Part 1—Background Information

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

1. Introduction

The State of California is committed to protecting its communities through ongoing efforts to reduce risk from future hazard events. California is culturally, ethnically, economically, ecologically, and politically diverse, with almost 12 percent of the U.S. population. If it were a separate nation, California would have the fourth largest economy in the world. A catastrophic disaster here could adversely affect the national and world economies.

The State of California is actively working to reduce risks from the many types of hazards that the state experiences. Past hazard events—from floods, fires, and earthquakes to atmospheric, biological, geologic, human-caused, climate-related, and other types of hazards—have resulted in great costs to the state's people, property, environment, infrastructure, and economy. As the climate continues to change, the pace and scale of hazard events will increase, resulting in more losses to California communities. Reducing these hazard risks requires integrated, collaborative, and equitable strategies to build statewide community resilience.

Hazard mitigation is the sustained effort to reduce loss of life and property by lessening or eliminating the impacts of natural disasters, climate hazards, and human-caused threats. It creates safer communities and helps maintain quality of life. Effective hazard mitigation requires an understanding of all risks and a sustained investment in long-term community well-being through the implementation of short- and long-term strategies before the next disaster (FEMA 2015). The 2023 State Hazard Mitigation Plan (SHMP or Plan) presents a robust risk assessment of the hazards that present the greatest threat to California's communities and outlines a collaboratively developed, science-based strategy to reduce these risks. California's mitigation strategy emphasizes equitable, whole-community risk reduction that protects natural and cultural resources and promotes resilient social and economic systems.

1.1. STATE HAZARD MITIGATION PLAN OVERVIEW

1.1.1. History of the California State Hazard Mitigation Plan

On September 28, 2004, the State of California's first approved State Hazard Mitigation Plan (SHMP or Plan) went into effect. As required by Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (the Stafford Act; 44 CFR 201.3(c), 201.4(d), and 201.5(c)), California reviews and updates this plan on a five-year cycle. The Federal Emergency Management Agency (FEMA) approved and California adopted the most recent SHMP in 2018 (Cal OES 2018a). The 2023 SHMP is the fifth update to the SHMP.

1.1.2. Purpose of the 2023 SHMP

The State of California is required to have a FEMA-approved hazard mitigation plan in order to be eligible for certain types of federal assistance under the Stafford Act. The SHMP provides a road map to reduce death, injuries, and property losses caused by natural hazards. It identifies hazards based on the history of disasters within the state and lists goals, objectives, strategies, and actions for reducing future losses. Implementation of planned, technically feasible, and cost-effective mitigation measures not only helps reduce damage to life, property, and the environment, but also streamlines the disaster recovery process. Hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster strikes.

The 2023 SHMP includes all requirements of an Enhanced plan. States with Enhanced plans must demonstrate commitment to a comprehensive state-wide mitigation program as well as capabilities to administer FEMA grant programs. A state that meets the Enhanced plan requirements will receive additional post-disaster mitigation funds compared to states with Standard plans.

The 2023 SHMP was developed to prioritize actionability and usability and to highlight emerging and critical issues, such as climate impacts and equity. It is a comprehensive update of the 2018 SHMP and performs the following functions:

- Presents a robust risk assessment for California's most prominent hazards
- Describes goals, objectives, and actions for future mitigation efforts
- Documents statewide hazard mitigation systems implemented to reduce risk

- Highlights new hazard mitigation initiatives since the 2018 SHMP
- Describes mitigation processes and success stories
- Facilitates integration of local, state, tribal, and non-governmental hazard mitigation activities into a comprehensive statewide effort
- Complies with applicable federal statutes and regulations authorizing federal grant funding
- Maintains State eligibility to participate in all FEMA funding programs
- Maintains California's Enhanced status by demonstrating California's commitment to a comprehensive mitigation program and capabilities to administer the additional funding conferred by this status
- Outlines a process to amend the SHMP whenever necessary to reflect changes in State or federal laws and statutes as required in Title 44 of the Code of Federal Regulations (44 CFR 201.4(c)(7) and (d), and 201.5(c)).

Guiding Risk-Informed Decision-Making

As the state's primary guidance document for all-hazards mitigation, the SHMP provides an updated and comprehensive description of California's historical and current hazards, a robust risk analysis for current hazards, and mitigation strategies, goals, and objectives to guide risk-informed decision-making. A statewide, collaborative planning process provided the opportunity to identify, select, and prioritize mitigation strategies that address vulnerabilities identified in the Plan's comprehensive risk assessment.

The SHMP provides critical information and guidance to local governments about risks from natural hazards as well as State capabilities, priorities, and action plans. It addresses risks to the built and natural environment and community lifelines, and considers future conditions, demographics, land use, and disparities in underserved communities to inform equity priority actions. The SHMP also considers the effects of climate change on hazards, hazard impacts, and long-term mitigation strategies.

Community Lifelines

Community lifelines are the most fundamental services available to a community. When stabilized, they enable all other aspects of society to function. They include the following (FEMA 2021e):

- Safety and Security
- Food, Water, and Shelter
- Health and Medical
- Energy Communications
- Transportation
- Hazardous Materials

Establishing Eligibility for FEMA Assistance

States must have an approved state mitigation plan meeting the requirements in 44 CFR 201.4 as a condition of receiving the Stafford Act assistance and FEMA mitigation grants listed in Table 1-1. FEMA requires that states update their mitigation plans every five years and submit them for review and approval. States must ensure that each update reflects changes in development, progress in statewide mitigation efforts, and changes in priorities.

Table 1-1. Non-Emergency Stafford Act Assistance Programs

Program	Description
Public Assistance Categories C-G	Post-disaster reimbursement of response and recovery costs
Fire Management Assistance Grants	Mitigation, management, and control of fires on publicly or privately owned forests or grasslands that threaten destruction that would constitute a major disaster
Building Resilient Infrastructure and Communities (BRIC)	Pre-disaster funding for proactive mitigation and community resilience projects and plans
Hazard Mitigation Assistance Grant Program (HMGP)	Post-disaster funding for mitigation and community resilience projects and plans
HMGP-Post Fire	Assistance to help communities implement hazard mitigation measures after wildfire disasters
Flood Mitigation Assistance (FMA)	Pre-disaster funding for flood hazard mitigation and community resilience activities that benefit properties insured under the National Flood Insurance Program (NFIP)
Rehabilitation of High Hazard Potential Dams	Technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams.

Assisting Local Governments

When developing their own hazard mitigation plans capable of satisfying FEMA requirements, local jurisdictions can use the SHMP as a reference and guidance document. The SHMP provides critical guidance to local jurisdictions about California's risks from natural hazards, as well as the State's capabilities, priorities, and mitigation actions. Local jurisdictions can also use this SHMP to guide their own risk assessment and mitigation strategies, as the hazards and risks assessed in this SHMP also affect local jurisdictions. This SHMP discusses risk impacts on the built environment, community lifelines, future conditions, demographics, population, land use, and existing disparities in underserved communities. The SHMP also discusses the effects of climate change on hazards and strategies to address potential impacts.

1.1.3. State Authorities and Responsibilities for Hazard Mitigation Planning

California's statewide hazard mitigation effort is led by the California Governor's Office of Emergency Services (Cal OES), whose mission is to protect lives and property, build capabilities, and support local communities for a more resilient California. In 1991, Governor's Executive Order W-9-91 (Executive Department, State of California 1991) authorized the Cal OES director to assign emergency support functions to state agencies through standing administrative orders. The current administrative order includes the following requirements related to hazard mitigation for agencies across State government:

- Identify, document, and when practical, implement activities that could reduce or lessen the impact of an emergency or hazard.
- In alignment with the SHMP, establish hazard mitigation as an integral element in operations and program delivery as appropriate.
- Participate in the development, annual maintenance, and implementation of the SHMP.
- During a federal declaration of a major disaster, participate in the hazard mitigation planning process and in project identification and prioritization
- Provide subject matter expertise and technical assistance to Cal OES in support of developing complex mitigation actions, including technical feasibility and cost benefit, and in support of post-wildfire watershed and debris flow mitigation
- Track and report to Cal OES on changes to natural hazard risk exposure, emerging vulnerabilities, and newly available mapping and data sources.

The Governor first included hazard mitigation in emergency management standing orders in an update letter sent to agency secretaries on September 12, 2000.

California's State Emergency Plan assigns mitigation duties to Cal OES and other state agencies under various emergency support functions. The Emergency Management Activities section of the 2017 State Emergency Plan requires the following of the lead agency for each emergency support function:

- Identify stakeholders and engage them in the development and maintenance of the emergency support function
- Complete a vulnerability assessment and prioritize actions to reduce vulnerabilities within the scope of the emergency support function
- Collaborate to pool emergency support function resources to prevent hazards and reduce vulnerability (leveraging funding, resources, and people)

- Develop strategies and processes to prevent or reduce the impact of emergency events and reduce the need for response activities
- Support the SHMP.

The Cal OES Hazard Mitigation Section is responsible for supporting state and local mitigation planning, grants administration, and technical assistance. The Hazard Mitigation Planning Division develops and maintains the SHMP and supports the development and review of local hazard mitigation plans. This division consists of the State Mitigation Planning Unit and Local Mitigation Planning Unit.

The responsibilities of Cal OES in preparing and implementing the SHMP are as follows:

- Ensuring that the SHMP meets FEMA Standard and Enhanced Hazard Mitigation Plan requirements, is approved by FEMA, and is adopted by the State of California
- Coordinating the continued development, implementation, and maintenance of the SHMP with stakeholders, strategic working groups, and federal, state, tribal, local, and non-governmental agencies
- Providing ample opportunities for stakeholder involvement in the SHMP update
- Administering FEMA Hazard Mitigation Assistance (HMA) programs, including the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) grant program, and Flood Mitigation Assistance (FMA) grant program
- Supporting integration of local, regional, and tribal hazard mitigation efforts with the SHMP

1.1.4. Federal Guidance for State Hazard Mitigation Planning

In 2000, the Disaster Mitigation Act of 2000 (DMA) was enacted to amend the Stafford Act to provide a framework for hazard mitigation planning. The requirements for meeting federal standards for hazard mitigation planning are established in 44 CFR Part 201 and FEMA publishes further guidance to assist state, local, tribal, and territorial governments in preparing a hazard mitigation plan. In 2022, FEMA updated its *State Mitigation Planning Policy Guide*, effective April 2023 (FEMA 2022).

The updated guidance serves as the official interpretation of 44 CFR Part 201 and provides additional clarity and guidance on requirements of hazard mitigation planning. Notable updates to the guidance include spotlighting the importance of integrating considerations for climate change impacts and equity. California began integrating climate change into the SHMP in 2007 and equity beginning in 2018. The

updated guidance provides guidance to ensure climate change impacts are assessed in terms of hazard impacts, vulnerability, extent, and location. Impacts on socially vulnerable communities are assessed for each hazard.

Hazard mitigation plans developed to meet federal standards must document the planning process, identify hazards, assess risk, assess state capabilities, document local planning coordination and capability building, develop a mitigation strategy, and establish an approach for plan maintenance and updates.

The planning process must include a cross-section of stakeholders from emergency management, economic development, land use and development, housing, health and social services, infrastructure, and natural and cultural resources. Additional stakeholders providing services associated with FEMA's community lifelines should also be engaged in the process. The hazard identification and risk assessment serve to provide the basis for plan development; the risk assessment establishes hazards impacting the planning area and associated vulnerabilities. Identifying state capabilities aids in determining what existing resources there are to address and mitigate vulnerabilities. This is further accomplished by documenting the resources available to local communities to ensure the state has a comprehensive, state-wide approach to mitigation in terms of overarching goals, utilization of data, and ensuring technical assistance is available to develop local plans. The mitigation strategy is the long-term roadmap for implementing activities to reduce risk. It establishes the goals of the plan and prioritizes actions for risk reduction.

The 2023 SHMP complies with FEMA's updated guidance and exemplifies the integration of climate change and equity. Central elements are described below.

Planning for Equitable Outcomes

California's disasters have had a significant impact on the health and economic security of its diverse communities across the state. Cal OES recognizes that long-standing institutional and systemic barriers continue to deliver disparate outcomes by which systems of inequity based on race, ethnicity, gender, sexuality, disability, socio-economic status, and other forms of discrimination intersect to create and maintain disadvantages for some and privileges for others. Californians who live in historically underserved and under-invested communities are more likely to be hit harder by and bear a disproportionate burden of the impact of disasters than other communities.

Equity is essential to reducing risk to the whole community, including those who face barriers to accessing information, assistance, and resources to recover from disasters.

Cal OES defines equity to mean that all people are justly and fairly included in society and that everyone is able to participate, prosper, and achieve their full potential. Whereas equality means providing the same to all, equity means recognizing that not all people start from the same place and acknowledging and making adjustments for imbalances. The process is ongoing and requires identifying and overcoming intentional and unintentional barriers arising from bias or systemic structures.

The concept of equity recognizes that everyone enjoys different advantages and faces different challenges, and that everyone should be treated justly and fairly, according to their circumstances, socio-historical experiences, and structurally imposed barriers. This builds upon FEMA's definition of equity as "the consistent and systematic fair, just, and impartial treatment of all individuals including individuals who belong to underserved communities of color, persons who belong to communities that may face discrimination based on sex, sexual orientation, and gender identity (including members of the LGBTQ+ community); persons with disabilities, persons who may face discrimination based on their religion, national origin and persons with Limited English Proficiency, and persons who live in rural areas that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life" (FEMA 2022).

Often, populations and communities are categorized based on shared characteristics that create barriers to accessing resources, leading to increased vulnerability. An individual or community may face barriers or have characteristics that apply to multiple populations and communities. Appendix B describes the many communities that need to be considered in integrating equity as a priority for hazard mitigation.

Cal OES has had a strong history of adopting integrated approaches to managing disasters and is a global leader in inclusive planning. Identifying concentrations of priority and underserved populations can assist emergency managers and the whole community in preparedness, response, recovery, and mitigation actions. Inclusive planning to assist identified populations may be accomplished through partnerships and relationships with whole community leaders as representatives of these populations. The State must ensure that considerations for higher-risk populations, such as those with disabilities or financial challenges, for example, are included in the decision-making process when identifying projects to mitigate risk and carrying out disaster management processes.

Centering equity in the mitigation plan helps ensure an inclusive planning process that benefits the whole community and directs information and resources to those who are

disproportionately impacted by disasters. Intentional inclusive planning ensures that everyone has the access and the opportunity to meaningfully participate and contribute to successful hazard mitigation.

Equity considerations are woven throughout the 2023 SHMP. The hazard risk assessments all consider risk to equity priority communities, and the goals, objective, and outcomes of the 2023 SHMP were developed through the lens of inclusion and equity. It is the intent of the State to prioritize the principles of social justice, equity, and inclusion in the planning and administration of all hazard mitigation programs and actions state-wide.

Relevant State Agencies

Office of Access and Functional Needs— Recognizing the disproportionate impact disasters have on underrepresented communities, California's governor, in 2008, established the Office of Access and Functional Needs (OAFN) within Cal OES. OAFN is tasked with a two-fold mission: Identifying the needs of all Californians before, during, and after disasters and integrating those needs throughout every facet of the State's emergency management system. To meet its mission, OAFN adopts a multi-pronged approach to inclusion and integration, which includes providing technical assistance, guidance, facilitation, partnership outreach, training, and other support services to emergency managers, disability stakeholders, and service providers responsible for planning, preparing, responding to and recovering from, all hazards.

Office of Diversity, Equity, and Inclusion—As part of its continued commitment to make emergency management equity-centered, Cal OES formally created the Office of Diversity, Equity, and Inclusion (ODEI) in 2022 to elevate and expand current equity and access programs and embed equity and engagement principles throughout Cal OES's actions, policies, programs, and procedures, both internally and externally. ODEI works to ensure that principles of equity, justice, inclusion, transparency, and accountability govern all aspects of emergency services. ODEI prioritizes actions that promote equity, foster community resilience, and put diversity into purposeful and meaningful action. The office knows that is not possible to be equitable without being inclusive to diverse voices, and thus continues to build a culture of belonging, respect, and connection by actively inviting the contribution and participation of all people. At Cal OES, diversity is an asset, one which is essential for a more resilient California.

