducing future hazard-related losses within the County's planning area:

- Goal 1: Minimize risk and vulnerability of El Dorado County to the impacts of natural hazards and protect lives and reduce damages to losses to property, economy, public health and safety, and the environment.
- Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts.
- Goal 3: Improve public awareness, education, and preparedness for all hazards.
- Goal 4: Increase communities' capabilities to mitigate losses and to be prepared for, respond to, and recover from a disaster event.
- Goal 5: Maintain FEMA Eligibility/Position the communities for grant funding.

To meet these goals, the plan recommends 76 mitigation actions, which are summarized by jurisdiction and the hazard they mitigate in the table that follows. Together, the 76 mitigation actions address more than one hazard relevant to each jurisdiction given the mitigation strategy consists of several multi-hazard actions. There are 18 mitigation actions that were carried forward from the previous plan and 58 new mitigation actions developed as part of the 2024 planning process. Once formally approved by the California Office of Emergency Services (Cal OES) and FEMA Region IX and adopted by the County and their participating jurisdictions, this MJHMP will be updated every five years.

Table ES-1 Mitigation actions

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
EDC-1	1,2,3,4,5	All Hazards	**Safety Element Integration.** Integrate the 2024 MJHMP into Safety Element of General Plan. To remain in compliance, the 2019 LHMP and 2024 MJHMP will be integrated into El Dorado County's General Plan Safety Element.	El Dorado County	El Dorado County Building and Planning Department (Lead Agency), City of Placerville	Little to no cost	El Dorado County General Fund, In-Kind	Safety and Security	High	Short-term	In Progress. Safety Element Update to be completed in May 2024
EDC-2	1,2,3,4,5	All Hazards	**Public Outreach Campaign.** The County, cities, and special districts will work with other agencies as appropriate to develop timely and consistent annual outreach messages to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will consider: 1) using a variety of information outlets, including social media, websites, local radio stations, news media, schools, and local, public sponsored events and 2) developing public-private partnerships and incentives to support public education activities.	El Dorado County	El Dorado County Sheriff's Office (Lead Agency); City of Placerville, EDCOE, EID,STPUD), Fire Prevention Districts, Fire Safe Councils, GDPUD, Cameron Park CSD, and Other Special Districts	Low	El Dorado County General Fund, In-Kind	Safety and Security	High	Ongoing	Annual Implementation. Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness is ongoing every year.
EDC-3	3,4,5	Avalanche, Debris Flow and Landslide, Flooding	**Update Debris Management Plan.** El Dorado County has experienced wildfires and flooding in which debris flows and landslides (and sometimes avalanches) are issues that needs to be addressed, mapped, and mitigated through slope stabilization and other techniques. Procedures and guidelines for managing disaster debris, clearing debris, addressing	El Dorado County	El Dorado County Environmental Management Department (Lead Agency); City of Placerville, EDCOE, EID, STPUD, Fire Prevention Districts, Fire Safe Councils, GDPUD,	High	El Dorado County General Fund, In-Kind Proposition 68, FEMA HMA HMGP, US Forest Service Grants, State Funding	Safety and Security, Transportation, Water Systems	High	Medium-term	The County is in the process of developing a Debris Management Plan. The County has faced multiple disasters during the last 5 years including the Caldor Fire and Mosquito Fire which required advanced debris removal.

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			safety protocols, and considering ecological impacts during recovery and stabilization efforts.		CSD, Other Special Districts						Environmental Management Department was the lead agency and coordinated the debris removals.
EDC-4	1,2,3,4,5	Avalanche	**Assess Critical Infrastructure Risk**. Avalanche hazards exist each winter in the upper elevations of eastern El Dorado County. Some of the County's facilities are potentially at risk to avalanche, and the majority of the EID water and wastewater treatment facilities, pump stations, storage tanks, and reservoirs are in the lower elevation on flatter terrain where the potential of avalanche damage is negligible to non-existent. The action is still designed to assess avalanche risk and consider removing or relocating facilities in hazard prone areas; with the exception being some major transportation corridors like U.S. Highway 50.	El Dorado County	El Dorado County GIS Department (Lead Agency), EID, STPUD, GTPUD, Fire Prevention Districts, Fire Safe Councils	Very High	FEMA HMA BRIC, HMGP, Emergency Management Performance Grant Program, El Dorado Irrigation District General Funds	Safety and Security; Energy; Communications; Transportation; Water Systems	Low	Short-term	In progress. This was a carryover mitigation action for EID.
EDC-5	1,2,3,4,5	Dam Failure	**Map Community Risk.** Dam Inundation (hazards have been identified as a low frequency event that can have both a low and a high impact potential). This action requires the County to annually update the dam inundation maps using National Inventory of Dams (NID) or California Division of Safety of Dams (DSOD) data.	El Dorado County	El Dorado County GIS Department (Lead Agency), Sacramento Municipal Utility District (SMUD), EID, City of Placerville, STPUD, GDPUD, Cameron Park CSD, Other CSDs, Other Special Districts	Low	County General Fund, Special Districts Budgets, Public and Private Dam Owners, Emergency Management Performance Grants (reimbursement funds), HHPD	Safety and Security; Energy; Communications; Water Systems	Low	Ongoing	Annual Implementation. Dam inundation maps were recently updated as part of the Safety Element update.

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EDC-6	1,2,4	Drought, Wildfire	**Retrofit High Water Use Facilities.** El Dorado County maintains acres of landscaped grounds in addition to playable turf areas. Much of that acreage consists of ornamental lawn and other high water use plantings, or outdated inefficient irrigation. Retrofit of these areas will be prioritized and completed on a site by site basis as funding becomes available. Other local agencies and districts within El Dorado County face a similar water usage situation, specifically EDCOE.	El Dorado County	El Dorado County Department Facilities and Parks (Lead Agency), City of Placerville, EDCOE, EID, STPUD, TCPUD, Fire Prevention Districts, Fire Safe Councils, GDPUD, Cameron Park CSD, Other CSDs, Other Special Districts	Very High	FEMA HMA HMGP, DWR, and Other Federal and State Loan and Grant Programs	Water Systems	Medium	Ongoing	In progress. Certain special districts such as GDPUD, STPUD, and TCPUD have initiated retrofits to reduce water use at district facilities and by promoting water use efficiency for private landowners during drought restrictions.
EDC-7	1,3,4,5	Drought	**Drought Public Education and Outreach.** The project involves public outreach and education with specific efforts targeted for the small community of Outingdale that is served by wells and has experienced water shortages. The ongoing drought has had numerous impacts on the County. In addition, the State was in a State of Emergency due to the drought. One key method to conserve groundwater is to reduce water uses in homes and landscaping; the focus of the outreach would therefore be on rural and isolated communities on private wells that are known to be more vulnerable to water shortages.	El Dorado County	El Dorado County Public Information Officer (Lead Agency), City of Placerville, EID, SMUD, City of Placerville, EDCOE, EID, STPUD, GDPUD, Fire Prevention Districts, Fire Safe Councils, CSDs, and Other Special Districts	Low	FEMA HMA HMGP, DWR, El Dorado County General Fund	Safety and Security; Water Systems; Food, Hydration, Shelter, Agriculture	Medium	Ongoing	Annual Implementation. As required by California Water Code section 6161, and the DWR and DSOD
EDC-8	1,2,4,5	Earthquake	**Update Building Code Provisions.** El Dorado County will adopt and enforce updated building code provisions, consistent with the latest California Building Code (CBC) to reduce earthquake	El Dorado County	El Dorado County Building and Planning Department (Lead Agency), City of Placerville,	Little to no cost	FEMA HMA HMGP	Safety and Security; Health and Medical, Water Systems	Low	Ongoing	Annual Implementation. El Dorado County follows and enforces CBC standards for earthquakes. Routine

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			damage. Seismic and geologic hazards have been identified as a low frequency event that can have both a low and high impact potential.		Cameron Park CSD, EID, EDCOE, GDPUD, STPUD, Fire Prevention Districts, Fire Safe Councils, Other CSDs, Other Special Districts						updates to the building code occur.
EDC-9	1,2,4,5	Erosion, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Stabilize Erosion Hazard Areas.** Many existing El Dorado County roads, culverts, and hillsides are susceptible to erosion – the erosion of land - that can destroy buildings and infrastructure.	El Dorado County	El Dorado County Department of Transportation (Lead Agency); City of Placerville, Cameron Park CSD, GDPUD, STPUD, TCPUD, EID, Caltrans, EDCOE, City of South Lake Tahoe, Fire Prevention Districts, Fire Safe Councils, and Other Special Districts	Moderate to High (varies by project type)	FEMA HMA HMPG, Prop 68, DWR	Safety and Security, Energy; Transportation; Water Systems	High	Medium-Term	Annual Implementation. Many capital improvement projects along major roads in the County are managed for slope stabilization through best management practices, particularly following wildfires. Erosion control is ongoing because the land is constantly being affected by wildfires, winter storm events, and soils erosion. County has multiple burn scars from large wildfires, Caldor and Mosquito, which have created additional erosion.
EDC-10	1,2,3,4,5	Flood	**Enhance Flood Mitigation through Local Planning.** Enhance participation under the NFIP Program and consider benefits of participating in the Community Rating System (CRS) program to improve floodplain management for communities more susceptible to flooding, like Cameron Park.	El Dorado County	El Dorado County (Lead Agency), City of Placerville, City of South Lake Tahoe, EDCOD, EID, GDPUD, Cameron Park CSD, EID, STPUD, Fire Prevention Districts, Fire Safe	Little to no cost	DWR, FEMA HMA HMGP Funds, El Dorado County General Fund, In-Kind	Safety and Security; Health and Medical; Energy; Communications, Water Systems	Medium	Ongoing	In Progress.

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					Councils, Other Special Districts						
EDC-11	1,2,3,4,5	Seiche (Lake Tsunami), Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather: Tornadoes and High Wind	**Work with the City of South Lake Tahoe to Map and Assess Vulnerability to Lake Seiches.** The County's General Plan sets the foundation for recognizing flood disaster potential and establishing through regulations, ordinances and building codes a strategy for protecting populations, new and existing development and economic sustainability.	El Dorado County	El Dorado County Building and Planning Department and GIS Department (Lead Agency & Departments), City of South Lake Tahoe Fire Department, University Nevada at Reno, EDCOE, Lake Tahoe Unified School District, EID, STPUD, Fire Prevention Districts, Fire Safe Councils	Low	FEMA HMA HMGP, CAP, CTP, HMA, DWR	Safety and Security; Energy; Water Systems	Low	Ongoing	In Progress. There have been multiple studies completed regarding seiches in Lake Tahoe from University Nevada at Reno and University of California at Davis; these need to be integrated into County and City of South Lake Tahoe planning documents. The South Lake Tahoe LHMP currently also profiles lake seiches, but mapping needs to be updated.
EDC-12	1,2,3,4	Extreme Heat	**Extreme Heat Outreach Campaign.** El Dorado County will work with agencies and organizations that serve vulnerable populations to prepare for extreme temperatures. Continue to raise awareness and planning regarding extreme temperatures and addressing needs of vulnerable populations.	El Dorado County	El Dorado County Administrative Office (Lead Agency), Marshall Hospital, Barton Medical Hospital, El Dorado County Food Bank, City of Placerville, EDCOE, CSDs, and Other Special Districts	Low	FEMA HMA HMGP, DWR	Food, Hydration, Shelter; Health and Medical	Medium	Ongoing	Annual Implementation. See County's Extreme Heat Plan
EDC-13	1,2,4,5	Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather:	**Protect Critical Facilities and Equipment.** El Dorado County will work with public and private partners to harden critical facilities and equipment. One way this will occur is through tree clearing along power lines and roadways.	El Dorado County	El Dorado County Department of Transportation (Lead Agency), City of Placerville, CalTrans, CSDs, PG&E, SMUD, Liberty Utilities,	Moderate (varies by event)	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, SHSGP Grant Program,	Safety and Security; Energy; Communications; Transportation	High	Ongoing	In Progress. El Dorado County does public education campaigns in the spring and the fall to educate the public for extreme weather during the

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		Tornadoes and High Wind, Seiche (Lake Tsunami)			EDCOE, GDPUD, EID, STPUD, Fire Prevention Districts, Fire Safe Councils, Community Service Districts and Other Special Districts		FEMA HMGP, and potentially the EOC Grant Program				summer and winter months.
EDC-14	1,3	Wildfire	**Create Fire Adapted Communities.** Public education through community outreach is an ongoing strategy and included in all mitigation efforts. El Dorado County, fire agencies, Animal Services, Fire Safe Councils, and other stakeholders work with as many residents as possible to provide information on defensible space and living with fire and creating fire adapted communities.	El Dorado County	El Dorado County Office of Wildfire Preparedness and Resilience (OWPR) (Lead Agency), Fire Agencies, Animal Services, Tahoe Resource Conservation District, City of Placerville, Cameron Park CSD, City of South Lake Tahoe, Lake Valley FPD, Fire Safe Councils, fand Other Special Districts	Little to no cost	El Dorado County General Fund, USACE, CALFIRE, FEMA HMGP, HMA, CAP, CTP Grants.	Safety and Security; Communications	High	Ongoing	Annual Implementation.
EDC-15	1,2,3,4,5	Wildfire	**Hazardous Fuels Reduction Activities.** These projects address the ongoing need to manage fuels in and around privately owned homes, businesses and communities, County-owned facilities freeways and roadways, and "Assets at Risk" in El Dorado County.	El Dorado County	El Dorado County, fire agencies, cities, fire safe councils, special districts, community service districts, public/private partners in fire safety (Lead Agency) Cities of Placerville and South Lake Tahoe, El Dorado County	Dependent on project.	The El Dorado County Fire Safe Council (EDCFSC) has three grants for this – the South County Fuel Reduction Project, the Georgetown Marshall Road Fuel Reduction Grant, and the Fuel Reduction		High	Ongoing	Annual Implementation. El Dorado County, PG&E, SMUD, Fire Safety Councils, and other organizations have brush clearing projects along power lines and roadways throughout the county to protect critical facilities and equipment. This is an ongoing mitigation effort. The South

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					Office of Education, El Dorado Irrigation District, South Tahoe Public Utility District, Fire Prevention Districts, Fire Safe Councils, Georgetown Public Utility District, Community Service Districts and Other Special Districts		for Critical Roads (Coloma Lotus). Each of these grants are in progress with an expiration date of March 2026.The EDCFCS sponsors programs to assist homeowners with defensible space, chipping and hazard tree removal.				County Project also includes fuel break projects (Outing dale, Slug Gulch, Hanks Exchange, and Martinez Creek. Additionally, FCS programs are ongoing.
EDC-16	1,2,4	Wildfire	**Large Strategic Fuel Break**. Large Strategic Fuel Break projects will provide landscape scale community protection in our area. When complete, these projects will help protect the communities identified as "Communities at Risk from Wildfire" listed in the National Fire Plan. OWPR and the El Dorado County Fire Safe Councils have worked with County, State, and Federal agencies to identify areas within their jurisdictions to develop large strategic fuel breaks to protect specific communities and watersheds within the County.	El Dorado County	El Dorado County OWPR (Lead Agency, City of Placerville, Fire Agencies, Fire Safe Councils, City of South Lake Tahoe, GDPUD, EID, Cameron Park CSD, EDCOE, Fire Prevention Districts, Fire Safe Councils, Other CSDs, and Other Special Districts	Moderate to High (varies by project)	Community Power Resiliency Allocation Program, EMPG, CALFIRE, FEMA HMA HMGP, SHSGP Grant Program	Safety and Security, Communications, Transportation, Water Systems	High	Ongoing	Annual Implementation
EDC-17	1,2,4	Wildfire	**Fuel Breaks in the Wildland Urban Interface (WUI).** The purpose of a Shaded Fuel Break within the WUI is to minimize destruction to communities from wildfire and to	El Dorado County	El Dorado County OWPR (Lead Agency, City of Placerville, Fire Agencies, Fire Safe	Moderate to High (varies by project)	Community Power Resiliency Allocation Program,	Safety and Security, Communications, Transportatio	High	Ongoing	Annual Implementation - Defensible Space Programs are ongoing throughout the County.

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			protect and enhance natural resources, watershed, and habitat of western El Dorado County. TheOWPR works with the EDCFSC County, State, and Federal agencies to identify areas within their jurisdictions to develop shaded fuel breaks to protect specific communities and watersheds within the WUI.		Councils, City of South Lake Tahoe, GDPUD, EID, Cameron Park CSD, EDCOE, Fire Prevention Districts, Fire Safe Councils, Other CSDs, and Other Special Districts		EMPG, CALFIRE, FEMA HMA HMGP, SHSGP Grant Program	n, Water Systems			
EDC-18	1,2,3,4,5	Subsidence	**Map and Assess Vulnerability to Subsidence.** Abandoned mines and culverts throughout the County, and primarily on the Western Slope, make El Dorado County vulnerable to subsidence.	El Dorado County	El Dorado County GIS Department (Lead Agency), City of Placerville, GDPUD, EID, Fire Prevention Districts, Fire Safe Councils, CSDs, Other Special Districts	Little to no cost	FEMA HMA HMGP Funds, DWR, USACE	Safety and Security, Water Systems	Low	Ongoing	Not Started.
EDC-19	1	Extreme Heat	**Water Hydrants and Tanks**. Many areas in the County lack water sources for firefighting. Install water sources in those areas lacking sources.	El Dorado County	El Dorado County OWPR Steering Committee (Lead Agency), Local Fire Agencies	Moderate	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIRE	Safety and Security	High	Annually	New in 2024.
EDC-20	1,2	Extreme Heat	**Heat Island Reduction.** Create greenspaces to mitigate effects of heat on schools, campuses, and community locations (libraries) identified for cooling centers.	El Dorado County (Lead Agency), EDCOE	County EPR EDCOE, County Planning	High	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIREState	Safety and Security	High	Long-Term	New in 2024

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EDC-21	1	Extreme Heat	**Extreme Heat Plan Revision.** Review and update heat response plan. .	El Dorado County, EDCOE	County Building and Planning Department, Long Range Planning (Lead Agency), Health and Human Services, Emergency Medical Services, Public Health Department	Moderate	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIRE, State	Safety and Security	High	Short-Term	New in 2024
EDC-22	1,2	Debris Flow and Landslide, Erosion, Flood	**Storm Drainage & Infrastructure Clearing During Winter Storm Events.** Every year due to rain and snow, multiple neighborhoods in the Meyers and along the Upper Truckee River flood. The clearing of snow increases this flooding because it creates walls of snow in the Lake Tahoe Region.	El Dorado County	El Dorado County, El Dorado County Water Agency (EDWA), County EPR, EDCOE, Lake Tahoe Unified School District	Very High	DWR and Cal OES Grants, Sierra Nevada Conservancy	Safety and Security	High	Long-Term	New in 2024
EDC-23	1,2,3	Flood, Debris Flow and Landslide, Erosion	**Reduce erosion and debris flows along Upper Canal**. Issue burned areas. Steep slopes. Unstable soils.	El Dorado County, GDPUD	El Dorado County DOT (Lead Agency), EDWA, County EPR	High	FEMA HMA HMGP, DWR	Safety and Security	High	Short-Term	New in 2024
EDC-24	1,2	Flood, Erosion	**Flood Mitigation. El Dorado Flooding**. Improve water diversion/shed.	El Dorado County	El Dorado County DOT (Lead Agency) CalTrans, EID, OES	Very High	FEMA HMGP, CDFG	Safety and Security	Medium	Long-Term	New in 2024.
EDC-25	1,2	Flooding, Debris Flow and Landslide, erosion	**Flooding Mitigation in Streams and Waterways**. Deer Creek in Cameron Park and Slate Creek in the Town of El Dorado both are limited in capacity to handle flood flows due to being filled in with sediment over time.	El Dorado County, Cameron Park CSD	El Dorado County OES (Lead Agency) Cameron Park CSD, County EDWA	Very High	FEMA HMA HMGP, DWR	Safety and Security, Water Systems	High	Long-Term	New in 2024.
EDC-26	1,2,4	Wildfire, Heavy Snow,	**Roadside Hazardous Vegetation and Road Surface Improvement.** Provide roadside clearance at	El Dorado County	County OWPR (Lead Agency), CalTrans, OES,	Moderate ($50-75 per house)	HMGP, CWMP, BRIC	Transportation	High	Long-Term	New in 2024.

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		Flood, Debris Flow and Landslide	identified critical roads (fire severity zones, one-way roads).		PG&E, Local Fire Agencies						
EDC-27	1, 2, 3, 4, 5	All Hazards	**Home Hardening/Ignition-Resistant Construction Retrofits.** Homes 20+ years old do not meet Chapter 7A building requirements. Actions include identifying number of homes, retrofitting homes, structures to meet requirements.	El Dorado County	County OPWR (Lead Agency), Local FDs, CALFIRE, FSCs, etc.	Very High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, Local budget, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety and Security	High	Medium-Term	New in 2024.
EDC-28	1, 2, 3, 4	Severe Weather	**Development and Implementation of a Common Operating Platform for Risk Assessment and Information.** A shared portal or platform for private utilities to communication companies to share risk information strategies and vulnerabilities. Integrate into overall county assessing priority planning mitigation.	El Dorado County	County OES(Lead Agency), CAL FIRE, USFS, RCDs, Liberty, PG&E, SMUD, AT&T	Moderate	Community Power Resiliency Allocation Program, FEMA EMPG, HMGP, FGMA Grants	Communications	High	Short-Term	New in 2024.
EDC-29	1, 2, 3, 4	Wildfire, All Hazards	**Permanent Generator Backup Power at County Libraries.** Install backup generators at all county libraries.	El Dorado County	County OES (Lead Agency), CAL FIRE, USFS, RCDs, Liberty, PG&E, SMUD, AT&T	Very High	El Dorado County General Fund, FEMA SHSGP, HMGP Grants, and potentially the EOC Grant Program	Safety and Security	Medium	Medium-Term	New in 2024.
EDC-30	1,2	Wildfire, Severe Weather:	**Establish a Backup Emergency Operations Center.** Current EOC is located in a high fire hazard	El Dorado County	El Dorado County OES (Lead Agency),	Very High	Community Power Resiliency	Communications	High	Long-Term	New in 2024.

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		Heavy Snow and Winter Storms	severity zone. No alternate EOC exists. EID facility is shown as an alternate site but is the City of Placerville's EOC site. West end of County is preferred.		Sacramento County		Allocation Program, EMPG, FEMA HMA HMGP, BRIC, SHSGP Grant Program				
EDC-31	1, 2, 3	Flood	**Storm Drainage & Flooding Master Plan.** Create a masterplan of flooding and drainage. Includes who is responsible for what role.	El Dorado County	EL Dorado County Building and Planning Department Long-Range Planning, County OES, County EPR (Lead Agency), Cities of Placerville and South Lake Tahoe, El Dorado County Office of Education, El Dorado Irrigation District, South Tahoe Public Utility District, Fire Prevention Districts, Fire Safe Councils, Georgetown Public Utility District, Community Service Districts and Other Special Districts	Very High ($5 Million)	CAL DWR, CAL OES, FEMA HMA, CAP, CTP, BRIC Grants, The Nature Conservancy, NOAA Grants.	Water Systems	Medium	Long-Term	New in 2024
EDC-32	1, 2, 4, 5	Wildfire, All Hazards	**Early Warning Systems for Evacuation Planning.** El Dorado County will continue to evaluate and improve early warning and notification systems to employ during evacuation events. They will partner with trusted organizations/leaders to relay	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	High	FEMA HMA HMGP	Safety and Security	High	Short-Term	New in 2024

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			information and communicate to the public when extreme conditions are forecasted in order to promote pre-evacuations for populations most in harm's way.								
EDC – 33	1, 3, 5	Wildfire, All Hazards	**Adapt Roadways to Support Evacuation.** The County will work towards adapting roadways to support partial and/or full contraflow during evacuation events consistent with findings and recommendations in traffic evacuation analysis and plans, such as the Greater Placerville Wildfire Evacuation Preparedness, Community Safety, and Resiliency Study and other relevant traffic evacuation studies that cover the unincorporated portions of the County. Projects may include lane widening, roundabouts, and optimizing signal timing to improve traffic flow.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services, EDCTC	High	FEMA HMA HMGP	Safety and Security	High	Medium-Term	New in 2024
EDC-34	1, 2,3, 4, 5	Wildfire, All Hazards	**Tabletop Exercises for Wildfire Evacuation.** Conduct tabletop exercises on a routine basis to improve agency coordination and identify how evacuation management strategies, such as phased evacuation zones and evacuation notification systems, can be implemented to improve traffic flow during an emergency.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services, ETCTC	High	FEMA HMA HMGP	Safety and Security	Medium	Medium-Term	New in 2024
EDC-35	1, 2, 3, 4, 5	Wildfire, All Hazards	**Support Community Resilience Centers.** Support bolstering capacity within neighborhoods or census tracts that have limited resources and prioritize the development of emergency resource centers or resilience hubs in underserved and	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	Moderate	FEMA HMA HMGP, BRIC	Safety and Security	High	Short-Term	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			at-risk areas with limited access to evacuation locations as well as emergency supplies and services.								
EDC-36	1, 2, 3, 4, 5	Wildfire, All Hazards	**Manage Evacuation Route and Location Demand during Emergencies.** Partner with housing services and other community-based organizations and entities to provide hotel vouchers to low-income and vulnerable communities that may be used during voluntary or mandatory evacuation events to address income-related barriers to evacuation and promote quicker evacuation response.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	High	General Fund, Potential Donation-Based System	Safety and Security	High	Short-Term	New in 2024.
CP-1	1, 2, 3, 4, 5	Flood	**Cameron Park Flood Management Plan.** Create a master plan or what flooding and drainage should look like amongst the community. Identify who is responsible for what. Include subdivisions, lakes, undersized drainage.	Cameron Park CSD	Cameron Park CSD (Lead Agency), County DOT, California Fish and Game, BLM, Private Property Owners	Very High	CAL DWR, CAL OES, FEMA HMA, CAP, CTP, BRIC Grants, The Nature Conservancy, NOAA Grants. Tax Payers, Stakeholders	Water Systems	High	Long-Term	New in 2024.
CP-2	1, 3, 5	Flooding, Erosion	**Flooding Mitigation in Streams and Waterways.** Deer Creek in Cameron Park and Slate Creek in the Town of El Dorado are both are limited in capacity to handle flood flows due to being filled in with sediment over time.	Cameron Park CSD	Cameron Park CSD (Lead Agency), County DOT, EDWA	Very High	FEMA HMGP, CDFG	Water Systems	High	Long-Term	New in 2024.
CP-3	1,3	Extreme Heat, Drought, Wildfire	**Achieve national recognition as a Firewise Community**. Enables benefits to residents with homeowner insurance policies.	Cameron Park CSD	County OWP (Lead Agency) Cameron Park CSD	Low, FEMA CAP, FMA Grants	Staff, General Fund	Safety and Security	Medium	Ongoing	New in 2024
CP-4	1,2	Flood, Drought, Extreme	**Implement Water Conservation Strategies in Parks and Facilities.**	Cameron Park CSD	County OES (Lead Agency), County Long Range Planning, CP CSD	Medium-High	Local CAL FIRE and Cal OES Grants, Sierra Nevada	Safety and Security	Medium	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
		Heat, Wildfire					Conservancy, CalEPA				
CP-5	1,2	Earthquake	**Earthquake Mitigation.** The District should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	Cameron Park CSD	District of District Engineering Department (Lead Agency), County Long Range Planning, County OES	high	FEMA HMA, HMGP, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024
CP-6	1,2	Flood	**Flood Reduction**. The District shall provide for channel improvements to and tree and brush clearance along watercourses in District to reduce flooding	Cameron Park CSD	District (Lead Agency), DWR	High	FEMA HMA, HMGP, BRIC, USACE	Safety and Security, Water Systems			
CP-7	1,2	Wildfire, Extreme Heat	**Home Hardening.** All new development in areas of high and extreme fire hazards shall be constructed with fire retardant roof coverings.	Cameron Park CSD	District Fire Dept. (Lead) County OPWR Agency), CALFIRE, FSCs, etc.	High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety a Security	Medium	Medium Term	New in 2024
CP-8	1,2,3	Earthquake, Land Subsidence, Landslide and Debris Flow	**Assessment of Critical Facilities.**	Cameron Park CSD	District Fire Dept. (Lead Agency), County Long Rang planning, County OES	Low	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	High	Medium Term	New in 2024
CP-9	1,2	Extreme Heat, Drought	**Extreme Weather Shelter.** - Develop plan for center to assist at-risk populations in Cameron Park during extreme weather events, including heavy rain, hail and lightning, high wind, and flood	Cameron Park CSD	District Fire Dept. (Lead Agency) County OES, County EPR	Medium	General Fund, FEMA CAP, CTP, FMA	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			events. Coordinate with regional plans for consistency.								
CP-10	1,2	Wildfire, Erosion and Flood	**Reduce the Vegetation throughout the Pine Hill Preserve on El Dorado County-Owned Land.** BLM owns the Pine Hill Preserve which is thick with vegetation. There are rare plant species on the Pine Hill Preserve, which protects the vegetation from being thinned out or maintained. EDC owns several parcels of land that not compliant with the County's Weed Abatement Ordinance and there is potential for extreme wildfire due to not managing vegetation.	Cameron Park CSD, El Dorado County	El Dorado EPR (Lead Agency) El Dorado County Irrigation District BLM, CPCSD	High (Up to $1M)	CAL HOME Program grants, SHSGP Grant, FEMA HMGP	Safety and Security	High	Long Term	New in 2024
CP-11	1,2,3	Erosion and Flood	**Cleaning the Sediment and Vegetation Growing in Deer Creek and Other Water Ways.** The majority of water ways in Cameron Park are filled up with vegetation and sediment. Deerk Creek is the main water was through Cameron Park. The CPCSD has Deer Creek and other water ways that flow throughout the park system. Creeks and drainage canals need to be cleaned out an maintained on a regular basis.	Cameron Park CSD	Land owner – CPCSD, EDDOT, BLM (Lead Agency) Property Owners.	High (up to $5M)	FEMA BRIC, Tax Assessment, County OES/EDWA, State OES.	Safety and Security. Waterways.	High	Medium Term	New in 2024
CP-12	1,2	Debris flow and landslide, Erosion, Flood, and Severe Weather: All.	**Dredging the Inlets to Cameron Park Lake**. Extreme flooding occurred in January of 2023. This caused an excess of sediment and material to build up in both inlets at Cameron Park Lake.	Cameron Park CSD	District Fire Dept (Lead Agency) Fish and Wildlife, EDWA	Medium ($40K)	FEMA BRIC,HMA, Local Operating Budget	Safety and Security, Water Systems	High	Short Terms. Fall of 2024 when the lake is at its lowest possible water level.	New in 2024

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GPU D-1	1, 2, 3, 4	Debris flow and Landslide, Erosion	**Reduce Erosion And Debris Flows** Along Upper Canal. Issue burned areas. Steep slopes. Unstable soils. Open water conveyance canals; Limit the amount of debris or sediment into the canal.	GDPUD	GDPUD (Lead Agency), County EDWA	Very High	CAL FIRE and Cal OES Grants, Sierra Nevada Conservancy	Water Systems	Medium	Short-Term	New in 2024.
GPU D-2	3, 4, 5	Extreme Heat, Drought	**Redundant Electrical Supply.** District has one supply for 210,000 customers. A second source would benefit the district in the event of failure.	GDPUD	GDPUD (Lead Agency), County EDWA	High	FEMA BRIC, CALFIRE	Water Systems	High	Medium-Term	New in 2024.
GPU D-3	1, 2, 4, 5	Wildfire	**Distribution System Protection.** Clear vegetation surrounds critical facilities (Treatment Plants/ Storage tanks).	GDPUD	District Staff (Lead Agency), County EDWA, Fire Safe Councils/Districts	High	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, BRIC, SHSGP Grant Program, HMGP, BRIC	Water Systems	High	Short-Term	New in 2024
GPU D-4	1,2	Dam Failure, Flood	**Annual Canal Lining Program.** Prioritized repair and lining of water conveyance canals and ditches.	GDPUD	GDPUD (Lead Agency), County Long Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $150,000.00. An additional $100,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPU D-5	1,2	Flood, Erosion, Severe Weather: all.	**Replace Pump Stations.** Replacement of aging pump stations.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $50,000.00. An additional $12,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPU D-6	1,3,4	Flood, Erosion, Severe Weather: all	**Sweetwater Treatment Plant Storage Tank.** Install a two million gallon storage tank adjacent to Sweetwater Treatment Plant.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County	High	GDPUD Funded: $3,000,000.	Water Systems	High	Ongoing	New in 2024

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					EPR, County EDWA						
GPU D-7	1,2	Flood, Erosion, Severe Weather: all, Extreme Heat, Wildfire	**Angel Camp Tank Recoating. Project.** Will clean and recoat Angel Camp Storage Tank to maintain high water quality.	El Dorado County, GDPUD	County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $366,800.00	Water Systems	High	Ongoing	New in 2024
GPU D-8	1,2,3	Flood, Erosion, Severe Weather: all	**Treated Water Line Replacement.** Projects will include treated water line replacements.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $300,000.0, An additional $50,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPU D-9	1,2,3,4		**Parshall Flume.** This project allocates $20,000 for the installation of Parshall Flumes along the raw water canal.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $20,000.00	Water Systems	High	Ongoing	New in 2024
GPU D-10	1,2	Flood, Erosion, Severe Weather: all	**Tunnel Hill Inspection and Lining.** Inspect Tunnel Hill raw water conveyance tunnel to access condition.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $65,000.00	Water Systems	High	Ongoing	New in 2024
GPU D-11	1,2	Flood, Erosion, Severe Weather: all	**Wastewater Lift Station Upgrade.** Upgrade wastewater lift station for increased capacity and replace worn out components.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $150,000	Safety and Security	High	Ongoing	New in 2024
GPU D-12	1,2	Dam Failure	**Mark Edson Dam Spillway Facility Rehabilitation and Mitigation.** Spillway underdrain is again and may need rehabilitation and mitigation. Spillway assessment identified the need to evaluate the	El Dorado County, GPUD	District Staff (Lead Agency County EDWA	High ($5M)	GPUD	Safety and Security, Water Systems	Low	Short Terms2026	New in 2024

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			spills underdrain system. Failure could threaten integrity of Dam.								
GPU D-13	1,2,3	Debris Flows, Severe Weather: All, Flood	**Debris Flows Mitigation Along Upper Canal**. Approximately 5-7 miles of the Districts upper canal is located within a high slope area that is threatened by debris flows. The debris flows and be contributed to longer term slope equilibrium process, water conveyance or weather events. Piping would protect the system from severe rain events. The water conveyance system along this area is the sole source for the Water District	El Dorado County, GPUD	District Staff (Lead Agency) County EDWA	High ($10-$20M)	FEMA HMGP, USDA, USBR, FEMA BRIC, Local funds	Safety and Security, Water Systems	High	Medium Term	New in 2024
GPU D-14	1,2	Drought, Extreme Heat, Wildfire, Flood	**Water Reliability.** The District relies on one supply to serve the community. Water reliability would include developing a second source to mitigate long-term droughts or extreme heat where supplies would be stressed. Additional supplies could be developed from a second reservoir or pumping facility.	El Dorado County, GPUD	District Staff (Lead Agency) County EDWA	High ($50-$100M)	FEMA BRIC, USDA, Local funds	Safety and Security, Hydration, Water Systems	High	Long Term (15-20 Years)	New in 2024
GPU D-15	1,3	Debris Flows, Flood, Severe Weather: All, Drought Extreme Heat, Wildfire	**Construct Rubicon River Diversion Conveyance System from South Fork Rubicon to Pilot Creek upstream of Stumpy Meadows Reservoir.** Anticipated drought resiliency benefits: This will construct a gravity diversion conveyance system from the South Fork of the Rubicon to Pilot Creek upstream of Stumpy Meadows Reservoir. It will require the Agency to negotiate with SMUD under the reopener provision of the El Dorado-SMUD Cooperation Agreement and would likely	El Dorado County, GPUD	District Staff	High	FEMA BRIC, SMUD, County EDWA	Safety and Security, Water Systems	High	Long Term	New in 2024

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			require payment to SMUD. This will provide water supply redundancy and improve water supply reliability, particularly during dry year conditions.								
GPU D-16	1,2	Earthquake	Earthquake Mitigation. The District should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	El Dorado County, GDPU	District Staff (Lead Agency) DWR	High	FEMA HMA, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024
EDC OE-1	1	Extreme Heat	**Heat Island Reduction.** Create greenspaces to mitigate effects of heat on schools, campuses, and community locations (libraries) identified for cooling centers.	El Dorado County, EDCOE	County OES (Lead Agency), EDCOE, County Planning	High	CAL FIRE and Cal OES Grants, FEMA BRIC Grant, Sierra Nevada Conservancy	Safety and Security	High	Ongoing	New in 2024
EDC OE-2	1,2	Extreme Heat	**Extreme Heat Plan Revision.** Review and update heat response plan.	El Dorado County, EDCOE	County EPR, County OES (Lead Agency) County Health and Human Services, County Emergency Medical Services, County Public Health Department	High	Staff, CAL FIRE and Cal OES Grants	Safety and Security	High	Ongoing	New in 2024
PL-1	1,2,3	Flood, Erosion	**Pierroz Road and Cold Springs Road Storm Drain Improvements.** Cold Springs Road connects to Pierroz Road just north of Placerville Drive and both roads have shown a need for storm drain system maintenance and improvements. The culvert that spans Hangtown Creek and	City of Placerville	City of Placerville Staff (Lead Agency), County Long Range Planning, County OES, County EPR	High	City of Placerville Funded: $25,000	Safety and Security	High	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			connects Pierroz Road to Placerville Drive has become scour critical as identified by the Bridge Inspection Report generated by Caltrans bi-annually. The City will evaluate the area, propose, and implement improvements to the storm drain system and related features along with any other necessary utility improvements and potential pavement improvements.								
PL-2	1,2,3	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Debbie Lane Storm Drain Maintenance.** Debbie Lane is a private road that receives public drainage from upstream culverts and roadways. During the storms of December 2022/January 2023, several deficiencies were identified in that system and will need to be addressed. The City will do a full assessment of the system and implement improvements to be completed in conjunction with the Placerville Drive Bicycle and Pedestrian Facility Improvements project, which includes a segment of work on Green Valley Road, adjacent to Debbie Lane.	El Dorado County, City of Placerville	City of Placerville Staff (Lead Agency), County Long range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $50,000	Safety and Security, Water Systems	High	Ongoing	New in 2024
Pl-3	1,23	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Wiltse Road Storm Drain Repair.** During the utility assessment of the Broadway Maintenance Project, segments of the storm drain system that crosses Broadway and continues down Wiltse Road were identified as deficient and in need of lining or replacement. The Broadway Maintenance project will soon go to construction and staff proposes to include improvements to the Wiltse Road storm drain	El Dorado County, City of Placerville	City of Placerville Staff (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $200,000	Safety and Security, Water Systems	High	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			system as it discharges into Hangtown Creek as part of that work and contract.								
PL-4	1,2,3	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Sacramento Street Waterline Relocation.** Recently, the City identified an existing water main that spans cross country, on privately owned parcels, and partially within easements. That water main was constructed in the early 1950s in between Chamberlain Street and Sacramento Street and that places the line near the end of its useful service life. Although there is no history of maintenance demands on this water main, in its present location, it is inaccessible and unmaintainable by the Public Works Department. This project proposes to construct a new water main in Sacramento Street by connecting to the recently constructed water main that was installed in the road in 2017 as part of the Pardi Way/Sacramento Street Water Main Replacement project.	El Dorado County, City of Placerville	City of Placerville, (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $25,000	Safety and Security, Water Systems	High	Ongoing	New in 2024
PL-5	1,2,3`	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather: Heavy Snow and Winter Storms	**Secondary Clarifier No. 1 Protective Coating.** The central mechanism of Secondary Clarifier No. 1 was replaced through the Secondary Clarifier No. 1 Mechanism Replacement project (CIP #42108) in 2022 just prior to the wet winter months that shortly followed. However, as the project progressed, the corrosion of the old mechanism was noted and coating the new mechanism with a	El Dorado County, City of Placerville	City of Placerville (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $130,000	Water Systems	High	Ongoing	New in 2024

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			protective coating is recommended.								
PL-6	1,2	Earthquake	**Earthquake Mitigation.** The City should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	City of Placerville	City of Placerville Engineering Department (Lead Agency), County Long Range Planning, County OES	high	FEMA HMA, HMGP, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024
PL-7	1,2	Flood	**Flood Reduction**. The City shall provide for channel improvements to and tree and brush clearance along watercourses in Placerville to reduce flooding	City of Placerville	City of Placerville Engineering Department (Lead Agency), DWR	High	FEMA HMA, HMGP, BRIC, USACE	Safety and Security, Water Systems	Medium	Medium Term	New in 2024
PL-8	1,2	Wildfire, Extreme Heat	**Home Hardening.** All new development in areas of high and extreme fire hazards shall be constructed with fire retardant roof coverings.	City of Placerville	City of Placerville DSD (Lead) County OPWR Agency), CALFIRE, FSCs, etc.	High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety a Security	Medium	Medium Term	New in 2024
PL-9	1,2,3	Earthquake, Land Subsidence, Landslide and Debris Flow	**Assessment of Critical Facilities**	City of Placerville	City of Placerville DSD (Lead Agency), County Long Rang planning, County OES	Low	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	High	Medium Term	New in 2024
PL-10	1,2	Extreme Heat, Drought	**Extreme Weather Shelter.** Develop plan for center to assist at-risk populations during extreme weather events. Coordinate with regional plans for consistency.	City of Placerville	City of Placerville Police (Lead Agency) County OES, County EPR	Medium	General Fund, FEMA CAP, CTP, FMA	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	New in 2024

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1 INTRODUCTION

1.1 PURPOSE OF PLAN

El Dorado County prepared this Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) update to the 2019 El Dorado County Local Hazard Mitigation Plan (LHMP) approved by the Federal Emergency Management Agency (FEMA). The purpose of this plan update is to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed, among other things, to ensure El Dorado County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities (BRIC) Grant Program), and the Flood Mitigation Assistance Grant Program (FMA).

1.2 HAZARD MITIGATION PLANNING

FEMA has determined that there is a critical link between hazard mitigation planning and sustainability. This means if El Dorado County has the foresight to plan ahead to reduce the impacts of hazards, the County will be better able to prevent injury, loss of life and damage to our homes, businesses, and neighborhoods. The County can use the threat of disaster as a catalyst to act and develop a plan so we can recover more quickly following a disaster.

El Dorado County and the four participating jurisdictions have committed to reducing long-term risk to their citizens and damage to property from the effects of natural hazards. By planning, preparing, and adopting a MJHMP, the County and each jurisdiction are taking a proactive approach to reduce or eliminate the impacts of hazards before they occur.

FEMA defines hazard mitigation as any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The County's plan will serve as a tool for learning from disasters that have already occurred, so they can deal with them more effectively and efficiently with less expenditure than in the past.

Direct benefits include:

- Reduced loss of life;
- Reduced loss of property and essential services;
- Reduced economic hardship;
- Reduced reconstruction costs;
- Increased cooperation and communication within the community through the planning process; and
- Expedited post-disaster funding.

Indirect benefits include:

- Disaster resilience;
- Environmental quality;
- Economic vitality; and
- Improved quality of life

1.3 FEDERAL REGULATORY FRAMEWORK

This plan update was prepared pursuant to the requirements and associated guidance of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that LHMPs must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the County is subject to many kinds of hazards, access to these programs is vital. As a result, the County and its participating jurisdictions must complete a comprehensive plan update every five years.

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

1.4 STATE AND LOCAL REGULATORY FRAMEWORK

The MJHMP was prepared consistent with the Health and Safety Element (Safety Element) of the County General Plan, as the planning effort covers common overlapping natural hazard issues and mutually reinforcing policies and implementation programs. The MJHMP and Safety Element are considered complimentary documents that address natural hazards, and both planning documents contain goals and project actions or implementation programs to enhance the County's mitigation efforts related to public safety.

California Government Code Section 65302.10, also referred to as Assembly Bill (AB) 2140 encourages California counties and cities to adopt their current, FEMA-approved LHMPs into the Safety Element of their General Plan. This adoption by reference or incorporation of the MJHMP into the Safety Element of the General Plan follows plan approval and makes the County and each participating jurisdiction eligible to be considered for part or all of its local-share costs on eligible public assistance funding to be provided by the State through the California Disaster Assistance Act (CDAA). The CDAA allows the State to pay up to 18.75% of the non-federal share that would otherwise fall upon a county, city, or local government to pay for public assistance projects. The legislature passed AB 2140 to provide additional funding after a disaster occurs. The local share is 25% of the total project cost; therefore, the legislation allows city, counties, and local governments that comply to be eligible for only the remaining local share (6.25%).

AB 2140 is an optional State incentive to help counties and cities become more resilient to natural hazards. Compliance with AB 2140 also expires when the MJHMP expires, and the County must re-adopt the plan into the Safety Element during update cycles to ensure continued compliance and funding eligibility. Additionally, each participating jurisdiction that is a municipality, like the City of Placerville in the County must adopt their annex into their own General Plan Safety Element, as the annex jurisdictions are not covered under the County's General Plan Safety Element adoption.

1.5 BACKGROUND AND SCOPE

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

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries (Multi-Hazard Mitigation Council 2019). This plan documents El Dorado County's hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability.

1.6 PLAN UPDATE

This plan underwent a comprehensive update in 2023-2024 in fulfillment of the five-year update requirement. Several factors underscore the need for this planning effort:

- El Dorado County is exposed to hazards that have caused past damage.
- Limited local resources make it difficult to be pre-emptive in reducing risk. Eligibility for federal financial assistance is paramount to promote successful hazard mitigation in the area.
- The County and its partners recognize the probability of certain future hazards is increasing and want to identify and implement mitigation actions that will address the needs of populations most vulnerable to these hazard impacts.
- The County and its partners participating in this plan want to be proactive in preparing for the probable impacts of natural hazards.

For the current plan update, the County completed the update as part of a multi-jurisdictional planning process in 2023-2024 to bring the MJHMP into compliance with recent legislation related to climate change probability, underserved and socially vulnerable populations, increased stakeholder engagement, and to address emerging concerns. The El Dorado County 2019 LHMP was approved by FEMA in March 2019, and adopted by the County on April 23, 2019.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The County planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

This MJHMP identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens. One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. FEMA encourages multi-jurisdictional planning under its guidance for the DMA. This plan will help guide and coordinate mitigation activities throughout the planning area. The plan was developed to meet the following objectives:

- Meet or exceed the requirements of the DMA.
- Enable all planning partners to use federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on El Dorado County hazards of concern.

- Update the risk assessment by evaluating the risk and vulnerability of people, property, critical facilities and infrastructure, natural and cultural resources, and future development from these hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the County and puts all partners on the same planning cycle for future updates.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are funded and implemented.

1.7 MULTI-JURISDICTIONAL PLANNING

All citizens and businesses of El Dorado County are the ultimate beneficiaries of this MJHMP. The plan reduces the risk for those who live in, work in, and visit the County. It also provides a viable planning framework for all foreseeable natural hazards that may impact the County. Participation in the development of the plan by key stakeholders in the County helps ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable Countywide, and the plan's goals and recommendations can lay the groundwork for the development and implementation of local mitigation activities and partnerships. Additionally, FEMA encourages multi-jurisdictional planning under its guidance for the DMA.

The El Dorado County 2024 MJHMP is a multi-jurisdictional plan that geographically covers people, property, and critical assets within the County's jurisdictional boundaries (hereinafter referred to as the planning area). Unincorporated El Dorado County and the following jurisdictions participated in the 2023-2024 update planning process:

- El Dorado County
- City of Placerville
- Cameron Park Community Services District
- El Dorado County Office of Education
- Georgetown Divide Public Utilities District

1.8 PLAN ORGANIZATION

The sections that comprise the County's MJHMP include:

Executive Summary – This section includes the executive summary of the MJHMP and addresses the formal adoption of the plan by each governing body to demonstrate the commitment of the community and elected officials to the County's goal of becoming disaster-resistant.

Section 1: Introduction – This section describes the purpose of the MJHMP update, the benefits of hazard mitigation planning, the federal and State regulatory requirements, and the background of the County's hazard mitigation planning process.

Section 2: Community Profile and Capability Assessment – This section provides the history and background of the County, including population trends and the demographic and economic conditions that have shaped the area. This section also includes the County's capability assessment. This section was previously incorporated into the introduction in the 2019 MJHMP.

Section 3: Planning Process – This section identifies the planning process, the HMPC members, the meetings held as part of the planning process, documents the outreach efforts, and the review and incorporation of existing plans, reports, and other appropriate information. It also summarizes how stakeholders were invited to participate in the process, and how they provided feedback during the development of the plan.

Section 4: Hazard Identification, Risk Assessment (HIRA), and Consequence Analysis –This section describes the process through which the HMPC and our local partners identified, screened, and selected the hazards to be profiled. The hazard analysis includes the description, location, extent, and probability of future events for each hazard. This section also includes a Vulnerability Assessment. The Vulnerability Assessment covers all hazards and considers the impact on the following assets: people; property; critical facilities and lifelines; economy; cultural, historic, and natural resources; and future development trends.

Section 5: Mitigation Strategy – The mitigation strategy section provides a plan for reducing the potential losses identified in the vulnerability analysis. Mitigation goals and potential actions to minimize the risks and losses associated with each hazard will be described along with a strategy for implementation.

Section 6: Plan Adoption, Implementation, and Maintenance – This section includes the plan adoption documentation and describes the method and schedule for monitoring, evaluating, and updating the plan to ensure it remains an active and applicable document.

Section 7: References – This section lists the sources cited in the plan.

Appendices

- Appendix A: Hazard Mitigation Planning Committee
- Appendix B: Planning Process Documentation
- Appendix C: Approval and Adoption Documentation
- Appendix D: Mitigation Categories and Alternatives
- Appendix E: Annual Progress Meeting Agenda and Report Template

Annexes

- Annex A: City of Placerville
- Annex B: El Dorado County Office of Education
- Annex C: Cameron Park Community Services District
- Annex D: Georgetown Divide Public Utilities District

2 COMMUNITY PROFILE AND CAPABILITY ASSESSMENT

Requirements §201.6(b) and §201.6(c)(1):

An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1. *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.*
2. *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and*
3. *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

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

2.1 HISTORY

The history of what is now El Dorado County is deeply rooted in the ancestral lands of the Miwok, Maidu, and Washoe tribes. The southwestern portion of the County was divided between the Miwok and Maidu tribes, with the Maidu occupying vast territories to the north, stretching from the Nevada state line over the mountains into the foothills of what is now El Dorado County, while the Miwok settled to the south along the Pacific coast. The Central Sierra Maidu arrived in the region between 2000 and 600 years ago.

The Shingle Springs Band of Miwok Indians, descendants of the Miwok and Southern Maidu "Nisenan" Indians, once inhabited California's central valley, eventually relocating to what is now the Shingle Springs Rancheria in the early 1900s. Despite enduring hardships, they have thrived, with the Rancheria expanding from its original 160 acres to nearly 1,000 acres.

The Washoe tribe's ancestral territory spanned across California and Nevada, extending over the Sierra Nevada range. By 1862, they had been stripped of all of their land, although they later received some allotments under the General Allotment Act of 1887. Presently, the Washoe tribe actively lobbies for land around the Lake Tahoe Basin and collaborates with various agencies and private landowners to protect sacred sites.

The most visible remnants of the County's past are found in its Gold Rush Era buildings and artifacts dating from 1848, however the County's rich heritage also is well-grounded in its lumber, railroad, and transportation development past. With this rich heritage, the County is, like many Central Sierra counties, home to numerous resources which are both concentrated along old, historic Main Streets and scattered throughout the hills, valleys, mountains, and waterways of the County's public and private lands.

2.2 GEOGRAPHY AND CLIMATE

El Dorado County is located in northern California and stretches from Sacramento County to Lake Tahoe and the Nevada border. The County spans the eastern part of the Central Valley of California, increasing in elevation from urban western El Dorado to the High Sierras of South Lake Tahoe, and the Nevada state line. Located on an area of over 1,786 square miles, 78 square miles of which are comprised of water, the County is generally divided into two geographically distinct areas: the West Slope – El Dorado Hills to Strawberry and the East Slope – Strawberry to South Lake Tahoe.

The County's topography is characterized by sweeping foothills areas, high mountains (Sierra Nevada) and the South Lake Tahoe Basin. Elevations range from 700 feet above mean sea level to more than 10,800 feet in the Sierra Nevada. Water resources within El Dorado County include the American River, Lake Tahoe, and several mountain lakes.

The climate varies throughout the County, primarily based on elevation. Summers are longer, relatively hot, and dry in the lower elevations and are relatively cooler in the higher elevations of the Sierra Nevada. There is little precipitation in the County during the summer. Winters in the lower elevations are shorter and precipitation is primarily in the form of rain. In the higher elevations of the Sierra Nevada, winters vary from short and mild with moderate snowfall to moderately severe with frequent snowfall. Most of the seasonal precipitation throughout the County occurs between October and April. More specific information about El Dorado County's climate can be found in the risk assessment in Chapter 4.

The counties of Sacramento, Placer, Amador, and Alpine border El Dorado County. El Dorado County includes the incorporated cities of Placerville and South Lake Tahoe and the unincorporated communities of Cameron Park, El Dorado Hills, Shingle Springs and Pollock Pines. El Dorado County is illustrated in Figure 2-1.

2.3 LAND OWNERSHIP

Large swaths of the County are designated as public land, with the Eldorado National Forest alone covering approximately 43% of its total acreage, predominantly on the Western Slope. Additionally, a significant portion of the Tahoe Basin comprises federally owned land managed by the U.S. Forest Service's (USFS) Lake Tahoe Basin Management Unit (LTBMU), as illustrated in Figure 2-2. The State of California also holds ownership of additional land, overseen by various entities including the California Department of Fish and Wildlife, California State Parks, California State Lands Commission, and the California Tahoe Conservancy.

Figure 2-1 El Dorado County Planning Area

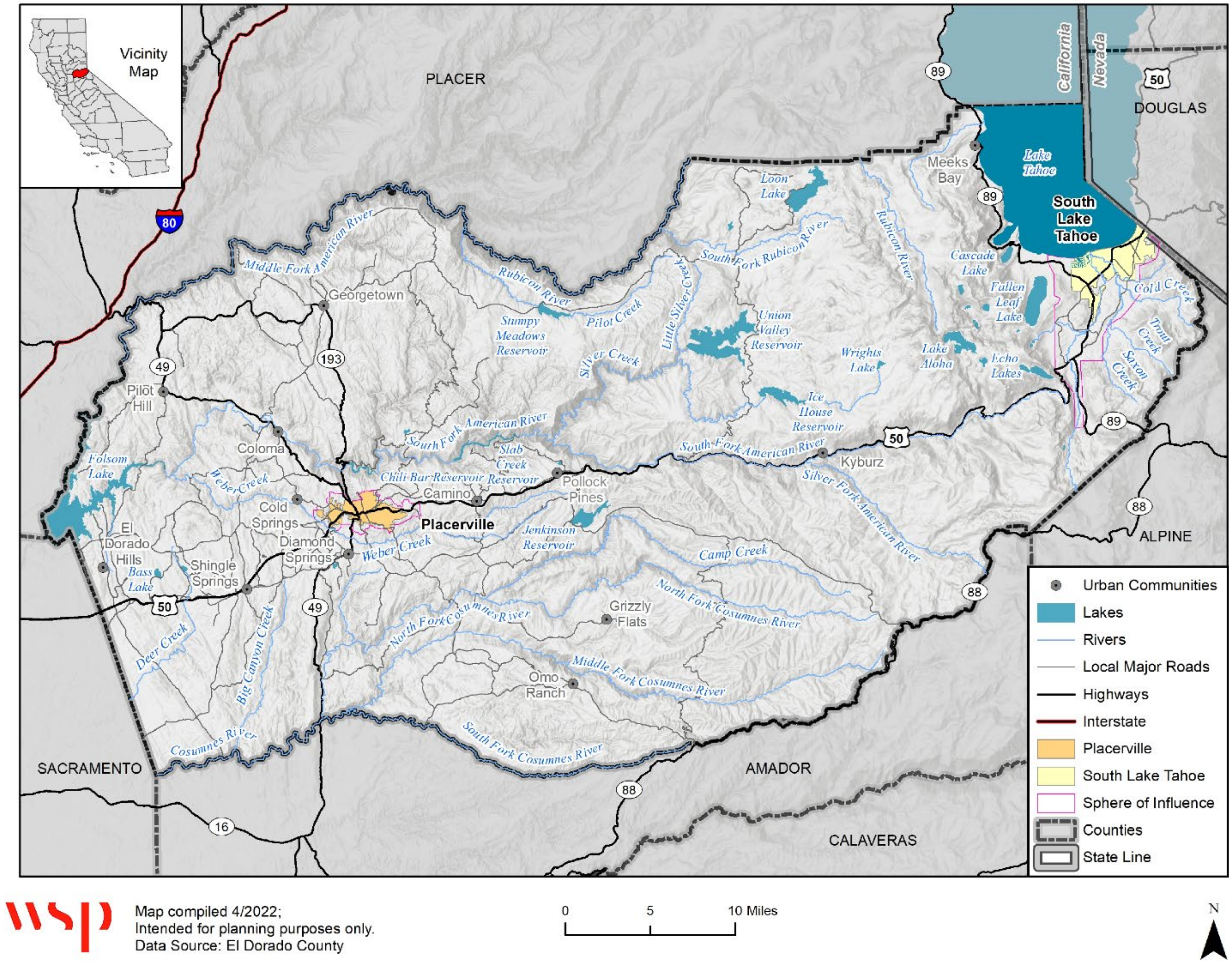
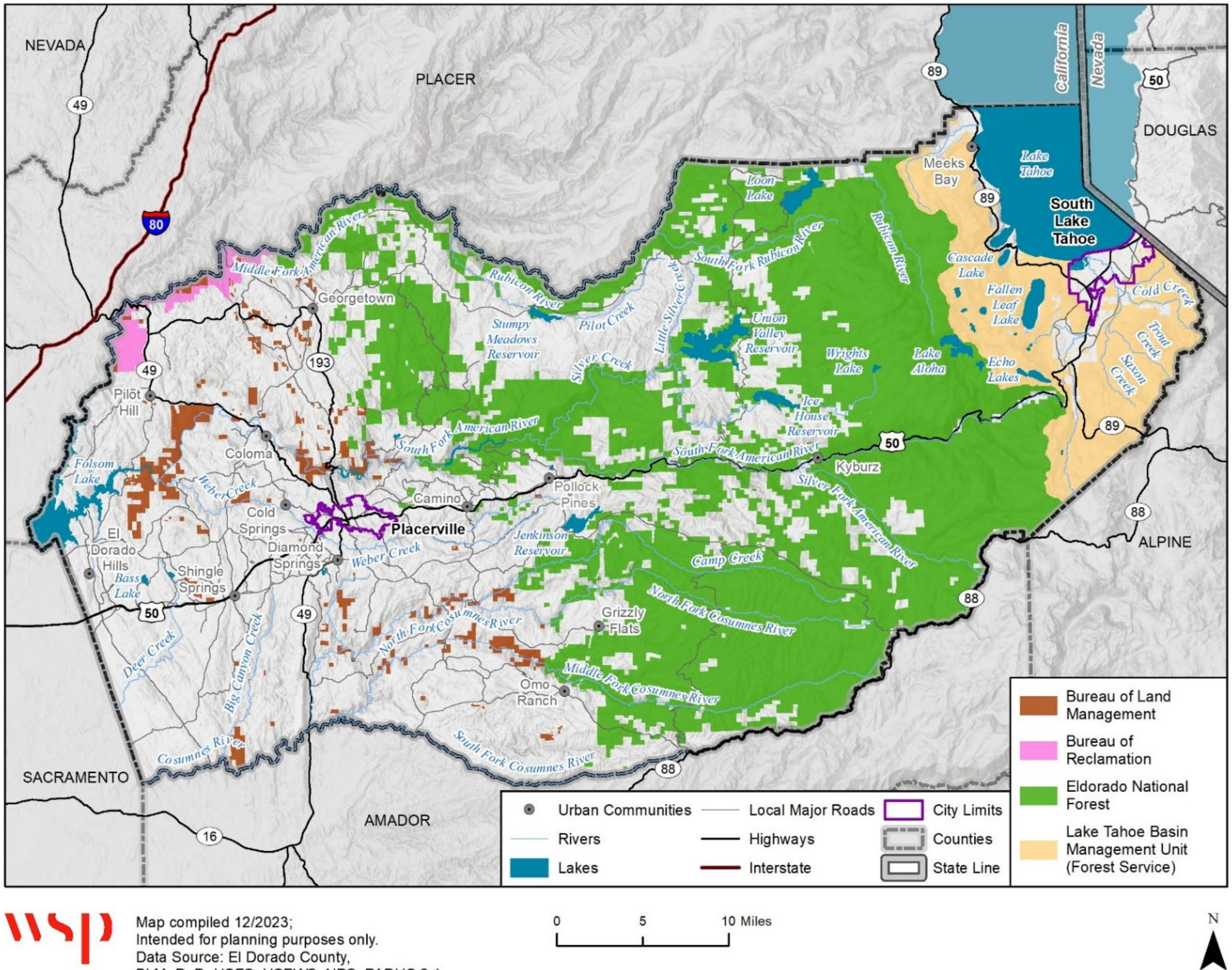


Figure 2-2 El Dorado County Federal Land Ownership



wsp

Map compiled 12/2023;
Intended for planning purposes only.
Data Source: El Dorado County,
BLM, DoD, USFS, USFWS, NPS, PADUS 2.1

2.4 TRANSPORTATION SYSTEM

The County's transportation network encompasses a regional roadway system, public transit, non-motorized paths, and aviation facilities. U.S. Highway 50 serves as the primary corridor, linking Sacramento County to Nevada, connecting major population centers like El Dorado Hills, Cameron Park, Diamond Springs, and Camino, along with the two cities in the County. The regional road system includes State Routes (SRs) 49, 89, 153, and 193, along with various local roads. All major roadways are shown in Figure 2-1.

Public transportation is managed by the El Dorado County Transit Authority in the West Slope and the Tahoe Transportation District in the Tahoe Basin. The unincorporated County also offers additional transit options such as Amtrak, taxi services, and carpool/vanpool services.

Despite the presence of regional bikeways and trails, non-motorized transportation is primarily recreational due to low-density development and limited investment in pedestrian and bicycle infrastructure. The County hosts four public and government-utilized general aviation airports: Placerville Airport, Lake Tahoe Airport, Cameron Park Airport, and Georgetown Airport.

2.5 ECONOMY

According to the California Employment Development Department, El Dorado County's economy heavily relies on recreation and tourism, with the Eldorado National Forest, the Sierra Nevada Mountains, the south fork of the American River, and Lake Tahoe serving as key natural attractions. As part of the rapidly growing Sacramento Region, the County boasts a diverse economy highlighted by major sectors such as Health & Social Services, Accommodation & Food Services, Retail Trade, and Construction.

The most common industries in the County are educational and healthcare services, making up a combined 20% of the workforce. Additional key sectors include professional, scientific, and management services, as well as arts, entertainment, recreation, and accommodation and food services, as detailed in Table 2-1 based on estimates from the 2018-2022 5-Year ACS.

Table 2-1 El Dorado County Employment by Industry Sector, 2018-2022

INDUSTRY SECTOR	POPULATION EMPLOYED	PERCENT OF WORKFORCE
Agriculture, forestry, fishing and hunting, and mining	1,451	1.6%
Construction	7,473	8.5%
Manufacturing	5,486	6.2%
Wholesale trade	1,382	1.6%
Retail trade	8,401	9.6%
Transportation and warehousing, and utilities	3,349	3.8%
Information	1,461	1.7%
Finance and insurance, and real estate and rental and leasing	6,696	7.6%
Professional, scientific, and management, and administrative and waste management services	12,356	14.0%
Educational services, and health care and social assistance	17,623	20.0%
Arts, entertainment, and recreation, and accommodation and food services	11,514	13.1%
Other services, except public administration	4,553	5.2%
Public administration	6214	7.1%
Total	87,959	100%

Source: U.S. Census Bureau ACS 2018-2022 5-Year Estimates, www.data.census.gov/

*Excludes armed forces

2.6 POPULATION AND HOUSING CHARACTERISTICS

The total population of the County in 2022 was 191,713, up from 186,661 people in 2018, as shown in Table 2-2. This is equal to a 2.7% increase in population, primarily in the unincorporated County. Increases in population growth increases exposure to severe weather-related hazards, as well as earthquakes and wildfire. This increase in growth also puts more demand on water resources and can increase vulnerability to drought.

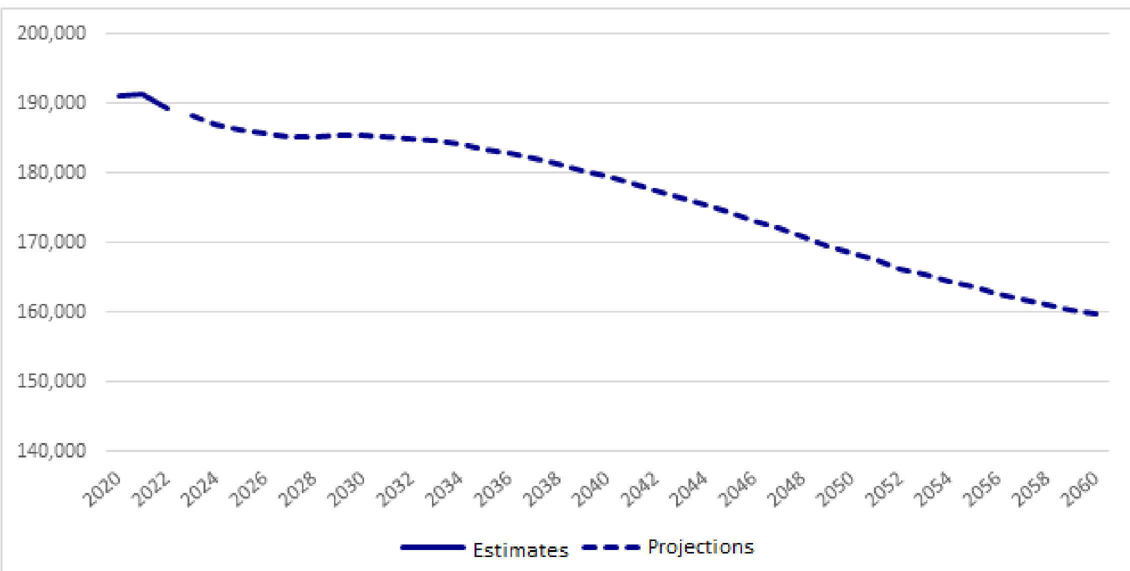
Table 2-2 El Dorado County Population Counts

JURISDICTION	2018	2022	% CHANGE
Placerville	10,860	10,744	-1.1%
South Lake Tahoe	21,814	21,346	-2.1%
El Dorado County	186,661	191,713	2.7%

Source: U.S. Census Bureau ACS 2018, 2022 5-Year Estimates, www.data.census.gov

According to the Department of Finance (DOF), the 2020 population of the County was estimated to be 191,032 (DOF 2023). The DOF projects the total population will decrease by 2.9% to 185,434 by 2030, as shown in Figure 2-3.

Figure 2-3 El Dorado County Observed and Projected Population (2020 – 2060)



Source: DOF 2024; www.dof.ca.gov

Select demographic and social characteristics for the County from the 2018-2022 ACS and the California Department of Finance (DOF) are shown in Table 2-3.

Table 2-3 El Dorado County Demographic and Social Characteristics, 2018-2022

CHARACTERISTIC	PERCENTAGE
Gender/Age	
Male	50.1%
Female	49.9%
Median age (years)	46.2
Under 5 years	4.5%
Under 18 years	19.7%
65 years and over	22.2%
Race/Ethnicity	

CHARACTERISTIC	PERCENTAGE
White	75.5%
Asian	4.9%
Black or African American	0.7%
American Indian/Alaska Native	0.3%
Hispanic or Latino (of any race)	13.5%
Native Hawaiian and Other Pacific Islander	0.2%
Some other race	0.4%
Two or more races	4.5%
Education*	
% High school graduate or higher	94.7%
% with bachelor's degree or higher	38.0%
Social Vulnerability	
% with Disability	12.3%
% Language other than English spoken at home	11.7%
% Speak English less than "Very Well"	3.6%
% of households with a computer	95.4%
% of households with an Internet subscription	91.8%
% of households with no vehicle available	3.8%

Source: U.S. Census Bureau ACS 2018-2022 5-Year Estimates, www.data.census.gov/
* Population 25 years and over

Table 2-4 summarizes information from the Census Bureau related to housing occupancy in the County.

Table 2-4 El Dorado County Housing Occupancy and Units, 2018-2022

HOUSING CHARACTERISTIC	ESTIMATE	PERCENTAGE
Housing Occupancy		
Total Housing Units	93,679	100%
Units Occupied	75,190	80.3%
Vacant	18,489	19.7%
Housing Units		
1-unit detached	74,590	79.6%
1-unit attached	2,426	2.6%
2 units	1,627	1.7%
3 or 4 units	3,050	3.3%
5-9 units	2,490	2.7%
10-19 units	1,728	1.8%
20 or more units	2,429	2.6%
Mobile Home	5,166	5.5%
Boat, RV, van etc.	173	0.2%
Housing Tenure		
Owner Occupied	57,235	76.1%
Renter Occupied	17,955	23.9%

Source: U.S. Census Bureau ACS 2017-2021 5-Year Estimates, www.data.census.gov/

Table 2-5 details economic characteristics related to social vulnerability in the County. Refer to the County's Climate Vulnerability Assessment (CVA) for detailed information on other indicators that represent social vulnerability in the County.

Table 2-5 El Dorado County Economic Characteristics, 2018-2022

CHARACTERISTIC	EL DORADO COUNTY
Families below Poverty Level (%)	5.9%

CHARACTERISTIC	EL DORADO COUNTY
All People below Poverty Level (%)	8.6%
Median Family Income	$122,465
Median Household Income	$99,246
Per Capita Income	$55,455
Population in Labor Force	58.2%
Population Employed*	55.3%
Unemployment Rate**	2.7%

Source: U.S. Census Bureau ACS 2018-2022 5-Year Estimates, www.census.gov/

*Excludes armed forces.

2.7 NATURAL AND RECREATION RESOURCES

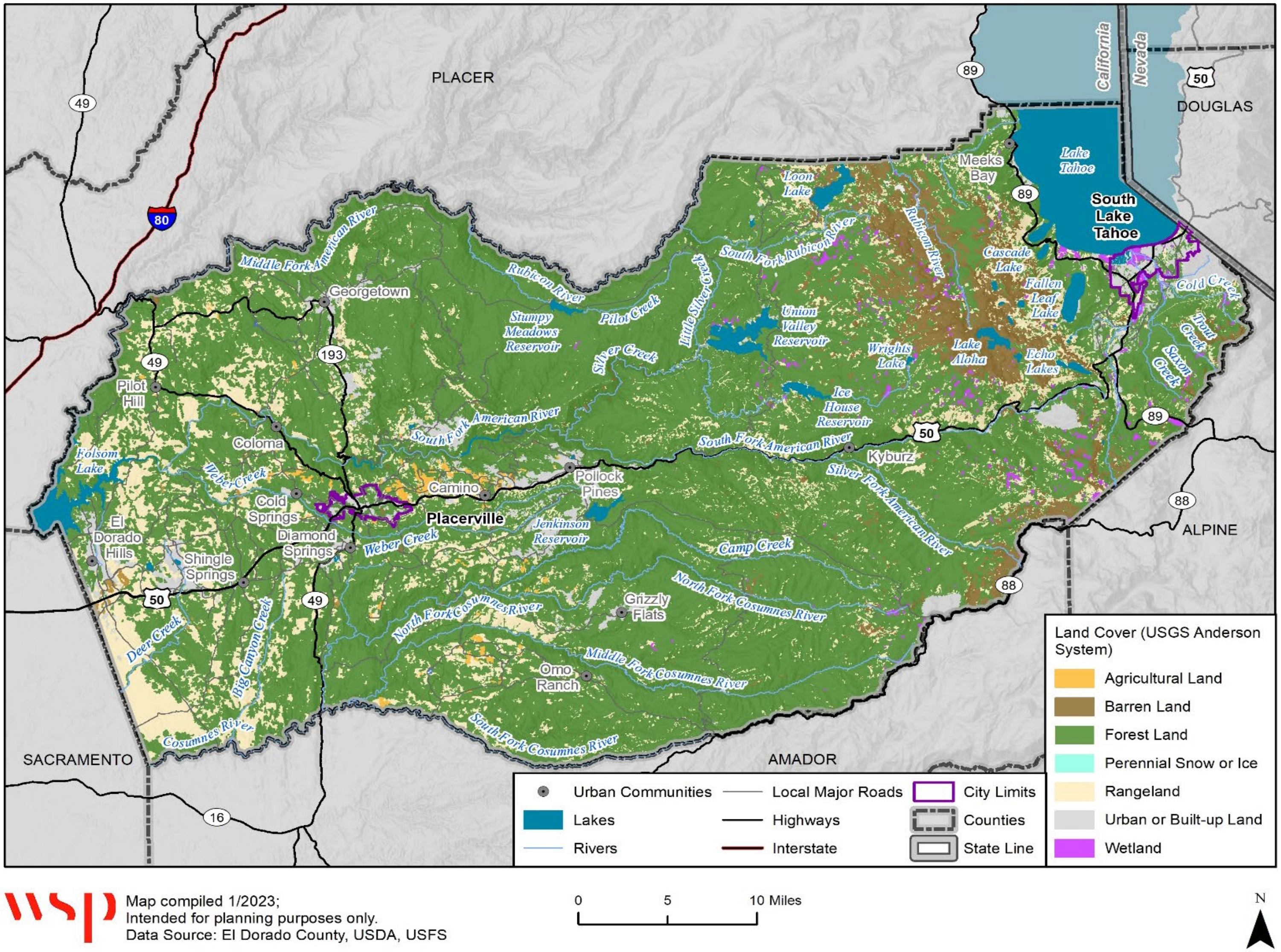
Nearly half of the County, totaling about 460,000 acres, is covered by the Eldorado National Forest. This vital resource regulates and supplies water from upper watersheds and meadows, contributing over 527 billion gallons annually to downstream systems—enough to meet California's drinking water needs for over 45 years. The forest attracts over 898,000 annual visitors, generating an estimated $116.3 million for the local economy through activities like camping, hiking, fishing, and hunting (USDA, 2018). Timber harvesting in the forest serves both fire prevention and sustainable timber and biomass production.

Lake Tahoe, a significant portion of which lies within the County, is the largest freshwater lake in California. Renowned for its clear waters and outdoor activities, it holds about 39 trillion gallons of water and draws an estimated 15 million visitors annually (Tahoe Fund, n.d.). Folsom Lake State Recreation Area, spanning 19,500 acres, includes Folsom Lake and Lake Natoma, created as part of the Central Valley Project. These reservoirs offer flood protection, drinking water, hydroelectric power, and recreation opportunities.

The County hosts three Resource Conservation Districts (RCDs): Tahoe RCD, Georgetown Divide RCD, and El Dorado RCD. These districts, operating as special entities, focus on conservation solutions through local leadership. The Tahoe RCD addresses various aspects in the Tahoe Basin, spanning 236 square miles. Georgetown Divide RCD covers almost 540 square miles in the northern County, while El Dorado RCD manages the remaining 340 square miles, jointly aiming to enhance the County's quality of life through effective natural resource management.

Other notable natural and recreational resources include the American River, Marshall Gold Discovery State Historic Park, and Sly Park Reservoir. The County's diverse terrain encompasses aquatic, wetland, riparian, oak woodland, grassland, shrublands, and mixed conifer forests, as illustrated in Figure 2-4.

Figure 2-4 El Dorado County Land Coverage



Map compiled 1/2023;
Intended for planning purposes only.
Data Source: El Dorado County, USDA, USFS

2.8 COUNTY MITIGATION CAPABILITIES

The following section assesses the County's and each participating jurisdiction's existing capabilities to pursue hazard mitigation. The capability assessment analyzes capabilities that can be leveraged to mitigate hazards. Combining the risk assessment with the mitigation capability assessment results in the County's net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County and jurisdictions. First, an inventory of common mitigation activities was made using a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This assessment is divided into four sections: regulatory mitigation capabilities; administrative and technical mitigation capabilities; fiscal mitigation capabilities; and mitigation outreach and partnerships. Additional information on jurisdiction capabilities can also be found in the participating jurisdictions' annexes.

2.8.1 Regulatory Mitigation Capabilities

The regulatory and planning capabilities listed in Table 2-6 outline planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicate those that are in place in the County.

Table 2-6 Regulatory Mitigation Capabilities

REGULATORY TOOL (ORDINANCES, CODES, PLANS)	YES/NO	COMMENTS
General plan	Yes	Current Safety Element update expected to be finalized spring 2024
Zoning ordinance	Yes	County Zoning Ordinance (Title 130)*
Subdivision ordinance	Yes	County Subdivision Ordinance (Title 120)*
Growth management ordinance	No	None
Floodplain ordinance	Yes	Flood Damage Prevention Chapter 130.32
Other special purpose ordinance (storm water, steep slope, wildfire)	Yes	Ordinances for avalanche, dam failure, airport safety, hillside development, and noise*
Building code	Yes	2022 California Building Standards Code
Fire department ISO rating	3/3x	
Erosion or sediment control	Yes	
Storm water management program	Yes	El Dorado County Storm Water Management Program
Site plan review requirements	Yes	Site plan review requirements are included on Site Plan/Plot Plan/Grading Requirements document for building permit and grading permit applications here. Site plan review requirements are included on Planning project and permit applications here.
Capital improvements plan	Yes	County Department of Transportation 2023 Plan https://www.edcgov.us/Government/dot/Pages/cip.aspx
Economic development plan	No	To be completed by early 2025

REGULATORY TOOL (ORDINANCES, CODES, PLANS)	YES/NO	COMMENTS
Local EOP	Yes	2023 Emergency Operations Plan
Flood insurance study or other engineering study for streams	Yes, 2012	Flood Insurance Study for El Dorado County, CA and Incorporated Areas, Revised April 3, 2012; FEMA Flood Insurance Study Number 06017CV000B
Elevation certificates	Yes	

Source: Hazard Mitigation Planning Committee

Code of Ordinances located here: https://library.municode.com/ca/el_dorado_county/codes/code_of_ordinances

2.8.1.1 Related Plans and Regulations

2004 El Dorado County General Plan

State law mandates that each county establish and uphold a comprehensive development framework, commonly known as a General Plan. Serving as the fundamental planning document, the General Plan is the County's tool for navigating and balancing the diverse interests and needs of its residents. The guiding vision for the County's General Plan aims to strategically steer growth and adopt measures to address and alleviate traffic-related challenges with the aim of fostering the creation and sustenance of high quality neighborhoods. On July 19, 2004, the El Dorado County Board of Supervisors adopted a new General Plan for the County. The last amendment for the General Plan was December 10, 2019. To put the General Plan into action, the County has initiated the adoption of ordinances, resolutions, and the approval of various programs

The County's General Plan includes the six mandatory elements: the Land Use Element, Circulation Element, Public Health, Safety, and Noise Element (which combines the required Safety and Noise Elements), Open Space Element, and Housing Element. The General Plan also has a Public Services and Utilities Element, an Agriculture and Forestry Element, a Parks and Recreation Element, and an Economic Development Element.

Public Health, Safety, and Noise Element

The Public Health, Safety, and Noise Element ("Safety Element") aims to mitigate long-term risks to people and property from natural or man-made hazards. It addresses community health and safety issues for residents living within the County. Focusing on land use decisions and development patterns, it safeguards residents' well-being, and property protection. While the Land Use Element identifies hazardous land use areas, the Health and Safety Element sets policies for acceptable public risk levels and mitigating the effects of catastrophes. The natural hazards discussed in the Health and Safety Element include:

- Fire Safety
- Geologic and Seismic Hazards;
- Flood Hazards
- Noise
- Air Quality
- Drought and Water Supply
- Evacuation Accessibility
- Agriculture and Forestry Disease and Tree Mortality
- Extreme Heat
- Human Health Hazards
- High Wind
- Severe Weather
- Climate Adaptation and Resiliency

Additionally, the Safety Element covers hazardous materials, aviation-related hazards, and highway safety. The 2024 update to the Safety Element incorporates by reference both the County's 2019 LHMP and the 2023 MJHMP update.

El Dorado County Emergency Operations Plan

The purpose of the County Emergency Operations Plan (EOP) is to provide the basis for a coordinated response before, during and after a disaster incident. This plan was last updated in 2023 and is the principal guide for the County's response to and management of real or potential emergencies and disasters occurring within its designated geographic boundaries. Specifically, this plan is intended to:

- Facilitate multi-jurisdictional and interagency coordination in emergency operations, particularly between local government, private sector, operational area (geographic county boundary), State response levels, and appropriate Federal agencies.
- Serve as a County plan, a reference document, and when possible, may be used for pre-emergency planning in addition to emergency operations.
- To be utilized in coordination with applicable local, State, and federal contingency plans.
- Identify the components of an Emergency Management Organization (EMO), and establish associated protocols required to effectively respond to, manage and recover from major emergencies and/or disasters.
- Establish the operational concepts and procedures associated with field response to emergencies, and Emergency Operations Center (EOC) activities.
- Establish the organizational framework of the California Standardized Emergency Management System (SEMS), and the National Incident Management System (NIMS).

Tahoe Bain Community Wildfire Protection Plan (CWPP)

The Lake Tahoe Basin Community Wildfire Protection Plan (CWPP) is being updated to reflect the needs of local communities around the basin. It was last updated in 2015. Funded by the California Tahoe Conservancy (CTC), the update is a collaborative effort between federal, State, and local agencies, along with community stakeholders, to reduce the risk of catastrophic wildfires in our area. The purpose of the CWPP update is to ensure that the plan remains current and reflects the changing conditions and needs of our community. It will incorporate the latest technology and best practices for wildfire management and prevention, as well as the input and feedback of community members. CWPPs are essential as they help reduce the risk of catastrophic wildfires and increase the resilience of communities.

Western El Dorado County CWPP

The El Dorado County Office of Wildfire Preparedness and Resilience (OWPR) is updating the current CWPP to eliminate geographic gaps, validate crucial infrastructure at risk, address omissions or conflicts related to other planning documents, compliment the Tahoe Basin CWPP initiatives, and meet the requirements of the Healthy Forests Restoration Act. The Western El Dorado County CWPP is intended to be a dynamic document initiated at a grass roots level that engages local fire safe councils, Firewise Communities, and other locally led fire-safe initiatives.

California State Hazard Mitigation Plan

The California Governor's Office of Emergency Services (Cal OES) has officially adopted the 2023 California Enhanced State Hazard Mitigation Plan (ESHMP). This comprehensive plan meticulously details historical and current hazards in California, presenting strategies and actions to effectively address them. The active ESHMP not only enables California to qualify for federal grant and disaster funding for recovery efforts but also signifies the State's commitment to long-term risk reduction and resilient community development. The Enhanced State Hazard

Mitigation Plan also grants California eligibility for a higher percentage of Hazard Mitigation Grant Program funding from the federal government.

The 2023 ESHMP includes a strong focus on equity, ensuring hazard impact analyses prioritize equity priority communities. Additionally, all hazard profiles incorporate discussions on the potential impacts of climate change. A noteworthy change is the organization of hazards based on a new impact rating score, considering factors like probability of occurrence, impact on communities, and overall risk. The plan is thoughtfully structured with clear organization and plain language to enhance accessibility and readability for agency stakeholders, local jurisdictions, and the public.

Additional Plans

The County has numerous other plans, programs, and procedures in place that support hazard mitigation, public health and safety, hazardous materials management, and emergency operations. Related partner agency plans were also reviewed to inform the MJHMP to update risk assessment and mitigation strategies based on public availability, as they relate to flooding, drought and water supply events, as well as agricultural pests and disease. These plans are listed below.

- El Dorado County 2019 LHMP
- El Dorado County 2023 Strategic Plan
- El Dorado County Building Code
- El Dorado County Department of Transportation Capital Improvements Plan
- El Dorado County Hazardous Vegetation and Defensible Space Ordinance
- El Dorado County Parks and Trails Master Plan
- El Dorado Irrigation District (EID) 2020 Urban Water Management Plan (UWMP)
- American Red Cross Emergency Plan
- California's Fourth Climate Change Assessment
- City of Placerville Emergency Operations Plan
- City of South Lake Tahoe Emergency Operations Plan
- County Land Use Ordinances and Subdivision Regulations
- Georgetown Divide Public Utility District 2023 UWMP
- Reclamation Emergency Action Plan (EAP)
- Safeguarding California Plan: California Climate Adaptation Strategy
- School Emergency Operations Plans
- Special District Emergency Response Plans
- Tahoe City Public Utility District (TCPUD) 2020 UWMP
- Terrorism Response Plan
- The South Tahoe Public Utility District (STPUD) 2021 UWMP

2.8.2 Administrative and Technical Mitigation Capabilities

Table 2-7 below identifies the County personnel responsible for activities related to mitigation and loss prevention. A summary of technical resources follows.

Table 2-7 El Dorado County Administrative and Technical Mitigation Capabilities

PERSONNEL RESOURCES	YES/NO	DEPARTMENT/POSITION
Emergency manager	Yes	El Dorado County Sheriff's Office / OES
Floodplain manager/Floodplain administrator	Yes	Building and Planning Services
Community planning:		
– Planner/engineer with knowledge of land development/land management practices	Yes	Building and Planning Services

PERSONNEL RESOURCES	YES/NO	DEPARTMENT/POSITION
– Planner/engineer/scientist with an understanding of natural hazards	Yes	Environmental Management
– Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Building and Planning Services
–Resiliency planner	Yes	Building and Planning Services
–Transportation planner	Yes	Department of Transportation
Full time building official	Yes	Building and Planning Services
Personnel skilled in Geographic Information System (GIS)	Yes	Surveyor's Office
Grant manager, writer, or specialist	Yes	Office of Wildfire Preparedness and Resilience
Housing Authority	Yes	Human Services
Warning Systems/Services:		
–Sirens	Yes	Spring Creek Track- HOA
–Reverse 911	No	El Dorado County OES does not use Reverse 911
–IPAWS/Wireless Emergency Alerts (WEA)	Yes	El Dorado County OES
–Opt-in notifications (CodeRed, Everbridge, etc.)	Yes	El Dorado County OES

Source: HMPC 2024

2.8.2.1 El Dorado County Office of Emergency Services (OES)

Using a whole community approach, OES coordinates with the State, County agencies, local cities, public and private organizations, and community groups for the mitigation, preparedness, planning, coordination of response, and recovery activities related to county emergencies and disasters.

OES updates and maintains local emergency response plans, provides Countywide training and exercises to the County, offers active violence training to County agencies and schools, maintains and exercises the emergency notification systems, and provides public education and information on preparing for disasters.

2.8.2.2 El Dorado County Planning Services

The El Dorado County Planning Department plays a pivotal role in guiding land use and development in accordance with the General Plan, building codes, and related regulations. The department is committed to delivering accurate, timely, and courteous professional and technical services to its customers, with the overarching goals of preserving the County's distinctive quality of life, ensuring public safety and environmental protection, and fostering economic vitality for both current and future generations.

2.8.2.3 Office of Wildfire Preparedness and Resilience (OWPR)

In response to the imminent wildfire threat to people, infrastructure, and natural resources, the Board of Supervisors took decisive action in 2022 by updating the County Strategic Plan. This strategic update aims to foster the development and sustainability of fire-adapted communities through the implementation of a comprehensive Countywide wildfire protection strategy. OWPR was established to spearhead this initiative and facilitate the coordination of wildfire mitigation activities across various jurisdictions and land ownerships.

2.8.2.4 Fire Agencies

Through a Joint Powers Authority, CAL FIRE manages Emergency Command Center Services for the west slope of the County, coordinating fire and emergency medical service responses. The El Dorado County Fire Protection District (FPD) provides fire protection to a 281-square mile area with 14 community fire stations, serving approximately 74,000 residents in various communities. In addition to the El Dorado County FPD, 12 local fire agencies, including Cameron Park CSD, Diamond Springs - El Dorado FPD, El Dorado Hills CWD, and others, provide fire protection services in unincorporated County areas. The USFS handles fire protection in the Eldorado National Forest and the LTBMU, while CAL FIRE is responsible for State Responsibility Area (SRA) lands.

2.8.3 Fiscal Mitigation Capabilities

Table 2-8 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 2-8 El Dorado County Financial Capabilities

FINANCIAL RESOURCES	ACCESSIBLE/ ELIGIBLE TO USE	HAS THIS BEEN USED FOR MITIGATION IN THE PAST?
Ability to fund projects through Capital Improvements funding	Yes	Unknown
Ability to incur debt through general obligation bonds	Yes	No
Ability to incur debt through private activities	No	No
Ability to incur debt through special tax bonds	Yes	No
Authority to levy taxes for a specific purpose with voter approval	Yes	No
Authority to withhold spending in hazard prone areas	Yes	Unknown
Bureau of Land Management Fuel Grants	Yes	Yes
CALFIRE Prevention and Forest Health Grants	Yes	Yes
Community Development Block Grants	Yes	Unknown
FEMA Hazard Mitigation Assistance grants	Yes	Yes
FEMA Public Assistance funds	Yes	Yes
Forest Service Community Wildfire Grants	Yes	No
Stormwater Service Fees	No	No
System Development Fee	Yes	Yes
Utility fees (water, sewer, gas, electric, etc.)	No	No

Source: HMPC 2022-2023

2.8.4 Other Mitigation Programs and Partnerships

Table 2-9 below summarizes some of the mitigation partnerships and education or outreach capabilities available to the County

Table 2-9 El Dorado County Education and Outreach Capabilities

EDUCATION & OUTREACH	YES/NO	COMMENTS
Fire Safe Councils that Communicate Hazard Risks	Yes	Public outreach materials, defensible space evaluations, homeowner assistance

EDUCATION & OUTREACH	YES/NO	COMMENTS
		programs, mitigation grant funding.
Firewise USA	Yes	Community wildfire risk assessments, actions plans, community projects, defensible space and home hardening assessments., and other public outreach materials.
StormReady	No	
OWPR Coordination Group	Yes	
Other	Yes	Agencies and organizations whose mission and funding focus on wildfire prevention and preparedness.

The El Dorado Food bank serves as a crucial ally for the County, particularly in reaching marginalized communities. Collaborating with 35 partner groups, the Food bank recognizes the significance of trusted partnerships overcoming specific barriers to reaching these populations. The Food Bank collaborates with County OES to ensure public awareness of available resources, as well as facilitating grants and disseminating preparedness information. As the County's OES office shifts focus toward targeted outreach efforts, the Food Bank provides a valuable resource in initiatives aimed at Spanish-speaking, elderly, and low-income groups. Additionally, the Food Bank is constructing an Emergency Resource Center to serve as a resilience hub for the broader community. Continued collaboration with the Food Bank remains integral to enhancing community resilience and emergency response capabilities.

2.8.5 Opportunities for Enhancement

The 2023-2024 MJHMP update process provided the County and the participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. This also provided an opportunity to identify where capabilities could be improved or enhanced. Specific opportunities could include:

Training: Provide training opportunities to help inform County staff on how best to integrate hazard information and mitigation projects into their departments. There are also several financial resources that the County could leverage in the future for funding mitigation efforts. In particular, the 2023-2024 MJHMP provides eligibility for FEMA HMA grants. County OES staff can attend workshops and training regarding the grant application process and how to develop successful grant applications under the HMGP. Cal OES periodically hosts related training and webinars. Understanding the types of projects that can be funded, and the components of a successful application will enhance the chances of a successful grant award.

Hazard Mitigation Specialist: The County could appoint or assign an relevant-individual to oversee hazard mitigation grant opportunities. This could be a follow-up goal to the Cal OES grant training. This specialist can notify the County departments/agencies of upcoming grant cycles, and support tracking and completing the Notice of Intent (NOI) applications, grant applications, and final grant management reporting requirements. Related financial opportunities for enhancement should include applying for HMA grants, such as BRIC and HMGP funding as it becomes available. The Hazard Mitigation Specialist should also focus on funding mitigation actions that mitigate critical infrastructure, provide protection for those most vulnerable in the community, address climate change, public health hazards, extreme heat, flooding, other climate-related hazards and needed and related climate adaptation strategies.

HMGP Technical Assistance: HMGP funding opportunity provides support for communities to implement mitigation activities to reduce risk to life and property from natural hazards. In California, natural hazards include wildfire, earthquake, drought, extreme weather, flooding, and the impacts of climate change. Cal OES technical subject-matter experts are available to discuss project eligibility, benefit cost analysis, technical feasibility, and Environmental and Historic Preservation (EHP) requirements.

Firewise: Firewise USA® is a voluntary program that provides a framework to help neighbors get organized, find direction, and take action to increase the ignition resistance of their homes and community. The program is co-sponsored by the U.S. Department of Agriculture (USDA) Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters. In order to become a Firewise USA site, a neighborhood, community, city, or county must form a board or committee comprised of residents and stakeholders, obtain a written wildfire risk assessment, develop and maintain an action plan, and contact the applicable state liaison to the program.

StormReady: The National Weather Service's (NWS) StormReady program helps local governments handle extreme weather and improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and EOC
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars, and
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

3 PLANNING PROCESS

Requirements §201.6(b) and §201.6(c)(1):

An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

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

3.1 BACKGROUND ON MITIGATION PLANNING IN EL DORADO COUNTY

The primary purpose of the El Dorado County MJHMP update is to reduce or eliminate long-term risk to people and property from natural hazards and their effects on the El Dorado County planning area. El Dorado County recognized the need for and importance of a MJHMP, and initiated its development in 2023 after receiving a grant award from FEMA.

The plan underwent a comprehensive update in 2023-2023. The planning process followed during the update was similar to what was used in the original plan development; however, the updated plan is multi-jurisdictional, including coverage of the City of Placerville, Cameron Park Community Service District (CSD), Georgetown Divide Public Utilities District (GDPUD), and the El Dorado County Office of Education (EDCOE). WSP USA Environment & Infrastructure Solutions, Inc. (WSP) was procured to assist with the update and the planning process in 2023 to 2024. The process is described further in this section and documented in Appendix B.

