Santa Cruz County

Multi-Jurisdictional Hazard Mitigation Plan

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EXECUTIVE SUMMARY

VOLUME 1

VOLUME 2

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Santa Cruz County

Multi-Jurisdictional Hazard Mitigation Plan

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

SANTA CRUZ COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN



Figure ES-1: Greyhound Rock Beach
Source: Santa Cruz County

ACKNOWLEDGMENTS

The 2025 Santa Cruz County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) update represents the first county-wide effort to establish a coordinated hazard mitigation strategy among the 10 jurisdictions that partnered on its development. Led by the County Office of Response, Recovery, and Resilience (OR3), the process was anchored by a county-wide Planning Team that brought together expertise from across County departments and was expanded through close collaboration with the Cities of Capitola, Scotts Valley, and Watsonville, as well as six special districts.

Technical guidance was provided by the California Governor's Office of Emergency Services (CalOES) and the Federal Emergency Management Agency (FEMA) Region IX. This 2025 update built upon existing mitigation efforts and planning documents and was shaped through extensive engagement with local and regional stakeholders, community-based organizations, and members of the public.

The collective data, expertise, and input provided by all participants ensured that the updated plan reflects local priorities and capabilities, addresses current and emerging hazard risks, and supports a coordinated approach to mitigation. This updated MJHMP serves as a comprehensive and actionable framework to reduce vulnerability and strengthen resilience throughout Santa Cruz County.

PLANNING PARTNERS

Santa Cruz County

Santa Cruz County

Office of Response, Recovery, & Resilience

Municipalities

City of Capitola

City of Scotts Valley

City of Watsonville

Special Districts

Soquel Creek Water District

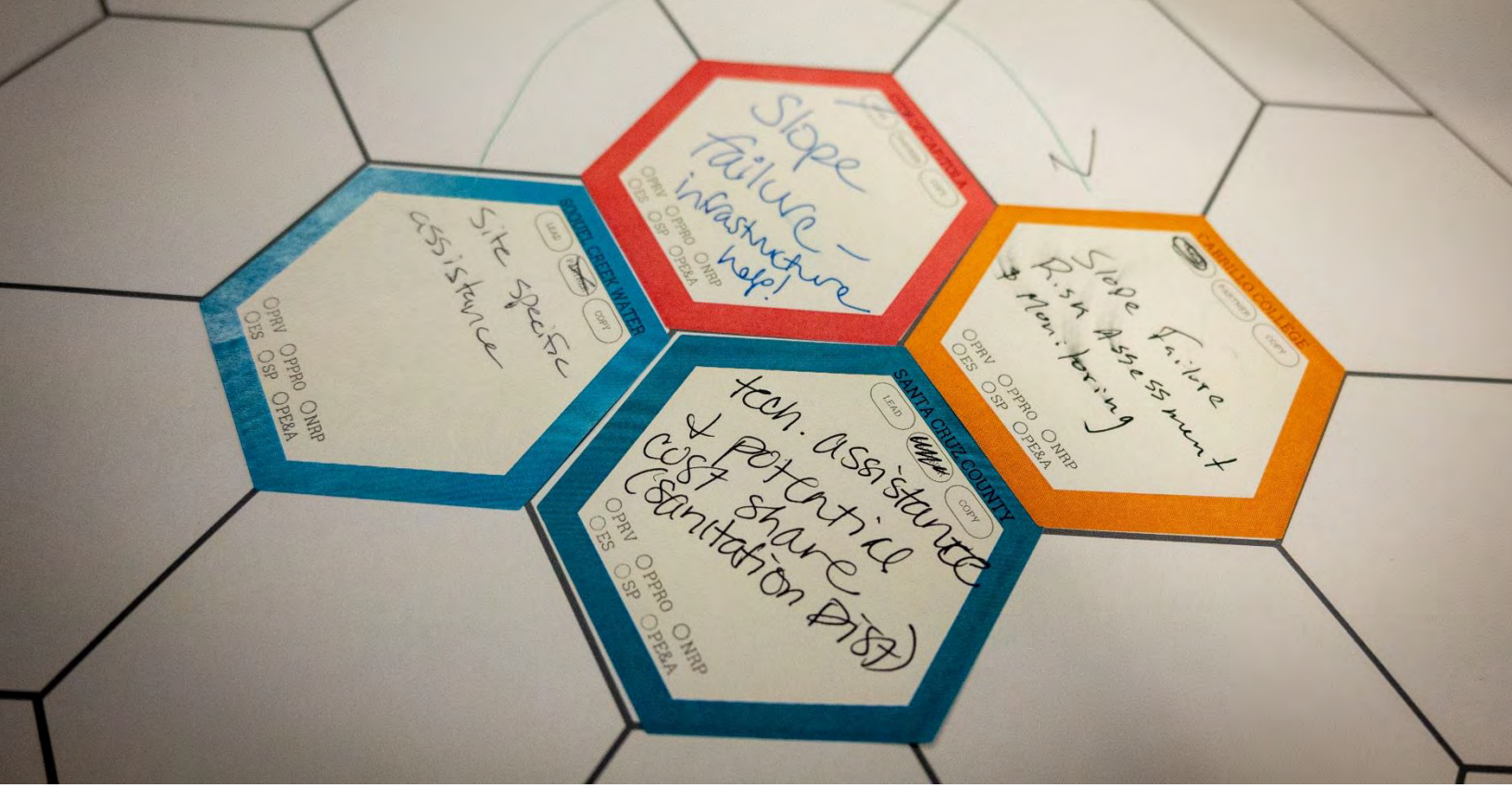
Scotts Valley Water District

Pajaro Valley Water Management Agency

RCD of Santa Cruz County

Santa Cruz Port District

Cabrillo College



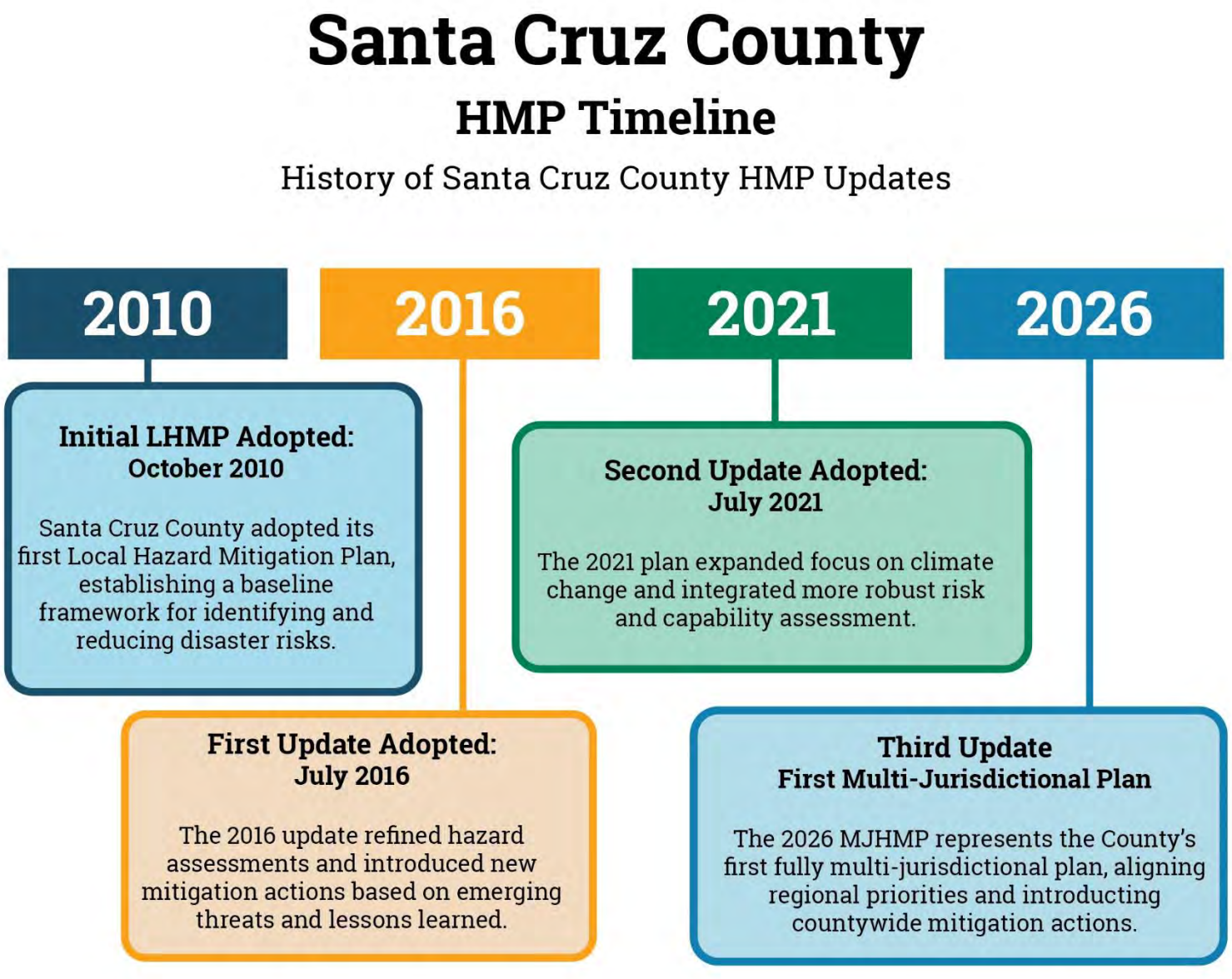
BACKGROUND

The 2025 Santa Cruz County MJHMP is the county's foundational document for reducing vulnerability to natural hazards. This plan reflects the participating jurisdictions' ongoing commitment to long-term risk reduction and provides local decision makers with a guiding framework to prioritize resources and actions that lessen the impacts of disasters. Whereas preparedness, response, and recovery focus on immediate or short-term needs, hazard mitigation emphasizes proactive, long-term strategies that build resilience and break the cycle of repeated damage and repair.

This plan is authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000 (DMA 2000). The requirements for local mitigation plans and their updates are set out in 42 USC 5165 and 44 CFR 201.6. Adoption and maintenance in accordance with these authorities ensure that Santa Cruz County and its partners remain eligible for federal and state mitigation funding, including FEMA Hazard Mitigation Assistance programs such as the Hazard Mitigation Grant Program and Flood Mitigation Assistance, as administered in California by CalOES.

PLAN UPDATE HISTORY

This is the third update to Santa Cruz County's Hazard Mitigation Plan (HMP) since its original adoption in 2010. For the first time, this 2025 update was developed as a multi-jurisdictional plan, with active participation from incorporated cities and key special districts. This transition strengthens alignment of mitigation efforts across the entire county, promoting regional coordination and more effective project implementation.



PURPOSE OF THE PLAN

The 2025 MJHMP serves three primary purposes. First, it supports local governments and public agencies in collectively identifying hazards, assessing vulnerabilities, and prioritizing cost-effective mitigation actions that protect critical assets and sustain operations during and after disasters.

Second, the MJHMP serves the broader community by providing educational, technical, and financial guidance to help residents, businesses, and organizations understand local risks and take steps to reduce their exposure.

Finally, the plan preserves eligibility for FEMA hazard mitigation grants and other funding, ensuring that jurisdictions can align local priorities with available resources. In doing so, it promotes collaboration across agencies and raises public awareness of hazards, creating a coordinated framework to reduce risk and strengthen resilience throughout Santa Cruz County.



Figure ES-3: A building floats in the ocean after a wharf partially collapsed Monday, Dec. 23, 2024, in Santa Cruz, Calif. (Shmuel Thaler/The Santa Cruz Sentinel via AP)

MITIGATION GOALS & STRATEGY

The 2025 MJHMP is guided by strategic goals developed by the county-wide Hazard Mitigation Planning Team (HMPT), based on a review of the 2021 County HMP, participating jurisdictions' previous LHMP's, the 2023 California State Hazard Mitigation Plan, and other relevant regional planning documents. The team retained and refined the four original goals from the 2021 County HMP to inform a mitigation strategy focused on long-term resilience.



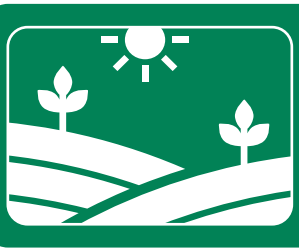
Goal 1: People & Community

Avoid or reduce the potential for life loss, injury, and economic damage to community members from hazard events.



Goal 2: Continuity of Services

Increase the ability of local government, agencies, special districts, and partner organizations to serve the community during and after hazard events.



Goal 3: Natural & Built Environment

Protect the County's unique character, scenic beauty, and values in the natural and built environment from being compromised by hazard events.



Goal 4: Lifeline Resilience

Identify and encourage mitigation activities that increase the disaster resilience of the community, institutions, private companies, and systems essential to a functioning County.

At the core of this plan are actionable mitigation measures that address identified risks, reduce exposure to hazards, and provide both community-wide and individual benefits—such as enhanced public safety, infrastructure protection, and direct support for residents and businesses. The plan prioritizes feasible, locally-driven actions and introduces new county-wide initiatives designed to support cross-jurisdictional resilience.

Implementation will be pursued through a mix of local, state, and federal funding opportunities—including hazard mitigation grants—as well as through actions that jurisdictions and community partners can carry out with existing resources. Many strategies can also be advanced through policy updates, enhanced coordination among partners, planning efforts, and programmatic changes that do not require new funding. Together, these efforts position Santa Cruz County and its partners to reduce disaster risks and adapt to the growing impacts of climate change.

DOCUMENT NAVIGATION

The 2025 Santa Cruz County MJHMP is structured into two volumes. **Volume 1** addresses countywide elements that apply broadly across the planning area, including the risk assessment, mitigation strategy, and plan maintenance procedures, **Volume 2** contains jurisdiction-specific annexes that document the unique risks, capabilities, and mitigation actions of each participating city and special district. This structure allows the plan to capture both shared countywide priorities and the distinct needs of individual jurisdictions, supporting effective coordination, resource allocation, and implementation of hazard mitigation strategies.

VOLUME 1 **(County-Wide Elements)**	**Santa Cruz County**	
VOLUME 2 **(Jurisdiction-Specific Annexes)**	**City of Capitola** **City of Scotts Valley** **City of Watsonville** **Soquel Creek Water District** **Scotts Valley Water District**	**Pajaro Valley Water Management Agency** **Resource Conservation District of Santa Cruz County** **Santa Cruz Port District** **Cabrillo College**

VOLUME 1 CONTENTS

SECTION 1 Introduction	Expanded to include climate data (Section 1.4.2), social vulnerability mapping, and a comparative analysis of demographic shifts since 2021. Also introduces a "What's New" section (1.5) highlighting key enhancements.
SECTION 2 Planning Process	Summarizes the robust public and stakeholder engagement process (Section 2.1.2) and organizes resources into a "Planning Process Library" (Section 2.1.3). Emphasizes equitable outreach methods (e.g., Spanish-language surveys, community events, social media) and utilizes updated tools like the Risk Assessment Mapping Platform (RAMP). Defines the plan implementation and evaluation process (Section 2.4) using the Mitigation Action Status Tracker (MAST) dashboard.
SECTION 3 Risk Assessment	Provides hazard profiles and exposure summaries with best available data and visual charts and maps, including updated damage estimates using HAZUS and enhanced vulnerability assessments. Incorporates climate change impacts across all hazards (Section 3.2.10) and highlights disproportionately impacted communities (Section 3.3). Integrates post-2021 disaster events like the 2023 -2024 winter/coastal storms and flooding.
SECTION 4 Mitigation Strategy	Maintains four core goals but updates language for clarity and alignment with the 2023 California SHMP. Introduces county-wide mitigation actions to promote regional coordination and summarizes the county's mitigation strategy. Incorporates prioritization framework. References various funding mechanisms, including local revenue sources such as Measure Q.

COMMUNITY PROFILE

The planning area for this 2025 MJHMP spans 445 square miles, excluding the City of Santa Cruz, and encompasses the Cities of Capitola, Scotts Valley, and Watsonville along with all unincorporated communities. Three distinct regions shape hazard exposure and access needs: the Pacific Coast with its economic opportunities and exposure to bluff erosion, storm surge, and tsunami; the Santa Cruz Mountains with steep terrain, forested canyons, and elevated risks from slope failure and wildfire; and the Pajaro Valley in South County, the county's primary agricultural area with concentrated riverine flood risk. These physical characteristics frame county-wide mitigation priorities and jurisdiction-specific strategies.

The county has an estimated total population of 266,021, with roughly half residing outside incorporated cities. Social and economic conditions vary significantly by location, with higher concentrations of Spanish-speaking and limited English households in South County, and the highest composite social vulnerability similarly clustered there. These and other demographic patterns discussed in Volume 1, Section 1, of the plan guide targeted outreach, evacuation planning, and investments that reduce disparate impacts during and after disasters.

The local economy is anchored by government, education and health services, trade and logistics, leisure and hospitality, and a significant agricultural sector, together supporting about 112,000 jobs as of June 2025. Agriculture alone contributed more than $1.5 billion to the economy in 2023, while spending from tourism exceeded $1.4 billion in the same year, underscoring sensitivity to flood, coastal storm, and transportation disruptions.

In the planning area, a Mediterranean climate prevails, but conditions range from mean low and high temperatures of 52 to 62 degrees Fahrenheit (°F) to annual rainfall that varies from about 22 inches in Watsonville to 80 inches in Bonny Doon. These trends inform hazard planning for both dry year shortages and extreme storm impacts. Water supply is almost entirely local, with about 80% from groundwater and 20% from surface sources, heightening the importance of drought resilience and aquifer management.

THE PLANNING AREA AT A GLANCE

The planning area covered by the 2025 MJHMP covers the entire unincorporated county as well as the Cities of Capitola, Scotts Valley, and Watsonville. It includes a wide range of landscapes, many different communities, and a robust economy, all of which are vulnerable to natural hazards at varying degrees. This summary provides an overview of the planning area and these characteristics county-wide, and some key regional differences that contribute to Santa Cruz County's hazard risks as well as its capacity for building resilience against those risks. Note that the figures presented here are rounded.

County-Wide Summary

445 Square Miles
in the planning area, including the Cities of Capitola, Scotts Valley, and Watsonville and the unincoporated areas of the county.

Mediterranean Climate
generally with mild, wet winters and warm, dry summers.

Rainfall Variability
from year to year, with 70% of normal in 2022 and 160% of normal in 2023.

Isolated Water Resources
with nearly 100% derived from local sources, including 80% from groundwater and 20% from surface streams and reservoirs.

Diverse Terrain
from steep bluffs along the coastline to 3,000-foot peaks in the mountains and flat farmland in South County.

Over 600 Miles
of county-maintained roads, plus hundreds of miles of private roads and driveways in hazard-prone areas.

266,021 People
total live in Santa Cruz County.

49% of the Population
lives in the unincorporated county.

33% of Households
are seniors 65+ years, with 8% living alone and 3% in poverty.

25% of Households
include at least one child <18 years, with 6% having a single caregiver.

60% of Housing Units
are owner-occupied while the remaining 40% are rentals.

11% of the Population
lives in poverty.

11% of the Population
has some form of disability.

35% of the Population
is Hispanic, with the remainder mostly identifying as White.

17% of Households
county-wide speak Spanish at home and 3% speak little to no English.

49% of South County Households
speak Spanish at home and 15% speak little to no English.

$16.5 Billion
was the county's gross domestic product (GDP) in 2023.

$109,300
is the median household income county-wide.

112,000 Jobs
in the planning area.

20% of Jobs
are in the Agricultural and Tourism Sectors.

$1.5 Billion
of the GDP in 2023 was attirbuted to the Agricultural Sector alone.

$1.4 Billion
was spent in the Tourism Sector in 2025, an increase of 3.2% from 2023.

PLANNING PROCESS

As described in Volume 1, Section 2, the 2025 MJHMP was developed using FEMA's four-phased planning approach. This method provided a clear structure for organizing the effort, assessing risks, and developing strategies that reflect both county-wide and local priorities. The four stages of the process are summarized below:

- **Organize resources** by convening jurisdictional teams, a county-wide planning team, and a Steering Group.
- **Assess risks** by identifying hazards, evaluating vulnerabilities, and analyzing potential impacts using the best available data.
- **Develop the mitigation plan** through collaborative workshops, public input, and tailored jurisdictional annexes that document local risks, capabilities, and strategies.
- **Implement and maintain** by adopting the plan across jurisdictions and setting up a framework for tracking progress and future updates.

Public engagement and collaboration are throughlines in this 2025 update – from organizing resources to implementation. The countywide Hazard Mitigation Planning Team, supported by a county-wide Steering Group, 10 jurisdictional teams, and a broad network of key stakeholders worked together to identify priority hazards, assess risks, and shape tailored mitigation actions. This process included intentional outreach to agencies, community-based organizations, and members of the public, with a focus on engaging underserved and vulnerable communities most at risk from disasters.

PLAN MAINTENANCE

The MJHMP is meant to be a "living" document—actively used, regularly evaluated, and updated as local conditions, capabilities, and priorities change. Sustaining momentum in implementing the mitigation strategy is essential to achieving long-term risk reduction and building community resilience. To support this, the County has established procedures for monitoring progress, evaluating effectiveness, and revising the plan over its five-year life cycle.

Implementation will follow the same joint approach used for plan development. A county-wide **Hazard Mitigation Advisory Team** will coordinate inter-jurisdictional efforts, track progress, and prepare annual reports. Section 2 also establishes procedures to integrate the plan with other local and regional efforts so that policy, investment, and coordination remain aligned over the five year life cycle of the 2025 plan.

The Office of Response, Recovery, and Resilience (OR3) is the lead agency responsible for the coordination, implementation, and maintenance of the 2025 MJHMP. OR3 will work collaboratively with the Hazard Mitigation Advisory Team, departments of participating jurisdictions, and other key stakeholders to ensure the plan remains current, actionable, and aligned with state and federal guidance over its five-year performance period.

RISK ASSESSMENT

The risk assessment undertaken for this 2025 update provides a factual basis for activities proposed in the mitigation strategy. Hazards that affect the county are identified and profiled in terms of location, extent, magnitude of impact, previous events, probability of future occurrences (including the potential effects of climate change), and particular vulnerabilities.

The 2025 MJHMP contains 10 hazard profiles and is located in Section 3 of Volume 1 and the participating jurisdiction annexes in Volume 2. Information in Volume 1 and Volume 2 includes the impact of hazards on physical, social, and economic assets; identification of areas of vulnerability; additional impacts of each hazard due to climate change; and estimates of the cost of potential damage.

Wildfire
SECTION 3.2.1



Flood
SECTION 3.2.2



Earthquake
SECTION 3.2.3



Severe Weather
SECTION 3.2.4



Coastal Hazards
SECTION 3.2.5



Slope Failure
SECTION 3.2.6



Dam Failure
SECTION 3.2.7



Drought
SECTION 3.2.8



Extreme Heat
SECTION 3.2.9



Climate Change
SECTION 3.2.10



ESTIMATING RISK

County-Wide Hazard Risks at a Glance

These risk snapshots provide a high-level view of what people, property, and infrastructure are located in mapped hazard areas. These estimates show exposure, not probability, and are limited to hazards with available mapping (such as liquefaction areas and floodplains, as opposed to extreme heat / drought which impacts the entire county). More detailed data, methods, and profiles can be found in Section 3 of Volume 1 and in the jurisdiction-specific annexes in Volume 2.

Over the five-year lifecycle of the plan, these snapshots and detailed profiles contained in Volume 1, Section 3, will continue to be used by the participating jurisdictions and other local and regional agencies to guide decision-making in hazard mitigation.

WILDFIRE EXPOSURE

51,600 people	Population living in high and very high fire hazard zones
18,800 parcels	Number of parcels located in high and very high fire hazard zones
$20 billion	Estimated total market value of property located in high and very high fire hazard zones
2,780 facilities	Critical facilities located in high and very high fire hazard zones
1,900 miles	Miles of lifeline infrastructure located in high and very high fire hazard zones

FLOOD EXPOSURE

9,200 people	Population living in 100-year and 500-year FEMA flood zones
3,000 parcels	Number of parcels located in 100-year and 500-year FEMA flood zones
$2.9 billion	Estimated total market value of property located in 100-year and 500-year FEMA flood zones
265 facilities	Critical facilities located in 100-year and 500-year FEMA flood zones
170 miles	Miles of lifeline infrastructure located in 100-year and 500-year FEMA flood zones

NFIP STATISTICS

1,114 policies	Total flood insurance policies in place
485 policies	Policies in the 100-year FEMA flood zone
85 policies	Policies in FEMA 100-year coastal flood zones
1,168 claims	NFIP Insurance claims paid
$17.2 million	Total insurance claim payments

FLOOD DAMAGE

$785 million	Estimated damages from a 100-year riverine flood
$93 million	Estimated damages from a 100-year coastal flood

EARTHQUAKE EXPOSURE (M7.1 San Andreas[1])

21,300 people	Population living in areas exposed to **"severe shaking"** from the modeled earthquake scenario
6,000 parcels	Number of parcels located in areas exposed to severe shaking from the modeled earthquake scenario
$7.4 billion	Estimated total assessed value of property located in areas exposed to severe shaking from the modeled earthquake scenario
2,790 points	Critical facilities located in areas exposed to severe shaking from the modeled earthquake scenario
1,380 miles	Miles of lifeline infrastructure located in areas exposed to severe shaking from the modeled earthquake scenario

LIQUEFACTION EXPOSURE

6,430 people	Population living in very high liquefaction susceptibility zones
1,900 parcels	Number of parcels located in very high liquefaction susceptibility zones
$2.1 billion	Estimated total assessed value of property located in very high liquefaction susceptibility zones
245 facilities	Critical facilities located in very high liquefaction susceptibility zones
170 miles	Miles of lifeline infrastructure located in very high liquefaction susceptibility zones

[1] According to California's earthquake forecasting model, the North San Andreas fault has a 33% probability of producing an magnitude (M) 6.7 or greater earthquake in a given 30-year period; this fault was used to model shaking for the earthquake hazard risk assessment at M7.1.

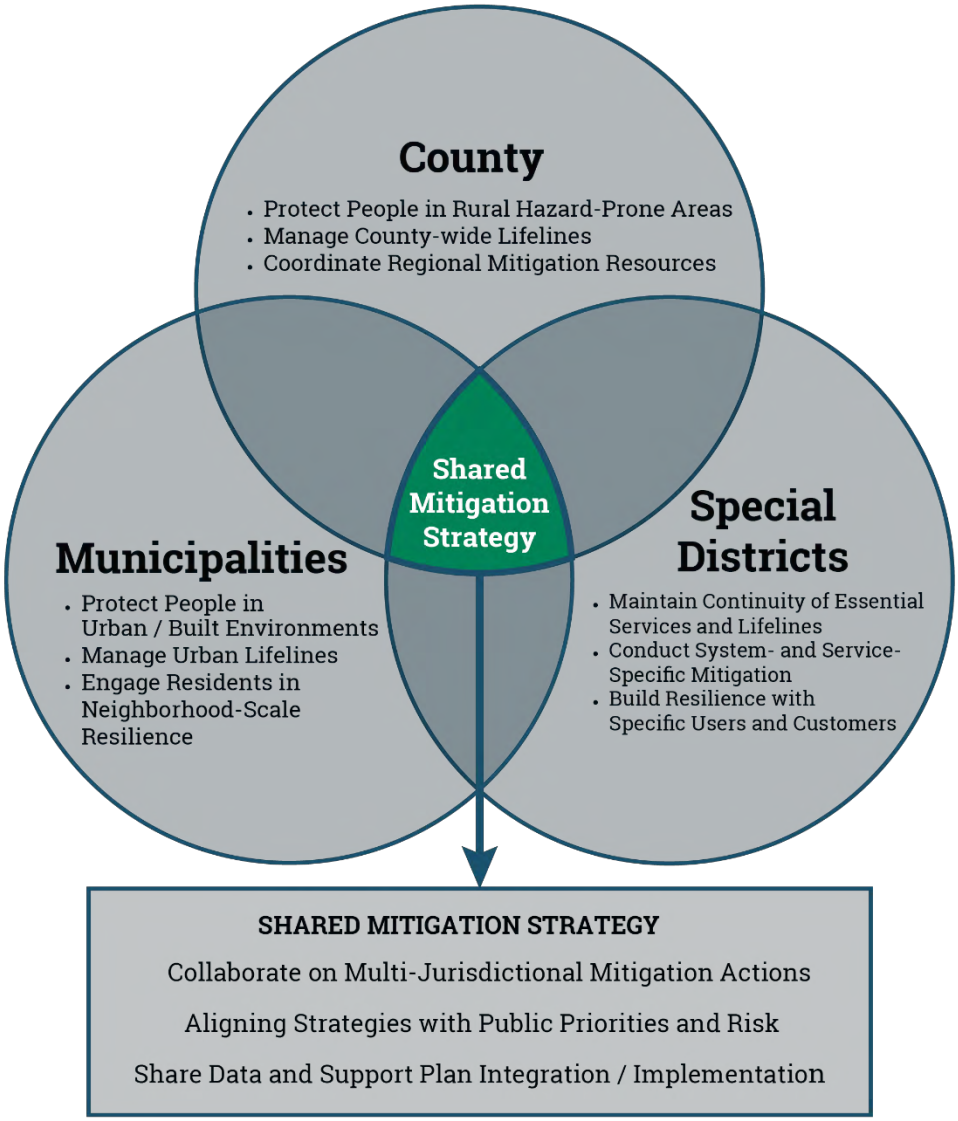
SLOPE FAILURE EXPOSURE

46,480 people	Population living in areas exposed to high slope failure risk
13,621 parcels	Number of parcels located in areas exposed to high slope failure risk
$15.8 billion	Estimated total assessed value of property located in areas exposed to high slope failure risk
1,772 points	Critical facilities located in areas exposed to high slope failure risk
1,125 miles	Miles of lifeline infrastructure located in areas exposed to high slope failure risk

MITIGATION STRATEGY PLANNING

In Santa Cruz County's hazard mitigation planning framework, the roles of different jurisdiction types—County, Cities, and Special Districts—are structured to reflect their operational scopes and legal authorities. Counties are primarily responsible for coordinating regional strategies and managing risks across large, often rural areas. This includes protecting people in hazard prone unincorporated areas, overseeing lifeline infrastructure like roads and emergency services, and aligning mitigation resources with regional and state goals. Cities, by contrast, manage denser urban environments and wield direct authority over land use and development. Their role centers on reducing risks in the built environment, enforcing urban codes, and engaging residents in neighborhood level resilience strategies.

Special Districts operate independently from counties and cities but play a critical role in maintaining continuity of essential services such as water, sanitation, fire protection, and education. Their mitigation responsibilities are system specific and focused on service continuity, infrastructure resilience, and user centered risk reduction. All three jurisdictions share core responsibilities: collaborating on cross jurisdictional mitigation projects, aligning strategies with public priorities and risk data, and supporting integrated planning and implementation. This operational differentiation ensures a whole community approach that is both targeted and collaborative, in alignment with FEMA's Local Mitigation Planning Policy Guide (2022).



MITIGATION ACTIONS

The mitigation strategy framework directly informed the structure and diversity of mitigation actions developed since the 2021 plan. The 190 actions identified reflect a balanced approach aligned with each jurisdiction's role and capacity. Of these, 47 focus on public education and awareness—critical for engaging residents across urban, rural, and system-specific contexts. Another 77 target prevention strategies, such as land use policies and regulatory efforts, often led by cities and the county due to their authority over planning and zoning. Structural and property protection actions, totaling 48, address vulnerabilities in the built environment and are frequently implemented by cities and special districts managing infrastructure and essential services. Finally, 42 actions emphasize natural resource protection, supporting resilience through ecological systems and often led by regional partners and special districts. This distribution demonstrates a whole community mitigation strategy tailored to the roles and responsibilities of each jurisdiction type.

Mitigation Actions by the Numbers

190
mitigation actions

have been developed to advance community resilience. These actions reflect a comprehensive strategy, addressing a wide range of hazards through education, planning, physical improvements, and environmental stewardship.

47
mitigation actions

are focused on public education and awareness to increase community understanding of hazard risks and preparedness

77
mitigation actions

are focused on Prevention including regulatory efforts to reduce risk.

48
mitigation actions

are focused on Property Protection and Structural Projects that reduce vulnerability through the built environment

42
mitigation actions

are focused on Natural Resource Protection to support mitigation through ecological functions.

COORDINATION OF LOCAL PLANNING

STANDARDIZING THE MULTI-JURISDICTIONAL PROCESS

This document has been reviewed and updated to reflect the current processes employed by Santa Cruz County, in coordination with Cal OES, to support and promote local and multi-jurisdictional mitigation planning efforts. The 2025 MJHMP update documents the county's progress in developing a more standardized, collaborative, and inclusive approach to hazard mitigation planning.

This plan describes how Santa Cruz County and the planning partners support:

- The development and maintenance of multi-jurisdictional local hazard mitigation plans through technical assistance, data support, and coordination with Cal OES and FEMA Region IX
- The identification and advancement of eligible mitigation projects under FEMA's Hazard Mitigation Assistance (HMA) programs
- The integration of mitigation planning with other County and local plans, including General Plans, Climate Action Strategies, Capital Improvement Plans (CIPs), and Local Coastal Programs
- The development and training of qualified floodplain administrators, in coordination with NFIP program requirements
- The capacity building of emergency management personnel and public agency staff through coordinated training, funding resources, and planning workshops
- The institutionalization of hazard mitigation principles into local planning, zoning, and development review procedures
- The periodic update and formal adoption of hazard mitigation plans by participating jurisdictions, consistent with FEMA's five-year update cycle and 44 CFR §201.6

FOR MORE INFORMATION CONTACT

David Reid, Director

Office of Response, Recovery, and Resilience (OR3)
County of Santa Cruz

Phone: (831) 454-2160
Email: or3@santacruzcountyca.gov
Website: santacruzcountyca.gov/OR3

ADOPTION RECORDS

To comply with the Federal Disaster Mitigation Act of 2000 (DMA 2000), the Santa Cruz County Board of Supervisors and officials for other participating jurisdictions have officially adopted this 2025 Santa Cruz County Multi-Jurisdictional Hazard Mitigation Plan, including Volume 1 in its entirety as well as their respective jurisdictional annex in Volume 2. The adoption of the MJHMP recognizes the jurisdictions' commitment to reducing the impacts of natural hazards within Santa Cruz County.