Office of Tribal Coordination—The role of the Office of Tribal Coordination (OTC) is to improve and maintain communication and collaboration between the Cal OES and all Native American Tribes in California. Our office aims to create effective collaboration and provide relevant information, that allow for informed decision-making, where all parties can share a goal of reaching an informed decision together. The OTC shares resource information, including grants, training opportunities, and key initiatives, provides consultation, technical assistance, and address inquiries from our Tribal partners. OTC's office priorities are to educate internal and external agencies and partners, to become informed about the cultural settings of California Native Americans, understand and relay their priorities for emergency management and homeland security issues, as well as provide cultural awareness and sensitivity, for the purpose of improving Cal OES's understanding of all Native American Tribes and related issues in California.

Equity and Social Vulnerability Definitions

To include equity in a plan, individuals and communities facing greater barriers must first be identified. Many definitions exist related to equitable planning. In this SHMP, "**social vulnerability**" is generally referred to as "**equity priority**." Social vulnerability is the commonly used term, but California recognizes that the purpose of an equity focus is to prioritize closing inequitable gaps through proactive action. Additionally, the term "socially vulnerable" may convey a negative connotation to those not familiar with the concept. This is similar to the use of the term "disaster victim" versus using "disaster survivor," as the former implies a focus on the impacts an individual has endured, while the latter calls attention to the individual's power and resilience in the face of a disaster. "Equity priority" conveys a more positive connotation and better expresses the goal of these considerations; it focuses on empowering communities rather than focusing on the barriers and challenges with which these communities are faced. However, when referring to a specific tool or resource, such as the Social Vulnerability Index (see Section 4.4), the SHMP still uses the term "social vulnerability."

- The term "**equity priority**" was identified collaboratively by stakeholders forming the Equity Working Group. The group discussed how to define equity and integrating equity into the SHMP. It was important to stakeholders that social vulnerability be discussed in a way to ensure the term was inclusive of the various factors that may contribute to vulnerability, but also highlighted the state's commitment to be proactive and intentional and provide aid to individuals and communities in need.
- **Social Vulnerability** refers to the social factors that influence or shape the susceptibility of various groups to harm and govern their ability to respond. It can also be the product of plan inequalities—those characteristics of communities and the built environment such as the level or urbanization, growth rates, and economic vitality, that make the people who live or work there vulnerable to disaster (Cutter, Boruff and Shirley 2003).
- **Access and Functional Needs Communities** refers to individuals and groups who have access and functional needs, such as, but not limited to, people without vehicles, people with disabilities, older adults, and people with limited English proficiency as defined by GC 8593.3.
- **Underserved Communities** refers to populations and geographic communities sharing characteristics that have been systematically denied a full opportunity to participate in aspects of economic, social, or civic life (Executive Order 13985).
- **Underrepresented Communities** refers to populations or groups lacking historical or current representation in decision-making or aspects of economic, social, or civic life.
- **Historically Marginalized Communities** refers to groups and communities that experience discrimination and exclusion because of unequal power relationships across economic, political, social, and cultural dimensions (National Collaborating Centre for Determinants of Health n.d.).
- **Environmental Justice** is the fair treatment and meaningful involvement of all people—regardless of race, color, national origin, or income—in the development, implementation, and enforcement of environmental laws, regulations, and policies (U.S. Environmental Protection Agency 2023)
- **Equity Priority Communities** are those that bear a disproportionate burden of emergency hazards because of a history of being systemically marginalized due to structural inequities relating to race, ethnicity, gender, sexuality, access and functional needs, language, documentation status, native or indigenous origins, mental health, age, socio-economic status, country of origin, religion, etc.
- **Diversity** refers to physical, social, and psychological differences between people and groups with multiple subjectivities, perspectives, experiences, backgrounds, and socially constructed differences.
- **Inclusion** means building a culture of belonging, respect, and connection by actively inviting the contribution and participation of all people.

Planning for Climate Change

Climate Adaptation and Mitigation

Climate change adaptation describes measures that seek to assist communities in adjusting to the actual or expected climate and its effects (Intergovernmental Panel on Climate Change 2014). Mitigation for natural hazards is a key component of climate change adaptation that focuses specifically on hazard risk reduction. Climate adaptation and hazard mitigation focus on long-term threats to human life, property, economic continuity, ecological integrity, and community function.

Effective hazard mitigation requires accurate, science-based and data driven prediction of the likelihood of hazard events. Historically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of hazards are used to estimate future frequencies. For example, if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

For hazards that are affected by climate conditions, the assumption that future behavior will be equivalent to past behavior is no longer valid. As flooding is generally associated with precipitation frequency and intensity, for example, the frequency of flooding will not remain constant if broad precipitation patterns continue to change over time. Specifically, as hydrology changes, storms currently considered to be the 1 percent annual chance flood might strike more often, leaving many communities at greater risk. The risks of flood, landslide, severe storms, extreme heat, drought, and wildfire are all affected by climate patterns.

For this reason, an understanding of climate change is pertinent to efforts to mitigate natural hazards, and risk assessments for hazards must be based on the best available data that incorporates future climate conditions. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis.

When planning for climate change the terms "climate adaptation," "sustainability," and "resilience" are frequently used interchangeably and associated with mitigation when looking at future impacts. "Climate adaptation" describes the actions taken to prepare for and adjust to current and projected impacts of climate change (EPA 2022). For this SHMP, "sustainability" includes the idea of preservation of resources—physical, social, economic, environmental, historical, and cultural—for the benefit of future generations. One path to sustainability is through investment in strong disaster mitigation. Resilience is defined as the ability of a system to absorb shock and maintain its structure and functions with a minimum of loss. A resilient system is one that can resume pre-event functionality in a relatively short time. A community is resilient when it maintains continuity and recovers quickly despite experiencing disaster events.

Addressing adaptation, sustainability, and resilience in the SHMP allows communities to identify ways that they might be harmed by future conditions—including those unique to their communities—and provides a tool for fining solutions to those risks.

Climate adaptation efforts may be undertaken separately or in addition to the hazard mitigation planning process. Hazard mitigation and climate adaptation are complementary efforts that have the same goal: long-term risk reduction for people and increased safety for communities. Adapting to the expected impacts of climate change is a form of hazard mitigation. A climate change-informed risk assessment and mitigation strategy provides the greatest potential for long-term risk reduction and increased resilience.

Integrating resilience into the SHMP addresses two factors. The first being the connection and dependencies among multiple geographic levels—cities, counties, regions, tribal nations, and the state. The second being the capacity of a city, county, tribal nation, or state to change and adapt during recovery to meet challenges posed by changed conditions. Resilience can be built through mitigation or through coordinated development and implementation of other disaster management functions such as preparedness, response, and recovery (Topping, et al. 2010)

An integrated approach to climate change and resilience involves both adapting to future climate conditions and reducing greenhouse gas emissions. Climate adaptation activities can have several benefits, such as increased public health and safety, greater economic stability, reduced cost for healthcare and infrastructure, increased resilience of housing, improved air and water quality, and better stormwater management (Cal OES 2020). Climate adaptation strategies can also lead to the sustainability of resources.

The best available science overwhelmingly confirms that climate change will continue to increase the frequency, duration, and intensity of natural hazards such as floods, wildfires, extreme heat, drought, storms, heavy precipitation, and sea-level rise. Communities are increasingly impacted by a changing climate, and many of these climate trends will continue and amplify for decades. Climate change heightens risks to California communities and residents and challenges conventional hazard mitigation approaches. It poses a unique threat to the nation's most at-risk populations by exacerbating the effects of disasters on marginalized and historically underserved communities, which already experience the greatest impacts from natural hazards.

Tools such as Cal-Adapt will be critical for assessing vulnerability to climate impacts. Cal-Adapt provides a way to explore peer-reviewed data that portrays how climate change might affect California at the state and local level. This data is available through downloads, visualizations, and the Cal-Adapt API for research, outreach, and

adaptation planning needs. Cal-Adapt is a collaboration between state agencies, universities, and private sector researchers.

The 2023 SHMP incorporates considerations of climate change throughout the risk assessments and in the development of mitigation goals and actions. The risk assessments in this plan are based on the best-available data that incorporates future conditions and an increase in the pace, intensity, and scale of future hazard events. Climate adaptation is a key theme in the goals and objectives outline in this plan.

1.2. HOW THIS PLAN WAS PREPARED

S1- 44 CFR 201.4(b) and (c)(1)]: Does the plan describe the planning process used to develop the plan? Section 1.2 addresses this requirement, including how the Plan was prepared, schedule or timeframe, specific milestones and activities, and agencies and other stakeholders who were involved, and the efforts to integrate that process into additional state planning efforts.

The planning process lays the foundation for developing an effective plan, for maintaining, updating, integrating, and improving it, and for tracking and evaluating progress on the recommended mitigation efforts. A successful planning process involves consultation with a cross section of stakeholders, including those who are impacted by the plan and those who have the authority to implement specific actions, reaching consensus on desired outcomes, and resolving problems. It results in widespread support for directing financial, technical, and human resources to the plan's recommended courses of action.

The Cal OES State Mitigation Planning Unit managed the planning process for the 2023 SHMP. The unit's activities included convening and supporting expert working groups; providing subject-matter expertise in hazard mitigation, planning, and FEMA requirements; researching and writing plan content; and making daily operational decisions. The State Mitigation Planning Unit coordinated the process with the support of consultant firm Tetra Tech.

Cal OES began the 2023 SHMP update in August 2021 to incorporate a wider range of stakeholders into the planning process. The Plan was made available for public review and comment on XXXX. Comments were addressed and a first draft was submitted to FEMA Region 9 on XXXX. The final draft was submitted to FEMA for review on XXX.

The hazard mitigation planning process consisted of four major tasks, as further described in the sections below:

- Organizing the process and resources
- Assessing risk and capabilities
- Developing a mitigation strategy
- Adopting and implementing the Plan

1.2.1. Organizing the Process and Resources

S2- 44 CFR 201.4(b) and (c)(1)]: Does the plan describe how the state coordinated with other agencies and stakeholders? Section 1.2.1 documents the agencies and stakeholders that were coordinated with and how their input was utilized to inform the plan update.

Cal OES initiated the 2023 SHMP update by conducting an internal review of the 2018 SHMP's content, format and deficiencies based on FEMA's new guidance to determine necessary edits. Cal OES established expert working groups organized around different hazards and themes, known as the Hazard and Working Groups, by examining California's disaster landscape since the 2018 SHMP and the overarching themes to be highlighted in the 2023 Plan.

FEMA's National Mitigation Framework (FEMA 2020a) emphasizes the value of collaboration among sectors to ensure that mitigation capabilities continually develop, and that comprehensive mitigation includes strategies for all community systems. Cal OES facilitated numerous meetings throughout the planning process to ensure a robust risk assessment based on best available validated data, an extensive review of capabilities and mitigation progress, and a comprehensive updated mitigation strategy. The following sections describe engagement outreach activities and the resulting input received from participating planning partners.

Activities to Engage with Stakeholders

The 2023 SHMP planning process engaged a wide range of stakeholders and subject matter experts. Cal OES, as lead agency, collaborated with partners across state government, local and tribal jurisdictions, federal agencies, and non-governmental organizations. The "public" for this SHMP update was defined in three categories:

- State agencies and subject matter experts
- Local jurisdictions
- The general public

Agency Engagement

HHPDS 1- Did Element S2 (planning process) describe how the state dam safety agency, other agencies, and stakeholders participated in the planning process and contributed expertise, data, studies, information, etc. relative to high hazard potential dams? The following text describes how state agencies were engaged during this plan update process, including those agencies associated with Dam Safety and program administration.

The State Mitigation Planning Unit collected significant input across Cal OES directorates and other state agencies and departments, such as the California Department of Forestry and Fire Protection (CAL FIRE), the Office of Planning and Research (OPR), the Department of Water Resources (DWR), the California Geological Survey (CGS), and the Department of Housing and Community Development (HCD).

Engagement with agencies that own and operate the State-owned facilities that are the basis of the risk assessment occurred through various working groups, which met on a bi-monthly basis. Four Hazard Groups and four Working Groups were established to assist in developing this SHMP update. Each group was co-led by the State Mitigation Planning Unit and one or two subject-matter experts referred to as "champions," as listed in Table 1-2. All groups met regularly between August 2021 and September 2022 to discuss the content and themes of the Plan.

Table 1-2. Hazard Group and Working Group Champions

Hazard Group/ Working Group	Champion		
	Name	Title	Agency
Seismic Hazards	Cindy Pridmore	Engineering Geologist	Department of Conservation
Flood Hazards	Mike Mierzwa	Technical and Policy Advisor	Department of Water Resources
Fire Hazards	Edith Hannigan	Executive Officer	Board of Forestry
Other Hazards	No designated champion. All group members were subject matter experts		
GIS Technical Assistance Working Group	Michael Crews		Cal OES
	David Harris		California Natural Resources Agency (CNRA)
Goals and Objectives Working Group	Victoria LaMar-Haas	Unit Chief, Local Mitigation Planning Unit	Cal OES
Climate Impacts Working Group	Neil Matouka	Program Manager, Fifth Climate Change Assessment	Governor's Office of Planning and Research
	JR DeLaRosa	Climate and Science Advisor	Cal OES
Social Vulnerability and Equity Working Group	Abby Browning	Chief of the Office of Private Sector/NGO Coordination	Cal OES
	L. Vance Taylor	Chief of the Office of Access and Functional Needs	Cal OES

By collaborating with the Hazard Groups and Working Groups, Cal OES engaged with a range of sectors throughout the planning process. Sector areas included emergency management, economic development, land use and development, housing, health and social services, infrastructure, and natural and cultural resources. Their participation provided these sectors with opportunities to provide plan input.

Appendix D lists key stakeholders engaged in the update process, provides rosters of each Hazard Group and Working Group, and presents details on coordination with agencies and stakeholders (e.g., distribution of capability assessment tables, interactive exercises at leadership meetings, meetings to discuss and collect risk assessment data and methodology).

Local Jurisdiction Engagement

County and operational area emergency managers were invited to participate in a webinar hosted by Cal OES on September 13, 2022. This webinar explained the overall SHMP planning process, the 2023 Plan update, and recent FEMA mitigation state-level guidance updates. The webinar concluded with a discussion of opportunities for continued SHMP involvement.

Following this webinar, Cal OES scheduled and delivered local listening sessions. The purpose of these listening sessions was to further develop working relationships between Cal OES and local jurisdictions, and to determine how to maximize the usefulness of the 2023 SHMP for counties developing their own hazard mitigation plans. Representatives from all 58 California counties were invited. Sessions were kept small, and attendees were grouped by common attributes to the extent possible. These attributes included hazards, geography, hazard history, planning experience, and planning challenges and strengths. Some key themes from these sessions included:

- Additional support and assistance to bolster capability and capacity of local planning entities
- Challenges to accessing funding to prepare and implement local plans
- Aligning feedback from Cal OES and FEMA with plan guidance and requirements, as well as state legislative requirements
- Better explanations of minimum requirements for plans and plan updates
- Techniques and best practices for engaging stakeholders and the public to create or update local plans
- Identifying mitigation actions to include and plans, and implementing those actions and the plans overall

These listening sessions were held from October 27, 2022, to November 9, 2022. Representatives from 32 counties attended.

Public Outreach

Residents of the state were engaged through a publicly facing website that was continually updated throughout the process. The public comment period took place from [Month] XX – XX, 2022. During this time the draft plan was posted online, and a public virtual webinar was held on [Month] XX, 2022.

Plans for Ongoing Engagement

Hazard mitigation planning is an ongoing process, and Cal OES is committed to increasing coordination and collaboration in future hazard mitigation planning and grant activities. Cal OES will integrate agencies/departments and stakeholders further as documented in the mitigation action plan (see Chapter 47) and plan maintenance strategy (see Chapter 48).

Support Received from Participating Agencies and Stakeholders

The content of the SHMP is the culmination of information provided by numerous stakeholders from local, tribal, state, and federal government agencies, public and private business organizations, and individual citizens. The following sections describe the contributions of each type of participating partner.

Hazard Groups and Working Groups

The Hazard Groups and Working Groups provided guidance and subject matter expertise for the Plan. The Hazard Groups focused on specific hazard profiles and mitigation actions. The Working Groups evaluated overarching themes integrated throughout the 2023 SHMP.

Subject-Matter Experts

Many hazard subject-matter experts in California participated in the 2023 SHMP Hazard Groups and Working Groups by providing spatial data, guiding the vulnerability assessment methodology, reviewing the draft risk assessment, and providing critical text updates to various hazard profiles. These subject-matter experts were consulted from the beginning stages of the planning process. Cal OES also engaged subject matter experts on critical themes such as equity and climate change through the Working Groups.