3.2 WHAT'S NEW IN THE PLAN UPDATE

DMA Requirement §201.6(d)(3):

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

The updated MJHMP complies with the latest FEMA guidance and California OES guidelines for LHMPs, specifically FEMA's 2022 Local Mitigation Planning Policy Guide. The update followed the requirements noted in the DMA of 2000 and FEMA's 2023 Local Hazard Mitigation Planning Handbook.

This MJHMP update involved a comprehensive review and update of each section of the 2019 MJHMP, the integration of a detailed risk assessment (including a parcel-level analysis, and detailed critical facility analysis), targeted outreach to certain organizations that best represent socially vulnerable communities, and an assessment of the progress in evaluating, monitoring, and implementing the mitigation strategy outlined in the initial plan. The planning process provided an opportunity to review jurisdictional priorities related to hazard significance and mitigation actions, and revisions were made where applicable to the base plan. Another change was the development of specific annexes for the City of Placerville, the Cameron Park CSD, the GDPUD, and EDCOE.

Representatives from multiple departments for each of the participating jurisdictions were engaged and involved in the development of the 2024 MJHMP through multiple planning workshops and numerous one-on-one work sessions. Only the information and data still valid from the 2019 plan were carried forward as applicable to this MJHMP update. Also, given the four municipalities' participation, significant new hazard information was integrated into the base plan and into each annex.

The 2019 LHMP assessed 13 hazards: severe weather, thunderstorms and tornadoes, avalanche, dam failure, drought and water shortage, earthquake, erosion, flood, debris flows and landslides, seiche (lake tsunami), subsidence, and wildfire.

The 2024 MJHMP update assessed 15 hazards, including avalanche; dam failure; debris flows and landslides; drought, water shortages, and tree mortality; earthquakes; erosion; extreme heat; flood; seiche (lake tsunami), severe weather; heavy rain, thunderstorms, hail, and lightning; heavy snow and winter storms; tornadoes and high winds; subsidence, and wildfire. As a result, there are 35 new Countywide mitigation actions, plus 15 jurisdiction-specific mitigation actions that were developed for the four annexes for a total of 53 new mitigation actions.

3.2.1 Plan Section Review and Analysis -2024 Update

During the 2023-2024 MJHMP update process, the HMPC updated each of the sections of the previously approved plan to include new information. WSP developed a summary of each section in the plan and guided the HMPC through the elements that needed updating during the kick-off webinar in October 2023. This included analyzing each section using FEMA's Local Mitigation Planning Handbook (2023) and the Local Mitigation Planning Policy Guide (2022; Effective April 19, 2023) to ensure that the plan met the latest requirements.

For this plan update, the FEMA Local Mitigation Plan Review Tool was not provided with the approval of the 2019 version of this plan; therefore, it was not referenced. The County and Cal OES did not have this available at the time of initiating the planning process for the update. As such, previous 2019 FEMA comments on opportunities for improvement were not considered and addressed in the 2023-2024 update. Instead, the County focused the update on meeting the new requirements outlined in the Local Mitigation Planning Policy Guide.

The HMPC and WSP determined that nearly every section of the plan would need revision to align the plan with the latest FEMA planning guidance and requirements and recent California legislation. A detailed summary of the changes in this plan update is highlighted in Table 3-1 below.

Table 3-1 El Dorado County Hazard Mitigation Plan Update Highlights

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
1. Introduction	• Revised to reflect updated plan and 2022-2023 planning process.
2. County Profile and Capability Assessment	• Updated with recent census data and current economy description. • Updated land use and development trends.
3. Planning Process	• Described and documented the planning process for the 2023-2024 update, including coordination among agencies. • Described how the 2019 plan was integrated with/into other planning efforts, like the County Safety Element and EOP. • Removed 2019 planning process information. • Described changes to jurisdictional participation. • Summarized the stakeholder involvement and focused outreach to certain community-based organizations that represented socially vulnerable communities. • Described 2023-2024 update public participation process. • Summarized the results of the Public Survey. • Described the HMPC. • Described the 10-step process followed for the update.
4. Hazard Identification and Risk Assessment and Consequence Analysis	• Climate change information was added to each hazard profile. • Updated list of disaster declarations to include recent data. • Updated tables to include recent National Center for Environmental Information data. • Updated past occurrences for each hazard to include recent data.

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
	• Climate Vulnerability Assessment is now cross referenced in the Risk Assessment and an integrated Vulnerability Assessment section is included and organized by hazard. • The Vulnerability Assessment considers the impacts on the following assets: (1) people; (2) property; (3) critical facilities and lifelines; (4) economy; (5) cultural, historic, and natural resources; (6) development trends. • The Vulnerability Assessment includes a discussion on impacts on population assets, including socially vulnerable populations and underserved communities. • Added a critical facilities analysis that was not included in the 2019 plan; the critical facilities database includes 1,231 facilities organized by Community Lifeline • Updated growth and development trends to include recent Census and local data sources from the County's Planning Department and Surveyors Office. • Updated historic and cultural resources using local/State/national sources. • Updated property values for vulnerability and exposure analysis, using updated building information based on 2024 assessor's data. • Updated estimated flood losses using the latest Digital Flood Insurance Rate Map (DFIRM) and assessor's data. • Updated National Flood Insurance Program (NFIP) data and Repetitive Loss structure data from the previous plan. • Incorporated new hazard loss estimates since 2019, as applicable. • Updated Hazus earthquake vulnerability analysis data with two scenarios performed (one probabilistic scenario and one ShakeMap scenario) • Two additional hazards, extreme heat and heavy snow and winter storms, that were not included in the 2019 plan were added and profiled. One previously profiled hazard, thunderstorms and tornadoes, was broken into two separate hazards: thunderstorms, heavy rain, lightning, hail, and fog, and tornadoes and high wind. • Each hazard was updated to include information regarding specific vulnerabilities to each hazard, including maps and tables of specific assets at risk, specific critical facilities at risk, and specific populations at risk. • Hazard significance and priority levels were revisited and updated. • Maps were updated where appropriate.
5. Mitigation Strategy	• Indicated what actions have been implemented that may reduce previously identified vulnerabilities. • Updated mitigation strategy based on the results of the updated risk assessment, completed mitigation actions, and implementation obstacles and opportunities since the completion of the 2019 plan. • Reviewed and updated goals and objectives based on HMPC input. • Included updated information on how actions are prioritized, or how priorities changed. • Reviewed mitigation actions from the 2019 plan and developed a status report for each. • Updated priorities on actions. • Summarized successful implementation to highlight the implementation of actions identified in the 2019 plan. • Identified new mitigation actions proposed by the HMPC with more detail on implementation than the previous plan. • 13 new Countywide mitigation actions were added to address existing hazards and new hazards. • 15 new jurisdiction-specific mitigation actions were included in the annexes.

PLAN SECTION	SUMMARY OF PLAN REVIEW, ANALYSIS, AND UPDATES
	• Developed a summary table of mitigation actions for all participating jurisdictions.
6. Plan Review, Evaluation, and Implementation	• Reviewed and updated procedures for monitoring, evaluating, and updating the plan. • Revised to reflect current methods. • Updated the system for monitoring the progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance. • Added a process for incorporation of the MJHMP update into existing mechanisms.
7. Plan Adoption	• Updated to reflect the 2024 adoption process.
Jurisdictional Annexes	• Integrated the following annexes: ○ City of Placerville ○ Cameron Park CSD ○ GDPUD ○ EDCOE
Appendices	• Appendix A: Planning Committee • Appendix B: Planning Process Documentation • Appendix C: Approval and Adoption • Appendix D: Mitigation Categories and Alternatives • Appendix E: Annual Progress Meeting Agenda and Report Template • Appendix F: Public Survey Results

3.3 MULTI-JURISDICTIONAL PARTICIPATION

In the 2024 MJHMP update, the following jurisdictions participated in the planning process and will be adopting the updated plan following FEMA approval.

Lead Jurisdiction:

- El Dorado County

Participating Jurisdictions:

- City of Placerville
- Cameron Park CSD
- Georgetown Divide PUD
- EDCOE

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 areas within the planning area where the risk differs from that facing the entire area.
- Identify potential mitigation actions.
- Formally adopt the plan.

For the El Dorado County HMPC, “participation” meant the following:

- Providing facilities for meetings.
- Attending and participating in the HMPC meetings.
- Completing and returning WSP Plan Update Guide worksheets.
- Supporting and validating development of the Critical Facilities database
- Collecting and providing other requested data (as available).
- Identifying mitigation actions for the plan.
- Reviewing and providing comments on plan drafts and jurisdictional annexes.
- Informing the public, local officials, and other interested parties about the planning process and providing the opportunity for them to comment on the plan.

- Coordinating, and participating in the public input process.
- Coordinating the formal adoption of the plan by the governing boards.

The County and each participating jurisdiction met all these participation requirements.

In most cases, one or more representatives for each jurisdiction attended the multi-jurisdictional webinars/meetings and workshops described in Table 3-4 and utilized the HMPC to help collect data, identify mitigation actions and implementation strategies, and review and provide data on annex drafts. In some cases, the jurisdictions had limited capacity to attend or had conflicts with HMPC meetings; in these cases, alternative forms of communication were used to provide input into the process, and in some instances, a representative from a different department attended the HMPC meeting on behalf of the main representative. Appendix B provides additional information and documentation of the planning process.

3.4 PLANNING PROCESS

WSP established the planning process for the El Dorado County MJHMP using the DMA planning requirements and FEMA's associated guidance. The original FEMA planning guidance is structured around a four-phase process:

- Organize Resources
- Assess Risks
- Develop the Mitigation Plan
- Implement the Plan and Monitor the Progress

Into this process, WSP integrated a more detailed 10-step planning process used for FEMA's CRS and FMA programs. Thus, the modified 10-step process used for this plan meets the requirements of major grant programs including FEMA's HMGP, Building Resilient Infrastructure and Communities (BRIC) program, FMA Program, and flood control projects authorized by the U.S. Army Corps of Engineers.

In May 2023, FEMA released the Local Mitigation Planning Handbook that has become the official guide for local governments, including special districts, to develop, update and implement local mitigation plans. While the requirements under Section 201.6 have not changed, the Handbook guides local governments on developing or updating hazard mitigation plans to meet the requirements under the CFR Title 44 – Emergency Management and Assistance Section 201.6, Local Mitigation Plans for FEMA approval and eligibility to apply for FEMA Hazard Mitigation Assistance (HMA) grant programs. It also offers practical approaches, tools, worksheets, and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook complements and liberally references the Local Mitigation Plan Review Guide (October 1, 2011), which was the official guidance for federal and state officials responsible for reviewing local mitigation plans in a fair and consistent manner.

Table 3-2 shows how the modified 10-step process fits into FEMA's four-phase process, and how these elements correspond to the tasks in the FEMA Mitigation Planning Handbook.

Table 3-2 El Dorado County Hazard Mitigation Planning Process

FEMA'S 4-PHASE DMA PROCESS	MODIFIED 10-STEP CRS PROCESS	FEMA LOCAL MITIGATION PLANNING HANDBOOK TASKS
1) Organize Resources		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1) 4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)
2) Assess Risks		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii)&(iii)
201.6(c)(2)(ii)	5) Assess the Risks	
3) Develop the Mitigation Plan		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
4) Implement the Plan and Monitor Progress		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current 9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

3.4.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

The commitment from El Dorado County and the participating jurisdictions to participate in the DMA planning process and the CRS program prompted County OES to establish the framework and organizational structure for plan development. An initial meeting was held with key community representatives to discuss the organizational and process aspects of this plan update process.

The initial kick-off meeting hosted by WSP and County OES was held on October 31, 2023. Invitations to the kickoff meeting were extended to key County departments, the two incorporated communities, special districts located within the County, as well as other federal, State, and local stakeholders, including representatives from the public that might have an interest in participating in the planning process. Representatives from participating jurisdictions, HMPC members from the 2019 update, and Safety Element Advisory Committee members from the 2024 update to the County's General Plan Safety Element were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process.

Representatives from the following County and municipal departments participated in the HMPC and the development of the plan update; these representatives are listed in Table 3-3. A list of specific HMPC representatives is included in Appendix A. Other local, state, federal, and agencies and stakeholders invited to participate in the HMPC are discussed under Planning Step 3.

Table 3-3 List of HMPC Participants for 2024 MJHMP Update

NAME	AGENCY/DEPARTMENT
Adam Brown	Georgetown Divide Public Utility District
Angela Johnson	Cameron Estates Community Services District
Bill Sugiyama	El Dorado County Emergency Services Authority
Brent Balderson	Tahoe City Public Utility District
Bret Sampson	County of El Dorado Long Range Planning
Brittany DiTonno	El Dorado Hills Community Services District
Carol S. Heape, MSW, CMC	Elder Options Inc.
Chris Perry	County of El Dorado Planning and Building Department
Chrishana Fields	El Dorado Hills Fire
Cleve Morris	City of Placerville
Dan Bolster	El Dorado County Transportation Commission
Daniel Newsom	El Dorado Irrigation District (EID)
Dave Johnston	El Dorado County Air Quality Management District
David Marino	El Dorado County Roads - Maintenance Division
Elizabeth Pope	Placer Independent Resource Services
Eric Taylor	Placerville Police Dept
Francisco González	Tahoe City Public Utility District
Jerry Barton	El Dorado County Transportation Commission
Jim Drennan	City of South Lake Tahoe
Jody Bailey	Mother Lode Rehabilitation Enterprise Inc.
Joy Reggiardo	Cameron Estates CSD
Justin Cisneros	El Dorado County Surveyors Office
Kelli Nuttall	Mother Lode Rehabilitation Enterprise Inc.
Ken Pimlott	El Dorado County Office of Wildfire Preparedness and Resilience
Kim Gustafson	Grizzly Flats Community Services District
Kim Nielsen	Cal OES
Kimberly Lusby	El Dorado County Animal Services
Kristine Guth	El Dorado County EMS and Emergency Preparedness
Lee Kiolbasa	Liberty Utilities
LeeAnne Mila	EDC Agriculture Commission
Liz Heape-Caldwell	Elder Options
Makenzie Gold	Food Bank of El Dorado County
Marianne Agudo	Garden Valley Ranch Estates Community Services District
Mark Magee	Rolling Hills Community Services District
Mark Moss	El Dorado County Environmental Management
Martin Goldberg	Lake Valley Fire Protection District
Matthew Minson, MD	El Dorado County Health and Human Services
Michael Grassle	Cameron Park Community Services District
Michael Lilienthal	El Dorado Hills Fire Department and El Dorado Sheriff's Office of Emergency Services
Michael Sumersille	Marshall Hospital

NAME	AGENCY/DEPARTMENT
Michael Ungeheuer	El Dorado County Public Health
Mike Sproull	Food Bank of El Dorado County
Philip Jones	El Dorado County Office of Education
Rebecca Howard	El Dorado County Emergency Preparedness
Robert Kohlstedt	Shingle Springs Rancheria
Scott Bare	El Dorado County OES
Susie Davies	Mother Lode Rehabilitation Enterprise Inc.
Thea Graybill	El Dorado County Planning and Building Department
Thea Schwartz	Barton Hospital
Tim Cordero	El Dorado County Fire
Tom Meyer	El Dorado County Office of Wildfire Preparedness and Resilience
Troy Morton	El Dorado County Sheriff's Office of Emergency Services
Veronica Hancock	Mother Lode Rehabilitation Enterprise Inc.

Planning Meetings

The planning process officially began with a kick-off meeting on October 31, 2023, which involved County OES staff and the WSP team. On November 27, 2023, the HMPC convened for the first time. The first HMPC meeting covered the scope of work and an introduction to the DMA requirements.

Participants were provided with a Plan Update Guide, which included electronic worksheets to facilitate the collection of information necessary to support the update of the plan. Using FEMA guidance, WSP designed the Plan Update Guide worksheets to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. A copy of WSP's Plan Update Guide for this project is included in Appendix B. The County and each jurisdiction seeking FEMA approval of their plan completed and returned the worksheets from the Plan Update Guide.

During the planning process, the HMPC communicated through bi-weekly meetings, virtual meetings, email, and telephone conversations. The first three HMPC meetings were held virtually while the last HMPC meeting was held in person. Draft documents were emailed so that the HMPC members could easily access and review them. The County OES staff and HMPC formally met four times during the planning period (October 2023 – April 2024). The purposes of these meetings are described in Table 3-4. WSP sent meeting handouts ahead of time to the participating jurisdictions to review and provide feedback before or at the meeting. In addition to these meetings, some jurisdictions held meetings with subcommittees to discuss the needed input for the plan update.

Table 3-4 Summary of Planning Meetings

MEETING NUMBER	MEETING TOPIC	DATE	LOCATION
1	Kick-off/HMPC Roles and Expectations (County Sheriff's Office and WSP staff only)	October 31, 2023	Virtual/Webinar – Microsoft Teams
2	HMPC #1: Overview of DMA 2000 & Hazard Mitigation Planning Process / Review 2019 MJHMP	November 27, 2023	Virtual/Webinar – Microsoft Teams
3	HMPC #2: Hazard Identification and Risk Assessment	January 23, 2024	Virtual/Webinar – Microsoft Teams

MEETING NUMBER	MEETING TOPIC	DATE	LOCATION
4	HMPC #3: Mitigation Strategy and Goals Update / New Mitigation Actions Brainstorm	March 18, 2024	In-Person

Internal Kick-off Meeting

On October 31, 2023, County Sheriff's Office staff and the WSP team held a kick-off meeting to discuss the project background, the MJHMP update process, and the scope of work and project goals. They also discussed the hazards requiring profiling in this MJHMP update, reviewed potential additional HMPC members, partners, and stakeholders, and discussed the outreach plan and GIS data needs for the MJHMP update.

HMPC Meeting #1 – Overview of DMA 2000 & Hazard Mitigation Planning Process

On November 27, 2023, the HMPC convened to discuss the process for completing the update of this plan. This first HMPC meeting was attended by 28 representatives. The HMPC consisted of a mix of County departments, local governments, special districts, and stakeholders. A complete list of those in attendance at the first HMPC meeting can be found in the meeting minutes in Appendix B.

WSP reviewed the DMA requirements and the suggested planning process to follow to meet the requirements as well as the expected schedule of the process for the MJHMP update. The roles of the HMPC and stakeholders were discussed including the participation requirements for the different roles.

During the first HMPC meeting, the HMPC validated the identified hazards within the 2019 plan, together with additional hazards that are added and profiled for this 2024 MJHMP update. The HMPC collaboratively prioritized the hazards to identify which are of most concern to the County. More details are included in Section 4: Hazard Identification and Risk Assessment.

The group also discussed other agencies that should be part of this planning process, as well as related planning efforts to be coordinated with and recent studies to be incorporated. Part of this discussion was also related to creating an outreach strategy to involve the public throughout the planning process. This outreach strategy is included in Appendix F and is based on the outreach tools and touchpoints followed for the County's Safety Element update. The first HMPC meeting ended with WSP sharing handouts to assist in the planning process. These handouts included the Plan Update Guide described above.

HMPC Meeting #2 –Risk Assessment and Mitigation Goal Refinement

On January 23, 2023, the HMPC convened virtually to discuss the results of the risk and vulnerability assessment. Forty members of the HMPC were present for the discussion. WSP began the meeting with a presentation on the results of the risk assessment findings for natural hazards. The group went through each hazard together and discussed the results as well as shared any local insight to inform the HIRA update. Refer to the meeting summary in Appendix B for notes related to each hazard discussed.

Following the discussion on the results of the risk assessment findings, WSP explained this update process provides an opportunity to review the previous plan's goals to determine if they are still valid, and comprehensive, and reflect current priorities, and updated risk assessment. Inputs on mitigation goals and objectives were solicited via virtual polls. The group was also encouraged to share insights on the development of mitigation goals, objectives, and specific actions and projects.

WSP shared with the HMPC that the online public survey had been opened. A link was shared with the HMPC to easily distribute by email and for posting on each of the participating jurisdiction's websites and social media. This was encouraged to promote engagement and input from the public and participating jurisdiction communities. The meeting ended with a review of the next steps and the planning process schedule.

HMPC Meeting #3 –Mitigation Strategy

The HMPC convened for an in-person workshop on March 18, 2024, with 26 people participating to update the plan's mitigation strategy. The group discussed the criteria for mitigation action selection and prioritization using a worksheet provided by WSP and reviewed possible new mitigation actions. Additional details were provided by the HMPC (Step 7). This was followed by a group activity to elicit the development of new mitigation actions followed by another group activity to prioritize (rank) the top mitigation actions. WSP then briefly explained the plan implementation and maintenance process. The meeting ended with a review of the next steps and planning process schedule.

Planning Step 2: Involve the Public

Involving the public assures support from the community at large and is a required part of the planning process per the DMA 2000. Early discussions with the County and input received in the first HMPC meeting established the initial plan for public involvement in the plan update.

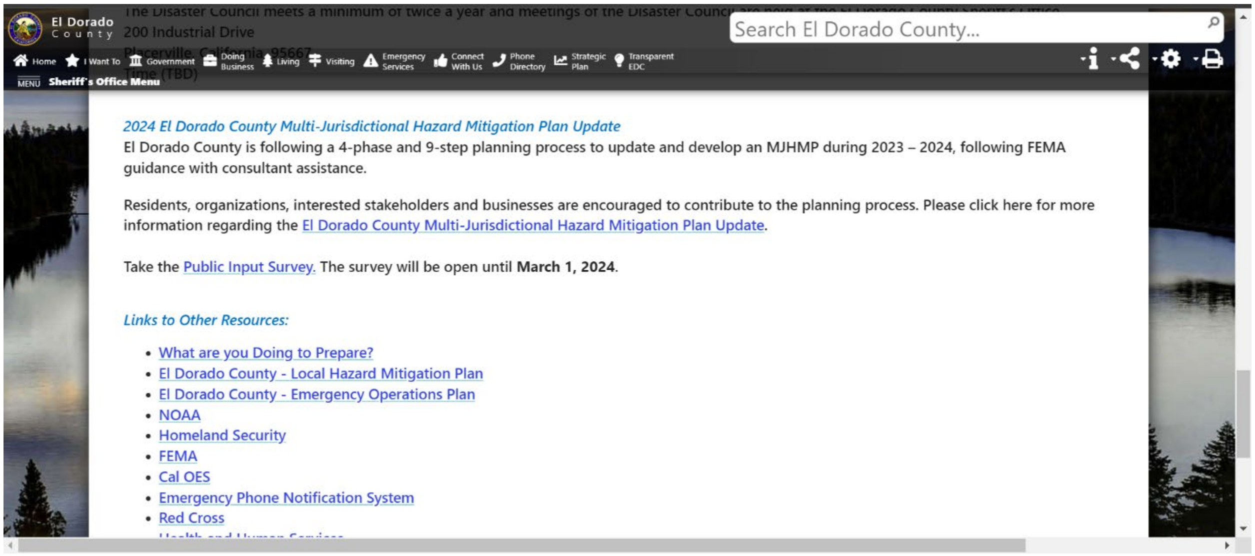
Public outreach began with the development of an online bi-lingual public survey that was shared with each participating jurisdiction to post on their websites and disseminate via email to local stakeholders. Two public workshops were held to inform the public of the purpose of the MJHMP and the hazard mitigation planning process, and to solicit feedback from the public. At each workshop, links to electronic comment forms were provided to leave any comments related to the County's MJHMP, as well as provide their contact information if they would like to receive ongoing updates and information related to the planning process.

Additional public involvement activities included press releases, website postings, flyer development and distribution, the two public workshops previously mentioned (one held during the plan development and one was held during public review), and the collection of public comments on the draft plan. Details on the outreach methods and approach are also summarized in the Outreach Strategy included in Appendix F.

Plan Facts

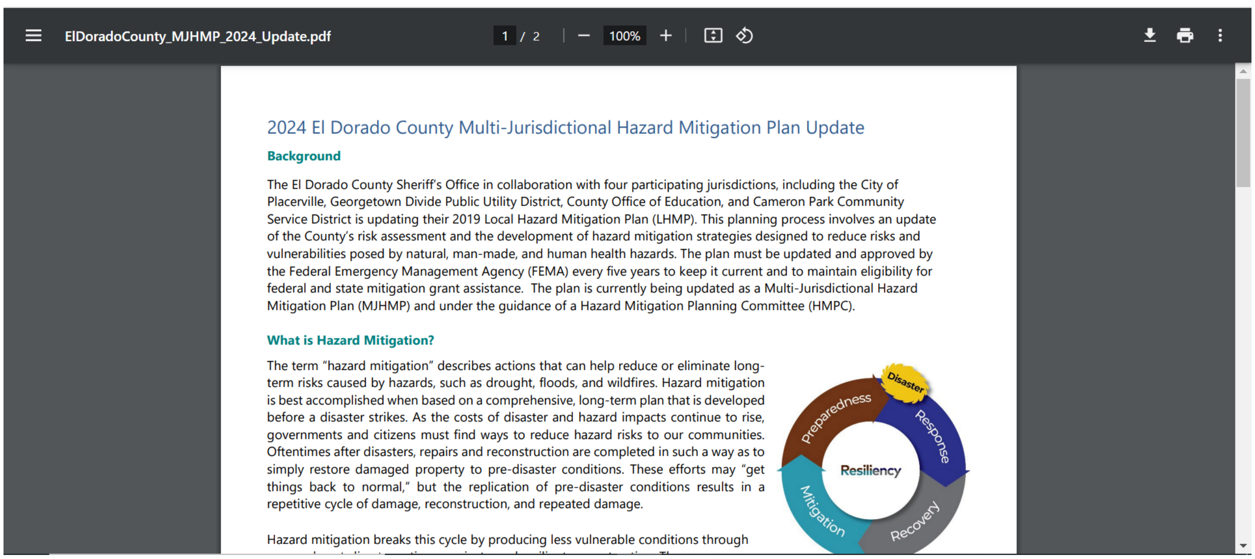
The WSP team provided the County with a Webpage Backgrounder document that included MJHMP update information for the MJHMP Webpage. Figure 3-1 includes a screenshot of the MJHMP information and resources on the County OES website. It includes a link to the public survey and a PDF (see Figure 3-2Figure 3-2) that explains hazard mitigation, the financial and structural benefits of creating a MJHMP, and contact information for both the WSP project manager and County OES contact.

Figure 3-1 El Dorado County OES Website



Source: El Dorado County OES, 2024

Figure 3-2 Project Information from County OES Website



Source: El Dorado County OES, 2024

Online Public Survey

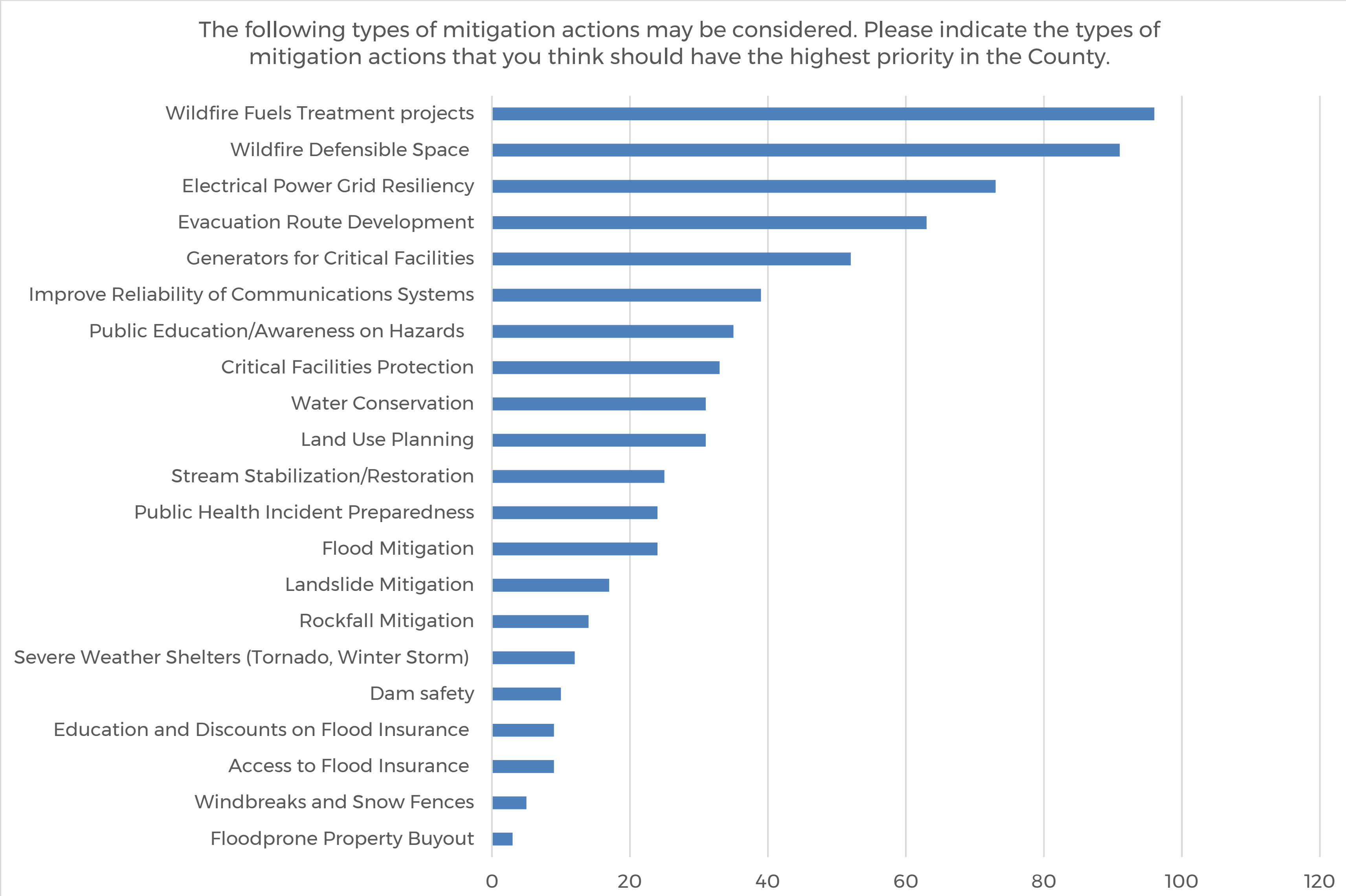
During the plan update's initial drafting stage, an online and bi-lingual public survey was used to gather public input for the HMPC. The survey provided an opportunity for public input during the planning process before the finalization of the plan update. The survey gathered public feedback on concerns about hazards and input on mitigation strategies to reduce their impacts. The survey was released on December 12, 2023, and closed on March 1, 2024. The usual input period for the public survey is one month, but the public survey was left open for an extended period to allow the County and participating jurisdictions to circulate additional advertisements during public meetings and outreach events to seek more input from the public. The HMPC provided links to the public survey by distributing it using social media, email, and posting the link on websites. Screenshots from the County's OES Webpage and social media channels can be found in Appendix B.

A total of 127 people filled out the survey online; all participants completed the English version of the survey even though a Spanish version with release materials translated in Spanish were circulated. Results showed that the public perceives the most significant hazards to be wildfire, agriculture/forestry disease and tree mortality, and drought and water supply challenges.

Figure 3-3 This information was used when developing mitigation actions, particularly those around issues and concerns on Public Safety Power Shutoff (PSPS) events, drought impacts, and wildfire hazards. The public input was also used to prioritize and rank hazards in the final plan.

Figure 3-3 shows the results of a question from the survey, which asked the public's opinion on what mitigation actions should have the highest priority in the updated MJHMP. The mitigation actions that the public thought should have highest priority were wildfire fuels treatment, wildfire defensible space, and electrical power grid resiliency. This information was shared with the HMPC during the update of the mitigation strategy and used as a starting point for developing individual mitigation actions. A summary of the survey data and documentation of the public feedback can be found in Appendix F.

Figure 3-3 Results from the Online Public Survey



Source: WSP, 2024

Additional themes emerged from the public survey open-ended questions. These themes are explored in Table 3-5 below. Collectively, these themes highlight the challenges faced by residents in terms of environmental risks, infrastructure maintenance, fire safety, and community development, calling for coordinated efforts and solutions from local authorities and residents alike.

Table 3-5 Themes from Public Survey Comments

GENERAL THEME	SPECIFIC CONCERNS
Natural Disasters and Environmental Concerns	Flooding during winter storms along waterways.
	Bark Beetle invasion of pine trees.
	Deer Creek flooding.
	Rain on snow events.
	Forest Fuel reduction.
	Hazard Trees from Caldor state.
	Martinez Creek fire risk.
	Lack of exit roads for residents in certain areas.
	Potential hazardous trees in neighborhoods.
Fire Safety and Preparedness	Adequate fire protection as communities grow.
	Fire hazards within city limits.
	Fire-wise community preparedness.
	Fire hazard clearing on county, state, and federal land.
	Fire hazards related to residential landscaping.
	Absentee landowner responsibility for creating defensible space.
	Evacuation routes and evacuation route management.
	Extended loss of power affecting utility services.
	Improving wildfire mitigation, forest management, and prescribed burns.
	Enforcement of fire safety regulations and riparian clearance.
	Development of apps for tree risk assessment and management.
Infrastructure and Maintenance Issues	Better shoulders on roads.
	Poor maintenance of roads.
	Road erosion and plowing issues.
	Problems with roadside ditches and rainwater diversion.
	Utility service vulnerabilities, including IT-related vulnerabilities.
	Moving powerlines underground for safety.
	Mobile home park maintenance issues.
	Roadside safety concerns related to property maintenance.
	Need for wider roads and improved road infrastructure.
Community Development and Management:	Concerns about overcrowding of homes.
	Housing crisis.
	Neighbors not maintaining their properties.
	Impact of logging and forest management projects on community safety.
	Need for community-wide home and infrastructure hardening.
	Concerns about community safety and emergency notification systems.

Online Public Workshops

Two public workshops were held during the planning process to inform the public, receive input to integrate into the plan update and keep the public updated on the progress being made in the planning process. Two workshops were held virtually as webinars followed by question-and-answer sessions (Q&A).

The first workshop took place on February 27, 2024, through Microsoft Teams. The workshop introduced the public to the hazard mitigation planning process for the County's Plan update and County and WSP staff answered any questions and gather public input to be integrated into the plan update. In addition, it was an opportunity to help staff identify risks, hazards, and vulnerabilities from the public's perspective. Figure 3-4 is copy of the first workshop press release.

Figure 3-4 Press Release for the First Public Workshop

EL DORADO COUNTY
OFFICE OF EMERGENCY SERVICES

330 Fair Ln • Placerville, California 95667
Phone: 530-621-5895

FOR IMMEDIATE RELEASE

Contact: Deputy Scott Bare
Phone: (530) 621-5895
Date of Release: February 14, 2024

El DORADO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
VIRTUAL PUBLIC WORKSHOP #1

Placerville - El Dorado County, in collaboration with the City of Placerville, Georgetown Divide Public Utility District, El Dorado County Office of Education, and Cameron Park Community Services District, is updating the 2019 Local Hazard Mitigation Plan (LHMP). This planning process involves the development of hazard mitigation strategies designed to reduce risks and vulnerabilities posed by natural, man-made, and human health hazards. The plan must be updated and approved by the Federal Emergency Management Agency (FEMA) every five years to keep it current and to maintain eligibility for federal and state mitigation grant assistance. The plan is currently being updated as a Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) in coordination with the four participating jurisdictions and under the guidance of a Hazard Mitigation Planning Committee (HMPC).

The people who live and work in El Dorado County are vulnerable to a range of natural hazards, including drought, climate change, earthquakes, extreme heat, flooding, severe weather, and wildfires. The 2024 MJHMP update will provide the County with valuable tools to identify risks and mitigate hazards through future project-specific actions. Hazard mitigation is an investment in the County's future safety, sustainability, and resiliency and results in less vulnerable conditions through pre- and post-disaster actions, projects, and adaptation strategies. The implementation of hazard mitigation actions means building stronger, safer, and smarter communities that will be able to withstand future impacts and damages.

Residents, organizations, businesses, and interested stakeholders are encouraged to contribute to the planning process. Broad public participation is an essential strategy for developing an updated and multi-jurisdictional plan that will be effective, implemented, and supported by County residents. El Dorado County will be hosting a virtual Public Workshop on **Tuesday, February 27, 2024, from 5:30 to 7:30 PM.** The Public Workshop will be an opportunity to get involved and learn more about the planning process and the hazards the County, participating jurisdictions, and HMPC plan to assess in the 2024 MJHMP. Information on how to participate is provided below:

- **Public Workshop** – Tuesday, February 27, 2024, 5:30 – 7:30 PM
  - The meeting can be accessed virtually here: https://msteams.link/QRL9
- **Meeting ID**: 362 266 499 42, Passcode: wsUekl, Call in: +1 213-267-3760,,352064963#
- **Public Survey** is available in English and Spanish: https://rb.gy/66632h.

Questions may be directed to Deputy Scott Bare, El Dorado County OES by calling (530) 621-5895 or by email at bares@edso.org.

Visit us online at **www.edcgov.us**

The second workshop took place virtually on April 18, 2023.. Members of the public were able to submit comments and ask questions verbally or via the chat function. The HMPC also received various questions and comments from the workshop on the public's priority hazards in their community and possible mitigation ideas to reduce hazard risk.

Focused One-on-One Stakeholder Meetings

The El Dorado County Sheriff's Office worked with one volunteer-based non-profit organization during the planning process that the HMPC agreed best represented the socially vulnerable and at-risk communities across the entire County. The Food Bank of El Dorado County was established in 2000 with the help of a few organizations. They provide food assistance through multiple programs including the Emergency Food Assistance Network, which consists of multiple agencies that make up the safety net for El Dorado County's at-risk population. They represent the majority of the County through 35 partner organizations by providing food supplies and meals to churches, emergency food pantries, shelters, youth programs, soup kitchens, and senior centers. The population group they serve are primarily low-income, seniors, children, disabled, houseless, single-parent families, disaster victims, and the unemployed. They are one of the largest collaborative charitable organizations in the County and are currently working with the Department of Social Services to construct a 15,000 square foot building next to the Food Bank that will serve as a new "Emergency Resource Center." It will be staged for evacuation support and serve as a response center so the County is prepared to act prior to a hazard event. The County's Sheriff's Office and WSP staff met with two representatives at the Food Bank on April 4, 2024 to discuss collaborating on future outreach and engagement efforts and to coordinate on how the County's Sheriff's Office can support the Food Bank in diversifying their services in the future beyond preparedness and recovery support. The group specifically discussed preparing an targeted outreach plan for the Spanish-speaking population, low-income, and senior populations in the County that informed them about hazard mitigation and preparedness resources.

Vulnerable / At-Risk Population Outreach

Alta California Regional Center (ACRC) is a private, non-profit corporation working under contract with the State of California, Department of Developmental Services, to provide services to persons aged three and above who have a developmental disability pursuant to the Lanterman Act. ACRC also provides services to infants and toddlers, between birth and 36 months, who have a need for early intervention services and who meet the eligibility criteria for the California Early Start program. ACRC sent a representative to participate in the third HMPC meeting and lend their expertise to mitigation actions that can help those with developmental disabilities in the County. While 105 of the 127 (82.7%) respondents of the public survey reported no disability, of those that did self-report a disability, 6% reported a cognitive disability (including learning disabilities, autism, intellectual and development disabilities, dementia, traumatic brain injury, mental health conditions), 23% reported a diagnosis that impacts the activities of daily living, and 26% reported mobility issues. ACRC was able to attend the third mitigation meeting to give voice to these communities.

Other community-based stakeholder groups that participated in the first and second HMPC meetings as part of the planning process are listed below:

- Elder Options, AFN community (2, first and second HMPC)
- Food Bank AFN, community (3, all HMPC)
- Mother Lode Rehabilitation Enterprise Inc. (MORE Workshop), AFN community (1, first HMPC)
- Placer Independent Resource Services, AFN (2, first and second HMPC)

While the online public survey was distributed in English and Spanish, only English responses were recorded. While links to the survey were distributed across El Dorado County platforms and email listservs, engagement may have been better if the link was published across strictly Spanish speaking platforms. Another effective strategy may involve posting a Spanish press release with a QR code at grocery stores such as Mi Pueblo or Plaza Tapatia to gather additional input during the next plan update. There is also a mitigation action focused on targeted outreach to the Spanish-speaking population, low-income, and elderly groups in the County

Enhancements can also be made in reaching out to organizations and agencies supporting vulnerable or at-risk populations. This improvement may involve broadening the scope of organizations, both in terms of quantity and diversity; for example, by considering inclusion of those aiding elderly individuals or supporting children in foster care. Furthermore, adopting a more personalized approach, such as one-on-one outreach through personal emails or phone calls or request for focused listening sessions with the organizations, may prove to be a more effective method for encouraging engagement.

Geographic Information System (GIS) Data Collection

During the project kick-off meeting, the WSP team discussed GIS hazard mapping for the Plan update with representatives from the County who are responsible for managing GIS data, including the County's Community Development Agency, Public Works, and the Assessor's Office. The WSP team then compiled a Data Needs List necessary for the update, which the County's GIS staff compiled and provided access to.

The required updates included incorporating inventory and valuation information for public infrastructure related to earthquake, landslide, dam failure, flood, and wildfire. Data sources include USACE, Department of Water Resources (DWR), Homeland Infrastructure Foundation-Level Data (HIFLD), National Inventory of Dams (NID), FEMA, California Department of Forestry and Fire Protection (CAL FIRE), Fire and Resource Assessment Program (FRAP), Department of Conservation (DOC), and California Geological Survey (CGS). Additional GIS spatial data was integrated to assess agricultural pests and diseases (important farmland data from DOC) and severe weather data from the National Weather Service (NWS) and National Oceanic Atmospheric Administration (NOAA).

To assess hazards' potential impacts on the County's critical facilities, a critical facilities GIS database was needed. While building the critical facilities GIS database, each participating jurisdiction's assistance was requested to validate the critical facilities GIS data. There were two primary aspects of validation: data completeness or correctness and alignment or classification within the FEMA Lifelines framework.

During the update, local jurisdictions considered current and expected future vulnerability to all hazards and integrated new hazard data such as flood studies. Local jurisdictions were asked to incorporate replacement costs for vulnerable buildings and impacts of population growth or loss in vulnerable areas. WSP staff integrated this information, if available, from each jurisdiction. This process helped the jurisdictions understand what facilities were vulnerable to hazards. The result was an updated comprehensive critical facilities database with 1,231 facilities.

Risk Assessment and GIS Methodology

The GIS methodology for the risk assessment is summarized below.

- Utilize the asset inventory provided by the County Assessor's Office database, encompassing individual parcels, address points, various land use codes, and taxing agencies or districts.
- Include County property inventory and valuation data for both current assets and planned ones.

- Each property within the County inventory should be identified by its Assessor's Parcel Number (APN), assessor's use code, government jurisdiction, and valuation data, which includes both improved and estimated content value.
- Classify County properties by type, such as agricultural, commercial, exempt, industrial, multi-family residential, multi-use, and residential.
- Calculate the potential impact of natural hazards on residential properties by multiplying the number of affected properties by the average household size, obtained from Census data.
- Address Repetitive Loss Properties specifically for flood hazard assessment.
- Estimate potential property losses, incorporating an inventory of assets from each participating jurisdiction and an assessment of all hazard risks, coordinated by El Dorado County, as part of the MJHMP development.
- Identify structures, including buildings, infrastructure, critical facilities, structures housing elderly or disabled individuals, and transportation systems, for both existing assets and planned ones, and categorize them according to FEMA Lifelines.

Public Review Period

The County OES department circulated the Public Review Draft MJHMP for a 14-day period from April 10, 2024 through April 23, 2024. The Public Review Draft was released for comment and made available for download via the County OES website. The Public Review Draft MJHMP was advertised through social media, mass emailing, and an advertisement through the media mechanisms noted previously. An electronic comment form through Microsoft Forms was provided with the draft plan. No comments were received on the Public Review Draft MJHMP.

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, State and local agencies and organizations were invited to participate as stakeholders in the process through email. Stakeholders include local and regional agencies involved in hazard mitigation activities or those beyond the County and local government that have the authority to regulate development. El Dorado County worked with the WSP team to come up with a list of potential HMPC participants and stakeholders.

Stakeholders could participate in various ways, either by contributing input at HMPC meetings, being aware of planning activities through an email group, providing information to support the effort, coordinating directly with the participating jurisdictions during the review of the annexes, or reviewing and commenting on the draft plan. Based on their involvement in other hazard mitigation planning efforts, and status in the County, representatives from the following agencies and organizations were invited to participate as stakeholders in the process by email; an asterisk indicates they participated in HMPC meetings or participated in focused on-on-one meetings. More specifics on stakeholder agency representatives can be found in Appendix A and documentation in Appendix B.

Federal, State, and Local Agencies

- American River Conservancy
- Auburn Lake Trails Fire Safety and Improvement Council*
- Black Oak Mine Unified School District
- Buckeye Union School District
- Bureau of Reclamation - Region 10 - California-Great Basin
- CAL FIRE
- CAL FIRE Amador - El Dorado
- CAL OES*
- California Conservation Corps
- California Department of Fish and Wildlife
- California Department of Transportation - District 3
- California Geological Survey - Department of Conservation
- California State Parks
- California Tahoe Conservancy
- Department of Transportation
- Diamond Springs / El Dorado Fire Protection District*
- EDC Agriculture Commission
- EDC Animal Services*
- EDC Chief Administrative Office
- EDC Dept. of Transportation*

- EDC Emergency Medical Services Agency*
- EDC Emergency Preparedness*
- EDC Environmental Management*
- EDC Farm Trails Association
- EDC Fire Protection District*
- EDC Fire Safe Council*
- EDC Health and Human Services
- EDC Health and Human Services Agency Public Housing Authority
- EDC Long Range Planning*
- EDC Mental Health
- EDC Office of Emergency Services*
- EDC Office of Wildfire Preparedness and Resilience*
- EDC Planning and Building Department
- EDC Public Health*
- EDC Resource Conservation District
- EDC Surveyors Office*
- EDC Transportation Commission
- EDC Water Agency*
- El Dorado Air Quality* Management District
- El Dorado Community Foundation
- El Dorado Irrigation District (EID)
- El Dorado Union High School District
- Eldorado National Forest
- Fallen Leaf Lake Fire District
- FEMA - Region 9
- Folsom Lake College - Placerville
- Garden Valley Fire Protection District
- Georgetown Divide Recreation
- Georgetown Divide Resource Conservation District
- Georgetown Fire Protection District
- Georgetown PUD*
- Gold Oak Union School District
- Gold Trail Union School District
- Indian Diggings School District
- Lake Tahoe Community College
- Lake Tahoe Unified School District
- Lake Valley Fire Protection District*
- Lakeside Water District
- Latrobe School District
- Los Rios College El Dorado Center
- Meeks Bay Fire District
- Mosquito Fire Protection District
- Nevada Division of Forestry
- NOAA
- NOAA - National Weather Service
- North Tahoe Fire Protection District
- Office of Planning and Research
- Oak Hill Fire Safe Council*
- Pioneer Fire Protection District
- Placerville Police Dept.*
- Rescue Fire Protection District
- Sacramento Area Council of Governments
- Sacramento Municipal Utility District
- Shingle Springs Bank of Miwok Indians
- Shingle Springs Health & Wellness Center/Tribal Health
- South Tahoe PUD
- Tahoe City PUD*
- Tahoe Douglas Fire Protection District
- Tahoe Regional Planning Agency
- Tahoe Resource Conservation District
- Tahoe Transportation District
- United States Forest Service*
- USDA Forest Service - Eldorado National Forest
- USDA Forest Service - Lake Tahoe Basin Management Unit
- USDA Forest Service - Pacific Southwest Research Station
- Washoe Tribe of Nevada and California

Agencies that have Authority to Regulate Development

- Arroyo Vista CSD
- Audubon Hills CSD
- Cameron Estates CSD*
- Cameron Park Airport District
- Cameron Park Fire Department
- Camino Union School District
- City of South Lake Tahoe*
- Connie Lane CSD
- Cosumnes River CSD
- East China Hill CSD
- El Dorado Hills CSD*
- El Dorado Hills Fire Department*
- Fallen Leaf Lake CSD
- Garden Valley Ranch CSD*
- Golden West CSD
- Greenstone Country CSD
- Grizzly Flats CSD*
- Hickok Road CSD
- Hillwood CSD
- Holiday Lake CSD
- Knolls Property Owners CSD
- Lakeview CSD
- Mortara Circle CSD
- Marble Mountain CSD
- Nashville Trail CSD
- Rising Hill Road CSD
- Rolling Hills CSD*
- Showcase CSD
- Sierra Oaks CSD
- West El Largo CSD

Neighboring Communities/Counties

- Alpine County
- Amador County
- Douglas County
- Placer County
- Sacramento County

Businesses, Academia, Utility Providers, Dam Owners and Operators and Non-Profits

- All About Equine Animal Rescue, Inc.
- American Red Cross - Northern California Chapter
- Barton Hospital*
- Blue Shield
- Camp Richardson Resort
- Clarksville Region Historical Society
- El Dorado Hills Chamber of Commerce

- El Dorado Winery Association
- League to Save Lake Tahoe
- Liberty Utilities*
- Marshall Foundation of Community Health
- Marshall Hospital*
- Marshall Hospital and Medical Center
- Marshall Medical Center
- Meyers Community Foundation
- Mother Lode Rehabilitation Enterprise Inc. (MORE Workshop)*
- National Fire Protection Association - Firewise USA Communities
- Nugget Markets
- Pacific Gas & Electric (PG&E)*
- Pollock Pines Community Center/First Baptist Church
- Salvation Army
- Shingle Springs Rancheria*
- Sierra Climate Adaptation and Mitigation Partnership (Sierra CAMP)
- Sierra Nevada Alliance
- SIG-GIS
- Tahoe Chamber of Commerce
- Tahoe Prosperity Center
- The Mountain Pact
- University of California - Davis Tahoe Environmental Research Center
- Valley Vision

Representatives that Provide Support to Underserved Communities

- Alta California Regional Center *
- Alliance of Regional Collaboratives for Climate Adaptation (ARCCA)
- El Dorado Community Foundation
- El Dorado Food Bank *
- El Dorado Habitat for Humanity
- Elder Options*
- Green Valley Community Church/Common Ground
- Hope House
- New Morning Youth and Family Services
- Placer Independent Resource Services*
- South Lake Tahoe Family Resource Center

Incorporation or Existing Plans and Other Information

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. El Dorado County uses a variety of comprehensive planning mechanisms, such as general plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

A high-level summary of the key plans, studies and reports is summarized in Table 3-6 below. Information on how they informed the update is noted and incorporated where applicable.

Table 3-6 Summary of Review of Key Plans, Studies and Reports

PLAN, STUDY, OR REPORT	HOW PLAN INFORMED MJHMP
California Climate Adaptation Strategy, 2021 and Extreme Heat Action Plan, 2022	Informed the Extreme Heat profile and climate change considerations in the risk assessment and consequence analysis.
California DOF/U.S. Census Bureau, ACS, 2018-2022	Informed the background of the community including demographic trends and the calculation of population at risk.
California Environmental Quality Act (CEQA)	CEQA is a California statute passed in 1970 (shortly after the United States Federal Government passed the National Environmental Policy Act (NEPA)), to institute Statewide policy of environmental protection. The County will complete supporting CEQA documentation prior to board approval and adoption.
California State Drought Contingency Plan	The State Drought Contingency Plan was consulted for areas of potential concern and potential Drought Relief Actions (DRAs).

PLAN, STUDY, OR REPORT	HOW PLAN INFORMED MJHMP
California State Hazard Mitigation Plan	Reviewed information on climate change and hazard assessment data to ensure consistency with this plan update. Reviewed list of hazards to inform risk assessment and consequence analysis (Section 4). Reviewed goals for consistency.
Community Wildfire Protection Plans (CWPPs)	The two County CWPPs were consulted to assess wildfire hazards and vulnerabilities, as well as mitigation strategies and the prioritization of proactive measures.
El Dorado County 2019 MJHMP	The plan was reviewed to provide a basis for the current update.
El Dorado County Emergency Operations Plan (EOP)	The 2023 El Dorado County EOP incorporates the FEMA Comprehensive Preparedness Guide 101 v. 2.0 and the State of California Emergency Plan best practices. The plan is designed to be read, understood, and exercised prior to an emergency and establishes the framework for implementation of the California Standardized Emergency Management System (SEMS) and the NIMS for the County. The EOP is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between the County and its jurisdictions, as well as special districts, utilities, major businesses, community groups, State agencies, and the federal government.
El Dorado County Flood Insurance Study	Reviewed for information on past floods and flood problems to inform risk assessment and consequence analysis (Section 4). Utilized digital flood insurance rate maps effective
El Dorado County General Plan	The El Dorado County General Plan was adopted by the Board of Supervisors in 2004. After undergoing a comprehensive update in 2024, the Public Health, Safety, and Noise Element ("Safety Element") addresses several hazards facing the County. The MJHMP references and was guided by this update. Multiple representatives from the HMPC also worked on the Safety Element update, which helped to ensure that both plans are integrated and contain mutually reinforcing policies. Future updates of the General Plan, including incorporation by reference of the 2024 MJHMP into the Safety Element will continue to ensure consistency between both plans.
El Dorado County Housing Element	The General Plan includes the Housing Element chapter. The 2021-2029 Housing Element is incorporated into the 2024 MJHMP update to identify development trends.

In the process of preparing this 2024 MJHMP update, many other existing plans, studies, reports, and technical information were evaluated or used as guidance. The HMPC included representatives who are charged with developing the El Dorado County General. The HMPC members work to ensure that local plans are integrated with the MJHMP and provide expertise for the integration of other local, State, and federal plans, codes, and regulations.

Other technical data, reports and studies were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include hazard identification, vulnerability assessment, and capability assessment. Information from the following agencies and groups was reviewed in the development and update of this plan. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

- CAL FIRE

- California Department of Parks and Recreation Office of Historic Preservation
- California Department of Public Health
- California Department of Transportation
- California DSOD
- California DWR
- California OES
- California Geological Survey
- California Natural Resources Agency
- California Water Foundation
- Center for Western Weather and Water Extremes
- El Dorado County OES
  FEMA
- National Register of Historic Places
- Natural Resource Conservation Service
- NOAA National Climatic Data Center
  NWS
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- Western Regional Climate Center

Integration of 2019 Plan into Other Plans and Planning Mechanisms

The 2019 LHMP was referenced in the County's 2023 EOP; it specifically references the plan in the hazard analysis, the drought section, and how preparedness actions and activities may also include implementation of hazard mitigation projects, Further, the 2023 EOP ties in the Hazard Mitigation Grant Program (HMGP) as a way the County can seek grants to implement hazard mitigation measures following a major disaster declaration and emphasizes the importance of implementing the County's MJHMP. The 2019 LHMP was also specifically incorporated by reference in the 2004 Public Health, Safety, and Noise Element (amended in 2019). For example, the County's 2004 General Plan Public Health, Safety, and Noise Element extensively references the County's current MJHMP, and the proposed Draft Safety Element also references the MJHMP, the CVA, and the Greater Placerville Wildfire Evacuation Preparedness, Community Safety, and Resiliency Study.

The 2019 El Dorado County LHMP included a process for plan maintenance and implementation of the mitigation strategy as well as formal updates to the plan document. The 2019 process called for a formal plan update as required by DMA regulations every 5 years. El Dorado County Office of Emergency Services conducted informal reviews in an annual basis and conducted formal documented reviews when necessary.

As stated, documented reviews of the 2019 plan took place on an as needed basis by the County and EDCOE. Other participants of the 2019 LHMP, like the South Tahoe Public Utility District (STPUD) coordinated annual reviews separately. The entire LHMP was adopted and incorporated by reference into the El Dorado County General Plan Safety Element as part of their General Plan update process. The risk assessment portion of the 2019 LHMP was relied on and further integrated into other planning mechanisms. Table 3-7 lists the planning mechanism the 2019 LHMP was integrated into by El Dorado County.

Table 3-7 Incorporation of El Dorado County 2019 LHMP into Other Planning Mechanisms

PLANNING MECHANISM	DETAILS
2004 General Plan – Safety Element and other sections	2019 LHMP fully incorporated by reference into Safety Element of the General Plan and the current Draft Safety Element update
2024 Emergency Operations Plan	LHMP risk assessment data incorporated into the Base EOP in the Hazard Analysis Summary; other LHMP data use in developing the 15 EOP Annexes
Community Wildfire Protection Plans	LHMP risk assessment data and mitigation projects, specific to wildfires are used and considered in the two CWPP updates: likewise, this MJHMP update will be implemented through CWPP updates

PLANNING MECHANISM	DETAILS
Capital Improvement Plans and Budgets	Mitigation projects are considered and included in annual CIPs as feasible

The plan implementation and maintenance process as set forth in the 2019 plan has been updated for this MJHMP update. The revised update implementation and maintenance process for the El Dorado County 2019 MJHMP update is set forth in Chapter 6 of this plan document.

3.4.2 Phase 2: Assess Risks

The HMPC began the effort to identify and assess all hazards with potential impacts on the planning area. Beginning with the 2019 plan, additional and revised hazards were incorporated into this MJHMP update. Data collection worksheets were used to assist in identifying hazards and vulnerabilities, particularly where risks may vary across the planning area. GIS was also used to visualize, analyze, and quantify hazards and vulnerabilities.

Additionally, the HMPC conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk and vulnerability to hazards. This assessment involved collecting information on government programs, policies, regulations, and plans, and evaluating the effectiveness of existing measures in mitigating identified risks and vulnerabilities. This capability assessment also built upon the adaptive capacity assessment in the CVA. A more detailed description of the risk assessment process, methodologies, and results are included in Chapter 4 Hazard Identification and Risk Assessment.

3.4.3 Phase 3: Develop the Mitigation Plan

The HMPC participated in brainstorming and discussion sessions to outline the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method for selecting and justifying recommended mitigation actions using specific selection criteria. Each recommended action includes key descriptors, such as a lead agency and possible funding sources, to help initiate implementation. This information is included in Chapter 5 Mitigation Strategy.

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified, a complete first draft of the plan was developed. This complete draft was provided for HMPC review and comment. Other State and local agencies were invited to comment on this draft. HMPC and agency comments were integrated into the second public review draft, which was advertised and distributed to collect public input and comments. The HMPC integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the CAL OES and FEMA Region IX to review and approve, contingent upon final adoption by the governing boards of each participant.

3.4.4 Phase 4: Implement the Plan and Monitor Progress

The true worth of any mitigation plan is in the effectiveness of its implementation. The plan was adopted by the governing boards of each participating jurisdiction using the sample resolution contained in Appendix C. An overall implementation strategy is described in Chapter 6 Plan Implementation and Maintenance.

4 HAZARD IDENTIFICATION AND RISK ASSESSMENT

Requirement §201.6(c)(2):

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

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

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

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

- Identify Hazards;
- Profile Hazard Events;
- Inventory Assets; and
- Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1: Hazard Identification: Natural Hazards** identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2: Asset Summary** describes the methodology for determining the vulnerability of the planning area to the identified hazards.
- **Section 4.3: Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences. All the hazards identified in Section 4.3 are profiled and assessed individually in this section. Research and information from the El Dorado County Hazard Mitigation Planning Committee (HMPC) is integrated into this section. This section also identifies the vulnerability of assets to each of the priority hazards, describing the impact that each hazard would have on the County and its critical assets, such as property; people; the economy; critical facilities and infrastructure; historic, cultural, and natural resources, and future development . The vulnerability assessment quantifies (to the extent possible) using the best available information, assets at risk to hazards, and estimates potential losses and provides a risk summary overall of each hazard highlighting key findings.

This risk assessment covers the entire geographical extent of unincorporated El Dorado County, including the incorporated area of the City of Placerville and the service area boundaries of Georgetown Divide Public Utility District (GDPUD), Cameron Park Community

Services District, and the El Dorado County Office of Education (EDCOE). Since this plan covers multiple participating jurisdictions, the HMPC is required to evaluate how the hazards and risks vary across participating jurisdictions. While these differences are noted in this chapter, they are expanded upon in the participating jurisdiction's annexes. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described for El Dorado County.

This MJHMP update involved a comprehensive review and update of each section of the risk assessment. As part of the risk assessment update, new federal, state, and local informational and spatial data was used, where available, and new spatial analyses and risk exposure modelling was conducted. Where data from existing studies and reports was used, the source is referenced throughout this risk assessment. Refinements, changes, and new methodologies used in the development of this risk assessment update are also detailed in this portion of the plan.

4.1 HAZARD IDENTIFICATION: NATURAL HAZARDS

Requirement §201.6(c)(2)(i):

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 El Dorado County HMPC conducted a hazard identification evaluation to determine the hazards that threaten El Dorado County. This section details the methodology and results of this effort.

4.1.0 Results and Methodology

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect El Dorado County. Hazards data from El Dorado County, California Office of Emergency Services (Cal OES), FEMA, California Department of Water Resources (DWR), the National Oceanic and Atmospheric Administration (NOAA), and other sources were examined to assess the significance of these hazards to the County's planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage. The natural hazards evaluated as part of this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future. Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in the risk assessment.

Table 4-1 below provides a crosswalk of the hazards identified in the 2019 El Dorado County Local Hazard Mitigation Plan (LHMP), 2021 City of South Lake Tahoe LHMP, and 2023 California State Hazard Mitigation Plan (SHMP). This risk assessment also compared the hazards addressed in the County's General Plan Safety Element and Draft Safety Element update. Numerous hazards were identified in the previous State and County plans. The crosswalk was used to develop a list of preliminary hazards for the HMPC to evaluate which were most relevant to the County's planning area.

Table 4-1 Crosswalk with Other Hazard Mitigation Plans

HAZARD	2024 EL DORADO COUNTY MJHMP	2019 EL DORADO COUNTY LHMP	2021 CITY OF SOUTH LAKE TAHOE LHMP	2023 CALIFORNIA SHMP
Agricultural Hazards			√	
Earthquake	√	√	√	√
Riverine, stream, and alluvial flood	√	√	√	√

HAZARD	2024 EL DORADO COUNTY MJHMP	2019 EL DORADO COUNTY LHMP	2021 CITY OF SOUTH LAKE TAHOE LHMP	2023 CALIFORNIA SHMP
Coastal flood/sea-level rise				√
Extreme heat	√		√	√
Extreme cold or freeze	√	√	√	√
Wildfire	√	√	√	√
Severe wind, weather, and storms	√	√	√	√
Landslide, debris flow, and other mass movements	√	√	√	√
Drought	√	V	√	√
Tsunami (Seiche)	√	√	√	√
Dam failure	√	√	√	√
Levee failure				√
Snow avalanche	√	√	√	√
Subsidence	√	√		√
Volcano			√	√
Urban structural fire				√
Other electrical outages			√	
Public safety power shutoff (PSPS)				√
Terrorism				
Air pollution				√
Tree mortality	√	√	√	√
Energy shortage			√	√
Cyber threats				√
Invasive and nuisance species			√	√
Epidemic, pandemic, vector-borne disease			√	√
Civil disorder				√
Natural gas pipeline hazards				√
Hazardous materials release				√
Transportation accidents resulting in explosion				√
Well stimulation and hydraulic fracturing				√
Oil spills				√
Electromagnetic pulse (EMP) attack				√

HAZARD	2024 EL DORADO COUNTY MJHMP	2019 EL DORADO COUNTY LHMP	2021 CITY OF SOUTH LAKE TAHOE LHMP	2023 CALIFORNIA SHMP
Radiological accidents				√
Geomagnetic Storm (Space Weather)				√

Source: 2024 El Dorado County MJHMP, 2019 El Dorado County LHMP, 2021 City Of South Lake Tahoe LHMP, and 2023 California SHMP.

The following hazards listed in Table 4-2, were identified and investigated for this plan update. As a starting point, the updated California SHMP was reviewed to evaluate the applicability of new hazards of concern to El Dorado County. Building upon this effort, hazards from the past plan were also identified, and comments explain how hazards were updated from the previous plan. All hazards from the 2012 and 2019 plans were profiled in this MJHMP plan update.

Overall hazard significance was based on a combination of geographic area, likelihood of future occurrences, and potential magnitude/severity. Climate change considerations are discussed qualitatively and quantitatively where applicable in each hazard profile, specifically on whether climate change is anticipated to have a low, medium, or high influence on future impacts. The individual ratings shown in Table 4-2 are based on or interpolated from the analysis of the hazards in the sections that follow.

Table 4-2 El Dorado County Hazard Mitigation Worksheet

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Avalanche	Limited	Likely	Moderate	Low
Dam Failure	Significant	Occasional	Critical	High
Debris Flow and Landslide	Limited	Likely	Moderate	Medium
Drought, Water Shortage, and Tree Mortality	Extensive	Likely	Critical	High
Earthquake	Significant	Occasional	Critical	Medium
Erosion	Limited	Occasional	Moderate	Low
Extreme Heat	Extensive	Likely	Moderate	Medium
Flood	Limited	Likely	Moderate	Medium
Seiche (Lake Tsunami)	Limited	Unlikely	Moderate	High
Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	Extensive	Highly Likely	Critical	Medium
Severe Weather: Tornadoes and High Wind	Extensive	Highly Likely	Critical	Medium
Severe Weather: Heavy Snow and Winter Storms	Extensive	Highly Likely	Catastrophic	High

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Subsidence	Limited	Unlikely	Moderate	Low
Wildfire	Extensive	Highly Likely	Catastrophic	High
Geographic Area Extensive: 50-100% of planning area Significant: 10-50% of planning area Limited: Less than 10% of planning area				
Likelihood of Occurrences Highly Likely: Near 100% probability each year. Likely: Between 10% and 100% probability per year or at least one chance in ten years. Occasional: Between 1% and 10% probability per year or at least one chance in next 100 years. Unlikely: Less than 1% probability in next 100 years.				
Magnitude/Severity Catastrophic: Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged. Critical: Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged. Moderate: Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged. Negligible: Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.				
Significance High: Widespread potential impact Medium: Moderate potential impact Low: Minimal potential impact				

Table 4-3 summarizes how these hazard rankings vary across each jurisdiction, which allows the jurisdictions to compare multiple hazards and priorities, and with a focus on the natural hazards.

Table 4-3 Hazard Rankings Across Jurisdictions

HAZARD	EL DORADO COUNTY	CITY OF PLACERVILLE	GEORGETOWN DIVIDE PUD	COUNTY OFFICE OF EDUCATION	CAMERON PARK CSD
Avalanche	Medium	Low	Medium	Medium	Low
Dam Failure	High	Medium	High	Medium	Medium
Debris Flow and Landslide	High	Medium	Medium	Low	Medium
Drought, Water Shortage, and Tree Mortality	Medium	Low	High	Medium	Medium
Earthquake	Medium	Low	Low	Medium	Medium
Erosion	Low	Low	Medium	Low	Low
Extreme Heat	Medium	Low	Medium	High	Medium
Flood	Medium	Medium	Low	Medium	High
Seiche (Lake Tsunami)	High	Low	Low	Low	Medium

HAZARD	EL DORADO COUNTY	CITY OF PLACERVILLE	GEORGETOWN DIVIDE PUD	COUNTY OFFICE OF EDUCATION	CAMERON PARK CSD
Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	Medium	Medium	Medium	Medium	Medium
Severe Weather: Tornadoes and High Wind	Medium	Low	Low	Low	Low
Severe Weather: Heavy Snow and Winter Storms	High	Low	Medium	Medium	Low
Subsidence	Low	Low	Low	Low	Low
Wildfire	High	High	High	High	High

4.1.1 Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the County. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible

businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Details on federal and state disaster declarations were obtained by the HMPC, FEMA, and Cal OES and compiled in chronological order in Table 4-4. A review of federal disasters shows 20 state and federal disaster declarations since 1997.

Table 4-4 El Dorado County - State and Federal Disasters Declaration, 1997-2023

HAZARD	DISASTER #	YEAR	STATE DECLARATION	FEDERAL DECLARATION	LOCATION
Winter Storms	DR-1155	1997	Yes	N/A	El Dorado County
Hollow Fire	FM-2532	2000	Yes	N/A	El Dorado County
2005/06 Winter Storms	DR-1628	2005-2006	Yes	Yes	El Dorado County
2006 Spring Storms	DR-1646	2006	Yes	Yes	El Dorado County
Angora Fire	FM-2700	2007	Yes	Yes	Meyers, South Lake Tahoe
January Storms	2008-01	2008	Yes	N/A	El Dorado County
King Fire	FM-5081	2014	Yes	Yes	El Dorado and Siskiyou Counties
January 2017 Storms	DR-4301	2017	Yes	Yes	El Dorado County
Late January 2017 Storms	DR-4305	2017	Yes	Yes	El Dorado County
February 2017 Storms	DR-4308	2017	Yes	Yes	El Dorado County
Severe Winter Storms	DR-4434	2019	Yes	Yes	El Dorado County (+17 additional counties)
Covid-19	EM-3428	2020	Yes	Yes	Statewide
Covid-19	DR-4482	2020	Yes	Yes	Statewide
Caldor Fire	FM-5413	2021	Yes	Yes	El Dorado County
Caldor Fire	EM-3571	2021	Yes	Yes	El Dorado County (+3 additional counties)
Wildfires	DR-4619	2021	Yes	Yes	El Dorado and Lake Counties
Mosquito Fire	FM-5453	2022	Yes	Yes	El Dorado and Placer Counties
Flood	EM-3591	2023	Yes	Yes	El Dorado County (+40 additional counties)
Flood	DR-4683	2023	Yes	Yes	El Dorado County (+43 additional counties)

HAZARD	DISASTER #	YEAR	STATE DECLARATION	FEDERAL DECLARATION	LOCATION
Flood	EM-3592	2023	Yes	Yes	El Dorado County (+42 additional counties)
Severe Winter Storms	DR-4699	2023	Yes	Yes	El Dorado County (+45 additional counties)

Source: Cal OES, FEMA

This disaster history (combined FEMA and State) suggests that El Dorado County experiences events that are worthy of a disaster declaration on average every two to three years.

4.2 ASSET SUMMARY

4.2.0.0 Assets Exposure

As a starting point for analyzing the County's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. This section describes significant assets exposed or at risk if a catastrophic disaster was to occur in the planning area.

Data used in this baseline assessment included:

- Total assets at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources;
- Parcel data; and
- Population growth and land use and development trends.

Total Assets at Risk

Building value assessments in this plan are based on data from the County's Assessor's Office. This data provided the baseline for an inventory of the total exposure of developed properties within the County and helps to ensure that the updated MJHMP reflects changes in development. It is important to note that depending on the nature and type of hazard events or disasters, it is generally the value of the infrastructure or improvements to the parcels that are of concern or at risk. Generally, the land itself is not a total loss, but may see a reduction in value. Thus, the parcel analysis excludes land value.

Parcel & Structure Exposure and Preparations for Analysis

The most up-to-date County Assessor data (2024) and parcel centroids were used to inventory the total number and types of parcels with improvements, defined as parcels with an improvement value greater than zero in the County, as well as the total number and types of structures on these parcels. Building content values were estimated based on the following formulas derived from FEMA/Hazus methods: a) Residential and Multi-Family Residential properties received content values worth 50% of the improved values; b) Commercial, Miscellaneous, Multi-Use, and Unassessed (Exempt) related properties received content values worth 100% of the improved values; and c) Industrial properties received content values worth 150% of the improved values. Adding up these content and original improved values yields the Total Value of Improved Parcels, which is an estimation of the total property exposure within the County. Table 4-5 shows the total property inventory by property type across jurisdictions. Total exposure for the Cameron Park CSD, EDCOE, and Georgetown Divide PUD were not broken out by jurisdiction as they share jurisdictional boundaries with the unincorporated County. The exposure analysis for the Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in their respective annexes. Please note: although include here because they are one of two incorporated jurisdictions in the County, the City of South Lake Tahoe did not participate in this plan update.

Table 4-5 Total Exposure by Jurisdiction and Property Type

JURISDICTION	PROPERTY TYPE	PARCEL COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE
Placerville	Commercial	274	$138,166,827	$138,166,827	$276,333,654
	Industrial	119	$165,583,976	$248,375,964	$413,959,940
	Miscellaneous	9	$5,376,181	$5,376,181	$10,752,362
	Multi-Family Residential	274	$125,613,428	$62,806,714	$188,420,142
	Residential	3,034	$658,714,309	$329,357,155	$988,071,464
	Unassessed	23	$0	$0	$0
	Total	**3,733**	**$1,093,454,721**	**$784,082,841**	**$1,877,537,562**
South Lake Tahoe	Commercial	427	$693,694,738	$693,694,738	$1,387,389,476
	Industrial	205	$190,097,182	$285,145,773	$475,242,955
	Miscellaneous	41	$62,044,302	$62,044,302	$124,088,604
	Multi-Family Residential	1,159	$428,757,849	$214,378,925	$643,136,774
	Residential	10,563	$3,277,900,166	$1,638,950,083	$4,916,850,249
	Unassessed	2	$0	$0	$0
	Total	**12,397**	**$4,652,494,237**	**$2,894,213,821**	**$7,546,708,058**
Unincorporated	Commercial	658	$656,248,328	$656,248,328	$1,312,496,656
	Industrial	804	$720,788,425	$1,081,182,638	$1,801,971,063
	Miscellaneous	747	$175,496,475	$175,496,475	$350,992,950
	Multi-Family Residential	512	$515,331,916	$257,665,958	$772,997,874
	Residential	66,242	$22,081,939,480	$11,040,969,740	$33,122,909,220
	Unassessed	72	$0	$0	$0
	Total	**69,035**	**$24,149,804,624**	**$13,211,563,139**	**$37,361,367,763**
	Grand Total	**85,165**	**$29,895,753,582**	**$16,889,859,800**	**$46,785,613,382**

Source: El Dorado County Assessor's Office 2024, WSP Analysis

Critical Facilities and Lifelines

A significant aspect of the risk assessment update was the update of critical facilities and an alignment/classification with the FEMA Community Lifelines framework. The critical facilities/lifelines Geographic Information Systems (GIS) database was based on a combination of County-provided data, Homeland Infrastructure Foundation-Level Data (HIFLD), and local and jurisdiction-specific input. Jurisdictions were able to review critical facility data, edit descriptive attributes and address information, and add new critical facilities. Jurisdictions also included ownership and replacement value information, where available. The results are summarized here and provided the basis for GIS-based vulnerability analyses, where data permitted.

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA sorts critical facilities into eight lifeline categories as shown in Figure 4-1.

Figure 4-1 Lifeline Categories

Source: FEMA 2023 Version 2.1

These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans, easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

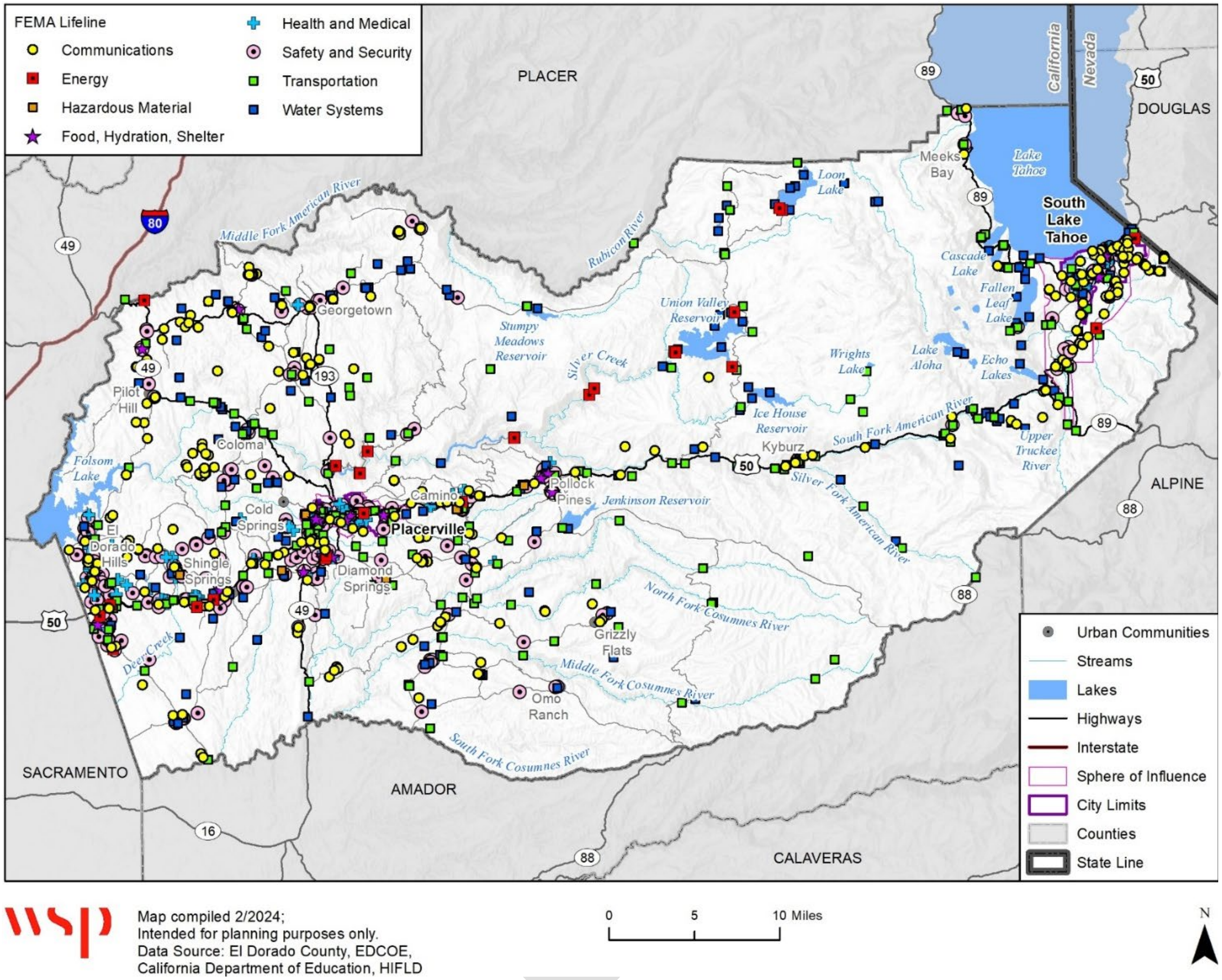
Table 4-6 shows a summary of the critical facilities inventory grouped by lifeline. Figure 4-2 illustrates the location of critical facilities in the County. The critical facility database includes water infrastructure facilities, such water treatment plants, pump stations, and key aboveground water diversion conveyance systems.

Table 4-6 Summary of Critical Facilities by Jurisdiction and Lifeline

JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, HYDRATION, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	WATER SYSTEMS	TOTAL
Placerville	1	1	6	1	36	92	20	2	**159**
Unincorporated	237	28	14	7	52	239	179	176	**932**
Total	**238**	**29**	**20**	**8**	**88**	**331**	**199**	**178**	**1,091**

Sources: El Dorado County, Placerville, Department of Education, HIFLD, National Inventory of Dams, National Bridge Inventory

Figure 4-2 El Dorado County Critical Facilities



Cultural, Historical and Natural Resources

Assessing the County's vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical, and cultural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Historic and Cultural Resources

Historical resources are buildings, structures, objects, places, and areas that are eligible for listing in the National Register of Historic Places (NRHP), the California Register of Historic Resources (CRHR), or the County's List of Historic Resources; or that have an association with important persons, events in history, or cultural heritage; or that have distinctive design or construction method.

For purpose of federal actions, a qualified historic resource is defined as a property listed in or formally determined eligible for listing in the NRHP before a disaster occurs. The NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the U.S. Department of the Interior National Park Service. Local and state agencies may consider a broader definition of qualified historic properties in the review, evaluation, and treatment of properties damaged during a disaster.

The State of California Office of Historic Preservation can provide technical rehabilitation and preservation services for historic properties affected by a natural disaster. Depending on the hazard, protection could range from emergency preparedness, developing a fire safe zone around sites susceptible to wildfires, or seismically strengthening or structurally reinforcing structures.

State and local registers of historic resources provide designated Historical Landmarks, Points of Historical Interest, and Historic Buildings. These resources include, but are not limited to:

- The California Register of Historical Resources
- The California Historical Landmarks
- The California Inventory of Historical Resources
- The California Points of Historical Interest
- National Park Service (NPS) Register of Historic Places

Historical Resources designated on a federal, State, or local level are listed in Table 4-7.

Table 4-7 El Dorado County Historical Resources

PROPERTY NAME	REGISTER	LOCATION	DATE LISTED
87000496, Baldwin Estate	National Register	South Lake Tahoe	4/1/1987

PROPERTY NAME	REGISTER	LOCATION	DATE LISTED
78000660, Bayley Hotel	National Register	Pilot Hill	12/17/1981
66000207, Coloma	National Register	Placerville	10/15/1966
5000259, Combellack-Blair House	National Register	Placerville	2/14/1985
82002174, Confidence Hall	National Register	Placerville	1/4/1982
91001522, Crawford Ditch	National Register	Pleasant Valley	10/21/1991
87000485, Eddy Tree Breeding Station	National Register	Placerville	3/31/1987
77000291, Episcopal Church of Our Saviour	National Register	Placerville	11/17/1977
84000770,Fountain-TallmaSoda Works	National Register	Placerville	9/13/1984
100001601, Georgetown Civil War Armory	National Register	Georgetown	9/18/2017
85003522, Hattie (Gold Bug)	National Register	Placerville	11/15/1985,
87000497, Heller Estate	National Register	South Lake Tahoe	4/1/1987
77000292, Lombardo Ranch	National Register	Placerville	9/30/1977
85003326, Pearson, John, Soda Works	National Register	Placerville	12/12/1985
87000495, Pope Estate	National Register	South Lake Tahoe	4/1/1987
73000401, Sugar Pine Point State Park	National Register	Homewood	3/30/1973
90000555, Tahoe Meadows	National Register	South Lake Tahoe	3/29/1990
96001078, Vikingsholm	National Register	South Lake Tahoe	10/10/1996
09000397, Wakamatsu Tea and Silk Colony Farm	National Register	Gold Hill	10/9/2009
Coloma road-Coloma (748)	State Landmark	Coloma	7/5/1960
Coloma road-Rescue (747)	State Landmark	Rescue	7/5/1960
Condemned bar (572)	State Landmark	Folsom	4/1/1957
Diamond springs (487)	State Landmark	Diamond Springs	8/7/1951
El Dorado (originally mud springs) (486)	State Landmark	El Dorado	8/7/1951
El Dorado-Nevada house (mud springs) - overland pony express route in California (700)	State Landmark	El Dorado	9/11/1959
Friday's station-overland pony express route in California (728)	State Landmark	El Dorado	4/8/1960
Georgetown (484)	State Landmark	Georgetown	8/7/1951
Gold discovery site (530)	State Landmark	Coloma	3/7/1955
Greenwood (521)	State Landmark	Greenwood	11/1/1954
Hangman's tree (141)	State Landmark	Placerville	6/6/1934
Marshall monument (143)	State Landmark	Coloma	6/6/1934
Marshall's blacksmith shop (319)	State Landmark	Kelsey	7/12/1939
Methodist episcopal church (767)	State Landmark	Placerville	11/3/1961
Moore's (riverton)-overland pony express route in California (705)	State Landmark	Kyburz	9/11/1959
Mormon island (569)	State Landmark	Folsom	4/1/1957
Mormon tavern-overland pony express route in California (699)	State Landmark	Clarksville	9/11/1959
Negro hill (570)	State Landmark	Folsom	4/1/1957
Old dry diggins-old Hangtown Placerville (475)	State Landmark	Placerville	10/30/1950

PROPERTY NAME	REGISTER	LOCATION	DATE LISTED
Placerville-overland pony express route in California (701)	State Landmark	Placerville	9/11/1959
Pleasant grove house overland pony express route in California (703)	State Landmark	Rescue	9/11/1959
Salmon falls (571)	State Landmark	Folsom	4/1/1957
Shingle springs (456)	State Landmark	Shingle Springs	1/11/1950
Site of California's first grange hall (551)	State Landmark	Pilot Hill	3/29/1956
Site of echo summit (1048)	State Landmark	South Lake Tahoe	12/2/2013
Sportsman's hall overland pony express route in California (704)	State Landmark	Cedar Grove	9/11/1959
Strawberry valley house-overland pony express route in California (707)	State Landmark	Kyburz	9/11/1959
Webster's (sugar loaf house)-overland pony express route in California (706)	State Landmark	Kyburz	9/11/1959
Yank's station-overland pony express route in California (708)	State Landmark	Meyers	9/11/1959

Sources: California Office of Historic Preservation, NPS National Register of Historical Places

Lists of designated historical resources change periodically, and they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Cultural resources defined in California Environmental Quality Act (CEQA) Section 15064.5 include prehistoric and historic archeological resources; historic-period resources (buildings, structures, area, place, or objects). Archeological resources reflect past human activity extending from Native American prehistoric cultures throughout the early 20th century. The artifacts left by previous occupants may be encountered in small to large residential sites, or special use areas.

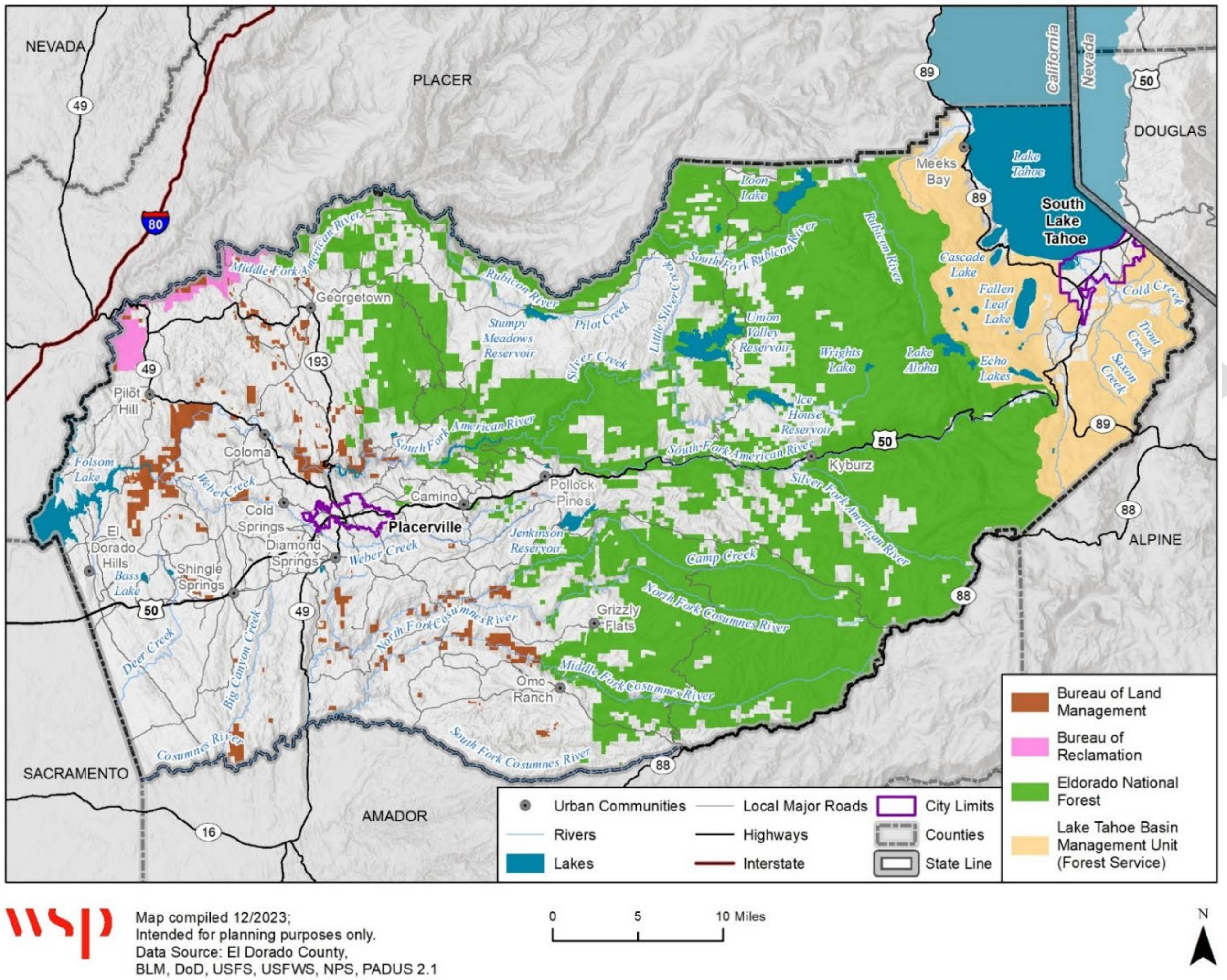
Many cultural and historical resources in the County are vulnerable to several hazards due to location and the nature of their construction. Some of these risks include earthquakes, wildfires, or adverse weather.

Natural Resources

Natural resources are important to include in benefit/cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Inventory and awareness of natural resource assets is vital to meeting conservation objectives. For example, protecting wetland areas provides sensitive habitat protection as well as floodwater conveyance and storage, which further enhances public safety.

shows the extent of federal land ownership in the County. Additional land is owned by the State of California, including the California Department of Fish and Wildlife, California State Parks, California State Lands Commission, and the California Tahoe Conservancy. The large amount of preserved and open spaces provides the County with an abundance of adaptive capacity for floodplain management, drought and water supply projects, and forestry and vegetation and fuels reduction opportunities.

Figure 4-3 El Dorado County Federal Landownership



To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (endangered and threatened species) in the planning area. The U.S. Fish and Wildlife Service (USFWS) maintains a list of federally listed threatened and endangered species for the county, which can be queried at the state or even county levels through the Information for Planning and Consultation (IPaC) database. The California Department of Fish and Wildlife (CDFW) also maintains species lists and accounts for threatened and endangered species. State and federal laws protect the habitat of these species through the environmental review process. Species of special concern may additionally include species that meet the State definition of threatened or endangered but that have not been formally listed, species that are experiencing serious population or habitat decline, or a species which has a naturally small population that is exhibiting high susceptibility to population decline (CDFW n.d.).

Table 4-8 summarizes El Dorado County's special status animal species as indicated in the IPaC database, within the Environmental Conservation Online System.

Table 4-8 Threatened and Endangered Species in El Dorado County

GROUP	COMMON NAME	SCIENTIFIC NAME	STATUS
Amphibians	California Red-legged Frog	*Rana draytonii*	Threatened
	Foothill Yellow-legged Frog	*Rana boylii*	Endangered
	Sierra Nevada Yellow-legged Frog	*Rana sierrae*	Endangered
	California Tiger Salamander	*Ambystoma californiense*	Threatened
Birds	California Spotted Owl	*Strix occidentalis*	Proposed Threatened
	Yellow-billed Cuckoo	*Coccyzus americanu*	Threatened
Crustaceans	Conservancy Fairy Shrimp	*Branchinecta conservatio*	Endangered
	Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	Threatened
	Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	Endangered
Conifers and Cycads	Whitebark Pine	*Pinus albicaulis*	Threatened
Flowering Plants	El Dorado Bedstraw	*Caulanthus californicus*	Endangered
	Layne's Butterweed	*Senecio layneae*	Threatened
	Pine Hill Ceanothus	*Ceanothus roderickii*	Endangered
	Pine Hill Flannelbush	*Fremontodendron californicum ssp. decumbens*	Endangered
	Stebbins' Morning-glory	*Calystegia stebbinsii*	Endangered
	Sacramento Orcutt Grass	*Orcuttia viscida*	Endangered
Fishes	Cui-ui	*Chasmistes cujus*	Endangered

GROUP	COMMON NAME	SCIENTIFIC NAME	STATUS
	Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	Threatened
Insects	Monarch Butterfly	*Danaus plexippus*	Candidate
	Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	Threatened
Mammals	North American Wolverine	*Gulo gulo luscus*	Threatened
	Sierra Nevada Red Fox	*Vulpes vulpes necator*	Endangered
Reptiles	Northwestern Pond Turtle	*Gambelia silus*	Proposed Threatened

Source: USFWS– Environmental Conservation Online System

Additionally, the El Dorado County Safety Element summarizes natural and cultural resources in the County as follows:

- Water resources are vulnerable to increased temperatures and precipitation variability if changes alter the ecosystem and the native plant composition.
- Extreme heat can result in harmful algal blooms in public parks and open spaces that could in turn impact public health.
- Vegetation communities are vulnerable to extreme heat, drought, pest infestations like bark beetle, and wildfire and often replaced by new communities following hazards events, like wildfires.
- State and County parks and open space facilities and campgrounds can be damaged and inundated by flooding, which would be exacerbated by more intense storms, further impacting regional recreation opportunities in the County. • Entire historic towns and districts can be lost during catastrophic events like wildfires.
- The Shingle Springs Band of Miwok Indians and the Washoe Tribe of Nevada and California traditional practices and social systems involved seasonal movements around the County for hunting and gathering. Climate change may affect these Tribe's cultural heritage, in addition to culturally and historically significant buildings, resources, places, practices, properties, districts, and other non-tangible values.

Growth and Development Trends

Population and Projected Growth

Over the last 10-year period 2012-2021, El Dorado County grew 8 percent. The majority of El Dorado County citizens (161,076) reside outside of the two incorporated cities of Placerville and South Lake Tahoe. According to the State of California Department of Finance (DOF) the 2023 population of the County was 189,006. The DOF projects the total population will slightly decrease by 1.88 % to 185,434 by 2030. While total households in the County are projected to increase from 75,383 in 2020 to 85,057 in 2030, people per household is projected to slightly decrease from 2.54 in 2020 to 2.42 persons per household in 2030.

Economy

The County's economy thrives on a diverse range of sectors, including tourism, healthcare, and government services. It is home to several hospitals, medical centers, and government agencies, creating a robust economic landscape. Tourism is a key driver, with attractions like the Lake Tahoe Basin and nearby ski resorts attracting millions of visitors annually. For instance, the Lake Tahoe Basin offers an array of outdoor activities such as hiking, biking, boating, and skiing against the backdrop of picturesque mountains. Historic Placerville is another notable attraction, known for its well-preserved landmarks, museums, and charming main street filled with shops, eateries, and galleries.

Furthermore, the County boasts a flourishing wine industry, benefiting from its favorable climate. The region, including the Sierra Foothills, is renowned for producing various wine styles, including Zinfandel, Syrah, and Cabernet Sauvignon. Despite its rural character, the County offers modern amenities such as shopping centers, supermarkets, top-rated schools, and community colleges. Its natural beauty is further complemented by parks and recreation areas like the expansive El Dorado National Forest and the iconic Lake Tahoe Basin, ensuring a high quality of life for residents and visitors alike.