Adoption records for all jurisdictions are summarized in Table ES-1. A copy of Santa Cruz County's adoption record is provided on the following pages; other jurisdictions' adoption records are provided in their individual annex in Volume 2.

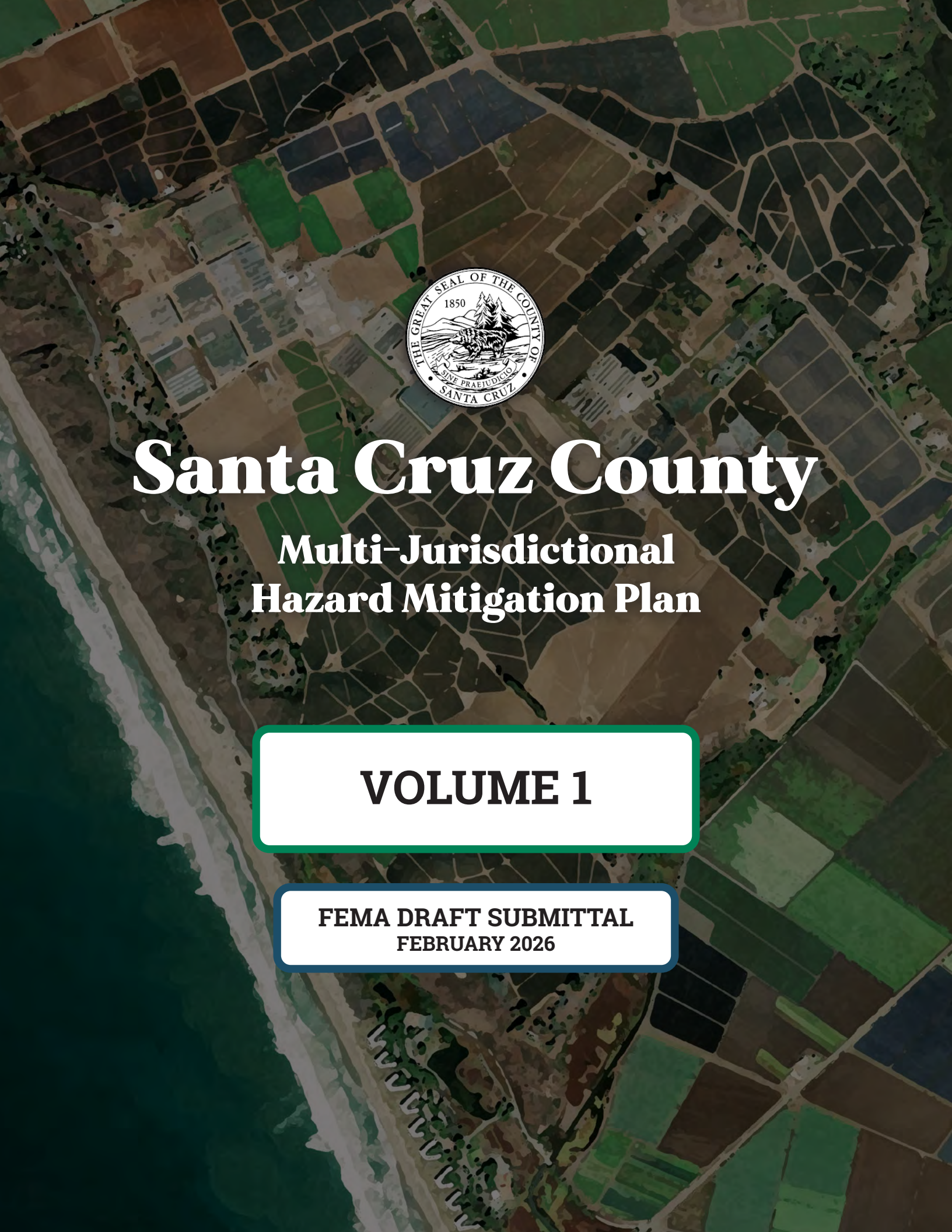
Table ES-1: Adoption Records

Jurisdiction	Adoption Record	Date of Adoption	Document Reference
Santa Cruz County	**Resolution No. XXXXX**	**XX/XX/2025**	**Executive Summary, Page 9**
City of Capitola	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 1
City of Scotts Valley	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 2
City of Watsonville	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 3
Soquel Creek Water District	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 4
Scotts Valley Water District	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 5
Pajaro Valley Water Management Agency	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 6
Resource Conservation District of Santa Cruz County	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 7
Santa Cruz Port District	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 8
Cabrillo College	Resolution No. XXXXX	XX/XX/2025	Volume 2, Section 9

SANTA CRUZ COUNTY ADOPTION RECORD

Santa Cruz County adoption record to be added upon plan adoption.

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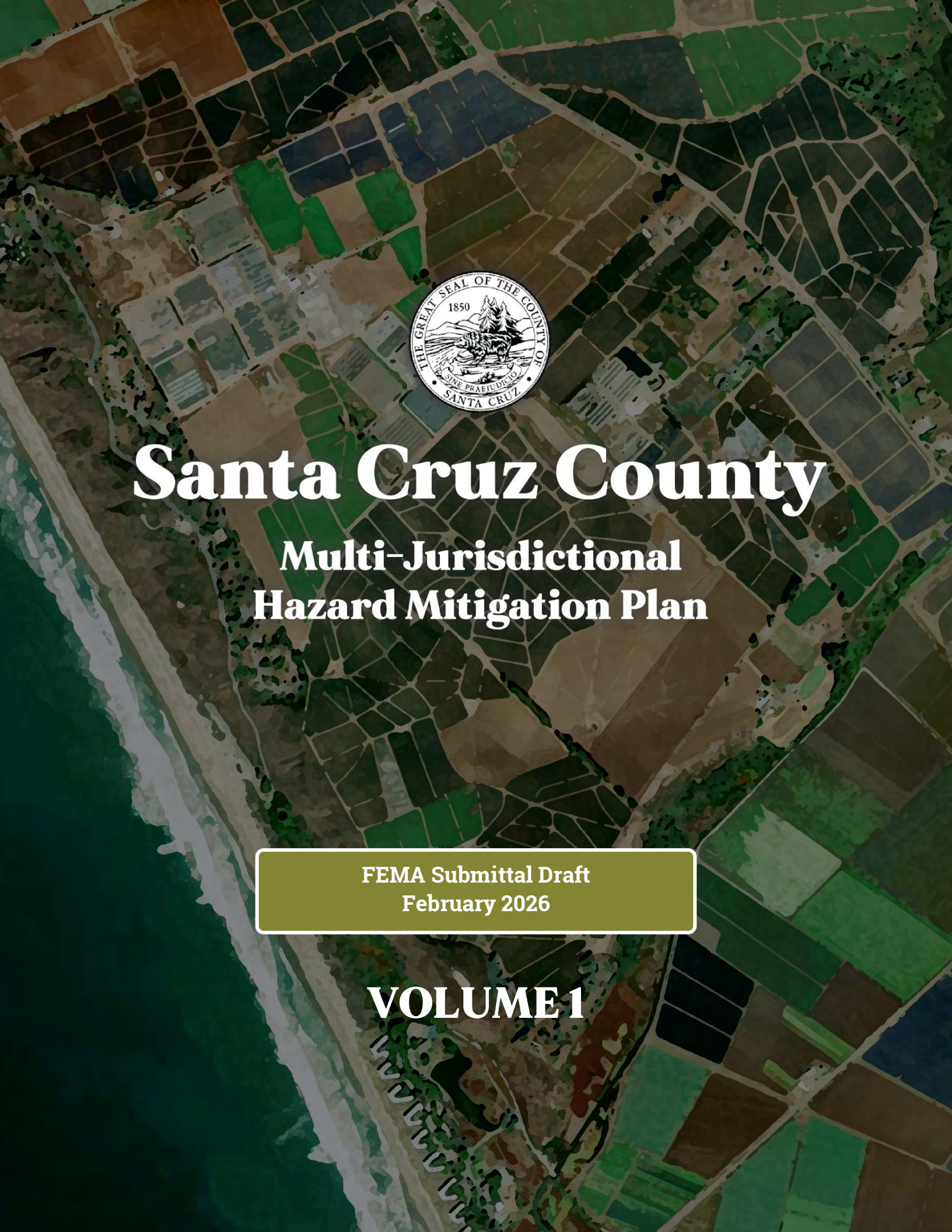
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February 2026

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Santa Cruz County

2025 Multi-Jurisdictional Hazard Mitigation Plan

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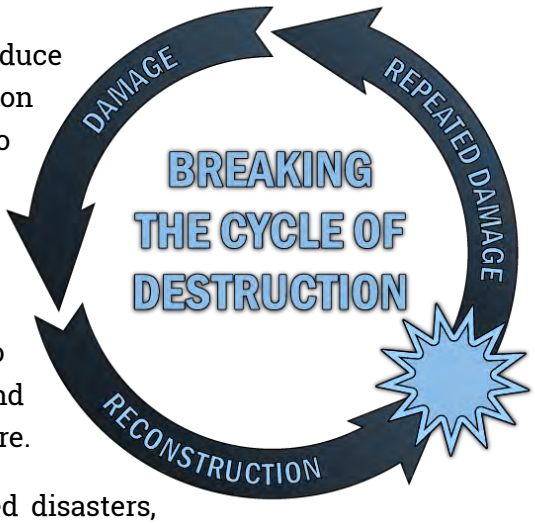
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Volume 1

SANTA CRUZ COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Section 1. Introduction

The Santa Cruz County 2025 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) involves the participation of multiple local planning partners and geographically covers the entire area within Santa Cruz County's boundaries (the "planning area"). This MJHMP was prepared to guide officials in protecting the people, infrastructure, and property within Santa Cruz County from the effects of natural disasters and hazard events. This plan demonstrates a commitment to reducing risk from natural hazards through strategic mitigation actions and serves as a tool to help decision-makers direct available administrative, technical, and financial resources toward the most effective actions.



The term "hazard mitigation" refers to actions or strategies that reduce or eliminate long-term risks from natural hazards. Mitigation activities can be implemented before or after a disaster occurs. Too often, disaster recovery focuses only on restoring property and infrastructure to pre-disaster conditions; returning to "normal" but leaving communities vulnerable to the same cycle of damage and repair. Hazard mitigation planning in Santa Cruz County is intended to break this repetitive cycle by reducing vulnerability to hazards through resilient construction, thoughtful land use, and proactive planning for future development and critical infrastructure.

Since 2017, Santa Cruz County has faced eight federally declared disasters, including winter storms, flooding, coastal wave damage, wildfires, and the COVID-19 pandemic, as well as numerous other hazard events such as landslides, straight-line winds, tornadoes, and tsunamis. These experiences have significantly affected our communities and infrastructure, shaping local priorities and underscoring the need for coordinated resilience efforts. In response, this planning cycle emphasizes a multi-jurisdictional approach to hazard mitigation.

To prepare its first MJHMP, Santa Cruz County formed a planning partnership with several cities, special districts, local agencies, and community-based organizations to develop and steer the contents of this plan. Together, these partners developed the goals, objectives, strategies, and implementation measures that will guide efforts to reduce risk from natural hazards across the planning area.

1.1 Participating Jurisdictions

The 2025 Santa Cruz County MJHMP includes Santa Cruz County, three municipalities, and six special districts and agencies, collectively referred to as "participating jurisdictions." Any local government or agency with the authority to regulate building or infrastructure development can participate in the hazard mitigation planning process; however, to receive Federal Emergency Management Agency (FEMA) approval, participating jurisdictions must also meet FEMA's planning requirements detailed in the Code of Federal Regulations (CFR). (44 C.F.R. § 201.6 *et seq.*) Throughout the development of this plan, all

participating jurisdictions adhered to FEMA's recommended process and fulfilled the necessary requirements for FEMA approval, as outlined in Volume 1 and in the individual jurisdiction annexes of Volume 2.

Together, the participating jurisdictions established shared goals, objectives, and mitigation strategies while also identifying jurisdiction-specific actions to reduce risk. This collaborative approach ensures that hazard mitigation efforts are coordinated across the county, while also reflecting the unique needs and priorities of each community. The jurisdictions listed in Table 1-1 formally participated in and completed this plan update process.

Table 1-1: Participating Jurisdictions

Jurisdiction Name
Municipalities
Santa Cruz County
City of Capitola
City of Scotts Valley
City of Watsonville
Special Districts and Agencies
Soquel Creek Water District
Scotts Valley Water District
Pajaro Valley Water Management Agency
Resource Conservation District of Santa Cruz County
Santa Cruz Port District
Cabrillo College

1.2 Purpose & Scope

Each year in the United States, natural disasters claim lives, cause injuries, and result in billions of dollars in damages. In 2024, the nation experienced 27 different billion-dollar or more weather and climate disasters, trailing only the record-setting 28 events recorded in 2023. (NOAA, 2025) Nationwide, residents contribute billions of their tax dollars to help communities, organizations, businesses, and individuals recover from disasters. Many residents also face the individual recovery journey from these disasters nationwide with limited financial resources to recover. Insurance companies absorb some of these financial losses but often pass on the cost of recovery through rate increases and dropped policies. Many non-governmental organizations, small private utilities, or other private infrastructure also absorb significant losses and are not reimbursed by state or federal tax dollars for their rebuild and recovery costs. While natural hazards cannot be prevented, much of the resulting damage can be reduced or even avoided through proactive mitigation.

The primary purpose of this 2025 MJHMP is to guide hazard mitigation planning to better protect the people, property, and assets of Santa Cruz County from the effects of natural hazard events. This MJHMP was also developed to ensure continued eligibility for certain federal disaster assistance. More specifically, the plan meets eligibility requirements for FEMA Hazard Mitigation Assistance (HMA) grants, including the Hazard Mitigation Grant (HMGP), Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA) programs.

Planning Objectives

This plan documents the hazard mitigation planning process undertaken by the participating jurisdictions to increase natural hazard resilience in Santa Cruz County. The effort was initiated for several key purposes. The planning area faces significant exposure to multiple hazards that have caused hundreds of millions of dollars in historical damages and that will continue to impact the area. Since limited local resources make it difficult to fully implement proactive risk reduction measures, federal and state financial assistance is essential to successful hazard mitigation.

The elements and strategies outlined in this plan were selected to best address the participating jurisdictions' specific needs. Collectively, the following planning objectives aim to enhance resilience, reduce vulnerability, and safeguard the well-being of Santa Cruz County community.

- Meet or exceed Federal Disaster Mitigation Act of 2000 (DMA 2000), California Senate Bill (SB) 379, and other state and federal requirements for hazard mitigation planning.
- Integrate climate adaptation strategies into hazard mitigation planning.
- Maintain eligibility for federal mitigation funding.
- Meet the planning requirements of FEMA's Community Rating System (CRS) program, allowing those jurisdictions that participate in CRS to maintain or enhance their classifications.
- Ensure the plan fulfills the needs of participating jurisdictions while complying with local, state, and federal regulations.
- Coordinate existing plans and programs to align priorities and maximize the impact of mitigation projects.
- Conduct a comprehensive risk assessment focused on hazards most relevant to the planning area.
- Incorporate and address additional goals and priorities identified through the involvement of community members and other stakeholders.
- Provide actions aligned with the local and state funding measures for building a more resilient community.

What is Hazard Mitigation?

Hazard mitigation refers to long- and short-term actions which reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster FEMA defines hazard mitigation as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Mitigation strategies can take many forms such as planning efforts, policy changes, programs,

projects, and other activities that can mitigate the impacts of hazards. These activities can be planned and implemented either before or after a disaster occurs. Too often, post-disaster recovery and repairs aim to restore property to its pre-disaster state, which may lead to repeated cycles of damage and rebuilding. Independent analysis by the National Institute of Building Sciences (NIBS) has demonstrated that hazard mitigation is highly cost-effective; on average, every dollar invested in mitigation saves society six dollars in future disaster losses, alongside preventing casualties and injuries. (NIBS, 2019)



Hazard mitigation planning is the structured process of identifying hazards, assessing potential impacts, setting goals, and developing strategies to reduce risk. This MJHMP identifies and describes hazards that could affect the Santa Cruz County planning area and evaluates their potential impacts and highlights "problem statements" or areas of concern where people and property are most vulnerable due based on social and geographic relationships to hazards. Most importantly, the mitigation strategy presented in this MJHMP responds to those identified vulnerabilities and outlines specific "mitigation actions" to achieve the greatest risk reduction available resources. Together, Santa Cruz County and other participating jurisdictions aim to save lives, reduce injuries and property damage, and protect natural resources for future generations through the mitigation actions identified and described herein.

Why Have a Hazard Mitigation Plan?

Enshrined in Public Law No. 106-390 of the United States Code (USC), DMA 2000 mandates that state and local governments develop hazard mitigation plans to qualify for federal disaster grant assistance. (42 USC § 5121 *et seq.*) Before DMA 2000, federal disaster funding primarily focused on post-disaster relief and recovery under the Robert T. Stafford Act, with limited support for proactive hazard mitigation planning. DMA 2000 shifted its focus by prioritizing pre-disaster planning and preparedness.

This MJHMP outlines the prevalent hazards in Santa Cruz County and examines how these hazards may impact the population and property differently across the planning area. It includes detailed information on natural hazard threats, identifying risks to vulnerable people, property, and assets. The plan's mitigation strategy addresses specific vulnerabilities and prescribes actions aimed at achieving the greatest reduction in these vulnerabilities, leading to quicker allocation of funds and more cost-effective projects aimed at reducing risks.

This approach ultimately leads to saving lives, minimizing injuries, reducing property damage, and protecting the environment during natural hazard events. Furthermore, the MJHMP ensures participating jurisdictions' ongoing eligibility for federal disaster assistance, specifically FEMA's HMA grants, including programs like the Hazard Mitigation Grant Program (HMGP) and FMA.

Why Update the Plan?

Local jurisdictions must maintain an active, approved hazard mitigation plan to pursue funding under the Robert T. Stafford Act. This requirement, established by DMA 2000, mandates that the plan be updated every five years to comply with federal mitigation grant conditions. Federal regulations stipulate that hazard mitigation plans must include a process for monitoring, evaluating, and updating the plan. This update process enables the reassessment of recommendations, the evaluation of completed actions' impacts, and the identification of necessary adjustments to mitigation strategies over time. Compliance with grant requirements hinges on meeting the plan update criteria specified in the CFR.

Santa Cruz County's previous LHMP was last updated and approved by FEMA in 2021. This current plan is the first multi-jurisdictional plan for Santa Cruz County and was comprehensively updated in 2025 to include nine additional participating jurisdictions. This update reflects extensive data analysis, public input, and guidance from a multi-disciplinary group of stakeholders. Throughout the planning process, all participating jurisdictions adhered to FEMA's recommended four-step process to develop this 2025 plan update. This comprehensive update includes:

- A robust and inclusive planning process
- Clear delineation of jurisdictional information
- Development of a new risk assessment
- Reevaluation of goals and objectives
- Creation of new mitigation actions
- New enhancements for implementing mitigation actions
- Updates to all sections of participating jurisdictions' previous plans
- A new project website (mitigatehazards.com/santacruzcountymjhmp) for stakeholder involvement and public information

This thorough approach ensures that the updated plan addresses current risks and mitigation needs effectively for the entire planning area.

Who Benefits from this Plan?

The 2025 Santa Cruz County MJHMP is a cornerstone for enhancing safety and resilience among residents, businesses, and visitors alike; all the community members in Santa Cruz County are the ultimate beneficiaries of this plan.

Hazard mitigation is a shared responsibility. Private property owners, businesses, industries, and all levels of government (local, federal, state) play a role in reducing risk. A key benefit of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has common risk exposures and vulnerabilities. This plan will help guide and coordinate mitigation activities throughout Santa Cruz County.

By consolidating resources and coordinating efforts, the MJHMP planning process optimizes the allocation of resources to Santa Cruz County's most vulnerable areas. This approach not only enhances efficiency but also amplifies the effectiveness of mitigation efforts, ultimately benefiting the community by reducing the overall impact from natural hazards based upon available resources.

1.3 How to Use This Plan

The 2025 Santa Cruz County MJHMP is structured into two volumes to effectively manage elements that apply broadly across the planning area and to the county, specifically (Volume 1), and those elements unique to other participating jurisdictions (Volume 2). All participating jurisdictions within the county adopted Volume 1 in its entirety. Additionally, each jurisdiction adopted its own specific annex within Volume 2, ensuring that both county-wide and local needs are addressed comprehensively. This structured approach facilitates effective coordination, resource allocation, and implementation of hazard mitigation strategies across the entire planning area.

VOLUME 1
(County-Wide Elements)

Volume 1 covers all federally required elements of a hazard mitigation plan that apply to the entire planning area. This includes:

- **Section 1 – Introduction:** Describes the overall purpose of the MJHMP, its structure, and characteristics of the county-wide planning area, and provides an overview of previous hazard mitigation efforts conducted and highlights updates made in this plan.
- **Section 2 – Planning Process:** Details how the plan was developed according to FEMA's four-step process, including stakeholder engagement and public involvement strategies, and outlines procedures for updating and maintaining the plan over time.
- **Section 3 – County-Wide Hazard Risk Assessment:** Provides an assessment of the natural hazards affecting the entire planning area and the unincorporated county specifically, including their characteristics and potential impacts.
- **Section 4 – County-Wide Mitigation Strategy:** Presents mitigation goals, strategies, and actions aimed at reducing risks and enhancing resilience across the entire planning area and for the unincorporated county specifically, matched with local capabilities.
- **Section 5 – Works Cited –** Citations to sources used.
- **Appendix A – Analysis Methodology:** Details the methods used for hazard and risk assessments.
- **Appendix B – Planning Process Documentation:** Provides documentation of the planning process, including meeting summaries and stakeholder input.

VOLUME 2 (Jurisdiction-Specific Annexes)	**Jurisdiction-Specific Annexes:** Each annex contains detailed information specific to that participating jurisdiction within the planning area, including elements mandated by state and federal regulations for each jurisdiction such as tailored hazard profiles and risk assessments; relevant supporting documentation and maps; jurisdiction-specific mitigation strategies and actions; and implementation schedules and responsibilities. Vol. 2 Jurisdictional Annexes include the following:	
	City of Capitola	**Pajaro Valley Water Management Agency**
	City of Scotts Valley	**Resource Conservation District of Santa Cruz County**
	City of Watsonville	**Santa Cruz Port District**
	Soquel Creek Water District	**Cabrillo College**
	Scotts Valley Water District	

1.4 Community Profile

The Community Profile for Santa Cruz County establishes the foundation for assessing risks and vulnerabilities across the planning area. By pairing the hazard-specific vulnerability assessments (Section 3.2) local geography, demographic characteristics, and economic conditions, mitigation strategies and actions can be more effectively directed toward key populations and areas. The Hazard Mitigation Planning Team reviewed geographic and demographic data as part of the risk prioritization and assessment process. By linking known community vulnerabilities to natural hazard risk the planning process ensures that mitigation efforts are tailored to address the most critical vulnerabilities first.

1.4.1 Planning Area & Geography

The Santa Cruz County MJHMP geographically covers the entire 446-square-mile area within the county's boundaries (the "planning area") with the exception of the City of Santa Cruz. The planning area includes the cities of Capitola, Scotts Valley, and Watsonville; several special districts; and all of the unincorporated areas. The county is located in the Governor's Office of Emergency Services Coastal Region and Mutual Aid Region II.

Approximately 49% of the county's population resides within unincorporated Santa Cruz County. Another 28% resides in the cities of Capitola, Scotts Valley, and Watsonville. The remaining 23% resides in the City of Santa Cruz. Figure 1-1 provides an overview of the planning area and participating jurisdictions.

Santa Cruz County is located on the northern stretch of the Monterey Bay, 70 miles south of San Francisco. It is one of the three Monterey Bay Area counties, the other two being Monterey and San Benito. Contiguous counties include San Mateo (north), Santa Clara (east), San Benito (southeast), and Monterey (south). The

landscape is topographically diverse and features coastal bluffs, beaches, deep mountain canyons, open meadows, and redwood, oak and madrone forests. Santa Cruz County has three distinct geographic regions: The Pacific Coast, the Santa Cruz Mountains, and the Pajaro Valley.

The coast extends the full length of the county along the Monterey Bay National Marine Sanctuary from Swanton in the north to Pajaro Dunes in the south. The cities of Capitola and Santa Cruz and the unincorporated communities of Davenport, Live Oak, Soquel, Aptos, Rio Del Mar, La Selva Beach, and Pajaro Dunes are located along the Pacific Coast and its coastal plain. Its location along the Pacific Coast provides valuable natural resources and economic opportunities, as well as threats from natural hazards such as coastal bluff erosion, storm surge, and tsunami.

The Santa Cruz Mountains occupy the central portion of the county and reach upwards of 3,000 feet above mean seal level, with the highest point being Mount Bielawski at 3,232 feet. Coast redwood and Douglas-fir forests are prevalent throughout the mountains. The City of Scotts Valley and the unincorporated communities of Ben Lomond, Bonny Doon, Boulder Creek, Felton, Lompico, and Mount Hermon are located in the Santa Cruz Mountains. Many of these mountainous areas are subject to slope failure and wildfire hazards, and the entire county is subject to seismic shaking from nearby active earthquake faults.

The Pajaro Valley extends east to west across the southern portion of Santa Cruz County along the Pajaro River and serves as the county's primary agricultural region. Portions of the valley are subject to riverine flood hazards, particularly in low-lying areas near the river and its tributaries, where flood risks can be compounded by coastal storms and tidal influences. The City of Watsonville, along with the unincorporated communities of Corralitos and Freedom, are located within the Pajaro Valley and have experienced recurring flood impacts.

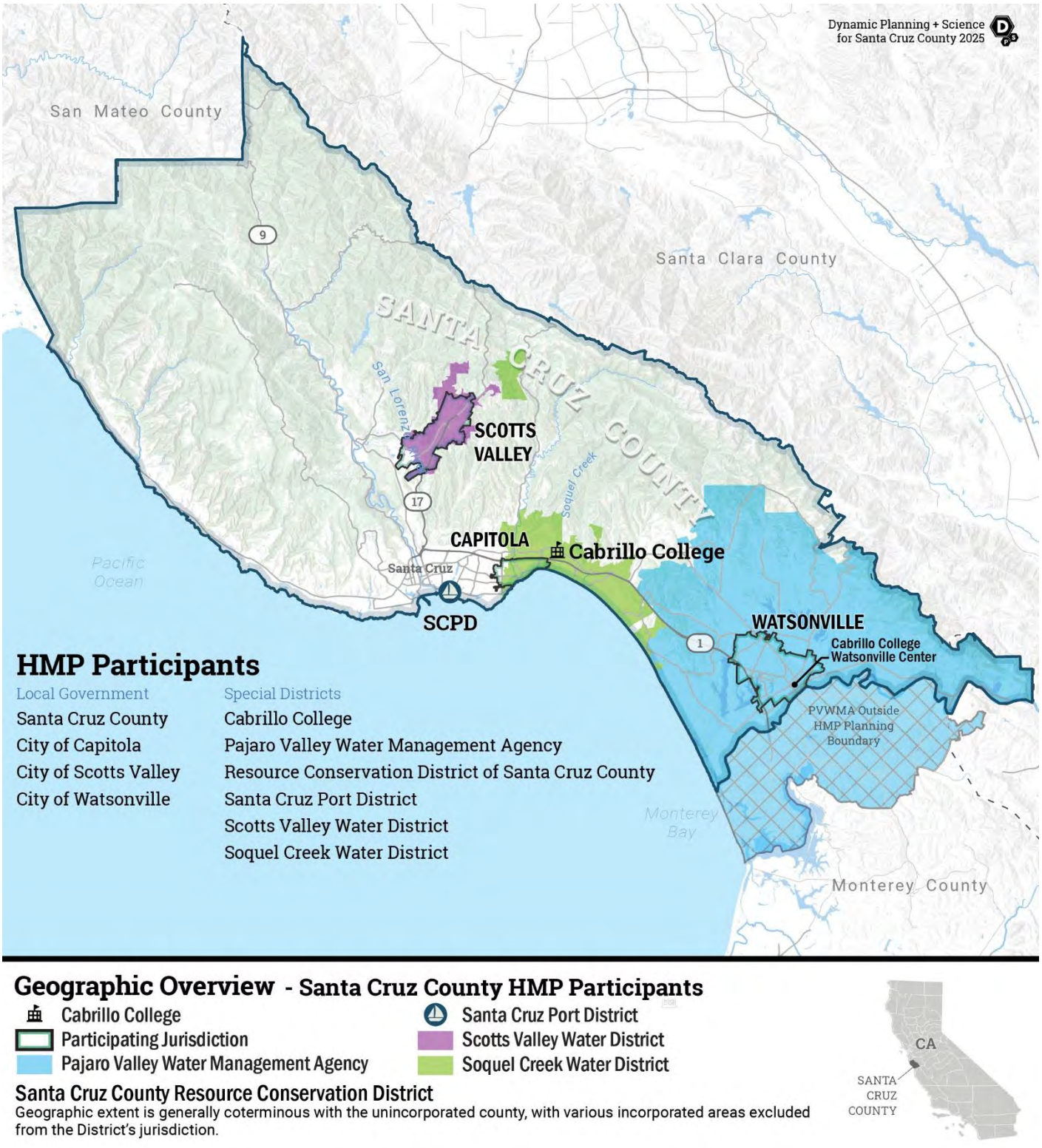


Figure 1-1: Geographic Overview of Planning Area and Participating Jurisdictions

Transportation Routes

Understanding transportation routes in the planning area is crucial for hazard mitigation planning. Several key roadways in Santa Cruz County provide important linkages and access during a hazard event, including functioning as critical evacuation routes, and other forms of transportation may also be utilized to assist in emergency ingress and egress.

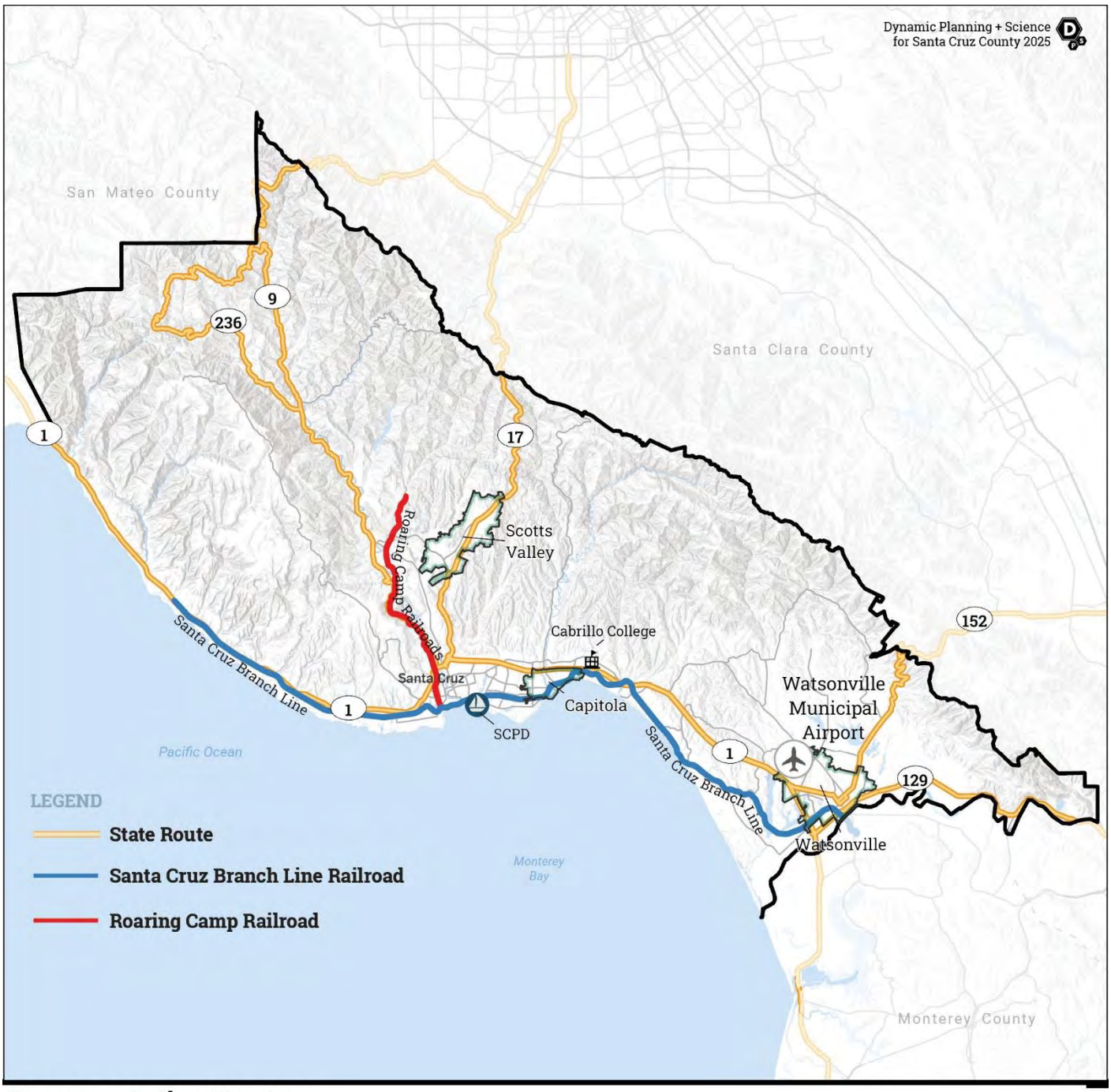
Five major state highways connect Santa Cruz County with adjacent counties. State Route 1 (SR-1) is located along the coast and extends from San Francisco, through San Mateo County along the coast, south to the cities of Santa Cruz, Capitola, and Watsonville, and then on to Monterey County. State Route 9 (SR-9) traverses the county from the City of Santa Cruz through the rural villages of Felton, Ben Lomond, and Boulder Creek, before descending into Santa Clara County at Saratoga Gap. State Route 17 (SR-17) crosses the Santa Cruz Mountains into Santa Clara County passing through the City of Scotts Valley. To the south, State Route 129 (SR-129) and State Route 152 (SR-152) connect the City of Watsonville with neighboring Santa Clara County and San Benito County, respectively. State Route 236 (SR-236) provides access to Big Basin State Park in the Santa Cruz Mountains from SR-9.