State Agencies

The 2023 SHMP reflects specific mitigation actions and activities from programs administered by other agencies and departments throughout the State. State agencies provided subject matter experts to participate in the Hazard and Working Groups, and partner agencies were consulted in the development of the goals and objectives, as well as the mitigation actions assigned to their agency.

Counties, Operational Areas, and Tribal Governments

Local governments provided input on content of the Plan to support local mitigation planning and capacity-building efforts through the county and operational area webinar and through the listening sessions with local jurisdictions.

Through the Cal OES Tribal Coordination Office, Cal OES also leveraged relationships with tribal associations to gather input on the 2023 SHMP planning process. This input included how to best incorporate tribal populations into the SHMP while maintaining their sovereignty relating to mitigation planning.

Public and Private Business Organizations, and Individual Citizens

The SHMP was made available to this audience via public-noticed, 45-day public comment period that commenced on _____, 2023 and concluded on _____, 2023. The SHMP was available for review and comment during this timeframe via a publicly accessible website that provided a web-based medium to provide comment.

1.2.2. Assessing Risk and Capabilities

Hazard Groups and Working Groups were consulted to determine how to organize and assess hazards in the 2023 update. The 2018 SHMP organized hazards by type (earthquake/geologic, flood, fire, and other). Based on input from the 2023 SHMP Hazard Groups and Working Groups, Cal OES elected to present hazards in alphabetical order for this update, while still acknowledging earthquake, flood, and fire as the hazards with the greatest cumulative impact statewide.

Subject matter experts were consulted to determine which phenomena should be assessed as stand-alone hazards and which ones represent cascading impacts of a standalone hazard. For example, post-fire debris flow is an impact of wildfire, while urban structural fire is a standalone hazard.

Cal OES worked with Hazard Groups and Working Groups to identify key information for integration into the plan, including best available data related to climate change

and equity priority communities. The Hazard Groups guided the development and methodologies for the hazard risk assessments.

1.2.3. Developing a Mitigation Strategy

Goals and Objectives

The 2023 SHMP provides a thorough description of the state's commitment to reducing or eliminating impacts of natural and human-caused disasters through preparation and implementation of comprehensive hazard mitigation strategies, plans, and actions. This commitment is reflected in the SHMP goals and objectives discussed in Chapter 44, which were reviewed and updated by the Goals and Objectives Strategic Working Group for this SHMP update.

The Goals and Objectives Working Group was responsible for reviewing the 2018 SHMP goals and objectives and updating them to reflect priorities for the 2023 update. The 2023 SHMP adopted a new linear strategy for goals and objectives, as shown in Figure 1-1. This strategy allows multiple objectives to apply under multiple goals. It provides an opportunity to establish more comprehensive objectives that the State can use to establish priorities for actions identified in the Plan. All stakeholders were invited to participate in reviewing and refining the goals and objectives.

Mitigation Actions

Once goals and objectives were confirmed, an action plan was developed and prioritized. The first step in action planning was to reconcile all actions recommended in the 2018 plan. The reconciliation process (see Chapter 45) identified which actions would be carried over to the 2023 SHMP.

Actions carried over from the previous SHMP were vetted through the Hazard Group/Working Group process, which also identified any new actions to be added to the Plan based on the groups' expertise and understanding of hazard impacts in California. After the actions were identified, each was assigned a priority based on metrics that emphasized state priorities and concerns (see Chapter 47).

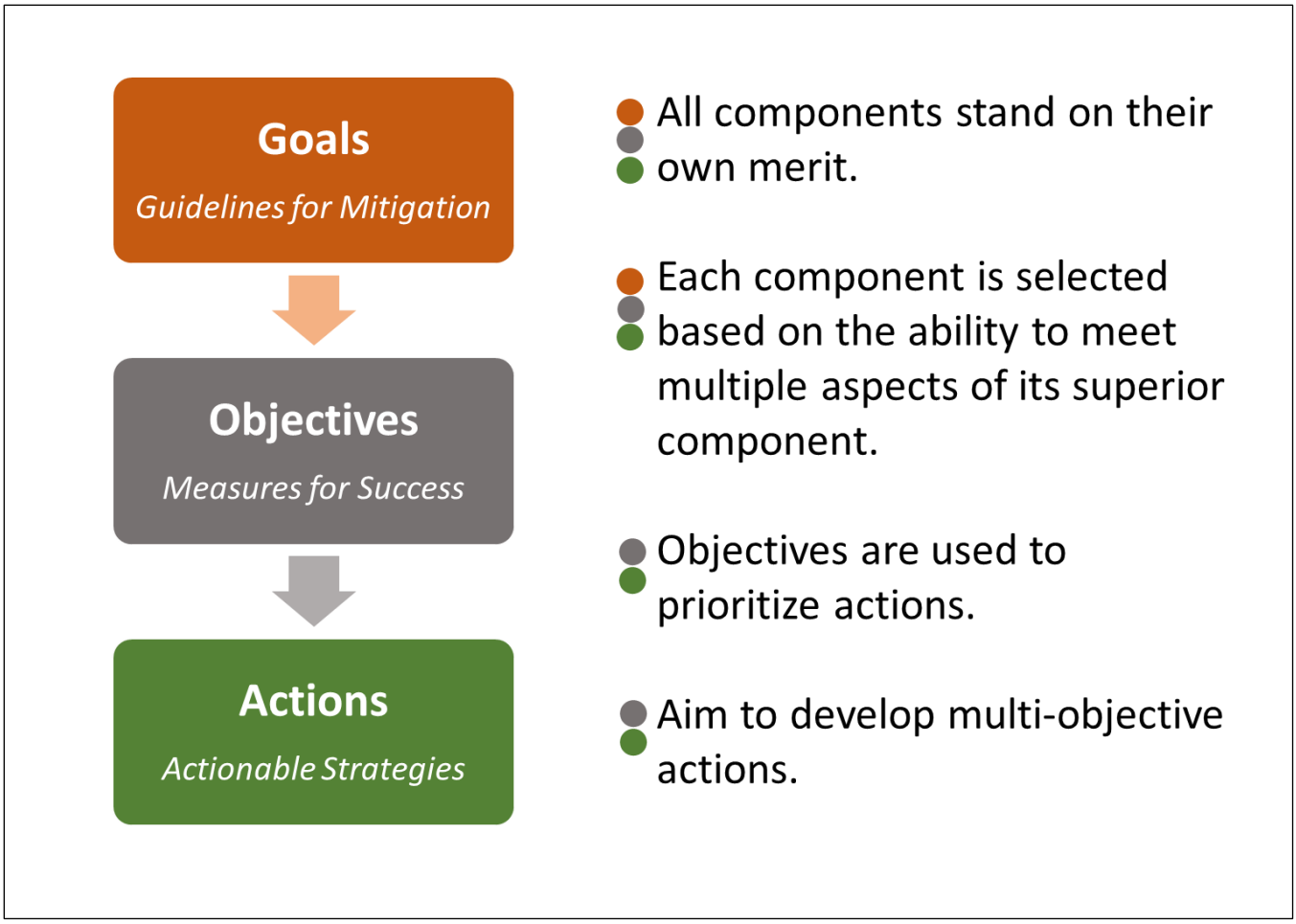


Figure 1-1. Linear Goal Setting Approach

Opportunities for Mitigation Activities

Development of new mitigation actions for this SHMP considered options from catalogs of potential mitigation opportunities. Each risk assessment chapter of this SHMP provides a catalog outlining potential actions for mitigating the hazard addressed in that chapter. These potential actions are categorized two ways:

By who would carry out the action

- **Personal-scale** (individuals, caregivers, guardians, households, and families)
- **Corporate-scale** (businesses and organizations)
- **Government-scale** (any government agency)

By how the action mitigates hazard risks

- **Manipulate the hazard** (actions to prevent hazard events from occurring)
- **Reduce exposure and vulnerability** (actions to safeguard people, property, and the environment from the impacts of the hazard)
- **Build local capacity** (actions to improve abilities to mitigate and respond to hazard events)

Nature-Based Solutions

California's climate adaptation strategy highlights the use of nature-based solutions to promote environmental and community resilience. Nature-based solutions are sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to build more resilient communities. Projects that incorporate nature-based solutions can achieve multiple benefits and contribute to climate change mitigation, climate adaptation, and hazard mitigation goals (FEMA 2021d).

Historically, most hazard mitigation projects have employed "gray" or "hard" infrastructure solutions in engineering projects that use concrete and steel. For example, seawalls are a gray infrastructure solution to protect shorelines from wave action and coastal erosion, thereby reducing coastal flooding. Preferred building materials in wildfire-prone areas have transitioned from wood to stone, steel, or composites. These approaches have been effective in providing site-specific hazard mitigation and are important risk reduction tools. However, projects that utilize nature-based solutions can, in some cases, achieve similar risk reduction benefits while providing social, economic, and environmental benefits. Nature-based solutions often employ "green infrastructure"—intentional or strategic preservation, enhancement, or restoration of a natural system or semi-natural systems to provide a desired benefit. Green infrastructure can simultaneously reduce risk and protect or enhance the environment, create wildfire habitat, reduce greenhouse gases, and provide recreational opportunities (The Nature Conservancy n.d.).

California's hazard mitigation strategy prioritizes the use of nature-based solutions to reduce hazard risk while enhancing the environment. Nature-based solutions such as the following can mitigate risk for most hazard types, especially those exacerbated by climate change:

- Floodplain restoration is an effective way to reduce riverine flooding by providing natural storage for floodwaters while reducing erosion, enhancing water quality, and creating habitat (FEMA 2021d).
- The restoration or creation of coastal dunes can serve as a barrier between the ocean and inland areas, reducing coastal erosion and flooding.
- Forest restoration, ecologically informed vegetation management, and prescribed fire are examples of nature-based solutions that can reduce wildfire risk.

- In urban areas, green infrastructure such as urban tree canopies, rain gardens, and green roofs can assist in stormwater management and reduce the impacts of extreme heat events.

Hazard mitigation projects that employ nature-based solutions are a key tool for promoting resilient communities and advancing climate adaptation goals.

1.2.4. Emergency Management Accreditation Program

The Emergency Management Accreditation Program (EMAP) provides emergency management programs an opportunity to be evaluated and recognized for compliance with standards certified by the American National Standard Institute and recognized by the industry and for compliance with EMAP's mission to build safer communities through standards of excellence. EMAP demonstrates accountability and focuses attention on areas and issues where resources are needed to heighten preparedness efforts to any disaster that may affect communities.

Applicants must demonstrate through self-assessment, documentation, and peer assessment verification that their programs meet the Emergency Management Standard. An emergency management program uses the accreditation to prove the capabilities of its disaster preparedness and response systems. Accreditation is valid for five years. The program must maintain compliance and be reassessed to maintain accredited status.

The EMAP process accredits an overall emergency management program, of which hazard mitigation is one component. Many EMAP standards for hazard mitigation planning fall outside of what FEMA requires for state hazard mitigation plans. This SHMP has been developed to be in full compliance with EMAP standards and criteria. The base plan emphasizes elements required by FEMA, in order to better support local planning in the state. Since the EMAP is a voluntary program, its components that deviate from FEMA requirements are packaged in Appendix C to this Plan.

1.3. ADOPTING AND IMPLEMENTING THE PLAN

Adoption of the 2023 SHMP as a supporting document to the State Emergency Plan is implemented on behalf of the state government by the Cal OES Director. The adopted SHMP communicates the state's priorities and facilitates communication and collaboration among jurisdictions and stakeholders.

Upon conditional approval of the finalized 2023 SHMP by FEMA, the Cal OES Director, acting as the Governor's designated official, formally adopts the SHMP, as required by 44 CFR Section 201.4(c)(6). The Director's letter of adoption is immediately forwarded to FEMA to finalize the approval process.

1.4. THE UPDATED PLAN—WHAT IS DIFFERENT?

The updated plan differs from the 2018 plan in a variety of ways due to program requirements and Plan enhancements. Key differences may be summarized as follows:

- The 2023 SHMP uses plain language that emphasizes readability for the general reader.
- The Plan format has been changed for a simplified base plan supported by a technical volume presenting multiple appendices.
- The number of fully assessed hazards has been expanded from 13 hazards of concern to 34.
- The planning process was conducted through a series of working groups consisting of subject-matter experts covering focus topics for the plan.
- Goals and objectives have been revised using a linear approach that emphasized multi-objective actions.
- The SHMP uses a hazard impact scoring methodology that categorizes risk as high, medium, or low based on projected impacts of each hazard.
- The SHMP includes a catalog of best-management practices for local hazard mitigation planning.
- The SHMP applies a new methodology for prioritizing actions
- The risk assessment for the SHMP has been expanded to include a quantitative analysis that looks at the vulnerability of equity priority communities.

Appendix E indicates the major changes between the two plans as they relate to federal requirements for state hazard mitigation plans.

1.5. HOW TO NAVIGATE THE PLAN

California's SHMP has been designed to use plain language and provide an engaging experience for readers by making critical information easily identifiable and ensuring

increased accessibility. Additionally, the SHMP is a resource for local governments to inform their own planning efforts. The Plan consists of two volumes:

- Volume 1 is the core plan, highlighting essential information on hazards and risk in California and the proposed strategy for actions to mitigate the risks. Volume 1 also includes a list of references cited in the core plan as authoritative sources of information.
- Volume 2 consists of technical appendices. Development of the 2023 SHMP yielded a large collection of documents and data that support the findings presented in the core plan. The appendices present these detailed results for readers who have a use for technical information about hazard mitigation in California. Volume 2 also includes a glossary defining the terms and acronyms used in this SHMP (Appendix A).

Throughout Volume 1, requirements for FEMA's Standard state hazard mitigation planning and Enhanced state mitigation planning along with EMAP requirements are identified using the below icons. The information is highlighted to indicate how the requirements are meet for each of these programs.

FEMA Standard State Hazard Mitigation Plans 44 CFR §201.4: Utilized to highlight the minimum standards required for a state-level hazard mitigation plan.

FEMA Enhanced State Hazard Mitigation Plans 44 CFR §201.5: Utilized to highlight the heightened standards required for an Enhanced state-level hazard mitigation plan that qualifies to receive additional funding.

Emergency Management Accreditation Program (EMAP): Utilized to highlight the required EMAP standards. EMAP accreditation is a voluntary program and is not required by FEMA for Standard or Enhanced state planning requirements. EMP standards are considered to be above and beyond those required by FEMA.

2. California's Hazards of Concern

2.1. California's Hazard History

California is subject to many natural and human-caused hazards. Wildfires are the most frequent disaster, followed by floods. Earthquakes occur less frequently but account for the greatest combined losses (deaths, injuries, and damage costs). Since 1950, California has experienced 702 hazard events, including 345 wildfires, 150 floods, 30 severe storms, and 27 earthquakes. Since 2000, 201 disaster events (approximately 9 per year) in California have cost the State over $19 billion. Most of the disasters have taken place between July and October, with the number of disasters increasing in frequency over the last 20 years (FEMA 2022d); (NCEI - NOAA 2022); (Cal OES 2022d).

Over the past seven decades, the frequency of disasters and corresponding losses have grown rapidly. Table 2-1 shows increases in state emergency proclamations and federal disaster declarations from 1950 through 2022. The table shows casualties and Cal OES-administered disaster costs by decade. These casualties and costs peaked in the 1990s due to the 1994 Northridge Earthquake. Appendix F presents a detailed history of disaster declarations for California.