The County's largest employment sector is Educational Services, Health Care, and Social Assistance, employing 10,543 people. Professional, Scientific, and Management, and Administrative and Waste Management Services employ 7,964 people and Public Administration comes in third, employing 5,377. The County's poverty rate is 8.5% compared to California's rate of 12.6%.

Social Vulnerability

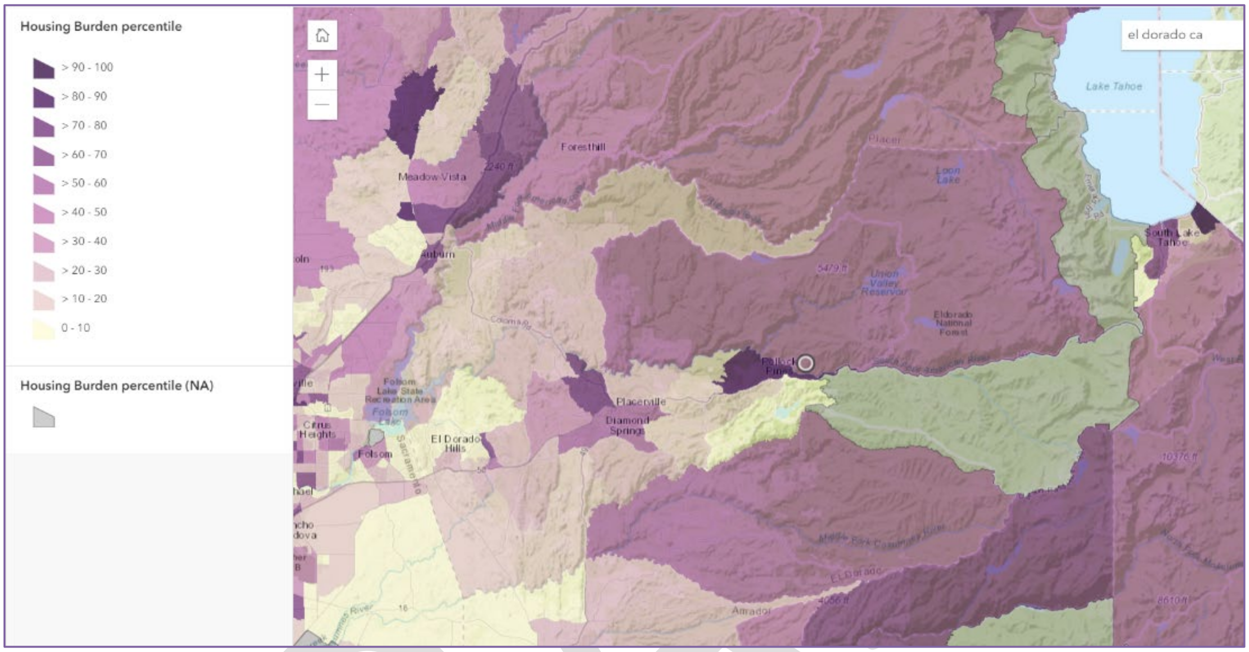
Social vulnerability considerations were included in this 2024 plan update to identify areas across the County that might be more vulnerable to hazard impacts based on many socioeconomic factors. In California, socially vulnerable populations, also referred to as disadvantaged communities (DACs) are mapped through Federal-developed and State mapping tools, including but not limited to the FEMA's National Risk Index (NRI) for Natural Hazards, the California Office of Environmental Health Hazard Assessment's (OEHHA) CalEnviroScreen, Department of Water Resources (DWR) Mapping Tools (DAC and Economically Distressed Areas [EDAs]), and, Center for Disease Control and Prevention (CDC) Agency for Toxic Substances and Disease Registry (ATSDR)'s Social Vulnerability Index (SVI). Of these mapping tools, FEMA's NRI and OEHHA's CalEnviroScreen are used to identify and assess socially vulnerable populations in the County's MJHMP update.

The OEHHA CalEnviroScreen tool applies a formula to generate a combined ranking score that considers 21 indicators for each census tract that cover pollution indicators, such as diesel emissions and concentrations of toxic clean-up sites and population indicators, such as poverty and unemployment rates. Census tracts with CalEnviroScreen rankings between 75 and 100 percent (i.e., a combined score in the top 25 percent of all census tracts in the State) are considered to be DACs.

One of the population indicators for the CalEnviroScreen is the Housing Burden Indicator, which identifies housing-burdened communities. Housing-burdened, low-income households are households that are both low-income and highly burdened by housing costs. The housing burden indicator measures the percentage of households in a census tract that are both low-income (making less than 80% of its County's median family income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs). California has very high housing costs relative to the rest of the country, which can make it hard for households to afford housing (OEHHA 2022). Households with lower incomes may spend a larger proportion of their income on housing and may suffer from housing-induced poverty (OEHHA 2022). Housing affordability is an important determinant of health and well-being. Low-income households with high housing costs may suffer adverse health impacts. These households are also more likely to be adversely affected during a hazard event and less likely to recover as quickly as other population groups.

Figure 4-4 shows the overall housing burden indicator for El Dorado County from the census tract level. There are a few communities within the County with a higher housing burden; these communities are concentrated around Pollock Pines, North and South Fork, Placerville, and the unincorporated area surrounding South Lake Tahoe. Twenty percent of the people in the dark purple census tract near the City of South Lake Tahoe are housing-burdened low-income households. This percent housing burdened is higher than 61% of the rest of California. In addition, 28% of the people in the dark purple census tract near Pollock Pines are housing-burdened low-income households. This percentage housing burdened is higher than 87% of the rest of California.

Figure 4-4 CalEnviroScreen Housing Burden Indicator – El Dorado County

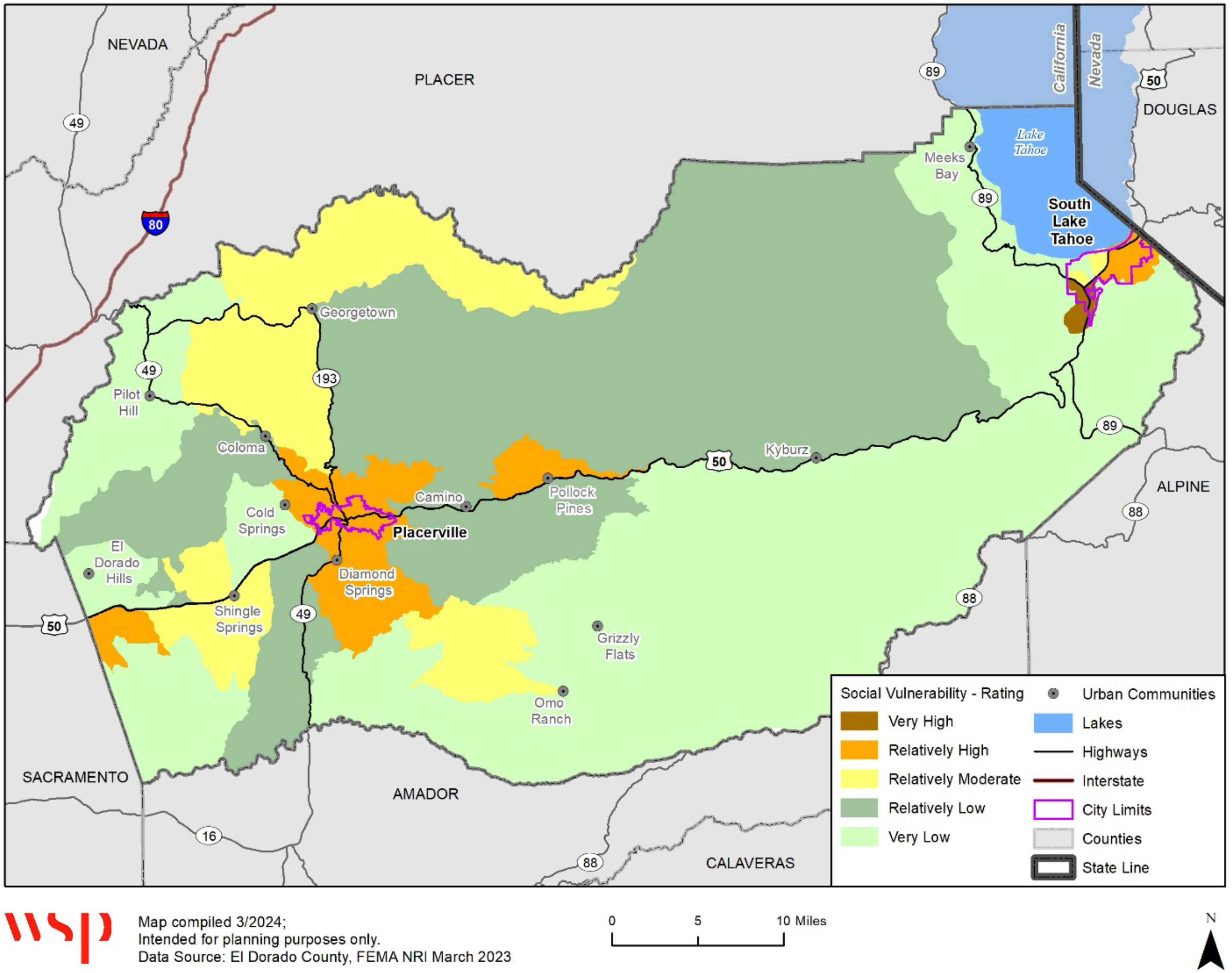


Source: CalEnviroScreen 2023

Social vulnerability is also one of the main three components of calculating FEMA's NRI level. As documented in the March 2023 NRI Technical Documentation, among various social vulnerability indices, the CDC/ATSDR's Social Vulnerability Index (SVI) was selected to be used in the NRI calculation. SVI is a location-specific assessment of social vulnerability that utilizes 16 socioeconomic variables deemed to contribute to a community's reduced ability to prepare for, respond to, and recover from hazards. Examples of these variables include racial and ethnic minority status, no high school diploma, and no health insurance.

Figure 4-5 below shows the overall social vulnerability of the County according to FEMA NRI and CDC/ATSDR's SVI. The darker the color, the higher social vulnerability the census tract possesses. Many census tracts within the County have relatively low to relatively moderate social vulnerability. The census tracks near Placerville, Pollock Pines and South Lake Tahoe in the County display the highest social vulnerability.

Figure 4-5 FEMA NRI Social Vulnerability – El Dorado County



The County can use the above information about these socially vulnerable communities to conduct targeted outreach and engage community members to consider what other hazards and mitigation strategies or programs should be considered to meet community needs. The County can also engage these communities to proactively prioritize hazard mitigation projects that benefit them.

Development Trends

The areas located in the Sphere of Influence (SOI) for each incorporated jurisdiction are areas each city plans to grow into and potentially slated for development trends. Understanding the potential hazard exposure in each area can help to mitigate the impacts of events before development occurs in those areas. Development trends since the previous 2019 LHMP update are also addressed. These growth and development trends are assessed in the Development Trends subsection of the vulnerability assessment, each annex, and broadly summarized below. In general, most residential development has occurred or is proposed within the city limits of each jurisdiction.

4.3 HAZARD PROFILES

Requirement §201.6(c)(2)(i):

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

The hazards identified in Section 4.1 Hazard Identification Natural Hazards, are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources.

Hazard Description – This section gives a description of the hazard problem and associated issues followed by details on the hazard specific to the County planning area.

Geographic Area– This section provides a spatial description of the potential location or areas of the County where the hazard is expected to impact.

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

Past Occurrences – This section contains information on historical incidents, including impacts where known events occurred. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.

Likelihood of Future Occurrence – The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance (probability) of an event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:

- **Highly Likely**: Near 100 percent chance of occurrence in next year or happens every year.
- **Likely**: Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
- **Occasional**: Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

- **Unlikely**: Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

Climate Change Considerations – This describes the potential for climate change to affect the frequency and intensity of the hazard in the future. The risk assessment describes two greenhouse gas (GHG) emissions scenarios that reflect different projections for how global emissions and atmospheric GHG concentrations may change over time but selects a high emissions scenario (Representative Concentration Pathway [RCP] 8.5) for each natural hazard affected by climate change. The Governor's Office of Planning and Research (OPR) recommends that agencies use RCP 8.5 for analyses when considering how primary indicators, like increased precipitation variability, increased temperatures, and reduced snowpack can result in potential impacts through 2050 because there are minimal differences between emissions scenarios during the first half of the century. The risk assessment also uses Cal-Adapt's default settings that provides outputs for subsets of 10 and 4 global climate models (GCMs) and integrates projections for mid-century (2040-2060) and through the end-of-century (2070-2090) but selects the high emissions scenario. Also, mapped climate projections using GIS data were only included for the mid-century (2040-2060) timeframe in the 2024 MJHMP given this plan is updated every 5 years. Refer to the County's Climate Vulnerability Assessment (CVA) for more information on both the mid-century and end-of-century projections and related hazard impacts and vulnerability summaries.

- **Magnitude and Severity** – This section describes the potential strength or magnitude of the hazard as it pertains to the County. It describes how much damage could occur as a result of a hazard event.
- **Catastrophic**: More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
- **Critical**: 25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
- **Moderate**: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
- **Negligible**: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Risk Assessment – Following the hazard profiles is a vulnerability assessment for each identified hazard. The assessment was conducted through the study of potential impacts on the following specific sectors:

- People
- Property
- Critical Facilities and Lifelines
- Economy
- Cultural, Historic and Natural Resources
- Development Trends
- Risk Summary

The vulnerabilities are summarized for all natural hazards. For example, the vulnerability assessment addresses who or what is vulnerable to natural hazards or climate stressors that influence the hazard, where someone or a critical facility is susceptible to related health impacts or direct damage, and when and why these assets may be vulnerable. The vulnerability assessment is used to inform strategic decision-making by identifying the assets or portions of the planning areas most vulnerable to natural hazards.

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

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

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities, historic structures, and valued natural resources. Together, this information conveys the impact, or vulnerability, of that area to that hazard.

Data used to support this assessment included the following information sources:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide and nationwide GIS datasets to support mitigation planning;
- California 2023 SHMP;
- El Dorado County 2012 and 2019 LHMP;
- 2024 Draft County Safety Element
- Count Safety Element including the 2023 Climate Vulnerability Analysis (CVA).
- Neighboring Jurisdictional HMPs (City of South Lake Tahoe 2021 LHMP);
- California Department of Forestry and Fire Protection (CAL FIRE) datasets;
- California's Fourth Climate Change Assessment;
- Written descriptions of inventory and risks provided by the jurisdictions;
- Online data sources (cited where applicable);
- Data and information from existing plans and studies; and
- Input from the HMPC members and staff from the County and local, state, and federal agencies

Section 4.1.1 Results and Methodology provides an initial assessment of the profiles and assigns a level of significance or priority to each hazard. Those hazards characterized as priority hazards are further evaluated in Section 4.3 Hazard Profiles. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of greatest significance to El Dorado County, enabling the County to focus resources where they are most needed.

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Hazard Identification.

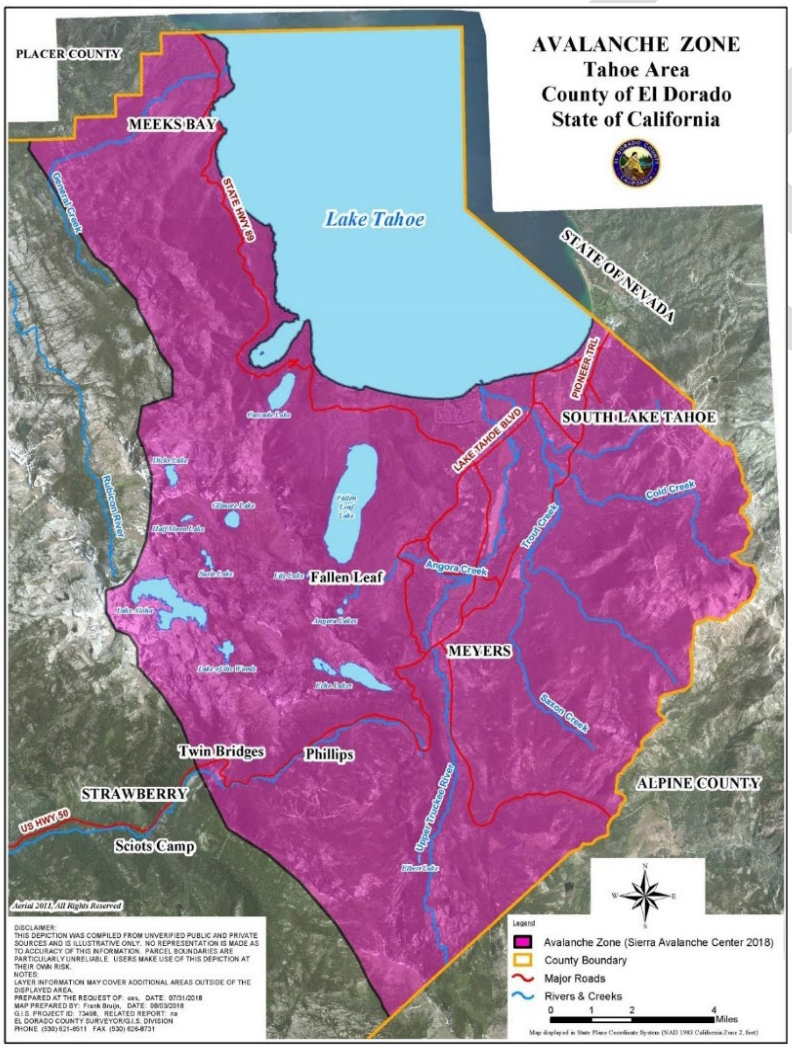
4.3.0 Avalanche

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Avalanche	Limited	Likely	Limited	Low

4.3.0.0 Hazard Description

An avalanche is a fall, release, or slide of a mass of snow in an amount sufficient to cause damage to or threaten the safety of people. Avalanches are possible when weak layers of snow within the cumulative seasonal snowpack fail to support the weight of the snow above and collapse. The result causes the overlying snow to break free and flow downhill. There are two destructive elements at work within an avalanche. First, is the actual impact from the displaced snow and ice. Embedded within the snow, debris such as broken-off trees and branches and rocks are just as dangerous as the snow itself. Secondly, the avalanche wind, caused by air pushed ahead of the moving mass of snow, can cause damages.

Figure 4-6 Avalanche Zone South Lake Tahoe



The terrain most susceptible to avalanches is typically in sheltered regions of mountain topography (where snow is most prone to accumulate) and along steep sloping angles ranging from 30 to 45 degrees. The most sheltered aspects in the Sierra Nevada, where snow most often accumulates, are upon north and northeast facing slopes. These slope faces are above 7,000 feet where snow is more likely to accumulate throughout the winter snowfall season, which typically lasts from November through April in El Dorado County.

Furthermore, snow avalanches can release loose snow (or slab-slides) and can be classified as wet or dry events, depending on the moisture content of the snowpack. Loss avalanches involve snow near the surface and release when cohesion is lost between the snow grains. Slab avalanches extend into deeper snow and release cohesiveness when a lower and weaker layer of snow fails. Slab avalanches can be both wet or dry and extremely large and destructive. However, both types of avalanches can flow downhill for long distances on gentle terrain and often damage or destroy buildings, cabins, and electrical transmission lines.

Additionally, avalanches can be triggered by human activity or environmental factors, such as wind loading, precipitation, or warm weather. Human-caused avalanches around the County usually occur away from developed areas, and most incidents involve backcountry skiers and hikers. Because human-triggered avalanche events are typically far from developed areas, they cause less damage and loss of life than a naturally caused avalanche could cause that occurs near developed areas. Once triggered, an avalanche path consists of a starting zone where they begin, a track where they develop speed and velocity, and a runout zone at lower gradient slopes where the slides slow down and the debris zone forms.

4.3.0.1 Geographic Area

Limited - El Dorado County is located in the Sierra Nevada geomorphic region of California, situated to the east of the Great Valley region and to the west of the Range and Basin region. The Sierra Nevada area is distinguished by its steep-sided hills and narrow, rocky stream channels. This region comprises deposits from the Pliocene and earlier periods, which have undergone uplift due to plate tectonics, granitic intrusion, and volcanic activity. The east-west alignment of stream channels is a result of subsequent glaciation and additional volcanic activity.

Avalanche hazards within El Dorado County are primarily confined to specific regions, including Echo Summit, State Route (SR) 89 (along the west shore of Lake Tahoe), and Fallen Leaf Lake. U.S. Highway 50 and SR 89 are also frequently subject to closures during the winter season, particularly in the Echo Summit and Emerald Bay areas, due to sliding snow and rocks. The California Department of Transportation (Caltrans) routinely engages in active avalanche control measures at Echo Summit and the surrounding areas near Emerald Bay.

Avalanche control along the mountain passes of U.S. Highway 50, the main east-west roadway through El Dorado County, is a continuous operation for Caltrans from November, when the first snow normally falls, until Spring. Caltrans monitors slope conditions, determining when any slope is ready for an avalanche. By triggering smaller, controlled avalanches, Caltrans reduces the potential for a large wall of snow from cascading down onto the highway, trapping motorists and causing injuries or deaths. These controlled "mini" avalanches are triggered by a projectile fired into the suspect slope from a LoCAT, a compressed air launcher, sending the unstable snow down the slope where Caltrans teams wait to clear the highway.

Additionally, the U.S. Forest Service (USFS) has pinpointed avalanche hazard zones in the Echo Lake and Fallen Leaf Lake regions, posing potential threats to private vacation cabins in those areas. However, there is currently no established program for actively mapping avalanche hazards in other areas across the County.

Typically limited to the steeper slopes of the Sierra Nevada Mountains, the majority of the land in this “avalanche zone” is owned and managed by the Eldorado National Forest or U.S Forest Service (USFS) Lake Tahoe Basin Management Unit (LTBMU). Private ownership development, when allowed, is done only after carefully considering appropriate setbacks from the known avalanche starting zones, tracks, and runout zones. Generally, the roadways running through this “avalanche zone” are also privately owned and therefore not a significant hazard for El Dorado County.

4.3.0.2 Past Occurrences

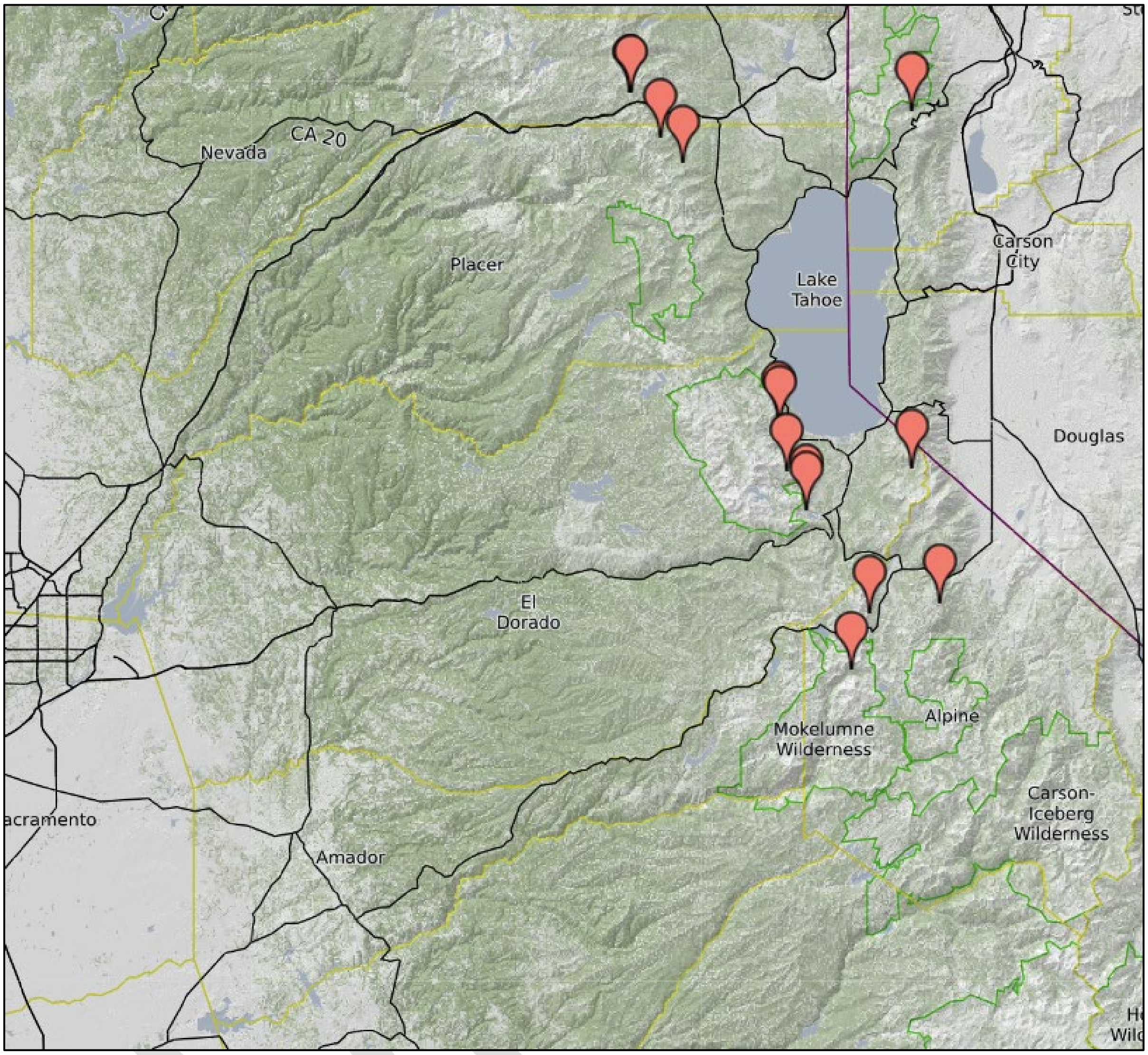
Historically, avalanches occur in the County between December and March, following snowstorms. Although avalanches have occurred on slopes of many angles, they most often occur on slopes ranging between 30 degrees and 45 degrees. Therefore, ski resorts, residences, roads, businesses, and other structures and activities in these areas are vulnerable. Areas where the potential for avalanches to exist are zoned as moderate or high avalanche hazard zones and have been identified. Moderate hazard zones are usually on shallow slopes and located immediately downhill of high zones. According to the 2023 El Dorado County Operational Area Emergency Operations Plan, areas of particular concern include:

- Mt. Tallac;
- Heavenly Ski Resort;
- Echo Summit;
- Sierra Ski Resort;
- Kyburz;
- White Hall;
- Highway 50 Corridor
- Desolation Wilderness;

According to NOAA’s National Center’s for Environmental Information (NCEI) database, since 1950, there have been 18 avalanches that resulted in nine deaths and 12 injuries in El Dorado County. Avalanche events in El Dorado County are likely to be centralized around the City of South Lake Tahoe.

The Sierra Avalanche Center (SAC) functions as a private-public partnership between the USFS and as a non-profit. SAC's mission is to inform and educate the public about backcountry avalanche conditions in the greater Lake Tahoe area. SAC makes avalanche forecasts regularly on their website and South Lake Tahoe is included in their forecasting zone. SAC also keeps records of the most recent 15 observations at a time, and this spatial data provides a good indication of recent snow conditions and avalanche activity for an area (SAC 2021). Figure 4-7 is an image from the SAC’s interactive avalanche map application showing recent incidents occurring in the County.

Figure 4-7 Recent Occurrences of Avalanches in El Dorado County near South Lake Tahoe



Source: SAC, 2023

4.3.0.3 Likelihood of Future Occurrence

Likely— Terrain and climatic factors make the County easily susceptible to avalanche hazards, which can be on the rise during snow seasons and pose risks to individuals in the backcountry regions of the County. Given the County's proximity to steep terrain and because backcountry avalanches triggered by human activity are an annual occurrence, the County can be affected, but these hazards are not expected to threaten residents and property. Potentially destructive avalanches triggered by environmental conditions are less common but can occur in higher hazard areas with steeper terrain. 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 eastern El Dorado County, avalanches and resulting damages, including injuries and loss of life, will continue to occur.

4.3.0.4 Climate Change Considerations

Climate change may influence the probability and characteristics of future avalanche potential. Shorter winters imply the possibility of less substantial snow accumulation at the base of the snowpack. However, with additional snow accumulating on a weakened layer and consistently warm temperatures, the upper layers of the snowpack, rich in moisture, become susceptible to sliding. The occurrence of more intense precipitation events depositing significant snow within a brief timeframe, coupled with rising temperatures, may intermittently heighten the risk of substantial avalanches.

4.3.0.5 Magnitude and Severity

Moderate – Avalanches are isolated occurrences predominantly located in the backcountry areas of the County and its surrounding areas. Avalanche events would most likely affect individuals in the backcountry during the snow seasons. Avalanche danger within the established ski resorts as well as on the highways that traverse the high elevation passes in El Dorado County is of a lesser degree given that safety measures are in place.

Weather and terrain factors determine avalanche severity and danger:

Weather:

- **Storms** – A large percentage of all snow avalanches occur during and shortly after storms.
- **Rate of snowfall** – Snow falling at a rate of 1 inch or more per hour rapidly increases avalanche danger.
- **Temperature** – Storms starting with low temperatures and dry snow, followed by rising temperatures and wetter snow, are more likely to cause avalanches than storms that start warm and then cool with snowfall.
- **Wet snow** – Rainstorms or spring weather with warm, moist winds and cloudy nights can warm the snow cover, resulting in wet snow avalanches. Wet snow avalanches are more likely on sun-exposed terrain (south-facing slopes) and under exposed rocks or cliffs.

Terrain:

- **Ground cover** – Large rocks, trees, and heavy shrubs help anchor snow.
- **Slope profile** – Dangerous slab avalanches are more likely to occur on convex slopes.
- **Slope aspect** – Leeward slopes are dangerous because windblown snow adds depth and creates dense slabs. South-facing slopes are more dangerous in the springtime.
- **Slope steepness** – Snow avalanches are most common on slopes of 30 to 45 degrees.

The common factors contributing to the avalanche hazard are existing snow depth, existing snow surface, new snow depth, new snow type, density, snowfall intensity, precipitation intensity, settlement, wind direction and speed, temperature, and subsurface snow crystal structure. The danger of an avalanche can be described in terms of its likelihood, size, which includes its width, length it travels, or the depth of the debris, and distribution. While there are a few scales that rate avalanches based on their destructive force, such as the D-Scale, a commonly used scale for search and rescue, ski patrollers, and backcountry travelers measures avalanche severity based on size, the mass, length, and pressure of the slide. Table 4-9 summarizes this avalanche danger scale.

Table 4-9 Avalanche Danger Scale

DANGER LEVEL	TRAVEL ADVICE	LIKELIHOOD OF AVALANCHES	AVALANCHE SIZE AND DISTRIBUTION
5 – Extreme	Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 – High	Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific area.
3 – Considerable	Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated area.
2 – Moderate	Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 – Low	Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Source: Avalanche.org

The avalanche season extends from the initial substantial snowfalls in late fall until the last remnants of snow have melted away. In certain high-elevation areas around the County, snow may persist throughout the entire year in some seasons.

The primary impact of avalanches on the County is felt in its transportation infrastructure. Two state highways traverse the County – U.S. Highway 50 and SR 89. The intermittent closure of Highway 50 over Echo Pass during the winter months is, in part, due to avalanche danger and the implementation of avalanche control measures by Caltrans. This closure affects the travel options for County residents, emphasizing the importance of SR 89 over Luther Pass and Nevada SR 207 over Daggett Pass, which remains open year-round. During winter storms, periodic avalanche control operations on U.S. Highway 50 are necessary to ensure motorist safety over the passes. Without these measures, travel on the County's main highway corridors would be challenging in the winter season. Avalanche control by Caltrans enhances public safety and minimizes avalanche risks.

Safety precautions are also in place to ensure the well-being of residents and tourists during snowy seasons. For instance, the primary ski resorts in the County, Heavenly Ski Resort and Sierra at Tahoe, both employ avalanche control techniques to mitigate the risk of avalanches. Ski patrollers conduct daily avalanche control, essential for ensuring safety on the mountain for all skiers and riders. Efforts are made to reduce the potential for avalanche events in areas frequented by people, as many of the risks associated with avalanches are well-known.

However, challenges may arise in backcountry areas lacking avalanche control measures. In these areas, out-of-bounds downhill skiers, cross-country skiers, and snowmobile riders can trigger avalanches, posing a threat to life and property. The County remains vulnerable to avalanche danger in underdeveloped areas without proper avalanche control methods. Traveling into backcountry regions during snowy seasons increases the possibility of injuries. Other issues linked to avalanches include power outages due to disabled power lines and localized environmental damage within the avalanche path.

Source: SAC, 2023

The images above show a 2023 avalanche off Monument Peak on the backside of Heavenly Ski Resort. Three skiers inadvertently set off an avalanche as they navigated the backside of Heavenly Mountain. Tragically, two out of the three skiers found themselves caught in the powerful force of the avalanche, resulting in severe injuries. Fortunately, there were no reported deaths. The snow conditions were accompanied by heavy wind (SAC 2023).

4.3.0.6 Vulnerability Assessment

People

Individuals engaged in backcountry recreation and road maintenance crews face the highest risks associated with avalanches. The increasing number of outdoor enthusiasts might contribute to a rise in fatal avalanche incidents. Apart from the growing popularity of backcountry skiing, there is a heightened interest in various recreational activities, often involving larger and heavier equipment that amplifies susceptibility to avalanches. Controlling public access to avalanche-prone recreational areas, even during periods of elevated risk, poses a significant challenge.

Backcountry avalanche events necessitate the deployment of search and rescue teams and resources, putting personnel at potential risk. Effective measures to minimize impacts on individuals engaging in hazardous areas involve the dissemination of knowledge and awareness regarding the hazards. Additionally, being properly equipped for potential self-rescue is crucial, with tools such as locator beacons, shovels, Geographic Positioning Systems (GPS) units, and communication devices. While hundreds of visitors may be present on the slopes at Heavenly Mountain Resort and Sierra-at-Tahoe simultaneously, ski resorts effectively manage avalanche risks, significantly reducing the threat to the public and visitors. Also, because climate change will result in rising temperatures and more intense precipitation events that deposit significant snow within a brief timeframe, these effects would heighten the risk of substantial avalanches in the County. They would in turn put more people, particularly motorists along U.S. Highway 50 and SR 89, and backcountry skiers and hikers at risk to avalanches.

Property

In relation to property, the impact on buildings in the County is minimal. Any potential damage is expected to be minor, possibly limited to snow sliding off building roofs. While Heavenly Ski Resort and Sierra-at-Tahoe lack residential structures, both resorts house commercial properties and infrastructure, including lodges and ski lifts, which may be susceptible to risks associated with runout paths from the ski area. Recent incidents and observations from the SAC show a lack of property damage, having events being mainly limited to natural areas. The damage caused by avalanches can result in broken power lines, leaving residents without electricity for an extended period. Telephone and cable lines may also be disrupted, impeding communication and the ability to seek help. These issues can further hinder rescue missions. Additionally, oil, gas, and water pipes may burst, leak, or be crushed, leading to a shortage of these essential supplies.

It is important to keep in mind that a severe avalanche has the capacity to devastate structures and constructions in its path entirely. Residences, cabins, and even ski resorts are vulnerable to this hazard. Increasing temperatures and more intense precipitation events associated with climate change could increase the amount of snow a storm may deposit within a brief timeframe, which was evident during the 2022/2023 winter storm events. These increased snowloads can have a substantial impact on residential properties and roof structures, particularly older constructed homes.

Critical Facilities and Lifelines

Avalanches have the potential to trigger various secondary effects, including the obstruction of roads, leading to the isolation of residents and businesses and causing delays in commercial, public, and private transportation. Additional issues that may arise include power and communication failures. While it is improbable that critical facilities are directly exposed to avalanche hazards, certain facilities, particularly the electrical grid network, may face disruptions. Power and communication failures are among the other potential challenges stemming from avalanches. U.S. Highway 50 and SR 89 are both susceptible to the impact of avalanche hazards during the winter months, but the implementation of avalanche control measures is in place to ensure the safety of motorists. Climate change is anticipate to only further exacerbate the potential for these heavy snowfall events and winter storms, and the cascading impacts that would result associated with highway and road closures and unplanned power outages.

Economy

Avalanche incidents within or beyond the County have the potential to disturb transportation to and from local communities, leading to temporary economic repercussions. The closure of transportation routes may impede the flow of goods and services, as well as disrupt the tourism and recreation industry. This hazard can also impact private property owners, orchards and cropland, and the tourism industry.

Avalanches also have the potential to isolate mountain communities at higher elevations from the surrounding regions entirely. The closure of railroads and roads may become necessary due to the damage inflicted by avalanches on the transportation infrastructure. Thick snow from the avalanche can cover roads, rendering vehicle movement impossible for several days until the snow is cleared. Vehicles, including cars and trains traversing the area during an avalanche, may also be swept away or buried under the snow.

Development Trends

With the increasing trends in tourism and backcountry recreation, accompanied by a rising number of visitors, there is a potential for heightened exposure to avalanche risks. However, the County, along with relevant agencies, has implemented precautionary measures to ensure public safety.

The El Dorado Zoning Ordinance establishes the Avalanche Hazard (AV) Combining Zone. The purpose is to implement General Plan policies by regulating new development, ensuring its safe location and design to mitigate avalanche hazards. It aims to minimize public exposure to avalanche-related hazards, emergency response, and transportation disruptions. The intent includes advising the public about avalanche-prone areas and reducing risks to development or human activities in these zones. The combining zone, when applied to designated areas on zoning maps, incorporates regulations to address avalanche potential.

The combining zone identifies avalanche hazard areas based on studies, designating severity zones such as High Hazard (Red) and Moderate Hazard (Blue). Specific development requirements are outlined for each zone, with conditions such as permitting requirements for residential and public developments in Red Zones. Additionally, construction standards within Avalanche Hazard Zones mandate certification by licensed professionals, emphasizing structural design resilience against avalanche forces. Discretionary permit requirements also involve a detailed study by certified experts, limiting new lots or increased density within the designated zones, with provisions for density transfers in more urbanized areas. The overall objective is to safeguard against avalanche risks while allowing for responsible development within the County. When coupled with climate change effects, new development in rural and avalanche hazard areas could be more prone to avalanche hazards; however, the application of the Avalanche Hazard AV Combining Zone, construction standards, and other permit requirements would minimize the public's exposure to avalanche-related hazards.

Cultural and Natural Resources

Avalanches can have adverse effects on the environment, particularly impacting trees situated on steep slopes. A sizable avalanche has the potential to uproot numerous trees and jeopardize the wildlife inhabiting and relying on them. During spring, the loss of vegetation on the mountains may weaken the soil, leading to the possibility of landslides and mudflows. If substantial woody debris reaches the valley bottoms, it could also pose a risk of ponding and flooding.

The influence on historic or cultural resources in the County is expected to be minimal, akin to the potential impact of avalanches on properties. However, a thorough assessment of the specific damage should be conducted on a case-by-case basis. For instance, structures that are already worn-out may be more susceptible to potential damage from avalanches and heavy snow hazards. For those cultural and historic structures located in remote and avalanche hazard areas may be a greater risk of avalanches due to climate change. For example, increasing temperatures and higher intensity winter storm events may increase snow loads on historic structures and in turn result in collapsed roofs. Increased snow loading on weak snow layers could also increase the number of avalanches in the backcountry, which may impact natural vegetation from larger slide events, which could later result in soil erosion and slope instability.

4.3.0.7 Risk Summary

- Since 1950, there have been 18 avalanches that resulted in 9 deaths and 12 injuries in the County.
- During the 2022-2023 season, there were five avalanche incidents in El Dorado County; none resulted in deaths or injuries.
- As winters become shorter due to increasing temperatures and climate change, the potential for weak snow accumulations at the bottom of the snowpack increases, increasing the likelihood of an avalanche.
- More extreme precipitation events that deposit large amounts of snow in a short period may also increase the potential for recurrent large avalanches.
- The overall significance of avalanche is **Low**.

4.3.1 Dam Failure

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Dam Failure	Significant	Occasional	Critical	High

4.3.1.0 Hazard/Problem Description

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

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

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

Water released by a failed dam generates energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure challenges local response capabilities and requires evacuations to save lives. Impacts to life safety depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Moreover, water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

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

Dams and reservoirs have been built throughout California to supply water for agriculture and domestic use, to provide capacity for flood management, as a source of hydroelectric power, and to serve as recreational facilities. The largest reservoir in El Dorado County is Folsom Lake. Folsom Lake was built by the U.S. Army Corps of Engineers (USACE) and it is now operated by the U.S. Bureau of Reclamation. It has a capacity of 976,000 acre-feet and its surface extends into both Placer and Sacramento counties. Folsom Lake is contained by and series of dams and dikes. Failure of some of the dikes could pose a hazard to areas in El Dorado County.

DWR's Division of Safety of Dams (DSOD) has jurisdiction over impoundments that meet certain capacity and height criteria. Embankments that are less than six feet high and impoundments that can store less than 15 acre-feet are non-jurisdictional. Additionally, dams that are less than 25 feet high can impound up to 50 acre-feet without being jurisdictional. DSOD assigns hazard ratings to large dams within the State. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam.

Dams are classified in three categories that identify the potential hazard to life and property. High hazard indicates that a failure would most probably result in the loss of life. Significant hazard indicates that a failure could result in appreciable property damage. Low hazard indicates that failure would result in only minimal property damage and loss of life is unlikely.

4.3.1.1 Geographic Area

Significant - According to the DSOD, as of January 2024, there are 50 total dams in the County. Of the 50 dams, 16 dams in the County are considered as "High" hazard classification and five are considered "Extremely High". Additionally, there are six high hazard dams outside of the County that could pose a threat of inundation: one in Alpine County, one in Amador County, and four in Placer County. These numbers are noted in Table 4-10, below.

Table 4-10 Total Dams with Inundation that Have Potential Risk to El Dorado County

NAME	COUNT
Extremely High	5
High	22
Significant	13
Low	22
Total	**62**

Source: Division of Safety of Dams, Department of Water Resources

Additionally, Table 4-11 lists the 50 DWR dams within the County by hazard class, including structure height and capacity in acres per foot.

Table 4-11 DWR Dams within El Dorado County by Hazard Class

ID	HAZARD CLASS	NAME	OWNER NAME	STRUCTURE HEIGHT (FT)	CAPACITY (ACRE FEET)
1	Extremely High	Echo Lake	El Dorado Irrigation District	14	1,900
2	Extremely High	Sly Park	El Dorado Irrigation District	182	41,000
3	Extremely High	Ice House	Sacramento Municipal Utility District	150	45,960
4	Extremely High	Union Valley	Sacramento Municipal Utility District	453	271,000
5	Extremely High	Crystal Lake	Bridlewood Canyon Owners Association	32	225
6	High	Cameron Park	Cameron Park Community Services District	29	480
7	High	Weber	El Dorado Irrigation District	92	1,100
8	High	New Bass Lake	El Dorado Hills Community Services District	26	745
9	High	El Dorado Hills	El Dorado Irrigation District	31	215

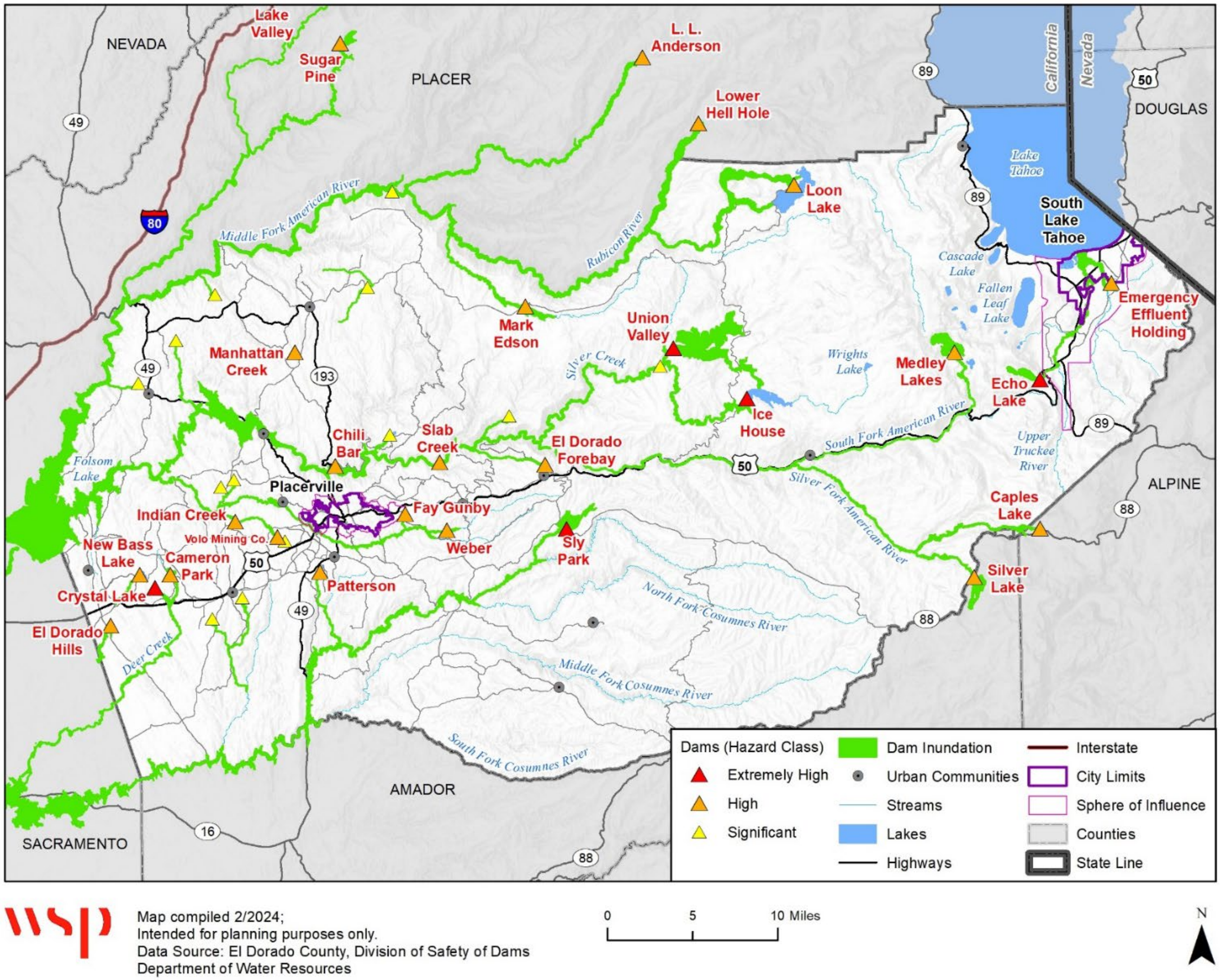
ID	HAZARD CLASS	NAME	OWNER NAME	STRUCTURE HEIGHT (FT)	CAPACITY (ACRE FEET)
10	High	El Dorado Forebay	El Dorado Irrigation District	102	600
11	High	Medley Lakes	El Dorado Irrigation District	21	5,350
12	High	Chili Bar	Sacramento Municipal Utility District	111	3,700
13	High	Mark Edson	Georgetown Divide Public Utility District	162	20,000
14	High	Loon Lake	Sacramento Municipal Utility District	108	76,500
15	High	Slab Creek	Sacramento Municipal Utility District	233	16,600
16	High	Emergency Effluent Holding	South Tahoe Public Utility District	27	184
17	High	Indian Creek	Greenstone Country Owners Association	36	457
18	High	Volo Mining Company	Private Entity	35	148
19	High	Manhattan Creek	Private Entity	32	110
20	High	Patterson	Lake Oaks Community	37	350
21	High	Fay Gunby	Private Entity	40	117
22	Significant	Georgetown Cntrl	Georgetown Divide Public Utility District	38	50
23	Significant	Williamson No. 1	Private Entity	42	117
24	Significant	Junction	Sacramento Municipal Utility District	168	3,250
25	Significant	Brush Creek	Sacramento Municipal Utility District	213	1,530
26	Significant	Holiday Lake	Holiday Lake Community Services District	39	150
27	Significant	Barnett	Lewis-DePaoli 2019 Trust	18	115
28	Significant	Schubin	Nawee Ventures, LLC	55	225
29	Significant	Niegel	Private Entity	63	99
30	Significant	Aeree	Pilot Hill Estates Homeowner Association	35	90
31	Significant	Auburn Lake Trails	Auburn Lake Trails Property Owners	41	68
32	Significant	Shingle Springs Band of Miwok Indians	Shingle Springs Band of Miwok Indians	33	111
33	Significant	Finnon Lake	Mosquito Volunteer Fire Department	46	400
34	Low	Blakely	Walker Land Company, LLC	19	152
35	Low	Rock Creek	Private Entity	35	34

ID	HAZARD CLASS	NAME	OWNER NAME	STRUCTURE HEIGHT (FT)	CAPACITY (ACRE FEET)
36	Low	D'Agostini	D'Agostini Family Ranch, Inc.	32	355
37	Low	Big Canyon Creek	Private Entity	63	395
38	Low	Camino	Sacramento Municipal Utility District	110	275
39	Low	Gerle	Sacramento Municipal Utility District	58	1,200
40	Low	Robbs Peak Forebay	Sacramento Municipal Utility District	44	30
41	Low	Buck Island	Sacramento Municipal Utility District	18	1,070
42	Low	Rubicon	Sacramento Municipal Utility District	36	1,450
43	Low	Cross Creek Ranch	Sauer Grapes, LLC	23	55
44	Low	Gastaldi	Private Entity	36	83
45	Low	Aukum View	Showcase Ranches Community Services District	32	136
46	Low	Straza	Private Entity	62	185
47	Low	Abrams	Private Entity	37	110
48	Low	Sun Ridge Meadow	Sun Ridge Meadow Owners Association	18	83
49	Low	Jacobs Creek	Four Corners Land Owners Association	53	587
50	Low	Tallac	Tahoe Keys Property Owners Association	16	1,399

Source: Division of Safety of Dams, Department of Water Resources

Flooding can also occur downstream of dams located within and outside the County as a result of dam incidents or failures. Figure 4-8 shows the dams, lakes and reservoirs, and rivers and streams within the County at risk of dam incidents or failure. 26 individual dam failure inundation zone maps are located in Appendix D of the County's Safety Element. The threat of dam failure varies across jurisdictions; however, there is no dam inundation risk to the City of Placerville. Dam risk to the other jurisdictions is further explored in each jurisdictional annex.

Figure 4-8 El Dorado County Dam Inundation



4.3.1.2 Past Occurrences

There is no history of dam incidents or failures affecting the County.

4.3.1.3 Likelihood of Future Occurrence

Occasional— The County is susceptible to potential dam failures from many dams owned and controlled by different entities, with diverse ages and conditions. The State of California's DSOD or the Federal Energy Regulatory Commission (FERC), or both, regulate and inspect these dams, providing subsequent written inspection reports. All dams within the County have been assessed and received satisfactory condition evaluations . Past occurrences have been rare. However, there are signs of change, discussed in the following section.

Source: 2021 City of South Lake Tahoe LHMP

The Echo Lake Dam is a roller-compacted concrete dam built on the southeast corner of Lower Echo Lake. It is located 7.5 miles to the southwest of the City of South Lake Tahoe near Echo Summit. The dam storage capacity is 1,860 acre-feet. This is a high-hazard dam owned by El Dorado Irrigation District, with an EAP in place.

4.3.1.4 Climate Change Considerations

A recent and high-profile dam incident related to an unexpected high runoff event has raised serious concerns over the impact of climate change on dam safety. In 2017, an Atmospheric River (AR) precipitation event in California dropped several inches of rain on a melting high-country snowpack that led to sudden and severe runoff. The resulting runoff nearly overtopped the Oroville Dam in northern California and did cause the spillway to fail. Concern for a catastrophic failure of the entire dam was sufficient to warrant an emergency evacuation of tens of thousands of people downstream. The 2017 Oroville Dam incident has led to increased scrutiny of the assumptions used in designing and building dams, especially in the western U.S.

More recently, evidence has mounted that climate change is making extreme weather events more frequent and more extreme. In 2022, researchers released the ARkStorm 2.0 severe storm and flood scenario (Huang and Swain 2022). This was an update to a 2010 California statewide disaster scenario, but was developed using updated and improved models and explicitly to evaluate runoff and flooding under future climate scenarios. The researchers found that climate change has already doubled the probability of an event sufficient to cause catastrophic flooding. In addition, the dynamics of a changing snow/rain regime could increase sudden runoff by another 200-400% in the future.

The Oroville Dam spillway failure and ARkStorm 2.0 developments serve to reveal a potential long-term vulnerability of dams to unexpectedly high sudden runoff caused by climatic conditions that did not exist when our dams were designed and constructed.

4.3.1.5 Magnitude and Severity

Critical – As previously mentioned, there are 16 dams rated as “High” significance and five dams rated as “Extremely High” significance that could result in extensive property damage and loss of life. For instance, Echo Lake Dam can inundate a significant eastern portion of the County. The extent of the impact depends on the nature of the failure.

There are several dams, which, if they fail, may impact the people and resources of El Dorado County. Eleven dams in El Dorado County are at least 100 feet tall or have a capacity of 10,000 acre-feet of water. Failure of any one of these dams would flood downstream areas and could cause loss of life and property. The inundation areas for each dam are generally downstream and include large rural and populated areas below the dams. Table 4-12 shows that there are

828 parcels and a population of 2,082 people at risk to dam inundation in the unincorporated areas of the County.

Table 4-12 Parcels at Risk to Dam Inundation in Unincorporated Areas

NAME	PROPERTY TYPE	PARCEL COUNT	POPULATION
Unincorporated	Commercial	26	0
	Industrial	2	0
	Miscellaneous	22	0
	Multi-Family Residential	18	45
	Residential	808	2,036
	Unassessed	2	0
	Total	**828**	**2,082**

.Source: El Dorado County Assessor Data 2024, Division of Safety of Dams, Department of Water Resources, WSP GIS Analysis

* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

4.3.1.6 Vulnerability Assessment

People

The failure of dams poses a significant threat to human lives, especially when downstream areas are densely populated. The rapid and uncontrolled flooding resulting from a dam break creates challenging conditions for timely evacuation, increasing the risk of drowning and other water-related accidents. In the event of a dam failure, communities situated downstream may be compelled to evacuate, leading to the displacement of residents. The loss of homes and possessions may necessitate temporary or long-term relocations, causing social and psychological impacts on those affected.

The risk to individuals downstream is influenced by factors such as topography, the volume of water in the reservoir, and the time of day of the breach. While populations at higher elevations within the inundation path may experience a lower level of risk, injuries, fatalities, and property damage can still occur due to debris, bodily harm, and drowning. Following a dam breach, standing water presents hazards similar to floodwaters from other sources, requiring the evacuation, care, and potential permanent relocation of individuals in the inundation area. The impacts could involve hundreds or thousands of evacuations and likely casualties, depending on the specific dam involved.

Source: Paul Kitagaki Jr. for the Sacramento Bee

The Union Valley Dam on Silver Creek, a tributary of the American River, is 453 structural feet high with a maximum storage capacity of 230,000 acre-feet. The reservoir is part of the Upper American River Project of the Sacramento Municipal Utility District, a public electric utility that operates the dam and numerous others in the area. Recreational activities, such as boating, fishing, and camping, are available in the vicinity. It stores snow melt runoff during the spring and releases it during the summer when electrical demand is greatest to a chain of hydroelectric power plants downstream. The Union Valley Powerhouse at the base of the dam has a capacity of 46.7 MW and operates as a peaking power plant, supplying electricity during times of the greatest demand. A failure of this dam would have significant consequences, impacting downstream communities, ecosystems, and potentially causing substantial flooding and property damage.

Additionally, climate change can intensify the impacts of dam failures, particularly for socially vulnerable populations. Dams intersecting the census tracks near Placerville, Pollock Pines and South Lake Tahoe in the County display the highest social vulnerability and risk for climate change-related dam failure threats. One significant factor is the increased frequency and severity of extreme weather events associated with climate change, such as intense rainfall, storms, and hurricanes, which can lead to higher water levels and increased pressure on dams, increasing the risk of breaches or failures. Socially vulnerable populations, including low-income communities, elderly individuals, and those with limited access to resources or transportation, face challenges in evacuating or accessing emergency services during dam failures exacerbated by climate change, leading to higher rates of injury, displacement, and even fatalities.

Moreover, climate change can alter hydrological patterns and water availability, affecting the management and maintenance of dams. For instance, droughts can lower water levels behind dams, potentially compromising their structural integrity, while rising temperatures can contribute to the melting of snowpacks and glaciers, altering the timing and volume of water flows into reservoirs, posing challenges for dam operators in managing water releases to maintain downstream safety and prevent overtopping or structural failures.

Property

Based on the classification of high hazard dams, the potential failure of these dams presents a severe risk of endangering human lives and causing significant harm to residential, industrial, or commercial zones, as well as vital public utilities, public structures, or major transportation facilities. With the increasing impacts of climate change, such as more frequent and intense extreme weather events, the vulnerability of properties within the inundation zone is further heightened.

Climate change can exacerbate the risk of dam failure, leading to larger and more frequent inundation events that extend beyond traditional floodplains. Inundation maps, which delineate anticipated flooded areas, may need to be updated to account for changing climate conditions and the potential for expanded flooding. These maps, along with comprehensive EAPs mandated for each dam, are essential tools for preparing communities situated downstream of high hazard dams along waterways to mitigate the impacts of climate-induced inundation events.

In the unlikely event of a complete dam failure, the susceptible areas in County's Planning Area include South Lake Tahoe, Echo Lake, Folsom Lake, and Slab Creek Reservoir. More population-dense communities including Placerville, El Dorado Hills and the South Lake Tahoe are also potentially at risk. However, it is important to note that catastrophic failure or flood release of water from multiple dams at a single point in time is considered to be extremely unlikely.

Critical Facilities and Lifelines

A complete dam failure can bring about consequences for regions downstream of the affected water body destroying critical infrastructure. Any vital asset positioned beneath the dam within an inundation area becomes vulnerable to the effects of a dam failure. Notably at risk are roads and bridges, which may be prone to washouts, thereby complicating response and recovery efforts by isolating impacted areas. The consequences for cities would extend to key infrastructure, encompassing hospitals, fire stations, clinics, and businesses.

As noted in Table 4-13, there are 93 critical facilities at risk to dam inundation in the County. This table displays the critical facilities at risk to dam inundation in the unincorporated County and the City of Placerville only. Critical facilities exposed to dam inundation within the other three participating jurisdictions was not summarized here for because some of the jurisdictions share the same boundary as the County. Critical facilities exposed by the jurisdiction they occur in are summarized in the annexes. All of these critical facilities fall within the unincorporated areas of the County.

Table 4-13 Critical Facilities at risk to Overall Dam Inundation by Jurisdiction

JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, HYDRATION SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	WATER SYSTEMS	TOTAL
Placerville	-	-	-	-	-	-	-	-	**0**
Unincorporated	1	13	-	-	-	3	49	27	**93**
Total	**1**	**13**	**0**	**0**	**0**	**3**	**49**	**27**	**93**

Source: DSOD, DWR, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Moreover, Table 4-14 shows the types of critical facilities at risk to dam Inundation.

Table 4-14 Critical Facilities at risk to Overall Dam Inundation by Type

FEMA LIFELINES	TYPE	COUNT
Communications	Communications	1
	Total	1
Energy	Power Plants	8
	Substation	5
	Total	**13**
Safety and Security	Fire Stations	1
	Government Facility	2
	Total	**3**
Transportation	Aviation Facilities	1
	Non-Scour Fair Condition Bridge	20
	Non-Scour Good Condition Bridge	28
	Total	**49**
Water Systems	Dam High Hazard Class	9
	Dam Signifigant Hazard Class	1
	Small Water Systems	17
	Total	27
	Grand Total	93

Source: DSOD, DWR, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI

Economy

The economic consequences following a dam failure are also significant. The impacts to infrastructure, the loss of agricultural land, and disruptions to businesses contribute to financial losses for individuals, communities, and the broader affected region. The process of rebuilding and recovery takes considerable expenses and demands increased amounts of time. Furthermore, the economic impacts may extend to increased insurance claims, reduced property values, and potential declines in tax revenues. In addition to direct economic losses, the long-term effects may include heightened unemployment, diminished business activity, and a broader economic downturn that reaches beyond the immediate affected area, affecting interconnected regions.

Development Trends

In the case of a dam failure, inundation would likely follow some existing FEMA-mapped floodplains, which contain development restrictions for areas in the 1% annual chance floodplain, but it could exceed those floodplains and affect areas that are not regulated for flood hazards. Also, development below a low or undetermined hazard dam could increase its hazard rating, as there are quite a few low hazard dams in the County. Finally, added development could compromise dams and reservoir resources if populations depend on them for critical needs such as potable water during or after a dam failure event.

The County has identified three policies under *Objective 6.4.2 Dam Failure* Inundation in its Safety Element:

- Protect life and property of County residents below dams:
- Policy 6.4.2.1 : Apply a zoning overlay for areas located within dam failure inundation zones as identified by the State Department of Water Resources Division of Safety of Dams.
- Policy 6.4.2.2 : No new critical or high occupancy structures (e.g., schools, hospitals) should be located within the inundation area resulting from failure of dams identified by the State Department of Water Resources Division of Safety of Dams.

- Policy 6.4.2.3: The County shall collaborate with the El Dorado Water Agency and El Dorado Irrigation District to ensure there are protections on plans in place for flood protection and to address risks associated with dam incidents.

Cultural and Natural Resources

Historic and cultural resources face potential vulnerability similar to housing or critical infrastructure in the event of a dam failure, leading to downstream inundation that could result in surface erosion or structural foundation damages. The preservation of these resources becomes crucial, as their potential impairment could diminish the cultural and historical richness of the affected region, impacting its identity and heritage for an extended period.

4.3.1.7 Risk Summary

- According to the DSOD, as of January 2024, there are 50 total dams in El Dorado County. Of the 50 dams, 16 dams in the County are considered as “High” hazard classification and five are considered “Extremely High”. Additionally, there are six high hazard dams outside of the County that could pose a threat of inundation: one in Alpine County, one in Amador County, and four in Placer County.
- Standard practice among federal and state dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or misoperation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental and lifeline facilities.
- The failure of dams poses a significant threat to human lives, especially when downstream areas are densely populated. The rapid and uncontrolled flooding resulting from a dam break creates challenging conditions for timely evacuation, increasing the risk of drowning and other water-related accidents.
- The overall significance for dam failure is **high**.

4.3.2 Debris Flows and Landslide

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Debris Flow/ (Landslide)	Limited	Likely	Moderate	Medium

4.3.2.0 Hazard Description

According to the California Geological Survey, landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation due to gravitational influence. Common landslide types include slump, rockslide, debris flow, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep.

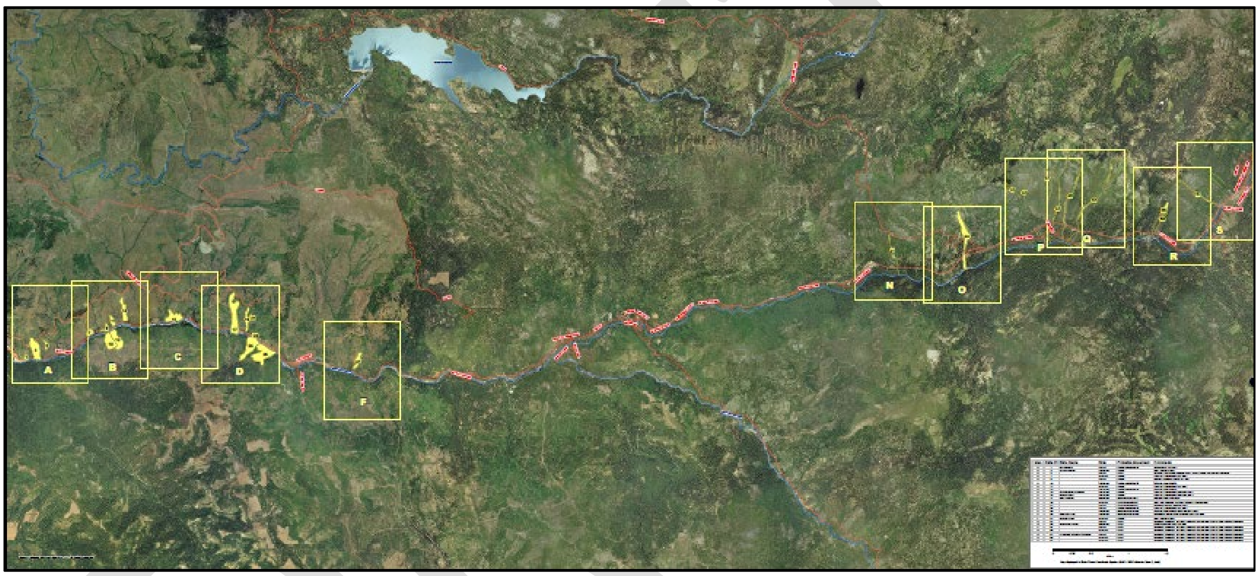
Landslides are categorized into groups based on movement and type of material involved. Movement types include falls, slides, and flows, with water content typically defining the movement. Falls involve minimal water, while flows have significant water present. Material types can be soil, rock, or debris, aiding in the identification of rockfalls, earthflows, or debris slides. Rockfalls are dry and fast, while debris slides are wet and slow.

A mudslide comprises water and fine-grained earth flowing, with debris flows occurring if over half the solids are larger than sand grains (rocks, stones, boulders). Two common debris flow types in the County are associated with shallow landslides and post-wildfire slope failure. Shallow landslide-related debris flows occur when soil liquefies and moves downhill following heavy rainfall, while post-wildfire debris flows result from increased runoff due to vegetation loss, picking up debris as it moves downslope.

The susceptibility of an area to debris flows depends on variables such as slope steepness, slope material type, material structure and properties, water content, vegetation amount, and proximity to erosion-prone areas or areas impacted by human activities like mining, construction, or surface drainage alterations. Debris flows often accompany other natural hazard events like floods, wildfires, or earthquakes, and can cause significant damage to structures, roads, utilities, and forests, as well as injury and death.

Post fire burn scar areas are a concern during El Nino winters, with debris flows occurring and contributing to sediment and debris loads in the American River tributaries. Slope failures are likely to become more frequent as more precipitation falls during fewer storms, particularly as higher temperatures, droughts, and wildfires impact the vegetation that holds soil in place, making it unable to absorb water and decreasing the stability of the slope. El Dorado County has monitored debris conditions in post fire areas and have incurred mobilization and other expenses as a result. Figure 4-9 depicts these areas.

Figure 4-9 El Dorado County Potential Debris Flow Areas (Highway 50 Corridor)



Source: El Dorado County 2018 LHMP

4.3.2.1 Geographic Area

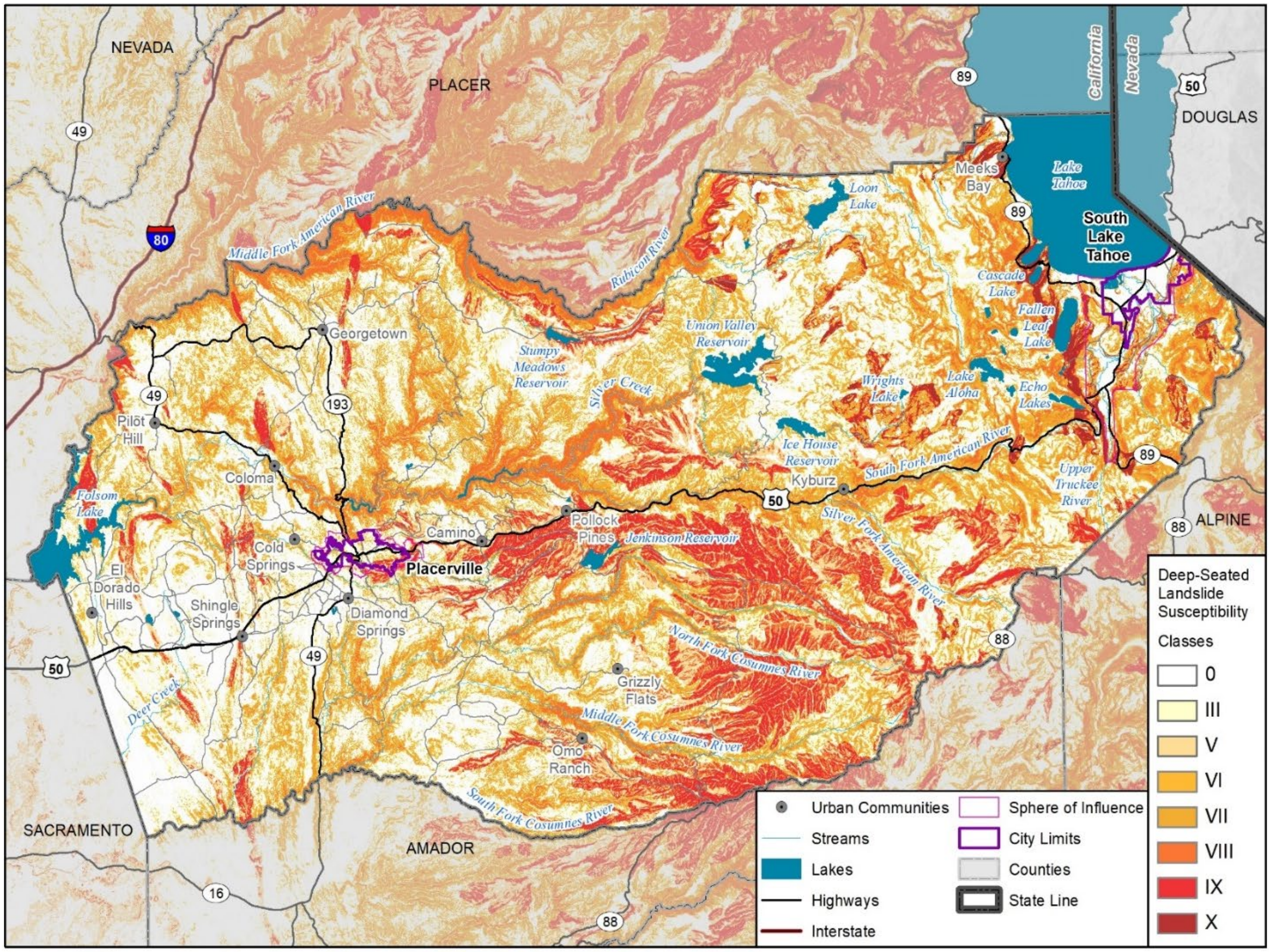
Limited–According to the 2018 El Dorado County LHMP, slope instability and debris flow hazards are generally found in areas of eastern El Dorado County, as seen in active and inactive landslide deposits. Historical and potential debris flow areas identified by the HMPC include Highway 50 east of Pollock Pines and State Route 49 north of Cool.

Figure 4-10 illustrates the susceptibility to deep-seated landslides in the County. On the most basic level, weak rocks and steep slopes are most likely to generate landslides. This map uses detailed information on the location of past landslides, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated land sliding.

Deep-seated landslides are those in which the majority of the slide plane sits below the roots of forest trees, with depths ranging from ten feet to several hundreds of feet. These slides often result from changes in geological and hydrological processes in the landslide area, such as seismic shaking or increased groundwater levels. This is distinct from shallow landslides, which occur within the rooting zone, are generally less than 10 feet deep, and are typically initiated by intense rainfall and/or rapid snowmelt which causes sudden saturation of the ground, triggering the slide.

Much of the County is susceptible to some degree of deep-seated landslides, with significant clusters of susceptibility evident in the central, unincorporated County below highway 50, and in and around the Tahoe Basin. It is notable that much of the area impacted by the Caldor Fire is in a high landslide susceptibility class, and that the data used predates the Fire, further exacerbating the susceptibility of landslide and debris flows in this area.

Figure 4-10 Susceptibility to Deep-Seated Landslides



Map compiled 1/2024;
Intended for planning purposes only.
Data Source: El Dorado County, Department of Conservation, California Geological Survey

4.3.2.2 Past Occurrences

There have been 13 FEMA disaster declarations in the County which have included landslides or mudflows, summarized in Table 4-15, below.

Table 4-15 FEMA Disaster Declarations Involving Mudflows or Landslides, 1950-2023

FEMA NUMBER	BEGIN DATE	END DATE	DECLARATION TITLE
DR-1044	1/3/1995	2/10/1995	Severe Winter Storms, Flooding, Landslides, Mud Flows
DR-1046	2/13/1995	4/19/1995	Severe Winter Storms, Flooding Landslides, Mud Flow
DR-1155	12/28/1996	4/1/1997	Severe Storms, Flooding, Mud and Landslides
DR-1628	12/17/2005	1/3/2006	Severe Storms, Flooding, Mudslides, and Landslides
DR-1646	3/29/2006	4/16/2006	Severe Storms, Flooding, Landslides, and Mudslides
DR-4301	1/3/2017	1/12/2017	Severe Winter Storms, Flooding, and Mudslides
DR-4305	1/18/2017	1/23/2017	Severe Winter Storms, Flooding, and Mudslides
DR-4308	2/1/2017	2/23/2017	Severe Winter Storms, Flooding, and Mudslides
DR-4434	2/24/2019	3/1/2019	Severe Winter Storms, Flooding, Landslides, and Mudslides
EM-3591	1/8/2023	1/31/2023	Severe Winter Storms, Flooding, and Mudslides
DR-4683	12/27/2022	1/31/2023	Severe Winter Storms, Flooding, Landslides, and Mudslides
EM-3592	3/9/2023	7/10/2023	Severe Winter Storms, Flooding, Landslides, and Mudslides
DR-4699	2/21/2023	7/10/2023	Severe Winter Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides

Source: FEMA, https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Additionally, there have been 15 mudslide events recorded by the NCEI Storm Events Database in El Dorado County, summarized by location and cause in Table 4-16 below. There were no deaths or injuries associated with these events.

Table 4-16 NCEI Storm Events Database Recorded Mudslide Events, 1998-2023

DATE	LOCATION	DAMAGES	DESCRIPTION
2/23/1998	Greater El Dorado County	$0	Mud Slide near Echo Summit closed U.S. 50 for four hours. A few cars were covered, but no injuries and no damage reported.
12/22/2005	Greater El Dorado County	$0	Heavy rain caused a rockslide on Highway 89 near Squaw Valley Road.
12/22/2005	Greater El Dorado County	$2,000	A tractor trailer hit a 3-foot diameter boulder on Interstate 80 near Farad.
10/13/2009	Greater Lake Tahoe Area	$0	Heavy rain caused a rockslide on CA SR 89 just south of Meeks Bay.
12/2/2012	Fallen Leaf	$0	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.

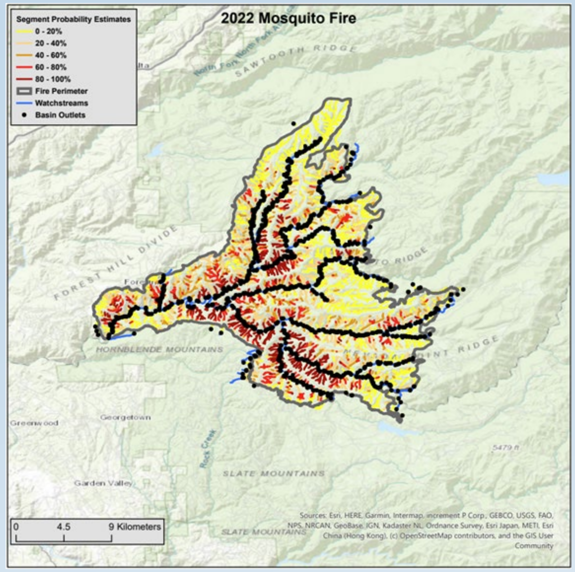
DATE	LOCATION	DAMAGES	DESCRIPTION
9/25/2014	Pollock Pines	$0	Rains produced several small debris flows. One was on Forebay Road after it crosses the American River and becomes Forest Road 123N34 due to storm rains. A second debris flow deposit was recorded at the Day Use area at Forbear Road and the South Fork American River. Some minor mudflow deposits occurred below the denuded slope of the upper burned portion of Spring Valley Road.
9/27/2014	Pollock Pines	$0	Heavy rain from several days of thunderstorms caused debris flows, blocking the road to Brush Creek Reservoir.
12/22/2015	Fresh Pond	$0	Minor mud flow in the King Fire burn area by Camino Reservoir at Jaybird Power House.
1/9/2017	Kyburz	$20,000	CalTrans reported a mud/rockslide on Highway 50, which closed westbound lanes.
1/10/2017	Chili Bar	$20,000	Law enforcement reported a mud/rockslide on State Route 193 near the junction with Rock Creek Road.
1/10/2017	Chili Bar	$0	Law enforcement reported rocks, mud, and a large tree on Rock Creek Rd. in northern Placerville, CA.
2/21/2017	Pacific	$6,500,000	A large sinkhole on US50 near Bridal Veil Falls Rd. closed the westbound lanes. The damage remained through the spring and required large scale repairs, with four lanes of the road have been reduced to two, one lane in each direction. Crews demolished the westbound lanes, and stabilized the slope down to the river and began erecting a retaining wall that will hold up the new westbound lanes. The process will likely take several months and could cost an estimated $6.5 million.
6/8/2017	White Hall	$0	Heavy rain on already saturated ground brought down debris onto the westbound lane of Highway 50 at Alder Creek, a rural location between White Hall and Kyburz. The westbound lane of Highway 50 was blocked for about 2 days before the debris was cleared by Caltrans.
12/2/2019	Echo Lake	$0	A rockslide occurred within the westbound lane of US Highway 50 approximately 2 miles east of Echo Summit on 2 December 1315PST. The highway was closed for approximately one hour to clean up. One lane control lasted for approximately 5 to 6 hours.
10/24/2021	Echo Lake	$0	US Highway 50 is closed due to a late-night rock fall near Echo Summit.

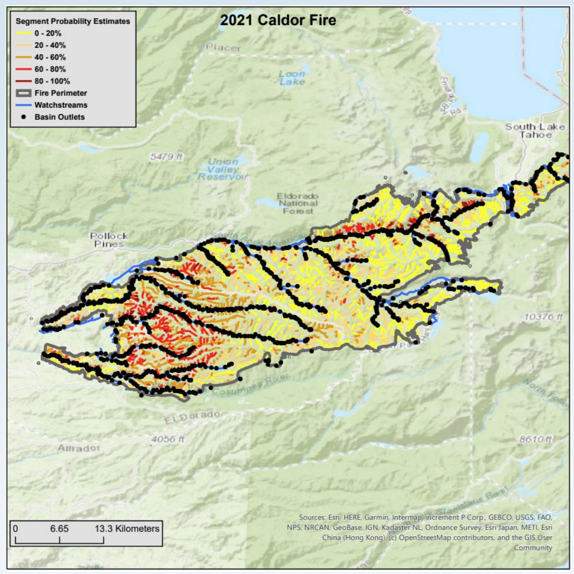
Source: NCEI Storm Events Database,

4.3.2.3 Likelihood of Occurrence

Likely — Based on data provided by the HMPC, minor debris flows have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely to occur within the identified landslide hazard areas. Given the nature of localized problems identified within the County, minor landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

In addition, areas affected by recent fires show an increased area of landslide risk. The King Fire in 2014, Caldor Fire in 2021, and Mosquito Fire in 2022, burned large areas of the County. The US Geological Survey (USGS) created debris flow probabilities in these burn scar areas.





These maps depict the likelihood and potential volume of debris flows as they exit the mountain front in response to a design storm having a 15-minute peak rainfall intensity of 24 mm/h. The models are designed to assess the potential for debris flow in the locations where debris flows initiate (i.e., where they form and get larger).

Source: USGS Landslide Hazards Program, https://earthquake.usgs.gov/arcgis/rest/services/ls/

4.3.2.4 Climate Change Considerations

Landslides can be triggered by intense rainfall and runoff events. This occurs because water adds weight to the slope as it infiltrates the ground, turning into groundwater and contributing to gravitational forces. Additionally, water diminishes the material's strength, making it less capable of resisting gravity. Furthermore, water reduces friction, making it easier for material to move downhill. These factors combine to explain why landslides are more prevalent during the rainy season, particularly during or immediately after significant storms (WA GS, 2017).

Predicted climate change-related shifts in rainfall patterns may lead to more high-intensity events, potentially increasing the frequency of landslides, driven by wetter wet periods and drier dry periods. Although the overall annual rainfall average may decrease, the projection suggests that rainfall will concentrate in fewer but more intense precipitation events.

As climate change affects the length of droughts and wildfire seasons, it is possible that a higher frequency of large fires may occur in late fall, when conditions remain dry, and then be followed immediately by intense rains early in the winter. The heightened occurrence of wildfires linked to climate change increases the susceptibility to landslides and debris flows in the post-fire period. During this time, slopes lack vegetation to stabilize soils, and burned surfaces enhance rainfall runoff. The future prospect of a generally drier climate, elevating the risk of droughts and wildfires, coupled with sporadic extreme downpours, is anticipated to amplify the occurrence of debris flows and landslides.

4.3.2.5 Magnitude and Severity

Moderate–As mentioned previously, deep-seated landslide susceptibility in the County is depicted in Figure 4-10; areas in darker red colors have a higher susceptibility to landslide. The map uses detailed information on the location of past landslides, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated land sliding (0 to X, low to high, as shown in the Figure's legend). On very low slopes, landslide susceptibility is low even if there are weak rock and geologic materials, and that susceptibility increases with increasing slope and weaker rocks. High landslide susceptibility classes (VIII, IX, and X) include very steep slopes with strong rocks and moderate to very steep slopes with weak rocks (Wills et al. 2011).

The extent of landslides and debris flow events within the County can range from negligible to significant. Landslides that occur within the County are most often experienced as part of a larger, more widespread natural hazard event. Landslides can take place because of severe storms, floods, and earthquakes. They can also happen as an aftermath of wildland fires. When landslides are ancillary events within larger natural hazard events, the dangers resulting from these larger hazard events combined with landslides would lead to much worse damage to properties, people, and infrastructure.

Landslides and rockslides can result in the destruction of infrastructure such as water and sewer lines, electrical and telecommunications utilities and drainage infrastructure where they are present. If power lines are compromised within the slide, electrical power can be lost. Moreover, the length of time during which power is interrupted is a direct result of the slide's size and its impact upon the power lines and electrical infrastructure. In addition, water lines and other buried facilities can be put in danger or lost to a landslide. Roads and highways are also often impacted by landslide events. When roads are compromised by landslides, motorist safety is threatened, and travel time is lengthened. Emergency personnel response time is also affected.

Table 4-17 provides a summary of improved properties a at risk to landslide susceptibility. There is a total population of 65,310 and a total structure value of $12.7 billion at risk to this hazard.

Table 4-17 El Dorado County Improved Properties at Risk to Landslide Susceptibility Summary

JURISDICTION	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	POPULATION
Placerville	$376,107,879	$209,901,446	$586,009,325	3,109
Unincorporated*	$8,069,614,849	$4,116,355,845	$12,185,970,694	62,201
Total	**$8,445,722,728**	**$4,326,257,291**	**$12,771,980,019**	**65,310**

Source: El Dorado County Assessor Data 2024, California Geological Survey, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

4.3.2.6 Vulnerability Assessment

The impacts of landslides in the County vary widely. In unpopulated areas, landslides may have minimal effects, primarily contributing to issues like waterway obstruction, flooding, and water contamination. However, if landslides occur in populated regions, they can result in damages to buildings, critical facilities, and infrastructure, with the potential for injuries or, in extreme cases, fatalities. Landslides can also disrupt ingress and egress routes, and given the limited routes in many County locations, such disruptions can lead to significant challenges. These challenges range from difficulties for the elderly and those with health issues to constraints on emergency response efforts by police, fire, and other County entities.

People

Recent studies indicate that California's wildfire season is extending, while the rainy season is becoming shorter yet more intense. This trend implies an increased risk for Californians who have already been disenfranchised by wildfires, as wildfires and subsequent post-wildfire landslides pose increased threats to property and human lives.

As shown in Figure 4-10, much of Class 9 susceptibility is in the central County below Highway 50, which overlaps with the Caldor burn scar. While this area isn't the most populated in the County, it does put further risk on individuals and vulnerable populations who have already been disenfranchised due to the Caldor Fire.

Class 10 susceptibility occurs in various slopes of the County, but primarily occur in the Tahoe Basin. Areas of relatively moderate to very high social vulnerability as determined by the NRI, as well as Census tracts with large percentages of families who are severely housing burdened as determined by CalEnviroScreen, intersect with this Class. Individuals and families in these areas are less likely to have the resources to harden property against potential landslides, or the excess financial capital to rebuild following a landslide event.

Areas of high deep-seated landslide susceptibility (classes 8-10) occur throughout the County, with prominent clustering near roads and waterways. These areas face heightened risks during heavy rainfall, and that risk will escalate with the shifting precipitation patterns that accompany rising temperatures. Riparian habitats that occur along rivers, stabilizing stream banks, may weaken due to increased drought and heat events, rendering them more susceptible to erosion from intensified precipitation occurring over shorter durations. This pattern will place all streambanks and roadways that occur along streambanks or rock cuttings, at increased risk.

As shown in Table 4-17 above, there are 65,310 people residing in landslide susceptible areas, primarily in the unincorporated County. Individuals may be at risk if caught in a landslide or debris flow, potentially resulting in injury or death. Drivers operating vehicles are also in danger, as rocks and debris can strike passing vehicles or cause dangerous shifts in roadways. Rock and debris falls are common along Echo Summit and along SR 89 at Emerald Bay.

Property

Landslides directly damage engineered structures in two general ways: 1) disruption of structural foundations caused by differential movement and deformation of the ground upon which the structure sits, and 2) physical impact of debris moving downslope against structures located in the travel path. Table 4-18 breaks out parcel susceptibility to landslide in the County by susceptibility class. By this analysis, there are 26,697 parcels at risk of landslide in the County, primarily occurring in the unincorporated County.

Table 4-18 El Dorado County Improved Properties at Risk to Landslide Susceptibility by Property Type

JURISDICTION	PROPERTY TYPE	CLASS 3 PARCEL COUNT	CLASS 5 PARCEL COUNT	CLASS 6 PARCEL COUNT	CLASS 7 PARCEL COUNT	CLASS 8 PARCEL COUNT	CLASS 9 PARCEL COUNT	CLASS 10 PARCEL COUNT	TOTAL PARCEL COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE	POPULATION
Placerville	Commercial	20	2	7	4	1	1	-	**35**	$14,698,408	$14,698,408	**$29,396,816**	0
	Industrial	24	-	4	2	-	-	-	**30**	$13,290,407	$19,935,611	**$33,226,018**	0
	Miscellaneous	1	-	-	-	-	-	-	**1**	$2,415,790	$2,415,790	**$4,831,580**	0
	Multi-Family Residential	43	4	25	11	2	-	-	**85**	$30,510,573	$15,255,287	**$45,765,860**	190
	Residential	578	103	236	138	131	123	-	**1,309**	$315,192,701	$157,596,351	**$472,789,052**	2,919
	Unassessed	1	-	-	-	-	-	-	**1**	$0	$0	**$0**	0
	Total	**667**	**109**	**272**	**155**	**134**	**124**	**0**	**1,461**	**$376,107,879**	**$209,901,446**	**$586,009,325**	**3,109**
Unincorporated County*	Commercial	24	58	9	9	9	2	-	**111**	$57,506,377	$57,506,377	**$115,012,754**	0
	Industrial	17	27	9	8	1	3	2	**67**	$19,551,197	$29,326,796	**$48,877,993**	0
	Miscellaneous	119	53	73	57	39	21	1	**363**	$66,488,070	$66,488,070	**$132,976,140**	0
	Multi-Family Residential	31	67	10	18	15	4	2	**147**	$45,286,252	$22,643,126	**$67,929,378**	370
	Residential	7,919	4,210	3,330	5,207	1,815	1,723	332	**24,536**	$7,880,782,953	$3,940,391,477	**$11,821,174,430**	61,831
	Unassessed	2	7	-	2	1	-	-	**12**	$0	$0	**$0**	0
	Total	**8,112**	**4,422**	**3,431**	**5,301**	**1,880**	**1,753**	**337**	**25,236**	**$8,069,614,849**	**$4,116,355,845**	**$12,185,970,694**	**62,201**
	Grand Total	**8,779**	**4,531**	**3,703**	**5,456**	**2,014**	**1,877**	**337**	**26,697**	**$8,445,722,728**	**$4,326,257,291**	**$12,771,980,019**	**65,310**

Source: El Dorado County Assessor Data 2024, California Geological Survey, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Critical Facilities and Lifelines

Critical facilities in landslide susceptible areas are broken out by jurisdiction and landslide class in Table 4-19. These facilities are also displayed in Figure 4-2. Of the County's 1,231 critical facilities, only 315 are located in areas susceptible to landslides. The majority of these facilities are located in landslide classes 3-7, while approximately 3% of total critical facilities are in landslide classes 8, 9, or 10. The majority of these high-vulnerability facilities are water systems and transportation structures, with a smaller number of communication resources.

Table 4-19 Critical Facilities at Risk to Landslide Susceptibility

	FEMA LIFELINE	CLASS 3 FACILITY COUNT	CLASS 5 FACILITY COUNT	CLASS 6 FACILITY COUNT	CLASS 7 FACILITY COUNT	CLASS 8 FACILITY COUNT	CLASS 9 FACILITY COUNT	CLASS 10 FACILITY COUNT	TOTAL FACILITY COUNT
Placerville	Communications	1	-	-	-	-	-	-	**1**
	Health and Medical	8	-	2	-	-	-	-	**10**
	Safety and Security	16	-	6	-	-	-	-	**22**
	Transportation	3	-	1	-	-	-	-	**4**
	Total	**28**	**0**	**9**	**0**	**0**	**0**	**0**	**37**
Unincorporated County*	Communications	33	23	15	17	1	8	1	**98**
	Energy	3	1	1	2	4	-	-	**11**
	Food, Hydration, Shelter	-	2	-	-	-	-	-	**2**
	Hazardous Materials	-	2	-	-	-	-	-	**2**
	Health and Medical	-	3	2	-	-	-	-	**5**
	Safety and Security	8	14	3	4	3	-	-	**32**
	Transportation	16	10	10	15	-	2	4	**57**
	Water Systems	31	5	12	10	7	5	1	**71**
	Total	**91**	**60**	**43**	**48**	**15**	**15**	**6**	**278**
	Grand Total	**119**	**60**	**52**	**48**	**15**	**15**	**6**	**315**

Source: California Geological Survey, Department of Conservation, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI

* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Water systems and transportation structures are particularly vulnerable to the impact of ground deformation caused by slope failures because of their geographic area and susceptibility to physical distress. Extension, bending, and compression caused by any ground deformation can break these lifelines.

Concurrent with the general vulnerability of these structures is their location within high hazard risk areas. Failure of any component along the lifeline can then cause a disruption of service over a large area. Once broken, the transmission of the commodity through the lifeline ceases, which can have catastrophic repercussions down the line, such as the complete isolation of a community through road and communication failures, or a lack of reliable water supply for several downstream communities. Therefore, the overall impact of lifeline failures, including secondary failure of systems that depend on primary lifelines, can be much greater than the impact of individual failures.

There is consensus that more extreme rain will cause more landslides in a warmer climate (SHMP, 2023). Increased storm rainfall puts roads, buildings, and utility infrastructure at greater risk of damage by landslides. Additionally, the impacts of increased wildfire severity will put all critical facilities in the affected area at greater risk to landslides. Generally, critical facilities in high deep-seated landslide susceptibility classes (8-10) will face the greatest risk as the occurrence of landslides increases. However, critical facilities in moderate deep-seated landslide classes will also face increased risk as these factors increase the susceptibility of sloped material to landslides, potentially increasing their susceptibility class.

Economy

Economic impacts typically center around transportation routes temporarily closed by debris flow or landslide activity. These roads may be used to transport goods across the County or provide access for commuters, visitors, and tourists. Depending on the amount of damage from landslides, the road may simply need to be cleaned off or may require some level of reconstruction. Because climate change has the potential to result in more intense rainfall and runoff events, the probability of landslide events could increase. More frequent landslide events could cause more disruptions due to road closures. Road closures would then result in temporary economic losses if goods and services cannot be delivered or if visitors and tourists cannot travel. These types of road impacts would most likely occur along the U.S. Highway 50 corridor and SR 89. However, because commuters, visitors, and tourists can take alternative routes through Placer and Amador counties, impacts are anticipated to be negligible.

Cultural, Historic, and Natural Resources

As primarily a natural process, landslides and debris flows can have varying impacts on the natural environment; however, debris flows have the potential to permanently alter the natural landscape.

As mentioned previously, rising temperatures and increasing drought have the capability to weaken riparian habitats. As precipitation patterns shift toward less frequent precipitation that falls in greater quantities over shorter periods of time, the riparian roots which previously stabilized streambanks are more prone to breakage, potentially rerouting streams and increasing sediment load in water ways.

Many of the County's natural and historic resources are water adjacent. Because of this, any landslide or debris flow near water sources, or cascading effects of landslides and debris flows such as increased sediment loads or altered stream channels near water sources, have the potential to damage or destroy these resources. Examples of natural and historic resources that could be affected include, but are not limited to, Salmon Falls, the Folsom Lake Recreation Area, and the Mountain Quarries Railroad Bridge.

Development Trends

Some individual mass-movement events have been attributed directly to climate change, but many landslides are caused more directly by factors without a clear link to a warming climate, such as slope oversteepening (by human construction) or local soil, bedrock, and hydrologic conditions (SHMP, 2023). Therefore, the severity of debris flow problems is directly related to the extent of human activity in hazard areas. Future development should take place carefully to prevent landslide damage to property or people.

As noted in the County's CVA, landslides are a natural process that are unavoidable in the long term due to the patient nature of gravity and the gradual weathering of the earth's surface. Landslides commonly result in disruptions in public services and emergency response, blocked transportation routes, diverted water flow in creeks and drainage ways, and contamination of water supplies. Therefore, landslides and debris flows cannot be prevented altogether, but their effects can be mitigated.

Adverse effects can be mitigated by early recognition and avoiding incompatible land uses in these areas or by corrective engineering. Improving mapping and information on landslide hazards and incorporating this information into the development review process could prevent siting of structures and infrastructure in identified landslide hazard areas. Additional preventive measures include prohibiting habitable structures atop unconsolidated landslide debris, discouraging grading and construction on slopes greater than a certain degree such as 30%, and enforcing grading standards of the International Building Code.