The Santa Cruz Branch Rail Line, owned by the Santa Cruz County Regional Transportation Commission (RTC), extends 32 miles along the coast from Watsonville Junction to Davenport. The northern portion of this rail line has been out of service for years and may be developed as a multi-modal recreational trail in the future. The RTC has studied the possibility of operating passenger rail service between the City of Santa Cruz and Watsonville Junction. Additionally, the Roaring Camp & Big Trees Narrow Guage Railroad operates passenger excursion trains between Felton and Santa Cruz.

Watsonville Municipal Airport (WVI) is the only airport in Santa Cruz County. The airport has two 4,000-foot runways and supports general aviation. There is no scheduled commercial passenger service at WVI.

In addition to these major transportation routes, areas across the county are connected by a network of publicly maintained roads (arterials, collectors, and local public roads); recreational trails for hiking, horseback riding, and biking; and an extensive network of privately owned and -maintained roads. Within the mountainous areas of the county, in particular, many of these secondary and tertiary travelways are geographically isolated along steep slopes, ridgelines, and canyons, complicating emergency ingress and egress. This condition is exemplified by the numerous single egress (i.e., one-way-in; one-way-out) neighborhoods in the Santa Cruz Mountains.

While major transportation routes are pivotal for evacuation planning, emergency response, and general transportation needs, as outlined in this MJHMP, alternate transportation modes and secondary and tertiary travelways can also be utilized to wholistically address emergency access deficiencies. Figure 1-2 provides a geographic overview of the planning area highlighting major transportation routes.



Transportation Routes

Source: Santa Cruz County

Figure 1-2: Major Transportation Routes

County Service Areas (CSAs)

Santa Cruz County administers a number of County Service Areas (CSAs) that provide locally initiated and voter-approved services beyond the baseline responsibilities of the county. There are currently 36 private road CSAs, which allow residents to collectively fund the maintenance and improvement of private mountain roads through a Benefit Assessment fee added to their property tax bills. This mechanism represents a viable local mitigation strategy by ensuring long-term upkeep of critical access routes, particularly in areas vulnerable to wildfire, landslides, and storm damage. In addition to road maintenance, CSAs also exist to support other community needs such as waste disposal, police and fire protection, streetscape improvements, and street lighting, allowing neighborhoods to tailor services to their specific priorities.

Water Resources

Nearly all of Santa Cruz County's domestic water supply comes from local sources, with approximately 20 percent from streams and reservoirs and 80 percent from groundwater. The county does not import significant amounts of water. Major agencies include the San Lorenzo Valley Water District, Scotts Valley Water District, City of Santa Cruz Water Department, Soquel Creek Water District, Central Water District, City of Watsonville, and the Pajaro Valley Water Management Agency, several of which participate directly in this plan. Outside of these systems, many residents rely on small water systems and private wells, which are often more vulnerable to disaster impacts. Water supply challenges, vulnerabilities, and long-term sustainability are addressed in greater detail in the Drought Hazard Profile Section 3.2.8.

County Sanitation

The Sanitation Unit, within the Community Development and Infrastructure (CDI) Department's Division of Public Works Special Services, is responsible for managing wastewater collection, treatment, and environmental compliance across multiple service areas. The unit oversees three sanitation districts: the Santa Cruz County Sanitation District, the Davenport Sanitation District, and the Freedom Sanitation District. It also manages five Sanitation CSAs. In addition to wastewater responsibilities, the Davenport Sanitation District also provides treated drinking water to its community. The Sanitation Unit ensures compliance with state and federal water quality standards, operates and maintains collection system infrastructure, and supports capital improvement projects to reduce the risk of overflows and protect public health and the environment. These services are critical to hazard mitigation, as wastewater systems are vulnerable to flooding, power outages, and storm damage, and their proper functioning is essential for maintaining community resilience during disasters.

1.4.2 Climate

Santa Cruz County's climate can generally be described as Mediterranean, with mild, wet winters and warm, dry summers. However, the county's coastal mountain terrain and proximity to the Pacific Ocean create distinct microclimates. Along the coast, the presence of a marine layer moderates temperature extremes and fog is common throughout the summer. By contrast, inland valleys and the uppermost elevations of the Santa Cruz Mountains experience much warmer conditions, with summer highs often exceeding 90 degrees Fahrenheit (°F) and occasionally over 100°F. The warmest portion of Santa Cruz County has historically been the San Lorenzo Valley and high-elevation inland-facing valleys throughout the Santa Cruz Mountains. At the highest peaks (over 3,500 feet in elevation), snowfall can occur during winter months.

Warm temperatures and low precipitation are the norm from approximately April through October, while cooler temperatures and heavy rains dominate November through March. Though winters are typically mild, colder winds from inland regions with more continental climates can result in short-term cold snaps. According to the National Oceanic and Atmospheric Administration (NOAA), the annual mean temperature in Santa Cruz is approximately 57°F, with an annual mean high of almost 62°F and mean low of around 52°F. Extreme heat and cold were historically rare threats to the community with both summer and winter temperatures moderated by marine influences, climate change is shifting local norms toward more frequent and severe extremes.

Figure 1-3 presents the county-wide 30-year monthly climate normals from 1991 to 2020 for precipitation and minimum and maximum temperatures.

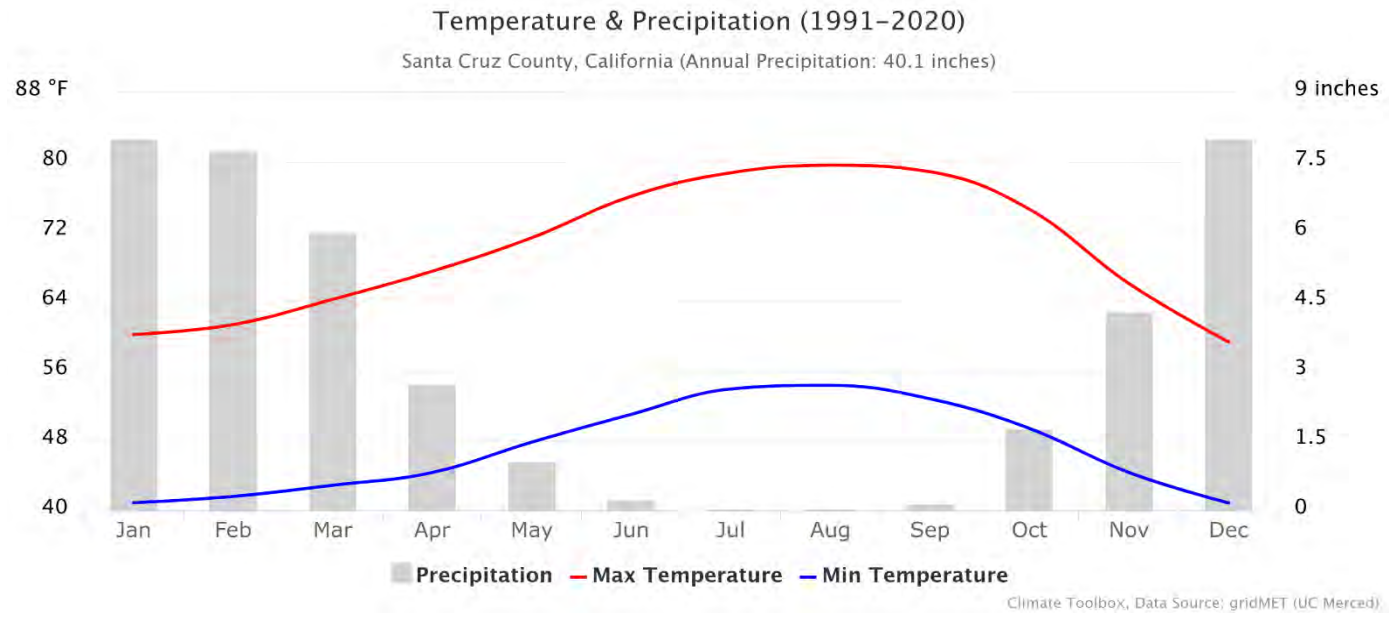


Figure 1-3: Santa Cruz County 30-Year Monthly Climate Normals (1991-2020)

Source: gridMET (UC Merced)

Prevailing winds are generally northwesterly during most of the year, shaped by marine conditions and topography. The Santa Cruz Mountains form a natural barrier to winds from the north and from the hot interior valleys. In summer and early fall, **offshore** (east and northeast) wind events can occur—producing dry, downslope adiabatic warming that dries fuels and heightens wildfire danger. For the remainder of the year, **onshore** winds from the Pacific bring moist, marine air that moderates temperatures and maintains the county's coastal fog cycle.

Most of the county's annual rainfall arrives from November to March and comes in heavy bursts from Pacific frontal systems and atmospheric rivers, which can produce intense short-term flooding and landslide risk. Rainfall varies widely throughout the county, from approximately 80 inches per year in Bonny Doon, to approximately 22 inches per year in the Watsonville area. According to NOAA, the mean annual precipitation in Santa Cruz is approximately 29 inches but increasingly frequent and severe drought conditions in recent years have resulted in annual precipitation as low as five inches.

1.4.3 Demographics & Vulnerable Populations

This section provides an overview of Santa Cruz County's social and economic landscape to inform hazard mitigation planning. Natural disasters affect communities both physically and socially, and their impacts are not distributed evenly. Certain populations may face greater challenges in preparedness, response, and recovery, which can magnify the overall consequences of a disaster. By examining demographic characteristics alongside the built environment, this section supports a better understanding of potential social costs from damage to housing, industry, public facilities, essential services, and transportation.

The demographic data for Santa Cruz County and the other participating jurisdictions discussed in this MJHMP is derived from the U.S. Census Bureau's American Community Survey 5-Year Estimates (ACS 5-Year) from 2018 to 2023. The figures presented are intended to highlight broader regional trends relevant to hazard mitigation planning efforts rather than inform specific decision-making or administrative actions.

The U.S. Census Bureau estimated Santa Cruz County's total population to be 266,021 in 2023, with around 49% living outside incorporated areas. Unincorporated Santa Cruz County's population represents 49% of the county-wide population, while the incorporated cities of Capitola, Scotts Valley, and Watsonville collectively total 28%. The City of Santa Cruz accounts for the remaining 23 Table 1-2 summarizes population and household characteristics for Santa Cruz County, including the unincorporated county and the incorporated cities that participated in this MJHMP.

Table 1-2: County-Wide Population and Households

Jurisdiction	Total Population	Total Households	Average Household Size
Unincorporated Santa Cruz County	131,149	56,539	-
City of Capitola	9,813	5,086	1.89
City of Santa Cruz	60,953	23,778	2.12

City of Scotts Valley	12,138	5,440	2.18
City of Watsonville	51,968	15,792	3.24
Santa Cruz County (Total)	**266,021**	**106,635**	**2.36**

Notes: Limited data available for unincorporated Santa Cruz County. City of Santa Cruz population provided for comparison only; not a participating jurisdiction.

Source: ACS 5-Year, 2018-2023

1.4.3.1 Introduction to Vulnerable Populations

Exploring local demographic data is crucial for identifying groups and geographic areas vulnerable to hazard events. Certain populations face heightened risks following disasters due to factors such as age, economic status, mobility limitations, physical or mental disabilities, and geographic location. Vulnerable residents are not always aggregated in any single area or high enough concentration to be recognized by census derived geographies. However, the county development history and demographics reflect that elderly and low-income residents are spread throughout the county and within every jurisdiction. Vulnerability is not static; individuals may be more at risk from some hazards than others. For instance, a low-income family without transportation may struggle during rapid evacuations for wildfires or floods but could be adequately prepared for an earthquake event. Mitigation efforts can reduce personal vulnerability for some but not all individuals, especially those reliant on caregiving networks like children, the elderly, and persons with disabilities. Further, environmental risk often disproportionately burdens lower-income and marginalized communities, who typically reside in hazard-prone areas with fewer mitigation resources. (National Center for Disaster Preparedness, 2020)

In all-hazards preparedness and response planning, at-risk individuals, often synonymous with vulnerable populations, are federally defined as "children, pregnant women, senior citizens, and others with access or functional needs during public health emergencies." (42 USC § 2802(b)(4)(B)) These include those who are economically disadvantaged, have chronic medical conditions, belong to historically marginalized groups, face language barriers, lack transportation, or experience homelessness. Prioritizing resources where they are most effective, such as cost-sharing for wildfire or flood mitigation measures and translating emergency information into languages needed by the local community, are prime examples of planning for vulnerable populations in hazard mitigation.

At-Risk Individuals with Access & Functional Needs

Access and functional needs may interfere with the ability for an at-risk individual to access or receive medical care before, during, or after a disaster or emergency event. Irrespective of a specific diagnosis, status, or label, the term “access and functional needs” refers to a broad set of cross-cutting access-based or function-based needs, generally distinguished according to the following:

- **Access-based needs** require that resources are accessible to all individuals to maintain health, such as social services, accommodations, information, transportation, and medications.

- **Function-based needs** refer to restrictions or limitations an individual may have that requires assistance before, during, and after a disaster or public health emergency.

At-risk individuals may have additional needs that must be considered in planning for, responding to, and recovering from a disaster or emergency. An approach recommended by the U.S. Department of Health and Human Services (HHS) for integrating the access and functional needs of at-risk individuals is to consider elements based on the "CMIST" framework:

- **C = Communication:** Individuals with communication needs may have limitations that interfere with the receipt of and response to information, requiring information to be provided in an appropriate and accessible format. This can include individuals who are deaf or hard of hearing, speak American Sign Language, have limited or no English proficiency, are blind or have low vision, or have cognitive or physiological disabilities.
- **M = Maintaining Health:** Individuals may require specific services, supplies, equipment, medication, or nutrition to reduce negative impacts of a disaster or emergency and maintain activities of daily living, such as breathing, eating, dressing, grooming, transferring, and toileting.
- **I = Independence:** Continuity of access to necessary assistive devices, such as wheelchairs, or other aids, like service animals, is crucial to maintaining independence for individuals who rely on these support tools to function autonomously.
- **S = Support:** Tailored, person-centered support may be necessary for individuals who have lost caregiver assistance, find it difficult to cope in a new or strange environment, have difficulty remembering or understanding, or have past trauma experiences. This includes support for victims of abuse, individuals with behavioral health needs, or those who have psychiatric conditions (e.g., Alzheimer's disease, Schizophrenia).
- **T = Transportation:** Individuals may lack access to personal transportation due to a variety of factors, including economic status, age, physical or mental disability, temporary condition or injury, or legal restriction. This requires coordination with mass transit and accessible transportation service providers to ensure access to support and necessary services. (HHS, 2020)

While most individuals with access and functional needs do not have acute medical conditions requiring the support of trained medical professionals, many require additional assistance to maintain health and minimize preventable negative outcomes, especially during a disaster event. These at-risk individuals may also require more time or personnel to assist during an evacuation. Therefore, special attention from planners and emergency managers is crucial for this highly vulnerable population.

Environmental Justice

Environmental justice issues can often exacerbate public health impacts from hazard events, and vice versa. The U.S. Environmental Protection Agency (EPA) defines environmental justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2021).

As previously discussed, hazard events can disproportionately impact low-income and vulnerable populations. Lower-income populations, for instance, are more likely to live in neighborhoods susceptible to flooding or near industrial areas or hazardous waste sites, increasing their risk to toxic leaks associated with flood and storm damage (Sherwin, 2019). With the increased frequency of wildfires in recent years, populations already living in air quality-impacted areas can be further affected by wildfire smoke. These populations often include agricultural and outdoor workers, children, seniors, and low-income residents who experience disproportionate health impacts from wildfire smoke, as well as other impacts from wildfires such as physical and psychological stress from evacuation, property loss, physical injury, or death (Shahir Masri et al., 2021)

Certain locations within Santa Cruz County are known to be at higher risk of hazard-related impacts to vulnerable populations due to historical development patterns and socioeconomic pressures, as well as changing demographics. For instance, areas along the Pajaro River where many low-income households and small farms are located are at higher risk of flooding, and these populations are more likely to lack adequate resources for effective flood mitigation and recovery. Similarly, rural communities in the Santa Cruz Mountains are often made up of seniors living in older structures and neighborhoods that do not meet modern standards and are at higher risk of wildfires due to overgrown, drought-stressed vegetation. The elderly and others with mobility issues may face additional challenges in conducting fuel management and during evacuation

It is vital that environmental laws and regulations, as well as hazard mitigation planning, meaningfully include these communities in their efforts to account for public health and safety. This approach ensures that vulnerable populations are not overlooked and that their specific needs and risks are addressed comprehensively.

Mental Health Impacts of Hazard Events

Hazard events are associated with many physical impacts on people and property, but they can also have mental health impacts. Specifically, hazards can precipitate anxiety, depression, shock, extreme stress, or Post Traumatic Stress Disorder (PTSD). (Makwana, 2019) Mental health challenges can also result from ongoing impacts after a disaster event, such as socioeconomic losses from damage to housing resulting in displacement. The death or injury of a loved one can lead to substantial and prolonged psychological stress as well. (*Id.*)

The county has also experienced the trauma impacts in major disaster recovery, especially in the aftermath of the San Mateo-Santa Cruz Unit (CZU) lightning Complex Fire in 2020. There is a clear need to ensure that the County and jurisdictions provide trauma informed training for staff in support of disaster recovery victims in the future.

1.4.3.2 Income & Housing

Economic status and mobility strongly predict hazard vulnerability. Low-income households and communities bear disproportionate financial burdens from the costs associated with disaster preparedness, response, and recovery. In the United States, households are expected to rely on private resources to prepare for, respond to, and recover from disasters, placing those in poverty at a distinct disadvantage. Moreover, economically disadvantaged households are more likely not to own their homes and frequently inhabit poorly constructed or inadequately maintained housing.

Disasters often result in unexpected expenses that can push families and individuals living on the brink of poverty or homelessness over the edge. Low-income residents are at significantly higher risk of injury and face greater challenges securing food and shelter during and after an event. Further, those lacking transportation may find it impossible to evacuate during an emergency, while recovery costs can be prohibitively high for households unable to afford hazard mitigation measures in advance. (Krause & Reeves, 2017) Renters and low-income residents are also less likely to purchase insurance, leaving them particularly vulnerable to significant losses during hazard events.

The overall poverty rate across Santa Cruz County is approximately 11% with a median annual income of over $109,000 (Table 1-3). In general, lower-income areas are concentrated within and around urban areas in the middle and southern portion of the county while the northern and mountainous regions, such as Scotts Valley, have higher median incomes and lower poverty rates (Figure 1-4 and Figure 1-5).

Table 1-3: County-Wide Income and Poverty

Jurisdiction	Median Income	Poverty Rate
Santa Cruz County (including municipalities)	**$109,266**	**11.2%**
City of Capitola	$96,412	13.9%
City of Scotts Valley	$140,887	4.8%
City of Watsonville	$74,785	15.1%

Source: ACS 5-Year, 2018-2023

Renters face additional challenges beyond being less likely to have personal property insurance. Decisions about major structural improvements typically rest with property owners, not tenants, and low-income renters may inhabit older, less resilient homes located in areas with greater exposure to hazards. For instance, mobile homes are more susceptible to damage from severe weather and floods compared to other types of residences, while aged homes may lack air conditioning or cooling units needed during heatwaves. Federal disaster recovery services can widen disparities between renters and homeowners, as homeowners generally receive higher payouts through FEMA's Individual Assistance (IA) program. Research spanning 1999 to 2013 indicates that homeowners' wealth tends to increase after local hazard events, while renters' wealth typically decreases. (Howell & Elliot, 2019)

Santa Cruz County has an overall homeownership rate of approximately 60%, which is higher than the state and national averages. Around 30% of occupied units in the unincorporated county are rentals. Many residents find themselves "House Rich" but "Cash Poor," which limits their ability to do proactive hazard mitigation around their homes. Such as wildfire risk reduction.

Cost-Burdened Households

Housing affordability remains one of the most significant challenges facing Santa Cruz County. A household is considered cost-burdened if it spends more than 30% of its income on housing, and severely cost-burdened if more than 50% of income goes toward housing costs. These pressures place households, particularly low-income renters, at higher risk of displacement, eviction, or homelessness.

In the unincorporated areas of the county, disparities in housing cost burden are evident across race, ethnicity, and tenure. Overall, approximately 38% of households experience housing cost burden, with 17% facing severe cost burdens. Renters are disproportionately affected: 51 percent of renters are cost-burdened compared with 30% of homeowners (Santa Cruz County, 2024).

According to the General Plan Housing Element, the highest proportion of cost burdens neighborhoods are concentrated in Rio Del Mar, Twin Lakes, Pleasure Point, Aptos Hills–Larkin Valley, Aptos, Monte Toyon, and the census tract northeast of Interlaken. The southern portion of the unincorporated county also exhibits higher shares of renters, poverty concentrations, and displacement vulnerability.

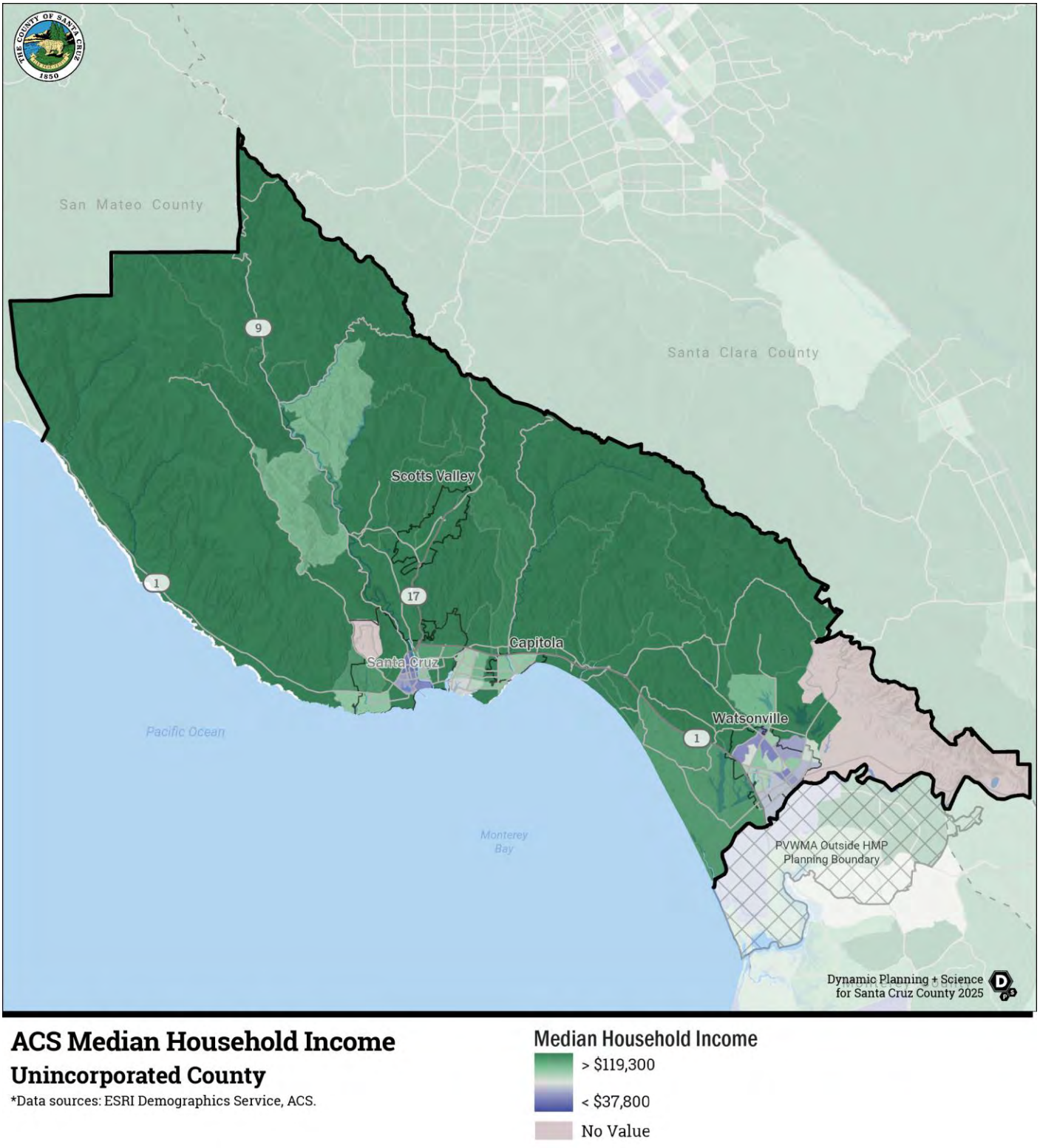


Figure 1-4: County-Wide Median Household Income Map

Source: ACS 5-Year, 2018-2023

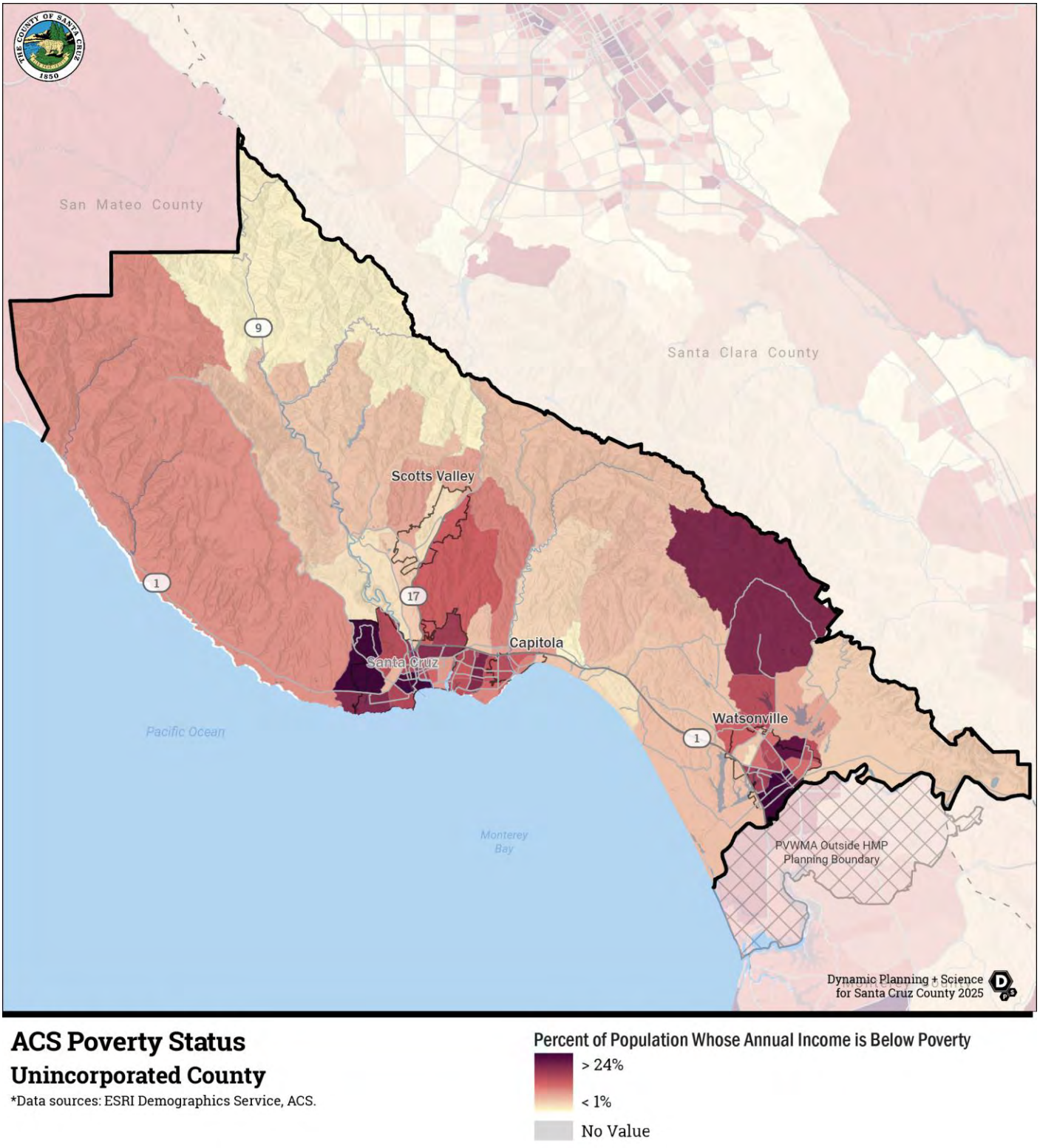


Figure 1-5: County-Wide Poverty Status Map

Source: ACS 5-Year, 2018-2023

Owner vs. Rental Occupancy

Housing tenure is a critical factor in hazard mitigation planning because renters and owners often face different levels of risk, resources, and recovery capacity. Renters may be more vulnerable to displacement following a disaster due to limited insurance coverage, fewer financial resources for temporary housing, and reliance on landlords to implement structural retrofits or repairs. Owner-occupants, while generally more likely to invest in property improvements, may also face significant financial burdens when major repairs or rebuilding are required.

As shown in Table 1-4, Santa Cruz County has close 97,000 occupied housing units, with 40.0% renter-occupied and 60.0% owner-occupied. Within incorporated cities, Watsonville has the highest proportion of renter households (56.4%), while Scotts Valley has the lowest (27.5%). The unincorporated county falls below the statewide average renter rate, with 30 % of units renter-occupied compared to the California statewide average of 44% renter-occupied and 55.8% owner-occupied (ACS 5-Year Estimates, 2018–2023).

These patterns have direct implications for hazard vulnerability. Communities with higher renter populations, such as Watsonville and Capitola, may require additional resources to support disaster preparedness, evacuation, and post-disaster housing recovery. In contrast, areas with predominantly owner-occupied housing stock, such as Scotts Valley, may face different challenges, such as financing mitigation retrofits for older homes. Recognizing these tenure-based differences helps ensure that mitigation strategies are tailored to meet the needs of both renters and homeowners across the county.

Table 1-4: County-Wide Renter- and Owner-Occupied Housing

Jurisdiction	# Occupied Housing Units	# Renter-Occupied	% Renter-Occupied	# Owner-Occupied	% Owner-Occupied
Unincorporated Santa Cruz County	50,423	15,212	30.2%	35,211	69.8%
City of Capitola	4,506	2,241	49.7%	2,265	50.3%
City of Scotts Valley	5,008	1,377	27.5%	3,631	72.5%
City of Watsonville	15,267	8,610	56.4%	6,657	43.6%
Santa Cruz County (Total)	**96,873**	**38,771**	**40.0%**	**58,102**	**60.0%**
California (Statewide)	~13.4 M	~5.9 M	~44.2%	~7.5 M	~55.8%
United States	~126.8 M	~43.6 M	~34.4%	~83.1 M	~65.6%

Source: ACS 5-Year, 2018-2023

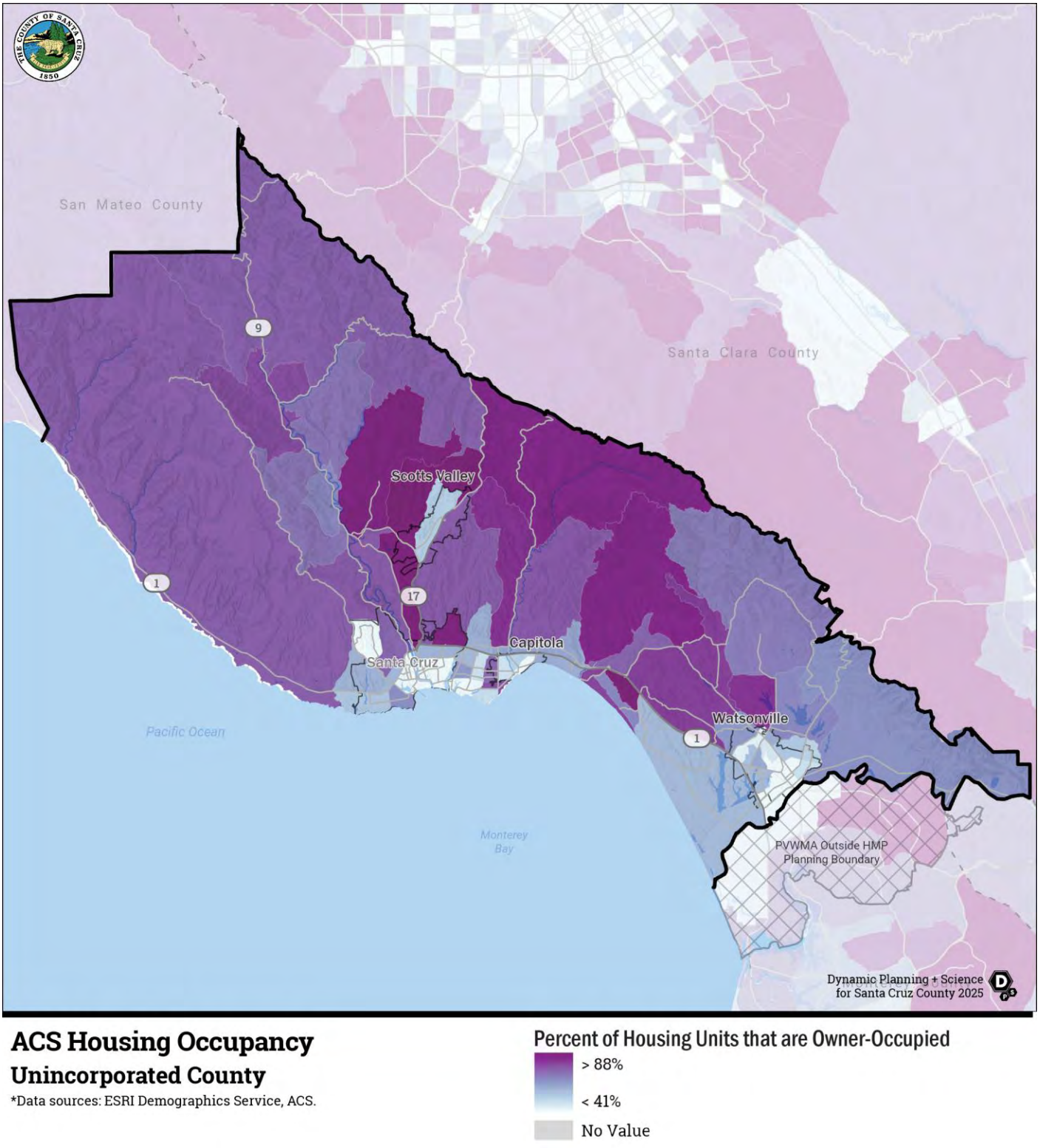


Figure 1-6: County-Wide Percentage of Owner-Occupied Housing Units Map

Source: ACS 5-Year, 2018-2023

Age of Building Stock

The age of buildings in Santa Cruz County has direct implications for hazard vulnerability and resilience. Data from the Santa Cruz County Assessor's Office (Figure 1-7) shows that a significant portion of the county's building stock was built between the 1960s and 1980s, prior to many of California's modern building code requirements for seismic safety, energy efficiency, and wildfire resilience.