Table 2-1. Hazard Event Frequency and Losses Since 1950

Year	State Emergency Proclamations	Federal Disaster Declarations	Deaths[a]	Injuries	Cal OES-Administered Costs
1950-1959	8	3	100	227	$332,283,000
1960-1969	32	12	99	1,224	$706,931,196
1970-1979	60	18	96	2,226	$4,197,670,330
1980-1989	60	23	128	5,243	$3,342,205,537
1990-1999	48	19	224	15,592	$9,245,038,369
2000-2009	63	101	59	885	$1,845,112,390
2010-2019	72	123	184	10	$1,120,667,471
2020-2022	22	38	28	4	____
TOTAL	**365**	**337**	**918**	**25,411**	**$20,789,908,293**

Source: (FEMA 2022d); (CAL FIRE 2022a); (Cal OES 2022d)

a. Fatality reporting is tracked by Cal OES is based on voluntary local jurisdiction reporting. Figures are likely undercounts because local jurisdictions are not mandated to report fatality numbers. As of January 2023, California has had roughly 11 million cases of COVID-19, and over 98,000 COVID-19 related deaths. These numbers are not reflected in this table because of unique disaster type of COVID-19. The most updated statistics are available on California's COVID-19 website. (https://covid19.ca.gov/state-dashboard/)

Disaster Declarations

Formal disaster declarations provide a good indication of the historical occurrences of a hazard in a given area. Such declarations may be issued by government agencies at the state, local, or federal level. This SHMP, reviews the following types of declarations for past hazard events:

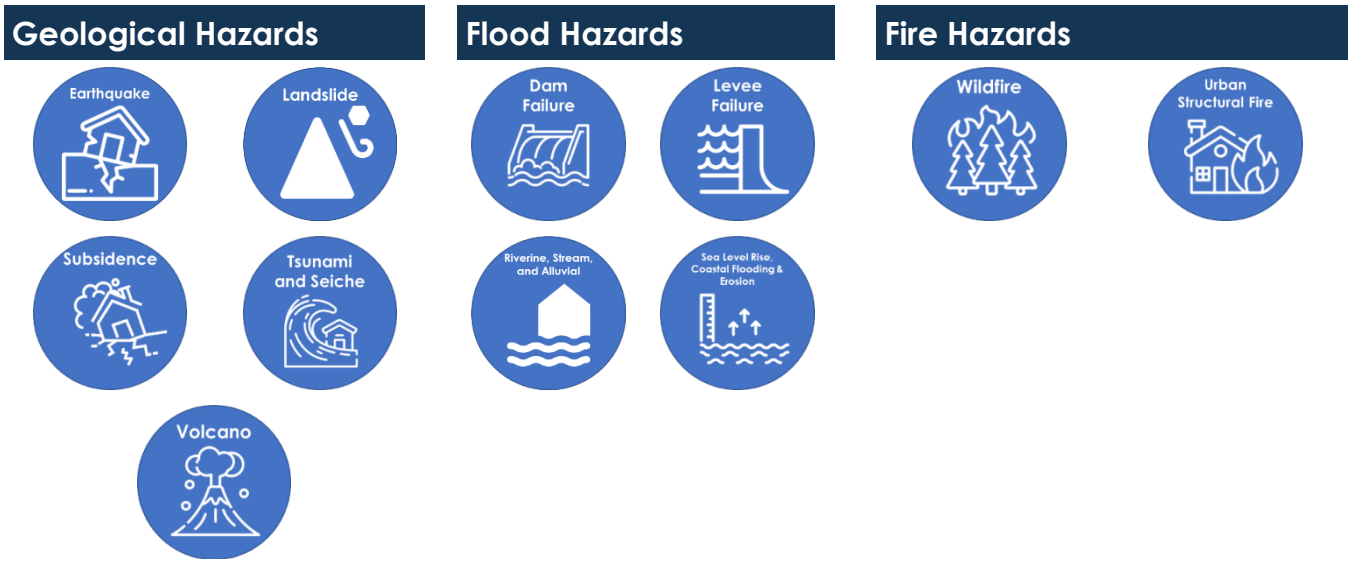
- **Federal (or Presidential) Major Disaster Declaration (DR)—**For a natural event that the President believes has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. Provides a wide range of federal assistance programs for individuals and public infrastructure.
- **Federal (or Presidential) Emergency Declaration (EM)—**For a event when the President determines federal assistance is needed to supplement state and local emergency services efforts, or to lessen the threat of a catastrophe. The total assistance for a single event may not exceed $5 million.
- **Federal Fire Management Assistance Declaration (FM/FMAG)—**Establishes eligibility for Fire Management Assistance Grants from FEMA for the mitigation, management, and control of fires that threaten to be a major disaster. This declaration type replaced the FS declaration in 2003.
- **Federal Fire Suppression Authorization (FS)—**Funding under FEMA's Fire Suppression Assistance Program and this declaration type were replaced after 2002 with Fire Management Assistance Grants.
- **U.S. Department of Agriculture Disaster Designation—**Designates counties as disaster areas to make EM loans available to producers suffering losses in those counties and in contiguous counties.
- **California State of Emergency Proclamation—**Issued by the Governor in cases of disaster or of extreme peril to the safety of persons and property that are likely to be beyond the control of any single county or city and require the combined forces of a mutual aid region or regions to combat.
- **California Disaster Assistance Act—**Authorizes the Director of Cal OES to administer a disaster assistance program providing state financial assistance for disaster-related costs incurred by local governments. Funding becomes available when the Director concurs with a local emergency proclamation requesting state disaster assistance. Funds may be used for the repair, restoration, or

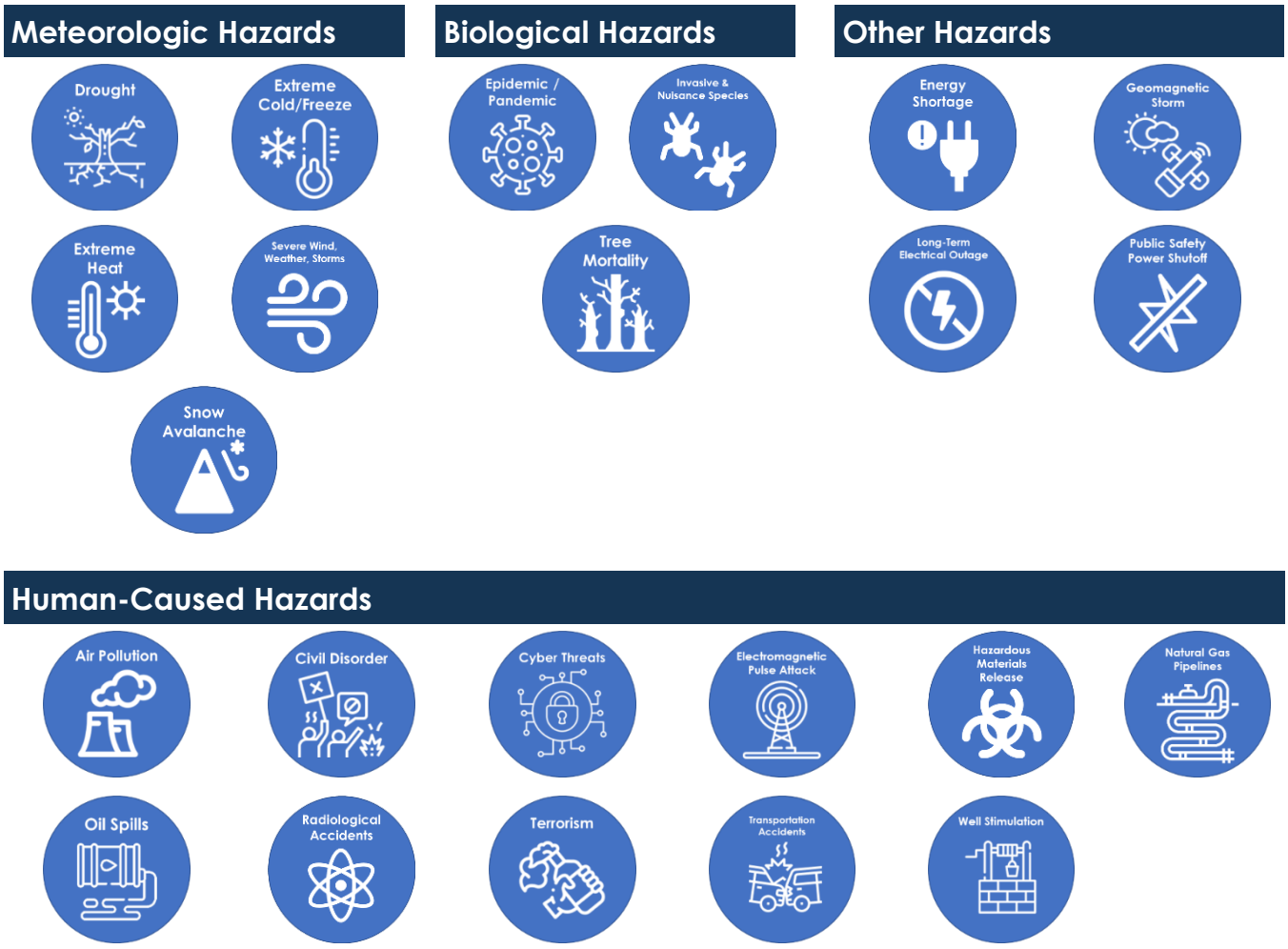
replacement of public real property damaged by a disaster. The program may assist with cost sharing required under federal public assistance programs in response disaster events.

- **U.S. Small Business Administration Economic Injury Disaster Loan**—Provides loans up to $2 million for businesses and private nonprofit organizations to repair or replace damaged or destroyed real estate, machinery and equipment, inventory, and other business assets. Funds may also be used to help businesses and homeowners with the cost of improvements to protect, prevent, or minimize the same type of disaster damage from occurring in the future.
- **U.S. Small Business Administration Physical Damage Loan**—Covers disaster losses not fully covered by insurance or other sources. Disaster loans up to $200,000 are available to homeowners to repair or replace damaged or destroyed real estate. Homeowners and renters are eligible for up to $40,000 to repair or replace damaged or destroyed personal property.
- **U.S. Department of Agriculture Secretarial Disaster Designation**—Establishes eligibility for farm operators in primary counties and contiguous counties to be considered for certain assistance from the Farm Service Agency (FSA), provided eligibility requirements are met. This assistance includes FSA emergency loans. Emergency loans help producers who suffer qualifying farm-related losses directly caused by the disaster in a county declared or designated as a primary disaster or quarantine area.

2.2. HAZARDS OF CONCERN

California's physical location, geographic features, population, and assets make the state susceptible to a wide variety of hazards. These hazards include geologic, flood, fire, meteorologic, biologic, and energy-related hazards as well as human-caused threats. The 2023 SHMP includes 34 hazards across these categories, as shown below.





Some assessed hazards are critical to include to ensure eligibility for federal funding. Others are profiled in order to establish a comprehensive view of risk in the state. The hazards identified in the SHMP were selected through a collaborative process with the Hazard Working Groups to ensure widespread and regionally specific hazards are assessed in the SHMP. Additionally, some hazards are required to be included in the SHMP by legislation, including electromagnetic pulse attack, geomagnetic storm, and other potential causes of a long-term electrical outrage.

2.3. COMMONLY RECOGNIZED NATURAL HAZARDS OMITTED

At the national level, hurricanes and tropical cyclones are significant natural hazards. However, due to their statistical historical improbability of impacting California, they are not assessed in this plan.

2.4. THE ROLE OF CLIMATE CHANGE

> "California is one of the most "climate-challenged" regions of North America; its historical climate is extremely variable, and climate change is making extreme conditions more frequent and severe. California's temperatures are already warming, heat waves are more frequent, and precipitation continues to be highly variable."
>
> California Fourth Climate Change Assessment

Climate change will continue to exacerbate the frequency, scale, and intensity of hazards across the State of California. Many communities have already experienced substantial damage from climate-related hazards. Climate patterns are shifting, resulting in more extreme and variable weather conditions across the state, with more intense precipitation events, declining snowpack, more frequent and severe heat waves, and drought conditions (CNRA; CEC; OPR 2022). Climate change has impacted the state's natural areas and forests, contributing to the increasing frequency of catastrophic wildfires. The planet's oceans and glaciers have also experienced changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. Global sea level has risen approximately 9 inches, on average, in the last 140 years (NASA 2022a). This has already put some coastal homes, beaches, roads, bridges, and wildlife at risk.

Areas across the state have experienced negative impacts on air and water quality, as well as energy reliability, from wildfires and extreme heat. Drought conditions have stressed water supplies and affected large industry sectors such as agriculture. There are no parts of California that escape climate impacts, although the scale, severity, and population vulnerability vary across the state.

Adapting to the changing climate will require an approach to hazard mitigation that prioritizes long-term community resilience practices with the goal of reducing harm from hazards across the whole community. The hazard mitigation actions necessary to achieve this goal are constantly evolving as conditions change, and all actions are enhanced by the participation of all levels of government, non-profit organizations, the private sector, and the public.

Climate adaptation actions, as defined by the Intergovernmental Panel on Climate Change, are adjustments in natural or human systems that respond to climatic conditions and moderate harm (Intergovernmental Panel on Climate Change 2022). Both hazard mitigation and climate adaptation actions ultimately move toward the same goal of long-term risk reduction. Integration of hazard mitigation and climate adaptation planning is particularly applicable to natural hazards that are influenced by climate change, such as coastal flooding and sea-level rise, extreme heat, wildfire, and drought.

S4- [44 CFR 201.4(c)(2)(i)]: Does the risk assessment provide an overview of the probabilities of future hazard events? The SHMP assesses 34 hazards of interest in Parts 2 and 3 of the plan. All 34 hazard profiles have a section dedicated to an overview of the probabilities of future hazard events.

2.4.1. Projected Impacts

The scientific consensus is that climate change will continue to increase the frequency, duration, and intensity of many natural hazards. According to California's Fourth Climate Change Assessment, the state will experience the following climate impacts (CNRA; CEC; OPR 2022):

- Annual average daily high temperatures are expected to rise by 2.7 °F by 2040, 5.8 °F by 2070, and 8.8 °F by 2100 compared to observed and modeled historical conditions. These changes are statewide averages.
- Heat waves are projected to become longer, more intense, and more frequent.
- Warming temperatures are expected to increase soil moisture loss and lead to drier conditions. Summer dryness may become prolonged, with soil drying beginning earlier in the spring and lasting longer into the fall and winter.
- Droughts are likely to become more frequent and persistent through 2100.
- The strength of the most intense precipitation and storm events affecting California is expected to increase.

- Snowpack levels are projected to decline significantly by 2100 due to reduced snowfall and faster snowmelt.
- Marine layer clouds are projected to decrease.
- Extreme wildfires (i.e., fires larger than 24,710 acres) would occur 50 percent more frequently. The maximum area burned statewide may increase 178 percent by the end of the century.
- Sea level rise is expected to continue to increase beach, cliff, and bluff erosion.

Exposure to these hazards will threaten public health, safety, and well-being; result in damage to infrastructure and property; and degrade natural resources (CNRA; CEC; OPR 2022).

S6- [44 CFR 201.4(c)(2)(ii) and 201.4(c)(2)(iii)]: Does the risk assessment include an overview and analysis of jurisdictions' vulnerability to the identified hazards and the potential losses? Section 2.5 includes a review and discussion on which hazards have been identified to have high impacts on all 58 counties within the State. This was based on a review of local hazard mitigation plans within each of the 58 counties in the State.

2.5. LOCAL HAZARDS OF CONCERN

California has 58 counties, 482 cities, and over 1,500 special purpose districts that are eligible to develop a local hazard mitigation plan. Many counties have led the development of multi-jurisdictional local hazard mitigation plans, in addition to the single-jurisdiction plans led by cities and special districts.

The information and data gathered through local planning efforts are valuable as the State implements mitigation strategies and actions and develops funding priorities. Planning efforts between the State and local jurisdictions should be consistent, and the State Plan integrates local assessments and data with emphasis directed to the hazards posing the greatest risks.

As shown in Figure 2-1, all of California's counties have been included in state and federal disaster declarations in recent years (2018 to 2022)—from as few as three declarations in several counties to as many as 18 in Los Angeles County.