4.3.2.7 Risk Summary

- 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
- Historical and potential debris flow areas identified by the HMPC include Highway 50 east of Pollock Pines and State Route 49 north of Cool.
- 13 FEMA disaster were declared in the County which have included landslides or mudflows.
- Based on data provided by the HMPC, minor debris flows have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely to occur within the identified landslide hazard areas.
- A drier climate will elevate the risk of droughts and wildfires, coupled with sporadic extreme downpours and is anticipated to amplify the occurrence of debris flows and landslides.
- Landslides and rockslides can result in the destruction of infrastructure such as water and sewer lines, electrical and telecommunications utilities and drainage facilities.
- Future development can be partially protected from debris flows through good zoning and building regulations.
- Due to the remote nature of this hazard, the overall significance of debris flows is **low**.

4.3.3 Drought, Water Shortage, and Tree Mortality

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Drought	Extensive	Likely	Critical	High

4.3.3.0 Hazard Description

Drought and Water Shortage

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 ten-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

Based on historical information, the occurrence of drought in California, including El Dorado County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of El Dorado County to drought is countywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels.

Drought is a complex issue involving many factors. It occurs when a normal amount of precipitation is not available to satisfy an area's usual water-consuming activities and can often be defined regionally based on its effects. The following definitions are provided by the National Drought Mitigation Center (NDMC), an organization based at the University of Nebraska-Lincoln, established in 1995 to address drought impacts through research, monitoring, and mitigation strategies. The NDMC provides valuable resources, information, and tools to help decision-makers, policymakers, and the public understand, manage, and mitigate the impacts of drought.

- **Meteorological drought** is usually defined by a period of below average water supply.
- **Agricultural drought** occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic drought** occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.
- **Ecological drought**, defined as "a prolonged and widespread deficit in naturally available water supplies — including changes in natural and managed hydrology — that create multiple stresses across ecosystems."

The U.S. Drought Monitor (USDM) is an accepted and widely used site for obtaining and summarizing drought information, as it integrates data from several other sources including the Palmer Drought Index, Soil Moisture Models, U.S. Geological Survey Weekly Stream Flows, Standardized Precipitation Index, and the Satellite Vegetation Health Index. It includes drought intensity categories for measuring dry conditions across counties, states, and regions of the U.S., so that drought can be quantified. These categories range from "abnormally dry" to "exceptional drought." Table 4-20 summarizes the historically observed impacts by category for drought in the County.

Table 4-20 Historically Observed Impacts by Drought Monitor Category in California

CATEGORY	HISTORICALLY OBSERVED IMPACTS
D0 – Abnormally Dry	• Soil is dry; irrigation delivery begins early • Dryland crop germination is stunted • Active fire season begins
D1 – Moderate Drought	• Dryland pasture growth is stunted; producers give supplemental feed to cattle • Landscaping and gardens need irrigation earlier; wildlife patterns begin to change • Stock ponds and creeks are lower than usual
D2 – Severe Drought	• Grazing land is inadequate • Fire season is longer, with high burn intensity, dry fuels, and large fire spatial extent • Trees are stressed; plants increase reproductive mechanisms; wildlife diseases increase

CATEGORY	HISTORICALLY OBSERVED IMPACTS
D3 – Extreme Drought	• Livestock need expensive supplemental feed; cattle and horses are sold; little pasture remains; fruit trees bud early; producers begin irrigating in the winter • Fire season lasts year-round; fires occur in typically wet parts of the State; burn bans are implemented • Water is inadequate for agriculture, wildlife, and urban needs; reservoirs are extremely low; hydropower is restricted
D4 – Exceptional Drought	• Fields are left fallow; orchards are removed; vegetable yields are low; honey harvest is small • Fire season is very costly; number of fires and area burned are extensive • Fish rescue and relocation begins; pine beetle infestation occurs; forest mortality is high; wetlands dry up; survival of native plants and animals is low; fewer wildflowers bloom; wildlife death is widespread; algae blooms appear

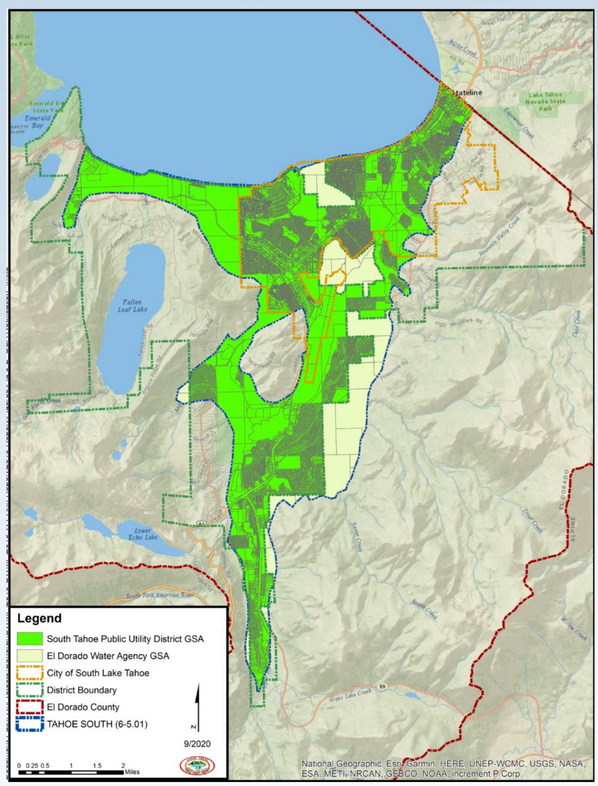
Sustainable Groundwater Management Act (SGMA) of 2014

In January 2014, Governor Brown declared an emergency proclamation due to multiple years of drought. The proclamation called on citizens to reduce water use by 20 percent, with a subsequent Executive Order in April 2015 that directed urban water agencies to reduce water use by 25 percent. In September 2014, the Governor signed a three-bill package (California SBs 1168 and 1319, and Assembly Bill [AB] 1739), known as the Sustainable Groundwater Management Act of 2014 (SGMA). SGMA provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainably within the groundwater subbasins defined by the California DWR.

While there are multiple subbasins within the County, there is only one subbasin which is required under SGMA to conduct sustainable groundwater management. The Tahoe Valley South (TVS) Subbasin is managed jointly by the South Tahoe Public Utilities District (STPUD) GSA and the El Dorado Water Agency (EDWA) GSA. The EDWA GSA was formed in 2017 to manage the portion of the TVS Subbasin located outside the STPUD's service area boundaries. The EDWA GSA and STPUD GSA created a joint Alternative Plan for Tahoe Valley South Subbasin, which serves as the Groundwater Management Plan for the subbasin which was approved by DWR in 2019, and STPUD SGA adopted its first five-year update in 2022.

STPUD and EDWA share joint jurisdiction of the TVS Subbasin, as shown above.

Source: STPUD Groundwater Management Plan, 2020, https://stpud.us/news/groundwater-management-plan/



Drought Planning for Small Water Suppliers and Rural Communities

In September 2021, Governor Gavin Newsom signed Senate Bill 552, Drought Planning for Small Water Suppliers and Rural Communities (SB 552), into law. Under the bill, the State, its counties, and small water suppliers have requirements to ensure shared responsibility in preparing and acting in case of a drought event. The requirements of the law are as follows:

- The State is required to maintain and update the Water Shortage Vulnerability Tool to assist small water providers and counties in accessing information about drought, water shortage vulnerabilities, and risks. Additionally, DWR will coordinate with other state agencies to establish a standing drought and water shortage task force for California.
- Counties are required to have a standing Drought Task Force that facilitates drought and water shortage preparedness for domestic wells[1], privately supplied homes within the county's jurisdiction(s), and small state water systems.[2] Additionally, the county is required to develop a plan that demonstrates potential drought and water shortage risks along with proposed short- and long-term solutions for small state and domestic wells within the county. Both requirements may be implemented as part of other existing committees and/or planning processes.
- Small water providers (those with fewer than 3,000 connections and serving fewer than 3,000-acre feet) are required to:
    - Have an abridged water shortage contingency plan by July 1, 2023,
    - Submit an annual report detailing their water supply conditions and usage by month,
    - Upgrade their infrastructure to drought-resilient standards if necessary.
    - DWR and the State Water Board have developed templates for abridged contingency plans for small suppliers on DWR's website: [Drought Planning for Small Water Suppliers and Rural Communities (SB 552) (ca.gov)]

State Requirements: Water Shortage Vulnerability Tool and Risk Assessment

The problem of drought risk and vulnerability to water shortages is acknowledged as stemming from a combination of hydrological and sociological factors. To assess the relative risk of drought and water shortage vulnerability in small water systems, a collaborative effort between DWR, the State Water Board, and the County Drought Advisory Group (CDAG) resulted in the development of a tool applying a common risk and vulnerability framework with indicators.

A series of 29 metrics were created, in collaboration with the advisory group and project team, to quantitatively indicate water shortage and drought risk for small suppliers. The risk score, ranging from 0 to 100 across small water systems, was established, with 100 representing the highest score and 0 the lowest. This range is determined through a simple rescaling using the min/max/range equation and multiplied by 100. This methodology refrains from defining thresholds that categorize certain small water suppliers and self-supplied communities as "at risk" of drought and water shortage while others are not.

The Water Shortage Vulnerability Explorer tools are designed to support small water suppliers and rural communities identify and understand their risk. The vulnerability scores are support drought task force discussions around water shortage preparedness for domestic wells and privately supplied homes and small state water systems.

County Requirements

SB 552 places the drought and water shortage planning responsibility on counties for state small water systems and domestic well communities within the county's jurisdiction. SB 552's

[1] Domestic Wells are those serving one connection.

[2] Section 116275 (n) of the Health and Safety Code (Water Code §10609.51 subd. (m)): A state small water system is a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year.

language allows for flexibility in how the County implements new requirements. Plans and response arrangements could be developed by GSAs that cover the County, in which case the County would need to formally recognize its agreement and adoption or reference to these plans as part of its compliance with SB 552.

County Drought and Water Shortage Task Force

The El Dorado Water Agency oversees the County Drought and Water Shortage Task Force (Task Force), tasked with coordinating drought and water shortage readiness for all small water systems and domestic wells across the County. Comprised of core members responsible for managing public water systems, state small water systems, and domestic wells, the Task Force is responsible for implementing the provisions of Senate Bill 552. Additionally, advisory members provide valuable insights and information regarding drought conditions, the needs of small water systems, and potential response measures.

Core members of the Task force include representatives from the Chief Administrative Office (CAO), County Environmental Management Department, County OES, and County Public Health, in addition to the El Dorado Water Agency. Advisory members include representatives from various small water providers outlined in Table 4-21 and Table 4-22, nonprofits such as Citizens for Water and the El Dorado County Farm Bureau, and local agencies including the Tahoe Groundwater Sustainability Agency and the County Planning and Building Department.

County Drought and Water Shortage Risk Mitigation Plan

The County and EDWA are currently preparing a County Drought and Water Shortage Plan to prepare for droughts and water shortages and meet the County requirements in SB 552. The plan will additionally go beyond the requirements of SB 552, which only requires addressing water shortage preparedness for state small water systems and domestic wells, and will instead address all small water systems within the region.

Small Water Supplier Requirements

SB 552 defines a small water supplier as a community water system[3] that serves 15 to 2,999 service connections and provides less than 3,000 acre-feet of water per year. It considers several categories of small water suppliers: Suppliers with 15 to 999 Connections, Suppliers with 1,000 to 2,999 Connections and NTNC Systems That Are Schools. SB 552 does not explicitly apply to transient, noncommunity water systems or NTNC water systems that are not schools.

Under SB 552, all small water suppliers are required to have:

- Drought resiliency measures,
- Annual reporting of water supply condition information to the State Water Board, and
- Annual water demand reporting to the State Water Board.

All small water suppliers and NTNC water systems that are schools must implement the following drought resilience measures, subject to funding availability:

- **No later than January 1, 2023**, implement monitoring systems sufficient to detect production well groundwater levels.
- **Beginning no later than January 1, 2023**, maintain membership in the California Water/Wastewater Agency Response Network (CalWARN) or similar mutual aid organization.
- **No later than January 1, 2024,** to ensure continuous operations during power failures, provide adequate backup electrical supply.

3 Section 116275 of the Health and Safety Code (Water Code §10609.51 subd. (a)) defines a community water system as a public water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents of the area served by the system.

- **No later than January 1, 2027,** have at least one backup source of water supply, or a water system intertie, that meets current water quality requirements and is sufficient to meet average daily demand.
- **No later than January 1, 2032,** meter each service connection and monitor for water loss due to leakages.
- **No later than January 1, 2032,** have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet fire flow requirements.

Suppliers with 15 to 999 Connections

Health and Safety Code §116460 requires all community water systems to have an Emergency Notification Plan (ENP) or Emergency Response Plan (ERP) approved by the State Water Board that describes process and methods for meeting the public notification requirements when any primary drinking water standard is not complied with, when a monitoring requirement is not performed, or when the conditions of any variance or exemption are not complied with.

Under SB 552, suppliers with 15 to 999 connections, shown in Table 4-21 must incorporate drought planning elements (including, but not limited to, drought-planning contacts and standard water shortage levels) into their ENP or ERP. The ENP or ERP is to be submitted to the State Water Board and updated every five years or when significant changes occur. Subject to funding availability, the State Water Board will offer technical assistance to support water suppliers with less than 1,000 connections in implementing this requirement.

Table 4-21 Small Water Suppliers with 15 to 999 Connections

WATER SUPPLIER	SOURCE	# OF CONNECTIONS	ACRE-FEET SUPPLIED	POPULATION SERVED	RISK SCORE
Bear State Water Works	Ground Water	56	11	100	53.91
Candlelight Village Mutual Water Co.	Ground Water	32	344	32	59.13
Crystal Caves MHP	Ground Water	40	6	112	62.79
Gold Beach Park	Ground Water	40	>5	100	78.09
Grizzly Flats Community Service	Surface Water	621	103	1,300	55.39
Kyburz Mutual Water System	Surface Water	118	20	30	63.13
Lakeside Park Association	Surface Water	139	89	1,000	22.43
Lukins Brothers Water Company	Ground Water	982	290	3,200	38.29
Oaklane Mobile Village, LLC	Ground Water	35	>5	75	72.51
Quintette Service Corp Water	Ground Water	52	>5	67	62.55

Sources: https://sdwis.waterboards.ca.gov/, https://www.waterboards.ca.gov/conservation/docs/2016_small_supplier_dataset.xlsx, Data from 2015 to 2016 self-reporting, https://data.cnra.ca.gov/dataset/drought-risk-small-suppliers-and-communities

Suppliers with 1,000 to 2,999 Connections and NTNC Systems That Are Schools

Suppliers in this category, listed in Table 4-22, must develop, adopt, and maintain on-site an abridged Water Shortage Contingency Plan (WSCP) that covers a subset of drought-planning elements included in the plans that urban water suppliers submit as part of their Urban Water Management Plan. The first plan must be developed by July 1, 2023, and posted on the supplier's website, if any, or made available upon request. This abridged WSCP must be updated at least every five years. The required elements must include:

- Drought-planning contacts, including all the following:

At least one contact at the Water System for water shortage planning and response and the development of the plan.

Contacts for local public safety partners and potential vendors that can provide repairs or alternative water sources, including but not limited to, local CBOs that work with the population in and around areas served by the water system, contractors for drilling wells, vended water suppliers, and emergency shower vendors.

State and local agency contacts who should be informed when a drought or water shortage emergency is emerging or has occurred.

Regional water planning groups or mutual aid networks, to the extent they exist.

- Triggering mechanisms and levels for action, including both of the following

Standard water shortage levels corresponding to progressive ranges based on the water supply conditions. Water shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, a fire, and other potential emergency events.

Water shortage mitigation, response, customer communications, enforcement, and relief actions that align with the water shortage levels.

Table 4-22 Small Water Suppliers with 1,000 to 2,999 Connections and NTNC School Systems

WATER SUPPLIER	SOURCE	# OF CONNECTIONS	POPULATION SERVED	RISK SCORE
City of Placerville	Surface Water	2,795	10,762	35.68
Latrobe Elementary School	Ground Water	5	65	79.86
Millers Hill School	Ground Water	7	120	56.45
Mountain Creek School	Ground Water	8	125	58.92
Pioneer Elementary School	Ground Water	19	250	62.34
Silverfork School (Health)	Ground Water	2	225	86.18
Tahoe Keys Water Company	Ground Water	1,566	1,420	22.34

Source: https://sdwis.waterboards.ca.gov/, https://data.cnra.ca.gov/dataset/drought-risk-small-suppliers-and-communities

A summary of the requirements for all small water suppliers is provided in Table 4-23.

Table 4-23 Summary of Small Water Supplier Requirements for Implementation of Senate Bill 552

SUMMARY OF REQUIREMENT	COMMUNITY WATER SYSTEM 1,000-2,999 CONNECTIONS	COMMUNITY WATER SYSTEM 15-999 CONNECTIONS	NTNC WATER SYSTEMS THAT ARE SCHOOLS
Drought Resiliency Measures	Yes	Yes	Yes
Abridged Water Shortage Contingency Plan	Yes	No	No
Drought Element added to Emergency Notification or Response Plan	No	Yes	No
Annual reporting of water supply condition information to the State Water Board	Yes	Yes	Yes
Annual water demand reporting to the State Water Board	Yes	Yes	Yes

Source: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/SB-552/Primer-of-SB-552-052522_final.pdf

Urban Water Suppliers

Water suppliers who provide potable water for municipal purposes to more than 3,000 customers, or who supply more than 3,000 acre-feet of water annually, are defined as "urban water suppliers." Urban water suppliers in El Dorado County, summarized in Table 4-24, are subject to the Urban Water Management Planning Act and other requirements but are not subject to SB 552.

Table 4-24 Urban Water Suppliers

WATER SUPPLIER	PRIMARY SOURCE	# OF CONNECTIONS	ACRE-FEET ANNUALLY	POPULATION SERVED
El Dorado Irrigation District*	Surface Water	42,879	75,000	140,751
Georgetown Divide Public Utility District	Surface Water	3,775	10,150	9,409
South Tahoe Public Utility District	Ground Water	14,235	5,778	29,824**
Tahoe City Public Utility District	Ground Water	5,704	1,783	8,028

Source: https://sdwis.waterboards.ca.gov/PDWW/index.jsp; Urban Water Management Plans
* includes City of Placerville water use, as the City is wholesale customer
** number increases to over 100,000 including transient water users during peak tourism season

Tree Mortality

Tree mortality refers to the death of forest trees and provides a measure of forest health. Forest health is important because trees remove CO_2 from the atmosphere and store a significant amount of the Earth's carbon. High levels of tree mortality can indicate widespread insect or disease impacts or stress from regional weather events such as drought (USFS 2021a). The USFS conducts annual aerial surveys of California's forests to identity tree mortality (see Figure 4-12)

Drought-induced stress renders trees more susceptible to pest infestations, escalating rates of tree mortality. This heightened tree mortality, exemplified by millions of deceased trees across the State, poses threats to human safety, property, and infrastructure, intensifying wildfire risks. Approximately 172 million trees died in forest lands from 2010 to 2021 (LAO 2022). The compounding effect of extreme drought exacerbates the strain on already stressed trees, resulting in increased mortality. According to the Fourth National Climate Assessment Report, the confluence of escalating drought severity and expanding bark beetle populations, linked to warming winters, accounts for about 30% of tree mortality in California (USGCRP 2023).

4.3.3.1 Geographic Area

Significant – Drought is a regional hazard, and at its worst can affect the entire State of California with varying levels of dryness and drought activity. It is safe to assume that unless the drought event is at its very beginning or very end, if any area of the County is affected by any level of drought, other areas of the County are experiencing varying effects as well.

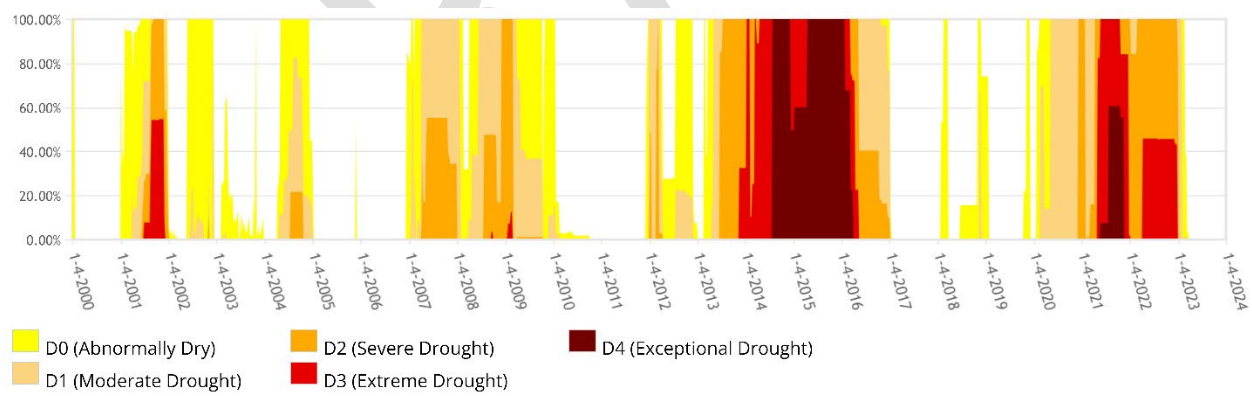
The water supply, water quality, and public safety issues vary from the West Slope to the Tahoe Basin. The West Slope lacks a consistent groundwater supply, making it vulnerable due to its reliance on surface water; there are also more than 100 small water public water systems susceptible to drought because they lack reliable and alternative supply sources (EDWA 2023; EDWA 2019).

The Tahoe Basin is less susceptible to drought given the region relies on both surface water and groundwater; however, there are small water systems that are vulnerable to the effects of drought in the event of a temporary loss of water supply. Long-term groundwater availability is also less of a concern because runoff and snowmelt are adequate for recharge (EDWA 2019).

Drought and Water Shortage

The USDM includes drought intensity categories for measuring dry conditions across counties, states, and regions of the U.S., so that drought can be quantified. These categories range from "abnormally dry" to "exceptional drought." Figure 4-11 displays a time series representing drought conditions in El Dorado County from January 2000 to December 2023, expressed as a percentage of the total area in each category. The data shows that although it may vary in severity, drought commonly affects 100% of the County's total area.

Figure 4-11 Percent Area in US Drought Monitor Categories



Source: US Drought Monitor, https://droughtmonitor.unl.edu/

Tree Mortality

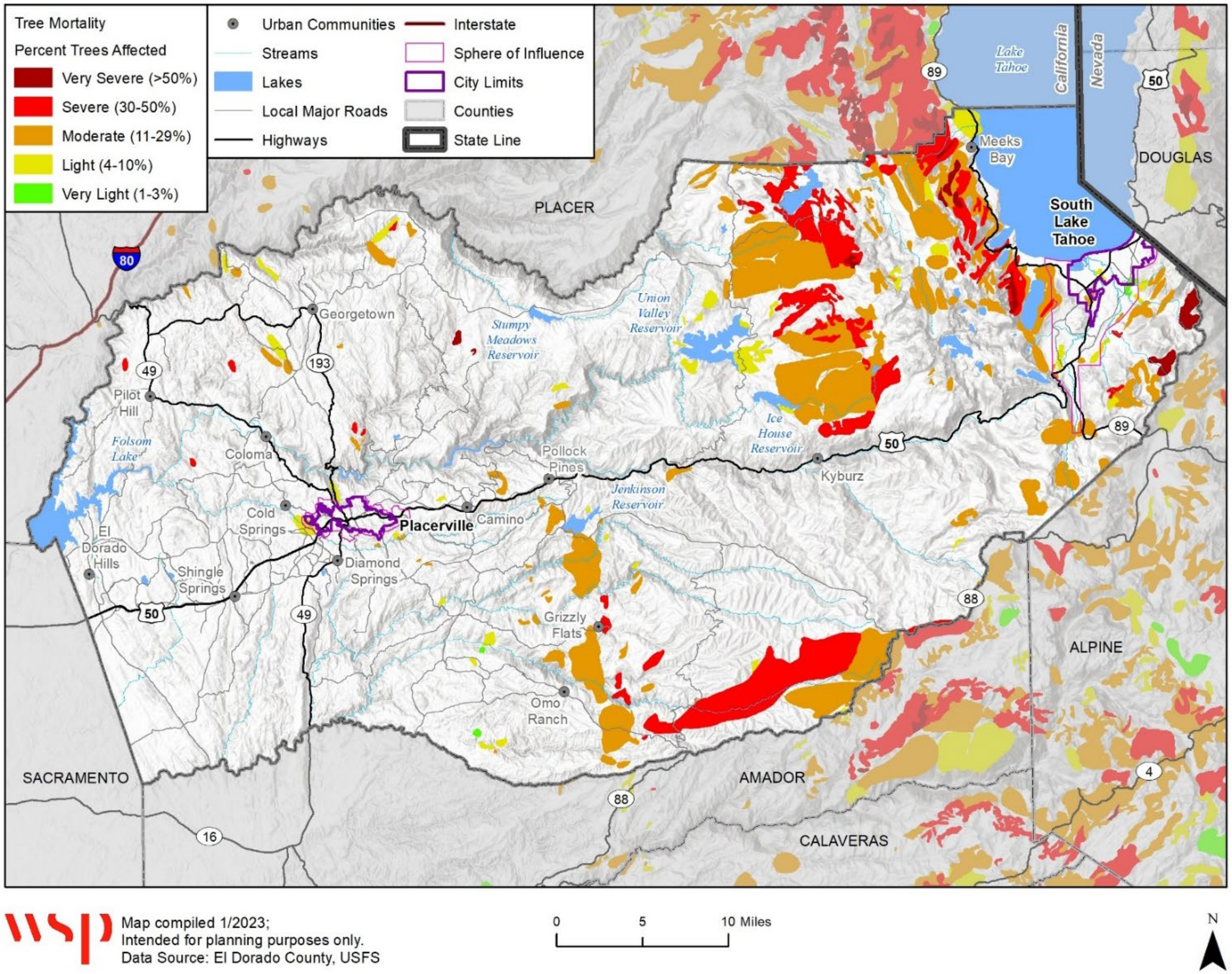
A 2023 report from the USFS revealed that about 28.8 million trees across 2.4 million acres of federal, state, and private land died in California in 2023. The central Sierra Nevada Range and areas further north showed the highest mortality rates, with true firs being the most impacted. In El Dorado County, an estimated 2.2 million trees died with an estimated 130,000 acres experiencing tree mortality in 2023 alone. This marks an increased level of mortality compared to 2022 (shown Figure 4-12) due to the cumulative impacts of extended drought, overstocked forest conditions, insect outbreaks, and disease. Table 4-25 includes a summary of arial detection surveys in El Dorado County from 2010 to 2023.

Table 4-25 Tree Mortality in California and El Dorado County

	EL DORADO COUNTY		STATEWIDE	
YEAR	ESTIMATED NUMBER OF ACRES WITH MORTALITY	ESTIMATED NUMBER OF DEAD TREES	ESTIMATED NUMBER OF ACRES WITH MORTALITY	ESTIMATED NUMBER OF DEAD TREES
2023	130,000	2,200,000	2,400,000	28,800,000
2022	78,000	1,400,000	2,600,000	36,300,000
2021	17,000	156,000	1,260,000	9,500,000
2020	Limited survey due to covid 19 pandemic			
2019	76,000	534,000	2,200,000	15,100,000
2018	75,000	614,000	2,000,000	18,600,000
2010-2017	381,000	1,371,000	8,829,000	129,000,000
Total*	**757,000**	**6,275,000**	**19,289,000**	**237,300,000**

Source: USDA Forest Service, https://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696
*total excludes limited 2020 data

Figure 4-12 Tree Mortality El Dorado County in 2023



4.3.3.2 Past Occurrences

Drought and Water Shortage

There has been one federal disaster declaration for drought in El Dorado County. EM-3023-CA was declared on January 20, 1977, and closed out on December 20, 1987 (FEMA 2023). A brief history of recent droughts and drought declarations that affected El Dorado County are summarized in Table 4-26.

Table 4-26 Drought Events in the State of California (2017 to 2022)

DATE	FEMA DECLARATION NUMBER	USDA DECLARATION NUMBER	COUNTIES/AREAS IMPACTED
April – September 2020	N/A	S4675, S4676, S4691, S4697, S4717, S4715, S4741, S4758, S4765, S4769, S4780, S4797, S4819, S4824, S4859	Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Imperial, Inyo, Kern, Lake, Lassen, Los Angeles, Marin, Mendocino, Merced, Modoc, Mono, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Yolo, Yuba
Precipitation was below average, and temperatures were above average. For maximum temperature, August 2020 came in second to 1967. For September, the maximum temperature ranked sixth warmest. On August 16, Death Valley recorded a temperature of 130 °F. Five of the State's largest six fires in history were ignited in August and September.			
October 2020 – May 2021	N/A	S4915, S4916, S4921, S4923, S4927, S4936, S4941, S4945, S4958, S4963, S4969, 4979, S4995, S5131	Alameda, Alpine, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kern, Kings, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Mono, Monterey, Napa, Nevada, Orange, Pauma and Yuima, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Ventura, Yolo, Yuba
October 2021 – April 2022	N/A	S5145, S5146, S5155, S5157, S5165, S5169, S5208	Alameda, Alpine, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Mono,

DATE	FEMA DECLARATION NUMBER	USDA DECLARATION NUMBER	COUNTIES/AREAS IMPACTED
			Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Ventura, Yolo, Yuba
The 2021 water year was the second driest on record, with extreme heat and lack of precipitation. By the end of 2021, all 58 counties in California were placed under a drought emergency proclamation. The drought continued through 2022.			

Source: 2023 State Hazard Mitigation Plan, https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf

There have been 36 NCEI drought events in El Dorado County between January 1996 and September 2023, but no damages, injuries, or losses were reported in the Storm Events database. These occurrences are detailed further in Table 4-27 below.

Table 4-27 NCEI Storm Events Database Recorded Droughts in El Dorado

AREA EFFECTED	NUMBER OF EVENTS
Motherlode/Camptonville to Groveland (Zone)	9
Southern Sacramento Valley (Zone)	17
West Slope Northern Sierra Nevada (Zone)	10
Grand Total	**36**

Source: NCEI Storm Events Database, https://www.NCEI.noaa.gov/stormevents/

Additionally, the USDA has declared 22 disaster designations due to drought in the County between 2012 and 2022, broken out by year in Table 4-28.

Table 4-28 USDA Disaster Declarations for Drought, 2012-2022

YEAR	COUNT OF DISASTER DESIGNATIONS
2012	4
2013	2
2014	5
2015	3
2016	2
2017	1
2020	1
2021	2
2022	2
Grand Total	**22**

Tree Mortality

In October 2015, Governor Jerry Brown proclaimed a State of Emergency due to unprecedented tree mortality caused by extreme drought and drought-related bark beetle infestations. The Governor's Proclamation contains 18 distinct actions that direct state agencies, utilities, and local governments to remove dead or dying trees in high hazard areas across the entire State of California. On March 28, 2016, the El Dorado County Board of Supervisors declared a state of emergency due to pervasive tree mortality in the County.

4.3.3.3 Likelihood of Future Occurrence

Likely—Recent historical data for water shortage indicates that El Dorado County may at some time be at risk to both short and prolonged periods of water shortage. Based on this it is possible that water shortages will affect the County in the future. Historical drought data for El Dorado County and the region indicate there have been five significant socioeconomic droughts in the last 30 years. This equates to a multi-year drought every 6 years on average, or a 5 percent chance of a drought in any given year (probability). Increased susceptibility to tree mortality accompanies droughts, making future occurrence likely.

4.3.3.4 Climate Change Considerations

According to California's Climate Adaptation Strategy (2021), climate change is likely to significantly diminish California's future water supply. As a result, the State must change its water management, as climate change will create greater competition for limited water supplies. According to El Dorado County's 2017 Climate Change and Health Profile Report, during the next few decades, scenarios project average temperatures to rise between 3.7 ˚F and 6.5 ˚F in El Dorado County.

Snowpack is currently the primary source of water in the County. Snowpack has historically melted throughout the year, providing a reliable source of water. As temperatures increase, precipitation that would have accumulated as snowpack is now falling as rain instead of snow. The decreased snowpack will melt sooner, shifting the seasonal distribution of precipitation, resulting in less water availability during late summer to early fall, often the warmest part of the year.

For example, the runoff midpoint (when 50 percent of the total annual runoff has occurred) may shift from March to between 30 to 35 days earlier by mid-century and end-of-century projections (EDWA 2023, Bureau of Reclamation 2022, EDWA 2019). Currently, the average snow-water equivalent (SWE) is about 5.2 inches for the County in April. Based on the RCP 8.5 scenario, that number could be as low as 0.8 inches by the end-of-century. At the same time, the County may experience "flashier" hydrology due to increased precipitation variability or short periods of time when there is more snow or rainfall, which could overwhelm existing facilities that were designed to operate based on historical hydrology (EDWA 2023).

Demand projections and climate hydrology also suggest a significant water supply-demand imbalance during drought conditions based on existing facilities and operations (EDWA 2019). During drought events, surface water supplies, and reservoir storage levels are expected to decrease as increased temperatures lead to increased water demand. Warmer temperatures also cause water to evaporate quicker, resulting in more demand for outdoor water use. Vegetation that is dehydrated is more susceptible to pest infestation and lends itself to becoming a wildfire risk. The increased frequency of wildfires can further degrade long-term water quality.

While the major public water agencies on the West Slope have drought plans in place that establish drought state water supply conditions and ways to respond to those conditions, because their water supplies rely on mainly the American River and local streams for supply, the reliability is threatened by climate change and the corresponding reductions in snowpack and increased evaporation. These public water agencies also only serve a small portion of the residential and agricultural water demands.

The effects of climate change on drought and water supply can significantly impact the prevalence of bark beetle infestations and tree mortality in forests. Prolonged drought conditions weaken trees, making them more susceptible to bark beetle attacks as they struggle to produce resin, their primary defense mechanism. Additionally, rising temperatures associated with climate change accelerate bark beetle development and reproduction, leading to higher population densities and increased infestations. Changes in precipitation patterns and reduced water availability further stress trees, making them more vulnerable to bark beetle attacks. Climate-driven changes in forest composition may also favor susceptible tree species, providing more food sources for bark beetles and facilitating larger infestations. Bark beetle outbreaks can exacerbate the effects of drought and climate change on forests through feedback loops, contributing to increased wildfire risk and further damage to vegetation.

4.3.3.5 Magnitude and Severity

Critical– The magnitude of a drought's impact is directly related to the severity and length of the drought. The severity of a drought depends on water availability and moisture deficiency, the time period, and the size and location of the affected area. The longer the drought persists and the larger the area effected, the more severe the potential impacts. Droughts can be a short-term event over several months or a long-term event that lasts for years or even decades.

In El Dorado County, the onset of drought is often signaled by a lack of significant winter precipitation and snowfall (moisture deficiency) in the Sierra Nevada Mountains and Lake Tahoe Basin. Droughts typically do not result in direct impacts on people or property, but they can have significant impacts on agriculture, which can indirectly impact people and property. Hot and dry conditions that persist into spring, summer, and fall can aggravate drought conditions, making the effects of drought more pronounced as water demands increase during the growing season and summer months. Impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Drought impacts in El Dorado County are diverse, affecting the economy, environment, and society. Major impacts include reductions in water availability, increased costs, and implications for water-intensive activities like agriculture, wildfire protection, and tourism. During droughts, voluntary conservation measures are implemented to manage water usage efficiently. Secondary impacts of drought include soil compaction, increased wildfire risk, reduced water supply for firefighting, and potential power generation reductions and water quality deterioration. Economically, drought can strain the agriculture industry, leading to hardships for farmers and workers, price increases for consumers, and risks to livestock due to feed shortages. These indirect impacts may also increase water demand from agricultural users.

California has experienced multiple severe droughts. According to the DWR, droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large northern California reservoirs. Table 4-29 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, 2007-09, 2012-15, and 2020-22 droughts.

Table 4-29 Severity of Extreme Water Shortages in the Sacramento and San Joaquin Valleys, 1929-2023

DROUGHT PERIOD	SACRAMENTO VALLEY RUNOFF		SAN JOAQUIN VALLEY RUNOFF	
	(MAF*/YR)	(% AVERAGE 1901-96)	(MAF*/YR)	(% AVERAGE 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47
2007-09	11.2	64	3.7	61
2012-16	11.6	65	2.8	47
2020-22	8.9	50	2.7	45

Source: CDEC WSIHIST, https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST
*maf=million-acre feet

4.3.3.6 Vulnerability Assessment

Drought is one of the few hazards with the potential to impact all the citizens of the County through water restrictions, economic losses, and increased energy costs. The historical and potential impacts of drought on populations include agricultural sector job loss, secondary economic losses to local businesses and public recreational resources, increased cost to the local and state government for large-scale water acquisition and delivery, water rationing, and water wells running dry for individuals and families. Climate change is expected to further exacerbate water use restrictions as the timing and amount of precipitation shifts, which could change the levels of water demand and the water quality available to residents.

While the West Slope is largely dependent on surface water and will therefore experience the effects of drought and water shortages concurrently, the City of Placerville and the Cameron Park CSD are dependent on the EID for their water supply, so any shortage or failure within EID will affect them more than other communities in the unincorporated County. However, EID has a reliable water supply and maintains good Urban Water Management Plans (UWMPs) so this is not expected to be a scenario that arises.

The Georgetown Divide PUD primarily gets its water from Stumpy Reservoir, which undergoes constant monitoring. An issue which effected Stumpy Reservoir specifically would have an increased effect on Georgetown PUD, however, a drop in regional water supply which affected water storage across the County would result in the entire unincorporated County facing the same level of risk.

A number of schools in the County are connected to groundwater sources. Collectively, Pioneer Elementary School, Millers High School, Silverfork School, Mountain Creek School, and Latrobe Elementary School serve a population of 585. If one of these groundwells went dry, it could affect between 25-250 people. However, given the redundancies in water supply on the West Slope, one well failure is not expected to significantly alter the risk of EDCOE in relation to the unincorporated County.

The specific risks and vulnerabilities associated with each jurisdiction will be discussed further in each jurisdiction's annex.

People

Droughts are often accompanied by high temperatures, which can cause heat stress and dehydration, especially in vulnerable populations such as the elderly, children, and those with pre-existing medical conditions. Additionally, droughts can increase the risk of wildfires, which can release large amounts of smoke and pollutants into the air, leading to respiratory problems such as asthma, bronchitis, and pneumonia. See Table 4-47 for additional cascading impacts of high heat and droughts.

Droughts can also lead to crop failures, food shortages, and rising food prices, resulting in malnutrition and undernutrition, especially in low-income populations. Several communities in the County are experiencing poverty, defined as twice the federal poverty level by CalEnviroScreen due to California's high cost of living. In Census Tract 6017030602, with a population of 7,911 spread across the rural communities of Greenwood, Buckeye, Spanish Flat, Lotus, Coloma, and Kelsey, 42 percent live below twice the federal poverty level, placing it at the 72nd percentile in comparison to other census tracts in California. Similarly, in Census Tract 6017031302 west of Pollock Pines with a population of 4,562, 42 percent live below twice the federal poverty level, placing it at the 73rd percentile. In Census Tract 6017032000, with a population of 889 on the westside of the Tahoe Basin, 28 percent live below twice the federal poverty level, placing it at the 51st percentile. These census tracts will be at the greatest risk of malnutrition and undernutrition due to drought, especially as warming temperatures and sporadic precipitation events will likely lead to increased food prices.

To determine the FEMA NRI value for drought, the average coverage of a drought event-week is calculated by summing the areas where the drought event-week intersects with the Census tract. This sum is then divided by the total number of intersecting event-weeks. This average coverage value is then multiplied by the total crop value density of the census tract. As a result, the FEMA NRI value for drought is only calculated for census tracts that are susceptible to agricultural losses due to drought.

Two census tracts in the County are at a "relatively high" risk from drought based on this data. Census tract 6017030712, in the far southwestern corner of the County, has a risk index score of 99.74 and an expected annual loss of over $2 million due to drought, and Census tract 6017031409, which includes Caldor, Grizzly Flats, and Omo Ranch, has a risk index score of 99.7 and an expected annual loss of over $1.2 million. The high expected annual loss of drought in these Census Tracts makes them especially vulnerable to drought impacts.

Those who rely on agriculture for their livelihoods in these census tracts may experience significant stress and anxiety due to drought and drought-related economic losses, which can also lead to social and psychological stress. Additionally, agricultural workers on the West Slope that support wineries and orchards may also be more susceptible to drought conditions and the secondary impacts to their livelihoods. As the climate warms and precipitation becomes more erratic, these impacts on these communities are likely to increase.

There are more than 100 small water public water systems susceptible to drought because they do not have secure water supplies or alternative supply sources and rely on water from small water systems or domestic wells that are supplied by low yield fractured rock groundwater or local springs that have limited capacity (EDWA 2023). Communities dependent upon or who get a large portion of water from groundwater sources are also at risk to threats to groundwater quality. These threats can include dairy farms and concentrated animal-feeding operations or storage tanks which may leak hazardous materials into groundwater reserves.

According to CalEnviroScreen, several communities in El Dorado County face groundwater threats. Census Tract 6017031100, comprised of the northern portion of the City of Placerville and its northern boundaries, is in the 83rd percentile of groundwater threats, meaning the number and type of groundwater threats in this census tract is higher than 83% of census tracts in California. Census Tract 6017031200, containing the southern portion of the City of Placerville, is in the 72nd percentile for groundwater threats, and Census Tract 6017031502 is in the 90th percentile for groundwater threats. These three contiguous Census Tracts contain approximately 16,417 people. Climate change will further exacerbate the threat of groundwater contamination, as decreased snowmelt runoff will further constrain low aquifer reserves, which can concentrate contaminants and reduce dilution capacity.

Communities in El Dorado County most likely to experience the range of these hazard impacts and vulnerabilities will include underserved communities located within rural areas in the unincorporated portions of the Tahoe Basin, central El Dorado County, and the neighborhoods outside of the City of Placerville. These unincorporated communities include Kyburz (Census Tract 6017031900), Pollock Pines (Census Tract 6017031302), and portions of the Meyers community (Census Tract 6017030402). Socially vulnerable communities are also located north of the City of Placerville.

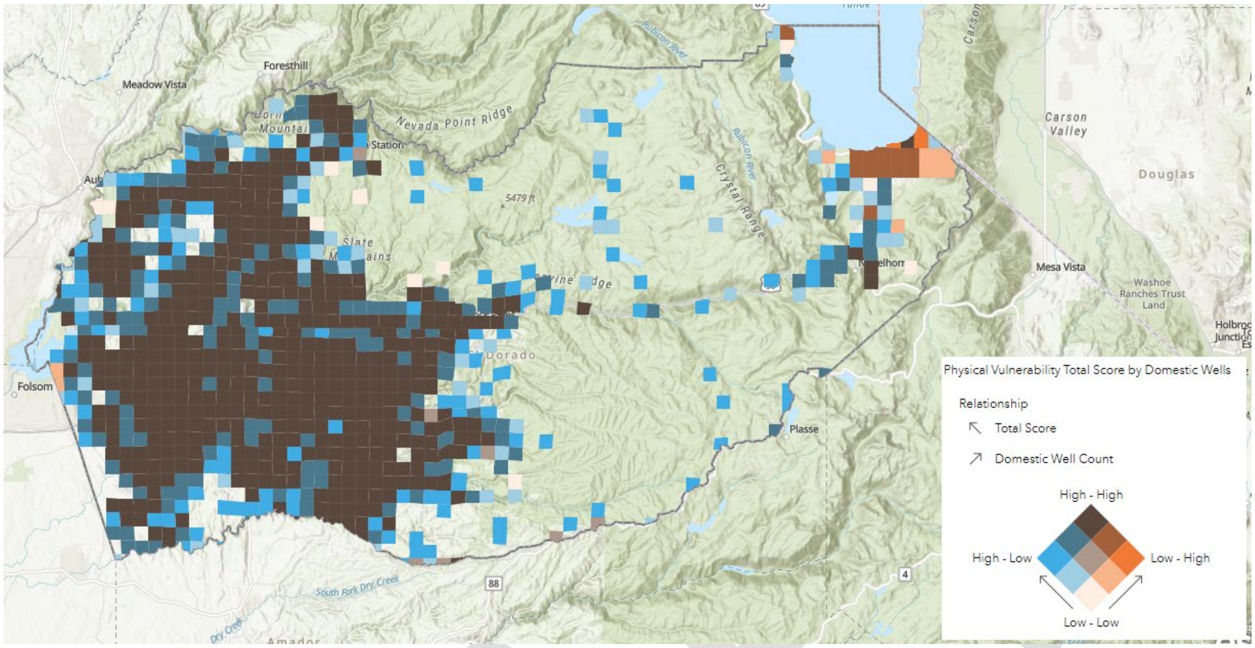
Of these socially vulnerable populations, those households that receive water from smaller water suppliers, such as Community Service Districts (CSDs), or private water suppliers, as well as any faculty and students at schools dependent on NTNCWS may be most vulnerable because these water suppliers may not have the capacity to track procedures in place to monitor groundwater levels.

Property

The drawdown of the groundwater table is one factor that occurs during repeated dry years in the County. Lowering of groundwater levels results in the need to deepen wells, which subsequently leads to increased pumping costs for small water suppliers. These costs are a major consideration for residents relying on domestic wells and agricultural producers that irrigate with groundwater and/or use it for frost protection.

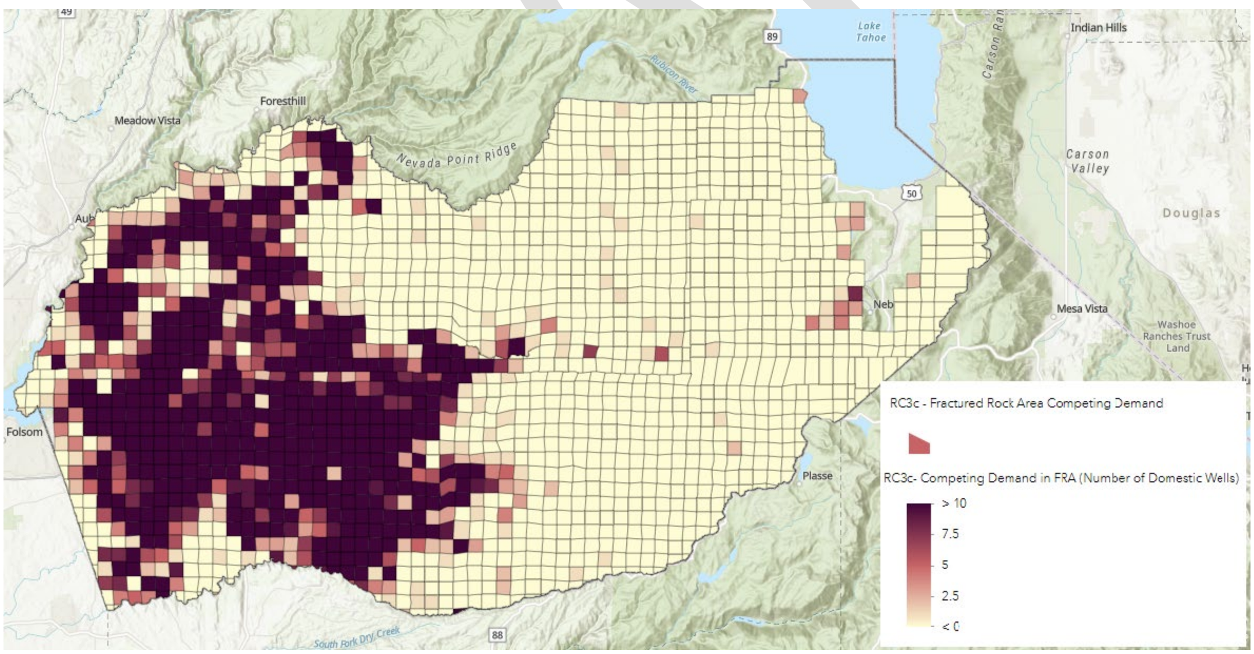
Residents who are dependent on vulnerable domestic wells are displayed in Figure 4-13 below. As shown, the West Slope has a high number of wells with high vulnerability scores. These areas correspond with areas with large numbers of wells competing for low yield fractured rock groundwater, shown in Figure 4-14. The Tahoe Basin tends to have high numbers of wells with low vulnerability. These wells are likely dependent on the TVS Subbasin and therefor regulated by the TVS Subbasin GSAs. Climate change will result in increased temperatures and a reduced snowpack that will affect the water supply of the small water suppliers and those that rely on domestic wells by further limiting water resources and emphasizing a greater need for water resource management

Figure 4-13 Physical Vulnerability Total Score by Domestic Wells



Source: DWR Water Shortage Vulnerability Explorer 2024

Figure 4-14 Competing Demand in Fractured Rock Areas



Source: DWR Water Shortage Vulnerability Explorer 2024

As noted previously, the census tracts most at risk to these agricultural and agricultural related impacts include Census Tracts 6017030712 and 6017031409. The USDA Risk Management Agency (RMA) tracks insurance payments, or indemnities, made to farmers as a safety net against natural hazards, such as drought and agricultural disease. Between the 15 years of 2007 through 2021, 67.3 acres of USDA insured crops were lost in El Dorado County due to drought, resulting in $33,657 in indemnity payments. These loses are detailed in Table 4-30 below. As the climate continues to warm and precipitation patterns become more unpredictable, the likelihood of these impacts on communities is expected to rise.

Table 4-30 USDA Drought Indemnity Payments

COMMODITY YEAR	COMMODITY NAME	DETERMINED ACRES	INDEMNITY AMOUNT
2009	All Other Crops	39.4	$2,626
2014	Grapes	12.8	$4,211
2021	Grapes	15.2	26820
Grand Total		**67.3**	**$33,657**

Source: USDA RMA Crop Indemnity Reports, 2007-2021

Critical Facilities and Lifelines

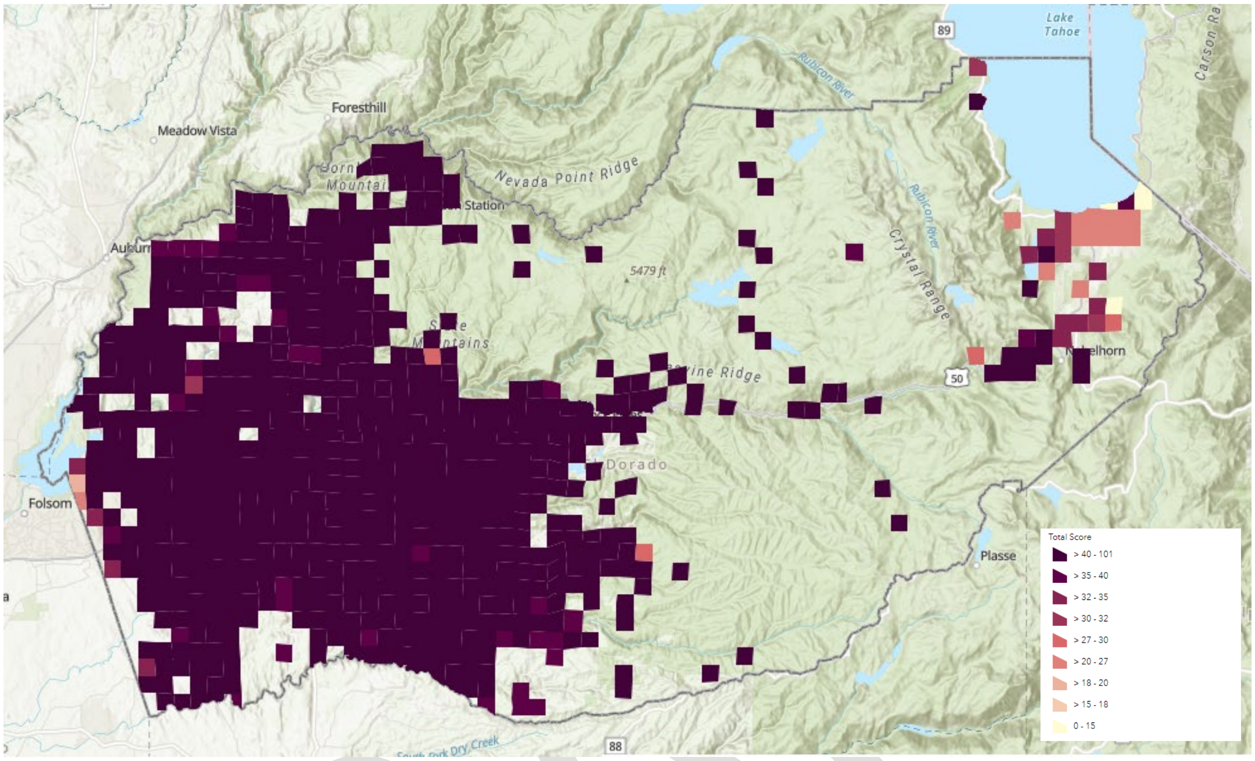
Severe to exceptional droughts can have significant consequences for water supply, water quality, firefighting, recreation, and other critical facilities. When groundwater levels decline, wells may need to be deepened in response, which can result in temporary losses of water supply. Higher demand on the water system infrastructure can lead to disruption of service due to line breakage, and the possible losses to infrastructure.

Rural communities on private domestic wells in the County were most impacted during the five-year drought that ended in 2016 (see Figure 4-13 above). Communities that rely on domestic wells are more vulnerable to higher costs and water quality issues during prolonged dry periods. Unlike the major public water agencies on the West Slope County, small water systems and private domestic well operators have not needed to maintain drought contingency plans. However, the UARB RDCP finalized in 2023 lays out a plan to increase the resiliency of water resources in the County. Specifically, the RDCP is designed to improve resiliency to droughts in the West Slope, particularly those not served by a public water agencies, lay out a plan for regional implementation to improve drought preparedness, and improve regional collaboration for sustainable water resources management.

According to the Drought and Water Shortage Vulnerability Explorer Tool for Small Water Suppliers, there are 11,556 domestic wells and 26 State Small Water Systems (SSWS) in El Dorado County. The analysis focuses on communities served by water suppliers with fewer than 15 service connections, which are either local small (serving between 2 to 4 connections), state smalls (serving 5 to 14 connections), or domestic wells (serving 1 connection). The State SSWS are those non-public systems with 5 to 14 service connections that do not provide water regularly to more than an average of 25 people for more than 60 days. That means the vulnerability scores for a location can be associated to the SSWS, local small, and domestic wells in that location.

Based on the vulnerability profiles for these water systems, many are concentrated in the West Slope of the County and had high vulnerability scores (scores greater than 40 depicted by a dark purple color). The physical vulnerabilities are associated with dry years, groundwater overdraft, lack of emergency interties, and the fact that these small water systems rely on single and small water sources for supply. Similarly, based on the water shortage vulnerability scores, the water suppliers located in the western part of the County had the highest physical vulnerability scores above 40 with an average physical vulnerability score of 48.20. The physical vulnerability score for El Dorado County's state small and domestic wells are shown in Figure 4-15.

Figure 4-15 El Dorado County State Small and Domestic Well Water Shortage Physical Vulnerability Score



Source: DWR Water Shortage Vulnerability Explorer 2024

Of the 17 small water providers identified in this plan (see Table 4-21 and Table 4-22), 13 have DWR Shortage Vulnerability risk scores of or above 53.9 (on a scale of 0 to 100). While DWR doesn't set a threshold for what score constitutes a vulnerable system, the calculated risk scores across all small water providers in the State follow a normal distribution with a mean and median of 54 (DWR 2021). This would suggest that the majority of small water providers in the County are at least somewhat vulnerable to water shortages.

The impact of this vulnerability is expected to intensify due to climate change. As temperatures rise and precipitation patterns become increasingly erratic, the County's small water providers are likely to face heightened challenges. Growing populations will place additional strain on water resources, exacerbating existing vulnerabilities. Prolonged droughts and heatwaves, which are anticipated to become more frequent and severe under climate change, will further stress water supplies and increase the risk of shortages. These compounding factors underscore the urgent need for proactive measures to address water scarcity and enhance resilience in the face of a changing climate.

Economy

Drought complications normally appear more than a year after a drought begins. In most areas of California, ranchers that rely on rainfall to support forage for their livestock are the earliest and most affected by drought. Even below normal water years could affect ranchers depending on the timing and duration of precipitation events. It is difficult to quantitatively assess drought impacts to El Dorado County because not many County-specific studies have been conducted. However, given the County's rural, low-density, and agricultural dominated landscape on the West Slope outside of Placerville and other compact communities like Georgetown and Cool, some factors to consider include the impacts of fallowed agricultural land, habitat loss and associated effects on wildlife, and the drawdown of the groundwater table.

The most direct and likely most difficult drought impact to quantify is to local economies, especially agricultural economies. The State has conducted empirical studies on the economic effects of fallowed lands with regard to water purchased by the State's Water Bank; but these studies do not quantitatively address the situation in El Dorado County given commercial farming operations in the County are mostly constrained by terrain and small in comparison to those in the Central Valley.

As the value of the agriculture industry in El Dorado County is estimated to be over $48.8 million including livestock, timber, and related products, it can be assumed that the loss of production in the agriculture sector would affect other economic sectors like agritourism, specialty produce to consumer markets, and recreation (El Dorado County 2022). Some agricultural uses, such as grapes and walnuts, are severely impacted through limited water supply. Irrigation of agricultural lands continues to be a concern in El Dorado County. Cultural and historic resources may also be affected.

As the climate shifts toward an increased warm season and a more accommodating environment for disease and infestations, cropping patterns of agricultural plants will be altered. Crops such as walnuts, which require a long, cool winter, may no longer be viable in the County. Increased stress on plants from warmer weather and decreased availability of water supply will be more vulnerable to infestations and diseases and will likely reduce agricultural yield. The implications of climate-induced changes extend beyond the agricultural industry and will continue to impact the broader socioeconomic landscape.

Cultural, Historic, and Natural Resources

Impaired water bodies may face increased vulnerability during drought conditions. According to CalEnviroScreen, Census Tract 6017032000 to the west of Lake Tahoe, either contains or is nearby waterbodies containing 7 impairments. The percentile for this census tract is 67, meaning the number of impairments is higher than 67% of the census tracts in California. As drought decreases snow-water runoff and disrupts regular precipitation patterns, decreased volumes of water in these waterbodies will increase the concentration of contaminants and decrease dilution capabilities. Increased temperatures also decrease the oxygen carrying capacity of water, disrupting natural underwater habitats.

Increased development puts further strain on waterbodies. In addition to overextraction of water, increased human activity can increase the number and amount of debris and pollutants introduced to a waterway. Contamination of these waters by pollutants can compromise the use of the water body for drinking, swimming, fishing, aquatic life protection, and other beneficial uses.

With a reduction in water and water quality, water supply issues based on water rights becomes more evident. Cultural and historic resources impacts due to drought are often place-specific and can result in food sovereignty concerns, water quality issues (often due to fishing), and lack of access to traditional foods. Tribes may also be impacted by drought if they are not able to conduct ceremonies during periods of extended drought conditions

Development Trends

According to each water district's UWMP, the El Dorado Irrigation District (EID) (2020), Georgetown Divide Public Utility District (GDPUD) (2023), the South Tahoe Public Utility District (STPUD) (2021) and Tahoe City Public Utility District (TCPUD) (2020) all have adequate water supply to meet customer needs during single and multiple dry year scenarios. As a wholesale customer of EID, the City of Placerville water use information is included in EID's data.

New growth and development in the County will also experience similar impacts as on the populations, property, critical facilities, and natural environment. Because the County's population is projected to steadily increase while climate change projections show an increase in the intensity and duration of drought events this further exemplifies the importance of addressing existing and future water supplies during development review.

4.3.3.7 Risk Summary

- The vulnerability of El Dorado County to drought is countywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels.
- Drought-induced stress renders trees more susceptible to pest infestations, escalating rates of tree mortality.
- Drought is a regional hazard, and at its worst can affect the entire State of California with varying levels of dryness and drought activity.
- An estimated 1.4 million trees died in El Dorado County in 2023 alone.
- There has been one federal emergency declaration for drought in El Dorado County, and one State emergency declaration for tree mortality.
- Five significant socioeconomic droughts occurred in the last several decades. Increased susceptibility to tree mortality accompanies droughts, making future occurrence likely.
- Drought impacts are wide-reaching and may be economic, environmental, and/or societal.
- **Medium** significance hazard

4.3.4 Earthquake

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Earthquake	Significant	Occasional	Critical	Medium

4.3.4.0 Hazard Description

An earthquake is the vibration of the earth's surface caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in "seismic waves" that travel through the earth's crust and cause the shaking that is felt during an earthquake. These seismic waves travel outward from the source of the earthquake at different speeds. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see discussion in the Magnitude and Severity section). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

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

An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Magnitude represents the amount of seismic energy released at the hypocenter of an earthquake. It is based on the amplitude of the earthquake waves recorded. Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake, see Table 4-31.

Table 4-31 Richter Scale

MAGNITUDE	DESCRIPTION	OCCURRENCE	MOVEMENT	EXTRA INFORMATION
1	Small	Daily	Small	We cannot feel these.
2	Small	Daily	Small	Smallest quake people can normally feel.
3	Small	Daily	Small	People near the epicenter feel this quake
4	Small	Daily	Moderate, sudden	This will cause damage around the epicenter. Same as small fission bomb.
5	Moderate	Monthly	Sudden, strong	Damage done to weak buildings around epicenter.
6	Moderate	Monthly	Sudden, strong	Can cause great damage around the epicenter.
7	Major	Monthly	Severe, sudden	Creates enough energy to heat NYC for one year. Can be detected all over world. Serious damage.
8	Great	Monthly	Very Severe	Causes death and major destruction. Destroyed San Fransisco in 1906.
9	Great	Yearly	Very Severe	Rare, would cause catastrophic damage.
10	Super	Rarely	Extreme	
Each level is 10 times stronger than the previous level				

Source: https://www.sms-tsunami-warning.com/pages/richter-scale

Intensity represents the observed effects of ground shaking at any specified location and earthquake shaking decreases with distance from the earthquake epicenter. Intensity is an expression of the amount of shaking at any given location on the ground surface based on felt or observed effects. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Intensity is measured with the Modified Mercalli Intensity (MMI) scale. The intensity of ground shaking at a particular site or structure is a function of many factors including 1) earthquake magnitude, 2) distance from the epicenter, 3) duration of strong ground motion, 4) local geologic conditions (soil type and topography), and 5) the fundamental period of the structure. A brief description of those factors is presented below. The MMI scale and associated magnitude scales are summarized in Table 4-32, along with the effects associated with the MMI scale. Damage typically occurs in MMI of scale VII or above.

Table 4-32 Earthquake Intensity Measurements and Characteristics

MAGNITUDE	MERCALLI INTENSITY	EFFECTS	FREQUENCY
Less than 2.0	I	Microearthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year

MAGNITUDE	MERCALLI INTENSITY	EFFECTS	FREQUENCY
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicentral area.	100 to 150 per year
7.0-7.9	VIII<	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII<	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII<	At or near total destruction – severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Source: USGS Volcanic Hazards Program

Faulting

A fault is defined as “a fracture or fracture zone in the earth’s crust along which there has been displacement of the sides relative to one another.” For the purpose of planning there are three types of faults, active, inactive, and potentially active.

- Active faults have experienced displacement in historic time, suggesting that future displacement may be expected.
- An inactive fault shows no evidence of movement in historic (last 200 years), suggesting that these faults are dormant. This does not mean, however, that faults having no evidence of surface displacement are necessarily inactive. For example, the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active.
- Potentially active faults are those that have shown displacement within the last 1.6 million years (Quaternary faults).

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement.

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

El Dorado County lies between two seismically active regions in the western United States. Tectonic stresses associated with the North American-Pacific Plate boundary can generate damaging earthquakes along faults 30 to 100 miles to the west of the County. Eastern El Dorado County borders the Basin and Range province that entails most of Nevada and western Utah.

This area is riddled with active faults that are responsible for and form the boundary between each basin or valley and the neighboring mountain range.

El Dorado County itself is traversed by a series of northwest-trending faults, called the Foothill Fault Zone, which are related to the Sierra Nevada uplift. This was the source of Oroville's 1975 earthquake (and an earlier event in the 1940s). Earthquakes on nearby fault segments in the zone could be the source of ground shaking in El Dorado County. The closest recently active fault in the western Sierra Nevada foothills is the Cleveland Hills fault, which is situated approximately 36 miles northwest of Auburn. Another potential earthquake source is the Midland Fault Zone on the western side of the Sacramento Valley. This was the source of the 1892 Vacaville-Winters earthquake.

Additionally, western El Dorado County may experience ground shaking from distant major to great earthquakes on faults to the west and east. For example, to the west, both the San Andreas Fault (source of the 8.0 estimated Richter magnitude San Francisco earthquake that caused damage in Sacramento in 1906, including the State Capitol, the full extent of which was not discovered until the mid-1970s) and the closer Hayward fault have the potential for experiencing major to great events. In 2004, the USGS estimated that there is a 62 percent probability of at least one 6.7 or greater magnitude earthquake occurring that could cause widespread damage in the greater San Francisco Bay area before 2032.

Ground Shaking

Ground shaking is motion that results from energy being released during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. Damage to structures from this vibration is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion.

Much of the County is located on alluvium, characterized by loose deposits of clay, silt, sand, or gravel formed by running water. Ground motion lasts longer, and the amplitude of earthquake waves are greater, when they occur on alluvium than they would be had they occurred on solid rock. As a result, structures located on alluvium typically suffer greater damage than those located on solid rock.

Several quaternary faults go through the County and the vicinity of the County's planning area. Both Tahoe Valley fault and East Tahoe fault go through the City of South Lake Tahoe. West Tahoe-Dollar Point fault, Genoa fault and Tahoe-Sierra frontal fault are in the vicinity of the City's boundary, and several faults surround the eastern County to the north and south. The Maidu East Fault and Rescue Fault traverse the western County.

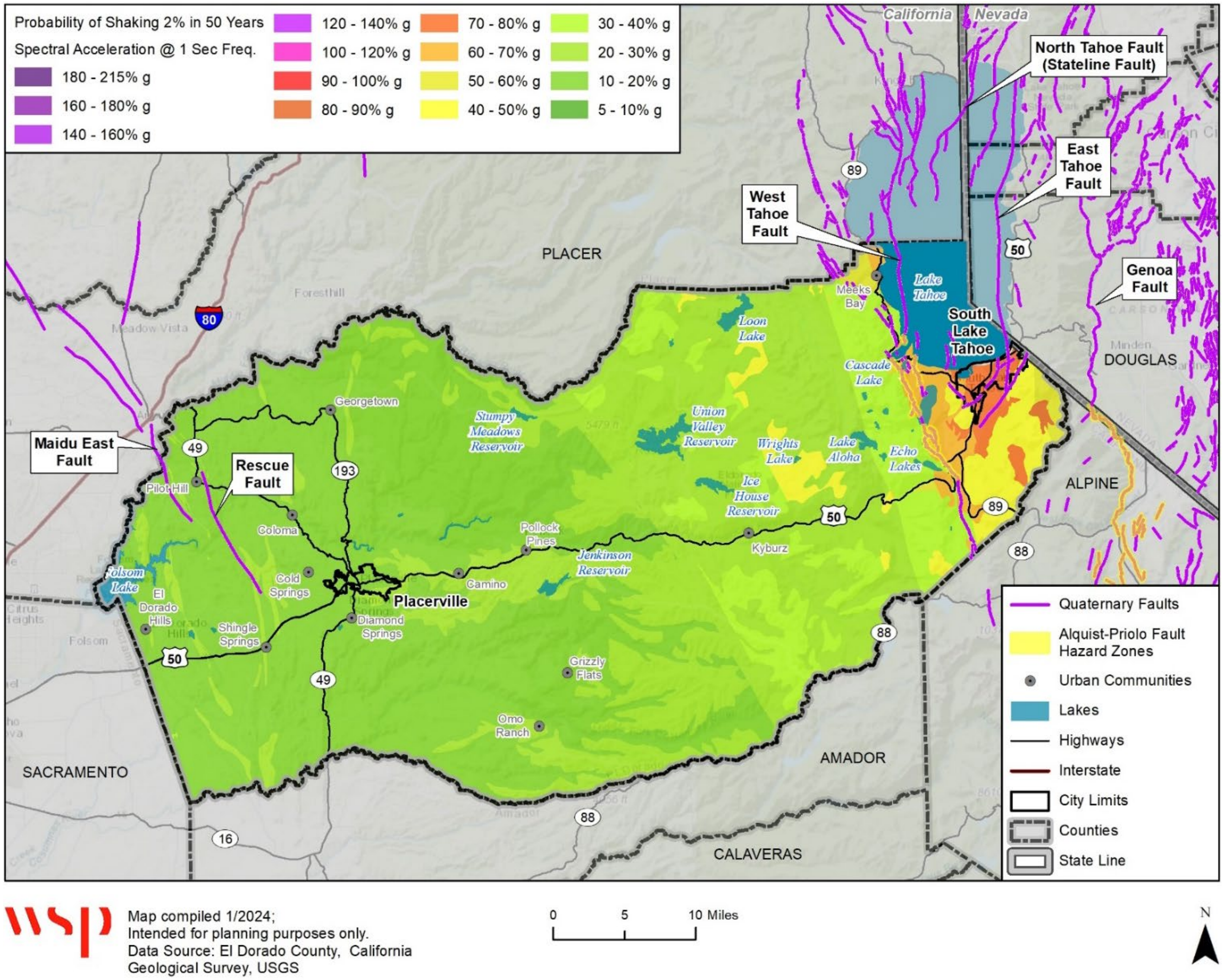
Figure 4-16 below shows the location of these faults and others, as well as the probability of strong ground shaking from earthquakes over the next 50 years. The values on the map represent the maximum shaking intensity with a 2 percent chance of happening during that time frame, per the USGS analyses of nearby faults. The intensity of shaking is expressed as peak ground acceleration (PGA, or the maximum ground acceleration that occurs during earthquake shaking at a location) as a percentage of g (the standard acceleration due to Earth's gravity, equivalent to g-force), see Table 4-33. This probability of occurrence map shows that the Eastern County could experience strong ground shaking (90% - 100% g), which has the potential to be damaging.

Table 4-33 Peak Ground Acceleration in % g Legend

PGA (% G)	SHAKING	DAMAGE	EFFECTS
<0.05	Not felt	None	Microearthquakes, not felt, or felt rarely by sensitive people.
0..3	Weak	None	Felt slightly by some people. No damage to buildings.
2.76	Light	None	Often felt by people, but very rarely causes damage. Shaking of indoor objects can be noticeable.
6.2	Moderate	Very light	Noticeable shaking of indoor objects and rattling noises. Felt by most people in the affected area; slightly felt outside. Some objects may fall off shelves or be knocked over.
11.5	Strong	Light	Felt by everyone. Casualties range from none to a few.
21.5	Very Strong	Moderate	Felt in wider areas, up to hundreds of miles from the epicenter. Strong to violent shaking in epicentral area. Death tool ranges from one to 25,000.
40.1	Severe	Moderate/heavy	Felt across great distance with major damage mostly limited to 155 miles from epicenter. Significant death toll.
74.7	Violent	Heavy	Damaging in large areas/ Felt in extremely large regions. Deal toll in the thousands.
>139	Extreme	Very heavy	Permanent changes in ground topography. Death toll can surpass 10,000.

Source: Worden, et. al, 2012; Murphy and O'Brien, 1977

Figure 4-16 El Dorado County Ground Shaking Potential and Nearby Faults



Seismic Structural Safety

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

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

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

Liquefaction Potential

Liquefaction is a process by which soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. Liquefaction that produces surface effects generally occurs in the upper 40 to 50 feet of the soil column, although the phenomenon can occur deeper than 100 feet. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, titling, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Fill areas that have been poorly compacted in developed and newly developing areas are also of particular concern.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to ground shaking is not available for El Dorado County.

4.3.4.1 Geographic Area

Significant–The eastern County is located along the border of California and Nevada, two of the most geologically active, earthquake-prone states in the United States. Here, two of the earth's tectonic plates collide. The North American plate slowly moves westward, colliding with the Pacific plate. Simultaneously, the Pacific plate migrates north and westward. As it migrates, the Pacific plate pulls at the North American plate to follow suit. This tensional force stretches the earth's crust, causing a system of north and south fault structural systems along the boundary between the two tectonic plates. As a result of this tensional stress, ranges of tilted fault block mountain ranges are formed.

Lake Tahoe would not exist today if not for earthquakes and three major fault zones. Three major fault zones - the West Tahoe Fault between modern-day Emerald Bay and Dollar Point, the Stateline Fault running south from Crystal Bay, and the Incline Village Fault running south from Incline Village – formed the Lake Tahoe Basin about 3.5 million years ago. Both the Tahoe Valley fault zone and the East Tahoe fault go through the City of South Lake Tahoe. In addition, West Tahoe-Dollar Point fault zone, Genoa fault and Tahoe-Sierra frontal fault zone are also in the vicinity of the City's boundary. This makes this portion of the County at much greater risk of damage from earthquakes than the West Slope.

4.3.4.2 Past Occurrences

There have been no earthquake disaster declarations in the County. Additionally, earthquake events are not tracked by the NCEI database. The USGS National Earthquake Information Center (NEIC) database contains data on earthquakes in El Dorado County. The USGS database was searched for magnitude 5.0 or greater on the Richter Scale within 90 miles of the City of Placerville in El Dorado County. These results are detailed in Table 4-34.

Table 4-34 Magnitude 5.0 Earthquakes within 90 Miles of El Dorado County, 2000-2023

DATE	RICHTER MAGNITUDE	LOCATION
7/8/2021	5.0	32km SE of Markleeville
7/8/2021	6.0	Antelope Valley, CA
8/24/2014	6.0	6km NW of American Canyon, California
5/24/2013	5.7	10km WNW of Greenville, California
4/26/2008	5.0	Nevada
8/10/2001	5.2	Northern California
9/3/2000	5.0	Northern California

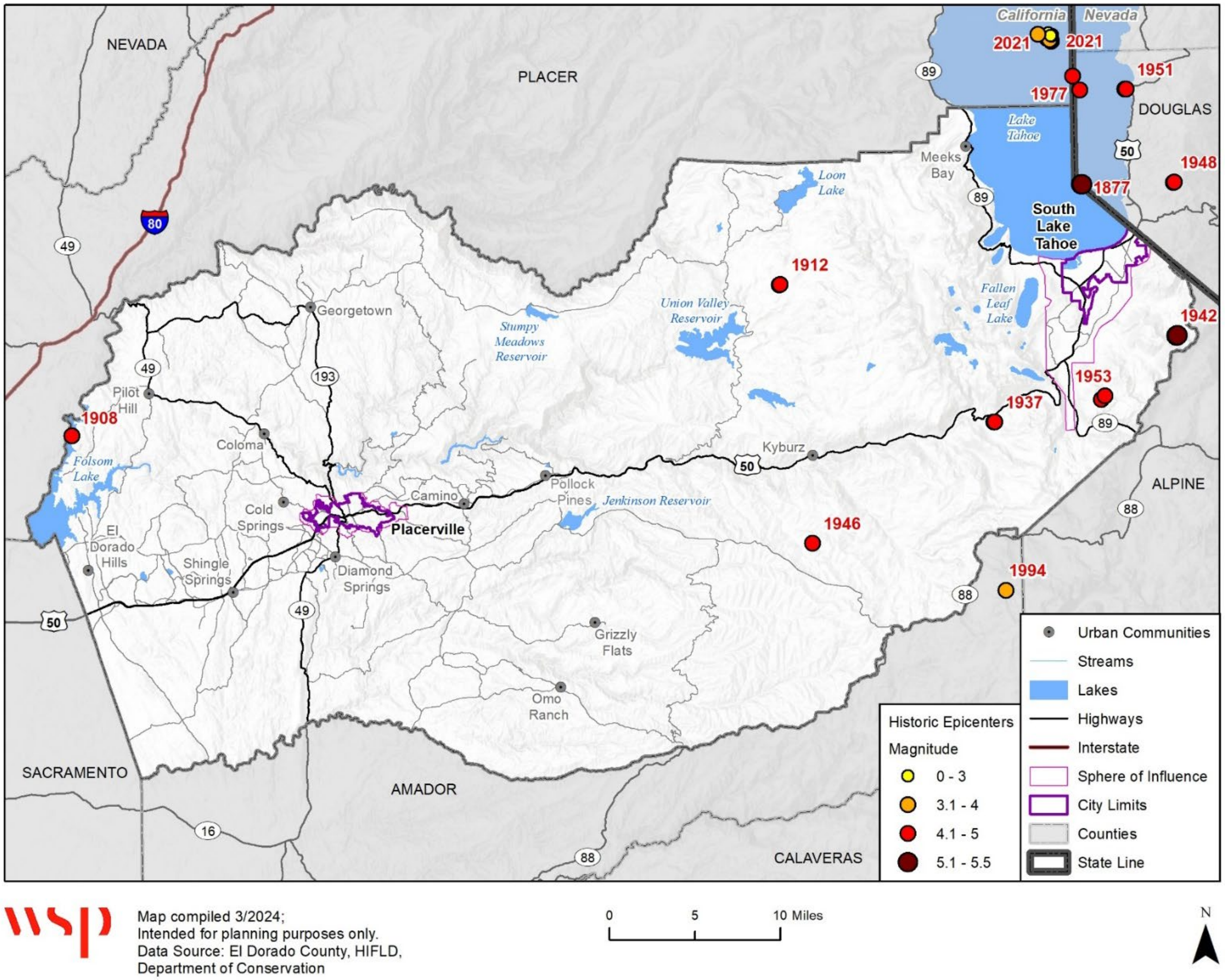
Source: USGS, https://earthquake.usgs.gov/earthquakes/search/

Historically, major earthquakes have not been an issue for El Dorado County. However, minor earthquakes have occurred in the County in the past. The 2019 El Dorado LHMP identified several earthquakes that were felt by area residents and/or caused damaging shaking in El Dorado County. Details on some of these events follow.

- 1908 – An estimated 4.0+ Richter magnitude earthquake occurred between Auburn and Folsom with an epicenter possibly associated with the Bear Mountain fault.
- 1975 – The Cleveland Hills fault was the source of the Oroville earthquake (Richter Magnitude: 5.7), which was felt in El Dorado County and neighboring areas.
- 2003/2004 – Volcanic magma (molten rock) migrating about 20 miles below the surface of the Sierra Nevada mountains caused a swarm of about 1,600 small earthquakes in late 2003 and early 2004. The 20-mile depth is about twice as deep as earthquakes caused by normal faulting in the region measured during the last 30 years. El Dorado County did not report any damages associated with these small earthquakes.
- 2008, 2013, 2014 – There were earthquakes in the El Dorado County vicinity in these years. No significant issues were reported in the County. Ground shaking was the primary concern.

The epicenters of historic earthquakes in and near the County are displayed in Figure 4-17 below.

Figure 4-17 El Dorado County Historic Epicenters



4.3.4.3 Likelihood of Future Occurrence

Occasional—No major earthquakes have been recorded within the County, although the County lies between two seismically active regions in the western United States. Tectonic stresses associated with the North American-Pacific Plate boundary can generate damaging earthquakes along faults 30 to 100 miles to the west of the County. Eastern El Dorado County borders the Basin and Range province that entails most of Nevada and western Utah. This area is riddled with active faults that are responsible for and form the boundary between each basin or valley and the neighboring mountain range.

Based on historical data and the location of El Dorado County relative to active and potentially active faults, the County could experience a significantly damaging earthquake occasionally.

4.3.4.4 Climate Change Considerations

The potential direct impacts of climate change on earthquake probability are unknown. Climate change can increase the risk of cascading hazards related to earthquakes, including landslides. Rising air temperatures can also facilitate soil breakdown, allowing more water to penetrate soils, affecting erosion rates, sediment control, and the likelihood of landslides. Climate change may also increase the probability of more frequent, intense rainstorms. This can result in more significant erosion, higher sediment transport in rivers and streams, and a higher probability of landslides, primarily from higher water content. Otherwise, climate change is not expected to directly affect earthquake frequency and intensity.

4.3.4.5 Magnitude and Severity

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

4.3.4.6 Vulnerability Assessment

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. Ground shaking is the primary earthquake hazard. Fault ruptures itself contribute very little to damage unless the structure or system element crosses the active fault.

Common impacts from earthquakes include damage to infrastructure and buildings (e.g., crumbling of unreinforced masonry, failure of architectural facades, rupturing of underground utilities, and road closures). Earthquakes frequently trigger secondary hazards, such as dam failures, landslides and rock falls, explosions, and fires that can become disasters themselves. Earthquakes may cause landslides, particularly during the wet season, in areas of high water or saturated soils. Earthquakes can cause dams to fail. Earthquakes can also cause seiches. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other factors that could cause flooding. Earthquake losses will vary across the El Dorado County Planning Area depending on the source and magnitude of the event.

Earthquake loss estimation for the 2024 MJHMP update utilized FEMA's Hazus-MH 6.1 natural hazard loss estimation software. Hazus is a GIS-based, standardized, nationally applicable multi-hazard loss estimation methodology and software. Local, state, and federal government officials use Hazus for preparedness, emergency response, and mitigation planning. A Hazus analysis was performed, which estimates damage based on an inventory database compiled at a national level aggregated to 2020 Census Tracts. As with any model, there are uncertainties, and the results should be considered approximate for planning purposes.

To evaluate potential losses associated with earthquake activity in the County's planning area, two Hazus scenarios were run for the County: a Hazus 2,500-year probabilistic scenario and the ShakeMap Magnitude 7.2 – West Tahoe v10 Scenario. The 2,500-year scenario considers multiple faults in the region. The methodology utilizes probabilistic seismic hazard contour maps developed by the USGS for the National Seismic Hazard Maps that are included with Hazus-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 seconds and 1.0 second, respectively. The 2,500-year return period analyzes ground shaking estimates from the various seismic sources in the area with a 2 percent probability of being exceeded in 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas.

The Magnitude 7.2 – West Tahoe v10 Scenario is a deterministic earthquake analysis that was modeled using Hazus for the County. A deterministic scenario predicts the outcome of a specific earthquake event. This deterministic scenario used USGS-provided ShakeMap datasets to model what a Magnitude 7.2 earthquake would generate in terms of damages and losses for the chosen area of interest (i.e. El Dorado County). The datasets used to import into Hazus 6.1 for the scenario included four USGS-provided data layers in geospatial format: peak ground velocity, peak ground acceleration, peak spectral acceleration for 0.3 seconds (0.3 % g, or gravitational velocity), and peak ground acceleration for 1.0 seconds (1.0 % g).

Hazus estimates the number of people displaced, the number of buildings and facilities/infrastructure damaged, the number of casualties, and the damage to transportation systems and utilities. Results produced by Hazus are reported at the census tract level. These results and the estimated impacts are summarized below in the vulnerability assessment.

People

Loss of utility service due to an earthquake would have major impacts on the people of the County, including socially vulnerable populations. The following tables indicate the number of projected households that would experience power and water loss, and the number of days the loss would last. As shown by Table 4-35, the 2,500-Year Probabilistic Scenario is expected to cause a longer delay in the recovery of potable water and electric power systems as well as cause more people to be without potable water or electric power compared to the West Tahoe ShakeMap Scenario.

Table 4-35 Expected Potable Water and Electric Power System

SCENARIO	AFFECTED SERVICE	TOTAL NUMBER OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS WITHOUT SERVICE				
			DAY 1	DAY 3	DAY 7	DAY 30	DAY 90
2,500-Year Probabilistic	Potable Water	75,320	7,048	4,075	405	0	0
	Electric Power		15,617	12,234	7,399	1,823	19
West Tahoe ShakeMap	Potable Water	75,320	0	0	0	0	0
	Electric Power		9,826	7,111	3,449	418	12

Source: Hazus 6.1

Sheltering is another concern during an earthquake – people may be displaced from their homes due to the earthquake, and those displaced people may need accommodations in temporary public shelters. Table 4-36 shows the projected total displacement and projected shelter needs for each scenario. The 2,500-Year Probabilistic Scenario is expected to result in many more displaced households and also people seeking shelter than the West Tahoe ShakeMap Scenario.

Table 4-36 Shelter Requirements

SCENARIO	TOTAL DISPLACED HOUSEHOLDS	TOTAL SEEKING SHELTER
2,500-Year Probabilistic	1,729	874
West Tahoe ShakeMap	331	158

Source: Hazus 6.1

The Hazus modeled potential casualty numbers vary based on the magnitude and time of occurrence of the earthquake. Casualties are broken out by occupancy class, and severity is separated into one of four categories.

- **Level 1** – Injuries will require medical attention, but hospitalization is not needed.
- **Level 2** – Injuries will require hospitalization but are not considered life-threatening.
- **Level 3** – Injuries will require hospitalization and can become life-threatening if not promptly treated.
- **Level 4** – Victims are killed by the earthquake.

Hazus estimates are provided for three times of day: 2 AM, 2 PM, and 5 PM. These times represent the periods of the day when different sectors of the community are at their peak occupancy loads. The 2 AM estimate considers that the residential occupancy load is maximum, the 2 PM estimate considers that the educational, commercial, and industrial sector loads are maximum, and 5 PM represents peak commute time. Table 4-37 shows casualty estimates for the different times of day for each scenario. The 2,500-Year Probabilistic Scenario is expected to result in much more casualties than the West Tahoe Scenario.

Table 4-37 Casualty Estimates

SCENARIO	Time	OCCUPANCY TYPE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
2,500-Year Probabilistic	2 AM	Commercial	3.34	0.87	0.13	0.26
		Commuting	0.01	0.02	0.03	0.01
		Educational	0.00	0.00	0.00	0.00
		Hotels	1.42	0.36	0.05	0.10
		Industrial	2.85	0.71	0.10	0.20
		Other- Residential	98.73	18.74	1.62	3.04
		Single Family	139.14	20.77	0.85	1.35
		Total	**245**	**41**	**3**	**5**
	2 PM	Commercial	221.8	56.52	8.55	16.71
		Commuting	0.11	0.16	0.26	0.05
		Educational	72.83	18.52	2.92	5.7
		Hotels	0.27	0.07	0.01	0.02
		Industrial	20.92	5.18	0.76	1.48
		Other- Residential	32.4	6.11	0.56	0.97
		Single Family	46.04	6.95	0.36	0.46
		Total	**394**	**94**	**13**	**25**
	5 PM	Commercial	149.28	37.55	5.66	10.93
		Commuting	2.17	2.93	4.9	0.95
		Educational	14.24	3.93	0.65	1.27

SCENARIO	Time	OCCUPANCY TYPE	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
		Hotels	0.42	0.11	0.01	0.03
		Industrial	13.08	3.24	0.48	0.93
		Other- Residential	37.48	7.13	0.65	1.13
		Single Family	54.21	8.22	0.43	0.55
		Total	**271**	**63**	**13**	**16**
West Tahoe ShakeMap	2 AM	Commercial	0.92	0.16	0.02	0.03
		Commuting	0.02	0.02	0.04	0.01
		Educational	0.00	0.00	0.00	0.00
		Hotels	0.26	0.03	0.00	0.00
		Industrial	0.89	0.17	0.02	0.04
		Other- Residential	20.49	2.87	0.16	0.30
		Single Family	19.58	1.55	0.00	0.00
		Total	**42**	**5**	**0**	**0**
	2 PM	Commercial	58.64	10.36	1.09	2.1
		Commuting	0.14	0.19	0.32	0.06
		Educational	20.58	3.49	0.36	0.70
		Hotels	0.05	0.01	0.00	0.00
		Industrial	6.50	1.24	0.13	0.26
		Other- Residential	6.45	0.90	0.05	0.09
		Single Family	6.15	0.49	0.00	0.00
		Total	**99**	**17**	**2**	**3**
	5 PM	Commercial	38.68	6.82	0.72	1.38
		Commuting	2.73	3.76	6.21	1.21
		Educational	5.15	0.92	0.11	0.20
		Hotels	0.08	0.01	0.00	0.00
		Industrial	4.06	0.78	0.08	0.16
		Other- Residential	7.65	1.06	0.06	0.11
		Single Family	7.34	0.59	0.00	0.00
		Total	**66**	**14**	**7**	**3**

Source: Hazus 6.1

Populations most vulnerable to earthquake hazards would also be those that rely on specific services or electrical power which may not be available during or after an earthquake. Over three million Medicare beneficiaries rely on electricity-dependent durable medical and assistive equipment and devices to live independently in their homes (DHHS 2024). Severe weather, earthquakes, and other emergencies that result in prolonged power outages can be life threatening for these individuals.

Of the 49,038 total beneficiaries in El Dorado County, 2,119 (5.3%) are at risk beneficiaries depending on electricity-dependent medical equipment (DHHS 2024). Populations that are homeless, those who with limited mobility, and those who may have difficulty receiving warning messages due to limited English proficiency, are also at a greater risk during earthquake events. Because there are numerous socially vulnerable communities spread across the eastern portion of the County around the City of South Lake Tahoe, near the communities of Kyburz and Pollock Pines and the unincorporated communities north of Placerville, earthquake hazards would have the greatest impacts on those households that rely on electrical power for medical conditions.

Property

Hazus estimates the number of buildings that will be damaged during a modeled earthquake, and these estimates are provided in the figures and tables below. The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake. Table 4-38 below provides a summary of the losses associated with the building damage for each scenario.

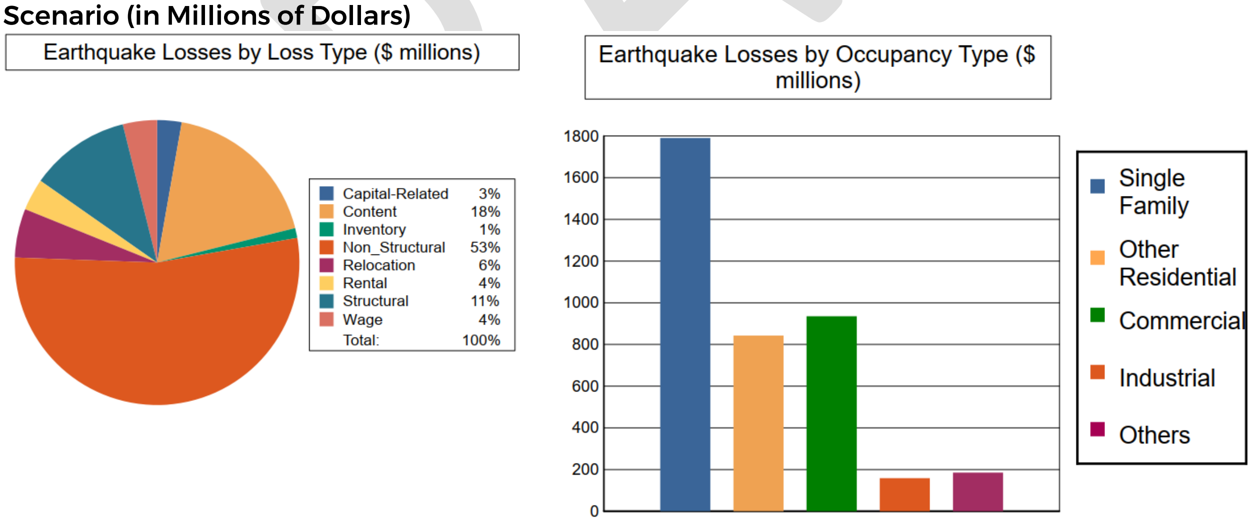
Table 4-38 Direct Economic Losses for Buildings

LOSS CATEGORY	LOSS TYPE	2,500-YEAR PROBABILISTIC SCENARIO	WEST TAHOE SHAKEMAP SCENARIO
Capital Stock Losses	Cost Structural Damage	$444,730,000	$120,834,000
	Cost Non-Struct. Damages	$2,090,719,000	$579,220,000
	Cost Contents Damage	$718,520,000	$213,949,000
	Inventory Loss	$32,719,000	$8,992,000
	Loss Ratio	5.68%	1.57%
Income Losses	Relocation Loss	$221,916,000	$65,738,000
	Capital Related Loss	$112,823,000	$52,374,000
	Wage Losses	$151,672,000	$65,084,000
	Rental Income Loss	$139,534,000	$48,916,000
Total Losses		**$3,912,633,000**	**$1,155,107,000**

Source: Hazus 6.1

The total building-related losses for the 2,500 probabilistic scenario were $3.9 billion; 16% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 67% of the total loss. See Figure 4-18 for a visual breakdown of total losses.

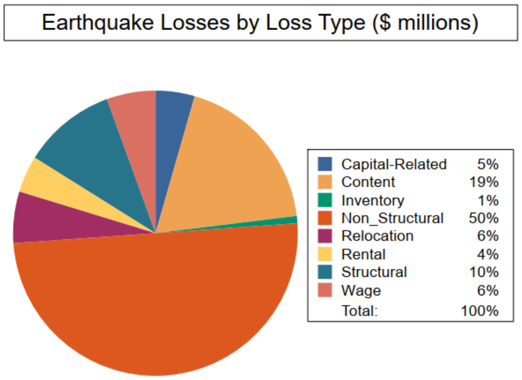
Figure 4-18 Earthquake Losses by Loss Type and Occupancy Type – 2,500 Probabilistic Scenario (in Millions of Dollars)

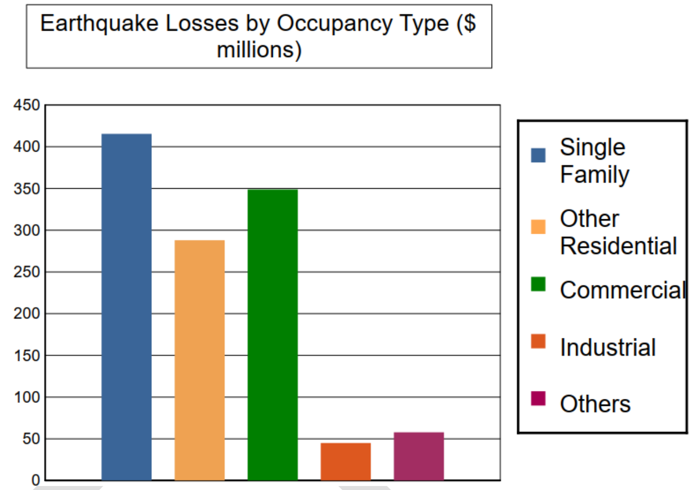


Source: Hazus 6.1

The total building-related losses for the West Tahoe ShakeMap were $1.2 billion; 20% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 61% of the total loss. See Figure 4-19 for a visual breakdown of total losses.