- **Unincorporated County** - has substantial mid-century housing, with 21% built in the 1970s and 18% in the 1980s.
- **Capitola** - nearly one-quarter (24%) of homes were constructed during the 1970s, with another 18% built in the 1960s.
- **Scotts Valley** - housing is newer overall, with the largest share (24%) constructed in the 1980s, followed by 21% in the 1970s.
- **Watsonville-** the housing stock is more evenly distributed, though 18% was built in both the 1970s and 1980s.

Overall, this distribution means that many homes were constructed before the 1997 Uniform Building Code (UBC) overhaul, which introduced strength-based seismic design, soil amplification factors, and near-source effects. California had already unified its building standards under Title 24 (1978), but homes built in the late 1970s and 1980s still predate the most rigorous seismic provisions later adopted into the California Building Code (CBC) from the International Building Code (IBC). Similarly, widespread

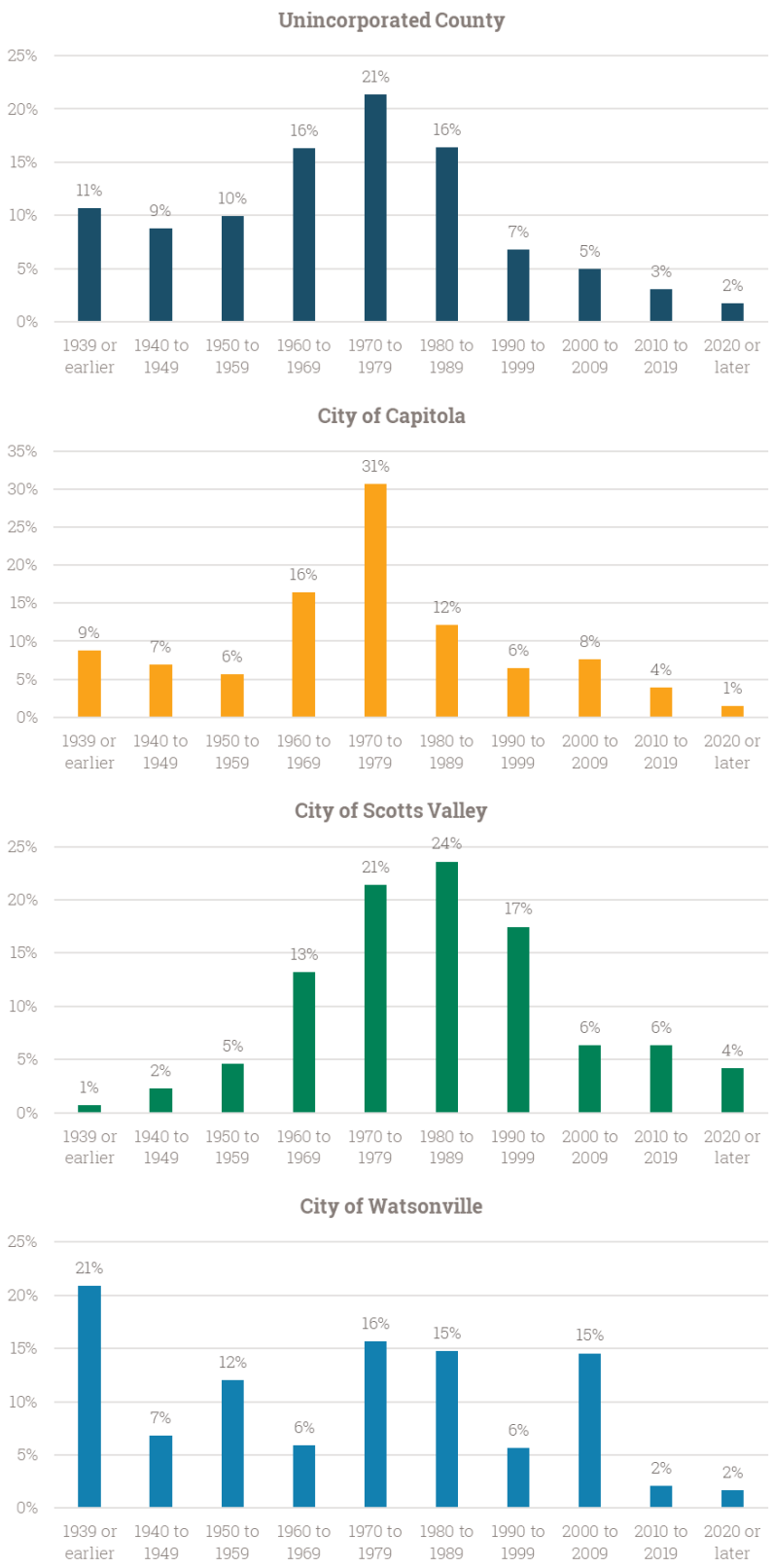


Figure 1-7: Age of Countywide Building Stock

requirements for fire-resistant materials and defensible space did not emerge until after major wildfire losses in the 1990s and 2000s.

The condition and age of housing stock highlight the importance of encouraging voluntary retrofits for older structures, maintaining critical lifelines in aging neighborhoods, and ensuring rental housing — which is often concentrated in older buildings — receives adequate investment to remain safe and habitable after disasters.

1.4.3.3 Access to Transportation

Transportation barriers also contribute to social vulnerability, as some parts of Santa Cruz County lack public transit infrastructure. Families and individuals without personal transportation, including many lower-income households and older adults, face challenges in rapidly evacuating and difficulties accessing essential or medical services due to limited transportation options. Rural communities, in particular, may experience longer travel times to economic centers where most healthcare facilities and emergency shelters are located, further exacerbating disparities in access. In the event of natural disasters or road closures due to earthquake, wildfire, flood, or another disaster, these transportation challenges can hinder evacuation efforts and access to relief services.

Across the county, reliance on public transit and the number of households lacking personal transportation are low, at less than 1% and less than 5%, respectively (Table 1-5). However, more than 3% of households in the unincorporated areas of the county have no personal vehicle, complicating emergency evacuation where there are very few public transit options. The highest rates of transit reliance and households with no vehicle correlate with areas of lower median income and higher poverty in the middle and southern portions of the county, including the City of Watsonville in the Pajaro Valley (Figure 1-4 and Figure 1-5).

Table 1-5: County-Wide Public Transit Reliance and Households with No Vehicle

Jurisdiction	# Persons Reliant on Public Transit	% Population Reliant on Public Transit	# Households w No Vehicle	% Households w No Vehicle
Unincorporated Santa Cruz County	561	0.4%	1,743	3.1%
City of Capitola	57	0.6%	228	4.5%
City of Scotts Valley	21	0.2%	303	5.6%
City of Watsonville	297	0.6%	1,127	7.1%
Santa Cruz County (Total)	**1,857**	**0.7%**	**5,107**	**4.8%**

Source: ACS 5-Year, 2018-2023

1.4.3.4 Dependent & Disabled Populations

Age and disability status play significant roles in vulnerability to natural hazards, as seniors, children, and many who experience disabilities are dependent populations who rely on caregiver networks for support and protection. Seniors and disabled persons may have mobility challenges and increased health concerns, necessitating additional assistance during evacuations and recovery. Similarly, children have limited ability to protect themselves and depend on caregivers to ensure their safety and well-being during emergencies. When combined with factors such as poverty, these vulnerabilities can be further compounded, highlighting the importance of targeted interventions to address the unique needs of dependent and disabled populations.

Although vulnerability among persons in the same age cohort varies significantly based on health and socioeconomic security, seniors as a group have a higher prevalence of physical and financial barriers to response and recovery, both during and after an emergency, and are more prone to health-related consequences, making recovery slower. They are more likely to experience vision, hearing, or mobility impairments, as well as mental impairments. Additionally, many elderly individuals reside in assisted-living facilities where emergency preparedness depends on the facility operators. These facilities are typically identified as "critical facilities" by emergency managers because they require extra notice and resources to implement evacuations. Further, seniors living alone may have difficulty evacuating their homes and could be stranded in dangerous situations. This population often needs special medical attention, which may not be readily available during a disaster event due to isolation. Given the current aging of the American population, specific planning for the elderly is warranted.

People under the age of 18 have little control over their living situation or household actions for hazard preparedness, response, or recovery. Disasters may have detrimental long-term effects on children, both mentally and physically and especially when living in poverty. Those children living in households with a single caregiver may also be more vulnerable due to compounding factors, such as reduced financial resources. Table 1-6 summarizes Santa Cruz County's economically dependent age groups. Although the county's population skews older than the state and national averages, with over a third of households composed of persons 65 years of age or older, the percentage of seniors living alone or in poverty is relatively low.

Over a quarter of households across the county include children under the age of 18, approximately 6% of which have a single caregiver. Both the number of households with children and those with a single caregiver are much higher in the southern portion of the county in and around the City of Watsonville compared to other regions. Figure 1-8 identifies concentrations of economically dependent age groups, including seniors and children.

Table 1-6: County-Wide Economically Dependent Age Groups

Jurisdiction	% Households 65+	% Households 65+ Living Alone	% Households 65+ in Poverty	% Households <18	% Households <18 w Single Caregiver
Unincorporated Santa Cruz County	36.5%	9.2%	2.0%	23.0%	4.7%
City of Capitola	35.3%	10.4%	2.3%	19.4%	7.3%
City of Scotts Valley	40.1%	7.8%	2.4%	23.3%	5.3%
City of Watsonville	30.6%	4.2%	5.3%	42.1%	12.9%
Santa Cruz County (Total)	**33.4%**	**7.9%**	**2.7%**	**24.8%**	**6.0%**
California Statewide	31.4%	9.8%	11.8%	32.9%	5.8%
Nationwide	31.3%	7.7%	11.2%	29.9%	6.1%

Source: ACS 5-Year, 2018-2023

Those with access and functional needs may experience more difficulties in preparing for, responding to, or recovering from a disaster or emergency event. This includes persons living with one or more physical or cognitive disabilities such as hearing or vision impairment, reliance on mobility or other medical devices, mental disorders or neurodivergence, and chronic health conditions that increase susceptibility to hazard impacts like wildfire smoke. As such, these at-risk individuals may require additional time or personnel to assist during an evacuation or other emergency and special attention is warranted from planners and emergency managers this highly vulnerable population.

Across the county, approximately 11% of the non-institutionalized population lives with some form of disability (Table 1-7). Figure 1-9 identifies elderly disabled persons, showing that this population is generally located within and adjacent to urban centers where more services are available; however, a significant number of seniors with a disability live in the Santa Cruz Mountains.

Table 1-7: County-Wide Non-Institutionalized Disabled Population

Jurisdiction	# Persons w Disability	% Persons w Disability
Unincorporated Santa Cruz County	13,890	10.6%
City of Capitola	1,631	16.6%
City of Scotts Valley	1,318	10.9%
City of Watsonville	6,109	11.8%
Santa Cruz County (Total)	**29,557**	**11.1%**

Source: ACS 5-Year, 2018-2023

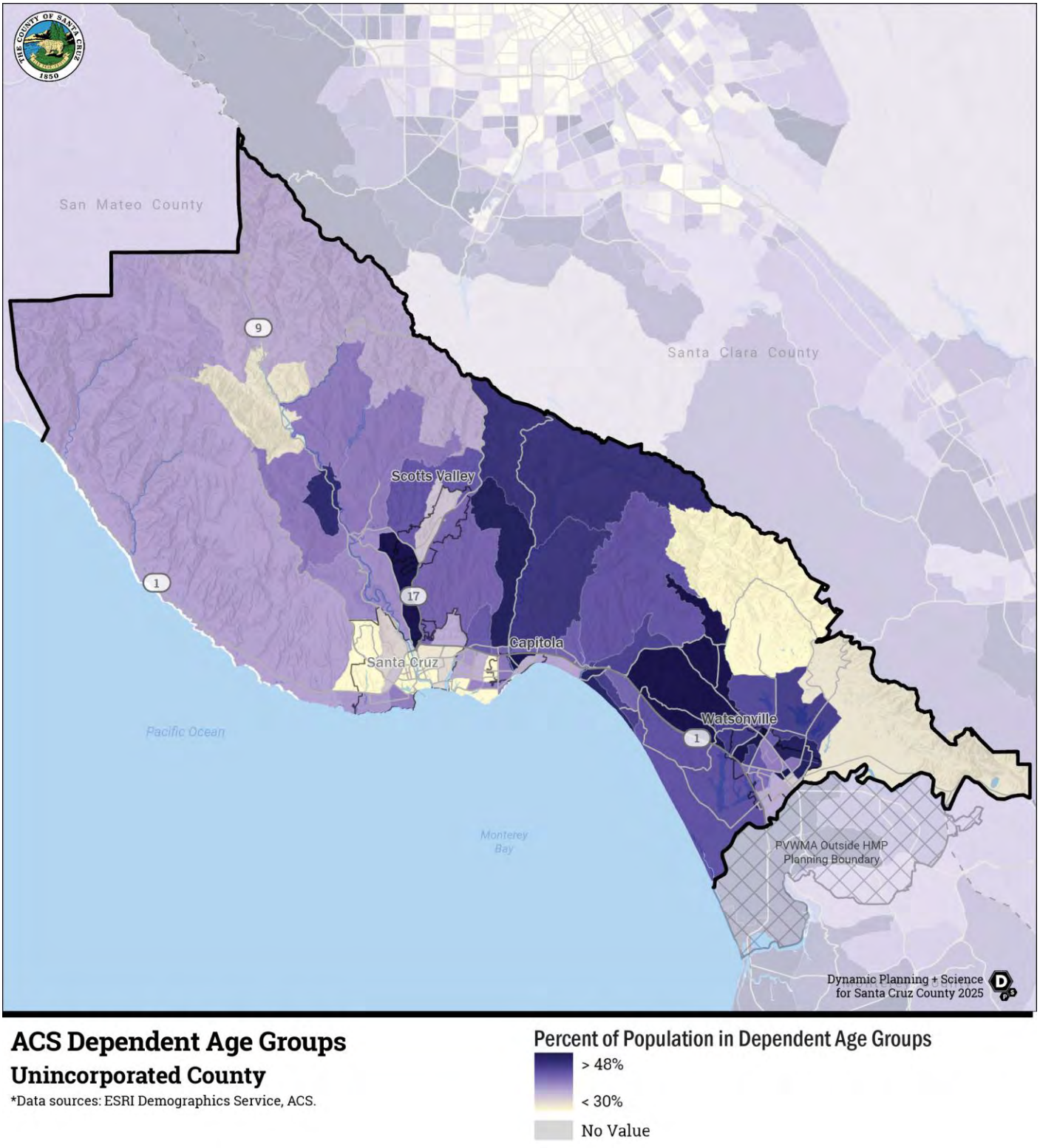


Figure 1-8: County-Wide Percentage of Economically Dependent Age Groups Map

Source: ACS 5-Year, 2018-2023

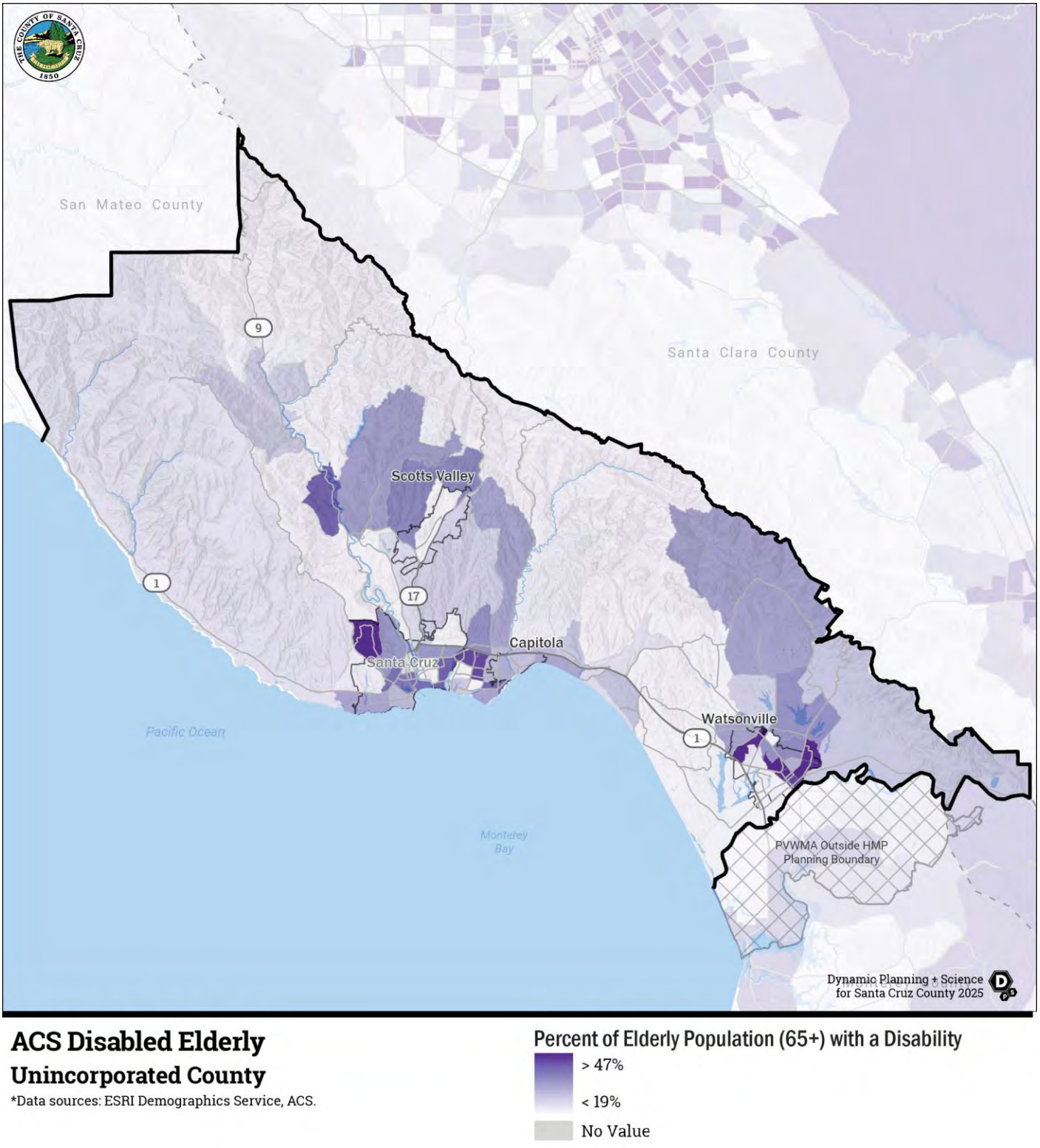


Figure 1-9: County-Wide Percentage of Disabled Elderly Map

Source: ACS 5-Year, 2018-2023

1.4.3.5 Race, Ethnicity & Language

Natural disasters compound racial disparities; non-white individuals and communities receive less recovery aid from FEMA than their white counterparts, even when the extent of damage is the same. (Howell & Elliot, 2019) (National Advisory Council, 2020) Research indicates that minorities are less likely to participate in pre-disaster planning and experience higher mortality rates during disaster events. Post-disaster recovery for these groups is also often ineffective and can sometimes be culturally insensitive. Since a higher proportion of ethnic minorities live below the poverty line compared to white populations, poverty exacerbates their vulnerability. (Fothergill, 1999)

These disparities illustrate the complex relationship between disaster recovery and overlapping social vulnerabilities such as race, income, language, and health. Black and Latino residents are more likely to be low-income renters, which creates barriers to navigating FEMA's IA programs. Communities with higher proportions of non-white residents may have lower tax revenue and property values, resulting in less investment in mitigation and rebuilding efforts both before and after emergencies. The recent COVID-19 pandemic highlighted these disparities, with non-white persons facing significantly higher morbidity rates from infections—ranging from 70% to 350%—than those of white, non-Hispanic individuals. (CDC, 2020)

It should be noted that U.S. Census Bureau ACS estimates are often less accurate in areas with high concentrations of undocumented persons. Some minority households may avoid participating in Census surveys due to mistrust of government agencies or concerns about immigration status. This can lead to underreporting, further obscuring the true extent of racial, ethnic, language-related vulnerabilities. As such, race and ethnicity are discussed as part of a more comprehensive approach using the Center for Disease Control's Social Vulnerability Index (SVI) in Section 1.4.3.7.

As identified in Figure 1-10 and Figure 1-11, Santa Cruz County is predominantly White and consists of smaller populations of other races and ethnicities compared to statewide averages. However, the Hispanic population, which is more concentrated in the heavily agricultural area of the Pajaro Valley and Watsonville, is significant at approximately 35%.

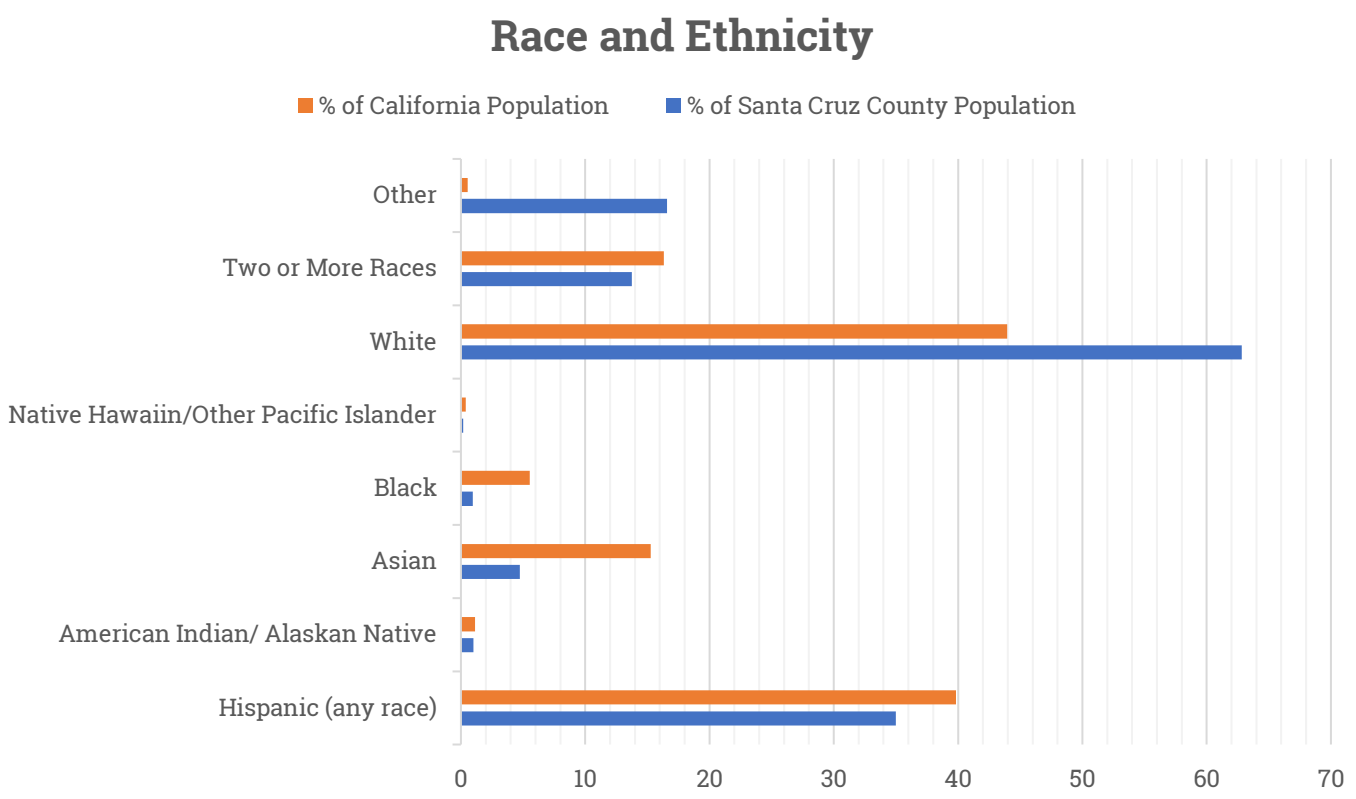


Figure 1-10: County-Wide Race and Ethnicity Chart

Source: ACS 5-Year, 2018-2023

Non-English speaking or limited-English proficiency individuals may struggle to understand emergency information due to language and literacy barriers, often resulting in confusion about who to trust for accurate information. These individuals may be unable to access up-to-date emergency information and may have difficulty navigating recovery programs. Local governments can take steps to increase equity in disaster preparedness and recovery outcomes by translating preparedness materials and emergency notifications in a timely manner and partnering with local community groups to target outreach more effectively to at-risk populations.

Across the county, around 17% of households speak Spanish and 3% speak little to no English (Table 1-8 and Figure 1-12). Within the Pajaro Valley and City of Watsonville, almost half of households speak Spanish and 15% are limited English. Other areas with concentrations of Spanish-speaking households include the North Coast communities of Davenport and Live Oak. The County also has identified some residents who speak indigenous non-written languages, such as Mixtec and Trique.

Table 1-8: County-Wide Household Languages

Jurisdiction	# Spanish-Speaking Households	% Spanish-Speaking Households	# Limited-English Households	% Limited-English Households	# Other Language Households
Unincorporated Santa Cruz County	6,929	12.3%	719	1.3%	90
City of Capitola	511	10.0%	49	1.0%	0
City of Scotts Valley	319	5.9%	12	0.2%	0
City of Watsonville	7,719	48.9%	2,363	15.0%	0
Santa Cruz County (Total)	**18,325**	**17.2%**	**3,354**	**3.1%**	**90**

Source: ACS 5-Year, 2018-2023

1.4.3.6 Agricultural Workers

Agricultural workers may be particularly vulnerable during a hazard event, especially those who are non-English speaking, working outdoors, or living in temporary worker housing. These characteristics significantly increase exposure to—and compound impacts from—hazards such as extreme heat and wildfire smoke. Further, drought and flood events can damage or destroy crops, causing economic impacts across the agricultural sector and putting agricultural workers at higher risk of poverty and displacement.

The Santa Cruz County Agricultural Commissioner issued a report in June 2025 indicating that agricultural production directly employed 7,231 persons in Santa Cruz County 2023. This employment figure includes a wide range of production-related jobs, not just growing and harvesting. Fruit farming, especially of berries, is the largest agricultural sector in the county, followed by greenhouse, nursery, and floriculture (i.e., flowers and other ornamentals). The California Employment Development Department estimated there were 7,800 workers in the "farm" sector as of June 2025.

The agricultural industry and the workers within it are primarily concentrated in the Pajaro Valley. There is also an agricultural presence in the Davenport area. This area is also home to a significant Hispanic population and large number of limited-English households, many of which are agricultural workers. These characteristics increase overall vulnerability to hazard events due to cultural and language barriers in communicating about risk, preparedness, and available resources.

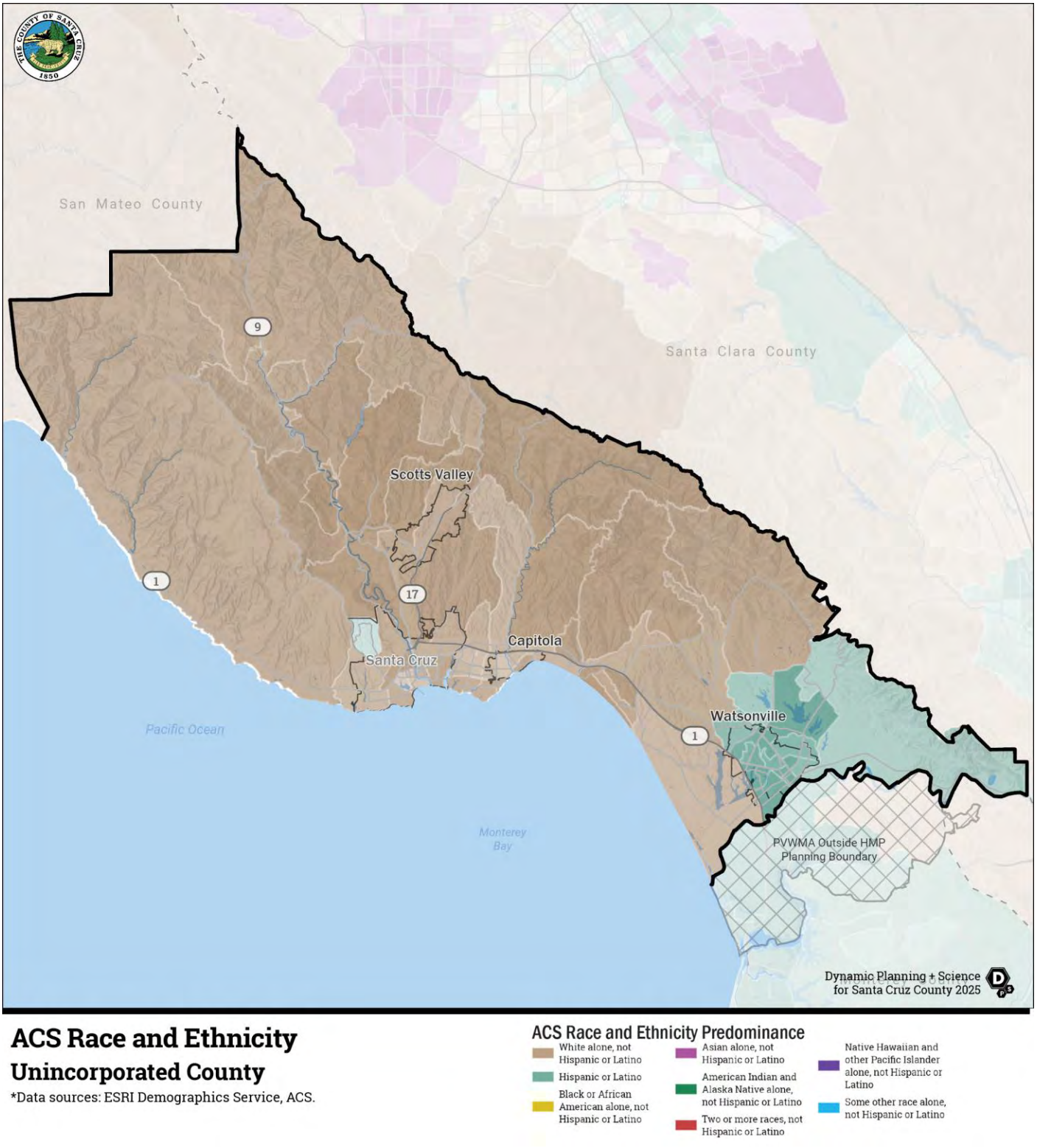


Figure 1-11: County-Wide Race and Ethnicity Predominance Map

Source: ACS 5-Year, 2018-2023

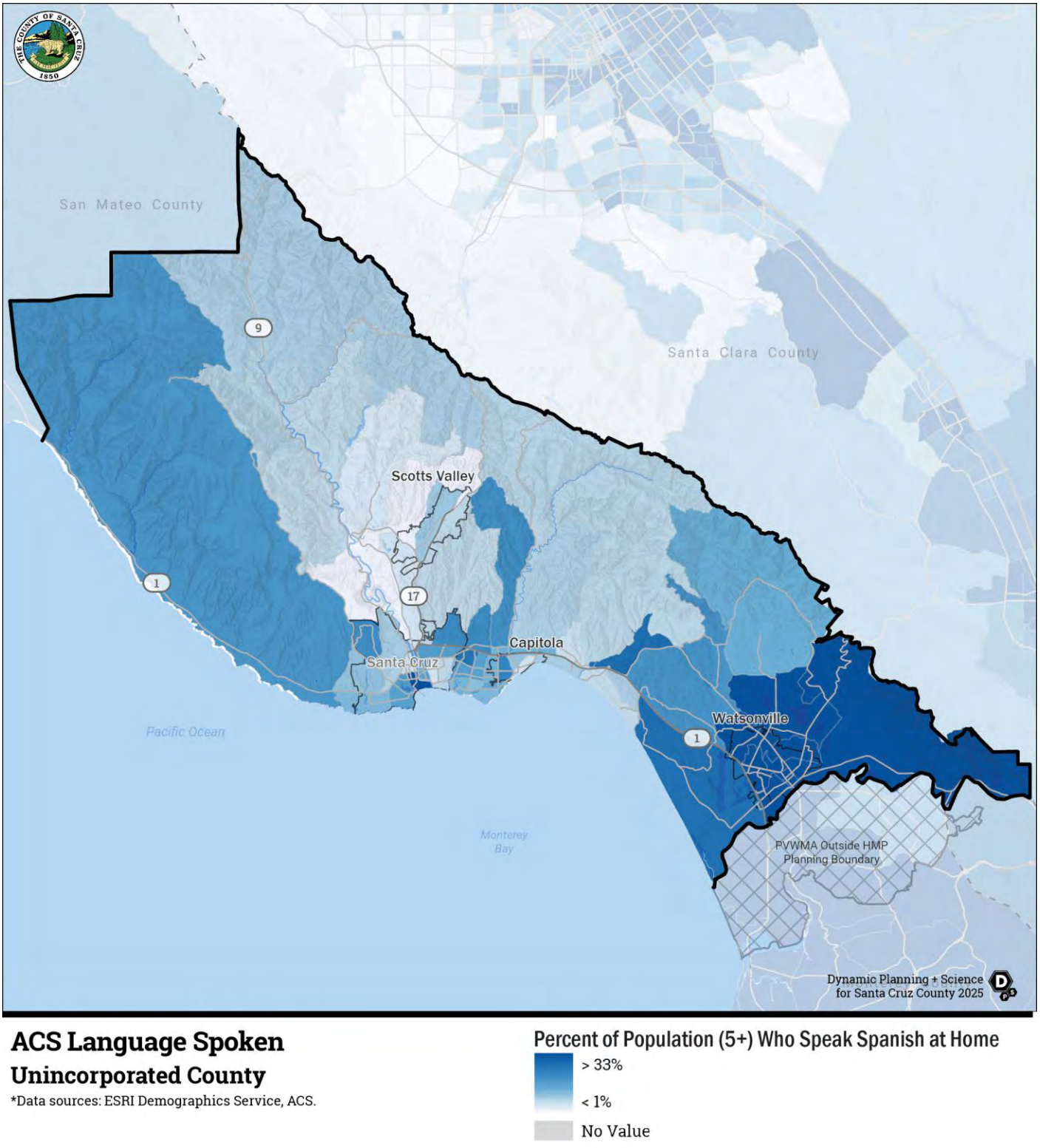


Figure 1-12: County-Wide Percentage of Spanish-Speaking Population Map

Source: ACS 5-Year, 2018-2023

1.4.3.7 Social Vulnerability Index (SVI)

The U.S. Centers for Disease Control (CDC) developed the Social Vulnerability Index (SVI) to quantify social vulnerability. The SVI ranks Census Tracts, Census County Divisions, or other appropriate statistical divisions based on sixteen variables across four key themes: socioeconomic status, housing and transportation, racial and ethnic minority status, and household characteristics. The SVI measures a community's ability to prepare for and recover from hazardous events. This composite index provides a percentile ranking, with those statistical divisions in the 90th percentile or above identified as having the highest social vulnerability to public health emergencies and natural hazard events.