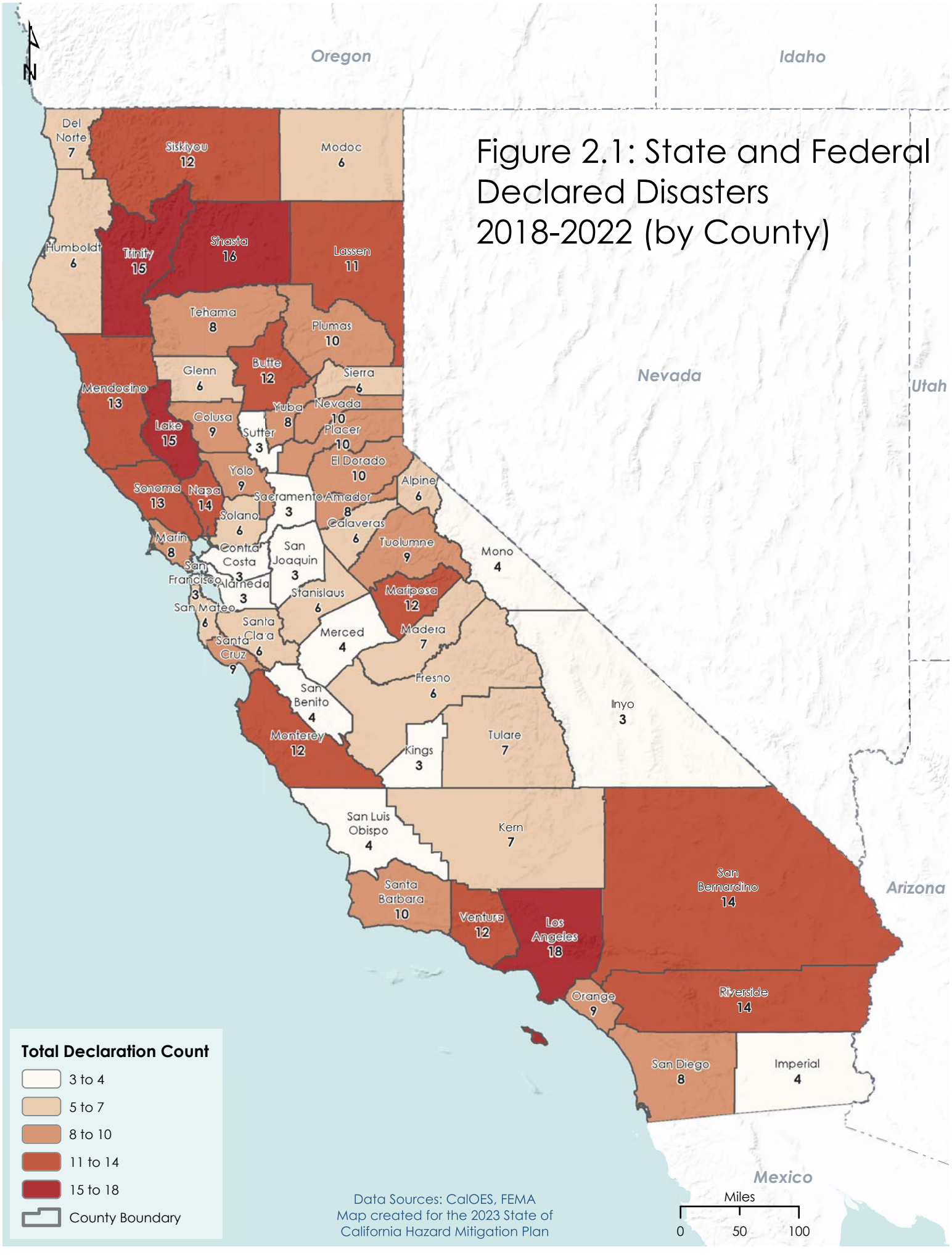


Figure 2.1: State and Federal Declared Disasters 2018-2022 (by County)
Oregon
Idaho
Nevada
Utah
Arizona
Mexico
Del Norte 7
Siskiyou 12
Modoc 6
Humboldt 6
Trinity 15
Shasta 16
Lassen 11
Tehama 8
Plumas 10
Glenn 6
Butte 12
Sierra 6
Mendocino 13
Yuba 8
Nevada 10
Colusa 9
Lake 15
Sutter 3
Placer 10
El Dorado 10
Yolo 9
Alpine 6
Sonoma 13
Napa 14
Sacramento 3
Amador 8
Solano 6
Calaveras 6
Marin 8
Contra Costa 3
San Joaquin 3
Tuolumne 9
Mono 4
San Francisco 3
Alameda 3
Stanislaus 6
Mariposa 12
San Mateo 6
Santa Clara 6
Merced 4
Madera 7
Santa Cruz 9
Fresno 6
San Benito 4
Inyo 3
Monterey 12
Kings 3
Tulare 7
San Luis Obispo 4
Kern 7
San Bernardino 14
Santa Barbara 10
Ventura 12
Los Angeles 18
Orange 9
Riverside 14
San Diego 8
Imperial 4
Total Declaration Count
3 to 4
5 to 7
8 to 10
11 to 14
15 to 18
County Boundary
Data Sources: CalOES, FEMA
Map created for the 2023 State of California Hazard Mitigation Plan
Miles
0
50
100

In developing local hazard mitigation plans, each jurisdiction identified the hazards of greatest concern to its jurisdiction, based on factors such as impact, history, probability, and local knowledge. Most plans identify significant "hazards of concern"—which are rated as high, medium, or low risk—as well as lesser "hazards of interest"—which are described but not given a full risk assessment and rating.

Different plans use different wording to identify hazards. The SHMP identifies several hazards in addition to the 19 hazards identified in county hazard mitigation plans. The SHMP's hazards of concern include natural and man-made or human-caused hazards, which are not required by FEMA for Standard or Enhanced state planning requirements. These hazards were identified through coordination with the Hazard Working Groups, required through legislation, and to meet EMAP requirements.

Expanding the types of hazards profiled and assessed in the SHMP ensures that the state has a comprehensive understanding of potential statewide risk. However, local jurisdictions are not required to include all of the hazards of concerns identified in the SHMP. The hazards of concern from the 58 county hazard mitigation plans in California can be summarized as shown below:

- Agricultural Hazards (includes pest infestation for plants and livestock)
- Avalanche
- Climate Change
- Coastal Hazards (includes erosion, and sea level rise)
- Dam Failure
- Dam/ Levee Failure
- Drought
- Earthquake
- Flood
- Levee Failure
- Mass Movement (includes landslides, mudslides, debris flow, and rain-induced landslide)
- Other Weather (includes freeze, extreme heat, and extreme cold)
- Seiche Wave
- Severe Weather (includes hail, high winds, winter storm, and fog)
- Subsidence
- Tornado
- Tsunami
- Volcano
- Wildfire

Figure 2-2 indicates the number of counties listing each hazard as a hazard of concern and the number that rate the hazard as a high, medium, or low risk. Table 2-2 lists what each county identified as its high-risk hazards and when FEMA approved each plan.

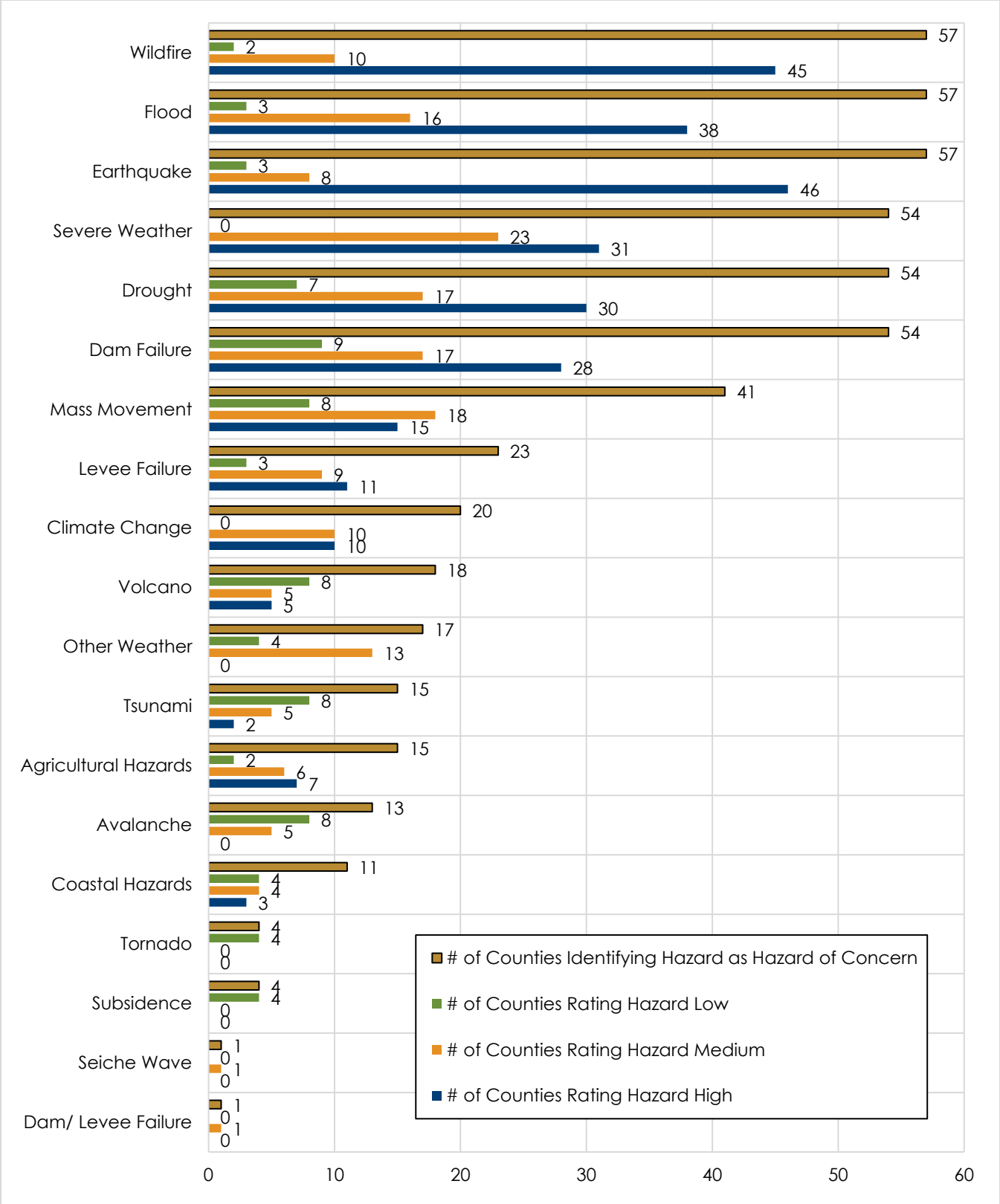


Figure 2-2. Identified Hazards from Local Plans

Table 2-2. High Hazards Listed by Counties in California

County	High-Risk Hazards[a]
Alameda	dam failure, wildfire, earthquake, drought, climate change
Alpine	wildfire, severe weather, drought
Amador	earthquake, wildfire, flood, dam failure mass movement, severe weather
Butte	dam failure, wildfire, earthquake, flood, levee failure, mass movement, drought, severe weather
Calaveras	wildfire drought, severe weather
Colusa	flood, drought, dam failure, levee failure, wildfire, agricultural, volcano, climate change
Contra Costa	earthquake, mass movement
Del Norte	earthquake, tsunami
El Dorado	wildfire, flood, severe weather, drought, dam failure, earthquake
Fresno	earthquake, dam failure, wildfire, flood, levee failure
Glenn	wildfire, drought, levee failure, flood
Humboldt	earthquake, wildfire, severe weather
Imperial	earthquake, flood, dam failure, severe weather, volcano
Inyo	wildfire, severe weather, flood, earthquake, drought
Kern	wildfire, severe weather, flood, earthquake, drought
Kings	drought, earthquake, wildfire dam failure, flood
Lake	drought, earthquake, severe weather, wildfire, volcano, agricultural hazards
Lassen	earthquake, wildfire, flooding, levee failure, drought
Los Angeles	earthquake, wildfire, dam failure, drought, mass movement, climate change
Madera	wildfire, flood, dam failure, agricultural hazards, climate change, drought, earthquake, mass movement, severe weather
Marin	earthquake, dam failure, mass movement, flood, wildfire
Mariposa	wildfire, climate change
Mendocino	earthquake, wildfire, dam failure, flood, drought, severe weather
Merced	severe weather, flood, levee failure, dam failure, agricultural hazards, drought, earthquake
Modoc	drought, earthquake, wildfire, agricultural hazards, dam failure, mass movement, severe weather, volcano
Mono	wildfire, severe weather
Monterey	drought, earthquake, wildfire, severe weather, flood
Napa	wildfire, severe weather, drought, earthquake, flood, climate change, mass movement
Nevada	wildfire, dam failure, flood, agricultural hazards, drought, earthquake, climate change, mass movement, severe weather
Orange	earthquake, dam failure, levee failure
Placer	wildfire, severe weather, flood, drought, dam failure, earthquake, agricultural hazards
Plumas	wildfire, dam failure, earthquake, flood
Riverside	earthquake, wildfire
Sacramento	dam failure, flood, wildfire, earthquake, levee failure
San Benito	earthquake, severe weather
San Bernardino	wildfire, flood, earthquake
San Diego	dam failure, earthquake, flood, wildfire, severe weather, drought
San Francisco	earthquake
San Joaquin	severe weather, flood, dam failure, levee failure

County	High-Risk Hazards[a]
San Luis Obispo	wildfire, mass movement, earthquake flood, dam failure, drought
San Mateo	earthquake, mass movement, coastal hazards
Santa Barbara	earthquake, wildfire, drought, severe weather, flood, mass movement, coastal hazards
Santa Clara	earthquake, flood, severe weather
Santa Cruz	earthquake, wildfire, drought, flood, tsunami, mass movement, coastal hazards, climate change
Shasta	flood, wildfire, severe weather, earthquake
Sierra	wildfire, flood, earthquake
Siskiyou	severe weather, wildfire, food
Solano	wildfire, flood, earthquake, drought, severe weather
Sonoma	mass movement, earthquake, wildfire
Stanislaus	dam failure, drought, earthquake, flood, severe weather
Sutter	levee failure, earthquake, flood, dam failure
Tehama	wildfire
Trinity	drought, flood, severe weather, wildfire, dam failure
Tulare	climate change, severe weather, wildfire, flood
Tuolumne	wildfire, earthquake
Ventura	dam failure, mass movement
Yolo	dam failure, levee failure, flood, severe weather, volcano, wildfire, earthquake, drought, subsidence, climate change
Yuba	dam failure, drought, earthquake, flood, wildfire

a. Based on the most recently approved LHMP

The highest ranked hazards in the local hazard mitigation plans were wildfire, earthquake and flood, all of which were evaluated in all but one county plan (a different county for each of the three). The counties assessing these hazards ranked them as follows:

- **Wildfire**—45 counties identified it as high risk, and 10 counties identified it as medium risk
- **Earthquake**—46 counties identified it as high risk, and 8 counties identified it as medium risk
- **Flood**—38 counties identified it as high risk, and 16 counties identified it as medium risk

In their mitigation planning initiatives, local jurisdictions recognize that a hazard can cause secondary and sometime tertiary hazard impacts. For example, a destructive wildfire can burn away all the vegetation on hillsides. When winter storms occur, the lack of vegetation that normally holds soil and slopes in place may result in a landslide. This possible occurrence has also been identified in state mitigation planning efforts.

Understanding the ranking of hazards at the local level informs the identification and ranking of hazards in the SHMP. Local hazard mitigation plans and the SHMP are integrated to ensure the SHMP serves as a resource for planning data and establishes shared statewide risk reduction goals. Local plans inform the SHMP's risk assessment and mitigation priorities by providing insight into how hazards are experienced at the local level and identifying local concerns. Integration of these planning efforts supports better alignment of mitigation actions and ensures future mitigation grants may be supported by the SHMP and the local plan.

Within California, the local identification and ranking of wildfire, flood, and earthquake affirm the state's perspective of these hazards as the "Big Three"— historically the most frequent and impactful hazards affecting the state. Additionally, a hazard may be more regionally focused, such as snow avalanche, and therefore not identified in all local plans. In these instances, the localized hazard is included in the SHMP to provide a comprehensive statewide risk assessment and ensure data related to regional hazards is still available to local jurisdictions.

3. California State Profile

California is the third largest U.S. state geographically and the largest by population. With Oregon and Washington, it makes up the western border of the contiguous United States. Known as the Golden State, it is bordered by Oregon to the north, Nevada to the east, Arizona to the southeast, Mexico to the south, and the Pacific Ocean to the west.

The state is filled with valleys, lakes, rivers, mountains, volcanos, beaches, forests, and deserts. California's diverse landscape includes 840 miles of coastline; nine national parks; 279 state parks; three desert regions; giant redwood and sequoia forests unique to the state; mountain ranges creating the important Central Valley; world-famous wine regions across the state; major metropolitan areas in the Bay Area, Los Angeles, and San Diego; and major agricultural lands predominantly throughout the Central Valley that supply more than half of the fruits, vegetables, and nuts grown in the United States.