Figure 4-19 Earthquake Losses by Loss Type and Occupancy Type – West Tahoe ShakeMap Scenario (in Millions of Dollars)





Source: Hazus 6.1

Figure 4-20 and Figure 4-21 below display the census tracts within the County that were analyzed in the two scenarios, color-coded by the amount of total building loss each tract experienced.

Figure 4-20 El Dorado County Hazus 2,500-Year Probabilistic Scenario Total Building Loss (in Thousands of Dollars)

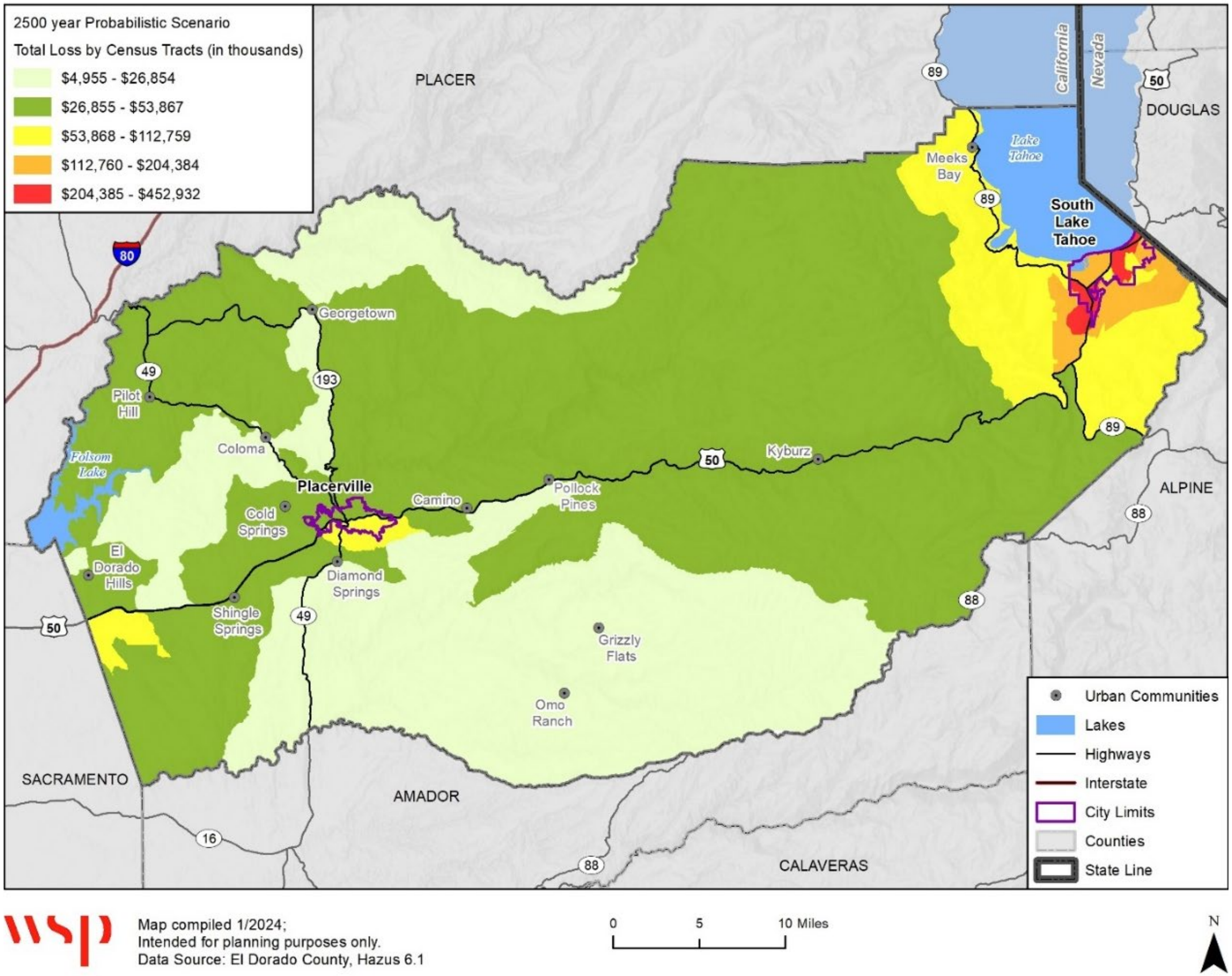
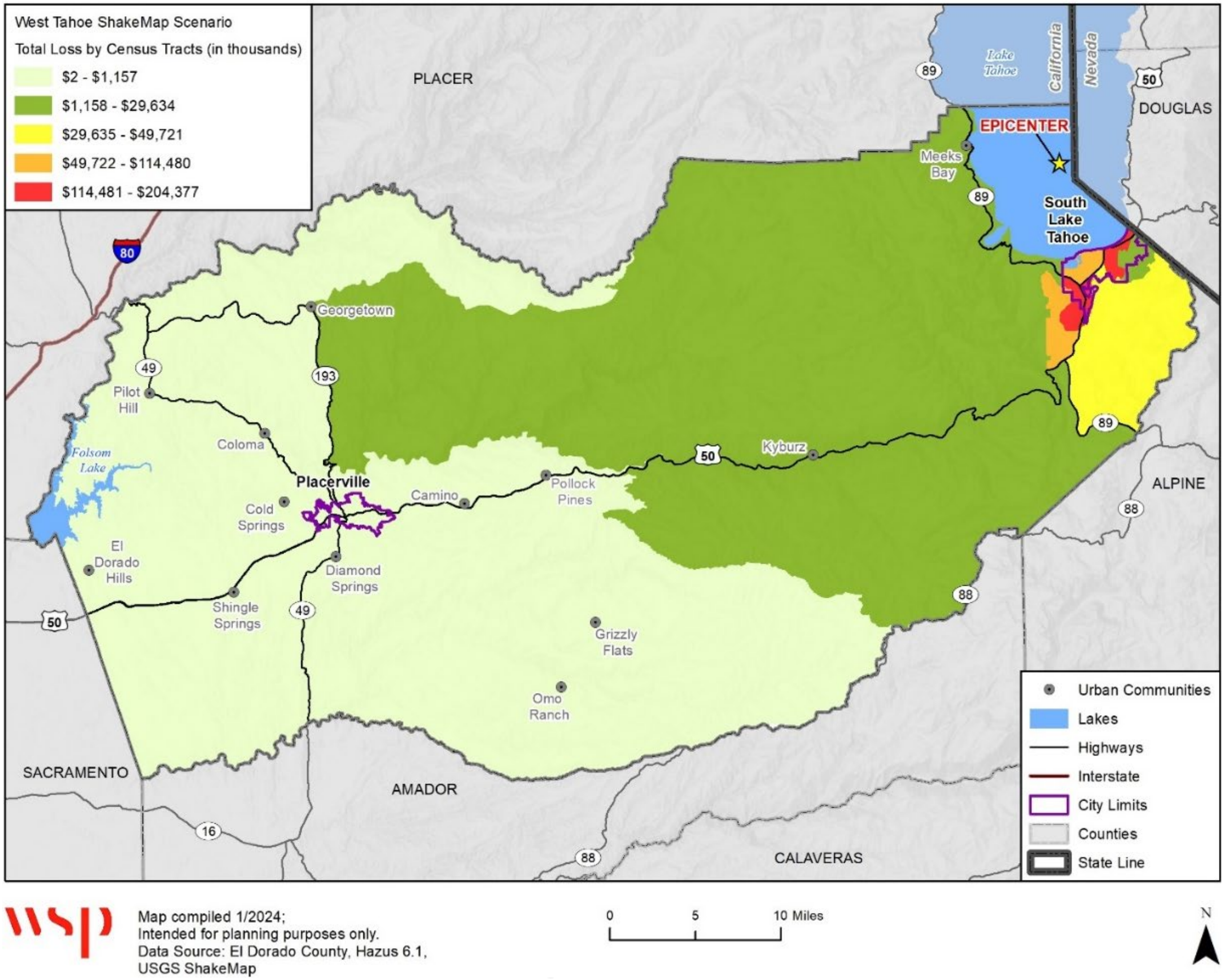


Figure 4-21 El Dorado County West Tahoe ShakeMap Scenario Total Building Loss (in Thousands of Dollars)



Critical Facilities and Lifelines

Hazus breaks critical facilities into two groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. HPL facilities include dams, levees, military installations, nuclear power plants and hazardous material sites. There are three hospitals in the County with a total bed capacity of 240 beds. There are 79 schools, 59 fire stations, seven police stations and one emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams, hazardous material sites, military installations, or nuclear power plants identified within the inventory.

Before the earthquake, the County had 240 hospital beds available for use. On the day of the earthquake in the 2,500-Year Probabilistic Scenario, the model estimates that only 83 hospital beds (35.0%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 59.0% of the beds will be back in service. By 30 days, 83.0% will be operational. In the West Tahoe ShakeMap Scenario, the model estimates that only 159 hospital beds (67.0%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 67.0% of the beds will be back in service. By 30 days, 74.0% will be operational. Table 4-39 breaks out expected damages to essential facilities for both scenarios.

Table 4-39 Expected Damage to Essential Facilities

SCENARIO	CLASSIFICATION	TOTAL	# FACILITIES		
			AT LEAST MODERATE DAMAGE > 50%	COMPLETE DAMAGE > 50%	WITH FUNCTIONALITY > 50% ON DAY 1
2,500-Year Probabilistic	Hospitals	3		0	
	Schools	79	10	0	59
	EOCs	1		0	1
	Police Stations	7		0	
	Fire Stations	59		0	46
West Tahoe ShakeMap	Hospitals	3	1	0	2
	Schools	79	10	0	69
	EOCs	1	0	0	1
	Police Stations	7	2	0	4
	Fire Stations	59	6	0	51

Source: Hazus 6.1

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven transportation systems that include highways, railways, light rail, bus, ports, ferries, and airports. There are six utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power, and communications. This inventory includes over 380.9 miles of highways, 183 bridges, and 7,037.7 miles of pipes. The total value of the lifeline inventory is over $10.4 billion. See the total expected damage to the transportation system in Table 4-40 below.

Table 4-40 Expected Damage to the Transportation System

SCENARIO	SYSTEM	COMPONENT	TOTAL	NUMBER OF LOCATIONS			
				WITH AT LEAST MOD. DAMAGE	WITH COMPLETE DAMAGE	WITH FUNCTIONALITY > 50 % AFTER DAY 1	AFTER DAY 7
2,500-Year Probabilistic	Highway	Segments	133	0	0	133	133
		Bridges	183	1	0	182	183
	Railways	Segments	8	0	0	8	8
	Bus	Facilities	3	2	0	1	3
	Airports	Facilities	4	1	0	3	4
		Runways	4	0	0	4	4
West Tahoe ShakeMap	Highway	Segments	133	0	0	133	133
		Bridges	183	1	0	182	182
	Railways	Segments	8	0	0	8	8
	Bus	Facilities	3	2	0	3	3
	Airports	Facilities	4	1	0	4	4
		Runways	4	0	0	4	4

Source: Hazus 6.1

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Table 4-41 provides a detailed breakdown in the expected lifeline losses.

Table 4-41 Transportation System Economic Losses (Millions of dollars)

SCENARIO	LIFELINE	SYSTEM	COMPONENT	INVENTORY VALUE	ECONOMIC LOSS	LOSS RATIO (%)
2,500-Year Probabilistic	Transportation	Highway	Segments	$2,374.1	-	-
			Bridges	$414.3	$4.9	1.2
		Railways	Segments	$76.9	-	-
		Bus	Facilities	$6.6	$3.1	46.4
		Airport	Facilities	$29.3	$7.5	25.7
			Runways	$23.6	-	-
	Utilities	Potable Water	Facilities	$39.3	$4.3	10.8
			Distribution Line	$141.5	$4.6	3.3
		Wastewater	Facilities	$687.8	$67.1	9.8
			Distribution Line	$84.9	$2.3	2.7
		Natural Gas	Pipelines	$9.7	-	-
			Distribution Line	$56.6	$0.8	1.4
		Electrical Power	Facilities	$6,514.8	$2,449.9	37.6
		Communication	Facilities	$0.8	$0.3	38.4
			Total	**$10,460.2**	**$2,544.8**	**-**

SCENARIO	LIFELINE	SYSTEM	COMPONENT	INVENTORY VALUE	ECONOMIC LOSS	LOSS RATIO (%)
West Tahoe ShakeMap	Transportation	Highway	Segments	$2,374.1	-	-
			Bridges	$414.3	$2.6	0.6
		Railways	Segments	$76.9	-	-
		Bus	Facilities	$6.6	$1.8	27.6
		Airport	Facilities	$29.3	$2.5	8.4
			Runways	$23.6	-	-
	Utilities	Potable Water	Facilities	$39.3	$0.0	0.1
			Distribution Line	$141.5	-	-
		Wastewater	Facilities	$687.8	$0.3	0.0
			Distribution Line	$84.9	-	-
		Natural Gas	Pipelines	$9.7	-	-
			Distribution Line	$56.6	-	-
		Electrical Power	Facilities	$6,514.8	$200.9	3.1
		Communication	Facilities	$0.8	$0.1	15.7
			Total	**$10,460.2**	**$208.2**	**-**

Source: Hazus 6.1

Major earthquakes will result in serious impacts to critical infrastructure. Major impacts on the critical facilities in the County will also result in impacts to socially vulnerable populations, particularly those communities in the rural and isolated communities outside the City of South Lake Tahoe, the unincorporated communities of Meyers, Kyburz, Pollock Pines, Camino, and the communities around Placerville. Those at greatest risk will be those that lack access to transportation or support systems and need to evacuate to neighboring counties for support. Any prolonged loss of power would also indirectly impact at-risk populations that depending on electricity to operate medical and life-saving equipment

Economy

Depending on its location and magnitude, an earthquake could have a devastating impact on the County's economy. Impacts would be related to debris cleanup and management, building and infrastructure damage, and losses related to business and infrastructure interruption. Hazus estimates the economic impacts of earthquakes. Losses estimated include building-related losses, and transportation and utility lifeline losses. The model estimates loss over a 15-year span after the incident.

Building losses are broken into two categories – direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. Business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake. Table 4-42 shows the economic losses under the two scenarios broken down by loss categories and occupancy types.

Table 4-42 Economic Losses (Millions of Dollars)

SCENARIO	LOSS CATEGORY	OCCUPANCY TYPE	SINGLE FAMILY	OTHER RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHERS	TOTAL
2,500-Year Probabilistic	Income Losses	Wage	-	$52.9	$91.5	$1.9	$5.3	$151.7
		Capital-Related	-	$22.5	$88.1	$1.1	$1.1	$112.8
		Rental	$32.0	$71.0	$33.0	$0.9	$2.7	$139.5
		Relocation	$1,17.1	$30.5	$50.9	$5.1	$18.3	$221.9
	Capital Stock Losses	Structural	$227.0	$81.3	$96.2	$17.9	$22.3	$444.7
		Nonstructural	$1,077.7	$480.1	$364.9	$ 74.2	$93.8	$2,090.7
		Content	$337.1	$104.3	$1,87.1	$50.1	$39.9	$718.5
		Inventory	-	-	$23.6	$7.4	$1.7	$32.7
		Total	**$1,791.0**	**$842.6**	**$935.3**	**$158.6**	**$185.2**	**$3,912.6**
West Tahoe ShakeMap	Income Losses	Wage	-	$16.8	$45.3	$0.7	$2.3	$65.1
		Capital-Related	-	$7.1	$44.4	$0.4	$0.4	$52.4
		Rental	$6.3	$26.7	$14.1	$0.4	$1.4	$48.9
		Relocation	$23.7	$10.2	$22.0	$2.2	$7.7	$65.7
	Capital Stock Losses	Structural	$43.1	$25.1	$38.3	$6.8	$7.4	$120.8
		Nonstructural	$246.0	$163.7	$121.9	$20.0	$27.6	$579.2
		Content	$96.3	$38.3	$56.1	$12.7	$10.6	$213.9
		Inventory	-	-	$6.8	$ 1.8	$0.3	$9.0
		Total	**$415.5**	**$287.9**	**$348.9**	**$45.0**	**$57.8**	**$ 1,155.1**

Source: Hazus 6.1

Cultural, Historic, and Natural Resources

An earthquake in the County or the surrounding region could cause cascading (secondary) effects, including dam or pipeline failure that would impact the natural environment in different ways, depending on the extent of the cascading hazard. For example, earthquake-induced landslides or debris flows could significantly damage habitat and re-route streams and waterways, causing water quality impacts. Other types of ground deformation could also result. Historic properties constructed with older wooden beams or masonry buildings would be at the greatest risk.

Development Trends

Each Hazus scenario only estimates damage and causalities for existing building inventory and populations and does not consider future development plans. The County needs to meet its General Plan Safety Element goal and objectives and ensure that risk reduction in the community is taken into account, particularly when dealing with earthquakes and other geologic hazards. The General Plan Safety Element establishes standards and requirements for the protection from geologic and seismic hazards. Building and development will also be regulated through the current International Building Code (IBC) and California Building Code (CBC) building standards.

4.3.4.7 Risk Summary

- Earthquakes are a Medium significance hazard for El Dorado County.
- El Dorado County lies between two seismically active regions in the western United States.
- El Dorado County is traversed by a series of northwest-trending faults, called the Foothill Fault Zone.
- Western El Dorado County may experience ground shaking from distant major to great earthquakes on faults to the west and east.
- The eastern County is located along the border of California and Nevada, two of the most geologically active, earthquake-prone states in the United States.
- Historically, major earthquakes have not been an issue for El Dorado County. However, minor earthquakes have occurred in the County in the past, and the County has felt ground shaking from earthquakes with epicenters located elsewhere.
- Based on historical data and the location of El Dorado County relative to active and potentially active faults, the County could experience a significantly damaging earthquake occasionally.
- Climate change can increase the risk of cascading hazards related to earthquakes, including landslides.

4.3.5 Erosion

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Erosion	Limited	Likely	Negligible	Low

4.3.5.0 Hazard Description

Streambank erosion is the result of water and gravity exerting greater forces than the streambank can withstand, leading to failure. Hydraulic failure occurs when flowing water directly impacts the streambank, while geologic failure happens when an overhanging bank collapses due to gravity. Various activities, both at the watershed and stream scale, contribute to streambank erosion. Urbanization, a large-scale activity, increases impervious surfaces like parking lots and roads within watersheds, reducing water infiltration into the soil. Consequently, more rainfall during storms becomes runoff, flowing into streams. Urbanized watersheds transport a larger volume of stormwater compared to undeveloped ones, leading to deeper waters in streams. Increased water depth elevates stress levels on the bed and banks, resulting in higher rates of streambank erosion. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that stream bank erosion contributes a large portion of the annual sediment yield. Although streambank erosion is a natural process, acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects.

4.3.5.1 Geographic Area

Limited–Erosion is limited to the banks of waterways and lakes in the County. However, a severe precipitation event over the South or Middle Fork of the American River watershed or the Cosumnes Watershed could result in erosion and deposition affecting ditches, streambeds, reservoirs, open space, and stormwater management structures. Heavy sediments can settle out in the water infrastructure limiting its capacity or clogging it. Lighter sediments can remain suspended in the water supply for an extended period degrading water quality and resulting in increased treatment costs.

4.3.5.2 Past Occurrences

There have been no disasters declarations in El Dorado County specifically for erosion activity. Additionally, the NCEI Storm Events Database does not track erosion events. Historically, erosion issues in El Dorado County have been a result of other hazards. Members of the HMPC noted erosion problems along Highway 50 near Bridal Veil Falls, Happy Valley in the Mt. Aukum area and Ft. Jim Road in the Placerville area. See Section 4.3.7.2 for information on past flooding events, and Section 4.3.10.2 for information on past heavy rain events.

Failed Drainage Culvert on Newtown Road in Placerville.

Source: https://www.mtdemocrat.com/news/newtown-to-close-at-big-barn-mining-brook/article_aa921942-31ec-5e86-9672-b57e1431a109.html

4.3.5.3 Likelihood of Future Occurrence

Likely–Due to the number of linear feet of stream banks and drainages, the likelihood of future occurrences of erosion in El Dorado County is likely. While it is difficult to predict the exact future likelihood of erosion, periods of erosion are most likely to occur in conjunction with other hazard events, such as after a flood or wildfire event, or during periods of heavy rain, high wind, and ice storms. Additionally, invasive species that damage natural vegetation can result in increased erosion of soils.

4.3.5.4 Climate Change Considerations

Climate change may affect flooding and erosion in the County. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. Rising air temperatures can contribute to increased soil breakdown, facilitating greater water penetration and directly influencing erosion rates. Climate change may then escalate the frequency and intensity of rainstorms. This intensification can lead to more pronounced erosion, elevated sediment transport in rivers and streams, and a heightened risk of landslides, predominantly driven by the expanded water content resulting from these climatic shifts.

4.3.5.5 Magnitude and Severity

Negligible– High-velocity floodwaters can cause rapid erosion as the water displaces and disposes of sediment and other natural materials. Severe erosion removes the earth from beneath bridges, roads and foundations of structures adjacent to streams. By undercutting it can lead to increased rockfall and landslide hazards. The deposition of material can block culverts, aggravate flooding, destroy crops and lawns by burying them, and reduce the capacity of water reservoirs as the deposited materials displace water. Further, erosion increases the sediment that a stream must carry, results in the loss of fertile land, and causes a decline in the quality of habitat on land and in the stream. Erosion can occur at once or over time as a function of the storm cycle and the scale of the peak storms.

4.3.5.6 Vulnerability Assessment

People

The risk of injury or fatalities as a result is erosion very low. Spontaneous collapse and opening of voids are rare but could potentially cause death or injury to any people in the area at the time. Because the risk of injuries to people from soil erosion are low, it is not expected to result in impacts to socially vulnerable populations.

Property

Erosion has the potential to cause structural damage in property by undermining the foundational support of the buildings. Additionally, structures located on slopes could collapse during periods of heavy rainfall when soil is removed and deposited elsewhere. Water containing sediment that enters drainage systems could also cause blockages that perpetuate flooding. Because climate change will intensify heavy rain events, it will result in greater flooding events and in turn greater soil erosion potential. This can, therefore, exacerbate the foundations and structural integrity of buildings and other structures.

Critical Facilities and Lifelines

Similar to property, critical facilities could be vulnerable to structural damage due to erosion. Drainage systems that the community uses to redirect water away from essential property are at risk to blockages due to water containing sentiment. Sediment on roadways can also make these streets hazardous to drivers and cyclers when wet. Since climate change will result in warmer air temperatures and over time result in drier soil, more intense rainfall events are likely to contribute to increased soil breakdown and higher erosion rates.

Economy

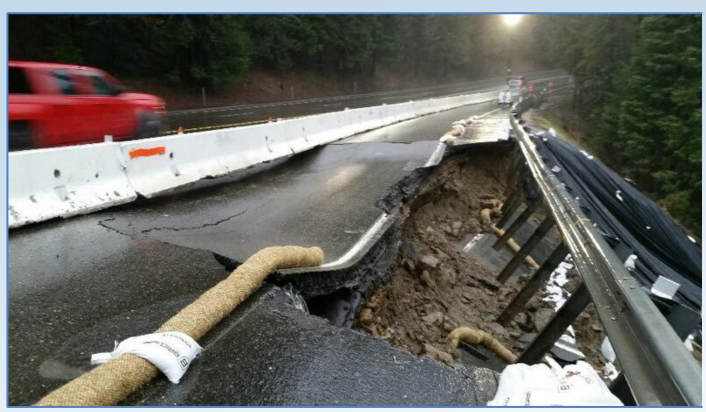
The economic cost of this hazard is typically minor in the short term, although over time they can add up to significant impacts. Road closures or detours during expansive soil repairs can result in temporary economic impacts on nearby communities that rely on the regular delivery of goods and services, and particularly impactful for those communities that rely on tourism and visitors (e.g. Tahoe Basin, Apple Hill). Erosion can also decrease the recreational value of a body of water (e.g. Lake Tahoe). Additionally, it can be costly for drinking water treatment plants to filter out sediment in the water caused by erosion.

Cultural, Historic, and Natural Resources

Erosion and collapse of riverbanks have the capacity to reshape landscapes. As water transports materials from eroded banks, they suspend sediment in the water, negatively affecting water quality and potentially fostering harmful algae blooms. The eventual settling of suspended sediment, known as sedimentation, can obstruct riverbeds and streams, leading to the smothering of aquatic organisms and the destruction of habitats. The adverse effects of erosion and sedimentation are particularly pronounced in ecosystems already degraded or significantly altered. Soil erosion is not expected to have a significant impacts on cultural and historic resources.

Development Trends

Typically, the process of erosion does not limit land use, especially if efforts are made to minimize it. Erosion impacts can be reduced and controlled by surface drainage management, re-vegetation, or disturbed lands, controlling stream-carried eroded materials in sediment catchment basins, and riprapping of erosion-prone stream banks (especially adjacent to structures). Ground modification and structural solutions can help mitigate the threats of localize erosion and deposition. Proper drainage and water



Severe Erosion on U.S Highway 50 in 2017

Source: https://www.kolotv.com/content/news/Severe-erosion-leads-to-delays-on-50-in-El-Dorado-County-414384713.html management are also important to prevent increasing vulnerability to erosion and deposition hazards.

4.3.5.7 Risk Summary

- Erosion is largely limited to areas along waterways in the County, such as the American and Cosumnes Rivers.
- There have been no disaster declarations in the County for erosion specifically, however, erosion has occurred in times of heavy precipitation.
- Due to the number of linear feet of stream banks and drainages, the likelihood of future occurrences of erosion in El Dorado County is somewhat likely.
- Climate change may escalate the frequency and intensity of rainstorms, which can lead to more pronounced erosion.
- The risk of injury or fatalities as a result is erosion very low. Greatest risk is to critical facilities or infrastructure along streams and waterways.
- Erosion is a **low** significance hazard for El Dorado County.

4.3.6 Extreme Heat

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Extreme Heat	Extensive	Likely	Moderate	Medium

4.3.6.0 Hazard Description

Extreme heat is defined as temperatures that hover 10 °F or more above the average high temperatures for a region for several days or weeks. Extreme heat events can lead to an increase in heat-related illnesses and deaths, worsen drought, and impact water supplies and other infrastructure such as transportation, agriculture, and energy.

Extreme heat can pose serious risks to human health and safety. The most common risks associated with exposure to extreme heat include dehydration, heat exhaustion, and heat stroke. In addition to the risks to human health and safety, extreme heat can have significant impacts on infrastructure, the economy, and agriculture. For example, high temperatures can cause power outages and damage to roads and other infrastructure. In agriculture, extreme heat can damage crops and livestock, leading to lower yields and economic losses for farmers.

Figure 4-22 shows the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes the air feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the Heat Index rises, so do health risks.

Figure 4-22 NWS Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

Source: The National Weather Service (NWS)

Table 4-43 summarizes temperature normals in the County with data from the Western Regional Climate Center (WRCC).

Table 4-43 El Dorado County Temperature and Precipitation Summary

METRIC	GEORGETOWN RANGER STATION (043384)	SOUTH LAKE TAHOE AP (048762)
Period of Record	1946-2012	1968-2016
Winter Average Maximum Temperature*	52.2˚F	41.8˚F
Winter Mean Temperature *	43.8˚F	29.3˚F
Summer Average Maximum Temperature**	86.2˚F	76.6˚F
Summer Mean Temperature**	72.5˚F	58.2˚F
Average Annual Number of Days >90˚F	49.6	1.6
Maximum Temperature	107˚F, 07/15/1972	99˚F, 07/22/1988

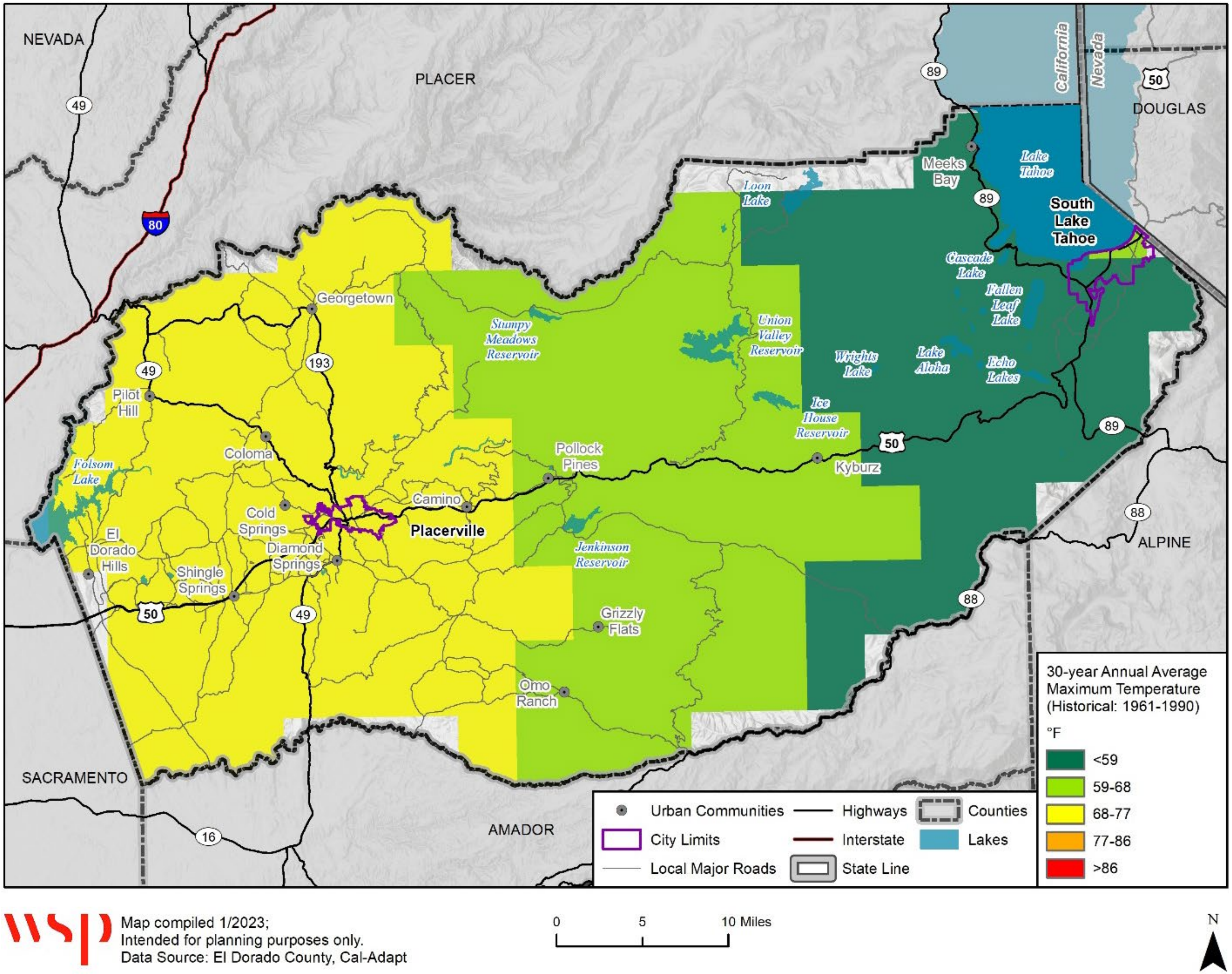
Source: Western Regional Climate Center (WRCC), https://wrcc.dri.edu/Climate/summaries.php
*Winter = Dec., Jan., and Feb.
**Summer = Jun., Jul., and Aug

4.3.6.1 Geographic Area

Extensive – One of the defining features of temperature hazards is that they tend to be regional in nature, impacting a large geographical area simultaneously. While the threshold for extreme heat may vary by location, see Figure 4-23, climatic factors which cause the conditions for extreme heat are likely to affect the whole County simultaneously.

Annual average maximum temperature, an average of all the hottest daily temperatures in a year, is used to measure temperature trends and projections. Using data from 1961-1990, the County had a historical 30-year annual average maximum temperature of 63.4 ˚F. Figure 4-23 shows a localized depiction of the historical 30-year annual average maximum temperature across the County. See Section 4.3.6.4 Climate Change Considerations for future projections of the 30-year annual average maximum temperatures.

Figure 4-23 30-Year Annual Average Maximum Temperature: Historical (1961-1990)



4.3.6.2 Past Occurrences

In late August 2022, a significant heat wave occurred across the State of California. In expectation of temperatures reaching 10-20˚F above normal, and surpassing 110˚F in some areas, California Governor Gavin Newsom declared an extreme heat state of emergency on August 31st. Two wildfires that began during the heat wave, the Mosquito fire in El Dorado and Placer counties and the Mill fire in Siskiyou County, prompted both State and federal emergency declarations. In total, the heat wave event caused an estimated $84 million in damages. More details on this event can be found in Table 4-44 below.

Table 4-44 Extreme Heat Event, August to September 2022

DISASTER NAME	DISASTER #	YEAR	AREAS DECLARED	STATE PROCLAMATION DATE	FEDERAL DECLARATION DATE	DAMAGES
Heat Dome and Wildfires	2022-08 FM-5453 FM-5450	2022	El Dorado, Madera, Modoc, Placer, Siskiyou	8/31/2022 (Extreme Heat) 9/8/2022 (Mosquito Fire) 9/2/2022 (Mill Fire)	(FM-5453, Mosquito Fire) 9/2/2022 (FM-5450, Mill Fire)	$84,513,380

Source: 2023 State Hazard Mitigation Plan, https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf

According to the NCEI Storm Events Database, 89 combined heat and excessive heat[4] events have been recorded in El Dorado County from January 1996 to September 2023. During this time, 13 injuries and 21 deaths occurred during 8 events. A summary of these events is listed in Table 4-45. Please not that excessive heat is a regional phenomenon which often affects several counties simultaneously, Therefore, the injuries reported in the following table may have occurred in a nearby county which was experiencing the same heat wave as El Dorado County.

Table 4-45 Extreme Heat Events in El Dorado County, 1996-2023

DATE	EVENT TYPE	# OF INJURIES	# OF DEATHS	SUMMARY OF EVENT
6/13/2000	Heat	3	0	None recorded by the NCEI.
7/9/2008	Heat	1	1	High temperatures exceeded the century mark, leading to the tying or breaking of records in the northern Central Valley on the 9th. At the Sacramento Executive Airport, the daily maximum temperature equaled the previous record of 108 degrees set in 1961. Overnight temperatures also remained notably warm, resulting in the establishment, or tying of several record high minimums. The daily high minimum temperature record of 72 degrees was matched at the Sacramento Executive Airport, replicating the mark set in 1896.

[4] According to the NCEI Storm Events Database, heat is the combination of high temperatures (above normal) and relative humidity. A Heat event occurs and is reported in Storm Data whenever heat index values meet or exceed locally/regionally established advisory thresholds. Excessive Heat results from a combination of high temperatures (well above normal) and high humidity. An Excessive Heat event occurs and is reported in Storm Data whenever heat index values meet or exceed locally/regionally established excessive heat warning thresholds.

DATE	EVENT TYPE	# OF INJURIES	# OF DEATHS	SUMMARY OF EVENT
				A 72-year-old Capay man died in his overheated home. His air conditioner had broken down, and the house was 103 degrees when he was found.
6/7/2013	Heat	15	0	Max temperatures in the valley ranged from approximately 100-112 degrees with minimum temperatures were approximately in the mid to upper 60s. The heat sickened at least 15 people, two critically, at a morning graduation ceremony Saturday at Del Oro High School in Loomis, which forced the cancellation of the event and sent several people to the local hospitals. Many of those stricken suffered heat exhaustion and heat stroke and ranged in age from 15 to 80 years of age and older.
6/18/2017	Excessive Heat	0	6	During the peak of the heatwave on the 21st, various locations experienced high temperatures: Redding reached 112, Red Bluff 113, Marysville 112, downtown Sacramento 108, and Stockton 108. Sacramento County reported a heat-related fatality, with two additional deaths in Glenn County and multiple heat-related hospitalizations. Nine cooling centers were opened in Sacramento County. Incidents included power outages at a hospital, potential heat-related damage to a roadway, and six heat-related deaths in Sacramento County
8/1/2017	Excessive Heat	1	0	Upper-level high pressure brought record heat to the area. A plume of subtropical moisture promoted the growth of isolated afternoon thunderstorms with large hail. A 13-year-old was hospitalized Tuesday after suffering heat stroke during tryouts for the freshman football team at Lincoln High School on August 1. Temperatures at Lincoln Airport reached 100 degrees between 4 and 7 pm PDT.
8/14/2020	Excessive Heat	0	1	A prolonged and significant heat wave occurred in mid-August due to high pressure parked over California. High temperatures soared between 100 to 115 degrees for much of the Valley and lower elevation foothills, while higher elevation areas in the mountains range from the mid-80s to low 100s. Overnight lows were oppressive during this time frame as well, with Valley and foothill locations holding in the 70s to low 80s. Many emergency room visits were recorded in the Sacramento area in addition to 3 confirmed heat related deaths. One out of these deaths also involved drug use.
8/18/2020	Excessive Heat	0	1	A heat wave was forecast for the initial part of this event; however, with many massive wildfires over northern California, intense heating was suppressed to wildfire smoke. Temperatures still rose to the mid-90s and low 100s, which was not much of a reprieve from the previous week's temperatures. A heat related death occurred during this time frame on August 22. The decedent was doing yard work in heat and fell ill. He was taken to Kaiser and died 3 days later. In addition to lingering heat, a renewed chance of

DATE	EVENT TYPE	# OF INJURIES	# OF DEATHS	SUMMARY OF EVENT
				thunderstorms and fire weather concerns were forecast August 23 and 24. Strikes generally remained confined, but not limited to, the west slopes of the Sierra.
9/4/2022	Excessive Heat	1	1	Strong high pressure over interior northern California brought widespread high to very high heat risk to the region. Triple-digit high temperatures were observed across most of the Central Valley, Delta, and foothills through the first 9 days of September. The hottest temperatures were on September 5 and 6, when temperatures exceeding 110 were observed at many locations. All-time records were set on the 6th for Sacramento stations and tied in Stockton. Numerous daily and monthly record high-temperature were also set in the area. There was one death attributed to the heat in Sacramento County.

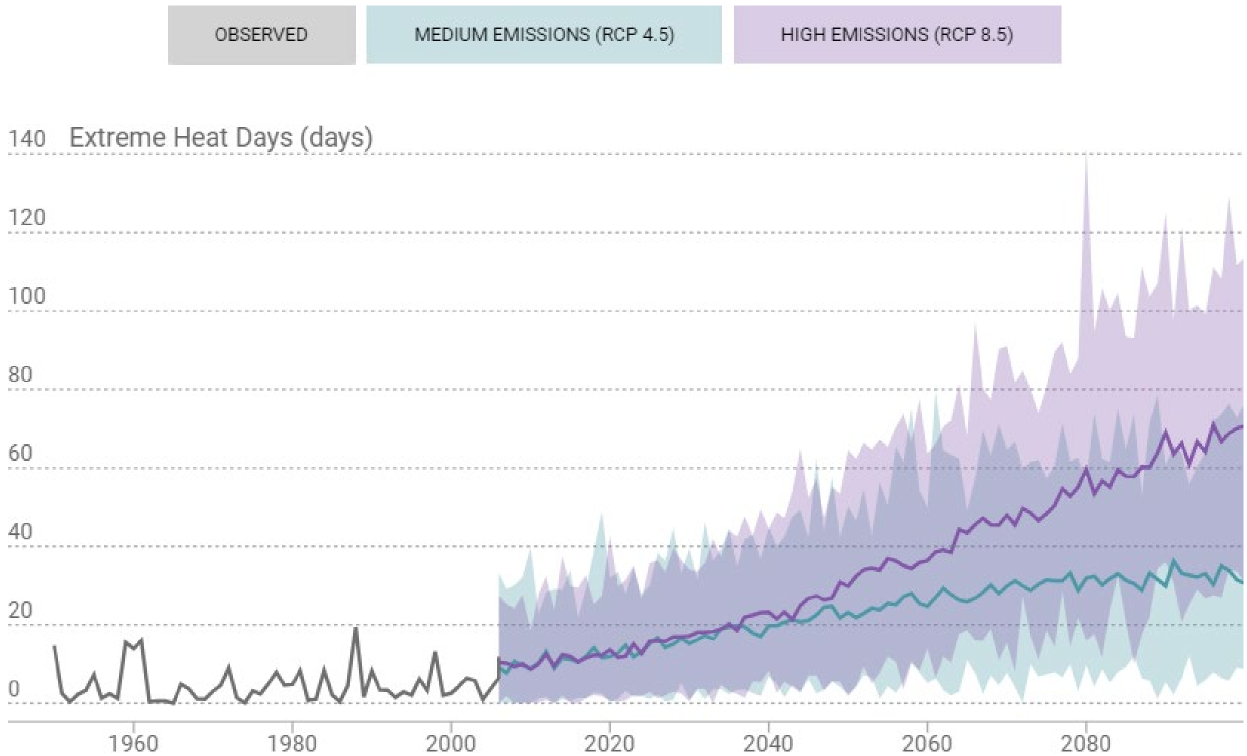
Source: NCEI Storm Events Database, https://www.ncdc.noaa.gov/stormevents/

4.3.6.3 Likelihood of Future Occurrence

Likely Based on the NCEI data, 89 heat and excessive heat events have occurred over a roughly 28 year span of record keeping, which equates to roughly three extreme heat events annually. This makes it likely that an extreme heat event will happen during any given year.

As climate change progresses, these events are likely to become more common. Future temperature estimates from Cal-Adapt for the County under high and low emission scenarios are shown in Figure 4-24. The graph shows the number of days per year when daily maximum temperature is above the locally-defined extreme heat threshold of 92.4˚F. Note: The threshold temperature used in Cal-Adapt is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed in the County.

Figure 4-24 Future Extreme Heat Days in El Dorado County



Source: Cal-Adapt 2024

4.3.6.4 Climate Change Considerations

The County is categorized into two geographical areas to showcase variations in the future-predicted annual average maximum temperature: the West Slope, primarily below an elevation of 4,000 feet above mean sea level (msl), encompassing the community of Camino, the City of Placerville, and all land west of the crest of the Sierra Nevada; and the Tahoe Basin, generally above 4,000 feet above msl, receiving snowfall, including South Lake Tahoe, and the County east of Echo Summit and south of the community of Tahoma and north of Hope Valley.

As observed in Figure 4-25, which shows the 30-year average annual maximum temperature at the mid-century, and Figure 4-26, which shows the 30-year average annual maximum temperature at the end-of-century, both the western and eastern County are anticipated to experience increases in maximum temperatures. Table 4-46 provides detailed information on temperature increases based on these figures.

Figure 4-25 30-Year Average Annual Maximum Temperature, Mid-Century (2035-2064)

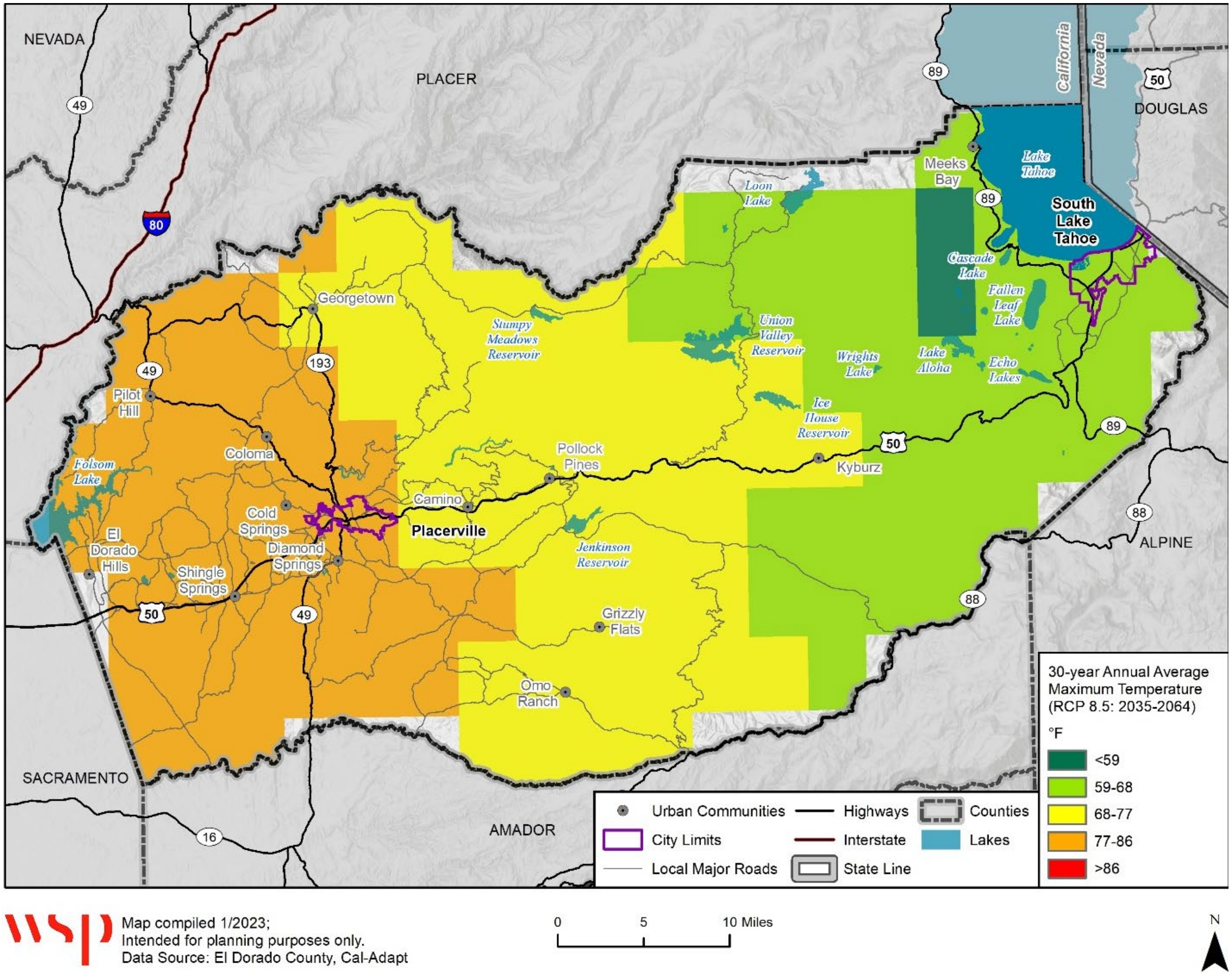


Figure 4-26 30-Year Average Annual Maximum Temperature, End-of-Century (2070-2099)

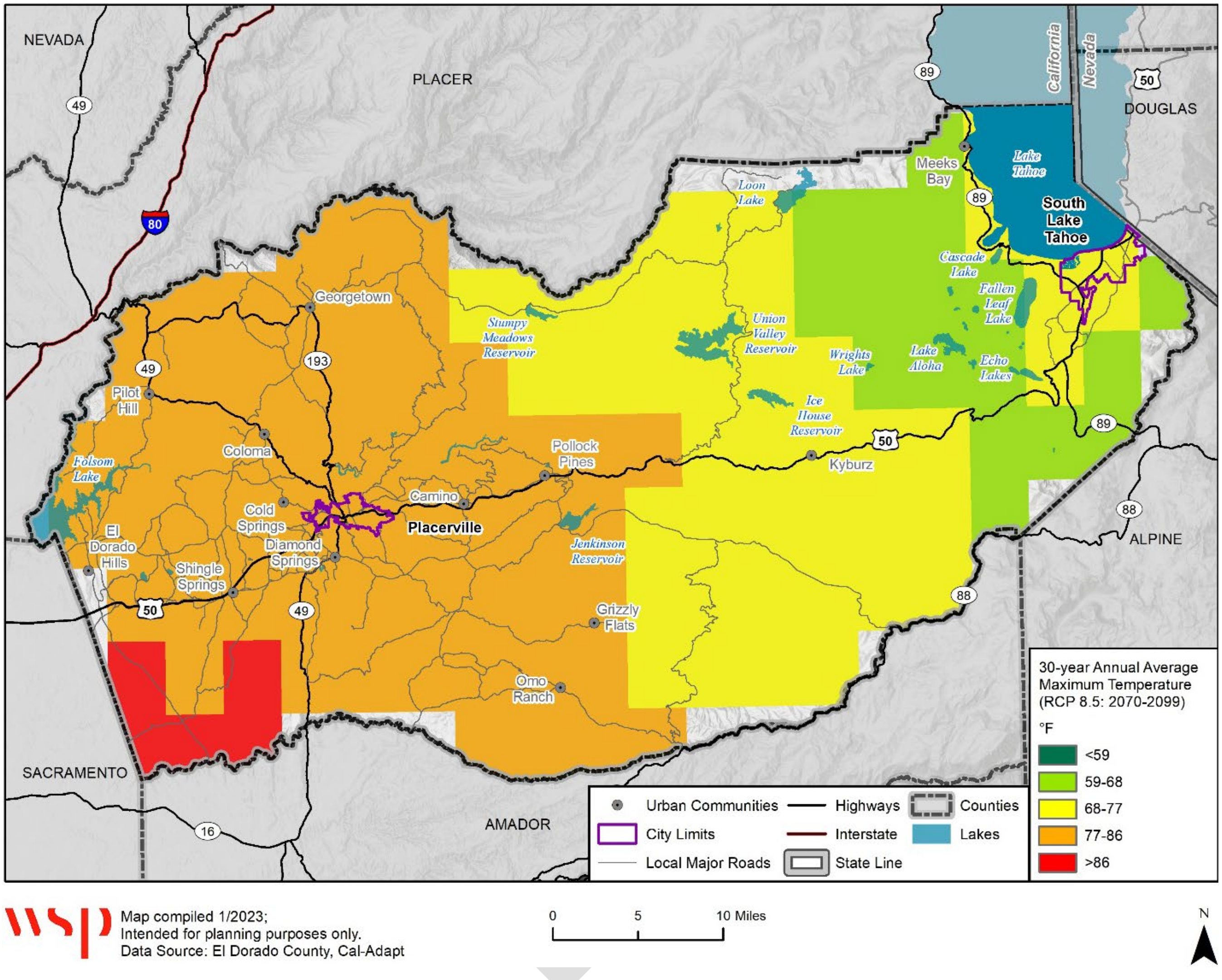


Table 4-46 Historical and Projected 30-year Annual Average Maximum Temperatures (˚F) under RCP 8.5 Scenario

GEOGRAPHY	HISTORICAL	MID-CENTURY	END-OF-CENTURY
West Slope	59-68˚F	68-86˚F	77-88˚F
Tahoe Basin	51-68˚F	51-77˚F	59-86˚F
Countywide	64˚F	69.7˚F	73.5˚F

Source: Cal-Adapt 2022

4.3.6.5 Magnitude and Severity

Moderate–Extreme heat is predicted to occur with increasing frequency in the County and has a moderate severity (see Table 4-46). While there were no recorded property or crop losses, the NCEI Storm Events Database recorded 13 injuries and 21 deaths associated with heat events that affected the County between 1996 and 2023, although not all of these mortalities necessarily took place within County boundaries. Figure 4-22 illustrated the severity of extreme heat using the heat index, which shows the relationship of temperature and humidity to heat disorders. The heat index describes how hot the heat-humidity combination makes the air feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the heat index rises, so do health risks.

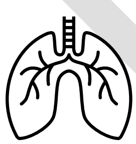
There are also significant secondary impacts associated with extreme heat (see Table 4-47). Potential economic impacts can occur due to lost time, maintenance costs, and damaged building contents. Even a minor event of extreme temperatures can have a significant impact on city resources, necessitating the activation of shelters, severe weather plans, and other measures.

4.3.6.6 Vulnerability Assessment

Cascading impacts are the impacts that result when one type of hazard event triggers one or more other hazard events, which may in turn trigger still others. Examples of cascading impacts associated with extreme heat events are detailed in Table 4-47.

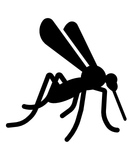
Table 4-47 Cascading Impacts of Extreme Heat

Air Quality



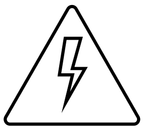
- Poor air quality, which can occur when stagnant atmospheric conditions trap humid air and pollutants near the ground. Ozone, a major component of smog, is created in the presence of sunlight via reactions between chemicals in gasoline vapors and industrial smokestacks. Hot weather can increase ozone levels. High ozone levels often cause or worsen respiratory problems (EPA 2022b).
- Ozone can impact plant health by interfering with plants' ability to produce and store food. This can lead to reduction in agricultural yields of many crops, from wheat and cotton to soybeans (Avnery, et al. 2011, Ainsworth 2017).

Disease



- Climate change-influenced heat events may also create a conducive environment for vector-borne diseases. Extended heat events can result in the emergence of vectors that can carry infectious diseases—such as dengue, Zika, yellow fever, and chikungunya—in areas of California that have not historically experienced their occurrence. Recent surges in Zika and dengue fever infections present an example. For these two pathogens, an increase in temperature allows mosquitoes to feed more frequently, breed more prolifically, and live longer, which ultimately results in their ability to travel farther to spread carried viruses (CDPH 2022b).

Power



- Air conditioning used during extreme heat events increases energy demand and could increase the risk of energy shortages. In the summer of 2020, the demand for electricity during heat waves in California contributed to the State's first rolling blackout in nearly 20 years (Kim, et al. 2021). The three largest utilities—Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric—turned off power to more than 410,000 homes and businesses for about an hour at a time until the Emergency Declaration ended after several hours (Har and Beam 2020).
- PSPSs are cascading hazards associated with extreme heat events. Under certain severe weather conditions, including extreme heat, utility service providers shut off power to help prevent wildfire and keep communities safe. A PSPS may be called in response to a combination of dry vegetation and high winds that can uproot trees, blow branches onto power lines or create sparks if power lines contact one another.

Wildfire

- Extreme heat contributes to more severe wildfires in a longer wildfire season and increases the health and safety risk experienced by wildland firefighters and populations near wildfires due to additional reductions in air quality. Wildfire can also further exacerbate worsening air quality caused by extreme heat, placing all vulnerable populations at risk of new or worsened respiratory conditions.

Water

- Heat evaporation can lead to loss of stored water in reservoirs and aqueducts. The amount of water lost depends largely on local climate conditions. High air temperatures, low humidity, strong winds and sunshine will increase evaporation.

Modified from 2023 State Hazard Mitigation Plan, https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf

People

Extreme heat is one of the leading causes of weather-related deaths in the United States, killing an average of more than 702 people per year from 2004–2018, more than all other weather hazards (except hurricanes) combined. The Billion Dollar Weather Disasters database compiled by NOAA lists heat waves as six of the top 10 deadliest U.S. disasters since 1980 (NOAA 2023b).

Heat-related illness includes a spectrum of illnesses ranging from heat cramps to severe heat exhaustion and life-threatening heat stroke. Table 4-48 describes common heat-related illnesses.

Table 4-48 Typical Heat-Related Illnesses

ILLNESS	DEFINITION	SYMPTOMS	FIRST AID
Heat Rash	Heat rash is a skin irritation caused by excessive sweating during hot, humid weather.	Red clusters of pimples or small blisters, usually on the neck, upper chest, groin, under the breasts, and in elbow creases	▪ Work in a cooler, less humid environment if possible ▪ Keep rash area dry ▪ Apply powder to increase comfort ▪ Do not use ointments or creams
Heat Cramps	Heat cramps usually affect workers who sweat a lot during strenuous activity. This sweating depletes the body's salt and moisture levels. Low salt levels in	Muscle cramps, pain, or spasms in the abdomen, arms, or legs	▪ Drink water and have a snack or drink that replaces carbohydrates or electrolytes every 15 to 20 minutes

ILLNESS	DEFINITION	SYMPTOMS	FIRST AID
	muscles cause painful cramps. Heat cramps may also be a symptom of heat exhaustion.		▪ Avoid salt tablets ▪ Get help if the sufferer has heart problems, is on a low-sodium diet, or has cramps that do not subside within 1 hour
Heat Syncope	Heat syncope is a fainting (syncope) episode or dizziness that usually occurs when standing for too long or suddenly standing up after sitting or lying. Factors that may contribute to heat syncope include dehydration and lack of acclimatization.	Fainting (short duration); dizziness; light-headedness from standing too long or suddenly rising from a sitting or lying position	▪ Sit or lie down in a cool place ▪ Slowly drink water, clear juice, or a sports drink
Rhabdomyolysis	Rhabdomyolysis is a medical condition associated with heat stress and prolonged physical exertion. It causes the rapid breakdown, rupture, and death of muscle. When muscle tissue dies, electrolytes and large proteins are released into the bloodstream. This can cause irregular heart rhythms, seizures, and damage to the kidneys.	Muscle cramps/pain; abnormally dark urine; weakness; exercise intolerance	▪ Stop activity ▪ Drink more liquids (water preferred) ▪ Seek immediate care at the nearest medical facility ▪ Ask to be checked for rhabdomyolysis
Heat Exhaustion	Heat exhaustion is the body's response to an excessive loss of water and salt, usually through excessive sweating. Heat exhaustion is most likely to affect older adults, infants and children, people with chronic medical conditions, athletes, pregnant women, and those working outdoors or in a hot environment.	Headache; nausea; dizziness; weakness; irritability; thirst; heavy sweating; elevated body temperature; decreased urine output	▪ Take sufferer to a clinic or emergency room for medical evaluation and treatment ▪ Call 911 if medical care is unavailable ▪ Stay with sufferer until help arrives ▪ Remove sufferer from hot area and give liquids to drink ▪ Remove unnecessary clothing ▪ Cool the sufferer with cold compresses or cold water ▪ Encourage frequent sips of cool water
Heat Stroke	Heat stroke occurs when the body can no longer control its temperature: the body's temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106 °F or higher within 10 to 15 minutes.	Confusion, altered mental status, slurred speech; loss of consciousness (coma); hot, dry skin or profuse sweating; seizures; very high body temperature; fatal if treatment delayed	▪ Call 911 ▪ Stay with sufferer until help arrives ▪ Move sufferer to a shaded, cool area and remove outer clothing ▪ Circulate air to speed cooling ▪ Place cold wet cloths or ice on head, neck, armpits, and groin

Source: 2023 State Hazard Mitigation Plan, https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf

Traditionally, the very young and very old are considered at higher risk of the effects of extreme temperatures, as are people in poor physical health; but any populations outdoors in the weather are exposed, including otherwise healthy adults and persons experiencing homelessness. Arguably, the young-and-otherwise-healthy demographic may be more exposed and experience a higher vulnerability because of the increased likelihood that they will be out in the extreme temperatures, whether due to commuting for work or school, working outdoors such as construction, utilities, snow removal, or for recreational reasons.

While everyone is vulnerable to extreme temperature incidents, some at-risk populations are more vulnerable than others. For example, extreme heat poses the greatest danger for the County's outdoor laborers mostly concentrated on the County's West Slope, who support the County's agriculture economy and are exposed to extreme temperatures and are at higher risk of heat-related illnesses than other populations of the County. At-risk populations that rely on electricity-dependent medical equipment and devices are also greater risk during prolonged power outages associated with heat waves. Generally, those living on the West Slope without air conditioning are also more vulnerable than that live at higher elevations and at cooler temperatures. In short, climate-vulnerable communities will experience the worst of these effects.

Property

Cascading impacts on urban systems can result from extreme heat stress applied on water, power, and transportation systems (UCLA Luskin Center for Innovation 2021). Heat can compromise infrastructure safety and reliability; it can cause issues such as train track buckling and road material softening. Extreme heat can also prevent aircraft from taking off as it reduces the density of air mass, making it more difficult for aircraft to lift, in addition to possibly softening tarmac materials (UCLA Luskin Center for Innovation 2021).

Critical Facilities and Lifelines

Extreme heat has direct impacts on critical infrastructure, including road surfaces, power lines, and water pumping stations. During extreme heat events, road infrastructure may become damaged and buckle, while power lines may sag and experience power surges. Water pumping stations that rely on public utility systems may also be affected, leading to impacts on critical infrastructure. In addition, extreme heat can accelerate wear and tear on natural gas and electrical infrastructure (CNRA 2018a). As temperatures continue to rise, projected increases in summer demand may exceed the capacity of existing energy infrastructure, including substations and distribution line infrastructure and systems. This may result in peak demand exceeding the local utility's capacity for supply, which can lead to blackout conditions or public safety power shutoffs (PSPSs).

Economy

The County has a large agricultural economy. As noted previously, outdoor laborers who are exposed to extreme heat are at a high risk of heat-related illnesses, and a long-term heat event could cause work interruptions. Crops are also impacted by heat events and could have an impact on the overall economy in the County.

Between the years of 2017 and 2021, 497.9 acres of USDA-insured crops were lost in the County due to extreme heat and fire events, resulting in over $1.2 million in indemnity payments. Table 4-49 summarizes these agricultural losses.

Table 4-49 Crop Loss Due to Extreme Heat and Fire, 2017 – 2021

CAUSE	DETERMINED ACRED	INDEMNITY PAYMENTS
Fire Total	**218.19**	**$1,056,936**
2020	105.5	$623,664
2021	112.69	$433,272

CAUSE	DETERMINED ACRED	INDEMNITY PAYMENTS
Heat Total	**203.77**	**$118,566**
2010	8.7	$8,295
2012	8.24	$10,427
2013	5.2	$500
2014	33.2	$45,423
2015	13.38	$20,103
2016	7.24	$2,921
2017	15.76	$2,360
2020	27.8	$25,320
2021	160.21	$90,887
Grand Total	**497.92**	**$1,263,172**

Source: USDA RMA Crop Indemnity Reports, 2017-2021

Cultural, Historic, and Natural Resources

Extreme heat can cause an increase in water temperatures in streams, rivers, and lakes. During storm events, increased and warmer runoff from impervious surfaces into streams can lead to a degradation of habitat. This impairs water quality and compromises aquatic species' metabolism and reproduction. Elevated water temperatures can inhibit aquatic life, especially if a species can only survive in a small range of water temperatures. The effects of thermal pollution are highly dependent upon air temperature conditions before the storm, suggesting that as temperatures rise, the impacts from heat pollution will also rise (Herb et al, 2008). Increasing temperatures may also cause species to shift habitats in elevation and latitude, and extended periods of extreme heat can stress both flora and fauna species. Extreme heat may cause temporary drought-like conditions. Several weeks of extreme heat will increase evapotranspiration and reduce moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist.

Development Trends

Since structures are not usually directly impacted by extreme temperature fluctuations, continued development is less impacted by this hazard than others in the plan. However, all structures in the planning area will be exposed to extreme weather events. Facilities with back-up generators are better equipped to handle a severe weather situation should the power go out. Additionally, pre-emptive measures such as construction of green buildings that require less energy to heat and cool, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposure to severe temperatures may help increase the overall durability of the buildings and the community to temperature variations.

Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations in temperature. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme temperature events.

4.3.6.7 Risk Summary

- Extreme heat is a **medium** significance hazard.
- Extreme heat poses serious risks to human health and safety.
- Critical facilities and infrastructure will be vulnerable to increasing temperatures, particularly the energy grid during heat waves when there is an increased demand associated with cooling loads.

- A significant extreme heat wave combined with wildfires in 2022 resulted in both a State and federal declaration for the County.
- Between 1996 and 2023, 13 injuries and 21 deaths related to extreme heat events which affected the County were recorded by the NCEI Storm Events Database.
- The number of extreme heat days is expected to steadily increase throughout the century.
- While development is not generally directly affected by extreme heat, continued development increases the number of people exposed to extreme heat events.

4.3.7 Flood

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Flood	Limited	Occasional/Highly Likely	Moderate	Medium

Hazard Description

Flooding is the rising and overflowing of a body of water onto normally dry land. Floods occur when infrastructure does not have adequate capacity to manage water levels, resulting in normally dry areas becoming inundated with water. While floods are usually caused by increased precipitation, they can also be caused by dam or levee failure. The risk of flood by infrastructure damage is increasing as current infrastructure in the United States is aging and, in many cases, has reached or exceeded its expected lifespan.

Floods are among the costliest natural disaster in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than any other hazard.

Additionally, 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 and objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines 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 is critically important to reduce life and safety impacts from any type of flooding.

As noted in the Safety Element, the County has a diverse geography with varying amounts of precipitation. Rainfall averages range from 30 inches a year at the western end of the County, to 70 inches a year at the Crystal Basin. Historical annual precipitation in the American River Basin, which is the upper watershed within the West Slope, has fluctuated between 50 to 200 percent of average (EDWA 2019). Snowfall averages span from 20 inches per year at an elevation of 3,500 feet to 250 inches in the areas immediately surrounding the Crystal Basin at the Sierra Nevada crest.

The County is prone to four types of flooding:

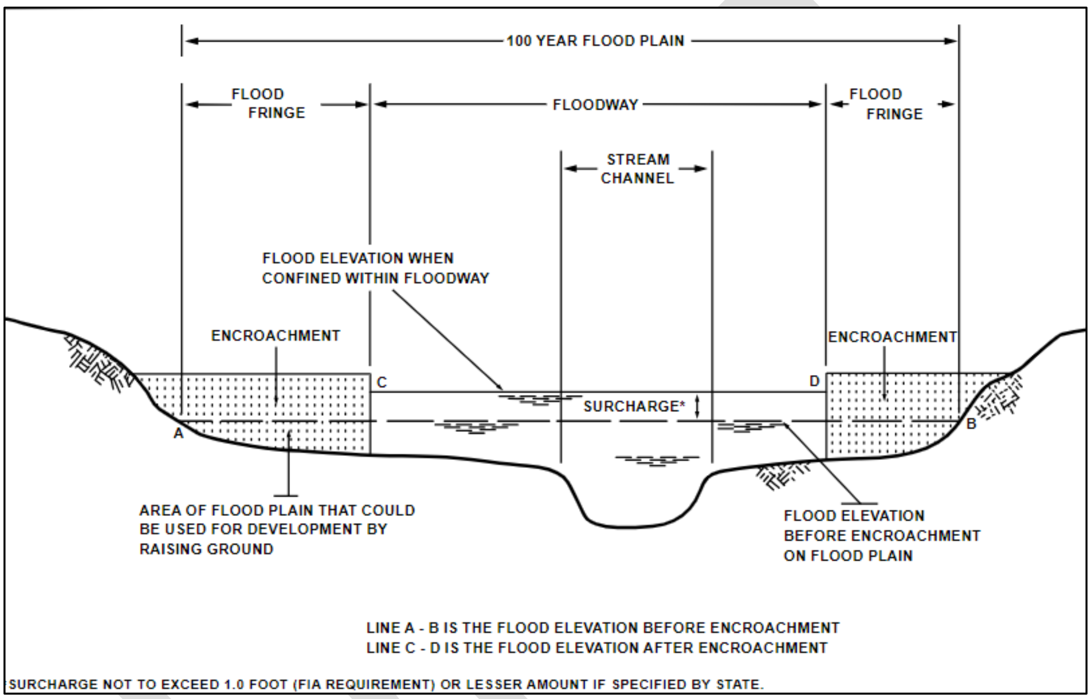
- Rain floods are likely to occur in the County from November to May. They are characterized by prolonged, heavy rainfall and a large volume of runoff with high peaks and moderate durations.
- Cloudburst storms are likely to occur from early fall to late spring. They can last up to three hours and are characterized by high peak flows, equal to or greater than the peak flow of general rainstorms, short duration of flood flow, and small volume of runoff.

- Snowmelt floods are prone to occur in the Upper Truckee River Basin between May and June. They last longer and consist of larger volumes than rain floods, although they do not have the high peak flows typically seen with those floods.
- Thunderstorm flooding may occur from late spring to early fall and usually lasts about 15 to 20 minutes. Although they may produce three inches or more of precipitation, their short duration and small extent make their runoff relatively small.

Floodplains Defined

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Figure 4-27 depicts a floodplain.

Figure 4-27 Floodplain Schematic



Source: Guidance for Flood Risk Analysis and Mapping – FEMA, 2020

Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. Based on FEMA guidelines, the floodplain refers to the area that is inundated by the 1% annual-chance flood. The 1% floodplain is also referred to as the "100-year floodplain," meaning that it is an area that has a 1% chance of experiencing a flood of a certain magnitude or greater in any given year. Similarly, the 0.2% floodplain is also known as the "500-year floodplain," meaning that it is an area that has a 0.2% chance of experiencing a flood of a certain magnitude or greater in any given year. The 1%-annual-chance flood is the national minimum standard by which communities regulate their floodplains through the FEMA NFIP. The floodway is the channel of the tributary and the land adjacent to it, whereas the flood fringe (shown above) is the remaining portion of the 100-year floodplain, excluding the floodway.

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

4.3.7.1 Geographic Area

Limited - California has ten hydrologic regions. El Dorado County mainly sits in Sacramento hydrologic region with a portion in the San Joaquin River and the North Lahontan region. The Sacramento River hydrologic region covers approximately 17.4 million acres (27,200 square miles). The region includes all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Plumas, Butte, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake, and Napa counties. Small areas of Alpine and Amador counties are also within the region. Geographically, the region extends south from the Modoc Plateau and Cascade Range at the Oregon border to the Sacramento-San Joaquin Delta. The Sacramento Valley, which forms the core of the region, is bounded to the east by the crest of the Sierra Nevada and southern Cascades and to the west by the crest of the Coast Range and Klamath Mountains. The Sacramento metropolitan area and surrounding communities form the major population center of the region. With the exception of the City of Redding, cities and towns to the north, while steadily increasing in size, are more rural than urban in nature, being based in major agricultural areas.

A map of the California's hydrological regions is provided in Figure 4-28,

Figure 4-28 California Hydrologic Regions

Source: CAL DWR

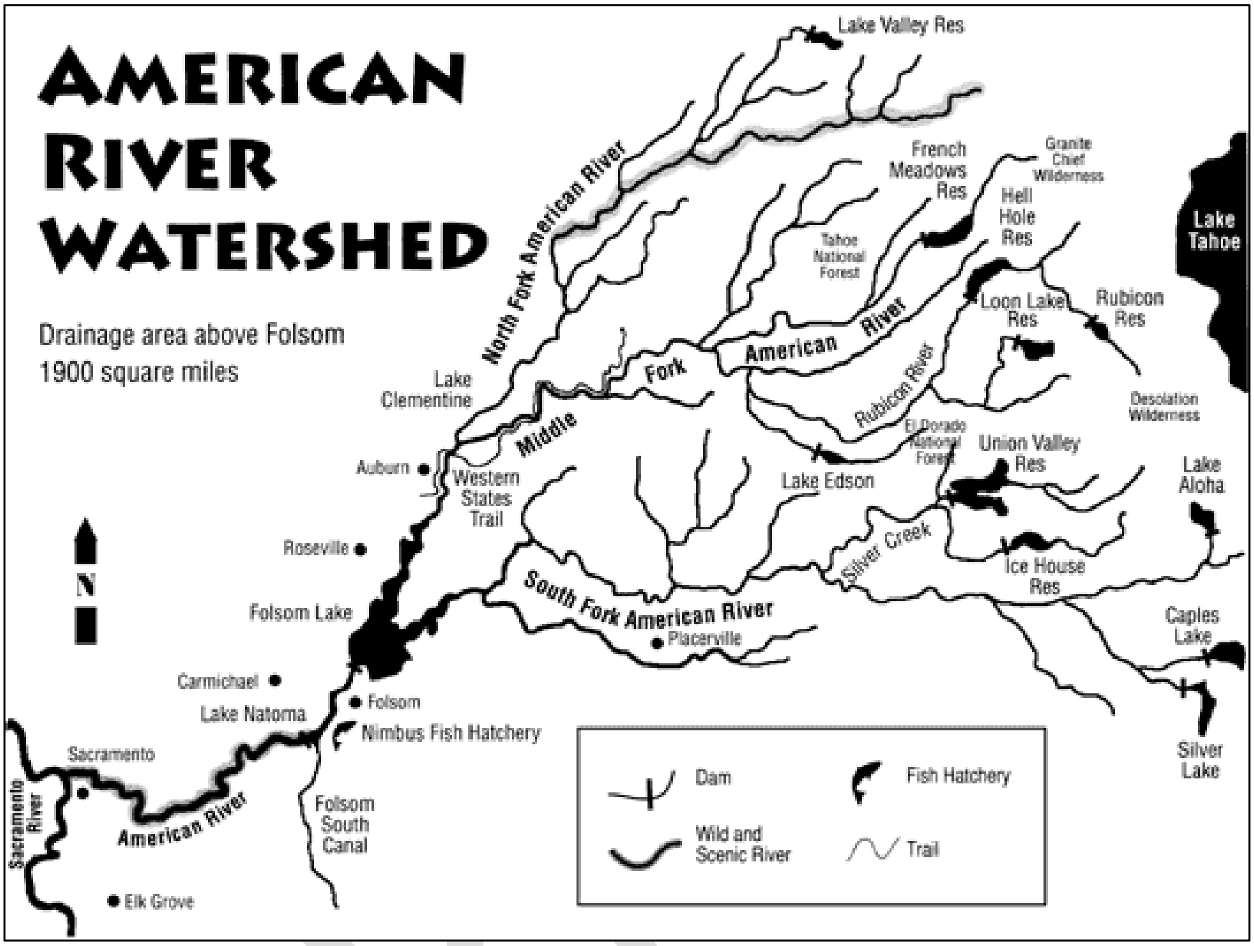
El Dorado County Waterway System

El Dorado County encompasses multiple rivers, streams, creeks, and associated watersheds. The County is situated in a region that dramatically drops in elevation from the eastern portion (Sierra Nevada) to the western portion, where excess rain on snow can contribute to downstream flooding. Damaging floods occur primarily in the developed areas of the County.

Located on the western slope of the Sierra Nevada Mountain Range and in an area of moderate seasonal rainfall, the runoff characteristics of the watersheds strongly determine the possibility of flooding. The western areas of the County are made up mostly of rolling foothills. The eastern areas of the County are at higher elevations. The City of Placerville, the County Seat, is at about 2,000 feet above sea level, while the City of South Lake Tahoe is at about 6,500 feet in elevation. Some mountain peaks in the County reach in excess of 10,000 feet. Moreover, the elevation range for the county is 200 to 10,881 feet above sea level. Due to the elevation of much of the watersheds in the County, most of the precipitation is in the form of snowfall, which melts over a long duration with snow prevailing at the higher elevations long into the summer. Additionally, reports of localized flooding in the County are localized and often related to capacity and conveyance issues on the West Slope and rain on snow flooding in the Tahoe Basin.

The overall slope of the watersheds is relatively steep, and most of the higher elevations of the County is owned or controlled by Federal agencies, and therefore not subject to private ownership or development. The seven watersheds that form El Dorado County are Lake Tahoe, the upper Carson River, lower American River, and North & South Forks of the American River, the upper Mokelumne River and the upper Cosumnes River (see Figure 4-29). Most are dammed in the lower elevations along much of the stream courses and are mostly contained within government or special district ownership. Therefore, except for a few tributaries, the larger rivers are not in areas where much private development can occur. In addition, due to the overall gradient of the streams and rivers, they reside within relatively steep canyons or valleys, where very little floodplain has been formed.

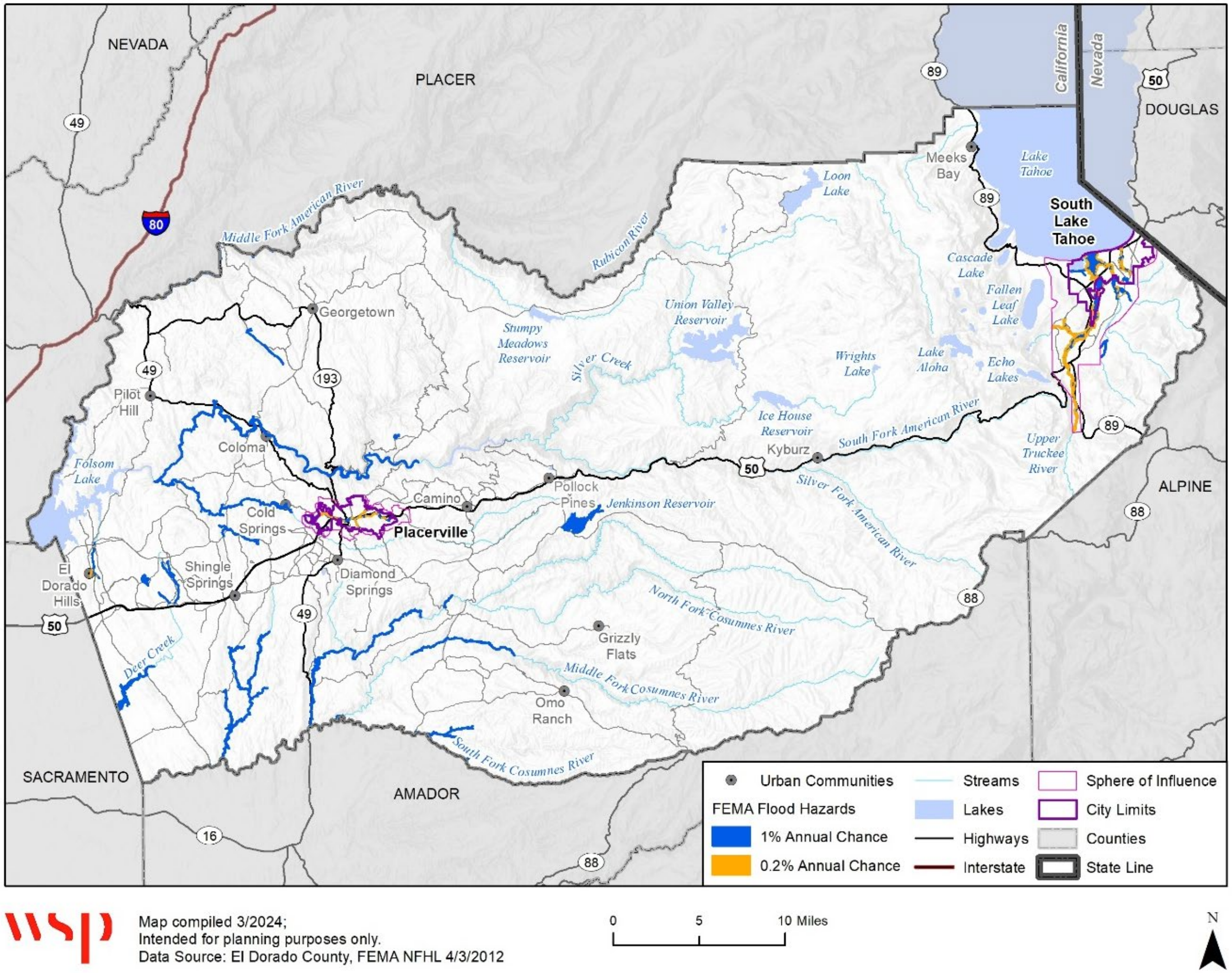
Figure 4-29 American River Watershed



Source: https://www.theamericanriver.com/rivers/american-river-watershed/

Figure 4-30 summarizes the flood zones in the County. As shown, the floodplains closely follow the major rivers and tributaries on the West Slope; Truckee River, Cold Creek, and Trout Creek in the Tahoe Basin; and the area around Lake Tahoe. The 0.2% annual chance floodplain is also shown; however, it is not easily visible at the current map scale.

Figure 4-30 El Dorado County FEMA 1% and 0.2% Annual Chance Floodplains



4.3.7.2 Past Occurrences

Historically, the County has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall, snowmelt runoff, and sometimes rain-on-snow events. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 100- and 500-year floodplains and in other localized areas.

Historically, much of the growth in the County has occurred adjacent to streams, resulting in significant flood damages to property, and losses from disruption of community activities when streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in storm water runoff. Other problems connected with flooding and storm water runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Disaster Declaration History

Recent State disaster declarations occurred in 1995, 1997, 2006, 2008, and 2017. Recent Federal disaster declarations occurred in 1955, 1962, 1963, 1997, 2005, 2006, 2017, and 2023. Many disasters in the Severe Weather: Heavy Rains, Thunderstorms, Hail and Lightning, profile in Section 4.3.11 also resulted in flood declarations.

NCEI Events

The NCEI tracks flooding events for the County. Table 4-50 shows flood events in El Dorado County since 1996. The total property damage and crop damage includes all areas impacted. There has been over $25 million in property damages and nearly $8 million in crop damages from flooding.

Table 4-50 NCEI Flood Events in El Dorado County 1993 to 12/31/2014

DATE	EVENT	DEATHS (DIRECT)	INJURIES (DIRECT)	PROPERTY DAMAGE	CROP DAMAGE	INJURIES (INDIRECT)	DEATHS (INDIRECT)
1/01/1997	Flash Flood	0	0	$10,000,000	$0	0	0
1/24/1997	Flash Flood	0	0	$5,000,000	$0	0	0
2/02/1998	Flood	0	0	$4,300,000	$7,800,000	0	0
7/18/2002	Flash Flood	0	0	$0	$0	0	0
12/31/2005	Flood	0	0	$1,000,000	$0	0	0
1/01/2006	Flood	0	0	$3,200,000	$0	0	0
12/3/2014	Flood	0	0	$0	$0	0	0
6/05/2015	Flood	0	0	$0	$0	0	0
6/05/2015	Flood	0	0	$0	$0	0	0
1/03/2017	Flood	0	0	$0	$0	0	0
2/08/2017	Flood	0	0	$1,000,000	$0	0	0
2/08/2017	Flood	0	0	$250,000	$0	0	0
2/17/2017	Flood	0	0	$500,000	$0	0	0

DATE	EVENT	DEATHS (DIRECT)	INJURIES (DIRECT)	PROPERTY DAMAGE	CROP DAMAGE	INJURIES (INDIRECT)	DEATHS (INDIRECT)
3/21/2018	Flood	0	0	$100,000	$0	0	0
3/21/2018	Flood	0	0	$100,000	$0	0	0
3/22/2018	Flood	0	0	$0	$0	0	0
4/06/2018	Flood	0	0	$20,000	$0	0	0
4/06/2018	Flood	0	0	$0	$0	0	0
4/6/2018	Flood	0	0	$0	$0	0	0
12/31/2022	Flood	0	0	$100,000	$0	0	0
1/03/2023	Flood	0	0	$0	$0	0	0
1/05/2023	Flood	0	0	$0	$0	0	0
1/14/2023	Flood	0	0	$0	$0	0	0
3/09/2023	Flood	0	0	$0	$0	0	0
10/22/2023	Flood	0	0	$0	$0	0	0
TOTAL	**25 Events**	**0**	**0**	**$25,570,000**	**$7,800,000**	**0**	**0**

Source: NOAA's National Centers for Environmental Information https://www.ncdc.noaa.gov/stormevents/

HMPC Events

Historically, portions of El Dorado County 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 County. Flooding events have caused severe damage in all portions of the County. Existing watershed reports confirm that under existing conditions, flooding will continue to occur. Localized stormwater flooding also continues to be a problem throughout El Dorado County.

The HMPC provided additional information on the following historical flood events in the County.

- February 1986 – This flood was classified as an approximate 70-year event. Flooding was significant in in several areas of the county. Nearly all bridges and culverts were overtopped, with 30 sustaining embankment damage.
- January 1997 – A significant amount of rainfall and snowmelt runoff poured out of the Sierra Nevada from December 30, 1996 to January 1997. This was a very warm system and rain was falling at the 9,000 foot elevation.
- December 31, 2005 to January 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.
- January and February, 2017– After several years of drought, record rainfall led to localized flooding and infrastructure damage throughout El Dorado County. Several culverts, roads and Highway 50 at Bridal Veil Falls eroded and washed out. States of emergencies were declared for 2017 storms.
- 2021-2022 Winter Storms - Heavy rainfall, snowfall, and freezing temperatures that led to downed trees and powerlines. These issues caused power outages lasting 15 days in El Dorado County and contributed to several roads

- 2022 – 2023 Winter Storms There were three communities that received mandatory evacuation orders due to flooding or risk of flooding.
- Over 100,000 sandbags deployed.
- 2022 flooding (noted by Cameron Park CSD) 10" rain in 24-hour period.

4.3.7.3 Likelihood of Future Occurrence

Likely - Over the past 30 years, El Dorado County has experienced a flood event roughly every year. Over the same period, the county experiences a flood worthy of State and Federal disaster declarations. This frequency would earn the likelihood of future flood occurrence a Likely rating.

However, climate change appears to be increasing the probability of future occurrence. This issue is discussed further in the following section. Considering the recent history of flood in El Dorado County and recent research, the likelihood of future flood occurrence is *Likely* (at least 1 occurrence in 10 years). However, it seems reasonable to anticipate this rating may increase in future HMP updates due to climate change.

4.3.7.4 Climate Change Considerations

As discussed in the Dam Failure section above, the Oroville Dam incident in 2017 triggered the State of California to pursue considerable academic research into extreme weather and runoff events. Specifically, the ARkStorm 2.0 study of severe storm and flood scenario was released in 2022 (Huang and Swain, 2022) and documented that climate change has already doubled the probability of an event sufficient to cause catastrophic flooding. In addition, the dynamics of a changing snow/rain regime could increase sudden runoff by another 200-400% in the future.

The underlying causes of these extreme events are complex. While climate change is not expected to drastically alter the overall amount of precipitation received by the County, warming temperatures are expected to shift precipitation patterns, resulting in both more droughts and flooding events. Precipitation that had previously fallen as snow is expected to increasingly fall as rain, triggering increased runoff during winter months and decreased snowmelt and corresponding water supply during warmer months. Secondary effects of this cycle are likely to result in increased flooding. Soil that has been dried out and hardened by drought is less adept at absorbing water, resulting in a greater volume of runoff. Vegetation, which may have slowed water flow, will likely be weakened, or killed by drought. Damaged vegetation also becomes fuel for wildland fire, which in turn dries out soil, hardening it, and in some severe fires the combustion of vegetation creates a gas that penetrates the soil profiles and as it cools condenses and forms a waxy coating that causes the soil to repel water (hydrophobic soil), which increases the rate of water runoff and makes the area more prone to flooding. The combination of West Slope hydrology, soils and topography may cause areas to experience frequent and localized flooding. Drainage problems and flooding have occurred in low-lying areas around Cameron Park, and areas where culverts are undersized or blocked with debris can intensify flooding (EDWA 2019). The Tahoe Basin experiences also flooding because of rain-on-snow events, particularly when severe storms start warm with rain and later, snow.

Further, *California's Fourth Climate Assessment* indicated shifts in California's precipitation regime to more dry days, more dry years, and a longer dry season, with increases in sporadic, heavy precipitation events and floods that are expected to exceed the State's flood control system capacity (CNRA 2018). With wildfires already being a problem in California, an increase in dry periods is expected to prime conditions for fires to occur, which will worsen the potential for runoff and flooding associated with burned areas. Greater storm intensity is also projected with climate change, resulting in more direct runoff and flooding (CNRA 2018). The Sierra Nevada Regional Summary Report from *the Fourth Climate Assessment* indicates that the frequency of catastrophic floods will increase in the coming years. This in turn will lead to increased stress on agriculture, natural ecosystems, water resources, land use and community development, transportation, energy, public health, and climate justice.

4.3.7.5 Magnitude and Severity

Moderate – Magnitude and severity can be described or evaluated in terms of a combination of the different levels of impact that a community sustains from a hazard event. Several factors contribute to the relative vulnerabilities of certain areas in the floodplain. Development, or the presence of people and property in the hazardous areas, is a critical factor in determining vulnerability to flooding. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. The following is a brief discussion of some of these flood factors which pose risk.

- **Elevation:** The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage, due to the higher likelihood that it will come into contact with water for a prolonged amount of time.
- **Flood depth:** The greater the depth of flooding, the higher the potential for significant damages due to larger availability of flooding waters.
- **Flood duration:** The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage.
- **Velocity**: Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage (such as scouring).
- **Construction type:** Certain types of construction and materials are more resistant to the effects of floodwaters than others. Typically, masonry buildings, constructed of brick or concrete blocks, are the most resistant to damages simply because masonry materials can be in contact with limited depths of flooding without sustaining significant damage. Wood frame structures are more susceptible to damage because the construction materials used are easily damaged when inundated with water.

Because of a lack of extensive low-lying areas and a larger amount of upland areas, the majority of the County is not subject to flooding. The primary flood-prone areas on the West Slope of the County consist of the following waterways: South Fork, American River from Kyburz to Riverton and below Chili Bar Dam; Coloma Canyon Creek between Greenwood and Garden Valley; Weber Creek from Placerville to the American River, including Cold Springs, Dry; Creek, and Spring Creek tributaries; Shingle Creek from Shingle Springs to the Amador County line; Deer Creek from Cameron Park to Sacramento County line; Big Canyon Creek from El Dorado to the Cosumnes River, including the Slate, Little; Indian, and French Creek tributaries; New York Creek; Middle Fork of the Cosumnes River within the Somerset - Fair Play vicinity, and its confluence with the North Fork of the Cosumnes River; Cedar Creek from Omo Ranch to the Cosumnes River (FEMA 1996; Maurer, pers. comm., 2003).

Additionally, it is important to consider the potential extent of inundation within the County due to flooding and various flooding-related hazards, including dam failures and extreme precipitation events. For instance, our parcel analysis indicates that approximately 8,334 acres of land in the County are susceptible to inundation within the 1% floodplain boundary (note: this excludes Lake Tahoe as it is not part of this update). Furthermore, a smaller but still significant area of approximately 81 acres falls within the 0.2%.

4.3.7.6 Vulnerability Assessment

Floods and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the County during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;

- Commercial and residential structural and property damage;
- Disruption of and damage to public infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.
- Impact on the overall mental/behavioral health of the community.

People

Floods can have significant impacts on people, affecting them physically, emotionally, and economically. Physically, floods can result in injuries or fatalities as individuals may become trapped or swept away by fast-moving water. They can also lead to waterborne diseases due to contaminated water sources, posing health risks to affected populations. Emotionally, floods can cause immense stress, anxiety, and trauma as people face the loss of homes, possessions, and even loved ones. The disruption of daily life and the uncertainty of recovery can exacerbate mental health challenges.

The total people at risk to flooding in the County was estimated by multiplying the average number of persons per household for the City of Placerville and unincorporated County times the number of residential parcels in each floodplain to estimate the population residing in flood hazard areas, South Lake Tahoe was omitted from this analysis. Based on this analysis, there are 982 residents living in the 1% annual chance flood zone throughout the County. The unincorporated County has the most residents living in the 1% annual chance flood area (902). There is also a portion of those living in the flood-prone areas of the County that consist of at-risk socially vulnerable populations. These particular at-risk communities are at even greater risk to flooding based on direct impacts flooding poses to their properties but also the indirect impacts flooding affects their livelihood and local economy.

Drainage problems and flooding have occurred in low-lying areas around Cameron Park, and areas where culverts are undersized or blocked with debris can intensify flooding (EDWA 2019). The Tahoe Basin experiences flooding because of rain-on-snow events, particularly when severe storms start warm with rain and later, snow. For example, residential neighborhoods and roads that are routinely plowed for snow removal still experience flooding during rain events when runoff pools because it cannot infiltrate through the snow or the densely packed surfaces. Much of this flooding has also occurred in neighborhoods near the floodplain in the incorporated areas of South Lake Tahoe and the City of Placerville and the unincorporated areas near the Truckee River, El Dorado Hills, Deer Creek, Cold Creek, and Shingle Springs.

The same analysis was conducted for the 0.2% annual chance floodplain, indicating that there are 137 residents living in the 0.2% annual chance flood zone throughout the County. Table 4-51, below, details population for the 1% and 0.2% annual chance floodplains.

Table 4-51 Population at Risk to Flood Hazards

JURISDICTION	1% FLOOD POPULATION	0.2 % FLOOD POPULATION
Placerville	80	51
Unincorporated	902	86
Total	**982**	**137**

Source: El Dorado County Assessor Data 2024, FEMA NFHL Effective Date 4/3/2012, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Property

Floods pose significant risks to property, causing damage that can be both extensive and costly. Homes, buildings, and infrastructure can suffer structural damage from floodwaters, leading to the destruction of walls, foundations, and utilities. Contents within properties, such as furniture, appliances, and personal belongings, are often irreparably damaged or destroyed by flooding. The infiltration of water into structures can also result in mold growth, further compromising property integrity and posing health hazards. In addition to direct damage, floods can lead to indirect costs related to cleanup, repairs, and restoration efforts. Insurance claims for flood damage can strain financial resources for property owners, particularly if they are uninsured or underinsured against flood risks. The loss of property value in flood-affected areas can also have broader economic implications, impacting real estate markets and local economies.

A flood property vulnerability assessment was performed using GIS overlay methodology. The County's parcel layer and associated 2024 assessor's building improvement valuation data were provided by the County and were used as the basis for the inventory. El Dorado County's effective FEMA Digital FIRM (DFIRM) dated April 3, 2012, was used as the hazard layer. A DFIRM is FEMA's flood risk data that depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events; this data is incorporated into the National Flood Hazard Layer (NFHL).

El Dorado County 2024 Assessor Parcel data was used to estimate flood hazard impacts to parcels with improvement values greater than zero. Parcel Centroids were used to represent structures' exposure to flood hazard. Building improvement values and counts for those parcels were then extracted from the assessor's parcel data and subsequently summed for the unincorporated County and City of Placerville. Results of the overlay analysis are shown in Table 4-52 for the 1% annual chance flood and Table 4-53 for 0.2% annual chance flood.

Table 4-52 El Dorado County Parcels at Risk to FEMA 1% Flood Hazard by Jurisdiction

JURISDICTION	PARCEL COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE
City of Placerville	112	$39,125,932	$39,737,576	$78,863,508
Unincorporated	368	$103,270,348	$52,819,760	$156,090,108
Total	**480**	**$142,396,280**	**$92,557,335**	**$234,953,615**

Source: El Dorado County Assessor Data 2024, FEMA NFHL Effective Date 4/3/2012, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Table 4-53 El Dorado County Parcels at Risk to FEMA 0.2% Flood Hazard by Jurisdiction

JURISDICTION	PARCEL COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE
City of Placerville	55	$14,321,808	$15,871,048	$30,192,856
Unincorporated	34	$10,204,235	$5,102,118	$15,306,353
Total	**89**	**$24,526,043**	**$20,973,166**	**$45,499,209**

Source: El Dorado County Assessor Data 2024, FEMA NFHL Effective Date 4/3/2012, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Based on this analysis, the County Planning Area has 480 parcels valued at over $234 million in the 1% annual chance floodplain. An additional 89 parcels valued at more than $45 million are within the 0.2% annual chance floodplain. When factoring in FEMA's estimated loss ratio, the estimated total losses from both 1% and 0.2% annual chance flood events is over $270 million. However, development in the 500-year floodplain is typically not regulated, thus a large flood event could be extremely damaging in the County.