A map of Santa Cruz County's SVI is provided in Figure 1-13. The greatest social vulnerability is present in the southern portion of the county, in the Pajaro Valley and City of Watsonville, where the SVI is greater than 0.75. Additionally, areas in and around the Cities of Santa Cruz and Capitola have higher social vulnerability than more rural, mountainous regions of the county.

Santa Cruz County's SVI highlights disparities in housing and transportation that disproportionately impact lower-income populations, rural residents, and agricultural worker communities. In Santa Cruz County, these vulnerabilities are shaped by geographic isolation, limited affordable housing, and reliance on personal vehicles for mobility in some areas.

1.4.4 Economy

Hazard events can have a significant impact on the economy of a region, including lost jobs and unemployment following the disaster. Loss of agricultural production and tourism impacts are particularly significant in Santa Cruz County, given that these industries account for approximately 20% of all jobs in the county.

According to the California Employment Development Department, in June 2025 there were close to 112,000 jobs in all industries in Santa Cruz County. Table 1-9 shows the number of jobs in the county within the top ten industries as of June 2025.

Despite being the second smallest county by geographical size in California, agriculture accounts for a significant portion of the Santa Cruz County economy. A 2025 report issued by the Santa Cruz County Agricultural Commissioner indicated that agriculture contributed over $1.5 billion to the county's economy in 2023. (Santa Cruz County, 2025) The report also indicated that the agricultural industry contributed to one in 18 jobs in the county that same year. Santa Cruz is one of the leading counties for berry production, with strawberries, raspberries, and blackberries accounting for approximately $384 million in production value in 2023. (*Id.*)

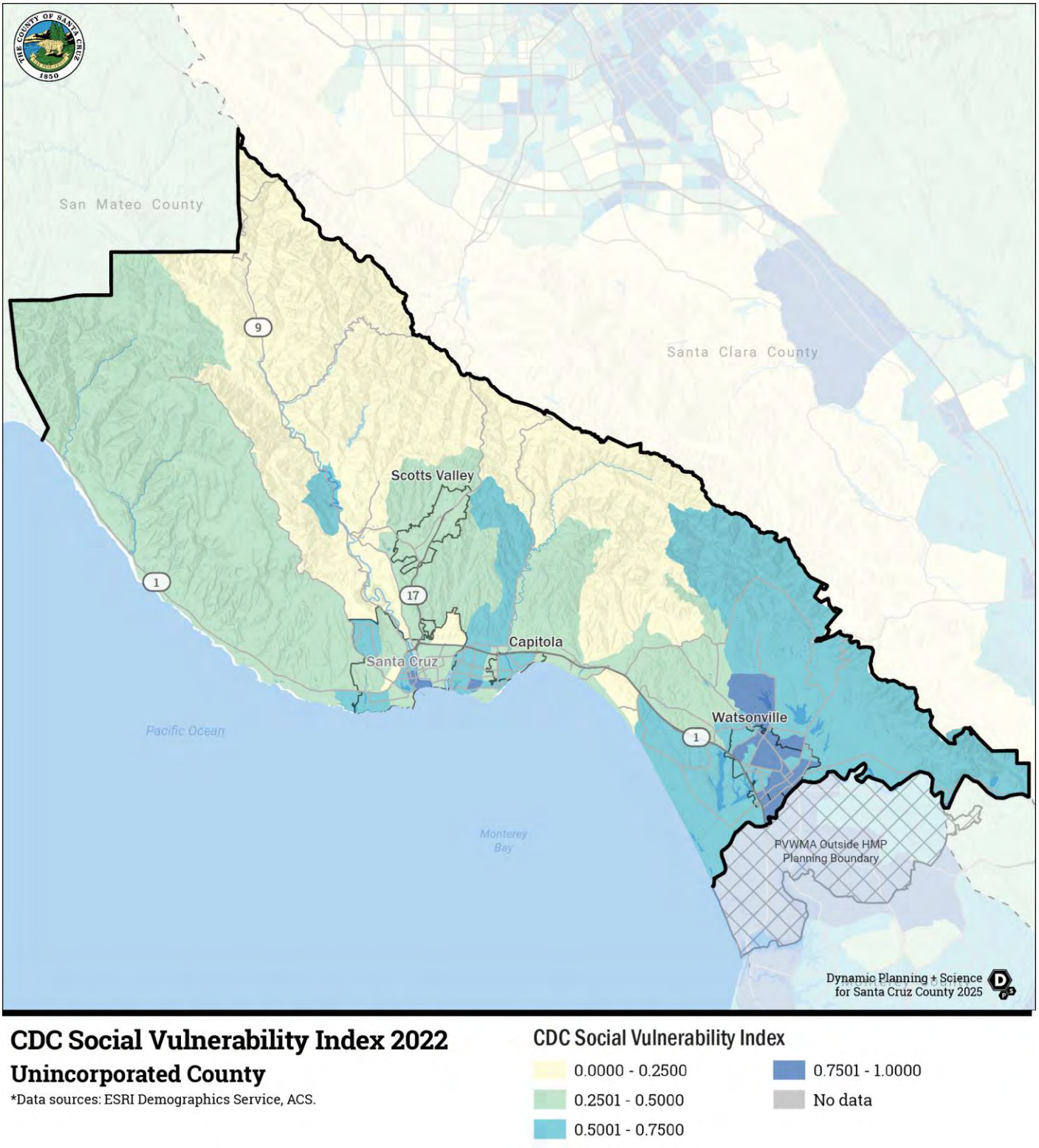


Figure 1-13: County-Wide Social Vulnerability Index (SVI) Map

Source: ACS 5-Year, 2018-2023

Table 1-9: County-Wide Jobs in Top Ten Industries

Industry	# of Jobs
Government	20,600
Private Education and Health Services	20,000
Trade, Transportation, and Utilities	15,200
Leisure and Hospitality	14,700
Professional and Business Services	9,400
Manufacturing	8,000
Farm	7,800
Mining, Logging, and Construction	5,000
Financial Activities	3,300
Information	700

Source: California Department of Employment Development, 2025.

According to Visit Santa Cruz, tourism is a more than $1.1 billion industry in Santa Cruz County. (Visit Santa Cruz, 2019) Average travel expenditures are more than $600 per trip or $150 per day. The average travel group size is five people, and the length of stay is 2.4 nights. Santa Cruz County tourism originates primarily from the San Francisco Bay Area and the Central Valley regions. (*Id.*)

Industries susceptible to deleterious effects of natural and human caused disasters include trade, transportation, and utilities; leisure and hospitality; farm; and mining, logging, and construction. Collectively, these three industries account for more than 38% of the jobs in Santa Cruz County and, if any one is disrupted by a major hazard event, it would have far-reaching impacts on the county-wide community.

1.4.5 Growth Trends

Understanding population, housing, and employment growth is essential for assessing hazard vulnerability and planning for long-term resilience in Santa Cruz County. Growth patterns influence where people live, how infrastructure is developed, and the extent to which new or existing development may be exposed to hazards such as flooding, wildfires, earthquakes, and coastal storms. The Association of Monterey Bay Area Governments (AMBAG) provides official long-range growth projections for the County and its four cities, which are used by local jurisdictions to guide land use and hazard mitigation planning. These projections, shown in Table 1-10 through Table 1-12, illustrate anticipated changes in population, housing, and employment between 2023 and 2050 and serve as a foundation for evaluating how future growth intersects with hazard-prone areas. Importantly, these trends must be considered within the framework of Measure J,

the County's voter-approved growth management policy, and the California Coastal Act, both of which shape where and how new development can occur.

As shown in Table 1-10, Santa Cruz County's total population is expected to grow by around 18,000 persons between 2023 and 2050. Most of the population growth is expected to occur in the City of Santa Cruz and is largely attributable to planned enrollment growth at the University of California Santa Cruz. Capitola is expected to add approximately 1,800 more people, Scotts Valley is anticipated to add over 1,300 people, and Watsonville is projected to add more than 1,400 people. The unincorporated county is shown as having a decline in population between 2023 and 2030 but then steadily growing again due to shifting age demographics.

Table 1-10: County-Wide Population Growth Projections

Jurisdiction	Projected Population					
	2023	2030	2035	2040	2045	2050
Unincorporated Santa Cruz County	128,159	126,990	127,679	127,747	128,139	128,568
City of Capitola	9,558	10,070	10,635	11,029	11,262	11,395
City of Santa Cruz	62,939	68,057	71,343	74,839	75,583	75,950
City of Scotts Valley	11,872	12,322	12,603	12,887	13,094	13,235
City of Watsonville	50,820	51,475	51,835	52,005	52,180	52,251
Santa Cruz County (Total)	**263,338**	**268,914**	**274,095**	**278,258**	**280,258**	**281,399**

Source: AMBAG, 2025

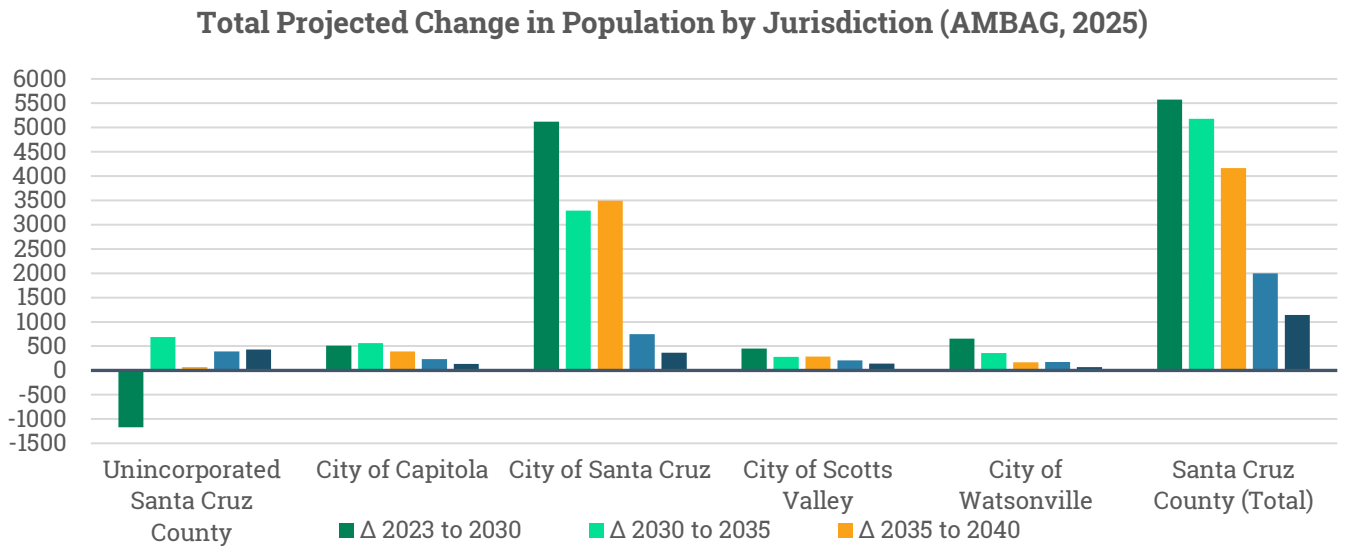


Figure 1-14: County-Wide Population Growth/Decline Projections

As shown in Table 1-11 and Figure 1-14, Santa Cruz County's total housing inventory is expected to grow by just under 13,000 dwelling units between 2023 and 2050. Capitola is expected to add approximately 1,200 dwelling units, Scotts Valley is anticipated to add just under 1,100 dwelling units, Watsonville is projected to add more than 1,900 dwelling units, and the unincorporated county is predicted to add more than 3,800 dwellings units. As with population, the City of Santa Cruz is expected to account for the most dwelling unit growth as a result of planned enrollment growth at the University of California Santa Cruz.

Table 1-11: County-Wide Housng Growth Projections

Jurisdiction	Projected Housing Units					
	2023	2030	2035	2040	2045	2050
Unincorporated Santa Cruz County	57,550	58,568	60,005	60,609	61,061	61,380
Capitola	5,507	5,887	6,242	6,491	6,634	6,715
Santa Cruz	24,415	26,441	27,499	28,295	28,918	29,267
Scotts Valley	4,994	5,400	5,643	5,844	5,988	6,088
Watsonville	14,699	15,524	16,000	16,331	16,523	16,642
Santa Cruz County (Total)	**107,165**	**111,820**	**115,389**	**117,570**	**119,124**	**120,092**

Source: AMBAG, 2025

As shown in Table 1-12, Santa Cruz County's total employment is expected to grow by more than 8,000 jobs between 2023 and 2050. Capitola is expected to approximately 500 jobs, Scotts Valley is anticipated to add more than 300 jobs, Watsonville is projected to add just under 1,700 jobs, and the unincorporated county is predicted to add more than 3,000 jobs.

Table 1-12: County-Wide Employment Growth Projections

Jurisdiction	Projected Jobs					
	2023	2030	2035	2040	2045	2050
Unincorporated Santa Cruz County	45,533	47,182	47,601	47,967	48,276	48,547
Capitola	12,169	12,485	12,559	12,622	12,662	12,689
Santa Cruz	43,059	44,196	44,649	45,062	45,417	45,737
Scotts Valley	10,206	10,447	10,484	10,504	10,517	10,525
Watsonville	28,125	29,061	29,234	29,456	29,637	29,804
Santa Cruz County (Total)	**139,092**	**143,371**	**144,527**	**145,611**	**146,509**	**147,302**

Source: AMBAG, 2025

Regional Housing Needs Allocation (RHNA)

The State of California requires every city and county to accommodate its share of housing need through the Regional Housing Needs Allocation (RHNA). For the Sixth Cycle (2023–2031), Santa Cruz County and its participating jurisdictions must collectively plan for 9,243 new housing units, distributed as shown in Table 1-13. Meeting these targets is critical for addressing housing needs, but it also requires careful consideration of hazard exposure.

Table 1-13: County-wide RHNA by Participating Jurisdiction

Jurisdiction	6th Cycle RHNA (2023–2031) Units
Unincorporated Santa Cruz County	4,634
City of Capitola	1,336
City of Scotts Valley	1,220
City of Watsonville	2,053
Total Allocated Units	**9,243**

Information from this MJHMP provides community development departments with data to evaluate the siting of future housing units, ensuring new construction avoids the most hazard-prone areas. Aligning RHNA implementation with hazard mitigation strategies not only supports the state's housing goals, but also advances long-term community resilience by reducing risk for future residents and protecting investments in affordable and market rate housing alike.

Growth Management

Santa Cruz County's growth is guided by Measure J, a voter-approved growth management policy adopted in 1978. Measure J established both an Urban Services Line (USL) and a Rural Services Line (RSL) to direct new development into incorporated cities and designated unincorporated communities (Figure 1-15). As a result, the majority of projected population, housing, and employment growth will occur within these service lines. The largest areas inside the USL and RSL include the Santa Cruz–Capitola urban area, Scotts Valley, and Watsonville, which continue to serve as the County's primary growth centers.

Coastal Development

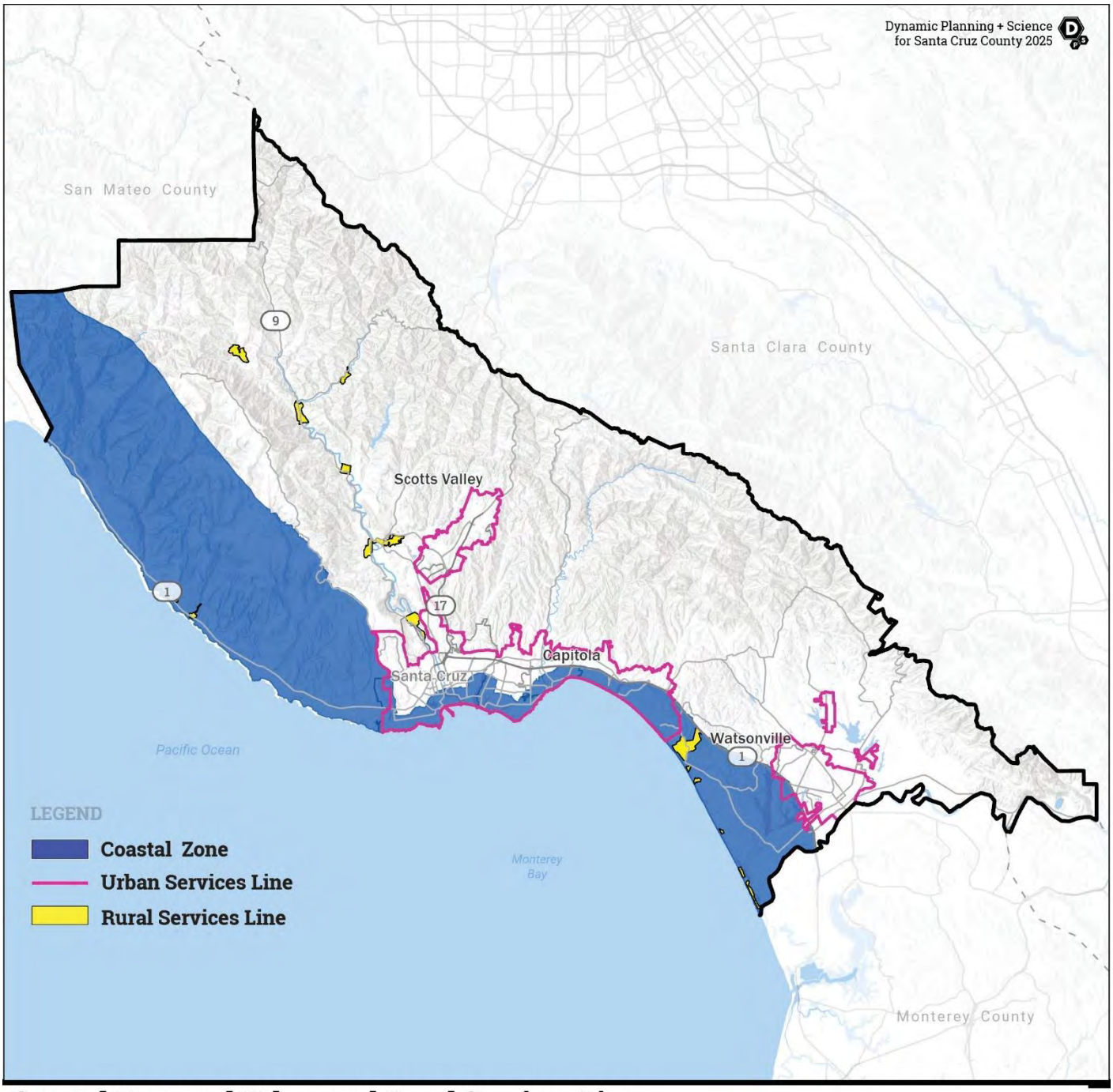
Development in coastal areas is further shaped by the California Coastal Act, which applies to lands within the Coastal Zone (Figure 1-15) and is subject to review by the California Coastal Commission. The Act prioritizes land uses that are dependent on the coast, such as fishing, marine industries, and visitor-serving commercial activities, while restricting development that is not coastal-related. It also places strong emphasis on the preservation of environmentally sensitive habitats. These requirements place additional limits on growth along the coast and help direct new development away from areas that are highly vulnerable to coastal hazards.

Past Development Trends

The past development that most increased hazard risk in Santa Cruz County occurred many decades ago, when homes and infrastructure were constructed without the benefit of modern seismic, flood, and wildfire safety standards. Much of this older housing stock remains in place today, particularly in unincorporated areas, and continues to shape the county's vulnerability profile. In recent decades, however, growth has taken place under a stronger framework of federal, state, and local regulations that require consideration of hazard risk in land use and construction. This has generally reduced the exposure of new development to the most hazardous areas.

Figure 1-15 illustrates where the most recent construction has occurred in the unincorporated county over the last 10 years over based upon assessors' data. The highest concentrations of new development are located along the urban edge near Capitola and Live Oak, with smaller pockets of growth extending inland toward Scotts Valley and the San Lorenzo Valley. Additional development pressure is evident in the Watsonville area, although growth there has been moderated by agricultural land preservation policies.

These patterns confirm that while most hazard-prone areas were established decades ago, new development is subject to far more rigorous planning, zoning, and building standards that significantly reduce exposure to hazards. Current growth along the coast and at the wildland-urban interface is generally safer than past construction, but it still requires careful planning to ensure long-term resilience. Although the county is not experiencing widespread sprawl into the most hazardous areas, the concentration of new housing in already dense coastal and foothill communities underscores the importance of continued investments in infrastructure resilience, defensible space, and public education, as well as the retrofit and maintenance of older structures that remain at higher risk.



Coastal Zone and Urban and Rural Services Line

Source: Santa Cruz County

Figure 1-15: County Coastal Zone and Urban and Rural Services Lines

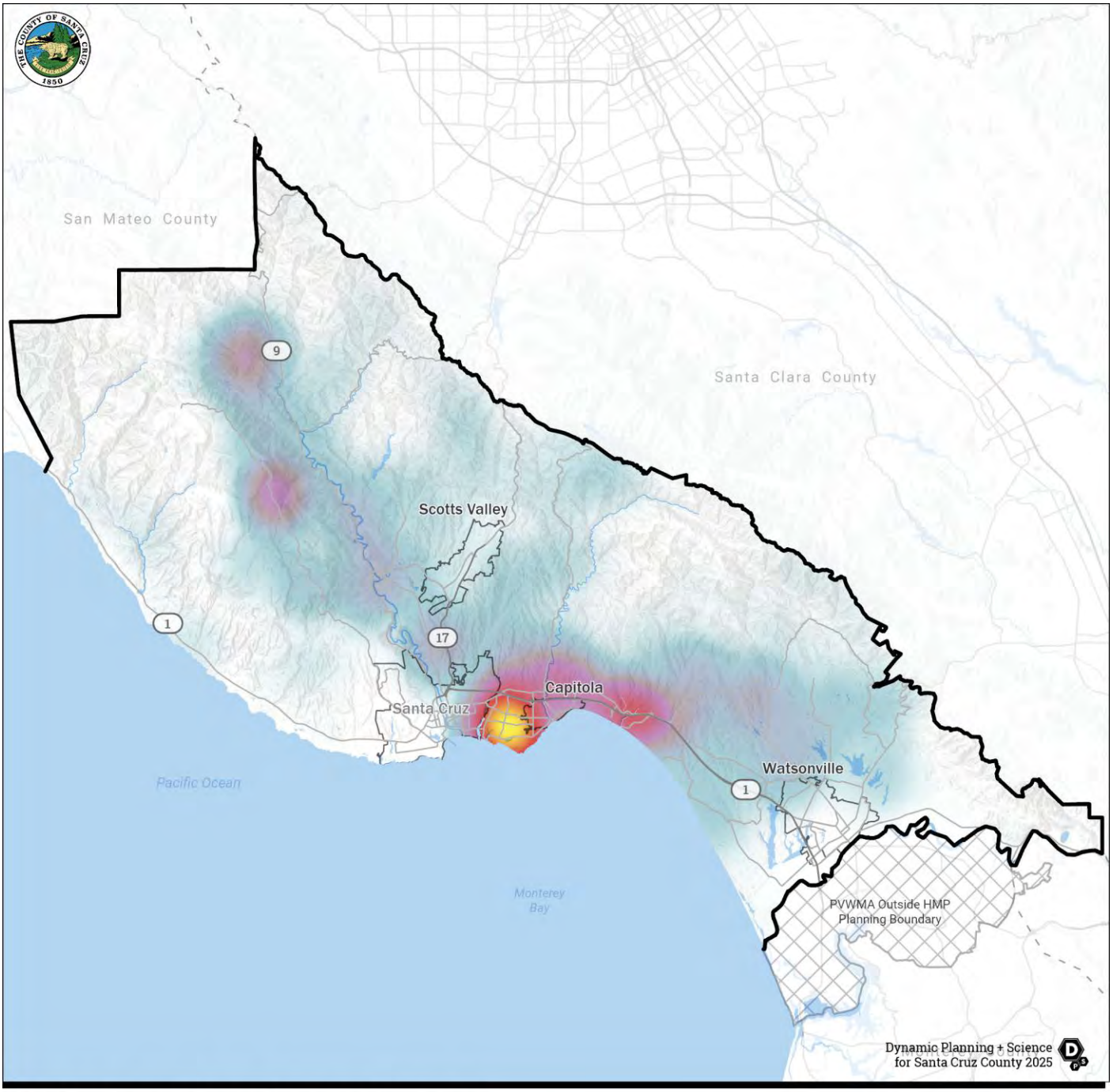


Figure 1-16: Unincorporated County 10 Year Parcel Development Density

1.5 What's New

This section offers an overview of the previous hazard mitigation planning efforts for the planning area and highlights the updates made in this 2025 MJHMP. Mitigation actions from the county's 2021 plan, as well as earlier plans from other jurisdictions, were carefully reviewed, updated, and revised to reflect the new priorities established in this update. Only relevant information and accurate data from the earlier plans were incorporated into the current version.

The following sections describe the comprehensive review and update processes undertaken. The 2025 Santa Cruz County MJHMP profiles ten county-wide hazards, revised from those profiled in the county's 2021 plan.

Wildfire
SECTION 3.2.1



Flood
SECTION 3.2.2



Earthquake
SECTION 3.2.3



Severe Weather
SECTION 3.2.4



Coastal Hazards
SECTION 3.2.5



Slope Failure
SECTION 3.2.6



Dam Failure
SECTION 3.2.7



Drought
SECTION 3.2.8



Extreme Heat
SECTION 3.2.9



Climate Change
SECTION 3.2.10



1.5.1 Background: 2021 vs. 2025

In 2021, Santa Cruz County successfully met all approval requirements outlined in DMA 2000, Title 44 CFR § 201.6, and California SB 379 before officially adopted its 2021 HMP. This plan has been updated from the earlier plan and incorporated elements from the Santa Cruz County 2020 General Plan and other long-range planning mechanisms, as well as those of other participating jurisdictions. Guided by input from hazard mitigation stakeholders, several improvements were implemented for the 2025 update, including:

- **Enhanced Partnerships:** The 2025 plan marks Santa Cruz County's first Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), developed in collaboration with the cities of Capitola, Scotts Valley, and Watsonville, as well as several special districts and local agencies. This broader partnership reflects the reality that hazards cross-jurisdictional boundaries and establishes a stronger foundation for coordinated action.

- **Focused on Priority Hazards:** The hazard mitigation planning teams and key stakeholders continued to prioritize natural hazards over human-caused ones for the 2025 MJHMP update and to exclude soil expansion since it is adequately mitigated by adherence to local building codes.
- **Assessed Local Mitigation Progress:** The 2025 update review progress made in local mitigation efforts since the adoption of previous plans, ensuring continuity and identifying areas for improvement.
- **Incorporated Climate Change and Adaptation:** While the 2021 Local Hazard Mitigation Plan (LHMP) incorporated climate change considerations, the 2025 MJHMP update has been carefully aligned with the latest FEMA and California Office of Emergency Services (Cal OES) guidelines, which emphasize the integration of climate change considerations into hazard mitigation planning. Given the increasing impact of climate change on natural hazards, the updated plan includes comprehensive strategies to address these evolving risks and ensures that climate adaptation and resilience measures are prioritized. This includes assessing the potential impacts of climate change on the frequency and intensity of hazards such as wildfires, floods, and severe weather. The plan also identifies vulnerable populations and critical infrastructure that may be disproportionately affected by climate-related events.
- **Aimed for State and Local Funding:** The plan update acknowledges recent changes in federal funding mechanisms for hazard mitigation by re-aligning the strategy to also target more state and local sources.

These updates reflect a strategic approach to focus resources on the most critical natural hazard threats facing Santa Cruz County while leveraging collaborative efforts and monitoring progress to enhance community resilience and hazard preparedness.

Participating Jurisdictions

This 2025 MJHMP represents the very first joint hazard mitigation planning effort conducted by the county and other local jurisdictions. Some of the participating jurisdictions had existing hazard mitigation plans from previous years. Although many of the jurisdictions have played the role of key stakeholder in past planning efforts, this MJHMP is their first adopted plan. Table 1-14 tracks local jurisdictions that participated in this 2025 MJHMP (or that may participate in the future) and notes the adoption year of their current or previous plan.

Table 1-14: Participating Jurisdictions Tracker

2025 MJHMP Participating Jurisdiction	Previous / Current Plan Year
Local Governments	
Santa Cruz County	2021
City of Capitola[1]	2020
City of Scotts Valley	-
City of Watsonville[1]	2020
Special Districts and Agencies	
Soquel Creek Water District	-
Scotts Valley Water District	-
Pajaro Valley Water Management Agency	-
Resource Conservation District of Santa Cruz County	-
Santa Cruz Port District	-
Cabrillo College[1]	2020

[1] – Jurisdiction previously developed its own stand-alone hazard mitigation plan. With this update cycle, stand-alone plans are being discontinued, and jurisdictions will instead recognize and adopt the Santa Cruz MJHMP.

1.5.2 Mitigation Activities

During the 2025 update process, all mitigation actions from jurisdictions' previous hazard mitigation plans or other organized efforts underwent a thorough review to assess their relevance and potential for future implementation. Each action was evaluated based on its feasibility and alignment with current priorities. Some actions were deemed integral to the MJHMP update process or lacked sufficient detail for local implementation, resulting in their exclusion from this update. Additionally, significant changes were made to other mitigation actions based on updated risk assessments, expanded detail, or adjustments to implementation strategies reflecting current practices or community priorities.

Adjustments to existing mitigation actions that are ongoing or pending from previous plans and remain pertinent are included alongside newly identified actions in the mitigation action plans, including the county's action plan in Table 4-1 and Table 4-2. For the county's previous actions, TABLE contains more specific status updates.

Information regarding mitigation actions specific to other participating jurisdictions can be found in their jurisdictional annex in Volume 2.



Figure 1-17: CruzAware

Source: Santa Cruz County

1.5.2.1 County-Wide Successes Since 2021

The guiding principles, goals, objectives, and many of the mitigation actions outlined in previous hazard mitigation plans have been effectively implemented through ongoing projects, programs, and planning efforts. These successful mitigation activities have resulted in substantial reductions in hazard risks to life and property and significantly enhancing overall emergency response capacity. This section highlights exemplary policies, programs, and projects specific to Santa Cruz County that have achieved notable risk reduction or enhanced hazard resiliency.

CruzAware Alert and Notification System

Santa Cruz County launched CruzAware in 2023 to enhance emergency communication capacity (Figure 1-17). CruzAware is a modern community alert platform developed with Santa Cruz Regional 9-1-1 to replace the outdated CodeRED system. The platform has improved message delivery, accessibility, and public engagement for both emergency and non-emergency notifications.