Understanding the unique characteristics of the state provides a foundation for identifying risks related to the natural hazards—based on the physical geography of the state—and the state's assets, which may be viewed as targets and increase the risk of human-caused threats. Following the history and governance of California provides details on how the State has historically approached reducing risk and building resilience. The state profile provides a foundational understanding of these factors to assist with understanding the impacts that hazards may have on the state's people, environment, infrastructure, and economy.

Information from the state profile also is used to inform the risk assessment. Evaluating development trends, population and demographic changes, and the state's assets and capabilities provides insight into how vulnerability may evolve over a period of time. Identifying geographic areas of increased risk, equity priority communities, and future land use changes guides the development of the mitigation strategy to take into account how future changes may increase or decrease vulnerability.

3.1. HISTORY

California's history serves as the background to understanding how risk has evolved over time. Vulnerability may be increased or decreased based on land use, governance, allocation of resources, and how residents utilize the state's resources.

California is the original home of numerous indigenous tribes, many of which still reside in the state as vibrant and resilient federally recognized and non-federally recognized tribes, governments, bands, and rancherias, despite centuries of genocide and occupation. The state was first claimed as a territory in the mid-1760s; Spain divided the region into Alta California and Baja California as provinces of New Spain, now known as Mexico. Following this, multiple missions, presidios, and pueblos were established in what are now California's major cities, including San Francisco, Los Angeles, San Diego, San Jose, Monterey, Santa Cruz, and others.

In 1821, Alta California became a territory of Mexico after it gained independence from Spain. During this time, land grants were deeded to soldiers and government officials. One of these land grants in the Sacramento area led to the creation of Sutter's Fort as a major agricultural and trading post. In 1848, gold was discovered at Sutter's Mill, leading to the famous California Gold Rush. This period brought booms in population and business, including the construction of the state's first railroad connecting Sacramento to Omaha, Nebraska, completed in 1869. The railroad was built primarily by Chinese immigrant labor forces, as well as other workers from a variety of ethnic and cultural backgrounds (National Park Service 2022).

As the population grew, so did the need for water. Large infrastructure projects moved water from within the state and outside it—the largest sources of water for California are the California Delta system and the Colorado River—and built reservoirs and canals. This allowed for the growth of agriculture in the Central Valley, but also created a flood risk from dams.

California became the 31st U.S. state in 1850. Since joining the union, the state has seen significant increases in population, industry, agriculture, and tourism. The state is now the most populous state in the United States and one of the largest producers of agricultural resources in the world. In addition to agriculture, California has one of the most diverse economies in the nation, dealing in technology, entertainment, tourism, manufacturing, healthcare, construction and development, and professional sports, among other sectors.

The state's past settlement patterns and economy are still reflected in modern day land use. Early settlement areas have continued to grow and have high population densities, so a larger percentage of the population may be exposed to hazards. In areas where population has historically been less dense, and agriculture is the dominant land use, the exposure of the population is decreased, but potential impacts to the agricultural economy increase.

3.2. GOVERNMENT

California gained statehood through the Compromise of 1850 and was the first declared U.S. state on the west coast (CDPR n.d.). The current capital city is Sacramento, but past capitals included Monterey, San Jose, Vallejo, Benicia, and San Francisco (California State Library n.d.). The state comprises 58 counties and 482 incorporated cities. California also has one city-county, the City and County of San Francisco (California State Association of Counties n.d.). California is home to 109 federally recognized tribes and several non-federally recognized tribes petitioning for recognition (California Courts n.d.).

The multiple levels of government result in varying degrees of responsibility and authority for carrying out hazard mitigation planning and actions. This creates a need for strong inter-jurisdictional coordination and support from the State to ensure success at the city, county, and tribal levels. Additionally, inter-jurisdictional coordination is required to address hazards at a meaningful scale rather than strictly based on jurisdictional boundaries.

3.3. GEOGRAPHY AND ENVIRONMENT

California's geography and environment have been shaped by many forces that present hazards today, and the large area and landscape diversity present challenges in developing plans for statewide hazard mitigation. The state's diverse landscape includes a long coastline, lakes, rivers, mountains, volcanos, valleys, desert areas, giant redwood and sequoia forests, vineyards, major metropolitan areas, and major agricultural fields.

3.3.1. Topography and Geology

California's topography and geology vary significantly. Elevations range from Mount Whitney's 14,505 feet above sea level—the tallest peak in the continental United

States—to Badwater Basin's 282 feet below sea level—the lowest point in North America—with less than 100 miles between the two landmarks. California has one of the longest coastlines of any U.S. state, and the San Francisco Bay and Sacramento-San Joaquin Delta stretch far inland, making much of the geographic interior of the State near or even below sea level.

Geologic forces are active throughout California, resulting in highly varied topography and geology that are often categorized as distinct regions. The Coastal Ranges, the Great Valley, and the Sierra Nevada mountains cover much of the state, running roughly 400 miles from north to south and each spanning over 50 miles east to west. The Coastal Ranges run along the State's coastline from the Oregon border to Santa Barbara County, separated into two portions by San Francisco Bay. To the east lies the Great Valley of the Sacramento and San Joaquin Rivers, and further east lie the Sierra Nevada mountains. The Klamath Mountains, the Cascade Mountains, and the Modoc Plateau stretch from the northern end of the Great Valley to the Oregon border. Southern California comprises the Transverse and Peninsular Ranges along the coast and the Mojave and Colorado Deserts farther inland.

These topographic and geologic variations are due to geologic forces, including faulting, erosion, and volcanism, that continue today:

- The San Andreas Fault and other faults extend over 700 miles from Mendocino in the northwest to the Cajon Pass in the southeast, where they branch into more faults. Additional faults, including the Hayward Fault, run nearly parallel to the San Andreas Fault in the San Francisco Bay area.
- Rivers transport rainfall and snowmelt across the state and erode land, depositing sediment in alluvial fans at the foot of steep mountains, in deltas, or in offshore environments where it can be re-deposited in beaches.
- The ocean has shaped California's coastline, eroding the land to create sea cliffs such as in the Lost Coast, Big Sur, and Palos Verdes.
- Landslides and similar flows also erode the land, especially in steeper terrains. These flows can be triggered by other events like wildfires, heavy rains, and earthquakes.
- California's Pacific coastline borders the Ring of Fire, a string of volcanoes and sites of significant seismic activity. Inland, California has eight potentially active volcanoes.

Topography in California also influences weather. For example, steep mountains enable fast, dry, downslope winds that have different local names—most notably Santa Ana winds in Southern California and Diablo Winds in Northern California. The speed and dryness of these types of wind make them an extreme concern for wildfires. Additionally,

elevation influences weather patterns and plant type, which impact such hazards as extreme temperatures and wildfires.

The geologic processes that created the current geographic landscape of the state over millions of years also can create disasters in California and present a risk to human life and property today. These geologic processes contribute to the "Big Three" hazards: earthquake, fire, and flood. Due to the physical characteristics of California, some of the risks posed by those and other hazards will always be present. Mitigative measures can be taken to reduce and lessen impacts, but the natural occurrence of contributing factors such as shifting tectonic plates, vast forested areas, and extensive waterways mean there will also be residual risks.

3.3.2. Hydrography and Hydrology

Water plays a vital role in California's natural and human landscapes. Natural features play a role in providing protection from natural hazards but are also vulnerable themselves to impacts from hazards. Natural systems, such as wetlands and estuaries, provide multiple co-benefits to the environment and people. These natural systems can improve air quality, reduce impacts from extreme heat, serve as storage for rainwater and flooding, and provide recreational and exercise opportunities for people (Kingsley 2019).

Potable drinking water in California highlights the nexus of mitigation, critical services, and natural hazards. In addition to in-state resources, California relies on water delivered to the State via built infrastructure, such as canals and aqueducts. California's built water infrastructure is vulnerable to natural and human-made hazards, including earthquakes, wildfires, and terrorism.

The most significant external water source is the Colorado River, which forms the California-Arizona border (Stern 2022). It currently provides up to one-third of the drinking water for Southern California and significant irrigation water for the region (E. Hanak 2018). Under the Law of the River, California is entitled to 4.4 million acre-feet of water from the Colorado River, which arrives by the Colorado River Aqueduct and All-American Canal (Stern 2022). Numerous other aqueducts, canals, and ditches are managed by multiple jurisdictions to move water around the state. The water infrastructure providing this critical water supply to California's population is vulnerable to impacts from natural disasters. Earthquakes can result in damage to pipes and interruption of potable water services to one-third of the state's population.

Water accumulates in natural lakes and artificially dammed reservoirs, providing recreational opportunities as well as hazard potential. Major water bodies include the Salton Sea, Lake Tahoe, Clear Lake, Mono Lake, and Owens Lake. Statewide, 240 large reservoirs account for 60 percent of the state's water-storage capacity (A. Escriva-Bou 2019). All water bodies are vulnerable to seiches, which are large tsunami-like waves that can endanger shoreline communities and infrastructure.

Major dams include Shasta Dam, which creates the largest-volume reservoir in California, and Oroville Dam, which is the tallest dam in the United States. Dams, like other forms of water infrastructure, are susceptible to hazards including earthquakes and terrorism. They also can fail due to degradation or overfilling from extreme precipitation or snowmelt, and their failure can cause devastating flooding.

Groundwater is an important water resource in California that is threatened by the State's prolonged drought. In an average year, groundwater contributes 38 percent of the state's total water supply. During dry years, groundwater contributes over 45 percent of the statewide annual supply (DWR n.d.). Many communities rely on groundwater for up to 100 percent of their water supply. Removing groundwater faster than it is recharged can lead to groundwater depletion, which in turn can lead to subsidence that can impact infrastructure at the surface.

3.3.3. Regional Climate

Evaluating current and future climate conditions establishes a baseline for the potential intensity, probability, and magnitude of several natural hazards. As the climate changes over the next several decades, the resulting impacts from hazards will change as well. The climate of California varies widely, from arid desert to highland and timberline, due to significant variation in latitude, elevation, and proximity to the Pacific Coast (California Department of Fish and Game 2003).

California's most common climate classification is Mediterranean under the Köppen climate classification, which is characterized by hot, dry summers and cool, wet winters and locations between about 30° and 45° latitude north and south of the equator and on the western sides of continents. Different sub-classifications of the Mediterranean climate exist in California's coastal regions, the Sierra Nevada foothills, and much of the Central Valley. Also common across the state are arid, semi-arid, and steppe climate classifications, which occur in the southern Central Valley and across Southern California, except for the coastal mountains. These hotter, drier climates extend north inland beyond the Mojave Desert. The remainder of the state in the northeast is classified as cool continental, except for the Sierra Nevada, which gets even colder

and is classified as highland/timberline. All of California's climates present opportunities for severe weather, including extreme heat or cold and high winds. Almost all present conditions for wildfires.

The average annual statewide precipitation is 23 inches, with significant variation from year to year—recently it was as low as 7.9 inches in 2013 and as high as 42.5 inches in 1983. Fifty percent of the annual precipitation occurs from December to February (California Office of Environmental Health Hazard Assessment 2019). Much of the year-to-year variability in precipitation has been linked to storms called "atmospheric rivers." Atmospheric rivers carry narrow bands of water vapor up to 1,000 miles long and several hundred miles wide. On average, atmospheric rivers that hit California provide 30 to 50 percent of the state's annual precipitation and 40 percent of the Sierra Nevada snowpack. The absence of atmospheric rivers can contribute to drought conditions, while too many atmospheric rivers can lead to catastrophic flooding, such as the Great Flood of 1862 and the ARkStorm megaflood scenario (Porter 2011). The ARkStorm megaflood scenario models a 1 percent-annual-chance storm from an atmospheric river, which would result in $725 billion in damage and widespread flooding, landslides, and extended disruption of critical services (USGS 2018).

Locally, annual precipitation varies from less than 3 inches in Death Valley to more than 100 inches near the City of Eureka (NOAA NCEI n.d.). Precipitation tends to be low during summer and highest during winter. Different regions of the state may be more prone to drought or flood due to the variability of precipitation throughout the year.

The vast and diverse land area of California contributes to the state's ranging climate. As a result of the varying climate, it is necessary to evaluate current and future risk that will be influenced by changes in climate.

3.4. POPULATION

Population and demographic data provide baseline information about residents. This baseline data and information may be used to identify the percentage of the population exposed to a hazard and identify communities that are prone to higher impacts and vulnerabilities from natural hazards.

3.4.1. Statewide Trends

The California Department of Finance publishes population estimates annually. Combined with U.S. Census Bureau decennial census data, these estimates show that the state's population increased significantly in the past seven decades. While population is estimated to continue to increase, it will slow down drastically as shown in Figure 3-1.

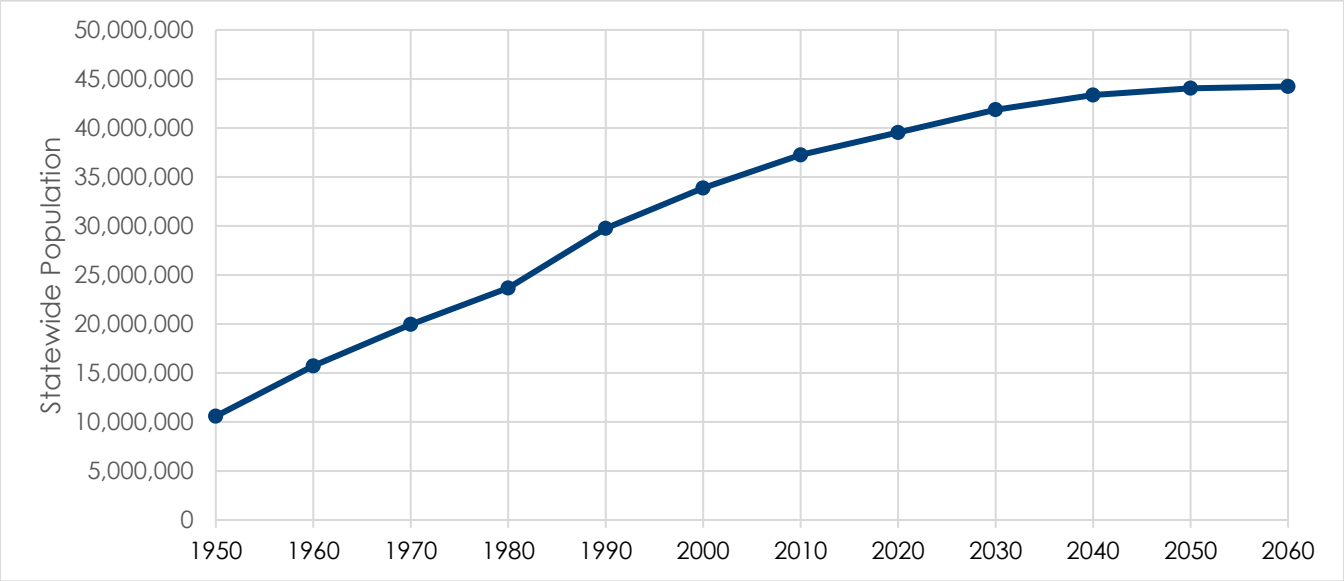


Figure 3-1. Historical Statewide Population

The State's population is dynamic and composed of several sub population groups and communities that make up large percentages of the total statewide population. California saw a 3.32 percent increase in population between 2012 and 2022, but Census data show a decrease in the State's population from 39,648,938 in 2020 to 39,185,605 in 2022. The Department of Finance attributes the population decrease to the following factors (California Department of Finance 2022):

> "…Baby Boomers [aging], and fertility declines among younger cohorts, the continuing slowdown in natural increase—births minus deaths—underlies the plateauing of the state's population growth. The addition of COVID-19-related deaths, federal policies restricting immigration, and an increase in domestic out-migration further affected population totals. Overall growth was also affected by continuing federal delays in processing foreign migration: while last year saw positive immigration (43,300), the level was below the average annual rate of 140,000 before the pandemic."

Although the population is estimated to stabilize in the coming decades, California's population will continue to represent a significant portion of the total U.S. population.

3.4.2. Regional Trends

The number of people in the state may remain relatively the same, but where people live, work, and play could continue to change. In addition to reviewing population changes, it will be critical to evaluate development trends to determine where people are in comparison to hazard prone areas.