Moreover, Table 4-54 and Table 4-55 show the parcels at risk to both the FEMA 1% and 0.2% and organized by the jurisdiction they are located in and the FEMA Lifeline category into which they are classified.

Additionally, a loss estimate analysis was also performed based on depth damage functions developed by the US Army Corps of Engineer (USACE) and FEMA. The result is an inventory of the number and types of improved parcels and structures subject to flooding. There is an estimated flooding loss of 25% of the total replacement value of properties in the County. Moreover, for the 1% annual chance flood zone, within the City of Placerville Commercial properties are at the highest risk with 63 parcels and an estimated loss of $12,750,425 and within the unincorporated areas Residential properties are at the highest risk with an estimated loss of $35,463,886. The same is true for the 0.2% annual chance flood zone with 22 commercial properties and an estimated loss of $3,991,518 for the City of Placerville and 34 residential properties with an estimated loss of $3,826,588 for the unincorporated areas.

Table 4-54 El Dorado County Parcels at Risk to FEMA 1% Flood Hazard by Jurisdiction

FLOOD HAZARD ZONE	JURISDICTION	PROPERTY TYPE	PARCEL COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE	ESTIMATED LOSS	POPULATION
1% Annual Chance	Placerville	Commercial	63	$25,500,849	$25,500,849	$51,001,698	$12,750,425	-
		Industrial	13	$7,424,185	$11,136,278	$18,560,463	$4,640,116	-
		Multi-Family Residential	7	$1,792,655	$896,328	$2,688,983	$672,246	16
		Residential	29	$4,408,243	$2,204,122	$6,612,365	$1,653,091	65
		Total	**112**	**$39,125,932**	**$39,737,576**	**$78,863,508**	**$19,715,877**	**80**
	Unincorporated	Commercial	3	$1,074,650	$1,074,650	$2,149,300	$537,325	-
		Miscellaneous	7	$1,294,521	$1,294,521	$2,589,042	$647,261	-
		Multi-Family Residential	7	$6,330,814	$3,165,407	$9,496,221	$2,374,055	18
		Residential	351	$94,570,363	$47,285,182	$141,855,545	$35,463,886	885
		Total	**368**	**$103,270,348**	**$52,819,760**	**$156,090,108**	**$39,022,527**	**902**

Source: El Dorado County Assessor Data 2024, FEMA NFHL Effective Date 4/3/2012, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Table 4-55 El Dorado County Parcels at Risk to FEMA 0.2% Flood Hazard by Jurisdiction

FLOOD HAZARD ZONE	JURISDICTION	PROPERTY TYPE	PARCEL COUNT	IMPROVED VALUE	CONTENT VALUE	TOTAL VALUE	ESTIMATED LOSS	POPULATION
0.2% Annual Chance	Placerville	Commercial	22	$7,983,036	$7,983,036	$15,966,072	$3,991,518	-
		Industrial	9	$4,718,626	$7,077,939	$11,796,565	$2,949,141	-
		Multi-Family Residential	1	$96,449	$48,225	$144,674	$36,168	2
		Residential	22	$1,523,697	$761,849	$2,285,546	$571,386	49
		Unassessed	1	$0	$0	$0	$0	-
		Total	**55**	**$14,321,808**	**$15,871,048**	**$30,192,856**	**$7,548,214**	**51**
	Unincorporated	Residential	34	$10,204,235	$5,102,118	$15,306,353	$3,826,588	86
		Total	**34**	**$10,204,235**	**$5,102,118**	**$15,306,353**	**$3,826,588**	**86**

Source: El Dorado County Assessor Data 2024, FEMA NFHL Effective Date 4/3/2012, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Insurance Coverage and NFIP Claims

The County joined the NFIP (regular entry) on October 18, 1983. The current effective map date is from April 4, 2012. NFIP Community Information System (CIS) insurance data indicates that as of March 11, 2024, there were 167 policies in place in the City (not including South Lake Tahoe), resulting in $50,531,000 of insurance in effect. Since the County began participating in the NFIP there have been 133 total claims, amounting to $2,848,334 in payments. Table 4-56 summaries NFIP policies and claims in the County.

Table 4-56 El Dorado County NFIP Polices and Claims Paid 1983 – March 11, 2024

COMMUNITY NAME	TOTAL PREMIUM	A ZONE	NO. POLICIES	TOTAL COVERAGE	TOTAL CLAIMS SINCE 1983	TOTAL PAID SINCE 1983
City of Placerville	$24,288	16	18	$5,213,000	14	$169,648
Unincorporated	$175,190	47	149	$45,318,000	119	$2,678,686
Total	**$199,478**	**63**	**167**	**$50,531,000**	**133**	**$2,848,334**

Source: FEMA CIS, 2024

The NFIP defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period since 1978. At least two of the claims must be more than 10 days apart but within 10 years of each other. A repetitive loss property may or may not be currently insured by the NFIP. The County's latest CIS data, shows 14 repetitive loss buildings (2 of which are insured) as defined by FEMA.

Repetitive loss properties have incurred 21 total losses, four of which were insured cases, and these accrued to $604,825.20 in payments from both building-and contents-related losses. 14 of these repetitive loss properties fell within B, C, and X flood hazard areas while six of these repetitive loss properties fell within AE, A, A1-A30, AO, AH flood hazard areas, and 1 fell into the other category (FEMA 2019c). Table 4-57 below summarizes the repetitive loss information detailed in the County's latest CIS report.

Table 4-57 El Dorado County Repetitive Loss Payments

REPETITIVE LOSS COMPONENT	ZONES AE, A, A1-30, AO, AH	ZONE B, C, X	OTHER	TOTAL
Total Buildings	3	10	1	14
Insured Buildings	0	2	-	2
Total Loses	6	14	1	21
Insured Losses	0	4	-	4
Total Payments	**$10,938.61**	**$583,386.59**	**$10,500**	**$604,825.20**
Building-Related Losses	$10,938.61	$437,849.97	-	$448,788.58
Contents-Related Losses	$.00	$.145,536.62	-	$156,036.62
Insured Payments	$.00	$224,268.02	-	$224,268.02

FEMA CIS, 2024

Critical Facilities and Lifelines

Key support facilities and structures most necessary to withstand the impacts of, and respond to, natural disasters are referred to as critical facilities. Examples of these critical facility types include utilities, transportation infrastructure, and emergency response and services facilities, given failures of components along major lifelines or even closures or inaccessibility to key emergency facilities could limit if not completely cut off transmission of commodities, essential services, and other potentially catastrophic repercussions. Floods and can disrupt, damage, or destroy these critical facilities, which in turn can impede the ability of El Dorado County to respond to and recover from a major flood event.

A GIS analysis of exposed critical facilities was conducted, similar to the parcel analysis. The results of critical facilities throughout the County which are exposed to the various flood hazards are shown in Table 4-58 below and organized by the jurisdiction they are located in and the FEMA Lifeline category into which they are classified.

A total of 46 critical facilities are in the 1% annual chance FEMA flood hazard zone and are at risk of flooding, see Table 4-58 while a total of six critical facilities are at risk in the 0.2% FEMA flood hazard zone, see Table 4-59. These tables display the critical facilities at risk to flood risk in the unincorporated County and the City of Placerville only. Critical facilities exposed to flood risk within the other three participating jurisdictions was not summarized here because some of the jurisdictions share the same boundary as the County. Critical facilities exposed by the jurisdiction they occur in are summarized in the annexes.

Table 4-58 Critical Facilities Within the 1% Annual Chance Flood Hazard by Jurisdiction

JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, HYDRATION SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	WATER SYSTEMS	TOTAL
Placerville	-	-	1	-	3	3	8	-	**15**
Unincorporated	3	3	-	-	-	-	23	2	**31**
Total	**3**	**3**	**1**	**0**	**3**	**3**	**31**	**2**	**46**

Source: FEMA NFHL Effective 4/3/2012, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Table 4-59 Critical Facilities Within the 0.2% Annual Chance Flood Hazard by Jurisdiction

JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, HYDRATION SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	WATER SYSTEMS	TOTAL
Placerville	-	-	-	-	-	-	2	-	**2**
Unincorporated	1	-	-	-	2	-	1	-	**4**
Total	**1**	**0**	**0**	**0**	**2**	**0**	**3**	**0**	**6**

Source: FEMA NFHL Effective 4/3/2012, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Economy

Floods in the County can have a substantial impact on the local economy. Businesses may face property damage, inventory loss, and disruption of operations, leading to financial losses and potential closure. The agricultural sector, which plays a significant role in the County's economy, can suffer crop damage, affecting farm revenues and supply chains. Infrastructure damage, such as roads and bridges, can impede transportation networks, hindering the movement of goods and people and causing delays in business activities. Additionally, the displacement of residents due to flooding can result in decreased consumer spending, further impacting local businesses.

Development Trends

The potential or likelihood of a flood event in the County increases with the annual onset of heavy rains in winter and spring months. Much of the historical growth in the problem areas connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards. For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in the 1% annual chance floodplains. A large amount of development has occurred in the 0.2% annual chance floodplain and these areas are not regulated or require flood mitigation, thus flood risk is increasing to a degree, although to the less frequent flood events.

The development trend in the County planning area consists of steady growth. Much of this growth is occurring in the more urbanized areas of El Dorado Hills, Cameron Park/Shingle Springs, Placerville, Camino/Pollock Pines and South Lake Tahoe, and such growth can result in more impervious surfaces due to buildings and infrastructure and increase stormwater runoff. The County's population is projected to continue to grow, and this growth may consume previously undeveloped acres, and the increase in impervious surfaces could affect existing drainage and flood control facilities.

Cultural and Natural Resources

The County boasts a rich cultural heritage, with historic sites, landmarks, and artifacts that are vulnerable to flood damage. Floodwaters can inundate historic buildings, museums, and archaeological sites, causing structural damage and irreparable harm to cultural treasures. Additionally, floods can disrupt cultural events, festivals, and tourism activities, impacting the local economy and community identity.

Moreover, the County is renowned for its diverse natural resources, including forests, rivers, and wildlife habitats. Flooding can also result in erosion of riverbanks, loss of vegetation, and habitat destruction, affecting the ecological balance and biodiversity of the area. In particular, riparian zones and wetlands, which are crucial for wildlife conservation and water quality maintenance, are at risk of degradation from flood events. Furthermore, floodwaters can carry pollutants and contaminants, posing threats to water quality and aquatic ecosystems.

4.3.7.7 Risk Summary

- According to the NCEI, there have been 25 flood events in the County since 1996. The total property damage and crop damage includes all areas impacted. There has also been over $25 million in property damages and nearly $8 million in crop damages from flooding.
- Increases in intense precipitation can trigger cascading flood hazards along waterways causing impacts to neighborhoods and loss of crops.
- Floods impact sensitive populations with lower-income households being displaced from their homes.
- Flooding is one of the most serious climate-related hazards, and extreme precipitation due to AR events often results in localized rain on snow flooding across the County.
- Current infrastructure is not designed to capture the increased runoff associated with climate change.
- Loss of snowpack will lead to increased winter flows and flooding, and reductions in warm season flows.
- Snow water runoff to reservoirs is expected to occur earlier in the season and at an increased magnitude that will likely result in flooding.
- 982 residents live in the 1% annual chance flood zone throughout the County and 137 residents live in the 0.2% annual chance flood zone throughout the County.
- 480 parcels valued at over $234 million are in the 1% annual chance floodplain and an additional 89 parcels valued at more than $45 million are within the 0.2% annual chance floodplain. When factoring in FEMA's estimated loss ratio, the estimated total losses from both 1% and 0.2% annual chance flood events is over $270 million.
- The overall significance of the flood hazard is **medium.**

4.3.8 Seiche (Lake Tsunami)

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Seiche (Lake Tsunami)	Limited	Unlikely	Moderate	High

4.3.8.0 Hazard/Problem Description

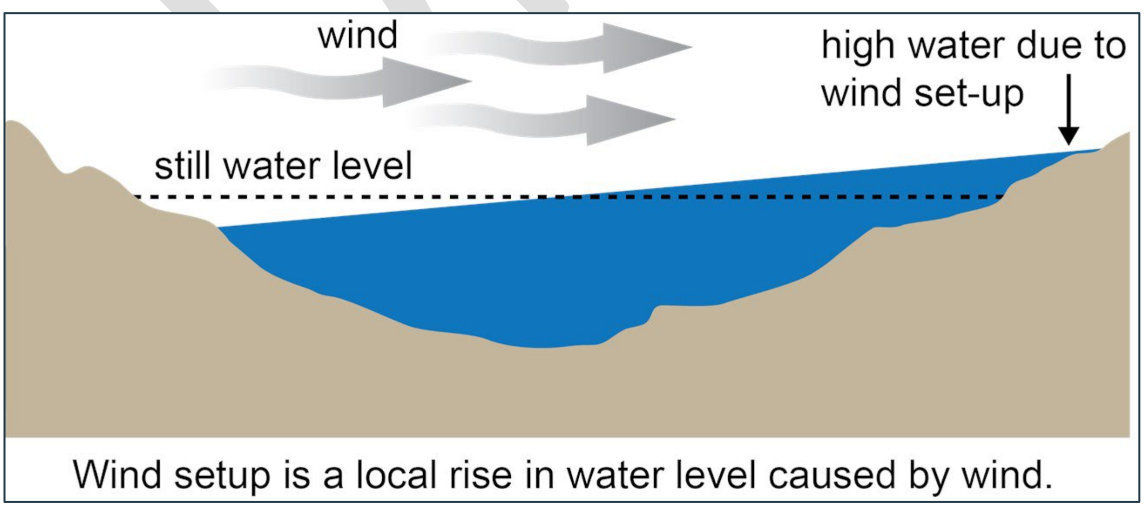
A tsunami, typically triggered by an underwater earthquake, landslide, or volcanic eruption, is a large, impactful wave with the potential for devastating impacts. In contrast, a seiche (lake tsunami) represents a rhythmic motion of water in a partially or completely landlocked water body, often induced by landslides or earthquake-induced ground shaking. As noted in the County's Safety Element, while the County is not situated in a coastal area susceptible to tsunamis, the Lake Tahoe region, nestled along Lake Tahoe, could encounter the effects of a lake seiche.

Expanding on this, the USACE defines a seiche as a standing wave oscillation in an enclosed water body, persisting pendulum-like after the cessation of the initiating force, whether seismic or atmospheric. Seiches can be induced by changes in wind or atmospheric pressure gradients, and in semi-enclosed basins, by the oscillation of connected water bodies. Less frequent causes include heavy precipitation, river flood discharge, seismic disturbances, submarine mudslides, or slumps, and tides. Notably, seiches can be exceptionally pronounced after earthquakes, and a sudden land tilt or drop resulting from fault rupture or seismic activity can also trigger them. Computer modeling indicates that such disturbances could generate a tsunami, subsequently inducing seiche waves across Lake Tahoe, potentially reaching heights of 30 feet or more and persisting for hours.

Moreover, the City of South Lake Tahoe faces potential flooding in its tributaries due to a lake seiche triggered by a significant landslide or earthquake. Recognizing this risk, the City's Emergency Operations Plan (EOP) outlines response measures for seiche wave hazards, including a warning system activated by earthquakes with a magnitude of 7 or greater capable of generating seiche waves.

As shown in Figure 4-31, seiches are typically caused when strong winds and rapid changes in atmospheric pressure pile up water on one end of a lake. When the wind stops, the water returns to the other side of the lake, often causing water levels to rise quite quickly.

Figure 4-31 How Wind-Driven Seiches Occur

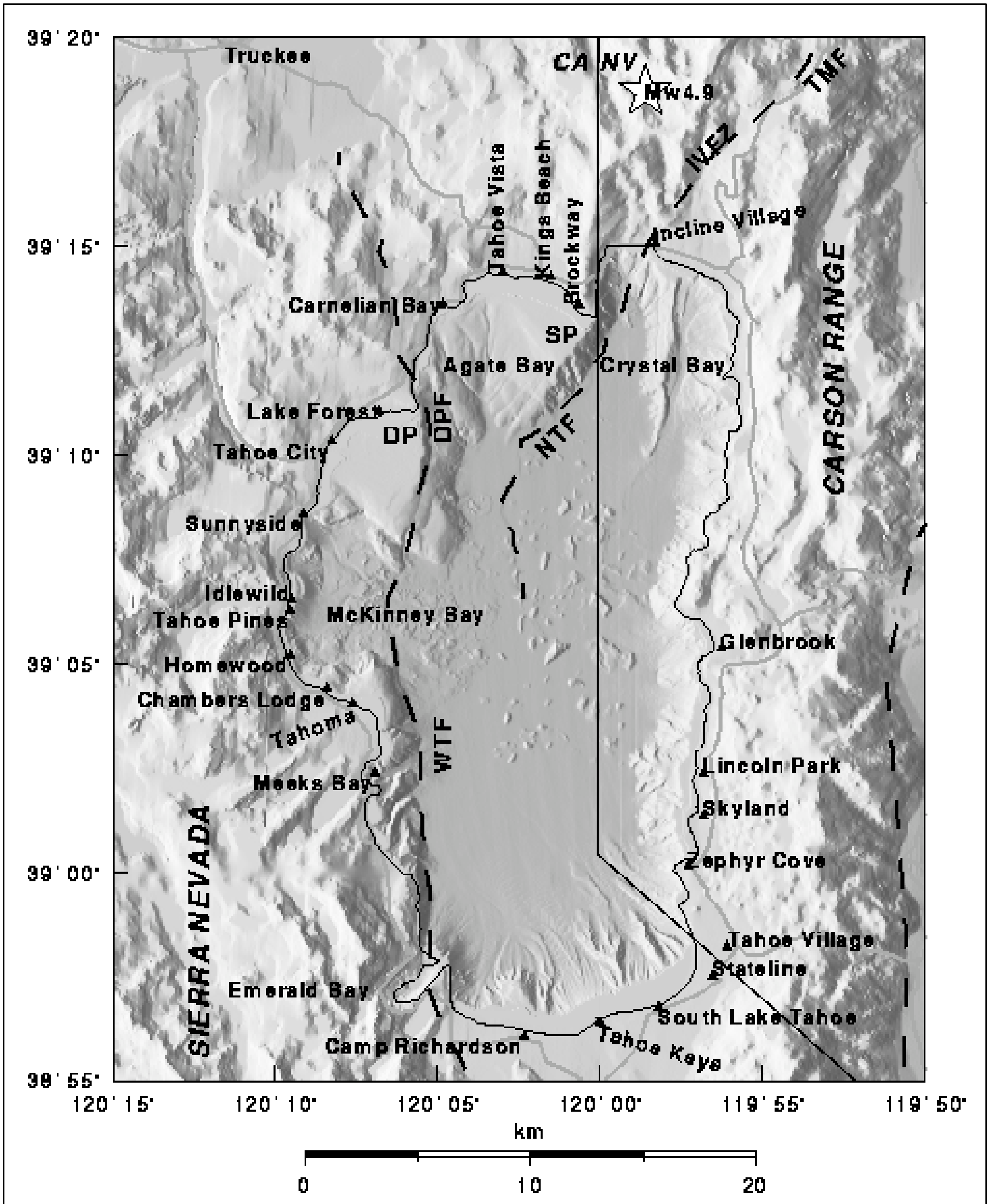


Source: NOAA, 2023

4.3.8.1 Geographic Area

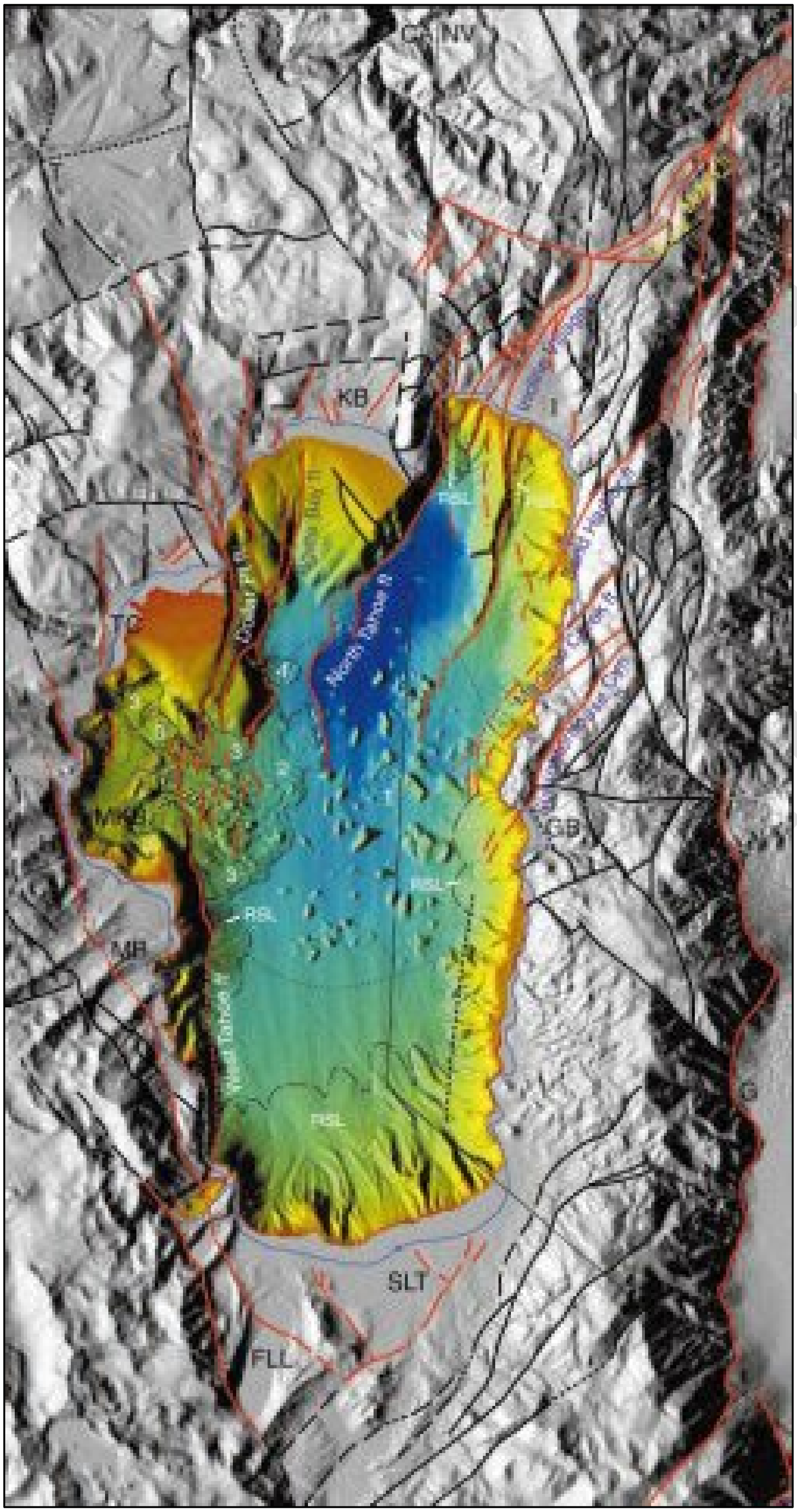
Limited - Within El Dorado County, locations with the highest probability of impact are shore areas of Lake Tahoe from 0 to 30 feet above mean lake water level. Japanese scientist Kenji Satake has created computer models that suggest the largest waves of a seiche event could hit Sugar Pine Point, Rubicon Point, and the casinos in South Lake Tahoe. Figure 4-32 shows the topography of the Lake Tahoe Basin. Figure 4-33 shows lake bathymetry, while shows fault locations

Figure 4-32 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)

Figure 4-33 Lake Tahoe Bathymetry



Source: University of Nevada Seismic Laboratory, (Schweickert); USGS

Research from the University of Nevada estimates that an earthquake must be at least a magnitude 6.5 to cause a damaging seiche at Lake Tahoe. The three faults directly underneath the lake are considered capable of generating magnitude 7.0 or larger earthquakes. Computer models of seiche activity at Lake Tahoe prepared by the University of Nevada research team estimate that waves as high as 30 feet could strike the shore. These projections suggest largest waves might hit Sugar Pine Point, Rubicon Point, and the casinos in South Lake Tahoe.

In the event of a magnitude 7 earthquake occurring on either of two major faults under the lake, the lake bottom could drop as much as 4 meters. Water supported by the lake floor could drop a corresponding distance and generate waves that heavily impact the shoreline.

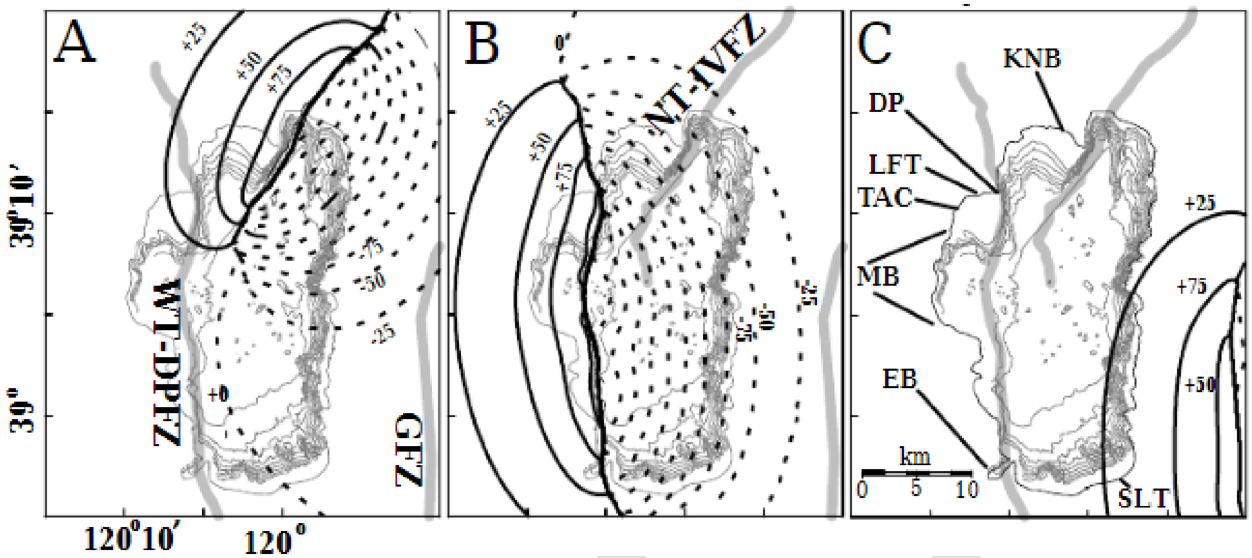
Figure 4-34 below shows three potential vertical displacement (uplift or subsidence) scenarios that could be caused by magnitude 7+ earthquakes along the three discrete fault systems in the Lake Tahoe region. These scenarios were done prior to the 2006 finding of the Stateline fault that traverses Lake 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.

Scenario C represents an earthquake event along the Genoa Fault Zone (GFZ) 7-10 miles east of the lake shore. This scenario projects minor to moderate uplift (0.25-0.75 meter) to the southwest of the lake. Scenario C produces waves with average heights of 0.5 meters, indicating that magnitude 7 earthquakes along faults outside of the lake are not likely to create a large seiche event.

Figure 4-34 Contours of Vertical Component Ground and Lake Bottom Displacements



Scenario A, B, and C vertical component ground and lake bottom coseismic displacements. Dashed contours represent subsidence and solid contours represent uplift. Geographic locations: TAC-Tahoe City, KNB-Kings Beach, LFT-Lake Forest, SLT-South Lake Tahoe, MB-McKinney Bay, EB-Emerald Bay, DP-Dollar Point
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)

4.3.8.2 Past Occurrences

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 towards the Nevada side. In 1955, a debris flow occurred in Emerald Bay and seiche activity occurred. Evidence of the debris flow can still be seen on the hillside near Emerald Bay. Recent occurrences of potential causal factors also include a magnitude 4.9 earthquake near Incline Village in 1998.

4.3.8.3 Likelihood of Future Occurrences

Unlikely—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.

However, risks for a seiche wave for the area, as well as potential losses due to a seiche wave impact, is considered to be low relative to much of California. Given the fact that there are not many homes built at the current lake level or on the immediate shores of Lake Tahoe, a seiche wave would cause little damage to homes in the unincorporated areas of the County.

There would be substantial damage to infrastructure such as county roads and two state highways that run through El Dorado County, Highway 50 and Highway 89.

Given this recognized area vulnerability, the State of California hosted a Functional Exercise involving a Seiche Wave (called Golden Guardian 2008) that impacted the south shore of Lake Tahoe. The exercise evaluated the response of numerous local and state government agencies to such an event. The exercise summarizes a detailed After Action report for Golden Guardian 2008, which was reviewed and considered in this vulnerability assessment.

Since there has not been a seiche wave on record in the Lake Tahoe area, it would be difficult to get an accurate estimate of damages such an event would cause. Some of the damages to infrastructure in this type of event would include repair and/or replace infrastructure such as roadways which would include manpower hours and resources to make the repairs. The size of the seiche wave would also dictate the amount of the debris removal cost to the County and/or State would incur.

Moreover, a small (0.4-foot) wave surge was reported in Lake Tahoe during the 1966 Truckee earthquake, which had a Richter Scale magnitude of between 6.0 and 6.9. Development in areas located around the lake in potential seiche impact areas consist of primarily infill and redevelopment of both residential and commercial areas.

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.

4.3.8.4 Climate Change Considerations

Climate change is unlikely to affect earthquake caused seiche; however, landslide caused seiche may be affected by climate change.

4.3.8.5 Magnitude and Severity

Moderate - The magnitude of a seiche event is closely tied to the initiating force, often related to seismic activity, underwater landslides, or sudden changes in atmospheric pressure. In the case of Lake Tahoe, a significant earthquake or landslide could potentially generate a powerful seiche wave due to the lake's considerable depth and the steep underwater topography.

The geological features of the lake, including its depth and shape, play a crucial role in amplifying or mitigating the effects of a seiche. A sudden disturbance, such as a seismic event, has the potential to displace a substantial volume of water, leading to the formation of seiche waves that can move across the lake.

The severity of a seiche-induced lake tsunami would also be influenced by the local topography and the proximity of vulnerable areas, including South Lake Tahoe and its surrounding regions. The impact on shorelines, structures, and infrastructure depends on the height, speed, and persistence of the seiche waves.

4.3.8.6 Vulnerability Assessment

People

A significant seiche hazard event in the County, particularly around the Lake Tahoe region, could have significant implications for the local population. The potential effects on people stem from the nature of seiche waves, which may be triggered by seismic activity, landslides, or sudden atmospheric changes. The unique geography of Lake Tahoe, being a deep and landlocked water body, makes the region susceptible to amplified seiche waves.

In the event of a seiche hazard, communities around the lake, including South Lake Tahoe, may face immediate threats to safety. The sudden onset of seiche waves could lead to flooding along the shorelines, impacting residential areas, recreational spaces, and critical infrastructure like schools. Given the popularity of the region for tourism and outdoor activities, there is also a heightened risk of injuries and casualties due to the influx of visitors, particularly if people are caught off guard. Evacuation routes, emergency shelters, and communication systems become crucial components in mitigating the potential harm to the local population. Additionally, the socio-economic fabric of the area, dependent on tourism and recreational activities, may experience long-term disruptions, affecting livelihoods and community well-being.

Property

The unique characteristics of seiche waves, often triggered by seismic activity or landslides, may result in flooding and structural damage to homes, businesses, and infrastructure along the lake's shoreline. The sudden and rhythmic oscillations of water associated with seiches could lead to inundation of properties, causing erosion, undermining foundations, and compromising structural integrity. Additionally, the displacement of debris carried by seiche waves could further contribute to property damage. Critical infrastructure, such as roads, bridges, and utilities, may be at risk of washouts and collapse, exacerbating the challenges of emergency response and recovery. Furthermore, the potential for economic losses due to property damage, disruptions to businesses, and a decline in property values necessitates thorough consideration in the vulnerability assessment.

Critical Facilities and Lifelines

Hospitals and emergency services may face challenges in providing critical care, with potential disruptions to accessibility and patient transportation. Utilities, such as water treatment plants and power substations, could be vulnerable to flood-related damage, impacting water supply and electrical services for the community. School facilities near the shoreline may also be at risk. Additionally, government buildings, including emergency operation centers, may be at risk of flooding and structural damage, highlighting the need for resilient infrastructure and contingency plans. Communication infrastructure, vital for coordinating emergency response efforts, could also be compromised.

Economy

The region's economy, reliant on tourism, outdoor recreation, and associated businesses, may face disruptions due to the effects of seiche waves. The sudden onset of flooding and potential damage to infrastructure could lead to the closure of businesses, hotels, and recreational facilities, causing financial losses for local entrepreneurs and employees. The decline in tourism, a significant economic driver, could have a cascading effect on related industries, such as hospitality and retail. Moreover, property values may be negatively impacted, affecting homeowners and the local tax base. The cost of repairing and rebuilding critical infrastructure, including roads and utilities, can also strain municipal budgets. Small businesses, often the backbone of the local economy, may encounter challenges in recovering from the economic setbacks caused by property damage and business disruptions.

Cultural and Natural Resources

The ecological balance of the Lake Tahoe region, characterized by its pristine waters and diverse nature, may face disruptions. Seiche-induced flooding can lead to habitat destruction, affecting wildlife and plant species. The sudden and forceful oscillations of water may disturb the lake's ecosystems, influencing water quality and aquatic life. The potential for debris deposition during seiche events further adds to the challenges faced by natural resources.

Cultural sites that could be impacted around South Lake Tahoe include: the historic Vikingsholm mansion in Emerald Bay State Park, the Tallac Historic Site (comprising several historic estates, including the Pope Estate and the Baldwin Estate, the Lake Tahoe History Museum), as well as the Fallen Leaf Lake archaeological sites. The Fallen Leaf Lake archaeological site hold archaeological significance and may also contain Native American sites or historical ruins vulnerable to the effects of seiche-induced flooding and debris. The Camp Richardson Resort and Marina and Vahalla Grand Hall and Boathouse Theater are also vulnerable.

Development Trends

As per the Safety Element, the County will continue to evaluate seismic related hazards such as liquefaction, landslides, and avalanche, and seiche particularly in the Tahoe Basin. Policies 6.3.2.7 and Policy 6.3.2.8 both focus on reducing the risk of seiches: Policy 6.3.2.7 requires development in potential seiche hazard areas within the Lake Tahoe 40 Basin to perform a geotechnical engineering investigation and mandate appropriate mitigation measures, based on the investigation, are incorporated into the project design. Policy 6.3.2.8 considers the inclusion of seiche hazard areas within the Lake Tahoe Basin during the update of Area Plans and complete geotechnical engineering investigations to guide the development in these hazard areas.

4.3.8.7 Risk Summary

- The shore areas of Lake Tahoe from 0 to 30 feet above mean lake water level are the highest probability of impact from lake seiches. The largest waves of a seiche event could hit Sugar Pine Point, Rubicon Point, and the casinos in South Lake Tahoe.
- The unique characteristics of seiche waves, often triggered by seismic activity or landslides, may result in flooding and structural damage to homes, businesses, and infrastructure along the lake's shoreline. The sudden and rhythmic oscillations of water associated with seiches could lead to inundation of properties, causing erosion, undermining foundations, and compromising structural integrity.
- No occurrences of major seiche activity at Lake Tahoe have been recorded 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.
- Should an event occur, the overall significance of a major seiche hazard is **high.**

4.3.9 Severe Weather: General

Severe weather is generally any destructive weather event. For this plan, severe weather is broken down as follows:

- Heavy Rain, Thunderstorms, Hail, And Lightning
- Tornadoes and High Wind
- Winter Storm and Heavy Snow

The NOAA NCEI has been tracking severe weather since 1950. Their Storm Events Database tracks severe weather events on a county basis and contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains over 900 severe weather events that occurred in El Dorado County between January 1, 1950, and December 31, 2023. Table 4-60 summarizes these events. El Dorado County contains the following zones in the database: Southern Sacramento Valley, Motherlode, West Slope Northern Sierra Nevada, Greater Lake Tahoe Area. Since 1950 there has been over 900 events leading to $5,000,000 in property damages, over $200,000 in crop damages and resulting in 28 deaths and 88 injuries.

Table 4-60 NCEI Hazard Event Reports for the El Dorado County* 1950-2023

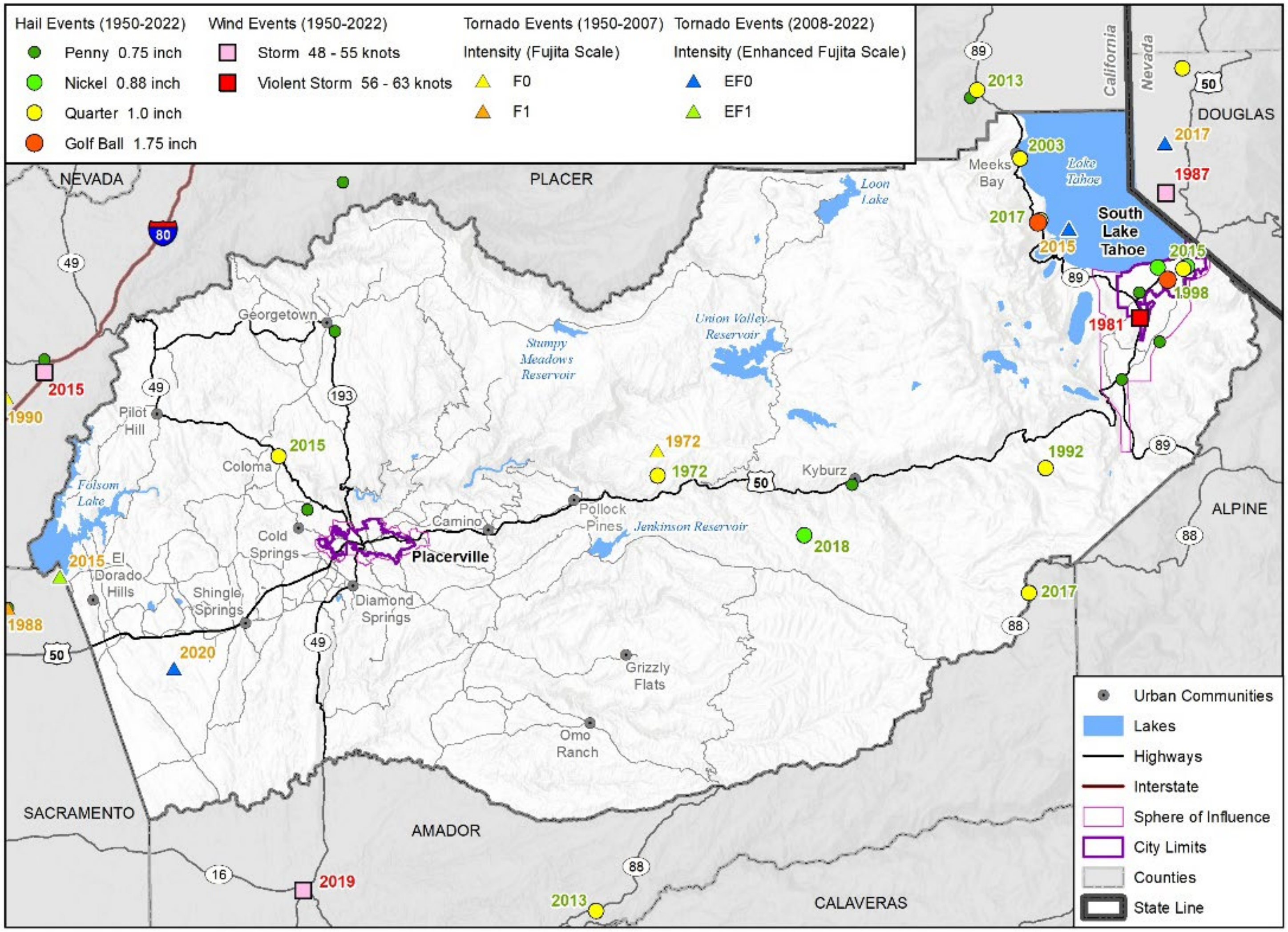
TYPE	# OF EVENTS	PROPERTY LOSS ($)	CROP LOSS ($)	DEATHS	INJURIES
Avalanche	20	0	0	9	12
Debris Flow	14	$6,542,000	0	0	0
Dense Fog	14	$2,320,000	0	6	38
Dense Smoke	4	0	0	0	0
Extreme Cold/Wind Chill	1	0	0	0	0
Flash Flood	2	$15,000,000	0	0	0
Flood	61	$10,550,000	$7,800,000	2	1
Frost/Freeze	9	$200,000	$5,000,000	0	0
Funnel Cloud	1	0	0	0	0
Hail	20	$1,000	$586,000	0	5
Heat	41	0	0	0	18
Heavy Rain	156	0	$10,250,000	0	0
Heavy Snow**	500+	$1,685,000	0	2	4
High Wind	225	$13,604,500	$48,000	1	3
Lightning	0	0	0	0	0
Strong Winds	62	$5,946,800	0	5	2
Tornado	5	$1,002,500	0	0	0
Winter Storm	304	$666,000	0	3	5
Total* **	**939**	**$5,7517,800**	**$236,840,000**	**28**	**88**

Source: NOAA's National Centers for Environmental Information https://www.ncdc.noaa.gov/stormevents/
*Note any reference to a coastal type weather event for El Dorado County has been excluded from this table.
**Number of events for heavy snow exceeds 500. The data shown here is for the date range between January 1, 2001, and December 31, 2023
***Wind Losses reflect totals for all impacted areas, inclusive of El Dorado County
****El Dorado County contains the following zones in the database: Southern Sacramento Valley, Motherlode, West Slope Northern Sierra Nevada, Greater Lake Tahoe Area.

Pertaining to severe weather, the NCEI contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 900 severe weather events that occurred in El Dorado County between January 1, 1950, and December 31, 2023.

As a Severe Weather overview, Figure 4-35 illustrates severe weather events in the County including hail, wind, and tornadoes from 1950-2022.

Figure 4-35 El Dorado County Severe Weather Events



Map compiled 3/2024;
Intended for planning purposes only.
Data Source: El Dorado County, NOAA, National Weather Services SVRGIS 2023

4.3.10 Severe Weather: Heavy Rain, Thunderstorms, Hail, And Lightning

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Severe Weather: Heavy Rain, Thunderstorms, Hail, And Lightning	Extensive	Highly Likely	Critical	Medium

4.3.10.0 Hazard Description

Heavy Rain

One significant consequence of thunderstorms is the potential for heavy rainfall. The combination of moisture, warm air, and atmospheric dynamics leading to thunderstorm formation can result in substantial and intense rainfall. This heavy rain can lead to flash flooding, especially in low-lying areas, urban drainage systems, and along rivers. Additionally, prolonged and intense rain during thunderstorms can contribute to soil erosion, mudslides, and elevated water levels in rivers and lakes.

Moreover, the County often experiences substantial precipitation events influenced by atmospheric phenomena such as Atmospheric Rivers (ARs). These ARs are long, narrow bands of highly concentrated water vapor in the atmosphere that transport immense amounts of moisture over long distances, often originating from tropical or subtropical regions. During El Niño years, which are characterized by warming sea surface temperatures in the equatorial Pacific Ocean, changes in atmospheric circulation patterns can enhance the formation and strength of ARs, leading to intensified rainfall and increased precipitation in regions along the West Coast, including El Dorado County. These intensified ARs can result in prolonged periods of heavy rainfall and heightened risk of flooding, posing significant challenges for the county's infrastructure and residents.

Thunderstorms

Thunderstorms are a meteorological phenomenon resulting from the convergence of moisture, rapidly rising warm air, and lifting forces such as warm/cold fronts or mountains. These atmospheric conditions can give rise to thunderstorms, occurring singularly, in clusters, or as lines. A single location may experience several thunderstorms within a short timeframe. These storms bring about lightning, thunder, and rainfall, and may also lead to the development of tornadoes, hail, downbursts, and microbursts of wind.

According to the Western Regional Climate Center (WRCC), average annual precipitation in the western side of El Dorado County (Placerville) is 38.27 inches per year. The highest recorded annual precipitation is 74.55 inches in 1983; the highest recorded precipitation for a 24-hour period is 6.22 inches on February 14, 2000. The lowest recorded annual precipitation was 11.85 inches in 1976.

Additionally, average annual precipitation in the eastern portion of El Dorado County is 31.63 inches per year. The highest recorded annual precipitation is 66.41 inches in 1996; the highest recorded precipitation for a 24-hour period is 9.34 inches on December 23, 1964. The lowest recorded annual precipitation is 9.34 inches in 1976.

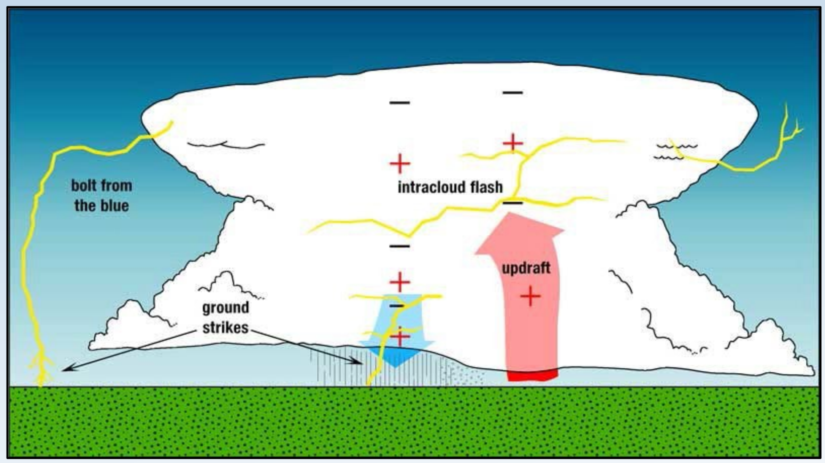
Hail

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

Lightning

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

Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud.



Depiction of cloud-to-ground lightning by the National Weather Service

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

4.3.10.1 Geographic Area

Extensive - Thunderstorms, accompanied by heavy rain, hail and lightning, have a widespread impact on the entire County, occurring with comparable frequency across the region during any month of the year. While these events are distributed similarly throughout the planning area, they are more frequently documented in densely populated urbanized areas. Moreover, damages are more likely to occur in these densely developed urban zones.

4.3.10.2 Past Occurrences

El Dorado County has experienced several severe storms which have led to federal and state disaster declarations. For more information on several storms and precipitation, please refer to the Safety Element.

Heavy Rain

Table 4-61 depicts that since 1997, the County has experienced heavy rain events 132 times, resulting in approximately $100,000 in property damages, as reported by the NCEI. These recurrent incidents underscore the region's vulnerability to adverse weather conditions, imposing a significant economic burden on local infrastructure and private properties.

Table 4-61 Heavy Rain Events in El Dorado County from 1997-2023

DATE	LOCATION	DEATHS	INJURIES	PROPERTY DAMAGE
12/29/1996	South Lake Tahoe	0	0	$100,000
1/12/1998	Countywide	0	0	0
1/18/1998	Countywide	0	0	0
7/31/2003	Meyers	0	0	0
12/17/2005	Countywide	0	0	0
12/1/2012	Shingle Springs	1	0	0
2/8/2015	Kyburz	0	0	0
2/8/2015	Pacific	0	0	0
2/8/2015	Kyburz	0	0	0
4/6/2015	Camino	0	0	0
4/24/2015	Camino	0	0	0
4/24/2015	Pacific	0	0	0
4/24/2015	Kyburz	0	0	0
6/5/2015	Pacific	0	0	0
6/5/2015	Pacific	0	0	0
7/4/2015	Kyburz	0	0	0
7/9/2015	Kyburz	0	0	0
7/9/2015	Kyburz	0	0	0
10/17/2015	Pacific	0	0	0
10/17/2015	Camino	0	0	0
11/9/2015	Pacific	0	0	0
11/15/2015	Pacific	0	0	0
11/15/2015	Kyburz	0	0	0
12/13/2015	Pacific	0	0	0
12/20/2015	Camino	0	0	0
12/21/2015	Gold Hill	0	0	0
12/21/2015	Pacific	0	0	0
12/21/2015	Kyburz	0	0	0
12/21/2015	Eight Mile House	0	0	0
1/13/2016	Pacific	0	0	0
1/14/2016	Kyburz	0	0	0
1/22/2016	Kyburz	0	0	0
1/22/2016	Pacific House	0	0	0
1/29/2016	Pacific	0	0	0
1/29/2016	Kyburz	0	0	0

DATE	LOCATION	DEATHS	INJURIES	PROPERTY DAMAGE
3/13/2016	Pacific House	0	0	0
3/13/2016	Kyburz	0	0	0
3/20/2016	Kyburz	0	0	0
3/20/2016	Pacific	0	0	0
5/5/2016	Kyburz	0	0	0
10/14/2016	Kyburz	0	0	0
10/14/2016	Pacific	0	0	0
10/14/2016	Placerville	0	0	0
10/15/2016	Pacific	0	0	0
10/15/2016	Pacific	0	0	0
10/15/2016	Kyburz	0	0	0
10/16/2016	Pacific	0	0	0
10/16/2016	Kyburz	0	0	0
10/27/2016	Pacific	0	0	0
10/27/2016	Kyburz	0	0	0
10/27/2016	Camino	0	0	0
10/29/2016	Pacific	0	0	0
10/30/2016	Kyburz	0	0	0
10/30/2016	Pacific	0	0	0
12/9/2016	Kyburz	0	0	0
12/10/2016	Kyburz	0	0	0
1/3/2017	Kyburz	0	0	0
1/3/2017	Pacific	0	0	0
1/8/2017	Kyburz	0	0	0
1/8/2017	Pacific	0	0	0
1/9/2017	Pacific	0	0	0
1/9/2017	Kyburz	0	0	0
1/9/2017	Pacific	0	0	0
1/10/2017	Fallen Leaf	0	0	0
1/10/2017	Pacific	0	0	0
2/2/2017	Kyburz	0	0	0
2/2/2017	Pacific	0	0	0
2/3/2017	Kyburz	0	0	0
2/5/2017	Kyburz	0	0	0
2/5/2017	Kyburz	0	0	0
2/6/2017	Pacific	0	0	0
2/7/2017	Pacific	0	0	0
2/9/2017	Placerville	0	0	0
2/9/2017	Kyburz	0	0	0
2/9/2017	Pacific	0	0	0
3/24/2017	Kyburz	0	0	0

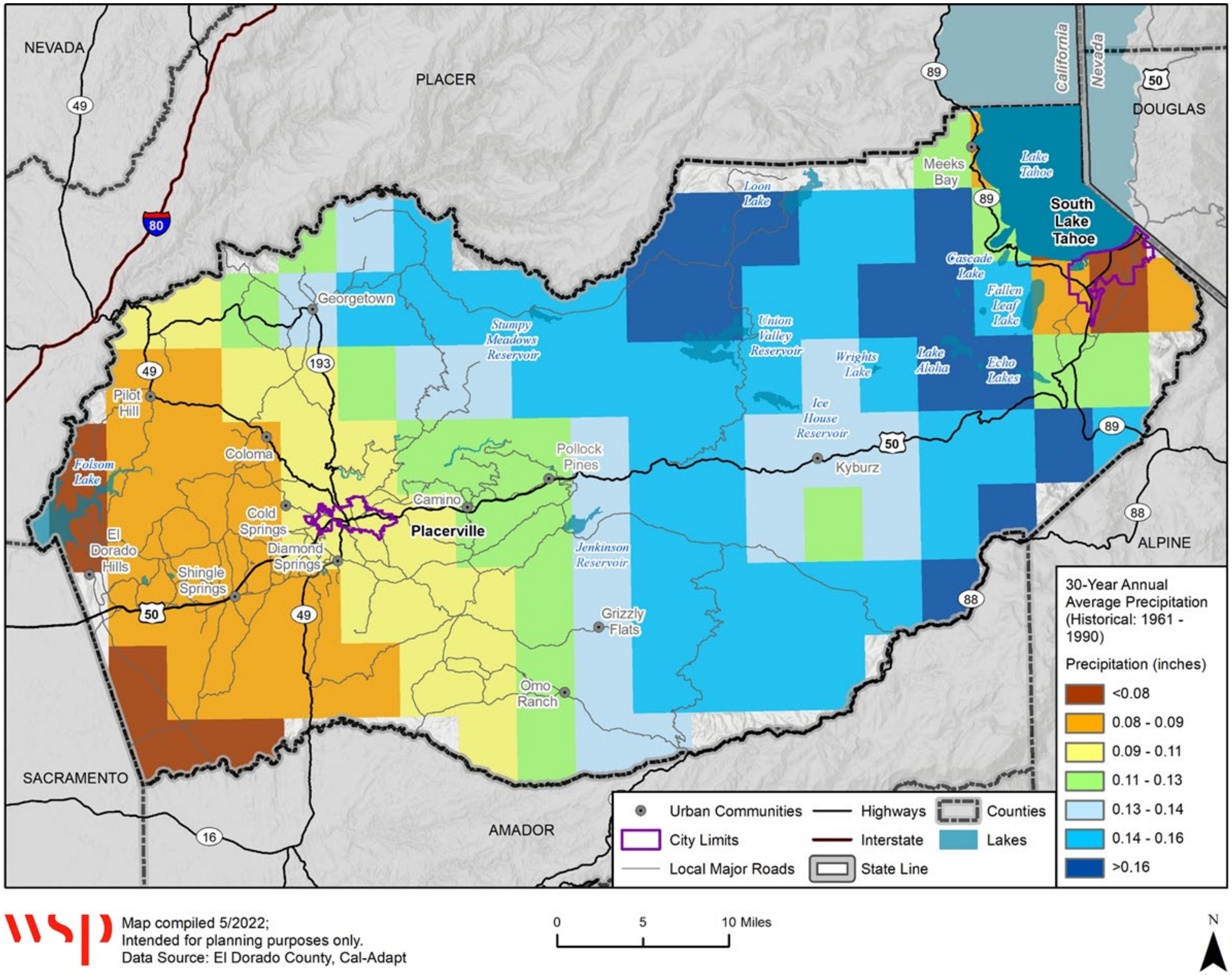
DATE	LOCATION	DEATHS	INJURIES	PROPERTY DAMAGE
11/15/2017	Lake Tahoe Airport	0	0	0
3/13/2018	Vade	0	0	0
3/13/2018	Tahoe Valley	0	0	0
3/13/2018	Tahoe Paradise	0	0	0
3/20/2018	Tahoe Valley	0	0	0
3/20/2018	Meeks Bay	0	0	0
3/20/2018	Meyers	0	0	0
4/6/2018	Fallen Leaf	0	0	0
4/6/2018	Vade	0	0	0
4/6/2018	Meyers	0	0	0
4/6/2018	Lake Tahoe Airport	0	0	0
5/24/2018	Tahoe Paradise	0	0	0
5/24/2018	Tahoe Valley	0	0	0
7/13/2018	Vade	0	0	0
7/13/2018	Fallen Leaf	0	0	0
7/13/2018	Tahoe Paradise	0	0	0
7/14/2018	Lake Tahoe Airport	0	0	0
10/3/2018	Pomins	0	0	0
10/3/2018	Pomins	0	0	0
10/3/2018	Meyers	0	0	0
10/3/2018	Meyers	0	0	0
10/3/2018	Meyers	0	0	0
10/3/2018	Pomins	0	0	0
11/21/2018	Pomins	0	0	0
11/21/2018	Lake Tahoe Airport	0	0	0
11/21/2018	Tahoe Paradise	0	0	0
12/24/2018	Lake Tahoe Airport	0	0	0
12/24/2018	Tahoe Paradise	0	0	0
1/16/2019	Tahoe Valley	0	0	0
1/16/2019	Meyers	0	0	0
3/6/2019	Tahoe Valley	0	0	0
3/27/2019	Tahoe Valley	0	0	0
3/27/2019	Meyers	0	0	0
3/27/2019	Pomins	0	0	0
5/15/2019	Pomins	0	0	0
5/15/2019	Meyers	0	0	0
12/1/2019	Vade	0	0	0
12/1/2019	Camp Richardson	0	0	0
12/6/2019	Pomins	0	0	0
12/6/2019	Meyers	0	0	0
12/6/2019	Placerville	0	0	0

DATE	LOCATION	DEATHS	INJURIES	PROPERTY DAMAGE
3/19/2021	Meyers	0	0	0
10/22/2021	Fallen Leaf	0	0	0
10/25/2021	Balderson	0	0	0
12/22/2021	Meyers	0	0	0
12/23/2021	Meyers	0	0	0
12/31/2022	Meyers	0	0	0
1/1/2023	Meyers	0	0	0
3/9/2023	Tahoma	0	0	0
9/1/2023	Twin Bridges	0	0	0
10/1/2023	South Lake Tahoe	0	0	0
10/25/2023	Meyers	0	0	0
11/5/2023	Meyers	0	0	0
11/15/2023	Twin Bridges	0	0	0
11/18/2023	Meyers	0	0	0
12/17/2023	Twin Bridges	0	0	0
-	Total	1	0	$100,000

Source: NOAA's National Centers for Environmental Information https://www.ncdc.noaa.gov/stormevents/

Additionally, Figure 4-36 shows the historical 30-year annual average precipitation from 1961-1990. As shown, historically the areas the east of the County near South Lake Tahoe and those west Shingle Springs, El Dorado Hills and Folsom Lake have the highest annual average precipitation.

Figure 4-36 30-Year Annual Average Precipitation (Historical 1961-1990)



Thunderstorms/Lightning

County-level thunderstorm data is not available and lighting data is limited; however, thunderstorm and lightning events are not uncommon in the County, especially during summer months. There are no NCEI recorded lighting event for the County.

Hail

According to the NCEI, there have been 20 hail events have occurred in the County, which is the equivalent of one hail event every 3.5 years .

As an example, in 2019, a hailstorm in the County wreaked havoc on thousands of fruit trees, severely damaging the summer crop for farmers. The hailstorm left peaches and nectarines scarred, resulting in significant losses. The aftermath of the hailstorm caused issues for farmers in the County, with significant damage to fruit trees and concerns about future crop viability (NCEI, 2023).

4.3.10.3 Likelihood of Future Occurrences

Highly Likely - According to historical hazard data, severe weather is an annual occurrence in the County. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the County. Wind and lightning often accompany these storms and have caused damage in the past. However, actual damage associated with the primary effects of severe weather have been limited. It is the secondary hazards caused by weather, such as floods, fire, and agricultural losses that have had the greatest impact on the County.

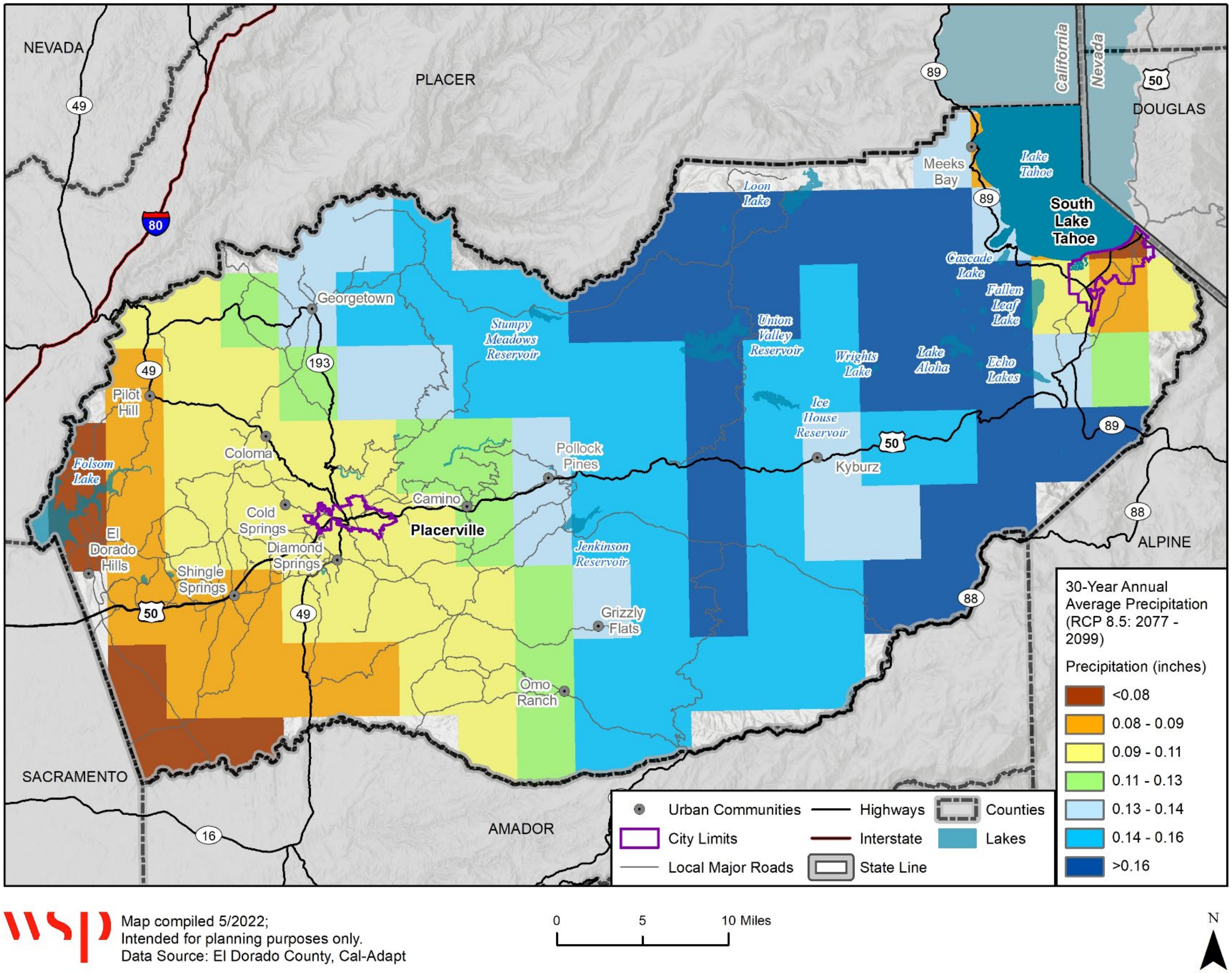
4.3.10.4 Climate Change Considerations

As average annual temperatures increase over time across the State, warming in the atmosphere can trigger more frequent extreme weather events. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year. Extreme temperatures (hot) are often found in the Western part of the County (El Dorado Hills, Cameron Park, Placerville) and extreme temperatures (cold) are often found in east of Camino/Pollock Pines and in the Tahoe Basin.

With the intensification of climate change, the frequency and severity of ARs are expected to increase. These ARs, characterized by long, narrow bands of highly concentrated water vapor in the atmosphere, can transport immense amounts of moisture over long distances. As a result, the County may experience more intense precipitation events, leading to heightened risks of flooding, particularly in areas vulnerable to extreme weather conditions.

As shown in Figure 4-37, under the RCP 8.5 scenario, the County's 30-year annual average precipitation based on all climate models could range between 32.6 and 59.8 inches by the end-of-century. Furthermore, around the year 2060 shows that the annual precipitation during that year could exceed 100 inches. (Cal-Adapt 2022). For more information, please refer to the Safety Element CVA.

Figure 4-37 30-Year Annual Average Precipitation (RCP 8.5 2070 – 2099)



Because the County will experience a slight increase in precipitation through the end-of-century, this may change the seasonality of precipitation and water resource related events, such as the timing of spring snowmelt in any given year. As further discussed in the California 4th Climate Change Assessment Sierra Nevada Region report, there could be more dry days punctuated by increased precipitation intensities when precipitation occurs, contributing to the overall increase in annual variability.

4.3.10.5 Magnitude and Severity

Critical – The extent of heavy rain, thunderstorms, hail, and lightning weather events can affect a large percentage of properties in the County. These weather events can also shutdown of facilities and result in severe injuries.

A 2022 heavy rain event caused water to flow through streets, pool around properties and flood homes in Cameron Park. Sandbags worked were deployed on Knollwood Drive to help prevent water from flowing into some homes.

Source: https://www.abc10.com/article/news/local/rio-vista-power-outage/103-3fac150c-56e5-48b0-942e-7feee40e61db

Heavy Rain

As previously noted, the substantial precipitation events experienced by the County and across California often result from Atmospheric Rivers (ARs). ARs are assessed using the Integrated Water Vapor Transport (IVT), a measurement unit considering both water vapor quantity and the associated wind movement. To qualify as an AR, a storm must surpass an IVT threshold of 250 units, with 1,000 IVT or more deemed "extreme" (Arcuni 2019).A discussion of Ars is expanded In 2019, the Center for Western Weather and Water Extremes (CW3E) at the Scripps Institution of Oceanography, UC San Diego, introduced a scale for categorizing AR strength and impacts.

This newly devised scale classifies ARs into five categories ranging from weak to exceptional, characterizing heavy rain events linked to ARs. Unlike the Fujita Scale for tornadoes, which focuses on potential damages, the AR scale considers both hazardous and beneficial aspects of storms on the local water supply. A category one AR is predominantly beneficial, lasting around 24 hours and producing modest rainfall. Conversely, a category five AR is labeled "exceptional" and predominantly hazardous, lasting several days with heavy rainfall and runoff that may cause significant damages. Table 4-62 details this scale, developed by CW3E as a practical tool for officials requiring operational assessments of flooding potential before storms make landfall. The scale also serves as a valuable tool in delineating the magnitude of heavy rain events.

Table 4-62 Atmospheric River Categories

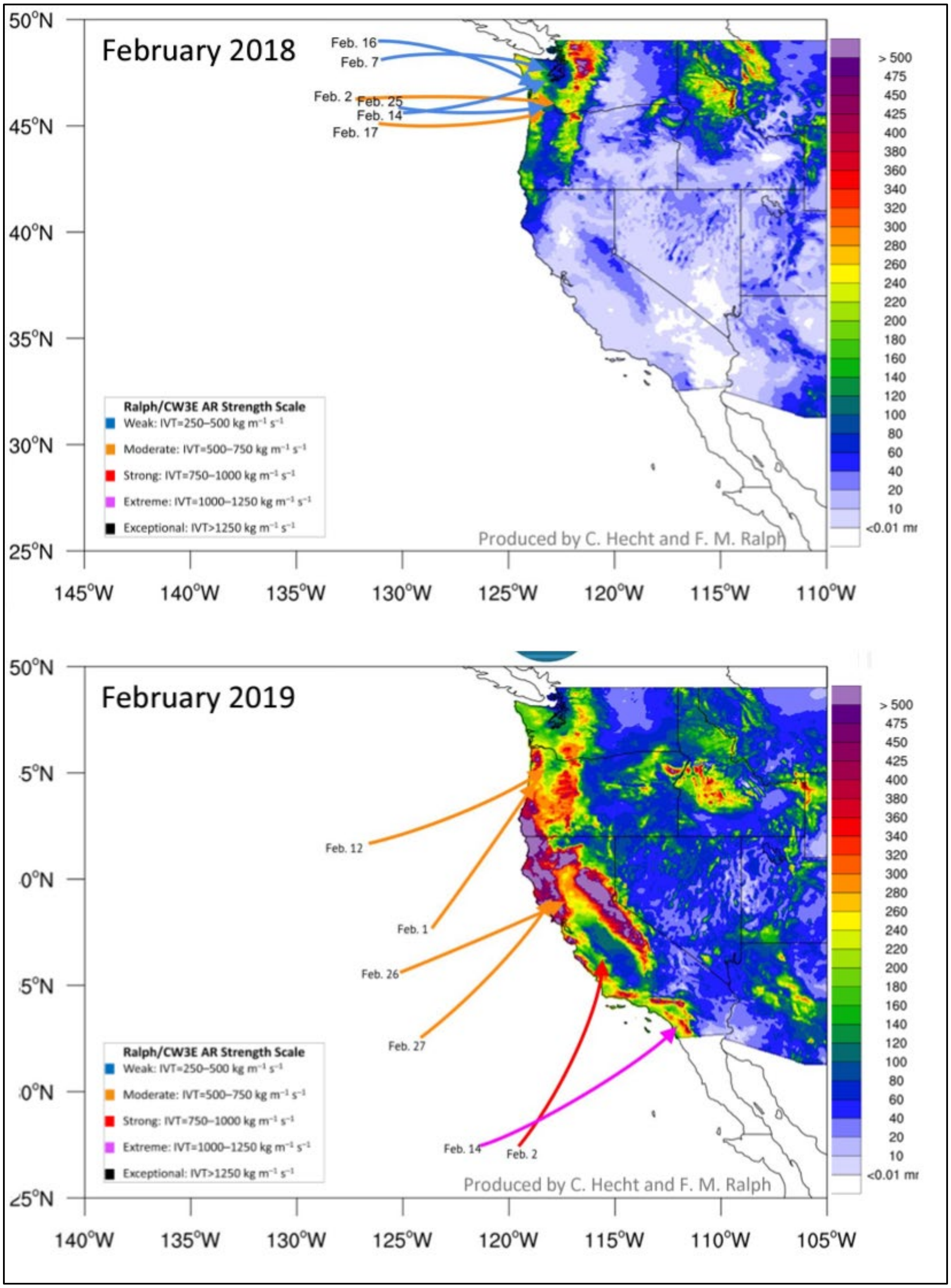
CATEGORY	DESCRIPTION	EXAMPLE
AR Cat. 1	Weak – Primarily beneficial	Feb. 2, 2017, AR hit California, lasted 24 hours at the coast, and produced modest rainfall.
AR Cat. 2	Moderate – Mostly beneficial, but also somewhat hazardous	Nov. 19-20, 2016, AR hit Northern California, lasted 42 hours at the coast, and produced several inches of rain that helped replenish low reservoirs after a drought.
AR Cat. 3	Strong balance of beneficial and hazardous	Oct. 14-15, 2016, AR lasted 36 hours at the coast, produced 5-10 inches of rain that helped refill reservoirs after a drought, but also caused some rivers to rise to just below flood stage.

AR Cat. 4	Extreme – Mostly hazardous, but also beneficial	Jan. 8-9, 2017, AR that persisted for 36 hours produced up to 14 inches of rain in the Sierra Nevada and caused at least a dozen rivers to reach flood stage.
AR Cat. 5	Exceptional – Primarily hazardous	Dec. 29, 1996, to Jan 2, 1997, AR lasted over 100 hours at the Central California coast. The associated heavy precipitation and runoff caused more than $1 billion in damages.

Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography at UC San Diego. Scale was developed by F. Martin Ralph Director of CW3E in collaboration with Jonathan Rutz of NWS.

In both February 2018 and 2019, the West Coast experienced six ARs. However, as shown in Figure 4-38, California experienced vastly different precipitation totals due to the location of the AR's landfall, as well as each AR's IVT. The ARs in February 2019 were all considered to be moderate to extreme, concentrated in California, and resulted in heavy precipitation; whereas the ARs in February 2018 had a negligible effect on California. Between October 2022 and March 2023, California was faced with an onslaught of additional ARs. Of the 31 ARs, one was categorized as extreme and six were strong. Almost half were moderate; 11 were weak (Toohey 2023). The strength of these ARs, as well as their locations, are shown in Figure 4-39.

Figure 4-38 Atmospheric River Strength and Land Distribution, February 2018 vs. February 2019



Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography at UC San Diego 2021-2026 Update P

Figure 4-39 Atmospheric Rivers Strength, October 2022 through March 2023

Source: Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, via the LA Times

Thunderstorms

While individual thunderstorm events may not pose significant damage or danger to the County, the combined occurrence of hail, lightning, and high winds with thunderstorms can result in considerable and potentially harmful effects.

Hail

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-63 indicates the hailstone measurements utilized by the NWS.

Table 4-63 Hail Measurements

AVERAGE DIAMETER	CORRESPONDING HOUSEHOLD OBJECT
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball

AVERAGE DIAMETER	CORRESPONDING HOUSEHOLD OBJECT
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: NWS

Distinguishing between storms that produce hailstones and those that do not is often challenging. The National Severe Storms Laboratory of NOAA indicates that nearly all severe thunderstorms likely generate hail, even though it may melt before reaching the ground. Multi-cell thunderstorms tend to produce numerous hailstones, though not typically the largest ones. The mature stage of these storms is relatively brief, limiting the time available for hailstone growth. In contrast, supercell thunderstorms, characterized by sustained updrafts, facilitate the formation of large hail by lifting hailstones repeatedly into the extremely cold air at the top of the thunderstorm cloud. Generally, hailstones measuring two inches (5 cm) or more in diameter are associated with supercells, while non-supercell storms can still produce golf ball-sized hail.

Hail falls when the thunderstorm's updraft can no longer support the weight of the ice, with the size of the hailstone directly linked to the strength of the updraft. Hail falls in distinct paths known as hail swaths, varying from a few acres to extensive areas measuring 10 miles wide and 100 miles long. On occasions, hail accumulations have been so substantial that snowplows were necessary for removal, and there have been reports of hail drifts several feet deep, composed of dime to nickel-sized hail. The impact of severe hailstorms on property can be significant, causing damage to vehicles, building roofs, and landscaping. Additionally, hail has the potential to inflict injuries on humans and, in rare instances, has led to fatalities.

Lightning

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. The County is at risk to experience lightning in any of these categories. The LAL is reproduced in Table 4-64.

Table 4-64 Lightning Activity Level Scale

CATEGORY	DESCRIPTION
LAL 1	No thunderstorms.
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

Source: NWS

4.3.10.6 Vulnerability Assessment

People

The entire County is susceptible to the impacts of heavy rain, thunderstorms, hail, and lightning, with certain areas facing heightened exposure due to their geographic location and local weather patterns. Portions of the County at higher elevations near the Sierra Nevada Crest and in the Tahoe Basin with extensive tree coverage may be most vulnerable to storm events accompanied with strong winds that could impact power lines and result in unplanned power outages, while lower elevation areas on the West Slope face an increased risk of potential flooding.

Among the more vulnerable populations are the elderly, low-income individuals, those who are linguistically isolated, people with life-threatening illnesses, and residents living in isolated areas without easy access to major roads. There are rural and isolated communities scattered across unincorporated El Dorado County, including the neighborhoods outside of the City of South Lake Tahoe, around the communities of Kyburz, Pollock Pines, Camino Sly Park, Pleasant Valley the communities north of Placerville around Georgetown, Spanish Flat, Greenwood, Garden Valley, Coloma, and Cool. For those relying on electricity for life support, power outages can pose life-threatening situations. The isolation of these populations becomes a significant concern during thunderstorms, hail, lightning, and high winds events, exposing them to potential harm and the secondary effects of the hazards.

Hikers and climbers in the region, particularly those travelling in the Eldorado National Forest and around the Sierra Nevada Crest also bear increased vulnerability to severe weather events. Additionally, visitors to the Tahoe Basin area may lack awareness of how swiftly thunderstorms can develop in mountainous terrain, adding an element of unpredictability to their exposure to adverse weather conditions.

Property

Weather phenomena can collectively pose significant challenges to both residents and property within the County. Heavy rain events, as documented by the NCEI, have occurred 156 times since 1950, resulting in over $10,000,000 in property damages. The recurrent nature of these heavy rain occurrences underscores the County's vulnerability to extreme weather conditions, placing stress on local communities and infrastructure.

Thunderstorms, accompanied by lightning, bring a dual threat of immediate safety concerns and the potential for wildfires during dry conditions, further endangering the well-being of residents and their properties. Hailstorms, as evidenced by recent incidents, can also wreak havoc on agricultural assets, causing extensive damage to fruit orchards and impacting the livelihoods of local farmers. The economic implications extend beyond agriculture, with severe hailstorms capable of damaging vehicles, roofs, and landscaping, thus posing a considerable threat to property. Long-term power outages and debris in roads and neighborhoods can also be a direct result of these storm events.

Critical Facilities and Lifelines

The transportation infrastructure in the area can be negatively impacted by occurrences of hail, heavy rain, and lightning, typically associated with secondary hazards. Extended heavy rainfall can lead to landslides, particularly in the western part of the County, and rockslides in the eastern part of the County, potentially obstructing roads (e.g. Echo Pass along U.S. Highway 50). This poses a significant concern for roads that provide access to isolated areas and the elderly, as the limited local road network may impede the movement of people and essential supplies in the County. For example, there are numerous single ingress/egress roads across the County (see the County Safety Element Background Report for more information). Prolonged blockage of major routes due to landslides, debris, or flooding also has the potential to disrupt the transportation of goods and other commercial activities.

Severe windstorms during heavy rain events and fallen trees can result in substantial impacts on electrical transmission and distribution lines and above-ground communication lines. The loss of electricity and phone connectivity could leave certain populations isolated, as residents may be unable to request assistance. Lightning events also carry destructive potential for power and information systems. A failure in these systems could have far-reaching consequences throughout the County, possibly disrupting the functions of critical facilities. Additionally, downed power lines may lead to blackouts, isolating large areas and exacerbating the challenges posed by severe weather events. Power outages would have the greatest impact on individuals that rely on electricity-dependent medical equipment.

Economy

The economic repercussions of severe thunderstorms are typically short-term, with lightning and high winds capable of causing power outages and fires. The enduring economic impacts, however, often stem from cascading hazards triggered by severe thunderstorms, such as wildfires ignited by lightning and ensuing flooding. Overall, severe thunderstorms pose a notable risk to the tourism economy and the outdoor recreation industry within the County. These events have the potential to disrupt travel both into and out of the County creating hazardous conditions for both residents and tourists alike.

According to the 2022 County of El Dorado Crop report, it is estimated that the impact of agriculture to the County's economy totaled approximately $565.8 million in 2022, of which Apple Hill and value-added products contributed an estimated $352.7 million while the wine industry added another $251.8 million. Apples and wine grapes, typically considered the highest grossing crop values, were decimated by a late freeze and severe weather in April 2022, as were most of the fruit and nut crops including olives, walnuts, stone fruit, and berries. Apple values in 2022 were $5.24 million representing an 83% decrease from 2021, and wine grape values were $4.18 million, representing a 42% decrease from 2021. These statistics show how detrimental severe weather can be for the economy of the agricultural sector of the County.

Cultural and Natural Resources

Severe thunderstorms in the County can significantly impact both cultural and natural resources. Lightning strikes, commonly associated with such storms, pose a direct threat to cultural landmarks and heritage sites, potentially causing structural damage or loss. The occurrence of hail during thunderstorms adds another layer of risk, particularly for outdoor sculptures, historical buildings, and artifacts.

In terms of natural resources, heavy rain during severe thunderstorms can result in flash floods and soil erosion, affecting local ecosystems. The inundation of water bodies may impact aquatic habitats and the overall biodiversity of the area. Additionally, the potential for flooding poses a risk to trails, park infrastructure, and archaeological sites. These severe weather events can disrupt cultural events and outdoor activities, impacting the engagement of residents and visitors. The tourism industry, often dependent on the allure of cultural and natural attractions, may also face short-term setbacks due to access issues and safety concerns associated with severe weather in the County.

Development Trends

Prospective development in the County will be exposed to severe weather events, including thunderstorms, hail, lightning, and high winds. The County's ability to withstand these impacts is tied to adopting sound land use practices and consistently enforcing codes and regulations for new construction. Equipping the County with codes and land use policies that can effectively manage the impacts of severe weather, including secondary effects like floods and landslides, is crucial for preparedness. Additional protective measures, relevant to both existing and future development, involve routine vegetation management practices, such as trimming of tree limbs around electrical power utilities and securing items prone to wind displacement when not in use in order to limit power outages and the loss of other utilities.

As development continues, the associated population growth implies an increasing number of individuals potentially exposed to severe weather. It becomes imperative for citizens, households, and businesses in the County to be adequately prepared to address these weather events. Having an emergency preparedness plan, which includes storing extra supplies such as food, water, flashlights, batteries, and firewood, and possessing a battery-operated radio within their homes or businesses is advisable. Concurrently, ongoing public education initiatives strive to enhance the population's understanding of the risks and vulnerabilities associated with outdoor activities, property maintenance, and regular exposures during periods of severe weather in the County, particularly for summer and winter storm events.

4.3.10.7 Risk Summary

- Flash floods, falling and downed trees, landslides, and downed power lines are the most significant secondary hazards associated with severe local storms.
- 156 heavy rain events have occurred since 1950 resulting in over $10,000,000 in property damages.
- Precipitation trends are expected to swing toward extreme values from both directions (drought and deluge) and maximum 1-day precipitation could hit 5.5 inches by mid-century and the maximum length of dry spell could reach more than 130 days in the West Slope by the end of the century.
- Precipitation will change over time with an overall concentration of events over a shorter period that will increase the likelihood of flooding.
- Climate change is expected to increase ARs in California, increasing the likelihood of heavy rain events.
- The overall significance of severe weather (heavy rain, thunderstorms, lightning and hail) is **medium.**

4.3.11 Severe Weather: Heavy Snow and Winter Storms

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Severe Weather: Heavy Snow and Winter Storms	Extensive	Highly Likely	Catastrophic	High

4.3.11.0 Hazard Description

As described in the Safety Element, winter snowstorms often originate as systems of low pressure from the Gulf of Alaska that move into the western United States. As the moist air masses push across the Sierra Nevada and Great Basin mountains, the air masses cool and the water condenses as snow. Some winter storms are accompanied by strong winds, creating blizzard conditions, severe snow drifting, and dangerous wind chills. In some instances, freezing rain may occur when very cold inland arctic air becomes trapped under warm moist air.

Winter storms can produce periods of widespread high winds. These winds of 40-60 mph typically precede the snow portion of a winter storm by a day or so and are most common from late fall through spring. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibility to only a few feet in areas where there are no trees or buildings.

The NWS describes different types of snow events as follows:

- **Blizzard** - Winds of 35 mph or more with snow and blowing snow reducing visibility to less than a quarter mile for at least 3 hours.
- **Blowing Snow** - Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls** - Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers** - Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Snow Flurries** - Light snow falling for short durations with little or no accumulation.

Ice, freezing rain, and sleet are also associated with heavy snow and winter storms. Freezing rain coats objects with ice. This ice coating on sidewalks, roads, etc., creates dangerous conditions. Sleet does not generally cling to objects like freezing rain, but it does make the ground very slippery. Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage; even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.

Winter storms can also generate flooding, usually as a result of ice jams or snowmelt, which can cause significant damage and loss of life. Ice jams form when long cold spells cause rivers and lakes to freeze and a rise in water level or a thaw breaks the ice into large chunks that become jammed at obstructions (e.g., a bridge). Water backs up at the jam, which is acting as a dam, and flooding results. The snowmelt hazard is defined as a sudden thaw of a heavy snowpack that often leads to flooding.

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

Furthermore, heavy snow can cause avalanches in areas along steep terrain. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees, power lines, electrical wires, and communication towers that result in long-term power outages; many of these impacts were evident during the recent snowstorm events in December 2021, December 2022 through January 2023, and again in March 2024 when multiple feet of heavy snow fell over a short period of time. During these conditions, communications and power may be disrupted for days until the damage can be repaired. In rural areas, homes and farms may also be isolated for days, and unprotected livestock may be lost. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. The cost of snow removal, damage repair, and business losses can have a tremendous impact on the County. The County has experienced 25 state emergency declarations from 1950 to 2017 (FEMA 2022). Of the 25, 18 were associated with severe winter storms, heavy rains, or flooding, and one was for a severe freeze event (FEMA 2022). Given this historical data, it is highly likely that both winter storms and heavy snow events will occur in the future.

4.3.11.1 Geographic Area

Extensive -The climate varies throughout the County, primarily based on elevation, which ranges from 700 feet above sea level in the far western portion of the County to more than 10,800 feet, in the peaks of the Sierra Nevada. The Sierra Nevada mountains act as a lifting mechanisms for air masses that migrate over them increasing the chance of precipitation. The County's proximity to the Pacific Ocean also brings cold and moist marine polar air masses across the County throughout much of the year, but especially during the winter months. Winters in the lower elevations are short, and precipitation is primarily in the form of rain. In higher elevations, winters vary from short and mild with moderate snowfall to moderately severe in the Tahoe Basin where frequent snowfall is common. Most of the precipitation throughout the County occurs between October and April.

Furthermore, the County is divided into two geographical areas to depict differences in future predicted annual average maximum temperature: the West Slope, which is predominantly below an elevation of 4,000 feet above mean sea level (msl) and includes the community of Camino, the City of Placerville, and all land west of the crest of the Sierra Nevada; and the Tahoe Basin, which is generally above 4,000 feet above msl, receives snowfall, and includes the City of South Lake Tahoe and all of the County east of Echo Summit and south of the community of

Tahoma and north of Hope Valley. The West Slope can receive more than 80 to 100 inches of snow/rain annually. In comparison, the Tahoe Basin's annual snowfall can vary from over 200 to 300 inches annually. .

4.3.11.2 Past Occurrences

As shown in Figure 4-40, winter storms and heavy snow hazards are not uncommon. Since 1950, there have been 500+ reports of winter storms that caused over $2,000,000 in property loss in combination with five deaths and nine injuries in El Dorado County (NOAA NCEI, 2023). In 2023, California's snowpack approached over 200% of its average for the season (CalMatter 2023).

In February 2023, a snow event occurred, resulting in snowfall reaching as low as Shingle Springs. This created hazardous conditions throughout the County, leading to power outages in Placerville, blizzard warnings for areas from Pollock Pines up to South Lake Tahoe, and excess snow loading on residences that resulted in collapsed roofs. Data from the UC Berkeley Central Sierra Snow Lab, situated at Donner Summit, reported the following measurements from the February 2023 event: 36 inches in the last 24 hours, 52.2 inches in the last 48 hours, and a total of 109.3 inches over the past 7 days. According to the Snow Lab's information, the snowpack on February 28 measured at 170% of the average.

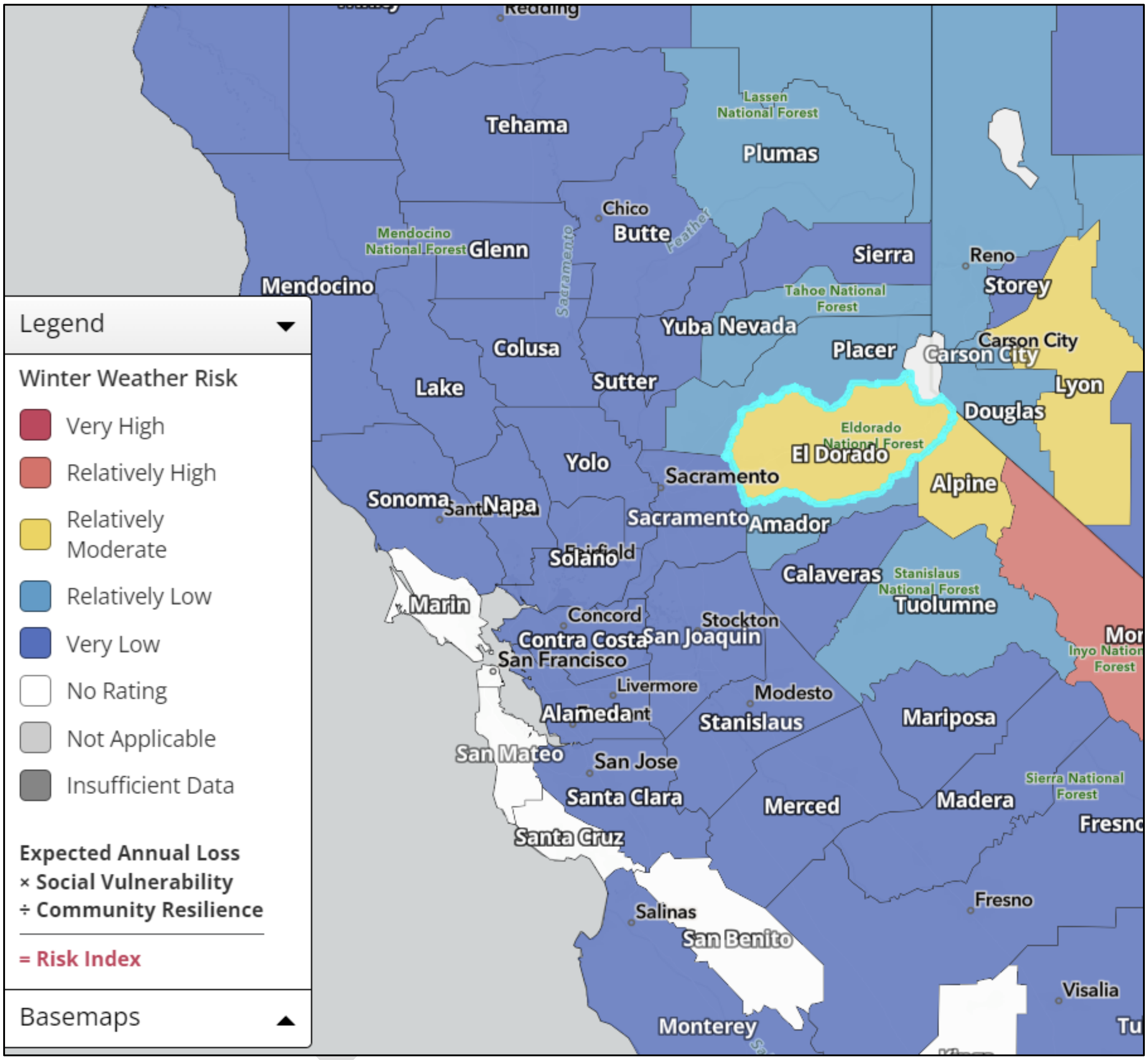
Figure 4-40 2023 Snowfall Impacting Roads Near South Lake Tahoe

Source: Caltrans, 2023.

4.3.11.3 Likelihood of Future Occurrences

Highly Likely – Given that climatic factors will continue influencing the weather and climate at the County and based on historical data, it is highly likely that both winter storms and heavy snow events are highly likely to occur in the future. Please see the Safety Element CVA on snow melt and precipitation data for further information on how climate change will intensify future heavy snow and winter storm events. As depicted in Figure 4-41, El Dorado County is at a moderate risk of winter storm events, which is higher than many of the surrounding counties in California.

Figure 4-41 Winter Weather Risk



Source NRI FEMA, 2023

4.3.11.4 Climate Change Considerations

As global temperatures rise, the region experiences alterations in precipitation patterns, affecting the frequency and intensity of winter storms. The warming climate may lead to shifts in snowfall levels and overall seasonal snowpack, potentially impacting the County's water resources and ecosystems. Changes in snowpack dynamics, crucial for water supply in the region, pose challenges for managing water resources. Additionally, rising temperatures can contribute to a higher likelihood of extreme weather events, such as intense winter storms or erratic snowfall over short periods of time, which can result in hazardous conditions for residents and disrupt local infrastructure.

According to the Cal-Adapt tool, the annual average maximum temperature for the County is expected to increase by 5.4 ˚F to 8.9 ˚F by the end-of-century. The annual average minimum temperature is expected to rise by the same values. This will result in less precipitation falling in the form of ice or snow, but increased precipitation falling in the form of rain. This is likely to lead to an increase in rain-on-snow flooding, an event which occurs when heavy snow precedes warm rain, resulting in mass snowmelt and rain runoff.

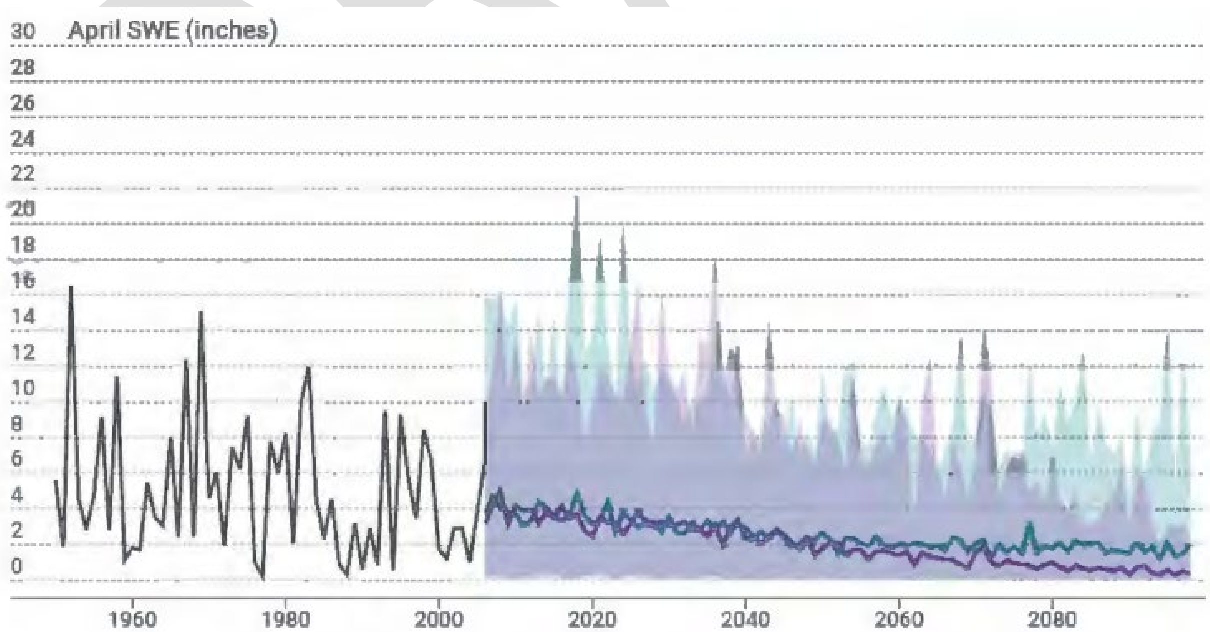
<u>Reduced Snowpack</u>

Snowpack is the accumulated snow that defines the dramatic peaks of the Sierra Nevada. In a warming climate, less precipitation is expected to fall as snow, leading to a reduced snowpack and a higher snow line (the elevation above which rainfall gives way to snowfall) over time. The snowpack plays a key role in the water cycle in western North America, storing water in the winter when the snow falls and releasing it as runoff in spring and summer when the snow melts. Millions of people in the West depend on the melting of mountain snowpack for hydropower, irrigation, and drinking water. In most western river basins, snowpack is a larger component of water storage than human-constructed reservoirs.

Snow Water Equivalent (SWE) is a measurement used to determine trends in snowpack. It is equal to the amount of water contained within the snowpack if it were to melt. SWE is often measured in April to determine changes in precipitation, although measurements may be taken throughout the year to gauge variability in seasonality. Spring snowpack at Donner Summit reached record-low levels in 2014, which were exceeded in 2015 by a SWE value of only 5% of average; however, as of March 2023 these levels are now above average (NRCS NWCC n.d.). Historically, the April SWE in the County has ranged from 4.1 to 6.6 inches (Cal-Adapt 2022).