New Grants & Grant-Funded Projects

Since 2021, Santa Cruz County has advanced a wide range of initiatives through new grant awards and funding partnerships that directly support hazard mitigation, climate adaptation, and community resilience. These investments reflect the County's proactive approach to securing external resources to address local needs and strengthen long-term capacity.

In 2021, the county also advanced drinking water equity and resilience through the Safe and Affordable Funding for Equity and Resilience program and the California Department of Water Resource's Urgent Drinking Water Grant. Administered by the Environmental Health Department, these funds have supported

household water quality testing, bottled water assistance, and treatment device distribution, as well as the creation of a comprehensive Geographic Information System (GIS) database of private wells and targeted outreach for underserved communities. Additional recent funding sources include:

- **County Coordinator Program (California Fire Safe Council / CAL FIRE):** which strengthened local partnerships, expanded emergency preparedness outreach, and addressed barriers to scaling wildfire fuel reduction.
- **Emergency Watershed Protection Program (EWPP):** administered by the Natural Resources Conservation Service (NRCS), which has funded streambank stabilization projects following the 2023 atmospheric river storms.
- **Hazard Mitigation Grant Program (HMGP):** award supporting evacuation route fuels treatment, reducing wildfire risk along key corridors.
- **Building Resilient Infrastructure and Communities (BRIC):** Phase 1 award, which is supporting early design and permitting for wildfire risk reduction.

In the area of sanitation and water infrastructure, the County has also implemented multiple grant-funded projects for the Davenport Sanitation District—a special district within the Community Development and Infrastructure (CDI) Department's Public Works Special Services Division. While this and other special districts under county jurisdiction did not formally participate in this MJHMP, they were represented on the county's Planning Team and their infrastructure is included in the county's critical infrastructure inventory as a part of the Risk Assessment. None of the districts would be direct applicants to HMA; rather, the county functions as a fiscal sponsor and direct Cal OES subapplicant.

Two significant water projects were recently completed in Davenport:

- The **Davenport Water Storage Tank Project**, funded with a $3.4 million grant, constructed two storage tanks providing 720,000 gallons of treated water storage.
- The **Davenport Water Tank Rehabilitation Project**, funded with a $556,000 Department of Water Resources grant, repaired an existing tank and added new process piping to provide 135,000 gallons of backup raw water storage for treatment.

Looking ahead, a $405,000 Proposition 1 grant administered by the Integrated Regional Water Management program will partially fund a project in 2026 to replace the deteriorated 50,000-gallon Equalization Tank at the Boulder Creek wastewater treatment plant with a tank with over twice the storage capacity.

Storm Monitoring System

To strengthen flood preparedness and watershed resilience, the Santa Cruz County Flood Control and Water Conservation District made improvements to its storm monitoring system. The system includes 18 District-maintained rain and/or stream monitoring sites, a flooded road warning system at Beach and Shell Roads, an X-band radar sensor, and the OneRain platform, which provides real-time flood data from District- and partner-maintained monitoring sites to emergency managers and the public.

Key improvements included the integration of several additional partner-maintained monitoring sites into OneRain in 2020 and 2021, enhancing debris flow awareness after the CZU fires. In 2022, the X-band radar was installed and was utilized by emergency managers during the 2022–2023 storm season. Additionally, and in support of monitoring efforts for the 2022-2023 storms, staff developed several new dashboards within the OneRain platform to visualize rainfall and stream levels in real-time. In 2023, the District partnered with United States Geological Survey (USGS) to reactivate the Aptos Creek station in Nisene Marks State Park, now delivering real-time stream data annually from October through April.

Situational Awareness for Emergency Response (S.A.F.E.R)

Santa Cruz County's S.A.F.E.R. (Situational Awareness for Emergency Response) is a dynamic, all-hazards situational awareness tool built by the county's GIS team. It integrates real-time data feeds from ArcGIS Online, web links, and social media platforms into a unified, interactive dashboard designed to support emergency managers, first responders, and the public with timely and actionable information. Embedded within the County's Emergency Operations Plan, the S.A.F.E.R. application helps stakeholders monitor evolving conditions during disasters such as storms, floods, and wildfires in Santa Cruz County.

Newell Creek Pipeline Project

The City of Santa Cruz is advancing a significant infrastructure project to enhance water supply reliability by relocating a 3.7-mile section of the aging Newell Creek Pipeline. Originally constructed in 1960, this 18- to 27-inch diameter pipeline conveys water from the Loch Lomond Reservoir to the Graham Hill Water Treatment Plant and has become increasingly vulnerable to storm damage, particularly within Henry Cowell Redwoods State Park (Figure 1-18). To address this, the pipeline will be rerouted under Graham Hill Road using a new 24-inch diameter pipe to avoid environmentally sensitive areas and reduce geologic risks. Construction is slated to begin in 2025 and is expected to extend over approximately two years.



Figure 1-18: Erosion Around the Newell Creek Pipeline

Source: Santa Cruz County

The City of Santa Cruz serves 100,000 customers, including residents of the unincorporated area, and the project includes interties with neighboring water agencies, which will enhance resilience for the county-wide water resources portfolio.

Pajaro River at Watsonville Project

In March 2023, a levee breach along the Pajaro River inundated nearly 300 homes, displacing residents in Pajaro and causing widespread damage in surrounding agricultural areas. Recognizing the need for enhanced flood protection in the Pajaro Valley, federal, state, and local agencies launched the Pajaro River at Watsonville Project in 2021, a nearly 14-mile levee improvement effort managed by the U.S. Army Corps of Engineers in partnership with the Pajaro Regional Flood Management Agency. (This agency is discussed in detail in Section 3.2.2) With an estimated cost of $600 million, the project is fully funded and will strengthen flood protection for Watsonville, Pajaro, and nearby farmlands. Construction began in 2024 and is expected to continue into the next decade, with initial work focused on Corralitos Creek—the most at-risk reach of the river. Until the new system is complete, however, the Pajaro Valley remains vulnerable to flooding during major storm events. Ongoing operations and maintenance of the levee system is funded by Pajaro Regional Flood Management Agency (PRFMA) member agencies and community assessments.

1.5.2.2 Plan Integration

Plan integration is the process of linking hazard mitigation strategies and data with other local and regional planning mechanisms, such as general plans, capital improvement programs, emergency operations plans, and regulatory codes. A planning mechanism refers to any policy, plan, program, or regulatory tool that guides development, land use, infrastructure, or emergency management. By weaving hazard mitigation into these tools, communities ensure that risk reduction becomes part of everyday decision-making rather than a stand-alone effort.

For Santa Cruz County, the 2021 Local Hazard Mitigation Plan (LHMP) has already been used to inform and strengthen a variety of planning mechanisms. Hazard background information, risk mapping, and exposure analysis have been incorporated into updates of land use policies, infrastructure planning, and emergency management procedures. This integration demonstrates progress toward reducing vulnerability and highlights how hazard mitigation is becoming a cross-cutting element of County planning. The following list provides specific examples of how the 2021 MJHMP was incorporated into other planning mechanisms and which components were most often applied:

- **2022 Santa Cruz County Climate Action and Adaptation Plan:** Climate change-driven hazards risk assessment, vulnerabilities, potential impacts, and mitigation strategy.
- **2023 Santa Cruz County General Plan Housing Element:** Hazard risk assessments, vulnerabilities, and potential impacts affecting housing development and security.
- **2022 San Mateo-Santa Cruz County Community (CZU) Wildfire Protection Plan:** Wildfire hazard risk assessment, vulnerabilities, potential impacts, and mitigation strategy. A plan update will begin in 2026.

This 2025 MJHMP will similarly be incorporated into local and regional planning documents, such as the general and capital improvement plans of participating jurisdictions. For example, the plan will be referenced in and used to help update the Santa Cruz County General Plan Public Safety Element as well as the county's Climate Action and Adaptation Plan.

Section 3.5.1 in Volume 1 outlines county planning mechanisms that have been and will be integrated with the MJHMP and the process for such integration in more detail. Each jurisdictional annex in Volume 2 also describes which planning mechanisms that jurisdiction has been integrating and will integrate with the updated plan, as part of its capabilities assessment.

1.5.3 New Tools & Risk Assessment Methodology

Santa Cruz County strengthened this plan by using new research methods and web-based information systems. Geographic Information Systems (GIS) mapping and analysis provided participating jurisdictions with the tools to develop more comprehensive data sets than those used in previous planning efforts. A web-based mapping tool, called the Risk Assessment Mapping Platform (RAMP), was used to assist and engage the planning teams in this analysis through a highly interactive approach. In addition, an application called the Mitigation Action Support Tool (MAST) was also used to record, update, and track described vulnerabilities (referred to herein as "problem statements") and to create associated mitigation actions. See Sections 2.2 and 2.3 for more information about the new tools and methodology used in developing the mitigation plan and strategy, including RAMP and MAST.

Section 2. Planning Process

This section outlines each stage of the planning process used in the development of this MJHMP. The planning process serves as the framework for document creation and adheres to FEMA's recommended four-step hazard mitigation planning approach.



It is essential to recognize that the MJHMP is a dynamic, living document shaped by community engagement. The participatory planning process holds equal importance to the finalized plan itself, fostering community awareness and ensuring that mitigation efforts are integrated into everyday decision-making processes.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000 (DMA 2000) (42 USC § 5165), mandates the development of hazard mitigation plans to mitigate the impact of natural disasters. These plans are prerequisites for certain non-emergency disaster assistance through FEMA's Hazard Mitigation Assistance (HMA) programs, with regulatory guidance provided in 44 CFR § 201.6 *et seq*.

FEMA outlines the following four major planning steps:

- **Step 1:** Organize Resources
- **Step 2:** Assess Risk
- **Step 3:** Develop a Mitigation Strategy
- **Step 4:** Adopt and Implement the Plan

Santa Cruz County and all other participating jurisdictions adhered to this FEMA four-step planning process and added two additional steps, modeling the process on FEMA's HMP guidelines. The resulting six-phase planning process shown in Figure 2-1 was followed for the development of the 2025 MJHMP. In conjunction with and supplementary to the four-step process, Santa Cruz County and the City of Watsonville conducted the 10-step planning process pursuant to Community Rating System (CRS) program requirements. These additional steps are further described in the county's Flood Hazard Profile (Section 3.2.2) and the city's jurisdictional annex in Volume 2 of this plan.

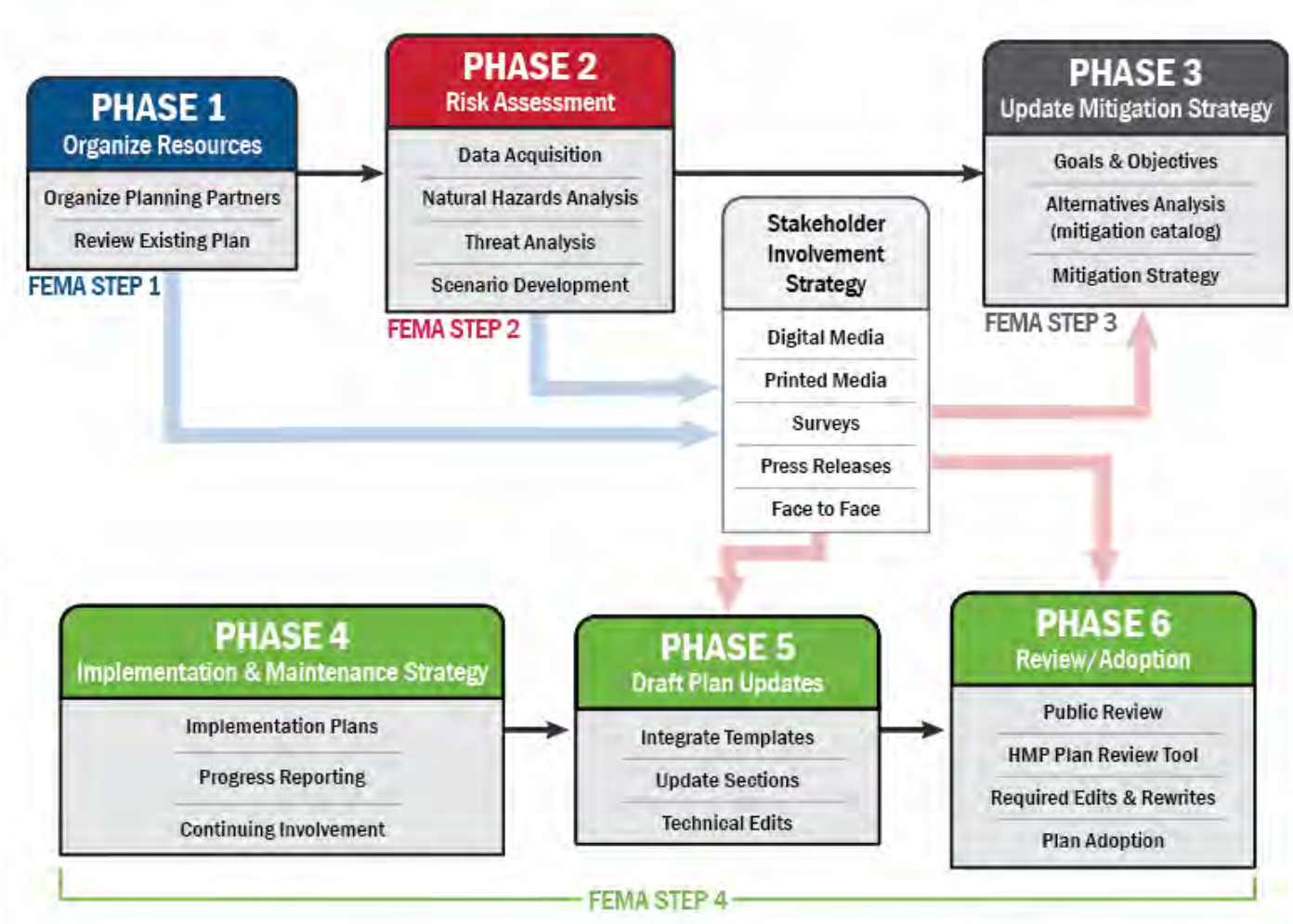


Figure 2-1: Planning Process Breakdown

Multi-Jurisdictional Planning Process

Multi-jurisdictional hazard mitigation planning offers many benefits, such as increased coordination and efficiency in planning and implementation efforts. At the same time, each jurisdiction has specific hazards and specific mitigation actions that must be individually addressed. This MJHMP balances the benefits of a comprehensive, coordinated approach to hazard mitigation with the specific realities of individual participating jurisdictions. Multi-jurisdictional plans are contemplated under FEMA regulations at 44 CFR § 201.6(4).

While Volume 1 of this MJHMP documents the overall planning process, county-wide elements of the plan, and Santa Cruz County-specific information, Volume 2 documents each participating jurisdiction's unique hazards, assessment of vulnerabilities and capabilities, and mitigation strategy in a stand-alone annex. Each jurisdictional annex was created following the same planning process Santa Cruz County followed, as detailed in this section.

STEP 1: Organize Resources

The first step of the MJHMP planning process was organizing resources, consisting of engaging a wide range of stakeholders with local expertise, conducting extensive community outreach and engagement, reviewing relevant existing documents, and gathering and organizing information. Santa Cruz County and the other participating jurisdictions, assisted by the Consultant Team, used a highly interactive and comprehensive approach in organizing their available resources to ensure that this MJHMP is a living document and will evolve with community needs and priorities. Being flexible in this way will enhance the plan's effectiveness in mitigating local hazards and building resilience in communities across the county.

These various resources are summarized and organized in the following sections of the plan:

- **People and Expertise:** Section 2.1.1
- **Public and Stakeholder Engagement:** Section 2.1.2 and Appendix B
- **Planning Process Library:** Section 2.1.3

STEP 2: Assess the Risk

In accordance with FEMA requirements, the county-wide Hazard Mitigation Planning Team and each of the jurisdictional planning teams identified and prioritized the natural hazards affecting Santa Cruz County as a whole and each participating jurisdiction individually and assessed the vulnerabilities to those identified hazards. Results from the risk assessment aided subsequent identification of appropriate mitigation actions. The real substance of the risk assessment is found in Section 3, with supplemental jurisdiction-specific assessments provided in the annexes of Volume 2.



Figure 2-2: Members of the County-Wide HMPT Engaged in Mitigation Strategy Development

The process and support tools used, and the results of the assessment, are described in the following sections:

- **Priority Hazards:** Section 3.1
- Vulnerabilities to Specific Hazards (Hazard Profiles): Section 3.2
- **Vulnerability Assessment Methodology:** Section 2.2.2 and Appendix A
- **RAMP (Risk Assessment Mapping Platform):** Section 2.2.1

STEP 3: Develop a Mitigation Strategy

The MJHMP was prepared in accordance with DMA 2000 plan update requirements, the California Office of Planning and Research (OPR), and FEMA's mitigation planning guidance. This document provides an explicit strategy and blueprint for reducing potential losses identified in the risk assessment based on existing authorities, policies, programs and resources, and participating jurisdictions' abilities to expand on and improve these existing tools. MJHMP development included identifying goals, assessing existing capabilities, reviewing the 2021 MJHMP goals, and identifying new mitigation actions. The substance of the mitigation strategy is detailed in 3.4.4 of Volume 1 for Santa Cruz County and in the Volume 2 jurisdictional annexes for all other participating jurisdictions.

This process, the tools used to support it, and the county results are found in the following sections of Volume 1:

- **Hazard Problem Statements:** Sections 2.3.1 and 3.2 (within each Hazard Profile)
- **Mitigation Goals:** Sections 2.3.2 and 4.1
- **Assessment of Current Capabilities and Future Opportunities:** Sections 2.3.3 and 3.4.4
- **Mitigation Action Plan:** Sections 2.3.4 and 0
- **Mitigation Action Support Tool (MAST):** Section 2.3.4.4

STEP 4: Adopt & Implement the Plan

Once the risk assessment and mitigation strategy were completed, information, data, and associated narratives were compiled into the MJHMP. The following sections describe the finalization, adoption, implementation, and update processes for the plan:

- **Adoption Proceedings:** See Executive Summary
- **Monitoring, Evaluating, and Updating:** Section 2.4.1
- **Plan Integration:** Section 2.4.2

2.1 Organizing Resources

Santa Cruz County and other participating jurisdictions organized local people and expertise into four main levels and engaged stakeholders throughout the planning process. At the forefront of this effort was the Steering Group, with support from a Consultant Team and county-wide Hazard Mitigation Planning Team (HMPT), as well as the individual jurisdictions' planning teams. In addition, Santa Cruz County engaged with a wide variety of stakeholders and members of communities across the county to inform the development of this 2025 MJHMP. Some participating jurisdictions delegated most outreach efforts to the county while others chose to conduct additional public and stakeholder engagement activities on their own. A summary of the county's public and stakeholder engagement strategy and the results thereof are provided in Section 2.1.2 and documented in Appendix B.

2.1.1 People & Expertise

Organizing the people and expertise needed to develop this MJHMP was implemented by the Steering Group for this plan, which consisted of at least one lead contact for each participating jurisdiction. A six-step stakeholder engagement strategy was used to conduct this complex process within the larger organization task, as detailed in Section 2.1.2. Part of this engagement strategy included inviting neighboring jurisdictions and other regulatory agencies to share information and to discuss public safety and hazard mitigation concerns and priorities in a variety of capacities. Non-governmental stakeholders within the community, such as business leaders, civic groups, academia, non-profit organizations, major employers, and other interested parties, were also invited to participate. While engagement with some of these stakeholders and the general public is described and documented in Section 2.1.2 and Appendix B, this section discusses those stakeholders who took an active and vital role in shaping this MJHMP from beginning to end.

In addition to the Steering Group, the development of this plan involved a county-wide HMPT, ten smaller jurisdictional planning teams (one for each participating jurisdiction), many Key Stakeholders, and a Consultant Team that facilitated and documented the process. All the members of these groups are listed in Table 2-3 through Table 2-5 at the end of this section.



Steering Group

The Steering Group was at the core of the MJHMP planning process and was integral to ensuring its success. This group consisted of staff-level leadership and decision-makers from each participating jurisdiction and worked closely with the Consultant Team throughout the development of this MJHMP, providing direction on the process and major plan components, including public and stakeholder engagement and the plan's future implementation and maintenance. Members of the Steering Group are listed in Table 2-3 and also doubled as members of the planning teams, which are discussed below and in the individual annexes in Volume 2.

Planning Teams

The development of this MJHMP was heavily influenced by the county-wide Hazard Mitigation Planning Team (HMPT or "Planning Team") as well as the smaller, internal planning teams of individual jurisdictions (e.g., City of Capitola Planning Team). These teams consisted of members of the Steering Group, jurisdictional staff, and other stakeholders with specific local expertise to contribute to the planning process from each participating jurisdiction. Planning team members represented public and private organizations within and adjacent to Santa Cruz County that possess knowledge about and regulatory authority over local public safety, development, and hazard conditions, issues, and priorities. They also served as data stewards and liaisons to the greater community.

Planning team members were chosen for their relevant expertise to develop a deeper understanding of hazard vulnerabilities, vulnerable and special needs populations, jurisdictional capabilities, and overall hazard perceptions across the planning area. Each planning team member was responsible for

communicating the direction and status of the planning effort to respective departments and constituents of each jurisdiction and was expected to represent the perspectives of their jurisdiction on the county-wide HMPT. Table 2-3 provides a list of the county-wide HMPT members. The planning team members for each participating jurisdiction are provided in their respective Volume 2 annex. The responsibilities of the HMPT and jurisdictional planning team members generally included:

- Participation in four structured HMPT meetings
- Participating in two jurisdiction-specific breakout meetings
- Contribution of detailed information and assisting in fulfilling data requests, when appropriate
- Input during the hazard selection and prioritization process
- Development of the county-wide and jurisdictional mitigation strategies
- Review and comment on administrative drafts of the plan
- Coordination and promotion of community and stakeholder engagement efforts

Steering Group & Planning Team Meetings

The Steering Group, HMPT, and individual jurisdictional planning teams met throughout the development of the 2025 MJHMP, including a kickoff meeting, four county-wide team meetings, two series of jurisdictional breakout meetings, and a pre-public draft release check-in facilitated by the Consultant Team. Table 2-1 provides details of the county-wide Steering Group and HMPT meetings, including dates, topics discussed, and input goals.

County breakout meetings are summarized in Table 2-2, and details of other jurisdictional breakout meetings are located in the annexes of Volume 2. In addition to the two breakout meetings facilitated by the Consultant Team, the Santa Cruz County Planning Team also conducted a series of focus area breakout meetings, building upon Breakout Meeting #2 to further develop their mitigation strategy. These focus areas included climate resilience, water resources, fire and law enforcement, and public infrastructure.

Meeting documentation, including agendas, sign-in sheets, hazard maps, PowerPoint presentations, minutes, and other relevant handouts, are provided in Appendix B. Not all HMPT members necessarily attended all group meetings; some participated by reviewing draft documents or assisting in individual jurisdictional vulnerability assessments, with public outreach, or at other stages of the process.

Table 2-1: County-Wide Steering Group and Planning Team Meetings

Meeting & Date	Agenda / Topics	Goals / Key Inputs
County-Wide Steering Group Kickoff Meeting December 13, 2024	▪ Welcome and introductions ▪ Review roles and responsibilities ▪ Review project schedule and scope of work ▪ Review expectations of Steering Group, county-wide HMPT, and jurisdictional planning teams	▪ Shared project understanding ▪ Confirm roles and responsibilities

Meeting & Date	Agenda / Topics	Goals / Key Inputs
County-Wide HMPT Meeting #1 January 27, 2025	▪ Welcome and introductions ▪ Hazard mitigation background and basic information ▪ Overview of funding opportunities ▪ Review of previous county plan and changes ▪ Mitigation successes in past 5 years ▪ Community engagement strategy ▪ Project schedule and expectations	▪ Shared project understanding ▪ Confirm roles and responsibilities ▪ Success stories ▪ Data requests
County-Wide HMPT Meeting #2 March 27, 2025	▪ Meeting #1 takeaways ▪ Community engagement progress and results ▪ Review of previous county plan mitigation goals and strategy ▪ Exercise #1: Risk Assessment (review of county-wide hazard risks and exposure and vulnerable populations) ▪ Introduction to Risk Assessment Mapping Platform (RAMP) ▪ Exercise #2: Hazard Prioritization (discussion of county-wide priority hazards and concerns) ▪ Project schedule, updates, and prep for Breakout Meetings Series #1	▪ Identify county-wide hazard problems and areas of concern ▪ Identify and prioritize county-wide hazards ▪ Community engagement volunteers
Jurisdictional Planning Team Breakout Meetings Series #1 April – May 2025		
County-Wide HMPT Meeting #3 June 2, 2025	▪ Meeting #2 and Breakout Meetings Series #1 summary and findings ▪ Community engagement progress and results ▪ Alignment of county-wide mitigation strategy with updated risk assessment and community input ▪ Exercise #2: Hazard Prioritization (finalization of county-wide priority hazards) ▪ Project schedule, updates, and prep for Breakout Meetings Series #2	▪ Consensus on plan goals ▪ Identify county-wide mitigation actions ▪ Community engagement volunteers
Jurisdictional Planning Team Breakout Meetings Series #2 July – August 2025		
County-Wide HMPT Meeting #4 August 4, 2025	▪ Meeting #3 and Breakout Meetings Series #2 summary and findings ▪ Exercise #5: Strategy Development (discussion of collaboration opportunities and county-wide mitigation actions) ▪ Plan maintenance and implementation discussion ▪ Project schedule, updates, and next steps	▪ Consensus on priority county-wide hazard problems ▪ Identification of collaborative county-wide mitigation actions ▪ Consensus on plan maintenance and implementation

Meeting & Date	Agenda / Topics	Goals / Key Inputs
County-Wide Steering Group Check-In Meeting September 22, 2025	▪ Schedule updates ▪ Administrative draft feedback ▪ Final public survey results ▪ Mitigation action prioritization framework ▪ County-wide mitigation strategy ▪ Public draft review and Cal OES submission	▪ Consensus on strategy alignment with public feedback ▪ Consensus on prioritization criteria ▪ Consensus on county-wide strategy

Table 2-2: Santa Cruz County Breakout Meetings

Meeting & Date	Agenda / Topics	Goals / Key Inputs
County-Wide Steering Group and HMPT Meetings #1 & #2 January 27, 2025 – March 27, 2025		
SCC Planning Team Breakout Meeting #1 May 7, 2025	▪ County-wide HMPT meetings #1 and #2 recaps ▪ Community engagement progress and results ▪ Risk assessment and community vulnerability ▪ Demographics and vulnerable populations ▪ Overview of jurisdiction-specific hazard risks and exposure ▪ Introduction to Risk Assessment Mapping Platform (RAMP) ▪ Jurisdiction-specific hazard risk ranking exercise ▪ Project schedule updates and next steps	▪ Consensus on jurisdiction-specific priority hazards ▪ Identify capabilities and potential mitigation actions ▪ Community engagement volunteers
County-Wide HMPT Meeting #3 June 2, 2025		
SCC Planning Team Breakout Meeting #2 July 30, 2025	▪ Breakout Meeting #1 and HMPT #3 recaps ▪ Review capabilities assessment ▪ Review areas of concern and define problem statements ▪ Principles of effective mitigation strategies and actions, and mitigation alternatives ▪ Refine and align jurisdiction-specific mitigation actions exercise ▪ Project schedule updates and next steps	▪ Consensus on jurisdiction-specific capabilities ▪ Consensus on jurisdiction-specific areas of concern ▪ Consensus on priority mitigation actions and collaboration opportunities ▪ Community engagement volunteers
County-Wide HMPT Meeting #4 August 4, 2025		
SCC Planning Team Breakout Meeting #2.5: Climate Resilience, Parks & Facilities Focus August 13, 2025	▪ Continuation of Breakout Meeting #2 work ▪ Mitigation strategy development specifically for climate resilience, parks, and facilities	▪ Strategy development for focus area

Meeting & Date	Agenda / Topics	Goals / Key Inputs
SCC Planning Team Breakout Meeting #2.5: Water Resources & Planning Focus August 13, 2025	▪ Continuation of Breakout Meeting #2 work ▪ Mitigation strategy development specifically for water resources and planning	▪ Strategy development for focus area
SCC Planning Team Breakout Meeting #2.5: Fire, Law & Communications Focus August 14, 2025	▪ Continuation of Breakout Meeting #2 work ▪ Mitigation strategy development specifically for fire, law enforcement, and communications	▪ Strategy development for focus area
SCC Planning Team Breakout Meeting #2.5: Stormwater, Wastewater & Roads Focus August 20, 2025	▪ Continuation of Breakout Meeting #2 work ▪ Mitigation strategy development specifically for stormwater, wastewater, and roads	▪ Strategy development for focus area

Key Stakeholders

Key Stakeholders serve as liaisons to the greater community outside of the Steering Group and planning teams. These are people representing local, regional, state, and federal agencies involved in hazard mitigation or with the authority to regulate development, such as neighboring jurisdictions. Also included were representatives of local businesses, academia, community-based organizations and non-profits, and members of the public. Outreach with Key Stakeholders consisted of email correspondence, informal interviews, and community events, which covered topics such as basic project information, primary hazard concerns and front-line experience, needs and challenges of vulnerable populations, coordinating engagement events, and advertising for the project. Organizations and individuals invited to participate in the planning process as Key Stakeholders are listed in Table 2-4.

Many of the Key Stakeholders engaged represent agencies and organizations that support underserved communities and vulnerable populations, providing channels to those who are often most impacted by hazard events and with the least resources for disaster preparedness, response, or recovery. In particular, Key Stakeholders offered opportunities to engage with community members through known and trusted networks and voices, ensuring that people in all corners of the county and from all backgrounds were provided with opportunities to influence the 2025 MJHMP and mitigation strategy. Key Stakeholders were engaged by Santa Cruz County and the Consultant Team on behalf of each participating jurisdiction at various points during the planning process. These efforts and the findings thereof are summarized in Section 2.1.2 and documented in Appendix B.

Consultant Team

Santa Cruz County enlisted Dynamic Planning + Science (DP+S) as the Consultant Team to assist in the development of the 2025 MJHMP. DP+S was chosen based on its extensive experience and expertise in helping public sector entities with developing hazard mitigation plans. DP+S staff facilitated the planning process from start to finish, collected and analyzed local data, produced materials for and conducted meetings and public engagement events, and developed drafts of the MJHMP for review. The Consultant Team members are listed in Table 2-5 and consisted of a variety of hazard mitigation, data analysis, and certified planning professionals.

Table 2-3: Members of Steering Group and All Planning Teams

Note: Jurisdiction leads in the Steering Group are presented in light blue rows with bold names.