Most counties experienced their highest population count between 2019 and 2020. In the past two years (2021, 2022), 34 counties saw a decrease in population while 24 experienced an increase. The Los Angeles metropolitan area (Los Angeles, Orange, and Ventura Counties), San Diego County, and the San Francisco Bay Area (Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo Counties), have all experienced a population decline. Outside the larger metropolitan areas, counties such as Sacramento, Merced, Colusa, San Luis Obispo, Placer, and others have witnessed a growth in population and others have remined relatively flat. Figure 3-2 highlights the population change in selected regions over the following time periods:

- 2012 – 2022: past 10 years (two mitigation plan cycles)
- 2018 – 2022: time from last mitigation plan
- 2020 – 2022: reflective of recent downward population trend in major areas

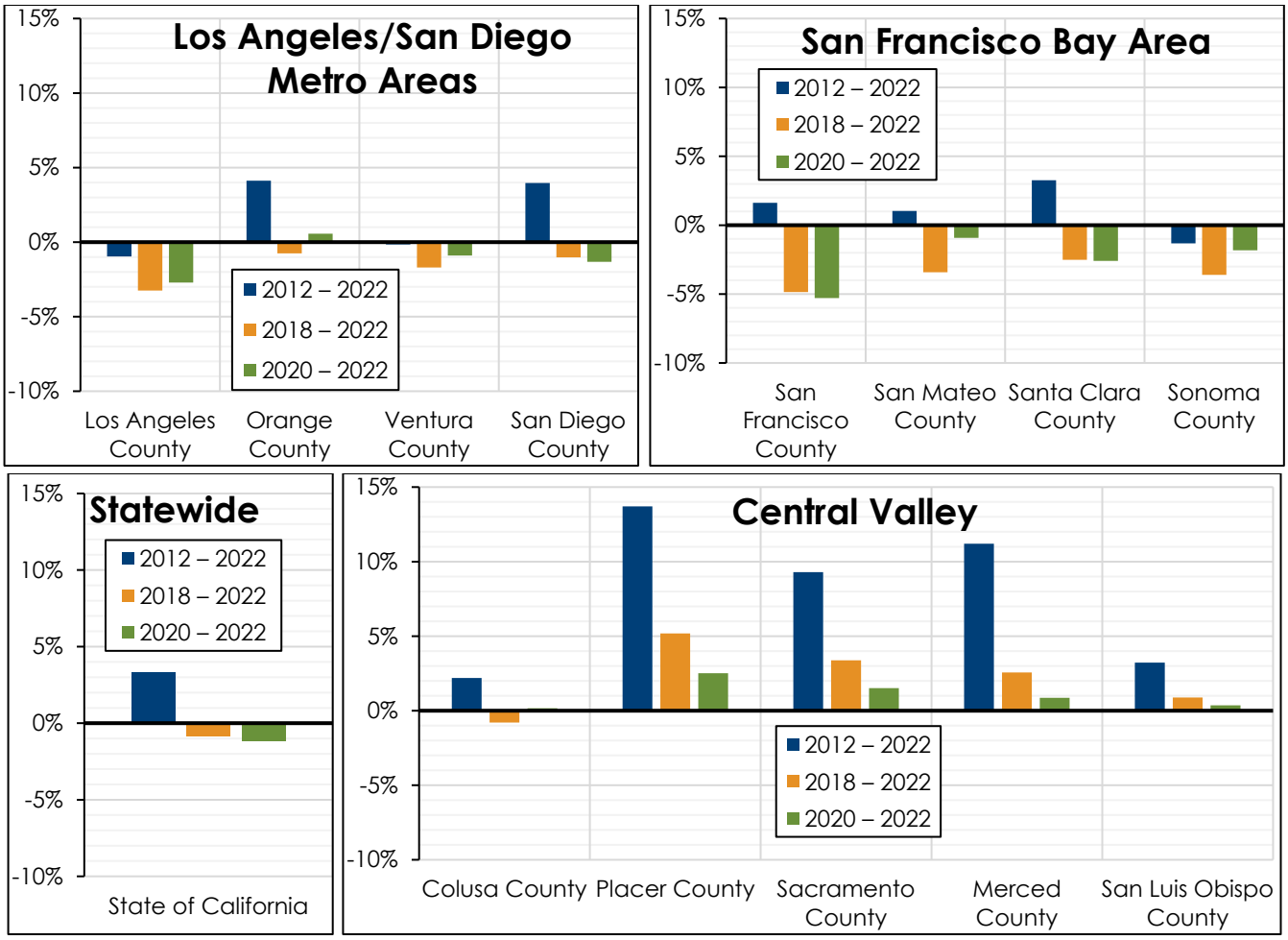


Figure 3-2. Population Growth Trends in Major State Regions

Los Angeles continues to be the most populated county, with 10,163,139 people in 2019. San Diego County's population peaked at 3,31,279 in 2019, and Orange County peaked that year at 3,185, 378.

3.4.3. Equity Priority Populations

California is committed to pursuing equitable outcomes for all populations through the delivery of hazard mitigation programs and actions. Decision-makers must first identify equity priority populations that are underserved or historically marginalized, have access or functional needs, or face additional barriers when preparing for, responding to, or recovering from a disaster. Such information can assist communities in prioritizing efforts to build resilience across the whole community. This includes identifying populations based on demographic information such as age, disability, income, and race, as well as identifying communities where data may not be as readily available, such as refugee and undocumented populations.

Examples of Equity Priority Communities (CDC 2020)

- Children (aged 5 years and under) are dependent on others to safely access resources during emergencies.
- Older adults (typically aged 65 and over) are more likely to lack the physical, technological, and economic resources necessary for response to hazard events.
- Economically disadvantaged populations are likely to lack the resources to adequately prepare for and respond to hazards.
- People with disabilities are faced with increased levels of cognitive and physical difficulty, which may reduce their capacity to receive, process, and respond to emergency information and warnings.
- Individuals with limited English proficiency may have difficulty with understanding information being conveyed to them. Cultural differences can also add complexity to how information is being conveyed to populations with limited English proficiency.

Note: These definitions are established by the CDC; the CDC refers to these populations as socially vulnerable populations.

Available Socioeconomic Data Sets

Several resources are available to gather demographic and socioeconomic data for California. Each dataset has beneficial data and gaps; the Equity Working Group collaborated to determine the most beneficial data to utilize for the SHMP. Other data sources may be more applicable based on the particular objectives or planning areas of other initiatives. Below is a list of datasets reviewed by the Equity Working Group:

- **Center for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry Social Vulnerability Index (SVI)**—Identities areas of vulnerability based on 15 indicators ranging across household composition, minority status, and access to transportation.
- **Hazards and Vulnerability Resilience Institute Social Vulnerability Index—**Measures the social vulnerability of all U.S. counties to environmental hazards. The index uses 29 socioeconomic variables.
- **Hazards and Vulnerability Resilience Institute Base Resilience Indicators for Communities (BRIC)—**Considers six broad categories of community disaster resilience including social, economic, community capital, institutional, infrastructural, and environmental at the county level.
- **U.S. EPA EJScreen**—Is a national dataset that combines environmental and demographic socioeconomic indicators. The tool uses several indicators including 12 environmental, 7 socioeconomic, 12 environmental justice, and 12 supplemental indices.
- **FEMA Resilience Analysis and Planning Tool—**Includes over 100 preloaded layers including community resilience indicators from peer-reviewed research, the most

current census demographic data, infrastructure data, and data on weather, hazards, and risk.

- **FEMA National Risk Index—**Ranks risk based on 18 natural hazards.
- **CalEnviroScreen**—Identifies California communities most affected by pollution, particularly in vulnerable socioeconomic areas.
- **Health Places Index**—Combines 25 community characteristics, such as access to healthcare, housing, and education, into a single indexed score. The healthier a community, the higher the score.

Index Selected for Risk Assessment in This SHMP

For this Plan, the CDC's 2018 Social Vulnerability Index (SVI) was identified by the Equity Working Group as the most appropriate and authoritative dataset to identify geographic areas where efforts can be prioritized to ensure equitable outcomes from mitigation planning and actions. At the time of this direction and analysis, the 2020 SVI updates had not yet been made public. The planning team adjusted the 2018 data to account for more current population data, as described in Appendix G.

The SVI is a combination of 15 social factors that contribute to social vulnerability as shown in Figure 3-3. Index values are based on a percentile ranging from 0 to 1, with higher values indicating greater vulnerability. Appendix G describes the development of SVI data used in the risk assessment for this SHMP.

Source: Centers for Disease Control and Prevention 2022

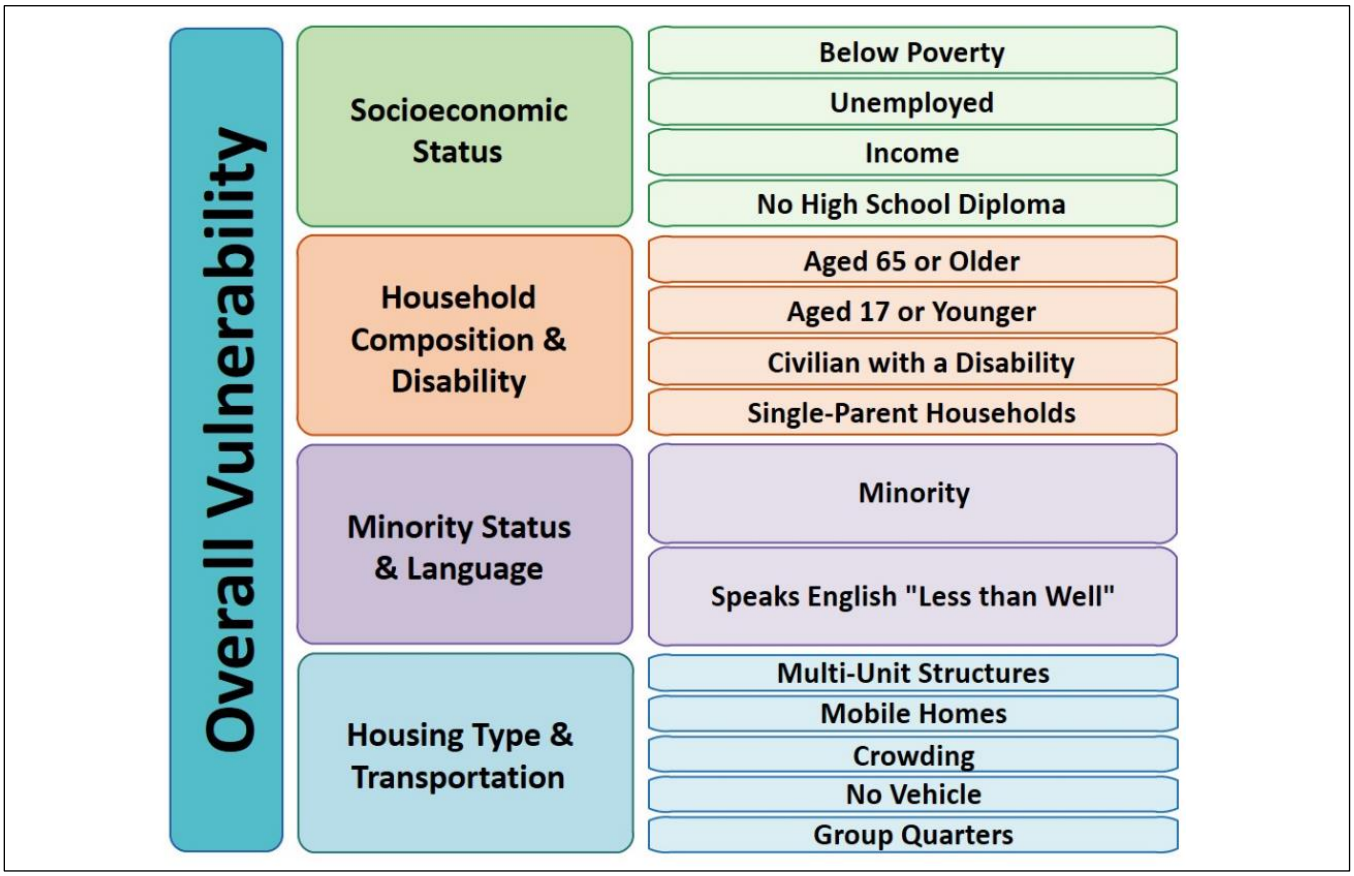


Figure 3-3. Factors Included in Social Vulnerability Index

For the risk analysis in this plan, locations with an SVI of 0.7 or greater are considered to be the most vulnerable areas; federal grant programs commonly establish thresholds in the range of 0.60 to 0.75 to prioritize communities with greater need for funding.

Baseline Equity Priority Communities

Figure 3-4 shows the percentage of population in each county that is highly vulnerable. Eleven counties in the state have no census tracts with an SVI of 0.7 or greater. The highly vulnerable population makes up more than 50 percent of the population in eight counties, including 100 percent of the population of Alpine County. Statewide, 30.4 percent of the population lives in a highly vulnerable community.

Since the inclusion of marginalized communities or socially vulnerable areas is a relatively new element in hazard mitigation planning, the assessment of such priority communities has not been a regular part of local hazard mitigation planning processes across California. As local plans require updating, consideration for such efforts will be included as part of the assessment and planning process.

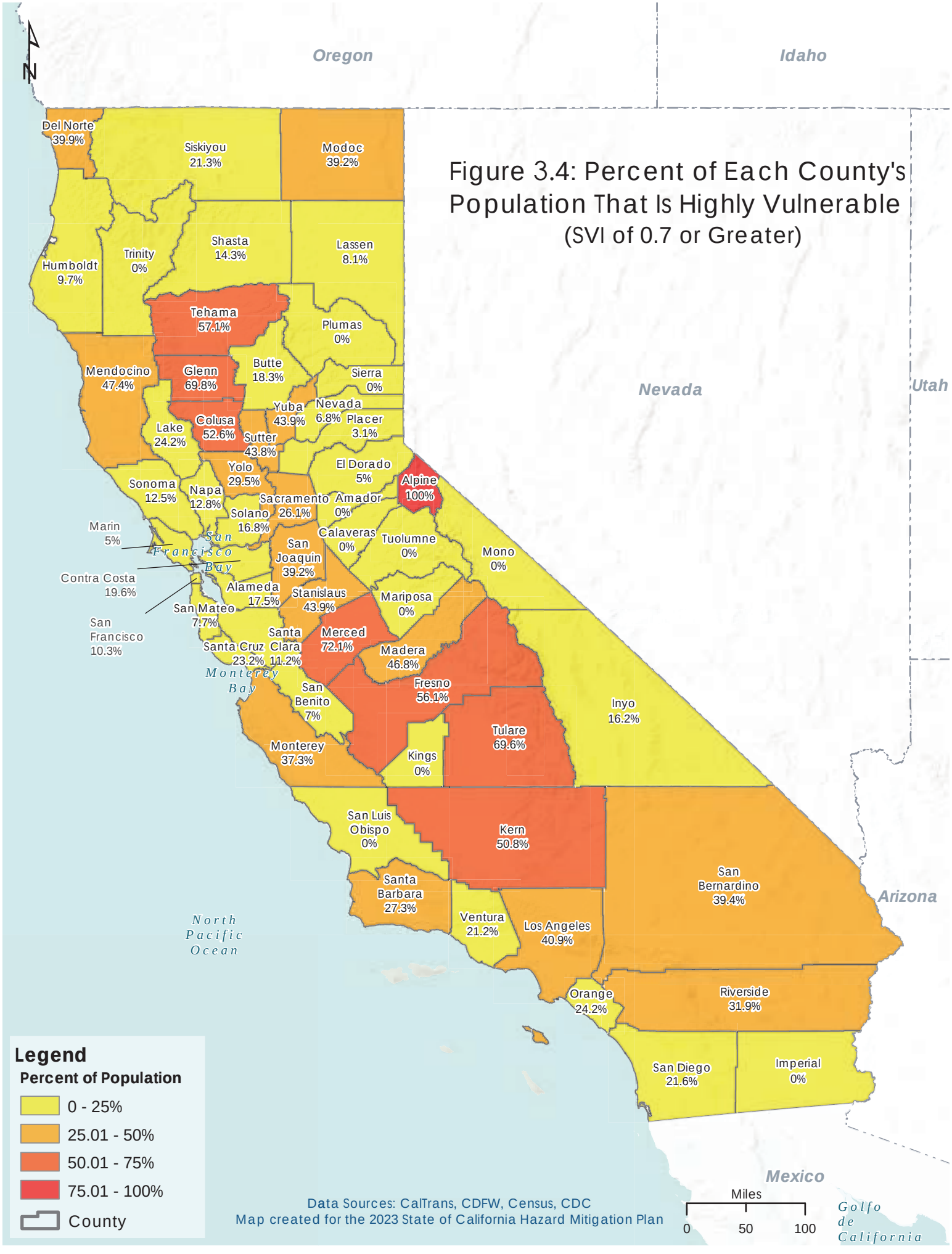


Figure 3.4: Percent of Each County's Population That Is Highly Vulnerable
(SVI of 0.7 or Greater)
N
Oregon
Idaho
Nevada
Utah
Arizona
Mexico
Del Norte 39.9%
Siskiyou 21.3%
Modoc 39.2%
Humboldt 9.7%
Trinity 0%
Shasta 14.3%
Lassen 8.1%
Tehama 57.1%
Plumas 0%
Mendocino 47.4%
Glenn 69.8%
Butte 18.3%
Sierra 0%
Nevada 6.8%
Yuba 43.9%
Placer 3.1%
Colusa 52.6%
Lake 24.2%
Sutter 43.8%
Yolo 29.5%
El Dorado 5%
Alpine 100%
Sonoma 12.5%
Napa 12.8%
Sacramento 26.1%
Amador 0%
Solano 16.8%
Marin 5%
Calaveras 0%
Tuolumne 0%
Mono 0%
San Joaquin 39.2%
San Francisco Bay
Contra Costa 19.6%
Alameda 17.5%
Stanislaus 43.9%
Mariposa 0%
San Mateo 7.7%
San Francisco 10.3%
Santa Clara 11.2%
Merced 72.1%
Santa Cruz 23.2%
Madera 46.8%
Monterey Bay
Fresno 56.1%
San Benito 7%
Inyo 16.2%
Tulare 69.6%
Monterey 37.3%
Kings 0%
San Luis Obispo 0%
Kern 50.8%
Santa Barbara 27.3%
San Bernardino 39.4%
Ventura 21.2%
Los Angeles 40.9%
Orange 24.2%
Riverside 31.9%
San Diego 21.6%
Imperial 0%
North Pacific Ocean
Golfo de California
Legend
Percent of Population
0 - 25%
25.01 - 50%
50.01 - 75%
75.01 - 100%
County
Data Sources: CalTrans, CDFW, Census, CDC
Map created for the 2023 State of California Hazard Mitigation Plan
Miles
0
50
100

Although the state uses the CDC's SVI in this Plan, local jurisdictions are encouraged to use the data source that best represents their community. Some communities may have finer scale data than at the census tract level or may determine that other sources are more useful in identifying equity priority areas within their community.