Figure 4-42 shows how the County's SWE is projected to gradually drop throughout the century, resulting in an estimated SWE of 0.1 to 3.1 inches by the end-of-century. The purple area shows the High Emissions (RCP 8.5), the teal area shows the Medium Emissions (RCP 4.5) and the grey area shows the Observed emissions.

Figure 4-42 El Dorado County Projected SWE in April from 1960-2080



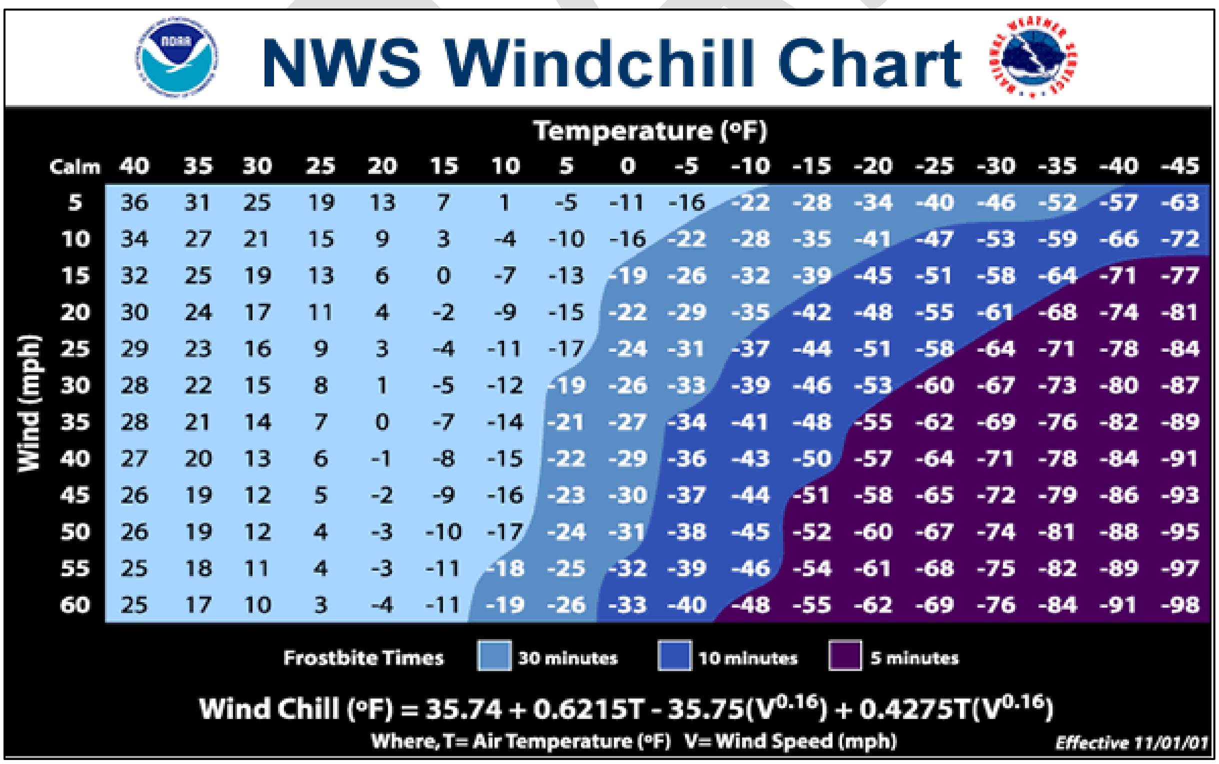
4.3.11.5 Magnitude and Severity

Critical - The classification of winter storms that cause issues in the County includes storms forecasted to be winter storm warnings or blizzard warnings. The NWS issues a winter storm warning when conditions that can quickly become life threatening and are more serious than an inconvenience are imminent or already occurring. Heavy snows, or a combination of snow, freezing rain or extreme wind chill due to strong wind, may bring widespread or lengthy road closures and hazardous travel conditions, plus threaten or result in the temporary loss of community services such as power and water. Deep snow and additional strong wind chill or frostbite may be a threat to even the appropriately dressed individual or to even the strongest person exposed to the frigid weather for only a short period.

The heavy snow and winter storms that occur in the County are often the result of AR events (see Table 4-62 for more information on the five AR categories and scales), and the magnitude of storms can be classified as an AR if it reaches an IVT threshold of 250 units; 1,000 IVT or more is considered to be "extreme" (Arcuni 2019). The most dangerous of all winter storms is the blizzard. A blizzard warning is issued when winds of 35 miles an hour will occur in combination with considerable falling and/or blowing snow for at least 3 hours. Visibilities will frequently be reduced to less than one-quarter mile and temperatures are usually 20 degrees Fahrenheit or lower. The blizzard marks the upper extent of severe winter storms that could be experienced in the County.

In 2001, the NWS implemented an updated Wind Chill Temperature index (see Figure 4-43). This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-43 National Weather Service Wind Chill Chart



NWS Windchill Chart

Temperature (°F)

Wind (mph) \ Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS

Winter storms and blizzards can result in multiple injuries and illnesses; major or long-term property damage that threatens structural stability; and/or interruption of essential facilities and services for 24-72 hours. This can include property damage, local and regional power and phone outages, and closures of streets, highways, schools, businesses, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly and contribute to high ground water tables and seepage into foundations. High snow loads also cause damage to buildings and roofs.

4.3.11.6 Vulnerability Assessment

People

Winter storms and heavy snow present many challenges within the County. The convergence of substantial snowfall and powerful winds has the potential to disrupt the County's power supply, leading to downed trees and power lines. This can impact transportation throughout the County, resulting in road closures and hindering the movement of people and goods and services. Homes, businesses, and government buildings may sustain damage, and there is a risk of fatalities due to threats like fire and electrocution. Power outages pose a significant concern, affecting various essential services such as heating, water pumping, refrigeration, lighting, computing, and communication systems like television and the internet. The interruption of power can be particularly life-threatening for individuals relying on electricity for life support.

Vulnerable populations, including the elderly, low-income, and linguistically isolated communities, may face increased isolation and exposure during severe winter weather events, along with secondary effects of the hazards. These socially vulnerable populations are concentrated mainly around the City of South Lake Tahoe, the unincorporated community of Meyers, and the communities near Echo Pass, Philips, Kyburz, and Strawberry. Outdoor enthusiasts engaged in recreational activities during severe winter events may also encounter challenges in terms of location and rescue.

Further, severe winter storms, characterized by snow and ice, create transportation difficulties, with uprooted trees and fallen limbs posing hazards to roads, structures, vehicles, and people. Road closures or restrictions to adequately equip vehicles are also common, resulting in lost productivity due to extended travel times. When roads are closed for avalanche prevention or snow removal, stranded drivers face an increased risk, potentially leading to carbon monoxide poisoning or hypothermia. The challenges posed by severe winter weather events in El Dorado County extend beyond transportation issues, impacting various aspects of daily life and safety for residents and visitors.

Property

The combination of substantial snow accumulation and powerful storms can lead to damages, including fallen trees and power lines, and substantial snow loading that can impact homes, businesses, and government buildings. Buildings would be the most exposed to severe winter weather, but structures in poor condition may be at most risk to damage. For example, vulnerability is influenced by both architecture and the types of construction materials; therefore, building susceptibility can vary on a building-by-building basis.

Property owners may also experience disruptions in essential services due to power outages, affecting heating, water pumping, and electronic devices. Individuals relying on electricity for medical needs face increased vulnerability. Property damage risks extend to structural issues, such as roof collapses. Adequate preparation is crucial to mitigate these risks and ensure property resilience against the challenges posed by severe winter weather in the county.

Critical Facilities and Lifelines

Critical facilities and essential infrastructure in the County are vulnerable to the impacts of severe winter weather. A primary concern is utility losses, with downed power lines leading to blackouts and isolating large rural communities. The functionality of phone, water, and sewer systems may be compromised. Roads can become impassable due to ice or snow, limiting the movement of people and supplies on available County roads and highways. Snowstorms can significantly disrupt transportation systems and public safety services, particularly on roads providing access to rural areas and vulnerable populations. Prolonged road closures may disrupt the shipment of goods, negatively impacting the region's economy. Additionally, rapidly melting snow combined with heavy rainfall can overwhelm both natural and manmade drainage systems, causing overflow, localized flooding, and property destruction.

Government offices may also face closures or reduced schedules during severe winter weather, and public schools could be closed or operating on a delayed start schedule during severe storm events. Schools are also often closed in the Tahoe Basin several days following a storm due to poor road conditions. Additionally, critical structures are at an increased risk due to snow loads on roofs, and the threat of falling trees or power lines. Power and phone lines may be knocked over, leading to electrical power loss and posing fire and electrocution threats. Uprooted trees and fallen limbs can also create hazards on roads, structures, and vehicles and pedestrians. Additionally, winter storms combined with violent winds may damage large, forested areas, causing economic losses to the forest products industry and recreation assets. Adequate preparedness is therefore essential to mitigate these risks and ensure the resilience of the County's infrastructure and services during severe winter weather events.

Economy

The County's local economy faces multifaceted challenges during severe winter weather events, encompassing critical infrastructure risks and operational threats to various industries. The impact of utility losses, especially from downed power lines, leads to blackouts, affecting essential services like phone, water, and sewer systems. Transportation systems, including County roads and highways, may be significantly disrupted, hindering the movement of people, supplies, and goods, thereby contributing to widespread economic consequences.

Businesses are particularly vulnerable to the interruption of power caused by winter storms, heavy snow, and high winds. The loss of electricity jeopardizes the functioning of crucial equipment, such as cash registers, gasoline pumps, and restaurant kitchen appliances, posing operational threats to industries like commerce, tourism, and recreation. The economic fallout extends to snow removal and restoration activities, with direct costs impacting the financial and insurance sector due to property damage. These disruptions may result in short-term regional or local impacts on business operations.

Cultural and Natural Resources

Severe winter weather can pose threats to natural resources, causing damage such as broken limbs and trees. Unseasonable storms may also harm or even lead to the death of plants and wildlife, potentially disrupting natural food chains until the next growing season. Historic structures, especially those constructed before building codes were established, are more susceptible to the impacts of severe winter storms due to their construction methods and age.

Cultural resources face similar vulnerabilities outlined in terms of property risks, compounded by lost revenue impacts stemming from transportation disruptions. The overall vulnerability of these resources is assessed as medium, emphasizing the need for proactive measures to safeguard against potential damages and economic losses associated with severe winter weather events.

Development Trends

Future development that is built to code should be able to withstand snow loads from severe winter storms. Pipes at risk of freezing should be mitigated be either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction.

Vulnerability to extreme cold will increase as the average age of the population in the County shifts. Greater numbers of future senior citizens will also result from the large number of baby boomers in the planning area. However, many of the residents of the County are self-sufficient and accustomed to rural living.

As development in the County continues in the higher elevation communities around the Tahoe Basin, the population is expected to grow, increasing the number of people potentially exposed to severe weather. Given the frequent occurrence of severe winter storms, heavy snowfall, and high winds in the County, it is crucial for individual citizens, households, and businesses to be well-prepared for these weather events. Residents and businesses are advised to create a comprehensive plan that includes storing extra supplies such as food, water, flashlights, batteries, firewood, and a battery-operated radio at home or in their establishments. Often residents and visitors are also discouraged to travel during these storm events to minimize the number of people of the roads.

4.3.11.7 Risk Summary

- Annual average maximum temperature for the County is expected to increase by 5.4 ˚F to 8.9 ˚F by the end-of-century, resulting in less precipitation falling in the form of ice or snow, but increased precipitation falling in the form of rain.
- Increased temperatures and altered precipitation patterns are likely to lead to an increase in rain-on-snow flooding.
- Rapidly melting snow combined with heavy rainfall can overwhelm both natural and manmade drainage systems, causing overflow, localized flooding, and property destruction.
- Snow loads that exceed the weight the building was designed to withstand may be susceptible to collapse or failure and increased snow loads are exacerbated by higher moisture content in the snow that increases the weight of the snow on structures.
- The most significant secondary hazards associated with severe local storms are flash floods, falling and downed trees, landslides, and downed power lines.
- There have also been 500+ reports of winter storms since 1950 that caused over $2,000,000 in property loss in combination with five deaths and nine injuries in El Dorado County.
- The Sierra Nevada snowpack is critical for water supply and acts as a natural reservoir for the County's water supply.
- Increasing temperatures cause earlier snowmelt, accelerates the start of the wildfire season, and results in negative impacts on water-dependent sectors and natural resources.
- Snowpack is predicted to decrease throughout the century and rising temperatures will raise the snow line – the average lowest elevation at which snow falls.
- Changes in snowpack can affect agriculture, winter recreation, and tourism in some areas, as well as hydropower production.
- The overall significance of severe weather (winter storms and heavy snow) is **high.**

4.3.12 Severe Weather: Tornadoes and High Winds

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Severe Weather: Tornadoes and High Wind	Extensive	Highly Likely	Critical	Medium

4.3.12.0 Hazard/Problem Description

High Winds

NWS defines high wind events as events during which sustained wind speeds of 40 miles per hour (mph) or greater last for 1 hour or longer, or winds of 58 mph or greater last for any duration. Strong winds are directly caused by large differences in atmospheric pressure from a storm and the surrounding environment. Winds can be further enhanced in localized areas on the leeward side of mountain ranges in what is called a downslope windstorm. Wind gusts in these situations can exceed 80 mph, reaching nearly 100 mph in the most extreme cases.

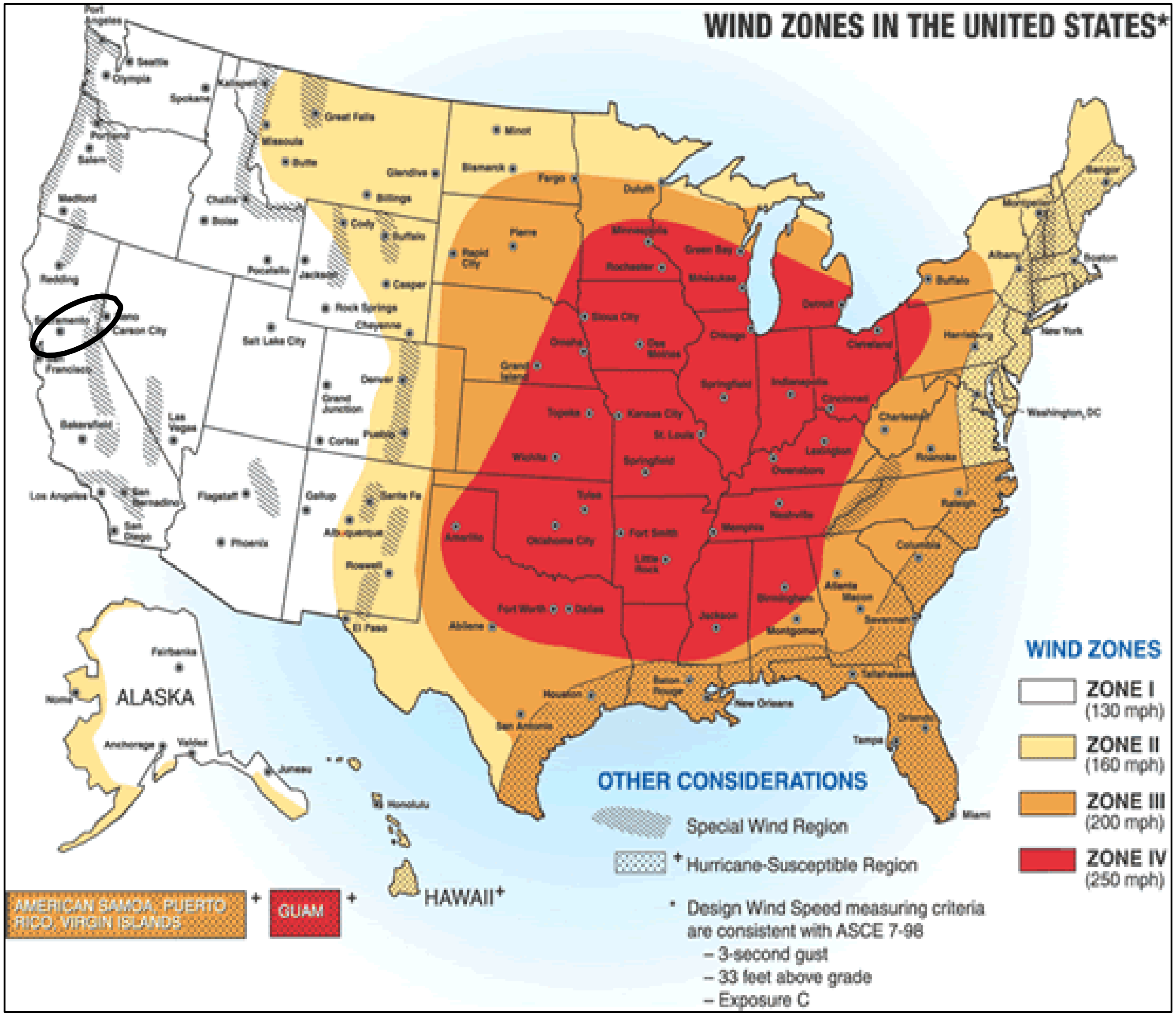
High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss.

California's Fourth Climate Assessment indicated that extreme fire weather, particularly in the form of hot and dry winds, can strongly influence shrub-land fire regimes. Strong winds have been associated with severe forest fires in California, meaning that climate change impacts on wind patterns may also affect forest health and wildfire susceptibility. Winds have the critical effect of drying out the air as the air descends after passing over mountain peaks. When the ultradry air overlays parched vegetation, tinderbox conditions develop, which facilitate extreme fire growth.

According to California Department of Forestry and Fire Protection (CAL FIRE, climate change is considered a key driver of California's flare-up fire activities in the past decade (CALFIRE 2021). Changes in Santa Ana and Diablo winds, which led to some of the most devastating wildfires in California, were assessed as evidence that climate change is worsening their effects. At this time, these changing factors are not well understood and are currently incorporated into state and regional research and risk analysis.

Figure 4-44 depicts wind zones for the United States. The map denotes that El Dorado County falls into Zone I, which is characterized by high winds of up to 130 mph. Portions of the County also fall into a Special Wind Region.

Figure 4-44 Wind Zones in the United States



Source: FEMA, 2020

Tornadoes

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

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado.

Table 4-65 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-65 Enhanced Fujita Scale

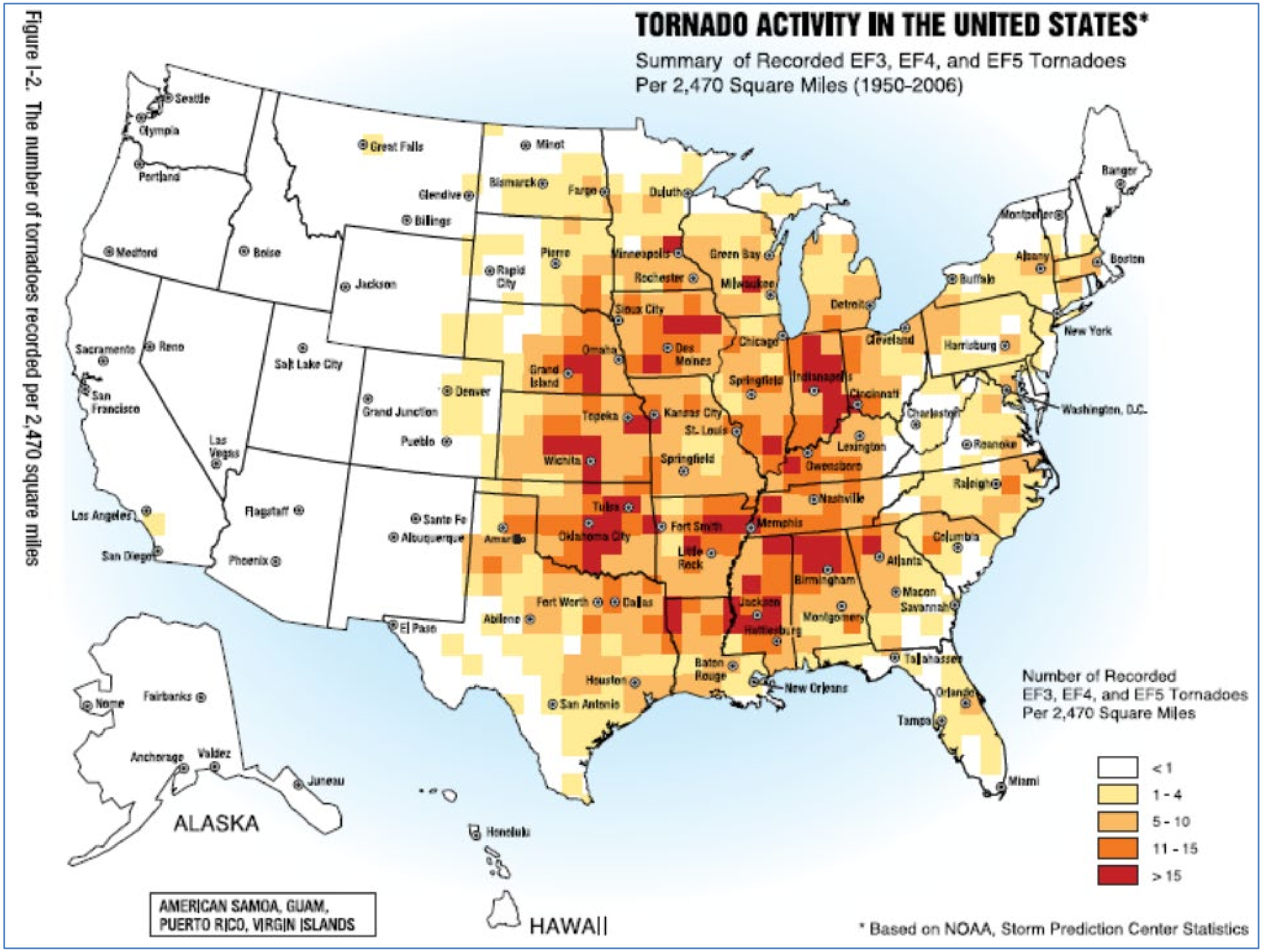
ENHANCED FUJITA (EF) SCALE	ENHANCED FUJITA SCALE WIND ESTIMATE (MPH)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

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

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

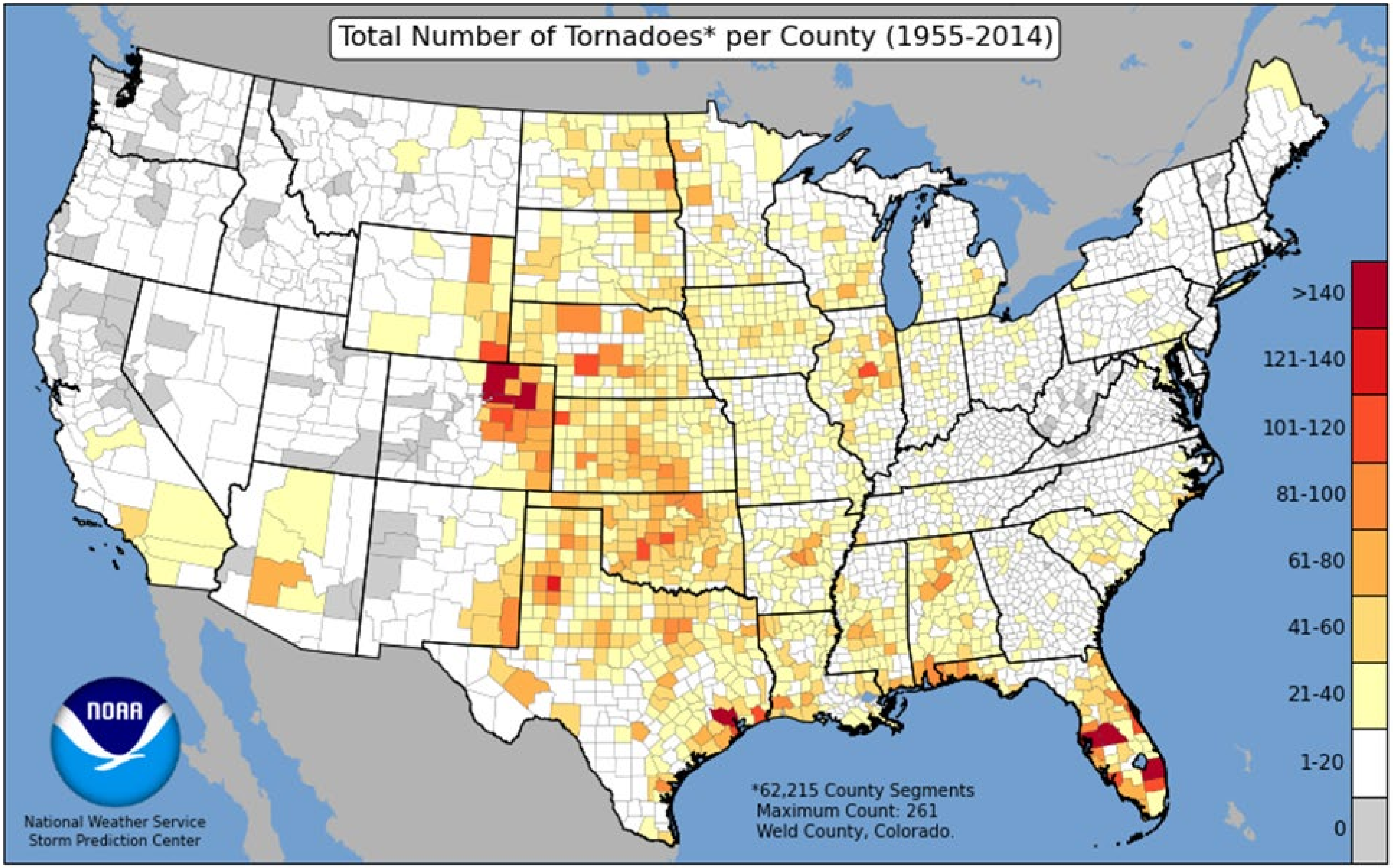
Figure 4-45 illustrates the number of F3, F4, and F5 tornadoes recorded in the United States per 2,470 square miles between 1950 and 2006. Figure 4-46 illustrates the total number of tornadoes per county from 1955 to 2014.

Figure 4-45 Tornado Activity in the United States



Source: Taking Shelter from the Storm (FEMA 2008)

Figure 4-46 Total Number of Tornadoes per County, 1955-2014



Source: NOAA

4.3.12.1 Past Occurrences

According to the NCEI, since 1950 there have been 225 high wind events and five tornado events, causing 5 deaths, 2 injuries and over $14,000,000 in property damages.

4.3.12.2 Likelihood of Future Occurrence

Highly Likely – Although tornadoes are less frequent, high wind events will continue to occur in the County. High wind events are associated with winter storms, thunderstorms, and wildfires and they will continue to occur in the future.

4.3.12.3 Climate Change Considerations

Currently, there is insufficient data or research to accurately quantify the extent of climate change's impact on tornado frequency and intensity. NASA's Earth Observatory has undertaken studies to explore the correlation between climate change and tornadoes. From these investigations, meteorologists acknowledge uncertainty regarding why certain thunderstorms generate tornadoes while others do not, except for the requirement of a specific wind shear.

Tornadoes typically emerge from approximately 1 percent of thunderstorms, predominantly supercell thunderstorms in environments conducive to rotation. Some studies, as mentioned in the summer storm profile, suggest the potential for a decrease in wind shear in mid-latitude areas. The influence of climate change on tornadoes remains uncertain, emphasizing the need for future updates to mitigation plans that incorporate the latest research on potential changes in tornado hazard frequency and severity. Regular reassessment of the significance of this hazard over time is warranted due to the evolving nature of our understanding of climate-related impacts on tornado activity.

Tornado Spotted Over Folsom Lake at 3 p.m. on Thursday, Dec. 24, 2015. For this event, a tornado warning was issued for the southwest region of El Dorado County and northwest Amador County, with the alert expiring at 4:30 p.m. The thunderstorm responsible for the tornado was moving east at approximately 20 mph, posing a threat to areas including El Dorado Hills, Cameron Park, Rescue, and Shingle Springs. It's improbable that the tornado remained consistently on the ground, as it likely alternated between being airborne and making contact with the ground as it progressed eastward.

The tornado traversed a path of 5 to 8 miles through western El Dorado County, stretching from Folsom Lake to Cameron Park. Reports of damage emerged from El Dorado Hills and Cameron Park, including structural damage and roof damage to a business on Green Valley Road. Approximately 5 to 6 miles away, a Cameron Park neighborhood experienced damage, with residents citing roof damage, downed trees, and broken fences along Sandpiper Way.

Source: Michell Truax, 2015.

4.3.12.4 Magnitude and Severity

Critical - The severity of a tornado is determined by the extent of damage it causes to structures and vegetation. EF0 tornadoes may result in minimal damage, while EF5 tornadoes can cause total destruction, see Figure 4-47 High winds, often associated with severe weather events, can also vary in magnitude and severity. The Beaufort Wind Scale is commonly used to assess wind speeds, ranging from Force 0 (calm) to Force 12 (hurricane). The severity of high winds is determined by their impact on the environment, structures, and human activities. Lower wind speeds may lead to minor disruptions, such as downed tree limbs, while higher wind speeds can result in more extensive damage, including uprooted trees, structural damage, and power outages.

Figure 4-47 Potential Damage Impacts from a Tornado

Source: National Oceanic and Atmospheric Administration

4.3.12.5 Vulnerability Assessment

People

People in El Dorado County face significant risks and impacts associated with tornadoes and high winds, both of which can have severe consequences on communities and individuals. Tornadoes, characterized by powerful rotating columns of air, pose a direct threat to life and property. The impact of a tornado can range from moderate structural damage to complete devastation, depending on the tornado's intensity. Residents must be prepared to respond swiftly to tornado warnings, seeking shelter in designated safe areas to minimize the risk of injury.

High winds, often associated with severe weather events, can also have substantial impacts on people and their surroundings. Strong winds can result in downed trees, power lines, and structural damage, leading to disruptions in transportation and utilities. Individuals should be cautious during high wind events, particularly when engaging in outdoor activities or navigating through affected areas. Falling debris, flying objects, and potential structural damage can pose significant risks to personal safety. While there is currently insufficient data on how climate change may impact tornado frequency and intensity, it is unlikely to have a disproportionate impact on socially vulnerable populations except that they would have a more difficult time responding to and recovering from the damage caused by the wind event.

Property

Property in El Dorado County is vulnerable to substantial risks and damages associated with tornadoes and high winds. Tornadoes, characterized by their intense rotating winds, have the potential to cause significant structural damage or complete destruction to homes, businesses, and infrastructure. The impact on property can range from roof damage and broken windows to the total collapse of buildings, depending on the tornado's strength.

High winds, often accompanying severe weather events, pose additional threats to property. Strong winds can result in the uprooting of trees, damage to roofs and siding, and the toppling of structures such as fences and outdoor installations. Property owners should take preventive measures, such as securing loose objects, trimming tree limbs, and reinforcing vulnerable structures, to minimize potential damages.

In the aftermath of tornadoes and high wind events, property owners may face challenges related to insurance claims, reconstruction, and restoration efforts.

Critical Facilities and Lifelines

The repercussions of tornado damage on infrastructure often lead to secondary impacts. The presence of downed power and communications transmission lines, along with disruptions in transportation, introduces challenges in both reporting and responding to emergencies. These indirect consequences exert significant pressure on a community.

In the immediate aftermath, of a tornado the primary focus shifts to emergency services. Law enforcement concentrates on securing the scene, while fire and EMS personnel prioritize rescuing the injured, managing fires resulting from broken gas lines or similar hazards, and contributing to the cleanup efforts. Utility crews work towards restoring power, phone, communication, and other essential services. Public gathering places, encompassing but not limited to schools, community centers, shelters, nursing homes, and churches, might experience heightened impacts during specific times of the day if struck by a tornado.

Economy

The economic consequences of tornadoes hinge on factors such as their size and trajectory. For instance, an EF5 tornado striking a densely populated business area or critical infrastructure could result in a significant and lasting economic impact. Smaller businesses, in particular, may face more pronounced effects, experiencing prolonged closures due to extensive destruction. Additionally, there could be broader economic repercussions, such as heightened insurance payouts and increased premiums, as a result of the widespread damage caused by the tornado.

Cultural and Natural Resources

Tornadoes and high winds present notable risks and potential impacts on both cultural and natural resources in El Dorado County. The magnitude of these weather events can lead to severe consequences for historical structures, landmarks, and artifacts that contribute to the cultural heritage of the region. Tornadoes, especially when accompanied by high winds, can cause structural damage, deterioration, or destruction to these valuable resources, posing a threat to the preservation of local history.

Additionally, the impact on natural resources is significant, affecting ecosystems, wildlife habitats, and scenic landscapes. High winds can also uproot trees, damage vegetation, and disturb the delicate balance of natural habitats. Tornadoes, in particular, may alter the landscape, impacting the ecological diversity and disrupting the natural processes that support local wildlife.

Development Trends

New urban development in El Dorado County can increase the region's vulnerability to tornadoes and high winds. Ongoing residential development, driven by population growth and lifestyle preferences, poses challenges in terms of mitigating the impact of severe weather events on new housing structures. As neighborhoods expand, there is an increasing need for incorporating resilient construction practices to withstand the potential damages caused by tornadoes and high winds.

Similarly, commercial and infrastructure development, essential for economic growth, require thorough planning and design to address the susceptibility of these areas to severe weather. Retail centers, office spaces, and public facilities should also integrate designs that prioritize safety and resilience against the impact of tornadoes and high winds, ensuring the continuity of business operations and community services during and after such events.

4.3.12.6 Risk Summary

- High winds and tornadoes spread wildfires and increase their intensity.
- High winds can cause significant property, infrastructure, and crop damage related to downed trees, damaged power lines, and agricultural loss.
- High winds can threaten public safety and have adverse economic impacts from business closures and power losses associated with Public Safety Power Shutoffs (PSPS).
- High wind events that are combined with other natural hazards, such as hail, can disrupt daily activities, cause damage to buildings and structures, and increase the potential for other hazards.
- The overall significance of severe weather tornadoes and high wind is **medium.**

4.3.13 Subsidence

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Subsidence	Limited	Unlikely	Moderate	Low

4.3.13.0 Hazard/Problem Description

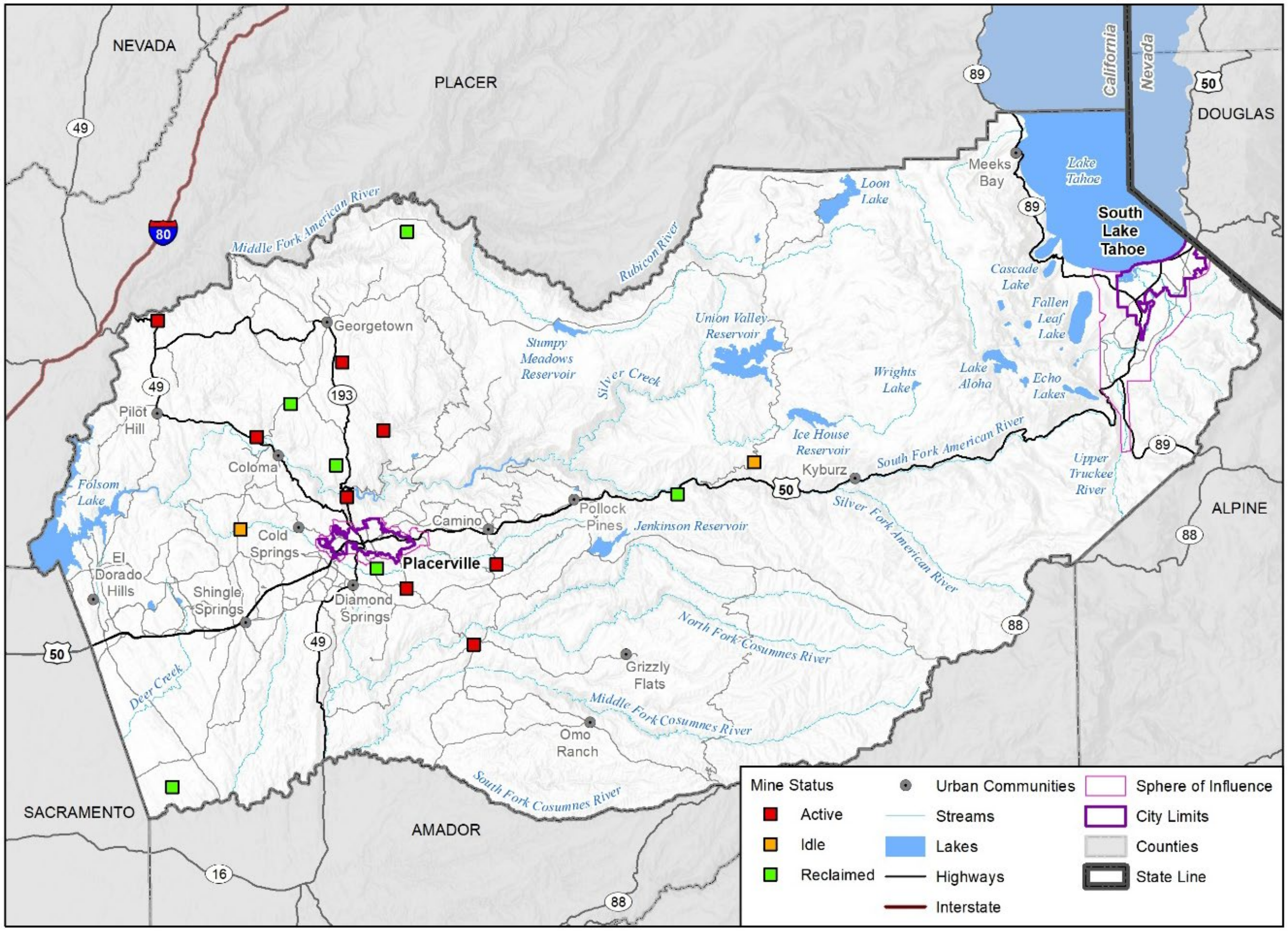
Land subsidence is defined as the sinking of the land over man-made or natural underground voids. Subsidence can result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate the natural processes of subsidence. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

The County's historical legacy, rooted in the Gold Rush era, has left behind a complex network of underground tunnels and excavations from mining, setting the stage for subsidence risks. One of the contributing factors is the ongoing challenge of groundwater extraction. With agriculture playing a prominent role in the region, the demand for water is substantial. Excessive withdrawal of groundwater for various purposes, including irrigation, can lead to soil compaction and subsequent land subsidence. This poses not only environmental concerns but also potential hazards for the communities residing in El Dorado County. As the ground shifts beneath, infrastructure integrity, property values, and overall community well-being are at stake, emphasizing the need for sustainable water management practices to mitigate subsidence hazards.

In El Dorado County, the type of subsidence of greatest concern is the settling of the ground over abandoned mine workings. Past mining activities have created surface subsidence in some areas and have created the potential for subsidence in other areas. Most of these abandoned mines are located west of Pollock Pines with several located in the Placerville, Coloma, Diamond Springs, Georgetown, Cool, Swansboro, Somerset, Grizzly Flats, Mt. Aukum, Shingle Springs, Rescue and Cameron Park. Figure 4-48 shows the status of mines in El Dorado County and Figure 4-49 shows the extent of abandoned mines in California in relation to the County.

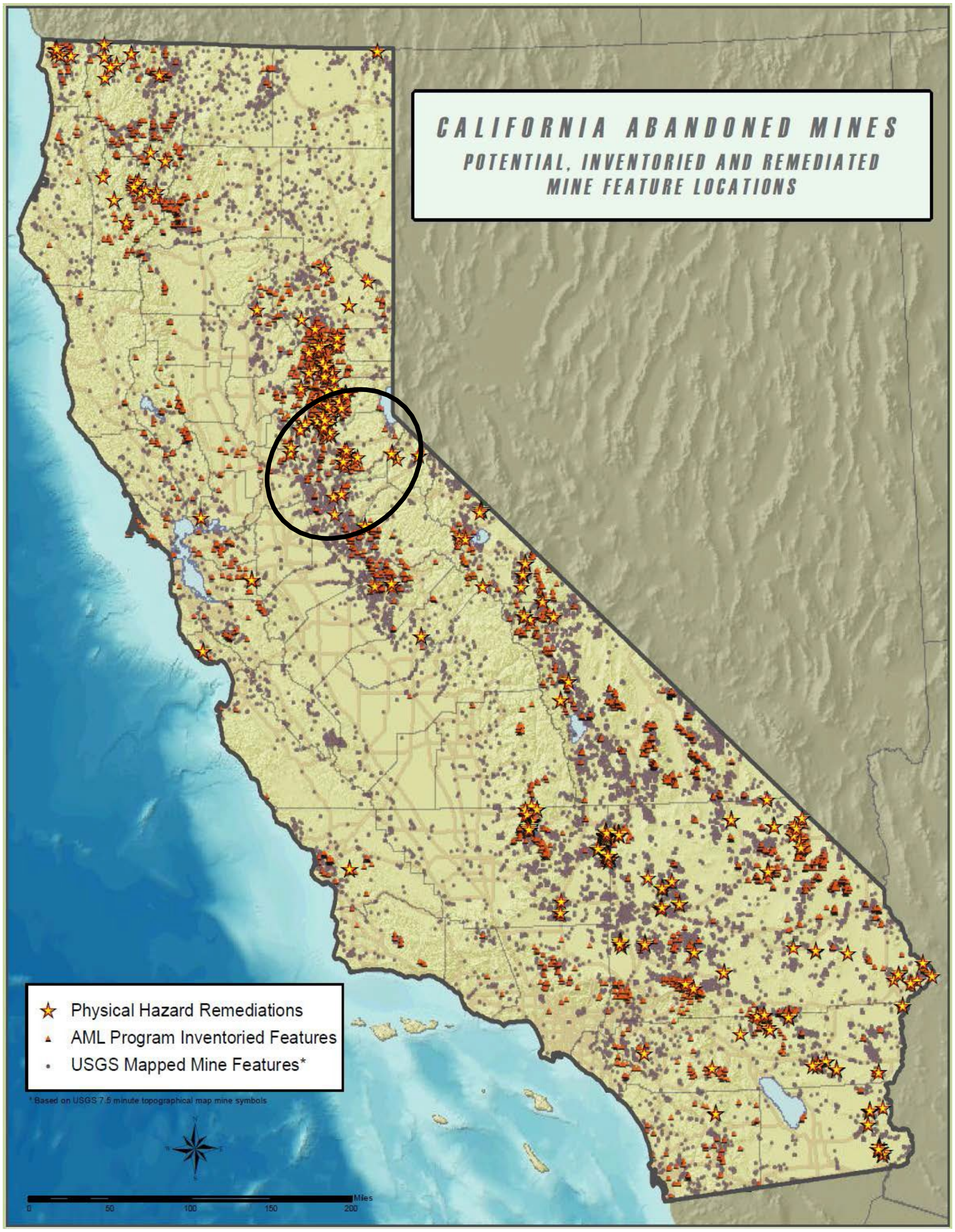
In addition to mines, the County is at risk to subsidence from karst. Distinctive surficial and subterranean features developed by solution of carbonate and other rocks and characterized by closed depressions, sinking streams, and cavern openings are commonly referred to as karst. Originally the term defined surface features derived by solution of carbonate rocks, but subsequent use has broadened the definition to include sulfates, halides, and other soluble rocks. The term has been expanded also to cover interrelated forms derived by solution on the surface in the subsurface. Most of the problems created by karst pertain to subterranean karst and pseudokarst features that affect foundations, tunnels, reservoir tightness, and diversion of surface drainage. A map of volcanic rocks with the potential for pseudokarst features in El Dorado County is provided in Figure 4-50. Areas in the eastern portion of the County show a risk to karst.

Figure 4-48 El Dorado County Mine Sites by Status



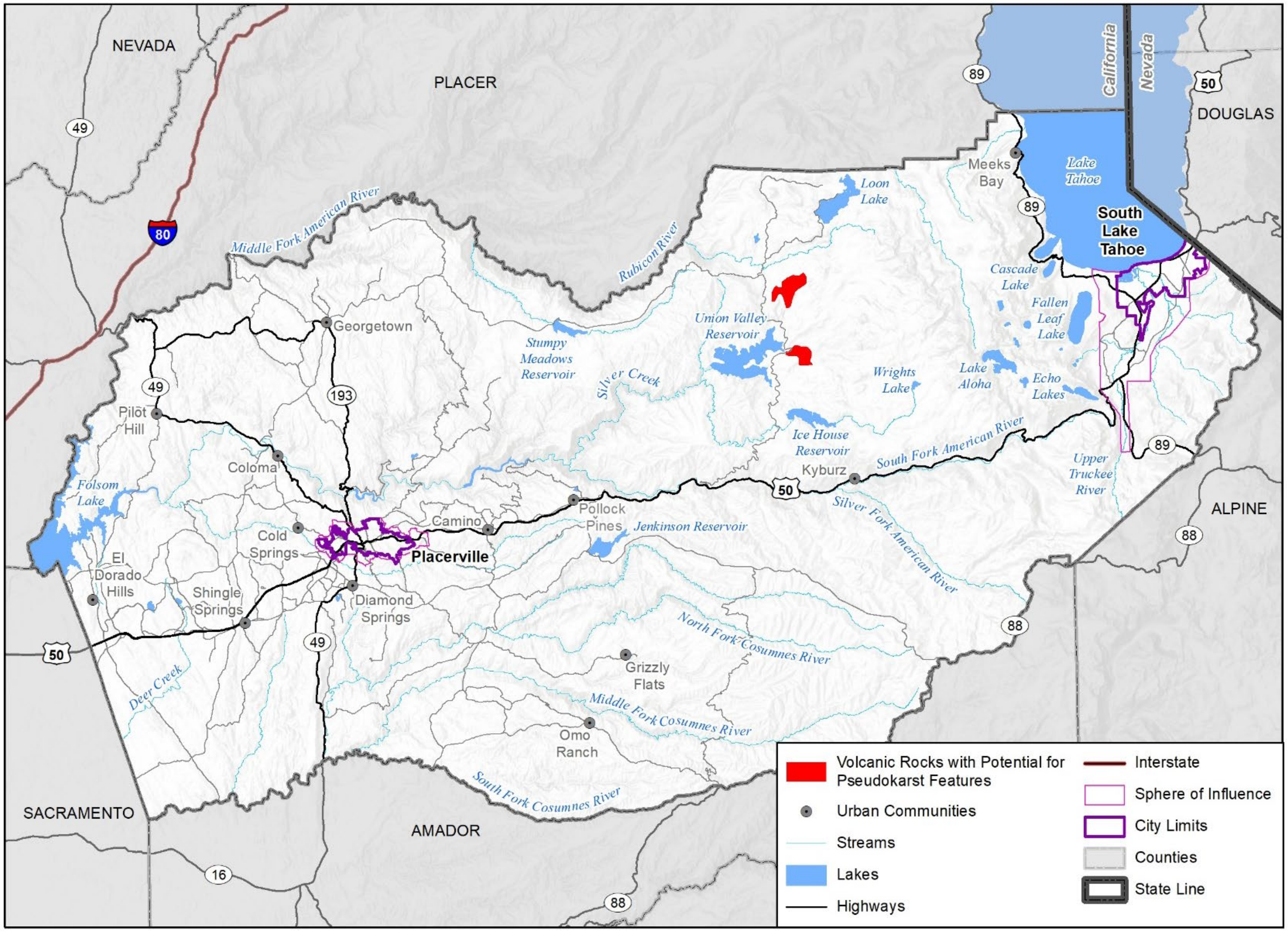
Map compiled 1/2024;
Intended for planning purposes only.
Data Source: El Dorado County, Department of Conservation, Division of Mine Relamation (DMR)

Figure 4-49 Abandoned Mines in California



Source: California Department of Conservation, Office of Mine Reclamation

Figure 4-50 El Dorado County Potential for Pseudokarst



Map compiled 3/2024;
Intended for planning purposes only.
Data Source: El Dorado County, USGS

0 5 10 Miles

N

Past Occurrences

Disaster Declaration History

There have been no disaster declarations related to subsidence in El Dorado County.

NCEI Events

The NCEI database does not track subsidence.

HMPC Events

There have been no documented events of land subsidence in El Dorado County. However, given the history of mining activity, the potential for subsidence to does still exist.

4.3.13.1 Likelihood of Future Occurrence

Unlikely—Historically, land subsidence issues in the County have been minimal. However, given the history of mining activity within El Dorado County, the potential exists for subsidence to occur.

4.3.13.2 Climate Change Considerations

Climate change is unlikely to change the effects of subsidence (abandoned mines and karst) in the County. However, data is showing that the groundwater table is lowering causing subsidence in California which can be caused by the changes in precipitation and periods of drought.

4.3.13.3 Magnitude Severity

Moderate - Subsidence is considered to have negligible magnitude. Less than 10% of property would be severely damaged, and the shutdown of facilities and services would be for less than 24 hours. There were no injuries, deaths, or property damages due to sinkholes in the County.

4.3.13.4 Vulnerability Assessment

People

Subsidence in the County has direct implications for the residents and communities within the region. As the land gradually sinks or settles, it can have profound effects on people's lives. Property owners may face structural damage to their homes and infrastructure, impacting the overall value of their investments. Additionally, subsidence can disrupt essential services such as roads, utilities, and drainage systems, affecting the day-to-day lives of residents.

In agricultural communities where groundwater extraction is prevalent, subsidence can pose a threat to the stability of farmland. The sinking of the land may result in uneven terrain, affecting crop yields and the livelihoods of farmers. Moreover, subsidence can lead to an increased risk of flooding as natural drainage patterns are altered, potentially causing damage to homes and posing safety concerns for residents.

Property

The impact on property values is a crucial concern. Homes in areas prone to subsidence may face decreased demand in the real estate market due to the associated risks and potential damages. Prospective buyers may be deterred by the uncertainty surrounding the stability of the land and the potential costs of repairing subsidence-related issues.

Property insurance considerations also come into play. Insurance premiums may increase for homes in areas with a history of subsidence, reflecting the heightened risk of damage. Some insurance providers may even impose restrictions or exclusions related to subsidence, leaving property owners financially vulnerable in the event of subsidence-related incidents.

Critical Facilities and Lifelines

Critical facilities, including hospitals, emergency response centers, and utility substations, are at risk of structural damage. The integrity of these structures is crucial for maintaining public safety and providing essential services during emergencies. Subsidence can compromise the functionality of these facilities, potentially leading to disruptions in healthcare services and emergency response capabilities.

Lifelines, such as transportation and utility networks, are also susceptible to subsidence-related hazards. Roads and bridges may experience structural stress and deterioration, affecting transportation routes vital for evacuations and daily commuting. Underground utilities, including water and sewer pipelines, can be compromised, leading to service interruptions and potential environmental concerns.

The consequences of subsidence on critical facilities and lifelines extend beyond immediate structural damage. Disruptions to essential services can have cascading effects on the overall well-being of the community, impacting public health, safety, and economic stability.

Economy

In agricultural communities, where groundwater extraction is common, subsidence can directly impact crop yields and agricultural productivity. Uneven terrain resulting from land sinking may disrupt traditional farming practices, leading to increased costs for farmers and potential revenue losses. This, in turn, can have a ripple effect on the broader regional economy, given the importance of agriculture in El Dorado County.

The real estate sector is also vulnerable to subsidence-related economic challenges. Reduced property values in areas prone to subsidence can impact homeowners' equity and influence housing market dynamics. Potential buyers may be discouraged by the associated risks, leading to decreased demand and affecting the overall economic vitality of the real estate market.

Infrastructure development and maintenance costs represent another economic consideration. Subsidence can result in increased expenses for repairing and reinforcing critical infrastructure such as roads, bridges, and utilities. These costs, borne by local governments and agencies, can strain budgets and divert resources away from other essential services and projects.

Development Trends

One of the primary effects of subsidence is on infrastructure development. Subsidence can lead to increased maintenance costs and challenges in ensuring the stability of roads, bridges, and utilities. This, in turn, may impact the planning and execution of infrastructure projects, potentially diverting resources towards addressing subsidence-related issues.

In the realm of real estate, the occurrence of subsidence can affect property values and market dynamics. Reduced stability of the land may deter potential buyers and impact the demand for housing in affected areas. Developers and investors may need to consider subsidence risks in their decision-making processes, influencing the locations chosen for new projects.

The agricultural sector, a significant component of El Dorado County's economy, can also feel the effects of subsidence. Changes in land elevation and uneven terrain may disrupt traditional farming practices, affecting crop yields and potentially leading to economic challenges for local farmers.

Cultural and Natural Resources

Historical sites and structures face the threat of compromised integrity, with foundations susceptible to shifting ground. This jeopardizes the preservation of cultural landmarks and disrupts archaeological sites, potentially leading to damage and loss of valuable artifacts. For natural resources, the sinking or settling of the land can alter landscapes, impacting the scenic beauty of natural areas. Changes in land elevation may affect water resources, soil quality, and wildlife habitats, influencing ecosystems and biodiversity. The interconnectedness of these effects underscores the importance of preservation efforts and sustainable land-use practices to safeguard the region's cultural and environmental heritage.

4.3.13.5 Risk Summary

- There have been no documented events of land subsidence in El Dorado County. However, given the history of mining activity, the potential for subsidence to occur exists,
- In addition to mines, El Dorado County is at risk to subsidence from karst.
- County's vulnerability to subsidence is associated with abandon mines and culverts located west of Pollock Pines with several located in the Placerville, Coloma, Diamond Springs, Georgetown, Cool, Swansboro, Somerset, Grizzly Flats, Mt. Aukum, Shingle Springs, Rescue and Cameron Park.
- The overall significance of the subsidence hazard threat to the County is **low**.

4.3.14 Wildfire

HAZARD	GEOGRAPHIC AREA	LIKELIHOOD OF FUTURE OCCURRENCE	MAGNITUDE/ SEVERITY	SIGNIFICANCE
Wildfire	Extensive	Highly Likely	Catastrophic	High

4.3.14.0 Hazard/Problem Description

Wildfires pose a substantial threat across California, with a noticeable surge in frequency, intensity, and scale over the past 25 years. These uncontrolled fire events can arise from both natural sources like lightning and human-related causes such as discarded cigarettes, arson, vehicle fires, abandoned campfires, and electrical malfunctions. Unchecked, wildfires can rapidly spread and endanger lives, property, and natural habitats.

Wildfires can occur in undeveloped areas or at the Wildland-Urban Interface (WUI), where development overlaps with wildfire-prone areas. Grasslands and brush-heavy locations are common wildfire sites, often ignited by lightning, downed powerlines, mechanical equipment, or human activities like debris burns, carelessness, or arson. While wildfires often begin in undeveloped and public lands, they can extend to urban areas, posing threats to people, property, and wildlife. Moreover, risks are often associated with WUI regions, but significant wildfires can also impact densely populated areas.

Wildland Urban Interface

WUI fires are the most damaging. WUI fires occur where the natural and urban development intersect. Even relatively small acreage fires may result in disastrous damages. WUI fires occur where the natural forested landscape and urban-built environment meet or intermix. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

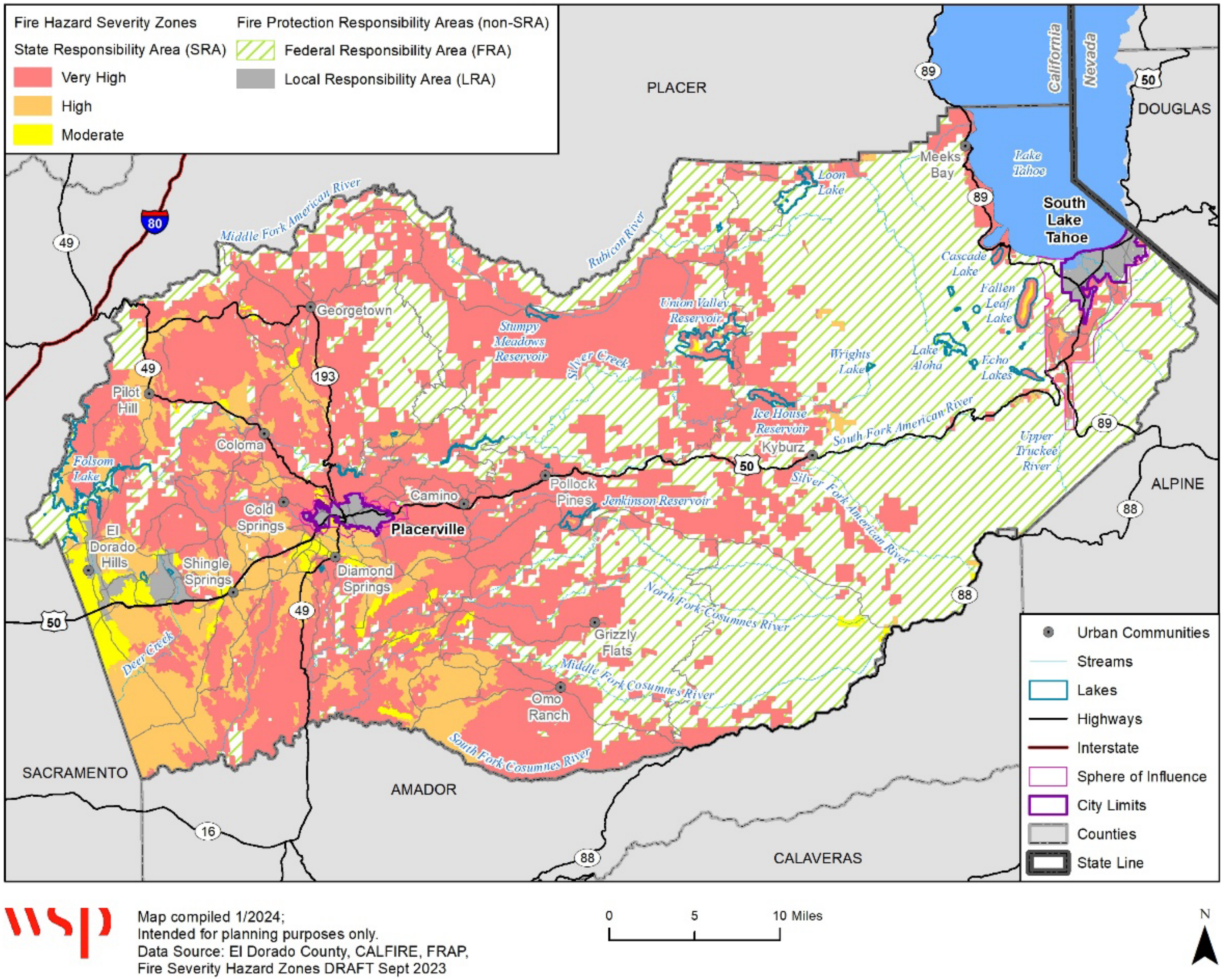
The pattern of increased damages is directly related to increased urban spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets. Additionally, human impact on wildland areas has made it much more difficult to protect life and property during a wildland fire.

4.3.14.1 Geographic Area

Extensive - Wildland fires affect grass, forest, and brush lands, as well as any structures located within them. Where there is human access to wildland areas, such as the Sierra Nevada and foothills areas, the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Wildfires may occur in all areas of El Dorado County, including the most populated areas of El Dorado Hills, Cameron Park/Shingle Springs, Placerville, Camino/Pollock Pines and South Lake Tahoe. Eldorado National Forest also covers approximately 460,000 acres and is also vulnerable to wildfire. The Western El Dorado Community Wildfire Protection Plan (CWPP) and Tahoe Basin CWPP further outline the vulnerability and extent of wildfire in the County. Additionally, the County uses NWS red flag warnings, advisories, and watches to address planning for wildfire in collaboration with fire prevention agencies and fire safe councils.

Figure 4-51 outlines those areas most vulnerable to wildfire in the County.

Figure 4-51 El Dorado County Federal, State, and Local Responsibility Severity Zones



4.3.14.2 Past Occurrences

Figure 4-52 shows past occurrences of different wildfire classes by acre from 1911-2022 ranging in different degrees of severity. These fires are also listed in Table 4-66 below.

Table 4-66 Major Wildfires in El Dorado County 1916-2022

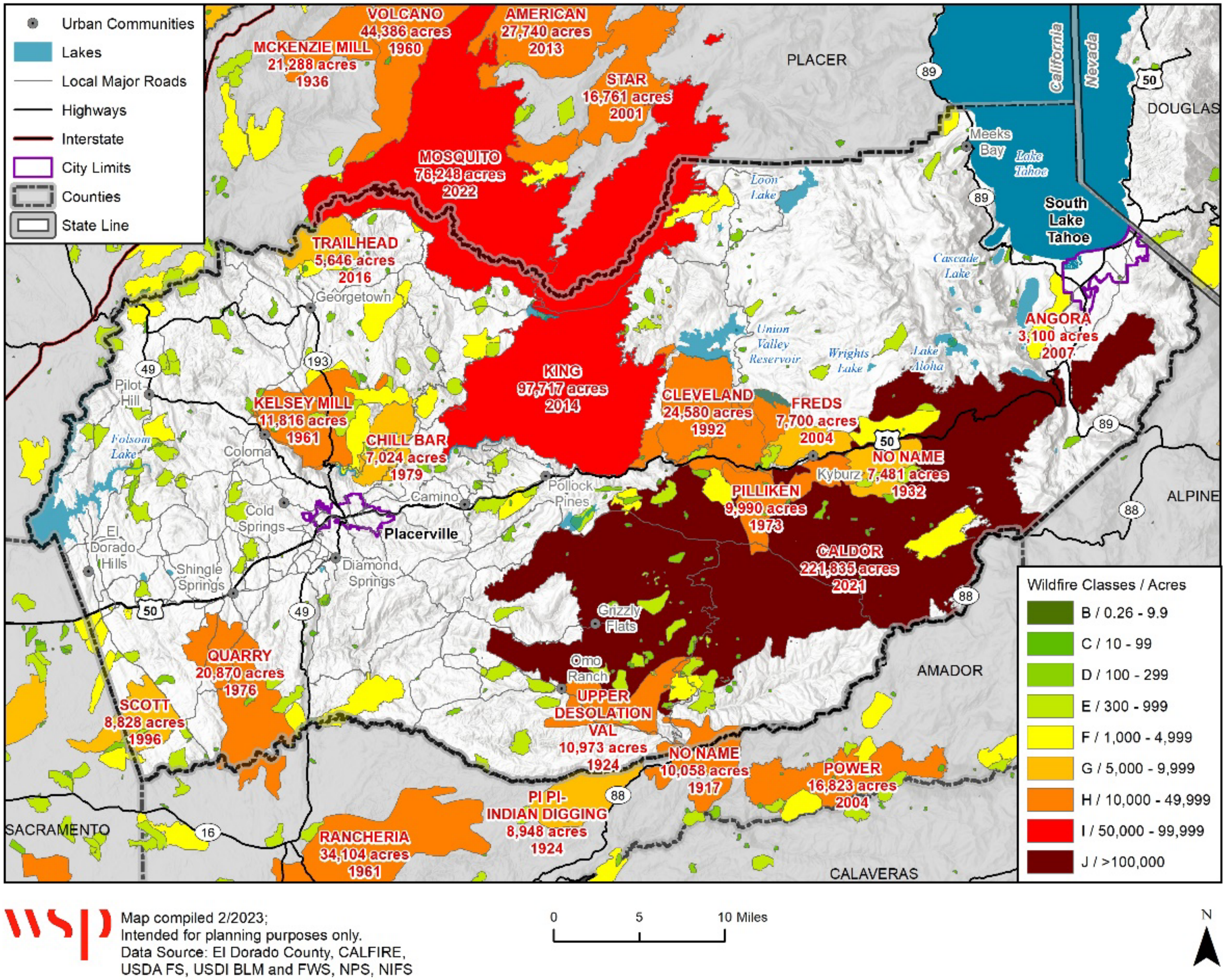
YEAR	FIRE NAME	CAUSE	ACRES BURNED
2022	Mosquito	Miscellaneous	76,771
2021	Caldor	Unknown / Unidentified	221,786
2020	Fork	Unknown / Unidentified	1,668
2019	Caples	Debris	3,442
2017	Latrobe	Debris	1,268
2016	Trailhead	Miscellaneous	5,645
2014	King	Arson	97,685
2014	Sand	Vehicle	4,239
2013	Kyburz	Miscellaneous	571
2009	Mammoth	Miscellaneous	643
2007	Angora	Campfire	3,070
2006	Ralston	Miscellaneous	8,421
2004	Freds	Equipment Use	7,558
2002	Plum	Debris	1,762
2002	Hickok	Arson	776
2002	Gondola	Smoking	643
2002	Hunter	Debris	545
1996	Scott	Arson	8,828
1994	Kelsey	Arson	813
1992	Cleveland	Miscellaneous	22,519
1992	SMUD #1	Powerline	1,179
1992	Farnham	Equipment Use	801
1988	Bear	Debris	582
1986	Salmon	Unknown / Unidentified	762
1985	8 Mile	Miscellaneous	813
1981	Wrights	Miscellaneous	3,843
1981	Joerger Series	Equipment Use	1,676
1979	Chili Bar	Campfire	6,927
1976	Quarry	Unknown / Unidentified	20,870
1974	Devore Station	Unknown / Unidentified	743
1973	Pilliken	Arson	10,316
1973	Park Creek	Arson	715
1972	Slug Gulch	Unknown / Unidentified	655
1970	-	Miscellaneous	1,455
1968	Fair Play	Unknown / Unidentified	916
1964	Roadside #51	Unknown / Unidentified	3,545
1964	Placer Roadside #51	Unknown / Unidentified	1,717
1964	Joerger	Unknown / Unidentified	1,514

YEAR	FIRE NAME	CAUSE	ACRES BURNED
1964	Indian Creek Fire	Unknown / Unidentified	725
1962	Buckeye	Unknown / Unidentified	870
1961	Kelsey Mill	Unknown / Unidentified	11,816
1961	Auburn	Unknown / Unidentified	672
1960	Volcano	Smoking	42,596
1960	-	Miscellaneous	11,213
1960	Volcano	Unknown / Unidentified	2,136
1959	Ice House (Usfs #8)	Unknown / Unidentified	19,099
1959	Camp 7	Unknown / Unidentified	10,226
1958	-	Unknown / Unidentified	1,170
1957	Snowline	Unknown / Unidentified	1,021
1955	B.O.B. Co-Op Escape	Unknown / Unidentified	814
1955	Brown Bar Canyon	Unknown / Unidentified	663
1954	-	Miscellaneous	14,710
1954	Luneman #2	Unknown / Unidentified	1,143
1952	Dressler	Unknown / Unidentified	1,555
1952	Long Escape	Unknown / Unidentified	564
1951	Dressler	Unknown / Unidentified	810
1951	Jameson	Unknown / Unidentified	536
1950	Steves Escape	Unknown / Unidentified	822
1950	Bear Mt. (Co.Rd #10)	Unknown / Unidentified	506
1947	-	Unknown / Unidentified	2,835
1943	-	Unknown / Unidentified	1,800
1936	-	Miscellaneous	777
1933	-	Miscellaneous	1,488
1932	-	Miscellaneous	7,481
1931	-	Unknown / Unidentified	3,297
1931	Rubicon	Unknown / Unidentified	1,378
1929	-	Lightning	806
1928	-	Miscellaneous	817
1926	-	Miscellaneous	734
1926	-	Miscellaneous	550
1924	Upper Desolation Val	Unknown / Unidentified	10,973
1924	Pi Pi-Indian Digging	Miscellaneous	8,948
1924	-	Unknown / Unidentified	701
1924	Badger Hill	Miscellaneous	638
1923	-	Miscellaneous	1,691
1923	-	Miscellaneous	1,106
1922	-	Miscellaneous	2,450
1920	Bryants Mill	Miscellaneous	1,665
1919	Sand Mt	Miscellaneous	1,874
1919	-	Miscellaneous	603
1919	-	Unknown / Unidentified	505

YEAR	FIRE NAME	CAUSE	ACRES BURNED
1918	-	Unknown / Unidentified	1,013
1917	-	Unknown / Unidentified	10,058
1917	Section 28	Miscellaneous	1,698
1917	Bottle Hill	Lightning	1,327
1917	-	Unknown / Unidentified	699
1917	-	Unknown / Unidentified	602
1916	-	Unknown / Unidentified	4,306
1916	-	Unknown / Unidentified	2,132
1916	-	Miscellaneous	1,860
1916	-	Miscellaneous	1,408
1916	-	Miscellaneous	1,397
1916	-	Unknown / Unidentified	773

Source: CAL FIRE 2023
NOTE – CAL FIRE does not define Miscellaneous.

Figure 4-52 El Dorado County Fire History 1911-2023



Disaster Declaration History

A search of FEMA and Cal OES disaster declarations turned up multiple events. State disaster declarations occurred in 2007, 2014, 2021, and 2022. Federal disaster declarations also occurred in 2007 and 2014, as well as the recent 2021 Caldor and 2022 Mosquito fires.

NCEI Events

The NCEI has tracked wildfire events in the County dating back to 1990. Wildfire events in the County are shown in Table 4-67 . The geographic zones under the NCEI for the County are: Southern Sacramento Valley, Motherlode, West Slope Northern Sierra Nevada, Greater Lake Tahoe Area. 46 events were reported between 1998 and 2023 with $500.725M in property damage, 5 direct deaths and 46 direct injuries.

Table 4-67 NCEI Wildfire Events in El Dorado County 1998 to 2016

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
1998-10-20	Wild fire fanned by gusty canyon winds near the town of Camino. Named the "Eight Mile FIre" with 150 acres burned. No structures destroyed.	- El Dorado - Camino	0	0	200K
2007-06-24	The human-caused Angora wildfire started on June 24th and continued to burn through the end of June. Strong winds gusting to 40 mph caused the wildfire to spread across 3,100 acres south of Lake Tahoe. A total of 254 houses and over 60 commercial structures were destroyed.	Greater Lake Tahoe Area	3	0	500.00M
2008-04-18	A debris fire in Cold Springs in Tuolumne County got out of control in windy conditions, spreading to 20 acres and destroying one home.	West Slope Northern Sierra Nevada	0	0	0
2008-04-18	A debris fire in the town of Rescue in El Dorado County spread out of control over 15 acres. Fifty homes were threatened, with one home destroyed and one resident of that home suffering burn injuries.	Motherlode/ Camptonville To Groveland	1	0	0
2008-05-12	A wildfire near the town of Rescue caused the evacuation of 50 homes. No damage or injuries were reported.	Motherlode/ Camptonville To Groveland	0	0	0
2008-06-21	Approximately 8000 lightning strikes were detected, sparking as many as 2000 wildfires across Northern California. These fires destroyed numerous structures and caused multiple deaths and injuries. Evacuations were ordered for affected communities. Smoke from the wildfires caused respiratory problems across the region. Due to a lack of resources, many fires were not initially attacked with fire crews and some fires were expected to continue to burn for the remainder of the fire season.	West Slope Northern Sierra Nevada	0	0	0
2008-07-01	Smoke from the wildfires caused respiratory concerns across the region. Due to the shear number of fires initiated and early season lower resource levels, many fires were not initially staffed. Many of these fires continued to burn through July and into August.	Motherlode/ Camptonville To Groveland	1	0	0
2009-07-26	A wildfire started on July 26th along the Middle Fork of the Stanislaus River, near Mt. Knight, in Stanislaus County. The fire had burned 2734	Motherlode/ Camptonville To Groveland	0	0	0

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
	acres by the end of July and continued to burn into August. It brought multiple local road closures and smoke to the nearby area.				
2009-08-01	There were 6130 acres of forest burned in rugged terrain along the Middle Fork of the American River. Local forest service roads were closed due to the fire, as were several campgrounds.	West Slope Northern Sierra Nevada	0	0	0
2009-09-13	Thunderstorms brought about 1500 recorded lightning strikes to northern California. One lightning strike injured a woman at a sporting event in Stockton and a number of small wildfires were started across the area.	West Slope Northern Sierra Nevada	0	0	0
2013-08-17	The Rim Fire was a wildfire that started on August 17th at around 3:15pm PDT in Tuolumne County. It was located in the Groveland Range District of Stanislaus National Forest. The fire grew to be the 3rd largest wildfire in California's history, at 257,314 acres. For the TOTAL FIRE EVENT: It cost approximately $127.2 million, caused 10 injuries, burned 11 residences, 3 commercial properties, and 98 outbuildings. For the month of OCTOBER ONLY: approximately 179 more acres, additional $1.4 million, 0 additional injuries, 0 new residences, 0 new commercial properties, and 0 new outbuildings..	West Slope Northern Sierra Nevada	5	0	0
2013-09-01	The Rim Fire was a wildfire that began in the Groveland Range District of the Stanislaus National Forest on August 17th.	West Slope Northern Sierra Nevada	5	0	0
2013-10-01	The Rim Fire was a wildfire that began in the Groveland Range District of the Stanislaus National Forest on August 17th.	West Slope Northern Sierra Nevada	0	0	0
2014-07-25	Building high pressure resulted in hot, above normal temperatures and generally light, dry northerly winds. Weather conditions combined with very dry fuels allowed Sand Fire incident to grow into 4,240 acres in Amador and El Dorado Counties.	Motherlode/ Camptonville To Groveland	2	0	0
2014-09-13	A wildfire broke out near Pollock Pines around 6:37 pm on September 13th. Hot and dry conditions with southwest winds 10-20 mph caused rapid growth of the fire. The fire doubled in size to 114 square miles in a strong surge on September 17th. The fire was fully contained on October 9th.	West Slope Northern Sierra Nevada	10	0	0
2015-07-23	The fire covered 75 acres. A vehicle fire started the fire east of Whitehall, which spread to both sides of US Highway 50. The vehicle that started the fire was destroyed, and there was one minor injury to a firefighter. Highway 50 was shut down through the rest of the afternoon into the next day. There were 15 people in the area evacuated.	West Slope Northern Sierra Nevada	1	0	25.00K
2015-07-25	There were 2304 acres burned, with a total of 6 firefighters injured. Two firefighters from the US Forest Service and 2 from CAL Fire suffered	West Slope Northern Sierra Nevada	6	0	0

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
	burns while fighting the fire. One of the firefighters had serious burns and required further hospitalization. There were 2 structures destroyed, 1 damaged. Wildfire suppression costs were estimated to be $18 million.				
2015-07-27	Dry northwest winds enhanced wildfires, including the Rocky Fire in Lake County and a property damaging grass fire in Elverta, in northern Sacramento County.	Southern Sacramento Valley	0	0	500.00K
2015-08-01	The Lowell Fire started on July 25th, with most fire growth and damage occurring in July. The cause is still under investigation. There were a total of 2304 acres burned, with a total of 6 firefighters injured (occurred and documented in July). Two firefighters from the US Forest Service and 2 from CAL Fire suffered burns while fighting the fire. One of the firefighters had serious burns and required further hospitalization. There were 2 structures destroyed, 1 damaged. Wildfire suppression costs were estimated to be $18 million.	West Slope Northern Sierra Nevada	0	0	0
2015-09-09	There were 70,868 acres were burned in the Butte Fire, the 7th most destructive fire in California history. There were 475 residences and 343 outbuildings destroyed, and 45 structures damaged. In the fire there were 2 civilian fatalities and 1 injury. The cause has tentatively been attributed to a PG&E power line coming in contact with a live tree. Extensive damage was done to power lines and poles. PG&E has identified 505 locations where equipment needs to be fixed.	West Slope Northern Sierra Nevada	1	2	0
2016-06-28	The Trailhead Fire started on June 28th and continued into early July. The cause is still under investigation. There were a total of 5646 acres burned, with a total of 3 firefighters injured. The were 2600 structures threatened, with extensive evacuations in the area around Todd Valley and Forest Hill.	Motherlode/ Camptonville To Groveland	0	0	0
2016-07-01	The Trailhead Fire started on June 28th and continued until containment on July 18th. The cause is still under investigation. There were a total of 5646 acres burned, with a total of 3 firefighters injured. The were 2600 structures threatened, with extensive evacuations in the area around Todd Valley and Forest Hill.	Motherlode/ Camptonville To Groveland	0	0	0
2017-07-10	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.	Greater Lake Tahoe Area	0	0	0

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
2017-07-17	A rancher was badly burned in the Maria Fire on Monday, July 17th. The fire was in Calaveras County, near Mokelumne Hill. There were 117 acres burned, with numerous structures threatened, but none reported burned. The rancher had third degree burns over 90% of his body, and passed away on July 29th.	Motherlode/ Camptonville To Groveland	0	1	0
2018-08-01	The Donnell Fire began on August 1, 2018, along Highway 108 in Stanislaus National Forest in Tuolumne County. The cause of the fire is unknown. The fire burned 36,450 acres, 54 structures destroyed and 81 minor structures destroyed. of them homes. Among the destroyed buildings was the historic Dardanelle Resort and Dardanelle Bridge. The fire was not fully contained until early October. There were a total of 9 injuries from the fire.	West Slope Northern Sierra Nevada	0	0	0
2019-06-08	A upper level low passed through the region, which brought elevated fire weather concerns to northern California. Areas impacted within Sacramento's forecast area include the Sacramento and San Joaquin Valleys for areas generally below 1000 feet.	Southern Sacramento Valley	2	0	0
2019-10-10	On October 10 a prescribed burn, which was started on September 30, was declared a wild fire incident. Extreme fire weather conditions were forecast which led to the growth of the prescribed burn. In total 3435 acres were burned across the month of October. The Forest Service noted that 7 injuries or illnesses happened on this fire.	West Slope Northern Sierra Nevada	7	0	0
2020-06-16	The Walker Fire broke out in Calaveras County on June 16 and burned for 4 days. Two structures were destroyed and the fire burned 1455 acres. The cause of the fire remains under investigation.	Motherlode/ Camptonville To Groveland	0	0	0
2020-08-17	During mid-August, moisture from tropical storm Fausto moved along the coast of southern CA and made landfall over central and northern California. This system, combined with an oppressive high pressure system that had predominately dry air, caused widespread dry thunderstorms to develop. Thousands of lightning strikes occurred overnight, which combined with the critical dry fuels, led to massive wildfire development.	Southern Sacramento Valley	0	0	0
2020-08-17	Per above.	Southern Sacramento Valley	0	1	0
2020-08-17	Per above	Southern Sacramento Valley	0	1	0
2020-09-01	For the month of September wildfires continued to burn across northern California. The August Complex is the largest fire in California history, and is spread across the county warning areas of weather forecast	Southern Sacramento Valley	0	0	0

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
	offices Sacramento and Eureka. One fatality and injury occurred on August 27 at the August Complex due to a vehicular accident, many structures were destroyed or damaged. The August Complex finally becomes fully contained by November 15, 2020.				
2020-10-01	For the month of October, numerous wildfires that started in September 2020, continued to burn across northern California.	Southern Sacramento Valley	0	0	0
2021-08-14	The Caldor Fire started on August 14th near Little Mountain, CA and south of Pollock Pines in El Dorado County, off Highway 50. The fire started in an area under drought conditions with hot weather and exceptionally dry vegetation in the area.	Motherlode/ Camptonville To Groveland	0	0	0
2021-08-14	Per above.	West Slope Northern Sierra Nevada	0	0	0
2021-09-01	Per above.	West Slope Northern Sierra Nevada	0	0	0
2021-09-01	Per above.	Motherlode/ Camptonville To Groveland	0	0	0
2021-10-01	Per above.	Motherlode/ Camptonville To Groveland	0	0	0
2021-10-01	Per above.	West Slope Northern Sierra Nevada	0	0	0
2022-06-28	The Rices Fire began when weather conditions were dry with relative humidity values around 13% and temperatures in the lower 90s. Southwest winds generally 5 to 8 mph with gusts up to 15 mph were observed with nearby ridge top gusts up to 20 mph. The fire experienced a moderate rate of spread.	Motherlode/ Camptonville To Groveland	0	0	0
2022-07-01	Per above.	Motherlode/Camptonville To Groveland	0	0	0
2022-07-04	The Electra Fire began when weather conditions were moderately dry with relative humidity values around 47-49% and temperatures in the upper 70s. West winds 6 to 12 mph with gusts 15 to 20 mph were observed. High temperatures, low humidity, and steep, rugged terrain made containment of the fire difficult.	Motherlode/ Camptonville To Groveland	0	0	0
2022-09-07	The Mosquito Fire began in Placer County 4 miles east of Foresthill near Mosquito Ridge Road, CA, and close to Oxbow Reservoir the evening of September 6, 2022, at 6:27 PM PDT and later spread into El Dorado County, CA. The cause is under investigation. The fire started in extreme heat and very low humidity, in an area with drought conditions with exceptionally dry vegetation.	West Slope Northern Sierra Nevada	2	0	0

DATE	DESCRIPTION	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE
2022-09-13	The Dutch Fire started on September 13th at 1 pm PDT on I-80WB, near the Dutch Flat off-ramp. The cause is under investigation. The fire started in very hot and dry weather in an area with drought conditions with exceptionally dry vegetation.	West Slope Northern Sierra Nevada	0	0	0
2022-10-01	Per Mosquito Fire description above.	West Slope Northern Sierra Nevada	0	0	0
2023-09-09	Monsoonal moisture brought thunderstorms over the Sierra the afternoon and evening of September 9th. The Quarry Fire started from a lightning strike on September 9th in Stanislaus National Forest.	West Slope Northern Sierra Nevada	0	0	0
	TOTAL		**46**	**5**	**500.725M**

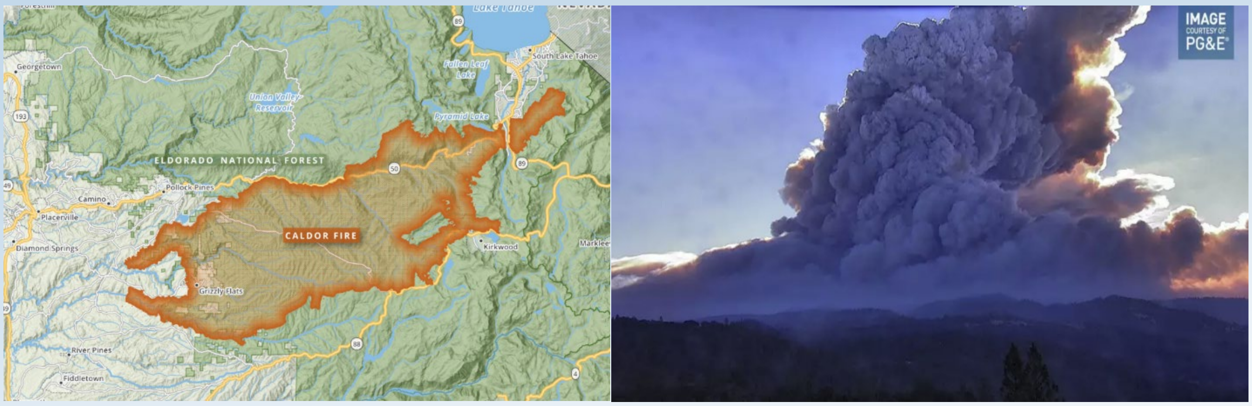
Source: NOAA NCEI
*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

Other notable recent events occurred in 2014 with two separate devastating fires. The Sand fire in South County burned 4,240 acres of land, destroyed 19 homes, and 47 outbuildings before it was contained. The King fire was in the Pollock Pines area burning 97,717 acres of forest, destroying 15 homes, and 86 outbuildings including 2 historical cabins.

Fire Perimeter from the 2014 King Fire, Source: NOAA/NWS

4.3.14.3 Likelihood of Future Occurrence

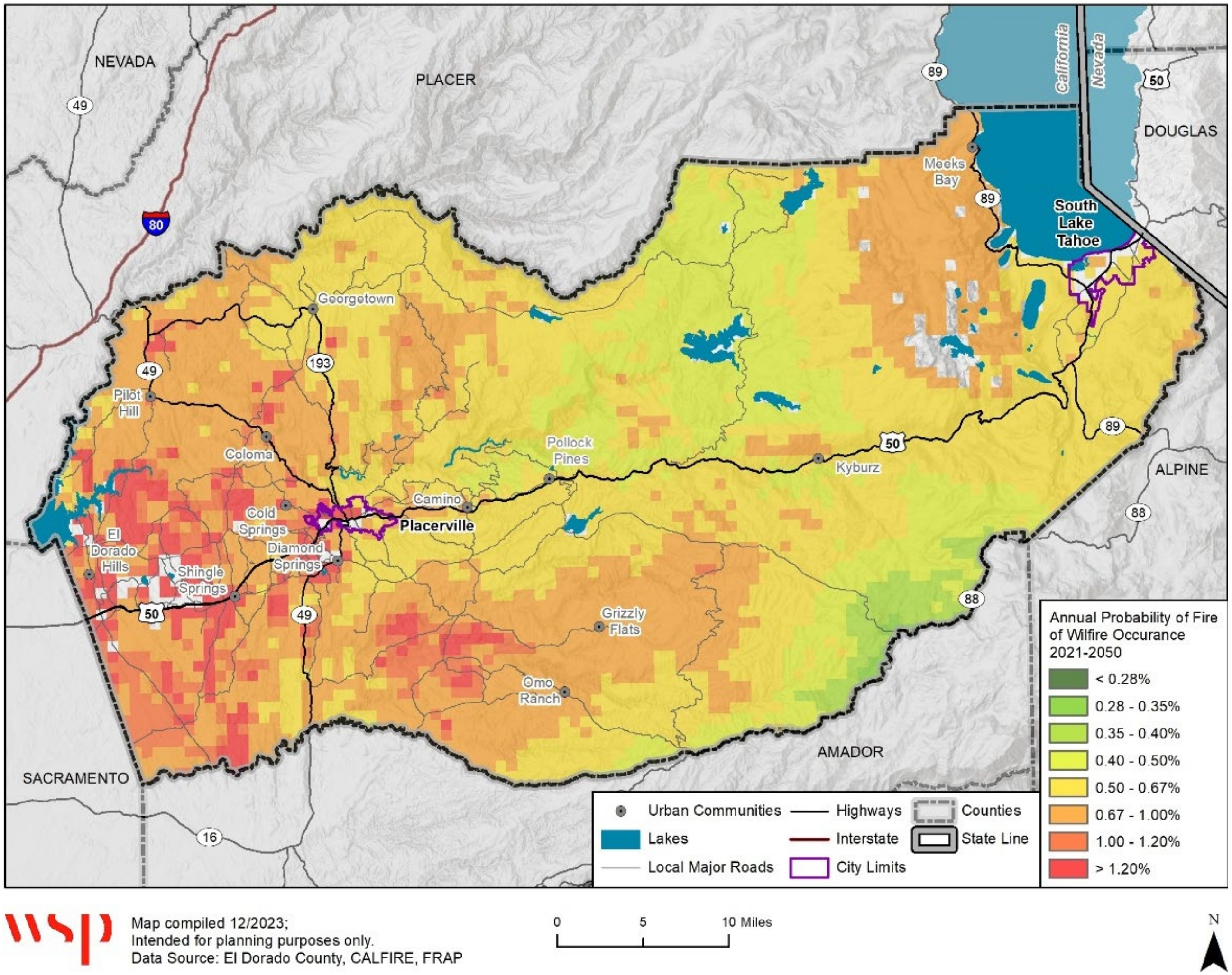
Highly Likely — Due to its high fuel load and long, dry summers, most of El Dorado County continues to be at risk from wildfire. As a result, from May to October of each year, the County faces a serious wildland fire threat. Based on recent trends, fires will continue to occur on a near annual basis in the County. As noted, the threat of wildfire and potential losses are constantly increasing as human development and population increase and the WUI areas expand. Figure 4-53 shows the annual probability of wildfire events in the County from 2021 - 2050. For more information, to include burn area maps, refer to the Safety Element.



Sources: Source: National Hydrography Dataset (NHD), 2022; AlertWildfire, 2021.

Figure 4-53. The images and photos above show the severity of the extent of the 2021 Caldor Fire and a towering plume of smoke billowing off the Caldor Fire while burning within the County. The Caldor Fire burned more than 220,000 acres in El Dorado, Amador, and Alpine counties in California in 2021. It destroyed more than a thousand structures. As of 2023, it was the 15th-largest wildfire in recorded state history and the 16th-most destructive.

Figure 4-53 El Dorado County Annual Probability of Fire, 2021 – 2050

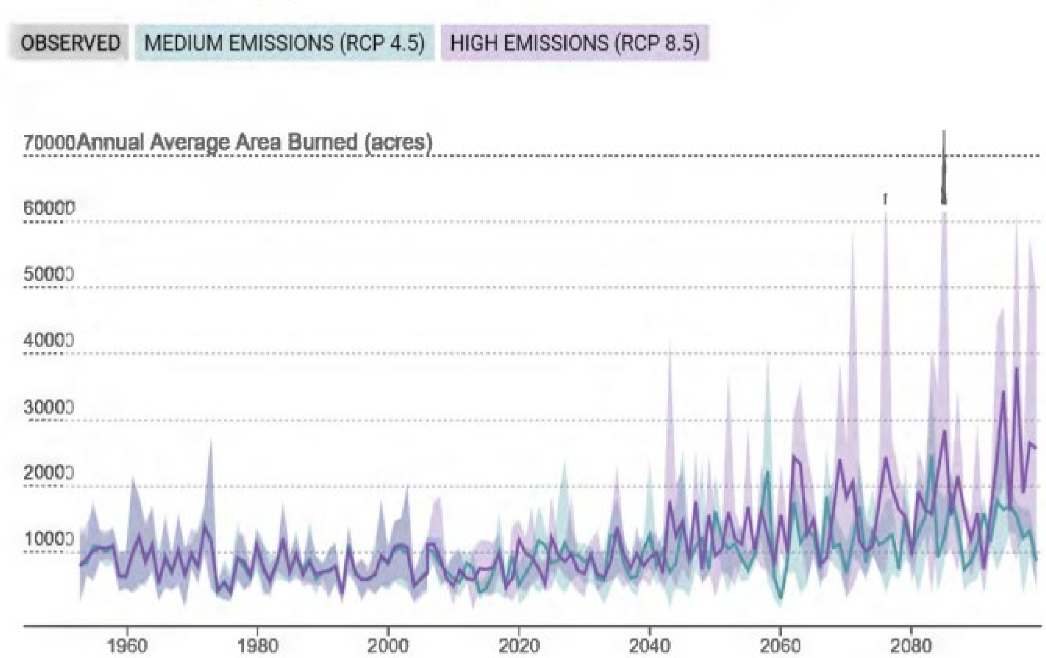


4.3.14.4 Climate Change Considerations

The region is grappling with noticeable shifts in weather patterns, rising temperatures, and changes in precipitation levels, all of which contribute to an elevated risk of wildfires. The prolonged periods of drought, attributed in part to climate change, result in drier vegetation that serves as readily ignitable fuel for wildfires. The changing climate also influences wind patterns, affecting the speed and direction of a fire's extent, further complicating firefighting efforts. Additionally, these rising temperatures and prolonged heatwaves contribute to the drying of fuels, intensifying the overall wildfire danger. The intersection of these climate-related factors magnifies the challenges faced by communities in the County, emphasizing the importance of incorporating climate change considerations into comprehensive wildfire hazard mitigation and adaptation strategies. Addressing the evolving climate conditions therefore becomes paramount for sustainable and effective wildfire management in the region. Moreover, as noted in the Safety Element, the frequency, severity, and impacts of wildfire are influenced by climate change, but also many other factors, including development patterns, temperature increases, wind patterns, precipitation variability, and pest infestations. It is therefore difficult to project where and how wildfires will burn (Cal-Adapt 2022). Therefore, climate models estimate increased risk of wildfire.

Wildfire risk is measured by the annual average area burned and by the Keetch-Byram Drought Index (KBDI). The annual average area burned is the projected area at risk of burning each year and can show at a high level if wildfire activity is likely to increase. The projections are magnified for the Sierra Nevada region compared to other parts of California, based on detailed model inputs. Figure 4-54 shows that the annual average area burned for the County is projected to increase throughout the 21st century. Historically, the County has had around 8,350 acres at risk of burning annually (Cal-Adapt 2022). According to the Cal-Adapt tool, the 30-year average annual area at risk of burning under the RCP 8.5 climate projection scenario shown on the graph below between the years of 2070 and 2099, is expected to more than double to around 18,850 acres annually. Refer to the El Dorado County CVA for more information on how drought will be affected by climate change.

Figure 4-54 El Dorado County Project Annual Average Area Burned



Source: Cal-Adapt 2022

4.3.14.5 Magnitude and Severity

Critical - The incidence and severity of wildfires in the County have undergone changes over the last five decades, especially in the past two decades, evident in recent events like the 2021 Caldor Fire and 2022 Mosquito Fire. As these wildfires escalate in both intensity and size, the number of vulnerable structures and human population also rises, potentially amplifying the magnitude and severity of their impact. Potential losses from wildfires encompass human lives, structures, natural and cultural resources, water supplies, cropland, timber, recreational opportunities, and the community's overall way of life. Economic losses may result from diminished recreation opportunities, reduced tourism, and impacts on various economic sectors. Wildfire-induced smoke, ash, and air pollution pose significant health hazards. Moreover, catastrophic wildfires can create conditions conducive to secondary hazards like flooding, landslides, and erosion during the rainy season.

Generally, there are four major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, weather, and human actions.

Fuel – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also, to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. As a result of effective fire suppression since the 1930s, vegetation throughout the County has continued to grow and accumulate, and hazardous fuels have increased. As such, certain areas in and surrounding the County are extremely vulnerable to fires as a result of dense vegetation combined with a growing number of structures being built near and within rural lands. These high fuel hazards, coupled with a greater potential for ignitions, increases the susceptibility of the County to a catastrophic wildfire.