Name	Title	CRS Expertise	Department
Cabrillo College			
Julia Charles	Director, Federal/State Emergency Grants	Emergency Management/Public Safety	President's Office
Luis Toledo	Assistant Director	Public Works/Drainage	Facilities Plan & Plant Operations
Brian Gallagher	Environmental Health & Safety Manager	Environmental Protection/Public Health	Cabrillo College
City of Capitola			
Jessica Kahn	Public Works Director	Public Works/Drainage	Department of Public Works
Katie Herlihy	Community Development Director	Planning/Zoning	Community Development Department
Chloe Woodmansee	Assistant to the City Manager	Public Information	City Manager
Eric Martin	Building Official	Building/Code Enforcement	Community Development Department
Jamie Goldstein	City Manager	Elected Official	City Manager
Jorge Melgoza	Building Services Tech	Building/Code Enforcement	Community Development Department
Matt Kotila	Operations Maintenance Supervisor	Public Works/Drainage	Department of Public Works
Nikki Bryant	Director	Parks and Recreation	Community Services and Recreation
Robin Woodman	Building Official	Building/Code Enforcement	
Sarah Ryan	Chief of Police	Emergency Management/Public Safety	Police Department
City of Scotts Valley			
Carly Blanchard	Senior Administrative Analyst	Public Works/Drainage	Public Works Department
Mindy Esqueda	Senior Administrative Analyst	Public Works/Drainage	Public Works

Name	Title	CRS Expertise	Department
Rodolfo Onchi	Public Works Director/City Engineer	Engineering/Public Works	City of Scotts Valley
Brian Froelich		Emergency Management/Public Safety	
Erin Collins	Interim Deputy Fire Marshal	Emergency Management/Public Safety	Scotts Valley Fire Protection District
Jayson Rutherford	Captain	Public Works/Drainage	Police Department
Jeremy Long	Wastewater Division Manager	Planning/Zoning	Public Works
Josh Wozynski	Associate Planner	Elected Official	Planning
Mali LaGoe	City Manager	Public Works/Drainage	
Matthew Spencer-Cooke	Maintenance Division Manager	Building/Code Enforcement	Public Works
Nelson Alfaro	Building Official	Planning/Zoning	Building Department
Taylor Bateman	Community Development Director	Public Works/Drainage	Community Development
City of Watsonville			
Courtney Lindberg	Public Works Director	Public Works/Drainage	Public Works & Utilities Department
Leslie Rios	Environmental Project Manager	Environmental Protection/Public Health	
Toto Vu-Duc	Environmental Projects Manager	Environmental Protection/Public Health	Public Works & Utilities
Brian Fulgoni	Police Captain	Emergency Management/Public Safety	Watsonville Police Department
Charles Hanley	GIS Coordinator	Public Information	Innovation and Technology
Christopher Gregorio	Assistant Engineer / CRS Coordinator	Engineering	Public Works & Utilities
Cristy Cassel	Conservation Outreach Program Manager	Public Information	Public Works & Utilities
Danielle Green	Assistant Director of Public Works	Public Works/Drainage	Public Works & Utilities
David Rodriguez	Assistant Police Chief	Emergency Management/Public Safety	Police
Ivan Carmona	Planner	Planning/Zoning	Community Development
Joseph DeSante	Chief Building Official	Building/Code Enforcement	Community Development
Justin Meek	Interim Community Development Director	Planning/Zoning	Community Development
Matt Orbach	Assistant Community Development Director	Planning/Zoning	Community Development
Matthew Orbach	Principal Planner	Public Information	Community Development

Name	Title	CRS Expertise	Department
Michelle Pulido	Public Information Officer	Public Information	Police
Nancy Porto	Community Outreach Coordinator	Elected Official	Public Works & Utilities
Nick Culabaquib	Deputy City Manager	Public Works/Drainage	City Manager
Raunel Zavala	Sr. Administrative Analyst	Emergency Management/Public Safety	
Rudy Lopez Sr.	Division Chief/Fire Marshal	Elected Official	Fire
Tamara Vides	City Manager	Emergency Management/Public Safety	City Manager
Tom Avila	Division Chief - Operations	Public Works/Drainage	Fire
Pajaro Valley Water Management Agency (PV Water)			
Brian Lockwood	General Manager / Hydrogeologist	Environmental Protection/Public Health	
Casey Meusel	Associate Hydrologist	Environmental Protection/Public Health	
Isabel Magana	Water Resources Technician	Environmental Protection/Public Health	Operations Division
Marcus Mendiola	Water Conservation & Outreach Specialist	Public Information	Administrative Division
Shinehah Bigham	Operations and Maintenance Manager	Public Works/Drainage	
Resource Conservation District (RCD) of Santa Cruz County			
Cameron McDonald	Ag Program Assistant	Environmental Protection/Public Health	
Lisa Lurie	Executive Director	Public Information	
Angela Gruys	Senior Program and Communications Specialist	Public Information	RCDSCC
Matt Abernathy	Forest Health Senior Program Specialist	Environmental Protection/Public Health	
Santa Cruz County			
Clare Peabody	Emergency Services Analyst	Emergency Management/Public Safety	Office of Response, Recovery & Resilience
Dave Reid	Director	Emergency Management/Public Safety	Office of Response, Recovery & Resilience
Alex Sandoval	Road Superintendent	Public Works/Drainage	Department of Community Development and Infrastructure
Amanda Gullings	Emergency Services Analyst	Emergency Management/Public Safety	Santa Cruz County Office of Response Recovery and Resilience
Annie Puckett	Administrative Analyst	Public Information	

Name	Title	CRS Expertise	Department
Antonella Gentile	Resource Planner – Flood Control	Planning/Zoning	Department of Community Development and Infrastructure
Carolyn Burke	Assistant Director of Public Works	Public Works/Drainage	Department of Community Development and Infrastructure
David Carlson	Resource Planner	Planning/Zoning	Department of Community Development and Infrastructure
David Sanford	Agricultural Commissioner	Environmental Protection/Public Health	Agricultural Commissioner
Elissa Benson	Assistant CAO	Elected Official	County Administrative Office
Elizabeth Byrd	Senior Human Services Analyst	Public Health	Human Services Department
Erin McCarthy	Water Resource Planner	Environmental Protection/Public Health	
Gregory Benson	Senior Health Services Mgr / MHOAC	Environmental Protection/Public Health	Health Services Agency
Jacob Ainsworth	Undersheriff	Emergency Management/Public Safety	Sherriff's Office
Jessica deGrassi	Resource Planner	Planning/Zoning	
Leah MacCarter	Resource Planner (CRS Program Manager)	CRS Coordination / Planning/Zoning	Department of Community Development and Infrastructure
Lun Wang	Health Equity Officer	Public Health	Health Services Agency
Matt Johnston	Principal Planner – Environmental Planning	Planning/Zoning	Department of Community Development and Infrastructure
Matt Machado	Deputy CAO / Director of CDI	Elected Official / Planning	Department of Community Development and Infrastructure
Matt Price	GIS Manager	Public Information	Information Services Department
Megan Reilly	Deputy Director	Public Works/Drainage	General Services
Nicholas Baldridge	Lieutenant	Emergency Management/Public Safety	Sheriffs Office
Rob Tidmore	Park Planner	Parks and Recreation	Parks and Community Services
Jed Wilson	Unit Chief / Fire Chief	Emergency Management/Public Safety	CalFire/Santa Cruz Fire
Sierra Ryan	Water Resources Program Manager	Environmental Protection/Public Health	Department of Environmental Health
Tammie Weigl	Director	Public Information	Information Services
Tatiana Brennan	Administrative Analyst	Public Information	OR3

Name	Title	CRS Expertise	Department
Santa Cruz Port District			
Holland MacLaurie	Port Director	Public Works/Drainage	
Blake Anderson	Harbormaster	Emergency Management/Public Safety	
Carl Wulf	Facilities Maintenance & Engineering Manager	Public Works/Drainage	
Scotts Valley Water District			
Nate Gillespie	Operations Manager	Public Works/Drainage	
Brody Knutson	Engineering Technician	Engineering	
David McNair	General Manager	Public Information / Public Works	
Soquel Creek Water District			
Shelley Flock	Water Resources Manager	Environmental Protection/Public Health	
Skyler Murphy	Water Resources Planner	Environmental Protection/Public Health	
Connor Pollard	Associate Engineer	Engineering	
Melanie Mow Shumacher	General Manager	Public Works/Drainage / Elected Official	
Nicholas Emmert	Operations & Maintenance Manager	Public Works/Drainage	
Taj Dufour	Engineering Manager	Engineering	

Table 2-4: Key Stakeholders

Name	Title
American Red Cross	
Patsy Gasca	Disaster Program Manager
AT&T	
Bettye Saxon	Director of Community and Government Relations
Nathan Cobos	
CalFire	
Jed Wilson	Deputy Chief
CalOES	
Joelle Mehner	
City of Santa Cruz	
Anne Hogan	Wastewater System Manager
David McCormice	Asset and Development Manager

Name	Title
Erika Smart	Public Information Officer
Heidi Luckenbach	Water Department Director
Kevin Crossley	Assistant Director / City Engineer
Larry Imwalle	Homelessness Response Manager
Lee Butler	Director of Planning
Meredith Albert	OES Manager
Richard Westfall	GIS Manager
Rob Oatey	Fire Captain
Sarah Easley Perez	Principal Planner
Tiffany Wise-West	Sustainability + Resilience Officer
Tony Elliot	Director
Community Bridges	
Patricia Zamora	Program Coordinator
CSU Monterey Bay	
Peyton Higgs	
Fire Safe Council of Santa Cruz County	
Lauren Moody	Communications, Education and Outreach Coordinator
Sally Mack	Board Member
Pajaro Regional Flood Management Agency	
Forrest Revere	Environmental Program manager
Santa Cruz Public Library	
Laura Whaley	Assistant Library Director
University of California Santa Cruz	
Courtney Trask	Storm Water Programs Manager
Erin Johnson	Deputy Fire Marshal
USDA	
Rich Casale	
Visit Santa Cruz County	
Denise Harris	Director of Operations
Watsonville Wetlands Watch	
Jonathan Pilch	Director, Operations and Restoration Programs
Zayante Fire Protection District	
Jeff Maxwell	Fire Chief

Table 2-5: Consultant Team Members

Name	Title	Project Role
Ethan Mobley, AICP	Owner / Principal Planner	Project Manager
Brian Greer	Co-Owner / Data Visualization Manager	GIS Lead / Data Analyst
Raini Ott, AICP, CFM	Principal Planner	Assistant Project Manager / Outreach Lead / Hazard Mitigation Planner
Cory Schreiner	Fire Prevention Service Manager	Hazard Mitigation Planner
Alex Krebs	Data Visualization Associate	GIS Assistant / Data Analyst
Grant Gruber	Senior Technical Writer	Hazard Mitigation Planner
Christopher Velasco	Senior Planner	Outreach Assistant / Hazard Mitigation Planner
Cassidy Baumann	Planning Associate	Outreach Assistant / Hazard Mitigation Planner / Data Analyst

2.1.2 Public & Stakeholder Engagement

Stakeholder engagement is a critical component in producing any effective and meaningful public planning process and actionable planning document, and public outreach is also a required component of the MJHMP. (44 CFR § 201.6(c)) As such, it is vital that early and continued engagement is facilitated through a diverse range of mediums to ensure community members, neighboring jurisdictions, and other stakeholders have an adequate opportunity to provide input, especially on the mitigation strategy.

The public and stakeholder engagement efforts deployed for this plan exceed the minimum state and federal requirements for outreach. But more than that, the engagement strategy was developed, implemented, and refined over the course of the MJHMP update planning process to ensure an abundance of enhanced opportunities for all types of community members to provide input.

By engaging with stakeholders and members of the public at specific points during the process, perspectives from an array of stakeholder categories were integrated throughout the MJHMP rather than being mentioned as an afterthought or an appendix. This extensive public and stakeholder engagement process and the results thereof are summarized in this section and fully documented in Appendix B.

On behalf of all the participating jurisdictions, Santa Cruz County conducted outreach and engagement following a six-step strategy and work plan with support from the Consultant Team, county-wide HMPT, and jurisdictional planning teams. The outreach strategy for this 2025 MJHMP maximized stakeholder input and public involvement throughout the planning process, utilizing a diverse range of channels, mediums, and formats to ensure residents, business owners, and other community members were solicited for input on the plan from start to finish. Other community stakeholders, such as non-profits serving vulnerable populations, were also engaged using a variety of methods.



Implementation of the six-step strategy and work plan was conducted by the Steering Group and consisted of first identifying goals and the timeframe for engagement followed by identifying the planning team members, key stakeholders, tools, and resources to support the effort. Then a work plan was developed to organize the timeframe, teams, key stakeholders, and engagement tools and resources into a usable framework to guide the process toward accomplishing its stated goals. As the process progressed, it was continually assessed for its effectiveness and adjusted accordingly. This adaptive management approach ensured the engagement process supported the three goals identified in step one. In executing this engagement strategy and work plan, Santa Cruz County accomplished the following three goals:

1. Understand public safety and hazard concerns, problem areas, assets, and policy and mitigation priorities on a neighborhood scale, with intentional outreach to socially vulnerable and underserved populations, including Spanish-speaking residents and people with access and functional needs.
2. Provide accessible, inclusive information and tools — offered in multiple languages and formats — to community members, residents, and businesses to increase safety and decrease hazard risk at the private property-level, ensuring engagement with socially vulnerable populations.
3. Collaborate with adjacent communities, special districts, utility providers, and other local and regional regulatory agencies providing public safety services, while prioritizing coordination that supports underserved and socially vulnerable populations.

The overall timeframe for public and stakeholder engagement stretched across the development of the MJHMP, occurring at regular intervals and important junctures. This schedule is illustrated below in Figure 2-3. A summary of engagement efforts outside of the planning team meetings and breakout sessions discussed in Section 2, Step 1, is provided in Section , including the many community outreach events hosted across the county. The various tools, resources, and efforts undertaken, as well as the feedback gained from stakeholders and community members, are summarized in the following sections. Appendix B fully documents the outreach process, as required by FEMA, Cal OES, and the California Office of Planning and Research (OPR).

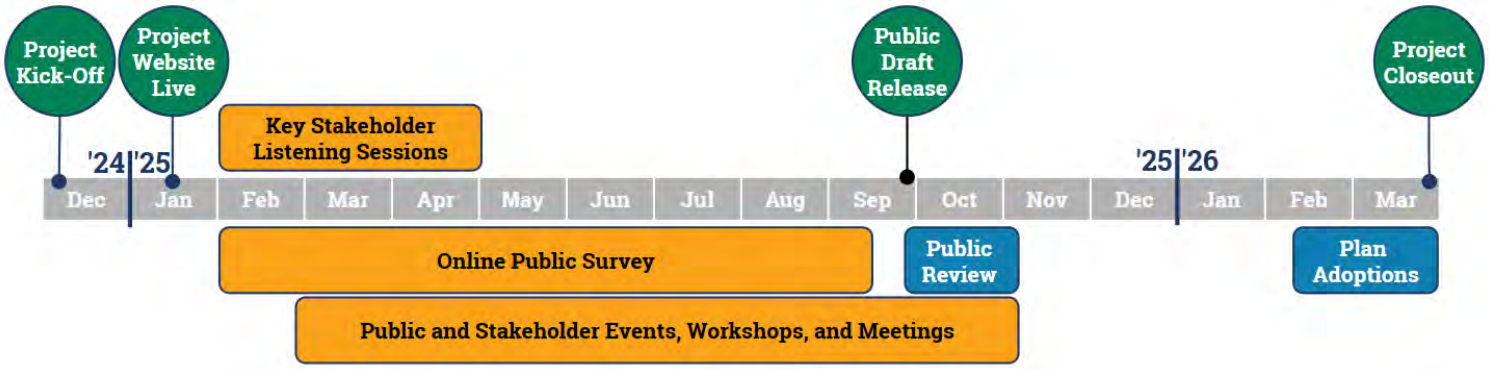


Figure 2-3: Overview of Public and Stakeholder Engagement Schedule

2.1.2.1 Outreach Tools & Resources

Members of the public possess valuable local knowledge about their communities and can help identify assets and problem areas, describe issues of concern, narrate safety threats and hazard history, prioritize proposed mitigation and planning policy alternatives, and provide ideas for continuing public involvement. Many public safety planning goals and hazard mitigation actions also affect private property; meaning that the public should be engaged early and often to understand community priorities and policies that might change. As such, the engagement strategy developed and deployed to support the planning process for this MJHMP used a variety of tools, resources, and methods to reach all segments of the county community and populations within other participating jurisdictions.

More than just informing the public of the plan's development, a good community engagement effort educates the public and motivates them to act. It must also be recognized that equal opportunity to participate does not result in equal participation. In every community, there are those who might otherwise engage but go unheard for various reasons, such as lack of internet access, time constraints, or childcare needs which may inhibit in-person engagement. It was Santa Cruz County's goal to identify and overcome these barriers and achieve equitable participation and meaningfully engage with the local community on their terms. The tools and resources discussed in this section aided in achieving this.

Key Stakeholders

Because public safety and hazard issues are not tied to jurisdictional boundaries, Santa Cruz County consulted with a variety of stakeholders throughout the development of this MJHMP, as described in Step 1 of the planning process in Section 2. This included gathering jurisdictional staff and other stakeholders with specific local expertise to contribute to the planning process and forming the county-wide Hazard Mitigation Planning Team (HMPT) as well as internal planning teams for each jurisdiction. In addition, the county consulted directly with a number of Key Stakeholders that represented a broader range of local and regional agencies, including those that work closely with underserved and vulnerable populations.

Key Stakeholders consisted of people from a variety of public and private organizations within Santa Cruz County and the surrounding region that possess knowledge about local public safety and hazard conditions, issues, and priorities. These included representatives of local businesses, community-based and non-profit organizations, academia, and neighborhood groups (see Table 2-4). While some Key Stakeholders were involved in the HMPT or jurisdictional planning teams, others were engaged through different means, such as emails and project announcements, informal interviews and phone calls ("listening sessions"), meetings, and collaboration on community engagement events. These engagement efforts that took place outside of the formal planning teams are summarized in Table 2-6.

Most importantly, Key Stakeholders that work with vulnerable populations and underserved communities provided critical channels and opportunities to meaningfully engage with those groups. Many of the Key Stakeholders consulted are trusted community figures and leaders, with voices that carry across language, cultural, and socioeconomic barriers to reach those who face some of the greatest risks and challenges in preparing for, responding to, and recovering from hazard events. By engaging with these community voices, Santa Cruz County and the other participating jurisdictions were able to develop more comprehensive mitigation strategies that were not only tailored to local hazard conditions and capacities, but that also addressed some of the most pressing needs of their most vulnerable community members. In this way, Key Stakeholders were central in developing the MJHMP goals and mitigation strategies that will make Santa Cruz County safer and more resilient.

Table 2-6: Summary of Key Stakeholder Engagement

Engagement Effort	Date	Location
Stakeholder Listening Sessions		
Fire Safe Council of Santa Cruz County	February 25, 2025	Virtual
Zayante Fire Protection District	February 26, 2025	Virtual
San Lorenzo Valley Water District	February 27, 2025	Virtual
Encompass Community Services	March 11, 2025	Virtual
Pajaro Regional Flood Management Agency	March 13, 2025	Virtual

Engagement Effort	Date	Location
CAL FIRE	March 21, 2025	Virtual
Community Bridges	April 1, 2025	Virtual
USDA Natural Resources Conservation Service	August 4, 2025	Santa Cruz County Emergency Operations Center, Santa Cruz
Other Stakeholder Engagement Efforts		
Meeting on Multi-Benefit Project for Paulsen Road, College Lake, and South County Park	March 3, 2025	District 5 Office, Watsonville
Regional Water Management Group Meeting	March 24, 2025	Community Foundation Santa Cruz County, Aptos
Santa Cruz County Emergency Management Council	May 15, 2025 September 11, 2025	Santa Cruz County Emergency Operations Center, Santa Cruz
Santa Cruz County Water Advisory Commission	August 6, 2025 October 1, 2025	County Government Center, Santa Cruz

Websites, Social & Other Media

Santa Cruz County and the other participating jurisdictions used their websites, social media platforms, and other media to widely advertise the update of the MJHMP and solicit input from a diverse array of community members. In addition, a project portal was created through the Mitigate Hazards website maintained by the Consultant Team (mitigatehazards.com/santacruzmjhmp), which served and will continue to serve as a centralized project information and file-sharing platform throughout the lifecycle of the plan. This website provides a tool for project management, collaborative content, and for mitigation planning resources.

Project participants from each jurisdiction and Key Stakeholders used the website as a project resource for the duration of the planning process and will continue to have access during the five-year cycle and beyond. The page hosts secure information, including a point of contact database and a mapping application built specifically for mitigation planning called the Risk Assessment Mapping Platform (RAMP). RAMP allows for interactive discovery of the robust risk assessment data that was developed for the MJHMP. It displays facilities and buildings overlaid with natural hazards layers to bring interactivity and individual discovery to the GIS analysis performed for the plan. The website also hosts the Mitigation Action Support Tool (MAST) to help each jurisdiction track and update their mitigation strategy. See Sections 2.2.1 and 2.3.4.3 for more information on RAMP and MAST, respectively.

In addition to internal coordination, the project website played a critical role in community engagement throughout the planning process and documenting public involvement, including for the public survey, engagement events, planning team meetings and breakout sessions, and public review of the draft plan.

Resources such as home-based mitigation measures, background documents, RAMP, links to meeting summaries, and the final plan are available to the public via the website.

Jurisdiction-maintained websites and social media are valuable and authoritative resources for the public that were used in addition to the project website to advertise the planning process and ways for community members to get involved. In general, users were directed from the jurisdiction websites and social media posts to the primary project website to avoid inactive or outdated information. Information on the MJHMP update was distributed through multiple social media platforms, such as Instagram, Facebook, and Twitter (X), using visually-oriented posts tailored to that jurisdiction's audience, including posts in Spanish. Local media outlets, such as local radio, were also used to advertise the update and opportunities to participate.

Alongside general project advertising, these websites, social media platforms, and local media outlets were used to publicize project milestones, the public survey, and community engagement events, as documented in Appendix B. The websites and media listed in Table 2-7 were used in the engagement effort, both county-wide and individually, and links to example advertisements of the 2025 MJHMP are provided.

Table 2-7: Summary of Community Outreach Media Tools

Jurisdiction / Agency	Media Tools Used	Example Links
Key Stakeholders and Other Partner Agencies		
KION News Channel 46	TV	March 2025 News Story
Regeneración	Website, Newsletter	March 2025 Newsletter
Participating Jurisdictions		
Santa Cruz County	Website, Press Release, Facebook, Instagram, Twitter (X), Nextdoor	March 2025 Press Release March 2025 Facebook Post March 2025 Twitter (X) Post
City of Capitola	Website, Facebook, Instagram	City of Capitola Public Works Webpage August 2025 Facebook Post
City of Scotts Valley	Website, Newsletter, Facebook, Instagram	April 2025 Facebook Post June 2025 Newsletter
City of Watsonville	Website, Facebook, Instagram, Twitter (X)	March 2025 Facebook Post
Soquel Creek Water District	Website, Facebook, Instagram, Twitter (X)	March 2025 Facebook Post
Scotts Valley Water District	Website, Facebook, Instagram	March 2025 Facebook Post March 2025 Instagram Post
Pajaro Valley Water Management Agency	Website, Facebook	August 2025 Facebook Post

Jurisdiction / Agency	Media Tools Used	Example Links
RCD of Santa Cruz County	Website, Newsletter, Facebook, Instagram	Spring 2025 Newsletter
Santa Cruz Port District	Website, Facebook, Instagram	April 2025 Facebook Post
Cabrillo College	Website, Facebook, Instagram	

Online Public Survey

A primary tool used in informing the development of this MJHMP was an online survey, which provided an easy and powerful way of gathering qualitative and quantitative data to inform plan preparation. The survey was open to the public between February and September 2025, ending just prior to the release of the public draft for review, ensuring as many responses as possible were collected. The survey was distributed in both English and Spanish and was widely advertised across the county through the websites and other platforms of participating jurisdictions, Key Stakeholders, and partner agencies (Figure 2-4). To incentivize greater public participation, Santa Cruz County offered all survey participants the chance to win a home emergency kit and, in addition, many of the individual participating jurisdictions provided small handouts for taking the survey at community outreach events.



Figure 2-4: Online Public Survey Advertisement in Spanish

A total of 450 responses were received, which are summarized in Figure 2-5 and documented in Appendix B. As intended through a series of 16 questions, the results from the survey were used to gauge community members' knowledge of local hazards, perceptions of different hazards, greatest safety concerns, and mitigation priorities. These results were used to ensure that the priorities of Santa Cruz County and the other participating jurisdictions match those of their respective community members.



Figure 2-5: Highlights from Public Survey Results

Community Outreach Events

Community outreach events were hosted across the county during the development of the MJHMP. In-person public engagement events, and in particular events that leveraged existing community events with large attendance, provided opportunities to go beyond other outreach efforts and directly engage with members of the community who might not have otherwise participated in the planning process. Primarily, these events were coordinated with jurisdictional planning teams and Key Stakeholders and consisted of hosting tables and tents at local famers' and art markets, community fairs, cultural events, and other local gatherings. Many of the leveraged events used to boost engagement brought together wide and diverse populations in relatively central locations within participating jurisdictions and across the county, and each event was widely advertised across multiple platforms (Figure 2-6).

A total of eight community outreach events were conducted during the development of the MJHMP and through the public draft review period, which are summarized in Table 2-8.



Figure 2-6: Strawberry Princess Advertising the Survey at the Watsonville Strawberry Festival

Table 2-8: Summary of Community Outreach Events

Outreach Event	Date	Location
Community Wildfire Preparedness Workshop	March 18, 2025	Scotts Valley Community Center, Scotts Valley
Entrenamiento Gratuito de Preparación para Incendios Forestales (Free Wildfire Preparedness Training)	March 29, 2025	Pajaro Middle School, Pajaro
Cultivating Community: Youth & Family Resource Fair	April 4, 2025	Romo Park, Watsonville
Earth Day Santa Cruz	April 19, 2025	Pacific Avenue, Cooper Street and Abbott Square Market, Santa Cruz
Watsonville Earth Day 2025 Celebration	April 27, 2025	Watsonville Plaza, Watsonville
Corralitos Wildfire Resiliency Fair	June 28, 2025	Corralitos Community Center, Corralitos
Watsonville Strawberry Festival	August 2, 2025	Downtown Watsonville, Watsonville
Capitola Makers Market	August 3, 2025	Capitola Esplanade, Capitola

Interactive Meeting & Outreach Materials

Santa Cruz County and the other participating jurisdictions, with assistance from the Consultant Team, conducted a series of county-wide and jurisdiction-specific planning team meetings (see, Step 1) and many community outreach events, as describe in this section. All of these meetings and most of the events were arranged in ways that were conducive to interactive engagement, providing enhanced opportunities for participants to learn and express their perceptions and priorities through a variety of tools.

The stakeholder and community feedback collected through interactive methods is documented in Appendix B. Examples of the tools and meeting materials that were used to create these engagement opportunities include:

- **Take-Home Cards:** Cards with important project information, such as the project website URL and a QR code to the online survey or public draft review page (Figure 2-7).
- **Balancing Act Exercise:** Using scales, collection jars, and dried beans, community and stakeholder feedback was collected on one of the most difficult choices in developing the mitigation strategy: whether to focus on supporting individual mitigation efforts or aim funding toward community-wide actions. This forced community members and stakeholders to weigh the pros and cons of prioritizing a major mitigation project vs individual property owner mitigation (Figure 2-7). Preliminary results could be seen at events by attendees, and the beans were tallied prior to the public draft release. The final result was heavily skewed toward funding community-wide mitigation.



Figure 2-7: Interactive Outreach Materials at Capitola Makers Market (Clockwise from Bottom Left: Take-Home Cards, Earthquake Kit Demo, and Balancing Act)

- **Earthquake Kit Demonstration:** Using a custom display board, several in-home earthquake safety measures were made available for members of the public to interact with. The display board featured different ways to secure furniture and heavy objects like TVs, as well as museum putty to help keep fragile valuables such as glassware in place (Figure 2-7).
- **Feedback Boards:** Prompts on large boards with mapping information or visualized data were provided to help collect stakeholder feedback. Planning team members were able to respond to the information on the board by attaching stickers or post-it notes, or by writing, drawing, or highlighting directly on it.

Public Review Period

After a complete draft of the MJHMP was developed based on the updated risk and capabilities assessments and on feedback from stakeholders and the public, community members across all participating jurisdictions were provided an opportunity to review and comment on the proposed hazard mitigation plan and strategy. This public review period was open for 21 days, between September 29 and October 20, 2025, and widely advertised through community outreach events and jurisdiction websites, social media, and other media platforms.

Reviewers were directed to the project website where the draft MJHMP was provided in a collaborative PDF format to allow quick and easy live commenting. In addition, an online commenting form and direct

emailing to the Steering Group via the Consultant Team were offered as options to give input on the draft. All comments received were reviewed and incorporated into the plan as appropriate, as documented in Appendix B.

2.1.2.2 Reaching Underserved Communities & Vulnerable Populations

As discussed in Section 1.4.3 of the Community Profile, there are populations in Santa Cruz County that are disproportionately impacted by hazard events than others, including Spanish-speakers, agricultural workers, seniors, and people with access and functional needs. Recognizing that traditional engagement methods, such as public hearings or submitting comments in emails or letters, are often inaccessible or intimidating ways to participate in the planning process, the engagement strategy for this MJHMP sought input directly from these communities and populations and from trusted voices within them through different means.

Partnering with Key Stakeholders to reach underserved and vulnerable populations through existing community lifelines and organizations was critical to understanding the concerns, needs, challenges, and priorities of these groups across Santa Cruz County. This was aided by the deployment of intentional outreach efforts using accessible and inclusive tools to engage residents in a variety of ways and on their own terms, including:

- **Translation of Materials:** Santa Cruz County translated all engagement materials into both English and Spanish, including content on the project website, the public survey, and social media posts in order to effectively exchange information with Spanish-speaking residents. Census data was also used to identify locations of linguistically isolated communities and tailor outreach efforts with translation needs.
- **Engagement with Agricultural Workers and Latino Business Owners:** Through Key Stakeholders and partner organizations, Santa Cruz County engaged with agricultural workers and Latino business owners to identify local hazard risks and disseminate risk reduction information. The county's agricultural industry employs a significant Latino workforce, and Latino-owned businesses represent important hubs throughout the county with strong community ties and trusted relationships with residents.
- **Trusted Community Organizations:** As an entity that facilitates, bridges, links, or mediates between groups or persons of differing cultural backgrounds, trusted community organizations provide opportunities to achieve mutual understanding and respect through the planning process. This role was often filled by Key Stakeholders. Translation services were also provided for community outreach events tailored toward linguistically isolated communities.
- **Pop-Up and Community Engagement Events:** Hosting outreach at existing community events proved to be one of the most effective ways to engage Santa Cruz County residents in the hazard mitigation planning process. Pop-up booths at gatherings such as the Watsonville Strawberry Festival and other local fairs, markets, and cultural celebrations created safe, approachable spaces for dialogue. These events allowed the planning team to connect with community members in familiar, trusted settings, reducing barriers for individuals who may feel hesitant to engage with government-led meetings.

- **Hardcopy Materials:** At all in-person events, participants were offered multiple options for taking the survey and providing feedback. This included hardcopy materials for those who may not have access to online resources or be comfortable with technology-based response, such as seniors.
- **Virtual Participation:** Virtual participation options were also offered to provide flexibility for Key Stakeholders and community members who were not able to attend in-person meetings or events due to inconvenience or other constraints. These options included the online public survey, virtual and hybrid meeting formats, and online commenting of the public review draft.

2.1.2.3 Incorporating Public & Stakeholder Feedback

The stakeholder and public feedback gained through the various engagement efforts described in this section and Section 2, Step 1, shaped the development of the MJHMP from start to finish. The Steering Group, county-wide HMPT, and jurisdictional planning teams laid the foundation for and provided critical input on the plan, including the history of hazard events, existing community conditions and hazard concerns, the successes of previous mitigation efforts, current capabilities and improvement opportunities, the overarching plan goals, and the final mitigation strategy. Key Stakeholders representing a range of interests from neighboring jurisdictions to disproportionately impacted communities, were also instrumental in setting the tone and direction of the plan from the beginning.

Building upon the local expertise and experience of these formalized groups, Santa Cruz County and the other participating jurisdictions incorporated comments from the public throughout the plan to tailor the goals and mitigation strategy toward specific community concerns and needs. Public feedback was collected on an ongoing basis and at major injection points, such as during community outreach events and during the public review period. These results are fully documented in Appendix B, and Figure 2-5 provides a summary of the feedback gained from the public survey. Major themes and key findings among the comments collected from members of the public and Key Stakeholders that were incorporated into the MJHMP, including the annexes for other participating jurisdictions as relevant, are summarized in Table 2-9.

Table 2-9: Public and Stakeholder Engagement Themes and Key Findings

Theme	Key Findings		
Top Hazard Risks	▪ Wildfire ▪ Flood ▪ Extreme heat	▪ Earthquake ▪ Slope failure ▪ High wind	▪ Coastal hazards ▪ Drought ▪ Climate change

Theme	Key Findings
Top Concerns	▪ Evacuation route vulnerability from substandard design, vegetation overgrowth, drainage issues, and landslide susceptibility ▪ Elderly, farmworker, low-income, and other underserved populations ▪ Lack of sustained mitigation funding or capacity to properly maintain mitigation projects ▪ Older, substandard and unregulated development in high-hazard areas ▪ Inadequate communication infrastructure and coordination ▪ Lack of community trust and outreach ▪ Disaster fatigue, complacency, and unpreparedness among residents
Lessons Learned	▪ Importance of inter-agency coordination and legislative support ▪ Past disasters highlight need for infrastructure hardening, increased public education and awareness, and collaboration among agencies and private landowners ▪ Incentives and outreach are more effective than mandates ▪ "One size fits all" approaches don't work; mitigation must be site-specific
County-Wide Challenges	▪ Infrastructure Vulnerability: o Concerns about aging infrastructure, limited backup power, and seismic vulnerability o Drainage, water, and road infrastructure often degraded in underserved areas o Flood-prone areas face repeated damage and access issues ▪ Evolving Conditions: o Limited capacity in small jurisdictions to develop and implement mitigation projects o More severe storms, rising seas, prolonged and intensified wildfire conditions ▪ Data and Capacity Gaps: o Desire for updated hazard maps, especially for flooding, fire, and erosion o Challenges coordinating across agencies for multi-jurisdictional hazards ▪ Planning and Policy Needs o Need for culturally responsive outreach and coordination across agency lines o Need for updated land use policy, public outreach, and regional coordination tools
Mitigation Barriers	▪ Complex, expensive, and delayed permitting processes discourage compliance ▪ Lack of awareness and education, underestimation of risks, and inconsistent incentives ▪ Little dedicated funding or labor support for vulnerable populations (e.g., seniors, low-income households) ▪ Funding, staffing, and other capacity limitations for grant administration, mitigation projects, and outreach programs ▪ Lack of inter-agency coordination and jurisdictional boundary challenges ▪ Language and cultural barriers
Needs	▪ County-wide communication uniformity, trust in local messengers, plain-language alerts, and engagement strategies for unhoused populations ▪ Emphasize both community-scale and large-scale, holistic planning efforts as well as human-centered mitigation

2.1.3 Planning Process Library

During the update process for this MJHMP, the Steering Group, county-wide HMPT, and each jurisdictional planning team engaged in and completed five different exercises to assess risk, prioritize hazards, identify areas of concern and hazard problems, assess existing capabilities and opportunities for improvement, and develop the mitigation strategy. These exercises, facilitated by the Steering Group and Consultant Team, were integral components of the planning team meetings described in Section 2.1.1 and listed in Table 2-1. A description of each exercise and its purpose are provided below.

The outcomes of the five exercises completed by each participating jurisdiction are organized and documented in the form of a Planning Process Library (Table 2-10). Specific results from these exercises are incorporated into Volume 1 for Santa Cruz County; the results for other participating jurisdictions are further described in their Volume 2 annex.

Exercise #1: Risk Assessment

The risk assessment exercise aimed to thoroughly identify both county-wide and jurisdiction-specific vulnerabilities based on the best available data. Hazard overlay maps, demographics reports, and other tools were utilized to educate and engage stakeholders with deep-dive discussions on local hazard concerns and priorities, guiding the development of the risk assessment. This exercise was facilitated by the Steering Group and Consultant Team and engaged all the planning teams in reviewing and discussing the many factors that can impact community hazard risk (Figure 2-8). The Planning Process Library contains the snapshot hazard maps for each participating jurisdiction and a county-wide demographics report that were refined through this exercise and formed the foundation for developing specific, actionable mitigation strategies.