As population changes occur, the percentage of the population within one or more equity priority population categories will fluctuate. Maintaining current demographic data will allow the State to better assess the vulnerability of communities and population categories to develop inclusive mitigation strategies that protect the whole community.

3.5. LAND USE AND DEVELOPMENT

Land strategies impact who is exposed to hazards and development strategies affect how vulnerable people are to the hazards they experience. Effective land use and development planning can reduce the risk of disasters in the future by reducing development in high-risk areas or by leveraging engineering and mitigation strategies to build homes and infrastructure that are resilient to hazards. An assessment of current and projected land use and development patterns is a critical step in the risk assessment process and in developing mitigation strategies that will meet the needs of the community in the future.

Identifying where people and development are located in comparison to hazard-prone areas allows the State to evaluate the exposure of the population, structures, and State assets. When assessing future development, it is important to ensure that new development is implemented in a manner that is compatible with existing land uses and the natural environment; avoiding unintended consequences is a mitigation strategy to alleviate future burdens on communities.

3.5.1. Statewide Guidance for Land Use

Consistency and compatibility between hazard mitigation and land use initiatives are critical to ensuring that California's residents, natural resources, businesses, and infrastructure are protected.

The Governor's Office of Planning and Research (OPR) formulates long-range goals and polices for land use, population growth and distribution, urban expansion, land development, resource preservation, and other factors affecting statewide development. OPR periodically revises the State General Plan Guidelines for the

preparation and content of general plans for cities and counties in California. The guidelines provide information on planning for climate resilience, environmental justice, fire hazards, and equitable and resilient communities (Governor's Office of Planning and Research 2020) and were utilized in drafting the SHMP.

California has very strong building and hazard-related codes and standards related to growth management and requires integration of hazard mitigation planning with land use planning. This enables the state and local governments to effectively manage risks using the best available data and science on hazard extent and location.

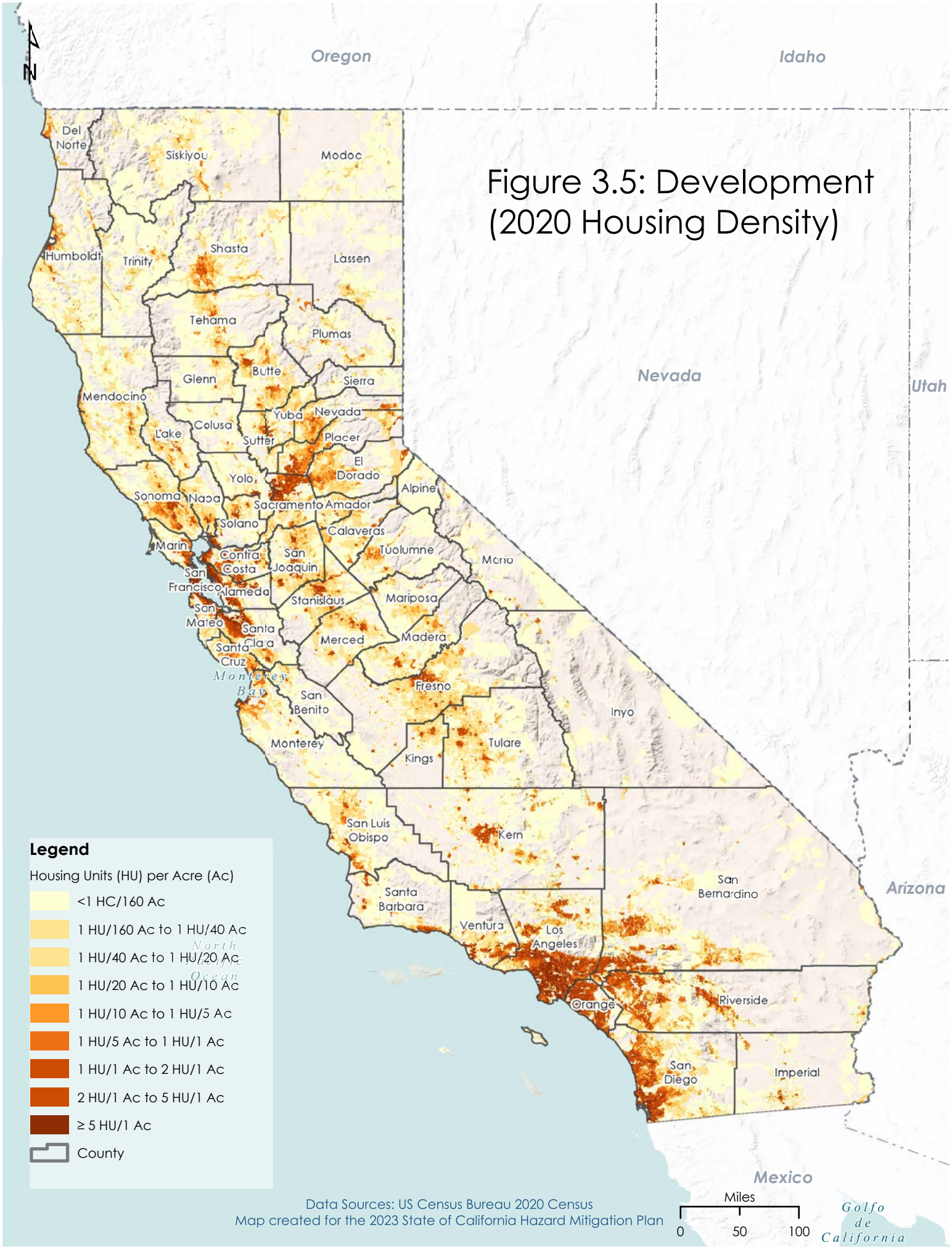
3.5.2. Existing Land Use

A 2018 study by the Terner Center for Housing Innovation at University of California, Berkley found that most of the land in California is zoned for single-family housing, which limits opportunities to construct multifamily housing (Mawhorter, et al. 2018). This can result in a scarcity of affordable housing and result in economically disadvantaged individuals and families seeking housing that does not provide adequate protection against disasters. Limited housing options become more pronounced during recovery if there is widespread displacement of residents who require housing and sheltering.

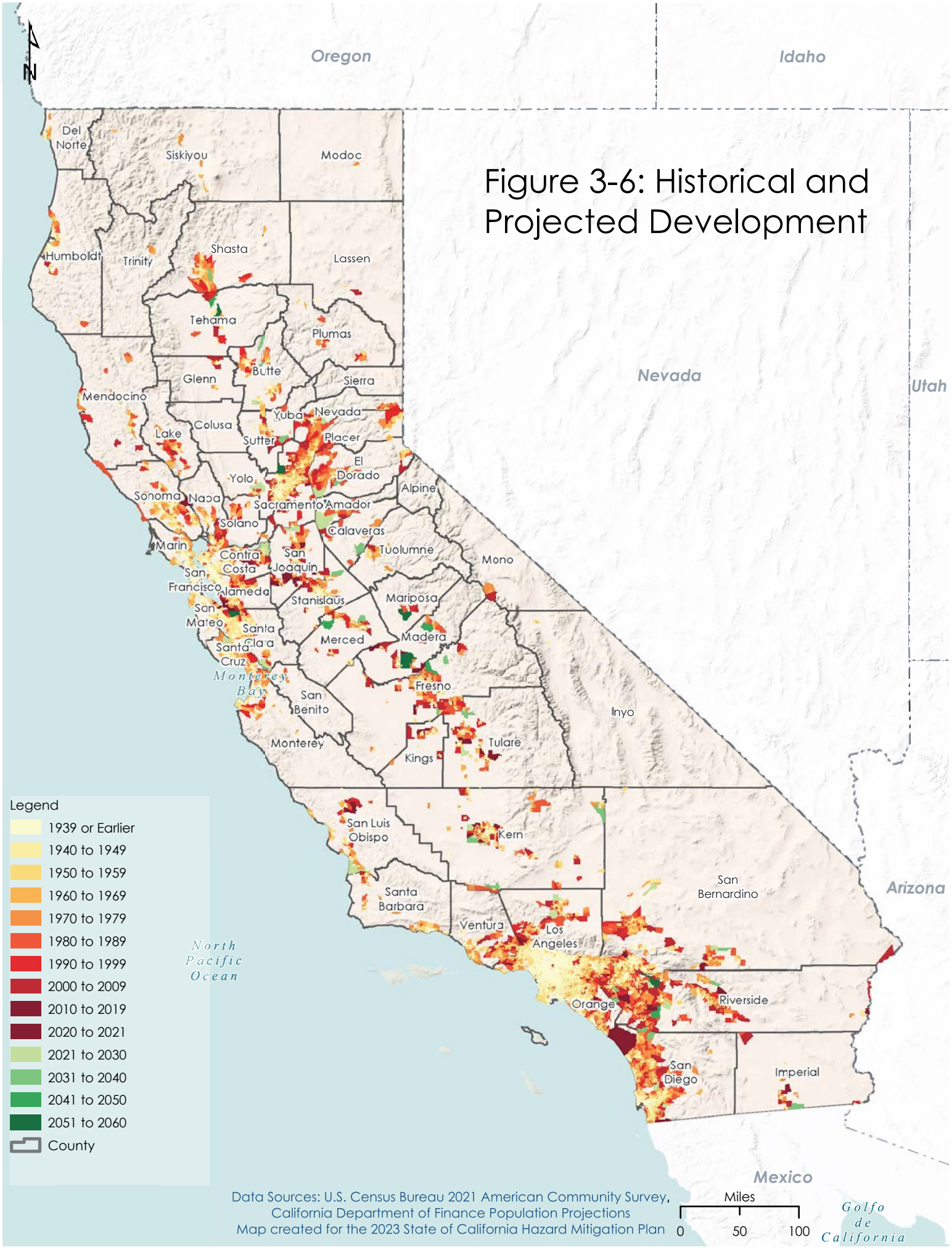
S7- [44 CFR 201.4(d)]: Was the risk assessment revised to reflect changes in development? The following sections include a review of population change trends as well as a look at building permit volumes over a time frame (since the last plan update)

3.5.3. Development Trends

In 2010, California's housing density, as shown in Figure 3-5, indicated an accumulation of residents in the three metropolitan areas—the Bay Area, Los Angeles, and San Diego—along with a band across the central portion of the state from Kern County to just north of Sacramento. With recent changes in population (see Figure 3-2), development is occurring in some of the more inland counties and moving away from the larger coastal and metropolitan areas of San Diego, Los Angeles, and the Bay Area (see Figure 3-6).



Data Sources: US Census Bureau 2020 Census
Map created for the 2023 State of California Hazard Mitigation Plan



Data Sources: U.S. Census Bureau 2021 American Community Survey, California Department of Finance Population Projections
Map created for the 2023 State of California Hazard Mitigation Plan

3.5.4. Implications of Growth on Risk

Growth patterns have a direct bearing on hazard impacts, risk, and vulnerability. Growth can lead to an increase in the number of people and developed properties exposed to hazards, although the vulnerability of those exposed does not necessarily increase at the same rate.

A review of building permit volumes can help paint a picture of development trends. However, it is difficult to directly correlate permit activity to an increase in hazard risk because, with the exception of development in regulated floodplains, it is not a standard practice for local governments to track building permit activity within designated hazard areas.

According to the Construction Industry Research Board, California's residential housing production for the period 2018 to 2022 was 15 percent greater than for 2013 to 2017 (the 5-year performance period of the 2018 SHMP). The increase could likely be tracked to counties that saw increases in population during this timeframe. Table 3-1 shows housing production by year for 2013 to 2022.

Table 3-1. Housing Production in CA for 2013 to 2022

Year	Single Family Units	Multi-Family Units	Total units
2013	36,991	48,481	87,485
2014	37,089	48,755	87,858
2015	44,896	53,337	100,248
2016	49,208	51,753	102,977
2017	55,827	59,843	117,687
2018	59,049	58,843	119,910
2019	58,052	53,232	113,303
2020	57,084	43,525	102,629
2021	65,022	53,268	120,311
2022	66,351	55,263	123,636

Source: (Construction Industry Research Board 2022)

According to the California Department of Housing and Community Development, the state faces the following housing challenges:

- **Not enough housing being built**—In the last 10 years, housing production averaged fewer than 80,000 new homes each year, and production continues to be far below the projected need of 180,000 additional homes annually.
- **Increased inequality and lack of opportunities**—Lack of supply and rising costs are compounding growing inequality and limiting advancement opportunities for younger Californians. Much of the new housing growth is expected to be in areas where fewer jobs are available to families that live there.

- **Too much of people's incomes going toward rent**—The majority of Californian renters—more than 3 million households—pay more than 30 percent of their income toward rent. Nearly one-third—more than 1.5 million households—pay more than 50 percent of their income toward rent.
- **Fewer people becoming homeowners**—Overall homeownership rates are at their lowest since the 1940s.
- **Disproportionate number of Californians experiencing homelessness**—California is home to 12 percent of the nation's population, but 22 percent of the nation's homeless population.
- **Barriers other than cost in trying to find an affordable place to live**—For California's vulnerable populations, discrimination and inadequate accommodations for people with disabilities are worsening housing cost and affordability challenges.

Severe housing pressure makes Californians vulnerable to disaster in numerous ways. Individuals experiencing homelessness are extremely vulnerable to a variety of disasters due to lack of shelter, difficulties receiving disaster-related communication, and many other factors. High fractions of income going to rent means families with less resources available for individual adaptive action. Low building rates mean that when a disaster destroys residences, there are fewer options for where to house survivors. Low homeowner rate means that people move more frequently, reducing community ties that are essential for community resiliency.

As California works to ensure equity, reduce greenhouse gas emissions, and reduce the loss of natural areas, many cities are encouraging compact development that reduces sprawl. Urban sprawl means that buildings and people can encroach into areas at high risk for wildfires, flooding, and other hazards, while also damaging natural resources. However, targeting development to specific areas can put pressure on limited land and result in higher costs. Through careful risk assessment that considers future land use and development patterns, communities can leverage land use planning as a mitigation strategy to avoid building in high-risk areas or by implementing engineering strategies to build communities that are more resilient.