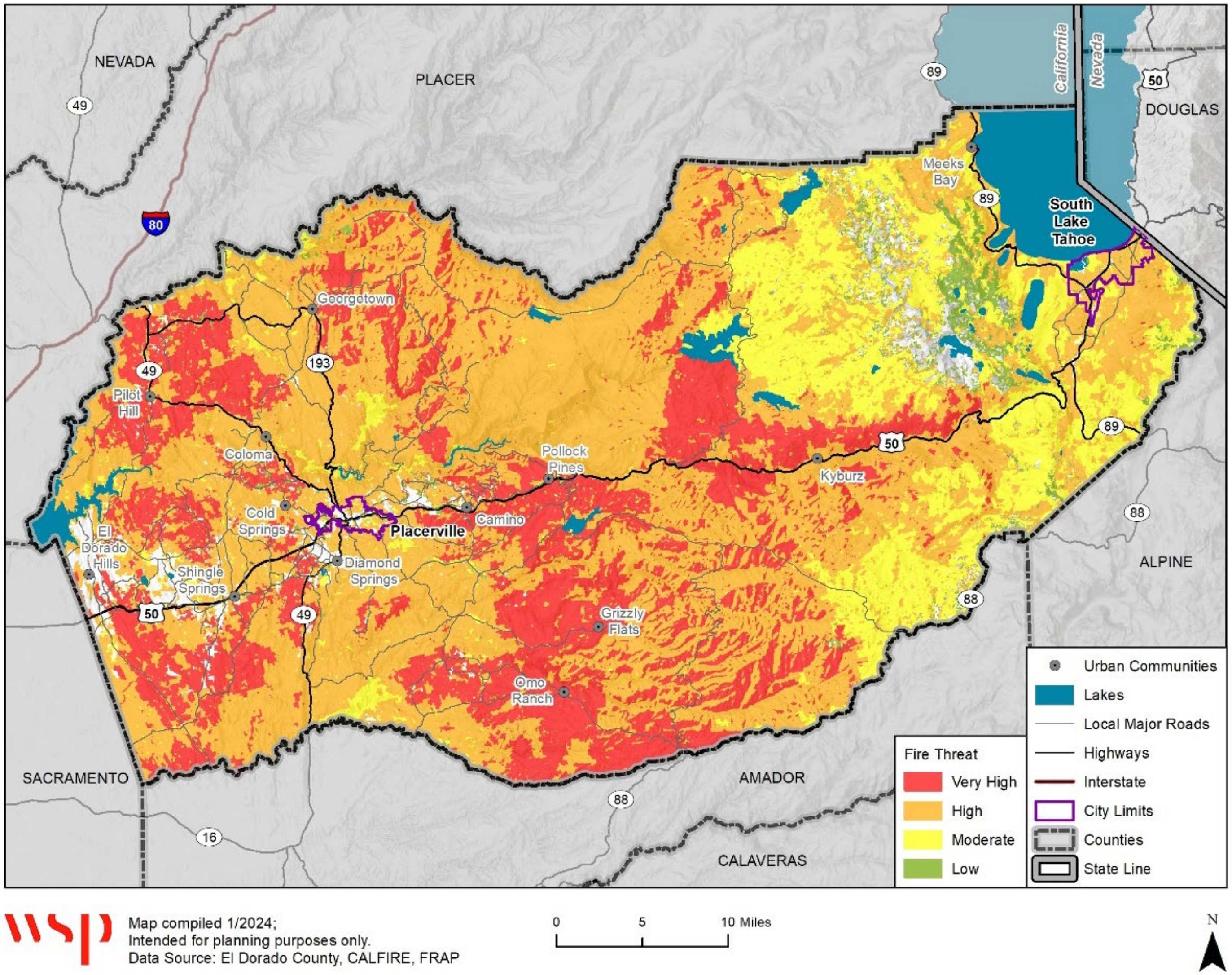
Topography – An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

Weather – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread and the more intense it will be. Winds can be significant at times in the County. North winds in El Dorado County are especially conducive to hot, dry conditions, which can lead to "red flag" days indicating extreme fire danger. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, often in difficult to reach terrain for firefighters.

Human Actions – Most wildfires are ignited by human action, the result of direct acts of arson, carelessness, or accidents. Many fires originate in populated areas along roads and around homes, and are often the result of arson or careless acts such as the disposal of cigarettes, use of equipment, or debris burning. Recreation areas that are located in high fire hazard areas also result in increased human activity that can increase the potential for wildfires to occur. Electrical hazards have also been known to ignite wildfires.

Fire threat is a combination of two factors: 1) fire probability, or the likelihood of a given area burning, and 2) potential fire behavior (hazard). These two factors are combined to create five threat classes ranging from low to extreme. Figure 4-55 below shows the wildfire threat areas throughout the County.

Figure 4-55 El Dorado County Wildfire Threat Areas



Factors contributing to the wildfire risk in El Dorado County include:

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures;
- Excessive vegetation along roadsides and hanging over roads, fire engine access, and evacuation routes;
- Drought and overstocked forests with increased beetle infestation or kill in weakened and stressed trees;
- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response as well as the many subdivisions that have only one means of ingress/egress;
- Inadequate or missing street signs on private roads and house address signs;
- Nature and frequency of lightning ignitions; and
- Increasing population density leading to more ignitions.
- Power transmission and distribution lines run throughout the County.

4.3.14.6 Vulnerability Assessment

The heightened concern regarding the County's susceptibility to wildfires stems from the potential for these events to inflict damage or destruction upon property and infrastructure, pose threats to human safety, and, in extreme cases, lead to loss of life.

People

In the County, wildfire hazards pose a significant concern for the local population. The region's susceptibility to wildfires is influenced by a combination of factors, including the diverse vegetation, varied topography, and prevailing weather conditions. The increased frequency and severity of wildfires in recent years, exacerbated by factors such as climate change and prolonged droughts, have heightened the risk for residents. Wildfires can rapidly spread through grasslands, brush, and woodlands, potentially leading to the destruction of property, infrastructure, and the natural environment. The threat to people is substantial, encompassing the risk of injuries, displacement, and, tragically, loss of life. The dynamic nature of wildfire behavior, driven by fuel, topography, and weather factors, makes it imperative for residents to be vigilant, prepared, and actively engaged in wildfire prevention and evacuation strategies. Table 4-68 shows that over 93,000 County residents at risk to wildfires. Note: this analysis excludes South Lake Tahoe as it is not included in this Plan Update.

Table 4-68 Population at Risk to Fire Hazard

JURISDICTION	POPULATION
Placerville	1,227
Unincorporated	92,376
Total	**93,602**

Source: El Dorado County Assessor Data 2024, CAL FIRE, FRAP, WSP GIS Analysis
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

The most sensitive populations are those with limited mobility and resources, existing economic and financial disparities, and those who are directly exposed to climate-related hazards. Residing in rural and isolated areas of the County, limited accessibility to health, language barriers, and a lack of emergency, and support services makes it more difficult to prepare for, respond to, and recover from disasters and climate-related shocks and stresses. People are generally the most vulnerable to extreme heat, human health hazards, wildfire, and severe weather. The most vulnerable sensitive populations are low-income households, seniors, children, and outdoor workers. People of color who lack resources are also vulnerable. These populations are concentrated in neighborhoods around the City of South Lake Tahoe (Al Tahoe and Stateline neighborhoods), Kyburz, Pollock Pines, Cedar Grove, Georgetown, and Coloma.

In addition to the direct risks posed by wildfires, such as damage to properties and endangerment of lives, there are also indirect hazards to human health associated with poor air quality resulting from smoke and pollutants released during wildfires. This presents a greater impact on socially vulnerable populations, particularly those with existing respiratory problems. To mitigate these risks, proactive measures such as implementing air filtration programs or distributing air filters to vulnerable communities may be necessary. These measures can help reduce the exposure of vulnerable populations to harmful air pollutants, thereby protecting their health during wildfire events.

Property

The potential impact on property is substantial, encompassing the risk of damage or complete destruction. Homes, structures, and other improvements are at particular risk, especially in areas designated as WUIs,

A wildfire threat assessment was performed for El Dorado County using the GIS methodology. Similar to the methodology used by the flood analysis, assessor's parcel centroid data were overlaid on a fire threat data layer. Improved parcel centroids were then assigned with wildfire threat area class (very high, high, and moderate). It was assumed that every parcel with an improved value greater than zero was developed in some way, thus only improved parcels and their values were analyzed. An exception to this was made for Exempt parcels or Unassessed, in that these parcels are usually government owned properties that don't have an improved value but were counted as structures for analysis. An analysis of the value of those parcels – the improvement value plus the estimated value of building contents – quantifies the potential losses from wildfires by wildfire threat areas, as shown Table 4-69 results show that over $18 billion worth of property and 38,120 parcels are exposed to the wildfire threat countywide (not including the properties in the City of South Lake Tahoe). Most of these buildings are in high wildfire threat areas. The unincorporated areas make up most of this risk and residential properties constitute the majority of the number of parcels and the projected losses. The total values shown in these tables include both structure value and contents and can be used as an estimate of potential losses since wildfires typically result in a total loss.

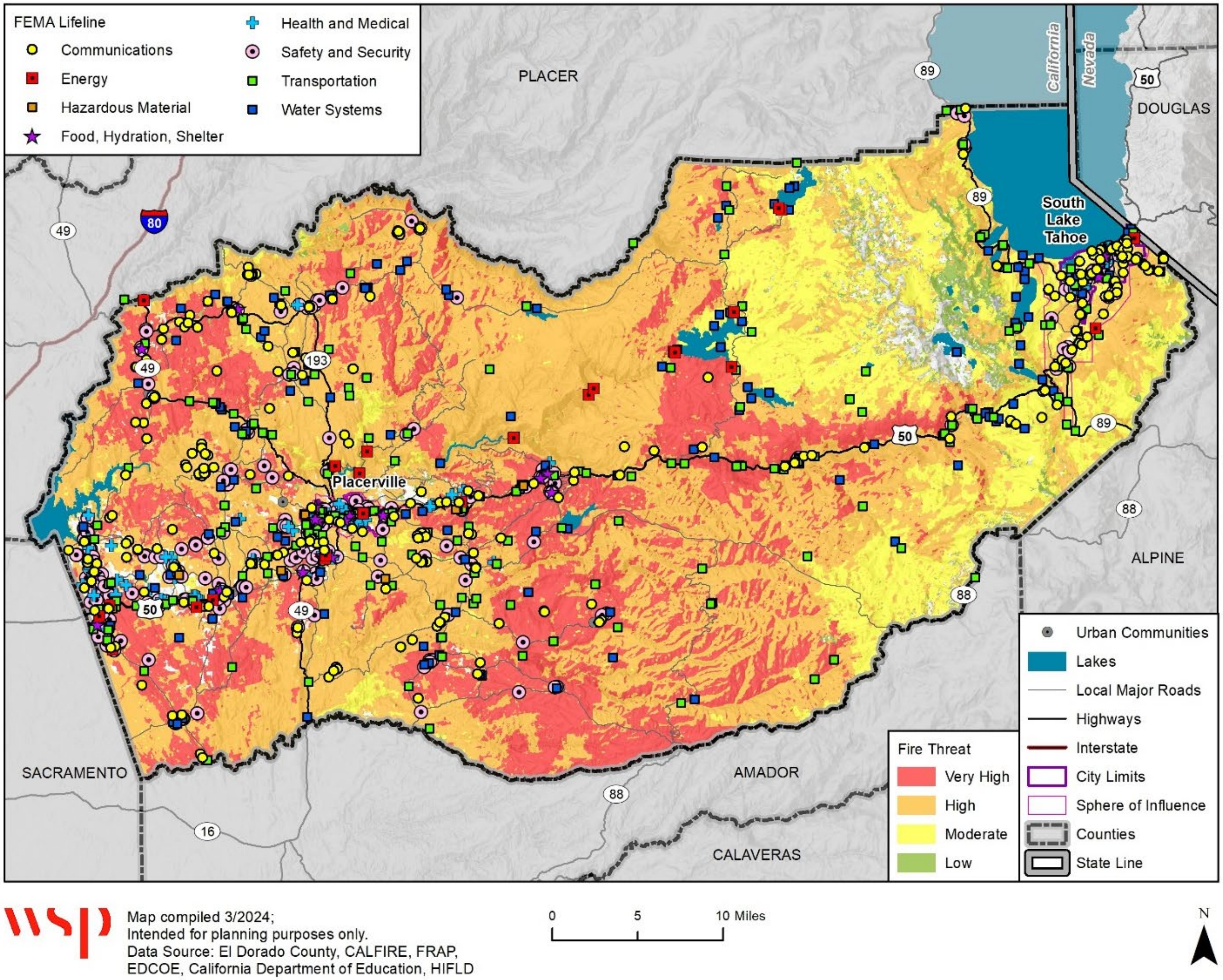
Table 4-69 Wildfire Hazard Exposure –Property Summary by Jurisdiction and Fire Threat Zone

JURISDICTION	PARCEL COUNT	IMPROVED VALUE	ESTIMATED CONTENT VALUE	TOTAL VALUE
City of Placerville	571	$159,092,470	$83,074,310	$242,166,780
Unincorporated	37,549	$11,759,094,566	$6,108,732,220	$17,867,826,786
Total	**38,120**	**$11,918,187,036**	**$6,191,806,530**	**$18,109,993,566**

Source: El Dorado County Assessor Data 2024, CAL FIRE, FRAP, WSP GIS Analysis

* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

Figure 4-56 FEMA Community Lifelines in El Dorado County in relation to Wildfire Threat



Critical Facilities and Lifelines

Wildfire, as highlighted in California's Fourth Climate Assessment, emerges as a prominent and immediate threat to the State's transportation system, with an ongoing increase in vegetation fuel accumulation (California Natural Resources Agency 2018). The ramifications extend beyond direct road closures, encompassing secondary hazards like mudslides and debris flows, thereby causing temporary disruptions and significant impacts on the community. Recent climate assessments specific to the Tahoe Basin underscore the exposure of a substantial amount of infrastructure to wildfire risk, particularly roads, highways, and major electrical and water utilities. This heightened risk poses potential disruptions to transportation and freight activities. Additionally, the presence of smoke and firefighting operations may lead to temporary service interruptions, impacting the smooth movement of goods and services (California Natural Resources Agency 2018).

The locations of critical facilities identified by the County, HIFLD, Districts, and organized by the jurisdictions they fall within the County are summarized by their exposure to wildfire threat levels in Table 4-70.

Table 4-70 Critical Facilities Within Wildfire Threat Zones by Jurisdiction and FEMA Lifeline

WILDFIRE RISK RATING	JURISDICTION	COMMUNICATIONS	ENERGY	FOOD, HYDRATION, SHELTER	HAZARDOUS MATERIAL	HEALTH AND MEDICAL	SAFETY AND SECURITY	TRANSPORTATION	WATER SYSTEMS	TOTAL COUNT
At Risk to **Very High** Wildfire Hazards	Placerville	-	-	-	-	-	-	-	-	**0**
	Unincorporated	37	-	1	1	3	14	23	21	**100**
	Total	**37**	**0**	**1**	**1**	**3**	**14**	**23**	**21**	**100**
At Risk to **High** Wildfire Hazards	Placerville	-	-	-	1	1	-	3	-	**5**
	Unincorporated	95	1	-	1	3	34	72	64	**270**
	Total	**95**	**1**	**0**	**2**	**4**	**34**	**75**	**64**	**275**
At Risk to **Moderate** Wildfire Hazards	Placerville	-	-	-	-	1	-	-	-	**1**
	Unincorporated	24	1	-	1	1	6	26	27	**86**
	Total	**24**	**1**	**0**	**1**	**2**	**6**	**26**	**27**	**87**
	Grand Total	**156**	**2**	**1**	**4**	**9**	**54**	**124**	**112**	**462**

Source: CAL FIRE, FRAP, El Dorado County, Placerville, Department of Education, HIFLD, NID, NBI
* Analysis for Cameron Park CSD, EDCOE, and Georgetown Divide PUD are included in the unincorporated analysis as they share jurisdictional boundaries with the unincorporated County. Analysis will be broken out for each participating jurisdiction in their respective annexes.

According to the analysis conducted, there are 462 critical facilities exposed to at least a moderate wildfire threat area. The highest rates of exposure to wildfire threat areas are facilities in the Communication, Transportation, and Water System Lifeline categories, each are crucial for response and evacuations in the event of a significant fire. This table display the critical facilities at risk to wildfire in the unincorporated County and the City of Placerville only. Critical facilities exposed to flood risk within the other three participating jurisdictions was not summarized here because some of the jurisdictions share the same boundary as the County. Critical facilities exposed by the jurisdiction they occur in are summarized in the annexes.

Economy

Wildfires pose substantial economic risks to affected regions, with consequences ranging from immediate financial burdens to long-term impacts. One of the most direct consequences is the destruction of property and critical infrastructure, necessitating extensive rebuilding efforts that strain local economies. Additionally, heightened wildfire activity may lead to increased insurance costs, affecting both residential and commercial property owners who face rising premiums. The agriculture sector, a vital component of many local economies, can suffer significant losses as wildfires destroy farmland, crops, and livestock. This not only impacts farmers but also disrupts the entire supply chain, potentially leading to higher food prices and economic downturns. Moreover, the decline in tourism and consumer spending during and after wildfires can adversely affect businesses, further contributing to economic challenges. In essence, the economic consequences of wildfires encompass a broad spectrum of services, affecting various sectors and necessitating comprehensive strategies for recovery and resilience.

The economic ramifications of the 2021 Caldor Fire, as assessed by economist Tom Harris from the University of Nevada, Reno, for the Tahoe Prosperity Center, showed significant challenges for El Dorado and Nevada's Douglas County. Preliminary estimates indicated combined losses of $93 million, a figure likely to be higher as it excludes impacts on sectors like rental homes, recreation businesses, economic disruptions caused by resident evacuations, and healthcare costs associated with wildfire smoke exposure. Although wildfire costs are not meticulously tracked, academic studies offer staggering figures. For instance, a 2020 research project examining the nationwide consequences of California's 2018 wildfire season estimated economic damages at an alarming $148.5 billion. This study, featured in Nature Sustainability, encompassed direct capital costs, health-related expenses due to air pollution exposure, and indirect losses such as disruptions to working hours and regional and national supply chains. The identified costs surpass those of any disaster in the U.S. between the 9/11 attacks in 2001 and the ongoing COVID-19 pandemic, with the exception of Hurricane Katrina, underlining the profound and extensive economic impact of wildfires.

The Tahoe Prosperity Center further examined the direct and indirect consequences of the Caldor Fire, focusing on secondary economic impacts stemming from the non-reinvestment of lost revenues across the broader economy. By considering the diminished revenue in the hotel/motel, retail, and restaurant sectors, El Dorado County incurred an approximate employment reduction of 522 employees, a total labor income loss amounting to $18.2 million, a lost total value-added totaling $29.2 million, and a decline in overall economic activity estimated at $50.3 million (Tahoe Prosperity Center 2021).

Development Trends

The County has several development policies identified in the Safety Element, notably that all existing and new development and structures shall meet “defensible space” requirements and adhere to fire code building requirements to minimize wildland fire hazards and the need to regulate development in areas of high and very high fire hazard as designated by the California Department of Forestry and Fire Protection Fire Hazard Severity Zone Maps.

As noted in the 2023 El Dorado Wildfire Strategy, following the devastating Caldor Fire in August 2021, the El Dorado County Board of Supervisors directed the Chief Administrative Office to form a vegetation management and wildfire resiliency working group to collaborate on lessons learned, define funding streams and initiate a robust, community-based wildfire resiliency and vegetation management program that would accelerate current efforts in El Dorado County on both public and private lands. A working group was established and comprised of the Chief Administrative Office, El Dorado County Fire Safe Council, CAL FIRE – Amador El Dorado Unit, Eldorado National Forest, El Dorado County Fire Chiefs Association, El Dorado County Fire Prevention Officers Association and the El Dorado and Georgetown Divide Resource Conservation Districts.

Additionally, the County maintains a Defensible Space Ordinance requiring property owners to maintain a defensible space of 100 feet around their homes or structures by clearing vegetation and other combustible materials. The purpose of these regulations is to create a buffer zone that helps protect buildings from encroaching flames and allows firefighters to more effectively defend the property in the event of a wildfire. Defensible space ordinances vary in their specific requirements and enforcement mechanisms depending on local conditions and regulations.

Cultural and Natural Resources

Given their sensitivity and potential non-compliance with modern building codes due to age, cultural and historic structures and historic districts are likely susceptible to wildfires, posing risks such as an inability to withstand intense heat. Additionally, areas like parks, natural spaces and expansive public lands within and around the County may also face wildfire risks.

4.3.14.7 Risk Summary

- The annual average area burned is expected to increase by the end of the century. The number of days where KDBI values exceed 600 (days with extreme wildfire susceptibility) is expected to increase by 51 days by the end of the century.
- Projected changes include large increases in the area burned by wildfire and increased frequency of large fires.
- The 2020 fire season broke records, as five of the State's six largest wildfires burned at the same time throughout California, destroying homes, forcing people to evacuate, and exposing millions of people to poor air quality. In 2021, the County was impacted by the Caldor Fire and in 2022, the Mosquito Fire.
- Three major factors contribute to wildfire sustenance and predict the potential for an area to burn: fuel, topography, and weather.
- The overall significance of the wildfire threat to the County is **High**.

5 MITIGATION STRATEGY

Requirement §201.6(c)(3):

[The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the El Dorado MHJMP update.

As the frequency of natural hazards in the U.S. rises and the costs of post-disaster recovery escalate, the need for hazard mitigation has gained greater recognition in recent years. Investing funds prior to a disaster event to mitigate its impacts can lead to substantial savings in both life and property in the aftermath. The benefits of implementing a mitigation program usually far outweigh the costs, and increasing funding is becoming available to support these efforts.

FEMA, in coordination with local and state governments, has developed national/pilot state mitigation strategies. These mitigation strategies are supported by State government and federal programs, in line with the Disaster Mitigation Act.

5.1 MITIGATION STRATEGY GOALS AND OBJECTIVES

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.

5.1.1.1 Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the mitigation strategy and mitigation action plan for this MHJMP update. As part of the plan update process, the HMPC conducted a comprehensive review and update of the mitigation strategy portion of the plan . Some of the initial goals and objectives from the previous plan versions were refined and reaffirmed, and others were added. The end result was a new set of goals, reorganized to reflect the status of previous actions, the updated risk assessment and the new priorities of this Plan update. To support the new MHJMP goals, the mitigation actions from 2019 were reviewed and assessed for their value in reducing risk and vulnerability to the planning area from identified hazards and evaluated for their inclusion in this Plan update. The sections below identify the new goals and objectives of this Plan update and detail the new mitigation action plan.

Taking all of the above into consideration, the HMPC developed the following umbrella mitigation strategy for this MHJMP update:

- Communicate the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- Implement the action plan recommendations of this plan.
- Use existing rules, regulations, policies, and procedures already in existence.
- Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

5.1.2 Mitigation Strategy Goals and Objectives

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and to develop the mitigation strategy for the El Dorado County planning area.

5.1.3 Goal and Objective Development Process

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- A time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

HMPC members were provided with the list of goals from the 2019 plan as well as a list of other sample goals to consider from the 2023 Enhanced SHMP. New goals from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use. Next, the HMPC developed objectives that summarized strategies to achieve each goal.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals and objectives, which provide the direction for reducing future hazard-related losses within the El Dorado County planning area.

Goal 1: Minimize risk and vulnerability of El Dorado County to the impacts of natural hazards; protect lives, public health and safety; and reduce damages and losses to property, economy, and the environment.

- Minimize economic and resource impacts and promote long-term viability and sustainability of County resources
- Minimize impacts to both existing and future development from all hazards (through well-planned communities)
- Minimize impacts to natural and cultural resources
- Minimize impacts from climate change
- Minimize impacts to watersheds/Promote watershed health
- Reduce wildland fire risk and related losses
- Reduce flood risk and related damages, with a focus on repetitive loss structures and infrastructure

Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts.

- Provide protection for critical infrastructure from the wildland fires, floods, and severe storms/weather (e.g., repeaters, cell towers, waters tanks, utilities)
- Improve infrastructure/system reliability for critical lifeline utilities, including storm water systems, roadways (evacuation routes, emergency services and supplies); rail lines, and pipelines
- Minimize risk of loss of life and injury to at-risk Populations

Goal 3: Improve public awareness, education, and preparedness for all hazards.

- Enhance public outreach, education, and preparedness program to include all hazards of concern (e.g. fire restrictions, water conservation measures, hazardous vegetation, air and water quality issues)
- Increase public knowledge of the risk and vulnerability to identified hazards and their recommended responses to disaster events to reduce losses with a focus on outreach to at-risk populations
- Educate general public on evacuation planning and sheltering options for all hazard types and to encompass all groups (e.g., residents, visitors, second homeowners, vulnerable populations, animals)
- Increase community awareness and participation in hazard mitigation activities to include defensible space, hazardous vegetation abatement projects, and forest management projects and practices to reduce flood risk on private property
- Utilize multiple public outreach avenues such as schools, new technologies, and social media
- Coordination with other regional jurisdictions to facilitate (consistent/coordinated) public information function prior to, during and after an event (e.g., Facebook, twitter, web, tv, radio)

Goal 4: Increase communities' capabilities to mitigate losses and to be prepared for, respond to, and recover from a disaster event.

- Continued enhancements to Emergency Services capabilities integrating new technologies to reduce losses and save lives
- Improve interagency (local, state, federal) emergency coordination, planning, training, exercising, and communication to ensure effective community preparedness, response and recovery
- Improve interagency coordination with respect to implementation of mitigation activities such as fuels reduction and other multi-jurisdictional wildland fire projects
- Enhance the use of shared resources/Develop a strong mutual aid support system
- Maintain current service levels/provide for enhanced service levels
- Increase first responders' awareness of vulnerable populations and other priority needs during a hazard event;(use of technology to pre-identify and communicate)
- Utilize lessons learned (debriefing) to improve response capabilities
- Promote efficient recovery from incidents to minimize impacts to lives, environment, and economy

Goal 5: Maintain FEMA Eligibility/Position the communities for grant funding.

- Continued compliance with the NFIP/enhancement of floodplain management program through participation in the NFIP's Community Rating System (CRS) where feasible

5.2 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

Requirement §201.6(c)(3)(ii):

[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

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 priority hazard were considered further in the development of hazard-specific mitigation actions.

These priority hazards (in alphabetical order) are:

- Avalanche
- Dam Failure
- Debris Flow and Landslide
- Drought, Water Shortage, and Tree Mortality
- Earthquake
- Erosion
- Extreme Heat
- Flood
- Seiche (Lake Tsunami)
- Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain
- Severe Weather: Tornadoes and High Wind
- Severe Weather: Heavy Snow and Winter Storms
- Subsidence
- Wildfire

The HMPC was provided with examples of potential mitigation actions for each of the above categories. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. Prevention type mitigation alternatives were discussed for each of the priority hazards. This was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

Once it was determined which hazards warranted the development of specific and new mitigation actions, the HMPC analyzed viable mitigation options that supported the revised goals and objectives.

The HMPC was provided with the following list of categories of mitigation actions, which originate from the CRS:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

At the mitigation strategy meeting the HMPC was provided with a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Other references distributed to the HMPC were FEMA's 2013 "Mitigation Ideas" publication, and FEMA's 2020 "Mitigation Action Portfolio." These documents list common mitigation activities and actions funded by FEMA by hazard. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. The 2013 reference provides four categories of mitigation actions that were discussed at the HMPC meeting in addition to the NFIP/CRS categories:

- Plans and Regulations
- Structure and Infrastructure Projects
- Education and Awareness
- Natural Systems Protection

Other alternatives discussed in the third HMPC included the four 'A's' of mitigation:

- **Alter** the physical nature of the hazard - Such as wildfire defensible space and fuels treatments, snow fences etc.
- **Avert** the hazard away from people, buildings, and infrastructure - Can include engineered solutions, drainage, and channel improvements, floodproofing, fuel breaks
- **Adapt** to the hazard - Through land use planning, building codes and design standards, warning systems etc.
- **Avoid** the hazard - Natural systems protection, open space, acquisition, or relocation of properties out of hazardous areas

Lastly, as part of the review of mitigation options, long-term climate change adaptation strategies were also discussed. The HMPC referred to the County's CVA and goals and policies included in the Draft Safety Element update. HMPC members were encouraged to incorporate climate change adaptation measures into the mitigation strategy utilizing resources and guidance available on the Cal-Adapt website like the California Climate Adaptation Guide.

5.2.1.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- **Social**: Does the measure treat people fairly? (e.g., different groups, different generations)
- **Technical**: Is the action technically feasible? Does it solve the problem?
- **Administrative**: Are there adequate staffing, funding, and other capabilities to implement the project?
- **Political**: Who are the stakeholders? Will there be adequate political and public support for the project?
- **Legal**: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- **Economic**: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental**: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

In addition to reviewing and incorporating the actions from the 2019 plan, the committee also considered and defined several new actions.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

Recognizing the limitations in prioritizing actions from multiple jurisdictions and departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue actions that contributed to saving lives and property first and foremost, with additional consideration given to the benefit-cost aspect of a project. This process drove the development of a determination of a high, medium, or low priority for each mitigation action, and a comprehensive prioritized action plan for the El Dorado County Planning Area.

5.2.2 Continued Compliance with NFIP

Given the flood hazard in the planning area, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP) by all communities, as well as participation by El Dorado County and others, as appropriate, in the Community Rating System (CRS). Detailed below is a description of El Dorado County's flood management program to ensure continued compliance with the NFIP. Also to be considered are the numerous flood mitigation actions contained in this MJHMP that support the ongoing efforts by the County to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management program. A summary of the flood management programs and continued compliance with the NFIP for the incorporated communities are detailed in their jurisdictional annexes.

5.2.2.1 El Dorado County's Flood Management Program

El Dorado County has participated in the NFIP since 1974. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country.

The County will continue to manage their floodplains in continued compliance with the NFIP. Table 5-1 provides an overview of the County's NFIP status and floodplain management program.

Table 5-1 El Dorado County NFIP Status and Floodplain Management Program Summary

NFIP TOPIC	COMMENTS
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	As of March 2024, there are 167 NFIP policies in the County (not including South Lake Tahoe). The total premium is $199,478 and the total coverage is $50,531,000.
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	Since the County began participating in the NFIP there have been 133 total claims, amounting to $2,848,334 in payments.

NFIP TOPIC	COMMENTS
How many structures are exposed to flood risk within the community?	There are 368 parcels at risk of flooding in the County (Not including South Lake Tahoe).
Describe any areas of flood risk with limited NFIP policy coverage	Not Applicable to El Dorado County – Non-jurisdictional
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Not at this time, but the County is pursuing certification for at least one Planning staff.

NFIP TOPIC	COMMENTS
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	In El Dorado County, the Planning Director is the Flood Zone Administrator. Planning staff, through the power of delegation from the Planning Director, implement the Flood Zone Ordinance, Chapter 130.32 (Flood Damage Prevention) of Title 130 of the El Dorado County Code of Ordinances. The flood ordinance offers multiple remedies to document, identify, and mitigate potential flood impacts when a Special Flood Hazard Area (SFHA)/Flood Zone is in the vicinity of a proposed project, whether ministerial or discretionary. Parcels are flagged in multiple databases for the potential SFHA/Flood Zone review. The first test of flood review is to determine whether a parcel is actually in a SFHA. Should insufficient information exist to make a determination of whether the project is in or out of a SFHA/Flood Zone flood, a Flood Elevation Certificate (FEC) is generally required, although under the ordinance, other forms of documentation/mitigations may be acceptable. If a FEC is required, one must be received prior to building permit issuance and prior to finalizing. Multiple databases contain SFHA/Flood Zone information but they are all based upon GIS data from FEMA. Selected studies have been done in limited areas that supplement this information (e.g., Cameron Park Drainage Studies). Inspections are done by building inspectors in the field as determined by the flood review mitigations from the building permit application's approval. Under the Flood Ordinance, BMPs under Building Codes can be used to mitigate required flood proofing/flood resistance. Historically, SFHA/ Flood Zone work/documentation was inconsistent at best. However, within the past 6-10 years, the County has begun to keep better records of flood correspondence/flood information to facilitate/assist citizens for/on past SFHA/Flood Zone work.
What are the barriers to running an effective NFIP program in the community, if any?	Community resistance to the NFIP requirements.
Compliance History	
Is the community in good standing with the NFIP?	Yes

NFIP TOPIC	COMMENTS
Are there any outstanding compliance issues (i.e., current violations)?	None that we are aware of at this time.
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	The last CAV was August 13, 2014.
Is a CAV or CAC scheduled or needed?	The County has not been notified of the need to schedule a CAV or CAC.
Regulation	
When did the community enter the NFIP?	The County joined the NFIP (regular entry) on October 18, 1983. The current effective map date is from April 4, 2012.
Are the FIRMs digital or paper?	Digital – FEMA provides an interactive mapping service through the National Flood Hazard Layer.
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet FEMA and the State's minimum requirements.
Provide an explanation of the permitting process.	When a parcel is flagged for SFHA/Flood Zone review, the first test of flood review is to determine whether a parcel <u>is actually</u> in a SFHA/Flood Zone. If insufficient information is available to remove the proposed project from the SFHA/Flood Zone, a FEC is generally required. If the FEC confirms the project is in a SFHA/Flood Zone, mitigations are required to be shown in the building permit application. If a FEC is required, as part of mitigations or to demonstrate the project being outside the SFHA/Flood Zone, one must be received prior to building permit issuance & prior to finalizing. Inspections are done by building inspectors in the field as determined by the flood review mitigations from the building permit application's approval.
Community Rating System	No
Does the community participate in CRS?	No
What is the community's CRS Class Ranking?	Not Applicable
What categories and activities provide CRS points and how can the class be improved?	Not Applicable
Does the plan include CRS planning requirements?	Not Applicable

Source: FEMA/El Dorado County

5.3 MITIGATION STRATEGY ACTION PLAN

Requirement §201.6(c)(3)(iii):

[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

5.3.1 Process on Previous Mitigation Actions

A review of mitigation actions in the 2019 HMP shows El Dorado County has been successful in implementing actions identified in the 2019 MJHMP Mitigation Strategy, thus, working diligently towards meeting the 2019 plan goals. During the 2024 MJHMP update process, the County and EDCOE reported on the status of 18 separate mitigation actions. They provided input on whether an action had been completed, deferred (continued-not-started, or not yet completed but relevant for the updated plan), in progress or under annual implementation, or deleted.

As of March 2024, four of these actions are in progress, one was not started and is continuing, and the remaining 13 are part of annual implementation, meaning they are 18 ongoing projects with no specified end date. Table 5-2 below summarizes progress implementing mitigation actions.

Table 5-2 Mitigation Action Progress Summary for County

PROGRESS CATEGORY	# OF MITIGATION ACTIONS
Completed	0
Deleted	0
Continue In-Progress	4
Continue Annual Implementation	13
Continue Not Started	1
New Actions in 2024	58
Grand Total	**76**

5.3.2 Updated Action Plan

This action plan was developed to present the recommendations developed by the HMPC for how the El Dorado County planning area can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. El Dorado County has 18 continuing or in progress mitigation actions carried over from the existing plan and has added an additional 58 new actions.

The action plan includes background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- **Little to no cost**
- **Low**: Less than $10,000
- **Moderate**: $10,000-$100,000
- **High**: $100,000-$1,000,000
- **Very High**: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- **Short Term:** 1-2 years
- **Medium Term**: 3-5 years
- **Long Term**: 5+ years
- **Ongoing**: action is implemented every year

The Status/Implementation Notes column that describe progress made on the actions so far, using the following categories, and, where applicable, notes if there were changes in the priority level from the previous plan:

- **Not Started:** Action is carried over from the previous plan; little to no work has begun
- **In Progress:** Action is carried over from the previous plan; work has begun but not completed
- **Annual Implementation:** Action is carried over from the previous plan; Ongoing with no specific end date
- **New in 2023:** The Action is new to this plan update; little to no work has been completed.

Table 5-3 provides details on 18 existing and 58 new mitigation actions for the County and its participating jurisdictions. The HMPC identified and prioritized the following mitigation actions based on the risk assessment, the goals and objectives, and the mitigation action resources summarized in Section 5.2. It is grouped by hazard(s) mitigated.

Table 5-3 El Dorado County Mitigation Actions

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
EDC-1	1,2,3,4,5	All Hazards	**Safety Element Integration.** Integrate the 2024 MJHMP into Safety Element of General Plan. To remain in compliance, the 2019 LHMP and 2024 MJHMP will be integrated into El Dorado County's General Plan Safety Element.	El Dorado County	El Dorado County Building and Planning Department (Lead Agency), City of Placerville	Little to no cost	El Dorado County General Fund, In-Kind	Safety and Security	High	Short-term	In Progress. Safety Element Update to be completed in May 2024
EDC-2	1,2,3,4,5	All Hazards	**Public Outreach Campaign.** The County, cities, and special districts will work with other agencies as appropriate to develop timely and consistent annual outreach messages to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will consider: 1) using a variety of information outlets, including social media, websites, local radio stations, news media, schools, and local, public sponsored events and 2) developing public-private partnerships and incentives to support public education activities.	El Dorado County	El Dorado County Sheriff's Office (Lead Agency); City of Placerville, EDCOE, EID,STPUD), Fire Prevention Districts, Fire Safe Councils, GDPUD, Cameron Park CSD, and Other Special Districts	Low	El Dorado County General Fund, In-Kind	Safety and Security	High	Ongoing	Annual Implementation. Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness is ongoing every year.
EDC-3	3,4,5	Avalanche, Debris Flow and Landslide, Flooding	**Update Debris Management Plan.** El Dorado County has experienced wildfires and flooding in which debris flows and landslides (and sometimes avalanches) are issues that needs to be addressed, mapped, and mitigated through slope stabilization and other techniques. Procedures and guidelines for managing disaster debris, clearing debris, addressing safety protocols, and considering ecological impacts during recovery and stabilization efforts.	El Dorado County	El Dorado County Environmental Management Department (Lead Agency); City of Placerville, EDCOE, EID, STPUD, Fire Prevention Districts, Fire Safe Councils, GDPUD, CSD, Other Special Districts	High	El Dorado County General Fund, In-Kind Proposition 68, FEMA HMA HMGP, US Forest Service Grants, State Funding	Safety and Security, Transportation, Water Systems	High	Medium-term	In progress. The County has faced multiple disasters during the last 5 years including the Caldor Fire and Mosquito Fire which required advanced debris removal. The Environmental Management Department was the lead agency and coordinated the debris removals.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
EDC-4	1,2,3,4,5	Avalanche	**Assess Critical Infrastructure Risk**. Avalanche hazards exist each winter in the upper elevations of eastern El Dorado County. Some of the County's facilities are potentially at risk to avalanche, and the majority of the EID water and wastewater treatment facilities, pump stations, storage tanks, and reservoirs are in the lower elevation on flatter terrain where the potential of avalanche damage is negligible to non-existent. The action is still designed to assess avalanche risk and consider removing or relocating facilities in hazard prone areas; with the exception being some major transportation corridors like U.S. Highway 50.	El Dorado County	El Dorado County GIS Department (Lead Agency), EID, STPUD, GTPUD, Fire Prevention Districts, Fire Safe Councils	Very High	FEMA HMA BRIC, HMGP, Emergency Management Performance Grant Program, El Dorado Irrigation District General Funds	Safety and Security; Energy; Communications; Transportation; Water Systems	Low	Short-term	In progress. This was a carryover mitigation action for EID.
EDC-5	1,2,3,4,5	Dam Failure	**Map Community Risk.** Dam Inundation (hazards have been identified as a low frequency event that can have both a low and a high impact potential). This action requires the County to annually update the dam inundation maps using National Inventory of Dams (NID) or California Division of Safety of Dams (DSOD) data.	El Dorado County	El Dorado County GIS Department (Lead Agency), Sacramento Municipal Utility District (SMUD), EID, City of Placerville, STPUD, GDPUD, Cameron Park CSD, Other CSDs, Other Special Districts	Low	County General Fund, Special Districts Budgets, Public and Private Dam Owners, Emergency Management Performance Grants (reimbursement funds), HHPD	Safety and Security; Energy; Communications; Water Systems	Low	Ongoing	Annual Implementation. Dam inundation maps were recently updated as part of the Safety Element update.
EDC-6	1,2,4	Drought, Wildfire	**Retrofit High Water Use Facilities.** El Dorado County maintains acres of landscaped grounds in addition to playable turf areas. Much of that acreage consists of ornamental lawn and other high water use plantings, or outdated inefficient irrigation. Retrofit of these areas will be prioritized and completed on a site by site basis as funding becomes available. Other local agencies and districts within El Dorado County face a similar water usage situation, specifically EDCOE.	El Dorado County	El Dorado County Department Facilities and Parks (Lead Agency), City of Placerville, EDCOE, EID, STPUD, TCPUD, Fire Prevention Districts, Fire Safe Councils, GDPUD, Cameron Park CSD, Other CSDs, Other Special Districts	Very High	FEMA HMA HMGP, DWR, and Other Federal and State Loan and Grant Programs	Water Systems	Medium	Ongoing	In progress. Certain special districts such as GDPUD, STPUD, and TCPUD have initiated retrofits to reduce water use at district facilities and by promoting water use efficiency for private landowners during drought restrictions.

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
EDC-7	1,3,4,5	Drought	**Drought Public Education and Outreach.** The project involves public outreach and education with specific efforts targeted for the small community of Outingdale that is served by wells and has experienced water shortages. The ongoing drought has had numerous impacts on the County. In addition, the State was in a State of Emergency due to the drought. One key method to conserve groundwater is to reduce water uses in homes and landscaping; the focus of the outreach would therefore be on rural and isolated communities on private wells that are known to be more vulnerable to water shortages.	El Dorado County	El Dorado County Public Information Officer (Lead Agency), City of Placerville, EID, SMUD, City of Placerville, EDCOE, EID, STPUD, GDPUD, Fire Prevention Districts, Fire Safe Councils, CSDs, and Other Special Districts	Low	FEMA HMA HMGP, DWR, El Dorado County General Fund	Safety and Security; Water Systems; Food, Hydration, Shelter, Agriculture	Medium	Ongoing	Annual Implementation. As required by California Water Code section 6161, and the DWR and DSOD
EDC-8	1,2,4,5	Earthquake	**Update Building Code Provisions.** El Dorado County will adopt and enforce updated building code provisions, consistent with the latest California Building Code (CBC) to reduce earthquake damage. Seismic and geologic hazards have been identified as a low frequency event that can have both a low and high impact potential.	El Dorado County	El Dorado County Building and Planning Department (Lead Agency), City of Placerville, Cameron Park CSD, EID, EDCOE, GDPUD, STPUD, Fire Prevention Districts, Fire Safe Councils, Other CSDs, Other Special Districts	Little to no cost	FEMA HMA HMGP	Safety and Security; Health and Medical, Water Systems	Low	Ongoing	Annual Implementation. El Dorado County follows and enforces CBC standards for earthquakes. Routine updates to the building code occur.
EDC-9	1,2,4,5	Erosion, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Stabilize Erosion Hazard Areas.** Many existing El Dorado County roads, culverts, and hillsides are susceptible to erosion – the erosion of land - that can destroy buildings and infrastructure.	El Dorado County	El Dorado County Department of Transportation (Lead Agency); City of Placerville, Cameron Park CSD, GDPUD, STPUD, TCPUD, EID, Caltrans, EDCOE, City of South Lake Tahoe, Fire Prevention Districts, Fire Safe Councils, and Other Special Districts	Moderate to High (varies by project type)	FEMA HMA HMPG, Prop 68, DWR	Safety and Security, Energy; Transportation; Water Systems	High	Medium-Term	Annual Implementation. Many capital improvement projects along major roads in the County are managed for slope stabilization through best management practices, particularly following wildfires. Erosion control is ongoing because the land is constantly

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
											being affected by wildfires, winter storm events, and soils erosion. County has multiple burn scars from large wildfires, Caldor and Mosquito, which have created additional erosion.
EDC-10	1,2,3,4,5	Flood	**Enhance Flood Mitigation through Local Planning.** Enhance participation under the NFIP Program and consider benefits of participating in the Community Rating System (CRS) program to improve floodplain management for communities more susceptible to flooding, like Cameron Park.	El Dorado County	El Dorado County (Lead Agency), City of Placerville, City of South Lake Tahoe, EDCOD, EID, GDPUD, Cameron Park CSD, EID, STPUD, Fire Prevention Districts, Fire Safe Councils, Other Special Districts	Little to no cost	DWR, FEMA HMA HMGP Funds, El Dorado County General Fund, In-Kind	Safety and Security; Health and Medical; Energy; Communications, Water Systems	Medium	Ongoing	In Progress.
EDC-11	1,2,3,4,5	Seiche (Lake Tsunami), Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather: Tornadoes and High Wind	**Work with the City of South Lake Tahoe to Map and Assess Vulnerability to Lake Seiches.** The County's General Plan sets the foundation for recognizing flood disaster potential and establishing through regulations, ordinances and building codes a strategy for protecting populations, new and existing development and economic sustainability.	El Dorado County	El Dorado County Building and Planning Department and GIS Department (Lead Agency & Departments), City of South Lake Tahoe Fire Department, University Nevada at Reno, EDCOE, Lake Tahoe Unified School District, EID, STPUD, Fire Prevention Districts, Fire Safe Councils	Low	FEMA HMA HMGP, CAP, CTP, HMA, DWR	Safety and Security; Energy; Water Systems	Low	Ongoing	In Progress. There have been multiple studies completed regarding seiches in Lake Tahoe from University Nevada at Reno and University of California at Davis; these need to be integrated into County and City of South Lake Tahoe planning documents. The South Lake Tahoe LHMP currently also profiles lake seiches, but mapping needs to be updated.
EDC-12	1,2,3,4	Extreme Heat	**Extreme Heat Outreach Campaign.** El Dorado County will work with agencies and organizations that serve vulnerable populations to prepare for extreme	El Dorado County	El Dorado County Administrative Office (Lead Agency), Marshall Hospital, Barton Medical	Low	FEMA HMA HMGP, DWR	Food, Hydration, Shelter; Health and Medical	Medium	Ongoing	Annual Implementation. See County's Extreme Heat Plan

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			temperatures. Continue to raise awareness and planning regarding extreme temperatures and addressing needs of vulnerable populations.		Hospital, El Dorado County Food Bank, City of Placerville, EDCOE, CSDs, and Other Special Districts						
EDC-13	1,2,4,5	Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather: Tornadoes and High Wind, Seiche (Lake Tsunami)	**Protect Critical Facilities and Equipment.** El Dorado County will work with public and private partners to harden critical facilities and equipment. One way this will occur is through tree clearing along power lines and roadways.	El Dorado County	El Dorado County Department of Transportation (Lead Agency), City of Placerville, CalTrans, CSDs, PG&E, SMUD, Liberty Utilities, EDCOE, GDPUD, EID, STPUD, Fire Prevention Districts, Fire Safe Councils, Community Service Districts and Other Special Districts	Moderate (varies by event)	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety and Security; Energy; Communications; Transportation	High	Ongoing	In Progress. El Dorado County does public education campaigns in the spring and the fall to educate the public for extreme weather during the summer and winter months.
EDC-14	1,3	Wildfire	**Create Fire Adapted Communities.** Public education through community outreach is an ongoing strategy and included in all mitigation efforts. El Dorado County, fire agencies, Animal Services, Fire Safe Councils, and other stakeholders work with as many residents as possible to provide information on defensible space and living with fire and creating fire adapted communities.	El Dorado County	El Dorado County Office of Wildfire Preparedness and Resilience (OWPR) (Lead Agency), Fire Agencies, Animal Services, Tahoe Resource Conservation District, City of Placerville, Cameron Park CSD, City of South Lake Tahoe, Lake Valley FPD, Fire Safe Councils, fand Other Special Districts	Little to no cost	El Dorado County General Fund, USACE, CALFIRE, FEMA HMGP, HMA, CAP, CTP Grants.	Safety and Security; Communications	High	Ongoing	Annual Implementation.
EDC-15	1,2,3,4,5	Wildfire	**Hazardous Fuels Reduction Activities.** These projects address the ongoing need to manage fuels in and around privately owned homes, businesses and communities, County-owned facilities freeways and roadways, and "Assets at Risk" in El Dorado County.	El Dorado County	El Dorado County, fire agencies, cities, fire safe councils, special districts, community service districts, public/private partners in fire safety (Lead Agency) Cities of Placerville and South Lake Tahoe, El Dorado County Office of Education, El Dorado Irrigation District,	Dependent on project.	The El Dorado County Fire Safe Council (EDCFSC) has three grants for this – the South County Fuel Reduction Project, the Georgetown Marshall Road Fuel Reduction		High	Ongoing	Annual Implementation. El Dorado County, PG&E, SMUD, Fire Safety Councils, and other organizations have brush clearing projects along power lines and roadways throughout the county to protect

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					South Tahoe Public Utility District, Fire Prevention Districts, Fire Safe Councils, Georgetown Public Utility District, Community Service Districts and Other Special Districts		Grant, and the Fuel Reduction for Critical Roads (Coloma Lotus). Each of these grants are in progress with an expiration date of March 2026.The EDCFCS sponsors programs to assist homeowners with defensible space, chipping and hazard tree removal.				critical facilities and equipment. This is an ongoing mitigation effort. The South County Project also includes fuel break projects (Outing dale, Slug Gulch, Hanks Exchange, and Martinez Creek. Additionally, FCS programs are ongoing.
EDC-16	1,2,4	Wildfire	**Large Strategic Fuel Break**. Large Strategic Fuel Break projects will provide landscape scale community protection in our area. When complete, these projects will help protect the communities identified as "Communities at Risk from Wildfire" listed in the National Fire Plan. OWPR and the El Dorado County Fire Safe Councils have worked with County, State, and Federal agencies to identify areas within their jurisdictions to develop large strategic fuel breaks to protect specific communities and watersheds within the County.	El Dorado County	El Dorado County OWPR (Lead Agency, City of Placerville, Fire Agencies, Fire Safe Councils, City of South Lake Tahoe, GDPUD, EID, Cameron Park CSD, EDCOE, Fire Prevention Districts, Fire Safe Councils, Other CSDs, and Other Special Districts	Moderate to High (varies by project)	Community Power Resiliency Allocation Program, EMPG, CALFIRE, FEMA HMA HMGP, SHSGP Grant Program	Safety and Security, Communications, Transportation, Water Systems	High	Ongoing	Annual Implementation
EDC-17	1,2,4	Wildfire	**Fuel Breaks in the Wildland Urban Interface (WUI).** The purpose of a Shaded Fuel Break within the WUI is to minimize destruction to communities from wildfire and to protect and enhance natural resources, watershed, and habitat of western El Dorado County. TheOWPR works with the EDCFSC County, State, and Federal agencies to identify areas within their jurisdictions to develop shaded fuel	El Dorado County	El Dorado County OWPR (Lead Agency, City of Placerville, Fire Agencies, Fire Safe Councils, City of South Lake Tahoe, GDPUD, EID, Cameron Park CSD, EDCOE, Fire Prevention Districts, Fire Safe Councils, Other CSDs,	Moderate to High (varies by project)	Community Power Resiliency Allocation Program, EMPG, CALFIRE, FEMA HMA HMGP, SHSGP Grant Program	Safety and Security, Communications, Transportation, Water Systems	High	Ongoing	Annual Implementation - Defensible Space Programs are ongoing throughout the County.

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			breaks to protect specific communities and watersheds within the WUI.		and Other Special Districts						
EDC-18	1,2,3,4,5	Subsidence	**Map and Assess Vulnerability to Subsidence.** Abandoned mines and culverts throughout the County, and primarily on the Western Slope, make El Dorado County vulnerable to subsidence.	El Dorado County	El Dorado County GIS Department (Lead Agency), City of Placerville, GDPUD, EID, Fire Prevention Districts, Fire Safe Councils, CSDs, Other Special Districts	Little to no cost	FEMA HMA HMGP Funds, DWR, USACE	Safety and Security, Water Systems	Low	Ongoing	Not Started.
EDC-19	1	Extreme Heat	**Water Hydrants and Tanks**. Many areas in the County lack water sources for firefighting. Install water sources in those areas lacking sources.	El Dorado County	El Dorado County OWPR Steering Committee (Lead Agency), Local Fire Agencies	Moderate	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIRE	Safety and Security	High	Annually	New in 2024.
EDC-20	1,2	Extreme Heat	**Heat Island Reduction.** Create greenspaces to mitigate effects of heat on schools, campuses, and community locations (libraries) identified for cooling centers.	El Dorado County (Lead Agency), EDCOE	County EPR EDCOE, County Planning	High	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIREState	Safety and Security	High	Long-Term	New in 2024
EDC-21	1	Extreme Heat	**Extreme Heat Plan Revision.** Review and update heat response plan. .	El Dorado County, EDCOE	County Building and Planning Department, Long Range Planning (Lead Agency), Health and Human Services, Emergency Medical Services, Public Health Department	Moderate	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, SHSGP Grant Program, CALFIRE, State	Safety and Security	High	Short-Term	New in 2024
EDC-22	1,2	Debris Flow and Landslide, Erosion, Flood	**Storm Drainage & Infrastructure Clearing During Winter Storm Events.** Every year due to rain and snow, multiple neighborhoods in the Meyers and along the Upper Truckee River flood. The clearing of snow increases this flooding because it creates walls of snow in the Lake Tahoe Region.	El Dorado County	El Dorado County, El Dorado County Water Agency (EDWA), County EPR, EDCOE, Lake Tahoe Unified School District	Very High	DWR and Cal OES Grants, Sierra Nevada Conservancy	Safety and Security	High	Long-Term	New in 2024

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EDC-23	1,2,3	Flood, Debris Flow and Landslide, Erosion	**Reduce erosion and debris flows along Upper Canal**. Issue burned areas. Steep slopes. Unstable soils.	El Dorado County, GDPUD	El Dorado County DOT (Lead Agency), EDWA, County EPR	High	FEMA HMA HMGP, DWR	Safety and Security	High	Short-Term	New in 2024
EDC-24	1,2	Flood, Erosion	**Flood Mitigation. El Dorado Flooding**. Improve water diversion/shed.	El Dorado County	El Dorado County DOT (Lead Agency) CalTrans, EID, OES	Very High	FEMA HMGP, CDFG	Safety and Security	Medium	Long-Term	New in 2024.
EDC-25	1,2	Flooding, Debris Flow and Landslide, erosion	**Flooding Mitigation in Streams and Waterways**. Deer Creek in Cameron Park and Slate Creek in the Town of El Dorado both are limited in capacity to handle flood flows due to being filled in with sediment over time.	El Dorado County, Cameron Park CSD	El Dorado County OES (Lead Agency) Cameron Park CSD, County EDWA	Very High	FEMA HMA HMGP, DWR	Safety and Security, Water Systems	High	Long-Term	New in 2024.
EDC-26	1,2,4	Wildfire, Heavy Snow, Flood, Debris Flow and Landslide	**Roadside Hazardous Vegetation and Road Surface Improvement.** Provide roadside clearance at identified critical roads (fire severity zones, one-way roads).	El Dorado County	County OWPR (Lead Agency), CalTrans, OES, PG&E, Local Fire Agencies	Moderate ($50-75 per house)	HMGP, CWMP, BRIC	Transportation	High	Long-Term	New in 2024.
EDC-27	1, 2, 3, 4, 5	All Hazards	**Home Hardening/Ignition-Resistant Construction Retrofits.** Homes 20+ years old do not meet Chapter 7A building requirements. Actions include identifying number of homes, retrofitting homes, structures to meet requirements.	El Dorado County	County OPWR (Lead Agency), Local FDs, CALFIRE, FSCs, etc.	Very High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, Local budget, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety and Security	High	Medium-Term	New in 2024.
EDC-28	1, 2, 3, 4	Severe Weather	**Development and Implementation of a Common Operating Platform for Risk Assessment and Information.** A shared portal or platform for private utilities to communication companies to share risk information strategies and vulnerabilities.	El Dorado County	County OES(Lead Agency), CAL FIRE, USFS, RCDs, Liberty, PG&E, SMUD, AT&T	Moderate	Community Power Resiliency Allocation Program, FEMA EMPG, HMGP, FGMA Grants	Communications	High	Short-Term	New in 2024.

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			Integrate into overall county assessing priority planning mitigation.								
EDC-29	1, 2, 3, 4	Wildfire, All Hazards	**Permanent Generator Backup Power at County Libraries.** Install backup generators at all county libraries.	El Dorado County	County OES (Lead Agency), CAL FIRE, USFS, RCDs, Liberty, PG&E, SMUD, AT&T	Very High	El Dorado County General Fund, FEMA SHSGP, HMGP Grants, and potentially the EOC Grant Program	Safety and Security	Medium	Medium-Term	New in 2024.
EDC-30	1,2	Wildfire, Severe Weather: Heavy Snow and Winter Storms	**Establish a Backup Emergency Operations Center.** Current EOC is located in a high fire hazard severity zone. No alternate EOC exists. EID facility is shown as an alternate site but is the City of Placerville's EOC site. West end of County is preferred.	El Dorado County	El Dorado County OES (Lead Agency), Sacramento County	Very High	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, BRIC, SHSGP Grant Program	Communications	High	Long-Term	New in 2024.
EDC-31	1, 2, 3	Flood	**Storm Drainage & Flooding Master Plan.** Create a masterplan of flooding and drainage. Includes who is responsible for what role.	El Dorado County	EL Dorado County Building and Planning Department Long-Range Planning, County OES, County EPR (Lead Agency), Cities of Placerville and South Lake Tahoe, El Dorado County Office of Education, El Dorado Irrigation District, South Tahoe Public Utility District, Fire Prevention Districts, Fire Safe Councils, Georgetown Public Utility District, Community Service Districts and Other Special Districts	Very High ($5 Million)	CAL DWR, CAL OES, FEMA HMA, CAP, CTP, BRIC Grants, The Nature Conservancy, NOAA Grants.	Water Systems	Medium	Long-Term	New in 2024
EDC-32	1, 2, 4, 5	Wildfire, All Hazards	**Early Warning Systems for Evacuation Planning.** El Dorado County will continue to evaluate and improve early warning and notification systems to employ during evacuation events. They will partner with trusted organizations/leaders to relay	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	High	FEMA HMA HMGP	Safety and Security	High	Short-Term	New in 2024

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			information and communicate to the public when extreme conditions are forecasted in order to promote pre-evacuations for populations most in harm's way.								
EDC – 33	1, 3, 5	Wildfire, All Hazards	**Adapt Roadways to Support Evacuation.** The County will work towards adapting roadways to support partial and/or full contraflow during evacuation events consistent with findings and recommendations in traffic evacuation analysis and plans, such as the Greater Placerville Wildfire Evacuation Preparedness, Community Safety, and Resiliency Study and other relevant traffic evacuation studies that cover the unincorporated portions of the County. Projects may include lane widening, roundabouts, and optimizing signal timing to improve traffic flow.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services, EDCTC	High	FEMA HMA HMGP	Safety and Security	High	Medium-Term	New in 2024
EDC-34	1, 2,3, 4, 5	Wildfire, All Hazards	**Tabletop Exercises for Wildfire Evacuation.** Conduct tabletop exercises on a routine basis to improve agency coordination and identify how evacuation management strategies, such as phased evacuation zones and evacuation notification systems, can be implemented to improve traffic flow during an emergency.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services, ETCTC	High	FEMA HMA HMGP	Safety and Security	Medium	Medium-Term	New in 2024
EDC-35	1, 2, 3, 4, 5	Wildfire, All Hazards	**Support Community Resilience Centers.** Support bolstering capacity within neighborhoods or census tracts that have limited resources and prioritize the development of emergency resource centers or resilience hubs in underserved and at-risk areas with limited access to evacuation locations as well as emergency supplies and services.	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	Moderate	FEMA HMA HMGP, BRIC	Safety and Security	High	Short-Term	New in 2024
EDC-36	1, 2, 3, 4, 5	Wildfire, All Hazards	**Manage Evacuation Route and Location Demand during Emergencies.** Partner with housing services and other	El Dorado County	El Dorado County Sheriff's Office of Emergency Services	High	General Fund, Potential	Safety and Security	High	Short-Term	New in 2024.

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			community-based organizations and entities to provide hotel vouchers to low-income and vulnerable communities that may be used during voluntary or mandatory evacuation events to address income-related barriers to evacuation and promote quicker evacuation response.				Donation-Based System				
CP-1	1, 2, 3, 4, 5	Flood	**Cameron Park Flood Management Plan.** Create a master plan or what flooding and drainage should look like amongst the community. Identify who is responsible for what. Include subdivisions, lakes, undersized drainage.	Cameron Park CSD	Cameron Park CSD (Lead Agency), County DOT, California Fish and Game, BLM, Private Property Owners	Very High	CAL DWR, CAL OES, FEMA HMA, CAP, CTP, BRIC Grants, The Nature Conservancy, NOAA Grants. Tax Payers, Stakeholders	Water Systems	High	Long-Term	New in 2024.
CP-2	1, 3, 5	Flooding, Erosion	**Flooding Mitigation in Streams and Waterways.** Deer Creek in Cameron Park and Slate Creek in the Town of El Dorado are both are limited in capacity to handle flood flows due to being filled in with sediment over time.	Cameron Park CSD	Cameron Park CSD (Lead Agency), County DOT, EDWA	Very High	FEMA HMGP, CDFG	Water Systems	High	Long-Term	New in 2024.
CP-3	1,3	Extreme Heat, Drought, Wildfire	**Achieve national recognition as a Firewise Community**. Enables benefits to residents with homeowner insurance policies.	Cameron Park CSD	County OWP (Lead Agencyy) Cameron Park CSD	Low, FEMA CAP, FMA Grants	Staff, General Fund	Safety and Security	Medium	Ongoing	New in 2024
CP-4	1,2	Flood, Drought, Extreme Heat, Wildfire	**Implement Water Conservation Strategies in Parks and Facilities.**	Cameron Park CSD	County OES (Lead Agency), County Long Range Planning, CP CSD	Medium-High	Local CAL FIRE and Cal OES Grants, Sierra Nevada Conservancy, CalEPA	Safety and Security	Medium	Ongoing	New in 2024
CP-5	1,2	Earthquake	**Earthquake Mitigation.** The District should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	Cameron Park CSD	District of District Engineering Department (Lead Agency), County Long Range Planning, County OES	high	FEMA HMA, HMGP, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024

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CP-6	1,2	Flood	**Flood Reduction**. The District shall provide for channel improvements to and tree and brush clearance along watercourses in District to reduce flooding	Cameron Park CSD	District (Lead Agency), DWR	High	FEMA HMA, HMGP, BRIC, USACE	Safety and Security, Water Systems			
CP-7	1,2	Wildfire, Extreme Heat	**Home Hardening.** All new development in areas of high and extreme fire hazards shall be constructed with fire retardant roof coverings.	Cameron Park CSD	District Fire Dept. (Lead) County OPWR Agency), CALFIRE, FSCs, etc.	High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety a Security	Medium	Medium Term	New in 2024
CP-8	1,2,3	Earthquake, Land Subsidence, Landslide and Debris Flow	**Assessment of Critical Facilities.**	Cameron Park CSD	District Fire Dept. (Lead Agency), County Long Rang planning, County OES	Low	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	High	Medium Term	New in 2024
CP-9	1,2	Extreme Heat, Drought	**Extreme Weather Shelter.** - Develop plan for center to assist at-risk populations in Cameron Park during extreme weather events, including heavy rain, hail and lightning, high wind, and flood events. Coordinate with regional plans for consistency.	Cameron Park CSD	District Fire Dept. (Lead Agency) County OES, County EPR	Medium	General Fund, FEMA CAP, CTP, FMA	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	New in 2024
CP-10	1,2	Wildfire, Erosion and Flood	**Reduce the Vegetation throughout the Pine Hill Preserve on El Dorado County-Owned Land.** BLM owns the Pine Hill Preserve which is thick with vegetation. There are rare plant species on the Pine Hill Preserve, which protects the vegetation from being thinned out or maintained. EDC owns several parcels of land that not compliant with the County's Weed Abatement Ordinance and there	Cameron Park CSD, El Dorado County	El Dorado EPR (Lead Agency) El Dorado County Irrigation District BLM, CPCSD	High (Up to $1M)	CAL HOME Program grants, SHSGP Grant, FEMA HMGP	Safety and Security	High	Long Term	New in 2024

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			ispotential for extreme wildfire due to not managing vegetation.								
CP-11	1,2,3	Erosion and Flood	**Cleaning the Sediment and Vegetation Growing in Deer Creek and Other Water Ways.** The majority of water ways in Cameron Park are filled up with vegetation and sediment. Deerk Creek is the main water was through Cameron Park. The CPCSD has Deer Creek and other water ways that flow throughout the park system. Creeks and drainage canals need to be cleaned out an maintained on a regular basis.	Cameron Park CSD	Land owner – CPCSD, EDDOT, BLM (Lead Agency) Property Owners.	High (up to $5M)	FEMA BRIC, Tax Assessment, County OES/EDWA, State OES.	Safety and Security. Waterways.	High	Medium Term	New in 2024
CP-12	1,2	Debris flow and landslide, Erosion, Flood, and Severe Weather: All.	**Dredging the Inlets to Cameron Park Lake**. Extreme flooding occurred in January of 2023. This caused an excess of sediment and material to build up in both inlets at Cameron Park Lake.	Cameron Park CSD	District Fire Dept (Lead Agency) Fish and Wildlife, EDWA	Medium ($40K)	FEMA BRIC,HMA, Local Operating Budget	Safety and Security, Water Systems	High	Short Terms. Fall of 2024 when the lake is at its lowest possible water level.	New in 2024
GPUD-1	1, 2, 3, 4	Debris flow and Landslide, Erosion	**Reduce Erosion And Debris Flows** Along Upper Canal. Issue burned areas. Steep slopes. Unstable soils. Open water conveyance canals; Limit the amount of debris or sediment into the canal.	GDPUD	GDPUD (Lead Agency), County EDWA	Very High	CAL FIRE and Cal OES Grants, Sierra Nevada Conservancy	Water Systems	Medium	Short-Term	New in 2024.
GPUD-2	3, 4, 5	Extreme Heat, Drought	**Redundant Electrical Supply.** District has one supply for 210,000 customers. A second source would benefit the district in the event of failure.	GDPUD	GDPUD (Lead Agency), County EDWA	High	FEMA BRIC, CALFIRE	Water Systems	High	Medium-Term	New in 2024.
GPUD-3	1, 2, 4, 5	Wildfire	**Distribution System Protection.** Clear vegetation surrounds critical facilities (Treatment Plants/ Storage tanks).	GDPUD	District Staff (Lead Agency), County EDWA, Fire Safe Councils/Districts	High	Community Power Resiliency Allocation Program, EMPG, FEMA HMA HMGP, BRIC, SHSGP Grant Program, HMGP, BRIC	Water Systems	High	Short-Term	New in 2024

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GPUD-4	1,2	Dam Failure, Flood	**Annual Canal Lining Program.** Prioritized repair and lining of water conveyance canals and ditches.	GDPUD	GDPUD (Lead Agency), County Long Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $150,000.00. An additional $100,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPUD-5	1,2	Flood, Erosion, Severe Weather: all.	**Replace Pump Stations.** Replacement of aging pump stations.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $50,000.00. An additional $12,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPUD-6	1,3,4	Flood, Erosion, Severe Weather: all	**Sweetwater Treatment Plant Storage Tank.** Install a two million gallon storage tank adjacent to Sweetwater Treatment Plant.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	High	GDPUD Funded: $3,000,000.	Water Systems	High	Ongoing	New in 2024
GPUD-7	1,2	Flood, Erosion, Severe Weather: all, Extreme Heat, Wildfire	**Angel Camp Tank Recoating. Project.** Will clean and recoat Angel Camp Storage Tank to maintain high water quality.	El Dorado County, GDPUD	County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $366,800.00	Water Systems	High	Ongoing	New in 2024
GPUD-8	1,2,3	Flood, Erosion, Severe Weather: all	**Treated Water Line Replacement.** Projects will include treated water line replacements.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $300,000.0, An additional $50,000 is allocated each fiscal year until 2026/2027.	Water Systems	High	Ongoing	New in 2024
GPUD-9	1,2,3,4		**Parshall Flume.** This project allocates $20,000 for the installation of Parshall Flumes along the raw water canal.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $20,000.00	Water Systems	High	Ongoing	New in 2024
GPUD-10	1,2	Flood, Erosion, Severe Weather: all	**Tunnel Hill Inspection and Lining.** Inspect Tunnel Hill raw water conveyance tunnel to access condition.	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe Range Planning, County EPR, County EDWA	Medium	GDPUD Funded: $65,000.00	Water Systems	High	Ongoing	New in 2024
GPUD-11	1,2	Flood, Erosion,	**Wastewater Lift Station Upgrade.** Upgrade wastewater lift station for	El Dorado County, GDPUD	District Staff (Lead Agency), County Longe	Medium	GDPUD Funded: $150,000	Safety and Security	High	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
		Severe Weather: all	increased capacity and replace worn out components.		Range Planning, County EPR, County EDWA						
GPUD-12	1,2	Dam Failure	**Mark Edson Dam Spillway Facility Rehabilitation and Mitigation.** Spillway underdrain is again and may need rehabilitation and mitigation. Spillway assessment identified the need to evaluate the spills underdrain system. Failure could threaten integrity of Dam.	El Dorado County, GPUD	District Staff (Lead Agency County EDWA	High ($5M)	GPUD	Safety and Security, Water Systems	Low	Short Terms2026	New in 2024
GPUD-13	1,2,3	Debris Flows, Severe Weather: All, Flood	**Debris Flows Mitigation Along Upper Canal**. Approximately 5-7 miles of the Districts upper canal is located within a high slope area that is threatened by debris flows. The debris flows and be contributed to longer term slope equilibrium process, water conveyance or weather events. Piping would protect the system from severe rain events. The water conveyance system along this area is the sole source for the Water District	El Dorado County, GPUD	District Staff (Lead Agency) County EDWA	High ($10-$20M)	FEMA HMGP, USDA, USBR, FEMA BRIC, Local funds	Safety and Security, Water Systems	High	Medium Term	New in 2024
GPUD-14	1,2	Drought, Extreme Heat, Wildfire, Flood	**Water Reliability.** The District relies on one supply to serve the community. Water reliability would include developing a second source to mitigate long-term droughts or extreme heat where supplies would be stressed. Additional supplies could be developed from a second reservoir or pumping facility.	El Dorado County, GPUD	District Staff (Lead Agency) County EDWA	High ($50-$100M)	FEMA BRIC, USDA, Local funds	Safety and Security, Hydration, Water Systems	High	Long Term (15-20 Years)	New in 2024
GPUD-15	1,3	Debris Flows, Flood, Severe Weather: All, Drought Extreme Heat, Wildfire	**Construct Rubicon River Diversion Conveyance System from South Fork Rubicon to Pilot Creek upstream of Stumpy Meadows Reservoir.** Anticipated drought resiliency benefits: This will construct a gravity diversion conveyance system from the South Fork of the Rubicon to Pilot Creek upstream of Stumpy Meadows Reservoir. It will require the Agency to negotiate with SMUD under the reopener provision of the El Dorado-SMUD Cooperation Agreement and would likely require payment to SMUD. This will	El Dorado County, GPUD	District Staff	High	FEMA BRIC, SMUD, County EDWA	Safety and Security, Water Systems	High	Long Term	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			provide water supply redundancy and improve water supply reliability, particularly during dry year conditions.								
GPUD-16	1,2	Earthquake	Earthquake Mitigation. The District should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	El Dorado County, GDPU	District Staff (Lead Agency) DWR	High	FEMA HMA, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024
EDCOE-1	1	Extreme Heat	**Heat Island Reduction.** Create greenspaces to mitigate effects of heat on schools, campuses, and community locations (libraries) identified for cooling centers.	El Dorado County, EDCOE	County OES (Lead Agency), EDCOE, County Planning	High	CAL FIRE and Cal OES Grants, FEMA BRIC Grant, Sierra Nevada Conservancy	Safety and Security	High	Ongoing	New in 2024
EDCOE-2	1,2	Extreme Heat	**Extreme Heat Plan Revision.** Review and update heat response plan.	El Dorado County, EDCOE	County EPR, County OES (Lead Agency) County Health and Human Services, County Emergency Medical Services, County Public Health Department	High	Staff, CAL FIRE and Cal OES Grants	Safety and Security	High	Ongoing	New in 2024
PL-1	1,2,3	Flood, Erosion	**Pierroz Road and Cold Springs Road Storm Drain Improvements.** Cold Springs Road connects to Pierroz Road just north of Placerville Drive and both roads have shown a need for storm drain system maintenance and improvements. The culvert that spans Hangtown Creek and connects Pierroz Road to Placerville Drive has become scour critical as identified by the Bridge Inspection Report generated by Caltrans bi-annually. The City will evaluate the area, propose, and implement improvements to the storm drain system and related features along with any other necessary utility improvements and potential pavement improvements.	City of Placerville	City of Placerville Staff (Lead Agency), County Long Range Planning, County OES, County EPR	High	City of Placerville Funded: $25,000	Safety and Security	High	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
PL-2	1,2,3	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Debbie Lane Storm Drain Maintenance.** Debbie Lane is a private road that receives public drainage from upstream culverts and roadways. During the storms of December 2022/January 2023, several deficiencies were identified in that system and will need to be addressed. The City will do a full assessment of the system and implement improvements to be completed in conjunction with the Placerville Drive Bicycle and Pedestrian Facility Improvements project, which includes a segment of work on Green Valley Road, adjacent to Debbie Lane.	El Dorado County, City of Placerville	City of Placerville Staff (Lead Agency), County Long range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $50,000	Safety and Security, Water Systems	High	Ongoing	New in 2024
Pl-3	1,23	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Wiltse Road Storm Drain Repair.** During the utility assessment of the Broadway Maintenance Project, segments of the storm drain system that crosses Broadway and continues down Wiltse Road were identified as deficient and in need of lining or replacement. The Broadway Maintenance project will soon go to construction and staff proposes to include improvements to the Wiltse Road storm drain system as it discharges into Hangtown Creek as part of that work and contract.	El Dorado County, City of Placerville	City of Placerville Staff (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $200,000	Safety and Security, Water Systems	High	Ongoing	New in 2024
PL-4	1,2,3	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain	**Sacramento Street Waterline Relocation.** Recently, the City identified an existing water main that spans cross country, on privately owned parcels, and partially within easements. That water main was constructed in the early 1950s in between Chamberlain Street and Sacramento Street and that places the line near the end of its useful service life. Although there is no history of maintenance demands on this water main, in its present location, it is inaccessible and unmaintainable by the Public Works Department. This project proposes to	El Dorado County, City of Placerville	City of Placerville, (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $25,000	Safety and Security, Water Systems	High	Ongoing	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
			construct a new water main in Sacramento Street by connecting to the recently constructed water main that was installed in the road in 2017 as part of the Pardi Way/Sacramento Street Water Main Replacement project.								
PL-5	1,2,3`	Flood, Severe Weather: Thunderstorms, Hail, Lightning, and Heavy Rain, Severe Weather: Heavy Snow and Winter Storms	**Secondary Clarifier No. 1 Protective Coating.** The central mechanism of Secondary Clarifier No. 1 was replaced through the Secondary Clarifier No. 1 Mechanism Replacement project (CIP #42108) in 2022 just prior to the wet winter months that shortly followed. However, as the project progressed, the corrosion of the old mechanism was noted and coating the new mechanism with a protective coating is recommended.	El Dorado County, City of Placerville	City of Placerville (Lead Agency), County Long Range Planning, County OES, County EPR, County EDWA	High	City of Placerville Funded: $130,000	Water Systems	High	Ongoing	New in 2024
PL-6	1,2	Earthquake	**Earthquake Mitigation.** The City should ensure that all public facilities, such as buildings, water tanks, and reservoirs, are structurally sound and able to withstand seismic shaking and the effect of seismically-induced ground failure.	City of Placerville	City of Placerville Engineering Department (Lead Agency), County Long Range Planning, County OES	high	FEMA HMA, HMGP, BRIC, USACE	Safety and Security; Health and Medical	Medium	Medium Term	New in 2024
PL-7	1,2	Flood	**Flood Reduction**. The City shall provide for channel improvements to and tree and brush clearance along watercourses in Placerville to reduce flooding	City of Placerville	City of Placerville Engineering Department (Lead Agency), DWR	High	FEMA HMA, HMGP, BRIC, USACE	Safety and Security, Water Systems	Medium	Medium Term	New in 2024
PL-8	1,2	Wildfire, Extreme Heat	**Home Hardening.** All new development in areas of high and extreme fire hazards shall be constructed with fire retardant roof coverings.	City of Placerville	City of Placerville DSD (Lead) County OPWR Agency), CALFIRE, FSCs, etc.	High	General Fund, HUD CDBG Funds, HOME, and Cal Home Program grants, General Fund, General Fund, SHSGP Grant Program, FEMA HMGP, and potentially the EOC Grant Program	Safety a Security	Medium	Medium Term	New in 2024

ID	LINKS TO GOALS	HAZARD(S) MITIGATED	DESCRIPTION/ BACKGROUND/ BENEFITS	JURISDICTION	LEAD AGENCY AND PARTNERS	COST ESTIMATE	POTENTIAL FUNDING	FEMA LIFELINE	PRIORITY	TIMELINE	IMPLEMENTATION STATUS
PL-9	1,2,3	Earthquake, Land Subsidence, Landslide and Debris Flow	**Assessment of Critical Facilities**	City of Placerville	City of Placerville DSD (Lead Agency), County Long Rang planning, County OES	Low	General Fund, HUD CDBG Funds	Safety and Security, Communication, Food, Hydration, Shelter	High	Medium Term	New in 2024
PL-10	1,2	Extreme Heat, Drought	**Extreme Weather Shelter.** Develop plan for center to assist at-risk populations during extreme weather events. Coordinate with regional plans for consistency.	City of Placerville	City of Placerville Police (Lead Agency) County OES, County EPR	Medium	General Fund, FEMA CAP, CTP, FMA	Safety and Security, Communication, Food, Hydration, Shelter	Medium	Medium Term	New in 2024

Acronyms and abbreviations referenced above are defined below:

- APGP – California Adaptation Planning Grant Program
- BLM – Bureau of Land Management
- BRIC – Building Resilient Infrastructure and Communities
- CAL FIRE - California Department of Forestry and Fire Protection
- CAP – Community Assistance Program (FEMA)
- CDFG- California Department of Fish and Wildlife
- CPRAGP – Community Power Resiliency Allocation Grant Program – formerly the Public Safety Power Shutoff (PSPS) Program Funds
- CSD – Community Service District
- CTP – Cooperating Technical Partners (FEMA)
- CWMP - California Wildfire Mitigation Program
- DOT - Department of Transportation
- DWR – California Department of Water Resources
- EDCOE - El Dorado County Office of Education
- EDWA - El Dorado County Water Agency
- EID - Irrigation District
- EMPG – Emergency Management Performance Grant
- OES - El Dorado Office of Emergency Services
- EPR - El Dorado County Emergency Preparedness and Response
- FSC – Fire Safety Council
- FSD – Fire Safety District
- FEMA – Federal Emergency Management Agency
- GDPUD – Georgetown Divide Public Utility District
- HMA – Hazard Mitigation Assistant Program
- HMGP – Hazard Mitigation Grant Program
- HSGP – Homeland Security Grant Program
- OWPR- Office of Wildfire Preparedness and Resilience
- SHSCP - State Homeland Security Grant Program
- SMUD - Sacramento Municipal Utility District
- STPUD - South Tahoe Public Utility
- USACE – United States Army Corps of Engineers
- USFS – United States Forest Service

6 PLAN ADOPTION, IMPLEMENTATION, AND MAINTENANCE

Requirement §201.6(c)(4)-(5):

[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.

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from El Dorado County decision makers and the participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan. The governing board for each participating jurisdiction has adopted this MJHMP by passing a resolution.

Implementation and maintenance of the plan are critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This section provides an overview of the overall strategy for plan implementation and maintenance, and outlines the method and schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

6.1 ADOPTION

The purpose of formally adopting this plan 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 plan 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 Local Hazard Mitigation Plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix D: Adoption Resolutions.

6.2 FORMAL PLAN ADOPTION DOCUMENTATION

Adoption by the local governing body demonstrates the community's commitment to implementing the mitigation strategy and authorizes responsible agencies to execute their actions. The final plan is not approved until El Dorado County and each participating jurisdiction adopts the plan and FEMA receives documentation of formal adoption by the governing body of each jurisdiction requesting approval. This plan covers El Dorado County and its participating jurisdictions: the City of Placerville, EDCOE, GDPUD, and Cameron Park CSD.

El Dorado County and the four participating jurisdictions plan to submit this plan to the El Dorado County Board of Supervisors (BOS), and their respective city councils and special districts upon successful completion of State and federal review and following the issuance of an Approved Pending Adoption (APA) designation from FEMA. This provides an efficient approval process if FEMA determines the MJHMP requires revisions because the County and each participating jurisdiction can make these revisions prior to initiating the local plan adoption process.

Once FEMA issues APA notification, adoption by each participating jurisdiction must take place within one year for each jurisdiction to become or remain eligible for FEMA HMA program funding. Given this is a multi-jurisdictional planning process, El Dorado County will coordinate the adoption of all four jurisdictions adoption process as soon as the plan receives APA status. Because each City/Board governing body has different meeting schedules, El Dorado County will also coordinate with each participating jurisdiction/agency regarding the timing of their adoptions to submit adoption documentation to Cal OES and FEMA at the same time.

Once the County records and submits the adoption documentation to Cal OES and FEMA, FEMA will issue an official approval letter stating which jurisdictions/agencies have adopted and are approved and eligible for FEMA HMA program funding. The approval letter will include an expiration date five years from the date of the letter and attached to the approval letter will be a final FEMA Local Mitigation Plan Review Tool that provides feedback on the strengths of the plan, recommendations for plan improvements during future plan updates, and suggestions for implementing the mitigation strategy

6.3 GENERAL PLAN SAFETY ELEMENT INTEGRATION

The MJHMP was prepared consistent with the El Dorado County General Plan Public Health, Safety, and Noise Element and the City of Placerville Safety Element. General Plan Safety Element integration is also only applicable to the two municipalities. The planning mechanisms cover common overlapping natural hazard issues and mutually reinforcing policies and implementation programs.

California Government Code Section 65302.10, (AB 2140) encourages California counties and cities to adopt their current, FEMA-approved LHMPs into the Safety Element of their General Plan. This adoption by reference or incorporation of the MJHMP into the Public Health, Safety, and Noise Element of the General Plan follows plan approval and makes El Dorado County and the City of Placerville eligible to be considered for part or all of its local-share costs on eligible public assistance funding to be provided by the State under the CDAA. As such, AB 2140 compliance provides additional funding after a disaster occurs and this is an optional state incentive to help counties and cities become more resilient to natural hazards.

Because compliance with AB 2140 expires when the MJHMP expires, the County must re-adopt the plan into their Safety Elements during the 8-year update cycles to ensure continued compliance and funding eligibility. Additionally, the City of Placerville must adopt their annex into their own General Plan Safety Element, as the annex jurisdictions are not covered under the County's General Plan Safety Element adoption.

6.4 IMPLEMENTATION

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participants will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the general plans and CWPPs for El Dorado County and participants. The County and participants already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the El Dorado County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community.

Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi- objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available; the participants will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

6.4.1 Role of the HMPC in Implementation and Maintenance

With adoption of this plan, the participants will be responsible for the plan implementation and maintenance. The HMPC identified in Appendix A (or a similar committee) will reconvene bi-annually each year to ensure mitigation strategies are being implemented; this effort will be led by the County's Sheriff's Office of Emergency Services. As such, El Dorado County and participants agree to continue its relationship with the HMPC to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the various governing boards or councils of all participants; and
- Inform and solicit input from the public.

During the annual an assessment of progress on each of the goals and activities in the plan will be determined and noted. At that time, recommendations can be made to modify timeframes for completion of activities, funding resources, and responsible entities.

On an annual basis, the priority standing of various activities may also be changed. Some activities that are found not to be doable may be deleted from the plan entirely and activities addressing problems unforeseen during plan development may be added.

The primary duty of the participants is to see the plan successfully carried out and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

6.5 MAINTENANCE AND MONITORING

6.5.1 Maintenance Schedule

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

6.5.2 Maintenance and Evaluation Process

The El Dorado County Sheriff's OES is responsible for initiating plan reviews and consulting with the other participants. To monitor progress and update the mitigation strategies identified in the action plan, El Dorado County Sheriff's OES, and a designated Project Manager, and the individual participants will revisit this plan annually and/or following a hazard event. The HMPC will meet bi-annually to review progress on plan implementation and will provide annual evaluation reports for each participant. The El Dorado County Sheriff's OES will also submit a five-year written update to the State and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in 2024, the next plan update for the El Dorado County Planning Area will occur in 2029.

6.5.2.1 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).

6.5.2.2 Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. All mitigation actions will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation.

Updating of the plan will be by written changes and submissions, as the El Dorado County Sheriff's OES deems appropriate and necessary, and as approved by the appropriate governing boards or councils of the other participating jurisdictions. In keeping with the five-year update process, the El Dorado County Sheriff's OES will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing boards or councils.

6.5.2.3 Annual Plan Review Process

The El Dorado County Sheriff's OES will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the plan. Plan reviews will normally occur on a bi-annual basis each year and will be conducted by the El Dorado County Sheriff's OES as follows:

- The El Dorado County Sheriff's OES will use social media, press release or similar public communication advising the public of the date, time, and place for the annual review of the plan and will be responsible for leading the meeting to review the plan.
- Notification will be sent to the members of the federal, state, and local agencies, non-profit groups, local planning agencies, and representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- County/City/District officials will be noticed by email, telephone or personal visit and urged to participate.

- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- After the review meeting, minutes of the meeting and an annual report will be prepared by the El Dorado County Sheriff's OES and made available upon request.
- The report will also be presented to the County/City/participating jurisdictions' governing boards for review, and a request will be made that the Board take action to recognize and adopt any changes resulting from the review.

6.5.2.4 Criteria for Annual Reviews

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the annual reviews will include the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone.
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to those events.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Hazard Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

6.5.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and City plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County and City general and master plans
- County and City EOPs
- County and City ordinances
- Flood/master plans

- CWPPs
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessments in the participant annexes
- Other plans, regulations, and practices with a mitigation focus

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

6.5.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. Efforts will be made to involve the public in the plan maintenance, evaluation, and review process. This includes maintaining a digital version of the plan on the County OES website for public review. In addition, information on who to contact within the OES will be posted with the plan. The El Dorado County OES will maintain a file of comments received for reference during the next five-year update. Any revisions to the plan that may occur as a result of a disaster will also be made public and posted on the County website.

The next five-year update process also provides an opportunity to solicit participation from new and existing stakeholders and publicize success stories from the plan implementation and seek additional public comment. A public hearing(s) or survey to receive public comment on the plan will be held during the plan update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted, and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets as well as email and social media announcements.

Public involvement strategies that were used during the 2023 – 2024 planning process are captured in the Outreach Strategy in Appendix F. The appendix can serve as a reference for continued public involvement over the next several years and lays the foundation for outreach associated with the next formal five-year update. The HMPC will incorporate the following engagement concepts from the Outreach Strategy:

- Recognizing that not everyone participates in the same way or at the same time, include a mix of participation strategies that provides for a broad and diverse set of engagement opportunities that consider the diversity of the County's planning area.
- Ensure that the public has an opportunity to provide input during the planning process and prior to the finalization of the County's MJHMP update.
- Ensure a "whole community" approach to building stakeholder and public support for, and ultimately ownership of, the County's MJHMP.
- Identify specific outreach activities and document activities as the planning effort progresses.
- Distribute emails and postcards and newsletters to the public about hazard mitigation.
- Participate in existing community events to share information about hazard mitigation (e.g., community farmer's markets, library events, senior centers).
- Continue to use the County's MJHMP Webpage as a distribution point or repository for HMP information.

7 REFERENCES

—— "2020 Urban Water Management Plan Draft." Georgetown Utility Divide Public Utility District (GDPUD), March 2023. https://www.gd-pud.org/files/0db560bb6/2020+UWMP+Text.pdf.

—— "2020 Urban Water Management Plan for South Tahoe Public Utility District." South Tahoe Public Utility District (STPUD), June 2021. https://stpud.us/asset/9036/.

—— "2020 Urban Water Management Plan." El Dorado Irrigation District (EID), June 28, 2021. https://www.eid.org/https://www.eid.org/home/showpublisheddocument/5666/637619651261230000.

—— "2020 Urban Water Management Plan." Tahoe City Public Utilities District (TCPUD), February 2020. https://www.tcpud.org/sites/default/files/TCPUD_2020UWMP__Final_3-22-22.pdf.

—— "Climate Change Impacts Across California - Crosscutting Issues." 2022 LAO. California Legislative Analyst's Office. April 5. Accessed July 2023. https://lao.ca.gov/Publications/Report/4575.

—— "California State Hazard Mitigation Plan Volume 1." 2023. California Governor's Office of Emergency Services. State of California. December 12. https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Primer_11.29.2023.pdf.

—— "CDEC Web Applications: WSIHIST." California Data Exchange Center. Accessed December 28, 2023. https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST.

—— "Lake Tahoe Fun Facts" (no date). Tahoe Fund. https://www.tahoefund.org/about-tahoe/tahoe-fun-facts/ Accessed: 22 March 2024.

—— "New Aerial Survey Identifies More than 100 Million Dead Trees in California." 2016. USDA Forest Service Press Release. November 18. https://www.usda.gov/media/press-releases/2016/11/18/new-aerial-survey-identifies-more-100-million-dead-trees-california.

—— "Search Earthquake Catalog." 2024. U.S. Geological Survey. Accessed January 3. https://earthquake.usgs.gov/earthquakes/search/.

—— "Survey Detects 36 Million Dead Trees in California." 2023. USDA Forest Service Press Release. February 7. https://www.fs.usda.gov/detail/r5/news-events/?cid=FSEPRD1088646.

—— "Types of Drought." National Drought Mitigation Center. Accessed December 28, 2023. https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx.

—— "Water Shortage Vulnerability Scoring and Tool." Department of Water Resources, February 2023. https://water.ca.gov/Programs/Water-Use-And-Efficiency/SB-552/SB-552-Tool.

——""Eldorado National Forest Facts Sheet." 2018. Nature's Benefits Eldorado Forest, USDA Forest Service, www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd596535.pdf. Accessed 22 Mar. 2024.

CA Climate Adaptation Strategy (2021) https://climateresilience.ca.gov/

California Department of Finance. Demographic Research Unit. Report P-2A: Total Population Projections, California Counties, 2020-2060 (Baseline 2019 Population Projections; Vintage 2023 Release). Sacramento: California. July 2023. https://dof.ca.gov/forecasting/demographics/projections/

California Employment Development Department. 2023. “El Dorado County Profile.” County Profiles. State of California. Accessed December 19. https://labormarketinfo.edd.ca.gov/cgi/databrowsing/localAreaProfileQSResults.asp?selectedarea=El%2BDorado%2BCounty&selectedindex=9&menuChoice=localAreaPro&state=true&geogArea=0604000017&countyName=.

El Dorado County. 2023. “Adopted General Plan.” Planning Services. County of El Dorado. Accessed December 19. https://www.edcgov.us/Government/Planning/pages/Adopted_General_Plan.aspx.

El Dorado Water Agency (EDWA). (2019). Water resources development and management plan. https://www.edwateragency.org/Shared%20Documents/2019_WRDMP_Final.pdf

El Dorado Water Agency (EDWA). (2023). Final Upper American River Basin Regional Drought Contingency Plan. March 2023. https://www.edwateragency.org/Shared Documents/UARB_RDCP_2023.0331.pdf

Federal Emergency Management Agency (FEMA). “Disaster Declarations for States and Counties.” FEMA.Gov, The Department of Homeland Security, www.fema.gov/data-visualization/disaster-declarations-states-and-counties. Accessed 26 Dec. 2023.

https://innovation.luskin.ucla.edu/wp-content/uploads/2021/10/Adapting-to-Extreme-Heat-in-California.pdf

https://www.edcgov.us/Government/ag/Documents/2022%20Crop%20Report%20-%20Final%20for%20Web%20%28Corrected%29.pdf

Huang, X., & Swain, D. L. (2022). Climate change is increasing the risk of a California megaflood. Science advances, 8(31), eabq0995.

Lorem Herb, William R., Ben Janke, Omid Mohseni, and Heinz G. Stefan. "Thermal pollution of streams by runoff from paved surfaces." Hydrological Processes: An International Journal 22, no. 7 (2008): 987-999.

Multi-Hazard Mitigation Council (2019.). Natural Hazard Mitigation Saves: 2019 Report. Principal Investigator Porter, K.; Co-Principal Investigators Dash, N., Huyck, C., Santos, J., Scawthorn, C.; Investigators: Eguchi, M., Eguchi, R., Ghosh., S., Isteita, M., Mickey, K., Rashed, T., Reeder, A.; Schneider, P.; and Yuan, J., Directors, MMC. Investigator Intern: Cohen-Porter, A. National Institute of Building Sciences. Washington, DC. www.nibs.org

Murphy, J. R., & O'Brien. (1 November, 1977). The correlation of peak ground acceleration amplitude with seismic intensity and other physical parameters. Bulletin of the Seismological Society of America, 877-915.

Tahoe Regional Planning Agency (TRPA). (2012). Threshold standards and regional plan. https://www.trpa.gov/wp-content/uploads/Adopted-Regional-Plan.pdf

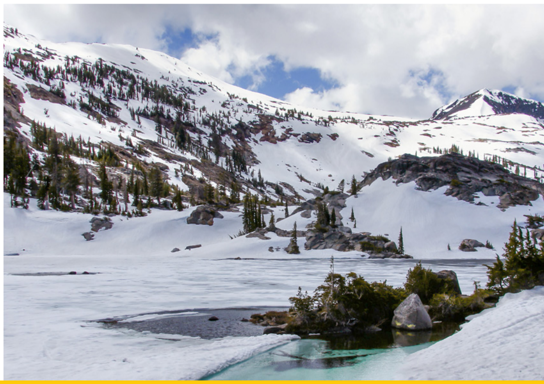
U.S. Department of Health and Human Services (DHHS). 2024. Assistant Secretary for Preparedness and Response (ASPR). HHS emPOWER Map. Medicare At-Risk Populations by Geography. January 31, 2024. Available at: https://empowerprogram.hhs.gov/empowermap

USGCRP – Jay, A.K., A.R. Crimmins, C.W. Avery, T.A. Dahl, R.S. Dodder, B.D. Hamlington, A. Lustig, K. Marvel, P.A. Méndez-Lazaro, M.S. Osler, A. Terando, E.S. Weeks, and A. Zycherman, 2023: Ch. 1. Overview: Understanding risks, impacts, and responses. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023.CH1

USGCRP, 2023: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023

Wills, C. J., F. G. Perez, and C. I. Gutierrez. "Susceptibility to Deep-Seated Landslides in California: California Geological Survey." (2011).

Worden, C.B., M.C. Gerstenberger, D.A. Rhoades, D.J. and Wald (2012). Probabilistic relationships between ground-motion parameters and Modified Mercalli intensity in California Bull. Seism. Soc. Am. 102(1), 204-221. DOI: https://doi.org/10.1785/0120110156.



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