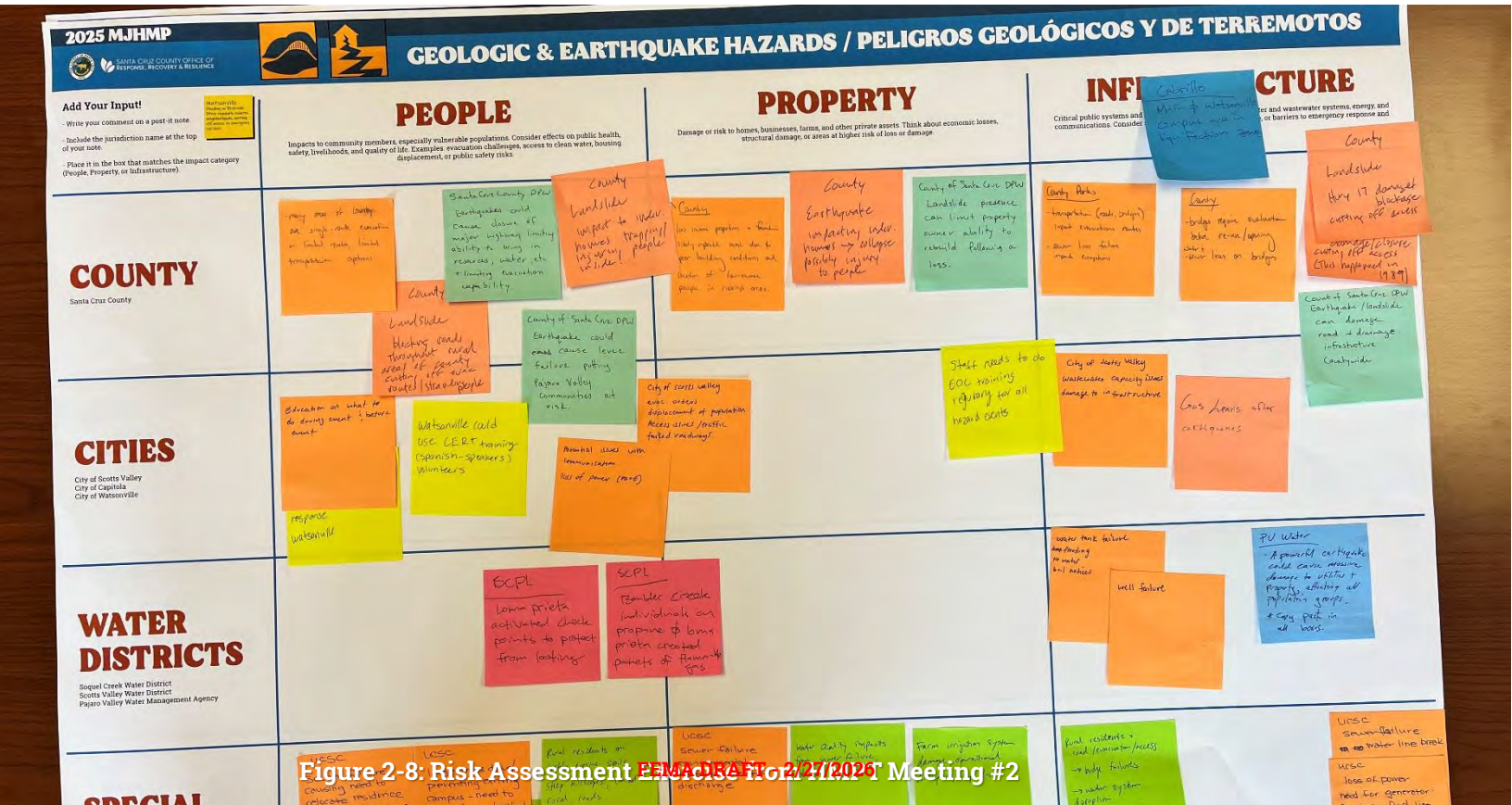


Figure 2-8: Risk Assessment Exercise from HMPT Meeting #2

REMOVE BEFORE 2/1/2025

Exercise #2: Hazard Prioritization

The county-wide HMPT and each of the jurisdictional planning teams considered and screened a broad range of hazards presented in relevant local, regional, and statewide hazard mitigation planning documents. The risk assessment (Exercise #1), past hazard events, and climate change projections also informed the selection of hazards for profiling in this plan. Each jurisdictional planning team then reviewed and prioritized all potential hazards, deciding which are most likely to happen (probability) vs how severe the impacts could be from an event (impact) (Figure 2-9). The crosswalk of documents reviewed, as well as the results of screening and prioritizing relevant hazards, are outlined in Section 3.1. The Planning Process Library contains the completed risk matrixes resulting from this exercise, ranking hazards based on probability in and potential impact on each participating jurisdiction.

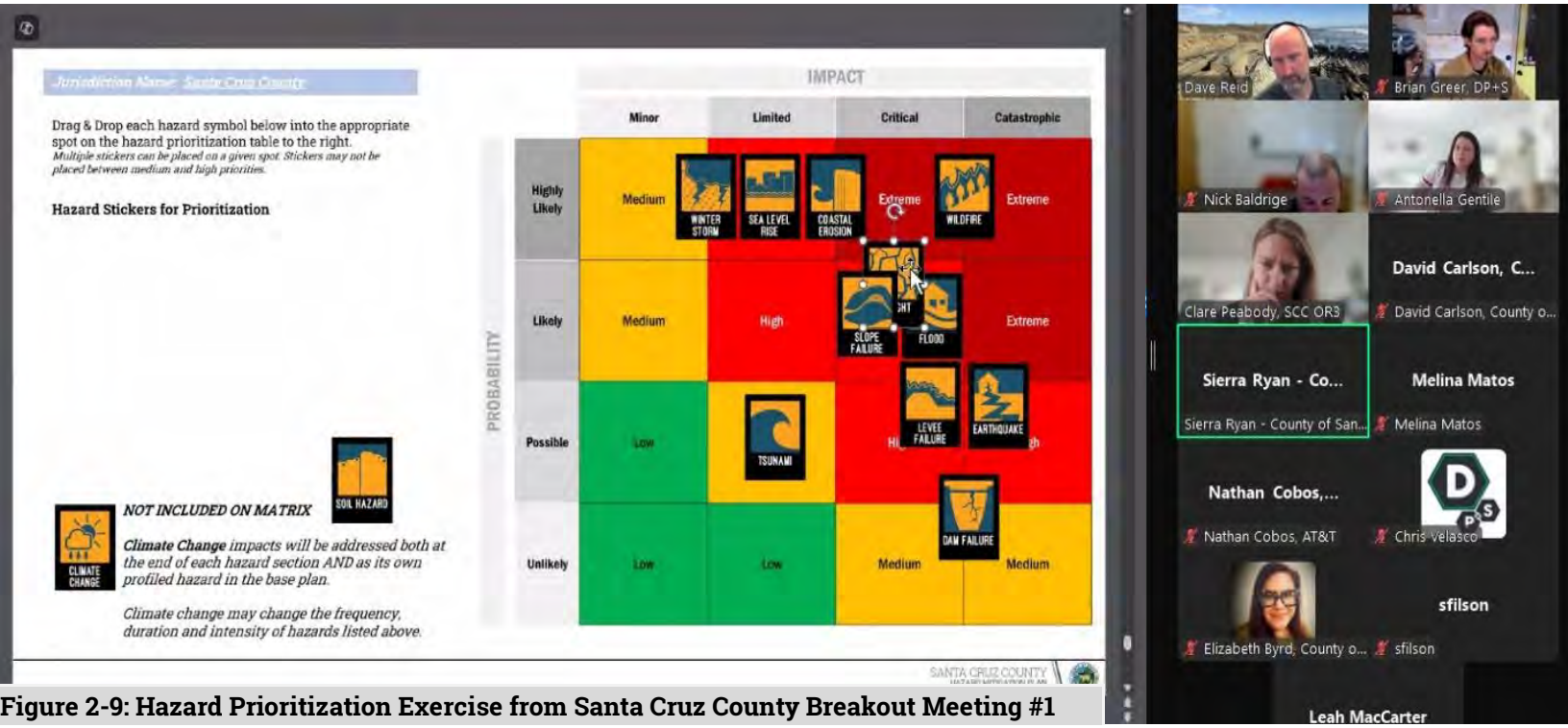


Figure 2-9: Hazard Prioritization Exercise from Santa Cruz County Breakout Meeting #1

Exercise #3: Areas of Concern

All of the planning teams engaged in this exercise to identify areas of concern and the potential effects of each of the identified priority hazards on the planning area in terms of impacts, victims, or threats. Problem statements were developed for these areas of concern, which describe the specific nature of the consequences of a hazard occurrence on the community and its assets. This ensured that the mitigation actions developed through the fifth exercise were tailored for each community and to the specific problems created by various hazard scenarios within it. The Planning Process Library contains the resulting problem statements for each jurisdiction.

Exercise #4: Capabilities Assessment

The capabilities assessment exercise involved analyzing the existing planning and regulatory, administrative and technical, financial, and education and outreach resources of each participating jurisdiction. Various tools are used to implement hazard mitigation activities, such as long-range planning documents; building, subdivision, and zoning regulations; trained staff; information systems; various funding mechanisms; and community preparedness education. Each of the Steering Group members, supported by their planning team and the Consultant Team, evaluated their jurisdiction's current capabilities in comparison to previous mitigation planning efforts and provided updated information to reflect recent developments. As part of the exercise, they also explored opportunities to improve capabilities and the various funding options available to support implementation of their mitigation strategy. The Planning Process Library contains the resulting capabilities assessment for each participating jurisdiction.

Review & Incorporation of Existing Documents

In organizing resources for the plan update, one of the initial steps was for each jurisdiction to identify and review their existing community plans, regulations, strategies, studies, and other documents with relevance to local community planning and hazards to help inform the development of the MJHMP. This effort was led by the Steering Group with support from the Consultant Team, county-wide HMPT, and jurisdictional planning teams. Many documents reviewed already incorporate hazard topics and mitigation planning while others, some seemingly unrelated, would be appropriate to integrate in the future. Relevant documents are cited throughout the MJHMP and in each hazard profile of the risk assessment.

As part of Exercises #1 through #4, the planning teams reviewed existing planning, policy, and regulatory documents for their relevance to hazard mitigation planning. The review included many documents into which previous mitigation plans are incorporated into the 4.5 -Works Cited, Capabilities assessment and each the hazard profiles. Since the adoption of its 2021 HMP, Santa Cruz County has incorporated the plan into its 2022 Climate Action and Adaptation Plan, 2022 Community Wildfire Protection Plan, and 2023 County General Plan Housing Element, among others.

The capabilities assessment for each participation jurisdiction identifies the past and current usage of the documents found to be relevant to hazard mitigation, and opportunities for their future integration with the MJHMP directly or indirectly (Table 2-10). The documents were also closely examined as part of the hazard prioritization exercise completed by each jurisdiction's planning team. The objective of this review was to ensure plan alignment with ongoing efforts, identify opportunities for integration, and avoid redundancy.

A summary of county-related documents which were identified, reviewed, and incorporated into this 2025 MJHMP, or that may be integrated with the county's hazard mitigation planning efforts in the future, is provided in the Capabilities and Opportunities Assessment, Section 3.5.1.



Figure 2-10: Strategy Development Exercise from HMPT Meeting #4

Exercise #5: Strategy Development

The final exercise conducted as part of the interactive and comprehensive development of this MJHMP was the creation of the mitigation strategy. Based on the results from all the previous exercises and background information surrounding them, including strategies from past mitigation plans, the Steering Group and Consultant Team led each of the planning teams through the review of potential mitigation actions and a variety of alternatives to consider for their particular jurisdiction during Breakout Meeting Series #2. Following individual strategy development, the HMPT met again to construct a collaborative, county-wide mitigation strategy that leverages resources to address shared needs among jurisdictions (Figure 2-10).

The draft actions were then further refined by the Steering Group and jurisdictional leads to incorporate community feedback received during the public draft review period. The final Mitigation Action Plan for Santa Cruz County is provided in Section 4, and the plans for the other participating jurisdictions are found in the Volume 2 annexes; the final plans are also in the Planning Process Library.

Table 2-10: Planning Process Library

Jurisdiction	Exercise No. / Title		Library Links
County-Wide	**1**	**Risk Assessment**	**County-Wide Demographics Report**
	5	**Strategy Development**	**County-Wide Mitigation Action Plan**
Local Governments			
Santa Cruz County	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
City of Capitola	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
City of Scotts Valley	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
City of Watsonville	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Special Districts and Agencies			
Soquel Creek Water District	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Scotts Valley Water District	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix

Jurisdiction	Exercise No. / Title		Library Links
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Pajaro Valley Water Management Agency (PV Water)	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Resource Conservation District (RCD) of Santa Cruz County	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Santa Cruz Port District	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered
Cabrillo College	1	Risk Assessment	Hazard & Demographics Maps
	2	Hazard Prioritization	Risk Matrix
	3	Areas of Concern	Problem Statements
	4	Capabilities Assessment	Capabilities Assessment
	5	Strategy Development	Mitigation Action Plan / Alternatives Considered

2.2 Assessing Risk

This section describes the second major step in the planning process: the comprehensive assessment of risks associated with natural hazards in Santa Cruz County. The county-wide HMPT and each of the jurisdictional planning teams conducted a risk assessment for their planning areas. This involved identifying and prioritizing the natural hazards affecting Santa Cruz County as a whole and each participating jurisdiction individually, followed by assessing vulnerabilities to those identified hazards. Results from this risk assessment process aided the identification of an effective mitigation strategy.

The process for, and results from, identifying and prioritizing which hazards to assess are described in Sections 3.1 and 3.1.2. This section describes the process, methods, and support tools used in assessing the hazard risks to all the planning areas. The hazard-specific vulnerability assessments are documented in the ten hazard profiles.

Wildfire
SECTION 3.2.1



Flood
SECTION 3.2.2



Earthquake
SECTION 3.2.3



Severe Weather
SECTION 3.2.4



Coastal Hazards
SECTION 3.2.5



Slope Failure
SECTION 3.2.6



Dam Failure
SECTION 3.2.7



Drought
SECTION 3.2.8



Extreme Heat
SECTION 3.2.9



Climate Change
SECTION 3.2.10



Assessing risks and vulnerabilities exposes the unique characteristics of individual hazards and begins the process of narrowing down which areas within the county are vulnerable to specific hazard events. The vulnerability assessment included field visits and a Geographic Information System (GIS) overlaying method for examining such vulnerabilities more in depth. The planning teams of participating jurisdictions completed this exercise both singly and jointly with the county-wide HMPT. The hazards ultimately identified and prioritized varied widely depending on the geographic make up of, priorities of, and services provided by the individual participating jurisdiction. Using these methods, participating jurisdictions estimated the potential losses of populations, property, and facilities and infrastructure from their priority hazards.

The risk assessment process was conducted in alignment with FEMA's Local Mitigation Planning Handbook and used best practices to identify vulnerabilities in populations, property and private assets, and critical facilities and infrastructure.

The purpose of the risk assessment in Section 3.2 is to evaluate the locations and causes of the priority natural hazards affecting significant parts of the planning area, as well as the existing regulatory environment around them, their probability, the extent and severity of their potential impacts, and the vulnerabilities within the community. The findings serve as the foundation for developing targeted mitigation strategies that are both proactive and cost-effective. The risk assessment is comprised of the following:

- **Section 1.4, Community Profile:** Providing a geographic and demographic overview of Santa Cruz County as the basis for the assessment, highlighting the populations most vulnerable to hazards in the planning area.
- **Section 3.1, Hazard Identification & Prioritization:** Identifying hazards that pose the most significant threats and prioritizing them based on probability and potential impact in the county and other participating jurisdictions.
- **Section 3.2, Hazard Profiles:** Detailing the characteristics, history, probability, and potential impacts of each hazard, including:
    - Exposure Analysis: Mapping the populations, assets, and critical facilities and infrastructure exposed to each hazard.
    - Vulnerability Analysis: Assessing how susceptible different populations, structures, and other assets are to hazard impacts.

Risk assessment data is provided for all county-wide priority hazards and for Santa Cruz County, specifically, in Section 3 of this volume; all other participating jurisdictions are profiled individually in Volume 2.

2.2.1 RAMP (Risk Assessment Mapping Platform)

A highly interactive, web-based mapping platform was used to assist in the vulnerability assessment. RAMP, the Risk Assessment Mapping Platform, is hosted by and accessed through the project website (mitigatehazards.com/santacruzmjhmp) and allows the interactive discovery of robust risk, vulnerability, and exposure data developed especially for Santa Cruz County and the other participating jurisdictions. RAMP was built specifically for mitigation planning and is a vital tool in identifying hazard exposure and risk (Figure 2-11).

RAMP displays the total population, total parcels and property values, and a jurisdiction's facilities and buildings overlaid with natural hazards layers. Users can filter these layers by hazard and inventory type, as well as by jurisdiction. RAMP's robust data filtering and summation calculations allow the user to understand and visualize vulnerabilities at the property-level with detailed information on the number of people and structures exposed to various hazards. This brings interactivity and individual discovery to the GIS analysis performed for the vulnerability assessment, allowing for the exploration of various hazard risks posed within and around a community and, ultimately, aiding in the prioritization of mitigation resources.

RAMP enabled Santa Cruz County and the other participating jurisdictions to pinpoint their vulnerabilities and reinforce problem statements to support the mitigation strategy. The county-wide HMPT and each of the jurisdictional planning teams used RAMP in meetings and as needed to understand vulnerabilities both county-wide and to their planning areas, and especially to vulnerable populations and critical facilities and infrastructure.

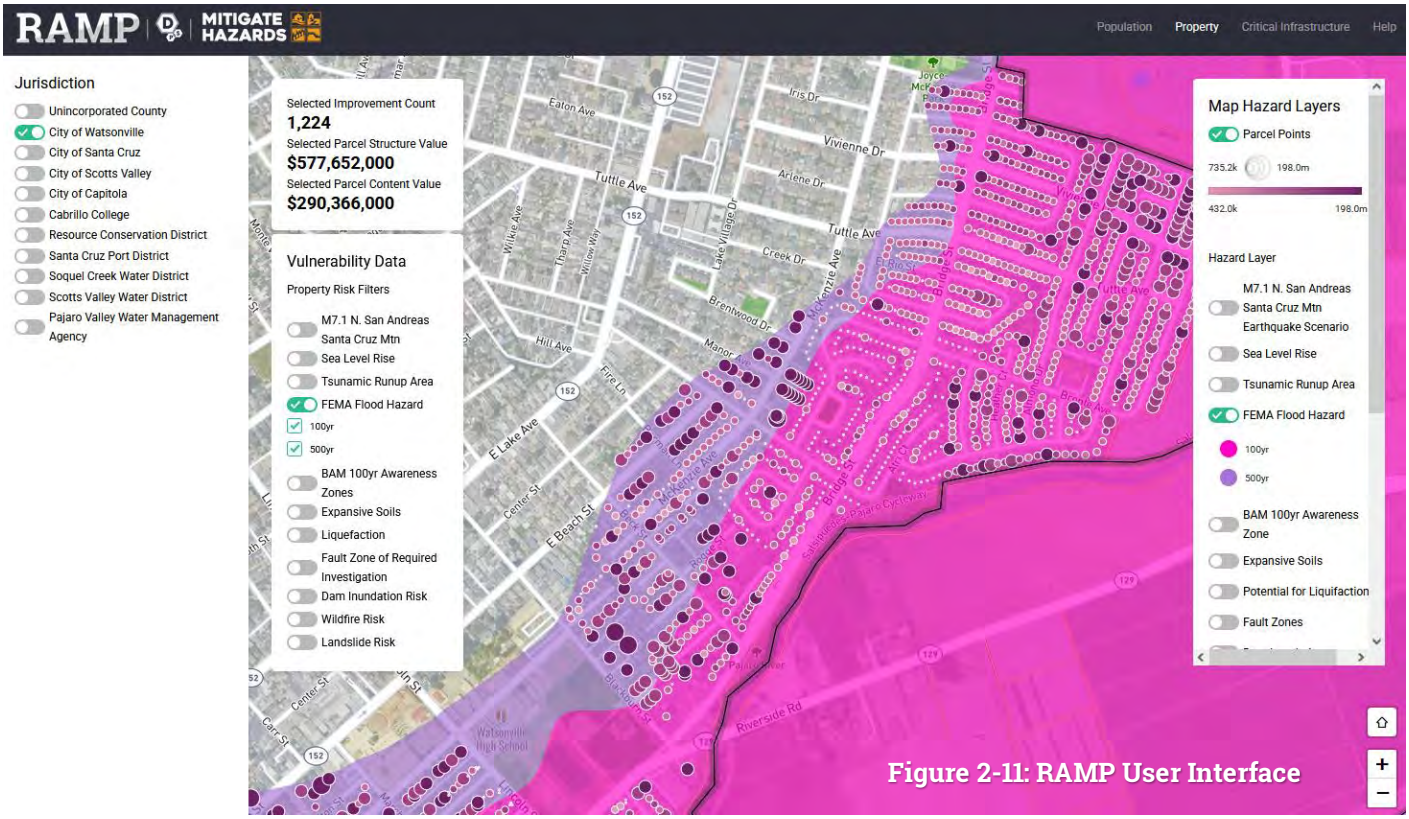


Figure 2-11: RAMP User Interface

2.2.2 Vulnerability Assessment Methodology

This subsection explains the methodologies used to assess vulnerabilities across the county and in individual communities. The approach includes both qualitative and quantitative analyses to evaluate the risks associated with specific hazards. Methodologies were selected based on FEMA guidelines, state-level best practices, and local policy and expertise to ensure accuracy and relevance, and all data sources used in the analysis meet standards appropriate for hazard mitigation planning. The vulnerability assessment includes:

- **GIS-Based Mapping:** Visually representing hazard-prone areas, critical infrastructure and facilities, and vulnerable populations.
- **Data Collection and Analysis:** Utilizing historical disaster data, climate projections, and demographic information to estimate risk.
- **Scenario Modeling (Earthquake and Climate Change):** Conducting hypothetical disaster scenarios to understand potential impacts under varying conditions, including climate change.

- **Community Surveys and Stakeholder Feedback:** Incorporating local knowledge to identify vulnerabilities not captured in traditional data.

This section also describes how the vulnerability assessment accounts for climate change impacts, which are expected to increase the frequency and severity of hazards like wildfire, flood, and coastal erosion.

In order to describe vulnerability for each hazard, it is important to first understand the total population and assets at risk. This section provides an overview of the methods used in the hazard-specific vulnerability assessments of Section 3.2. For each type of hazard, the assessment begins with a general explanation of the phenomenon. Vulnerabilities to each hazard are then assessed through a two-step process. First, population, critical facilities and infrastructure, and all parcels across the county are inventoried to establish a comprehensive understanding of the area ("lay of the land"). Second, the inventories are used to calculate the exposure and potential damage (flooding and earthquake) at various levels of severity. A more detailed explanation of the explanation on risk assessment methods, see Appendix B.

2.2.2.1 Population & Asset Inventory

This subsection details the process for developing the inventory of populations and assets that are vulnerable to hazard events. It includes the following:

- **Critical Facilities:** Hospitals, fire stations, police stations, and emergency shelters.
- **Critical Infrastructure:** Roads, bridges, utilities, and communication networks.
- **Essential Services:** Water treatment facilities, power plants, and public health facilities.
- **Vulnerable Populations:** Areas with high concentrations of elderly residents, disabled individuals, low-income households, and non-English-speaking communities.

The inventory was mapped using GIS tools to clearly illustrate hazard exposure and support data-driven decision-making for developing the mitigation strategies. The population and asset inventory provides a baseline to measure the significance of or vulnerability to natural hazard events. The asset inventory can also be used to estimate damages and financial losses expected during a "worst-case scenario" event for each hazard.

Each participating jurisdiction's assets have been inventoried to use as inputs for the vulnerability assessment, including people, parcels, property values, and critical facilities and infrastructure.

Population

The primary purpose of the MJHMP is to better protect people; thus, determining the population located near each geographically defined natural hazard is critical. The demographic data for Santa Cruz County and the other participating jurisdictions discussed is derived from the U.S. Census Bureau's American Community Survey 5-Year Estimates (ACS 5-Year) from 2018 to 2023. The figures presented are intended to highlight broader regional trends relevant to hazard mitigation planning efforts rather than inform specific decision-making or administrative actions.

Each natural hazard scenario affects county residents differently depending on the location of the hazard, the population characteristics and density where the hazard event could occur, and other local factors. In the Community Profile, Section 1.4, specific characteristics of Santa Cruz County's population are discussed in detail, including highlighting which populations are most vulnerable to hazard events and impacts. The hazard-specific vulnerability assessments presented in the hazard profiles of Section 3.2 summarize the population exposure for each priority hazard, if definable.

Parcel Value Inventory

The Santa Cruz County Assessor's data was essential in identifying parcel and property value exposures to each priority hazard. The data includes 2025 fair market values of at-risk private parcels and improvements as well as jurisdictional properties and assets. The parcel value inventory for Santa Cruz County is summarized in Table 2-11 and includes market value[1], content replacement value, and total assessed value ("total value"). These elements are called out in the table because, in the event of a disaster, the value of the infrastructure or improvements to the land is usually the focus of concern, as structures can be rebuilt or contents replaced. Although there may be severe environmental impacts that result from a hazard event, the land itself is generally not a total loss.

- **Total market value** as presented in this MJHMP reflects Santa Cruz County Assessor data, including fair market value where available. If no fair market value was available for a given property, the value reflects the assessed improvement value, which is often an underestimate of actual value.
- **Total content value** was calculated based on the Assessor's use codes, translated to occupancy-based multipliers.

Each occupancy class prescribes a specific content cost multiplier used to calculate the content cost values shown in the summary and in the hazard profiles in Section 3.2. Occupancy-based content cost multipliers used in this plan reflect those found in the FEMA HAZUS-MH (Hazards U.S. Multi-Hazard) 4.2 technical manuals.

The hazard profiles in Volume 1 outline predicted impacts to Santa Cruz County's parcel value inventory for each hazard's geographic extent. The annexes in Volume 2 contain the same information for other participating jurisdictions.

[1] Market Value Includes a long-term asset which indicates the cost of the constructed improvements to land, such as buildings, driveways, walkways, lighting, and parking lots.

Table 2-11: Santa Cruz County Parcel Counts and Values

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$ 35,189,614,790	$ 19,116,504,796	$ 54,306,119,586
City of Watsonville	9,501	$ 8,496,490,409	$ 6,290,123,018	$ 14,786,613,427
City of Santa Cruz	16,939	$ 13,397,517,595	$ 8,354,246,391	$ 21,751,763,986
City of Capitola	3,957	$ 2,814,517,999	$ 1,710,821,997	$ 4,525,339,996
City of Scotts Valley	3,951	$ 4,343,987,999	$ 2,894,213,196	$ 7,238,201,195
Total Santa Cruz County	**81,978**	**$ 64,242,128,792**	**$ 38,365,909,398**	**$ 102,608,038,191**

Note: Total market value as provided by the Santa Cruz County Assessor's Office. Content value calculated using content multipliers per HAZUS occupancy classes.

Critical Facilities & Infrastructure Inventory

Critical facilities and infrastructure, such as a fire station or bridge along an evacuation route, are of particular concern when conducting hazard mitigation planning. These critical assets can be structures, infrastructure, or other improvements that, because of their function, size, service area, or uniqueness, have the potential to cause disruption of vital socioeconomic activities if destroyed, damaged, or functionally impaired. As such, the vulnerability assessment for each profiled hazard qualitatively discusses critical facilities and infrastructure with regard to each hazard's severity footprint.

The critical facilities and infrastructure inventory for this MJHMP was developed from a variety of sources, including datasets from participating jurisdictions as well as state, federal, and private industry sources. Although the inventory is not comprehensive due to data limitations, all data sources have a level of accuracy acceptable for planning purposes. For additional information on sources, see Appendix B. Based on the inventory, a spatial database developed to translate this information into georeferenced[2] points and lifelines that represent physical locations.

- **Points** include critical facilities such as government buildings, police stations, fire stations, shelters, hospitals, elder care facilities, childcare facilities, schools, and transportation and utility structures. Points also include facilities that handle hazardous materials.
- **Lifelines** include critical infrastructure related to transportation routes; delivery of water, wastewater, electrical power, liquid fuel, and natural gas; and other crucial utility infrastructure lines.

Figure 2-12provides an overview of the critical facility points and infrastructure lifelines located within the participating jurisdictions. Some critical facility information has been omitted from this document due to security concerns and requirements, and a detailed list of these assets is not provided. More detailed lists are on file with the individual jurisdictions that oversee those assets.

[2] To georeference something means to define its existence in physical space; that is, to establish its location in terms of map projections or coordinate systems. The term is used both when establishing the relation between raster or vector images and coordinates and when determining the spatial location of other geographical features.

2.2.2.2 Hazard Exposure & Damage Estimation

This subsection describes how the exposure of populations and assets to hazards was quantified. Damage estimation uses analytical tools to project financial impacts and loss estimations under various disaster scenarios and footprints. The analysis estimated potential damage based on factors such as:

- **Hazard Intensity and Frequency:** Historical data on past events, combined with climate projections.
- **Building Stock and Infrastructure Vulnerabilities:** Age, construction materials, and resilience of existing infrastructure.
- **Geographic Distribution:** Identification of floodplains, wildfire zones, landslide-prone areas, seismic fault lines, and other hazard areas with geospatial extents.
- **Socioeconomic Impacts:** Potential economic losses to businesses, critical services, and residential properties.

Alongside a study of past hazard events, geospatial data plays a critical role in these assessments by pinpointing the population and assets vulnerable to the hazards identified in this plan. This analysis is particularly effective when hazards have distinct spatial footprints that can be overlaid onto the locations of people and assets. In Santa Cruz County's planning area, such hazards as flood, wildfire, and earthquake have known geographic extents and corresponding spatial information; drought and severe weather hazards, on the other hand, impact large areas and do not have specific geospatial extents.

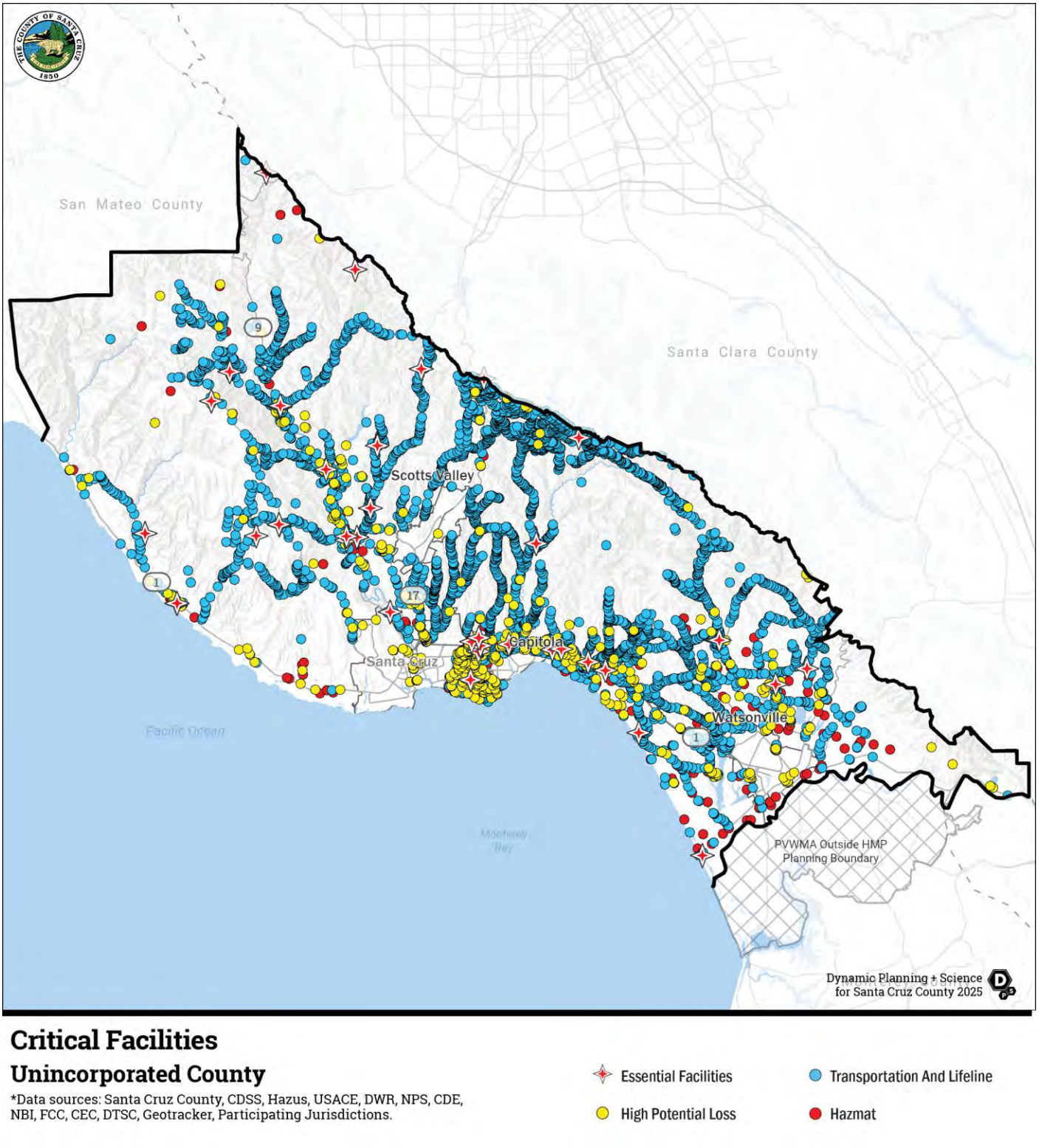


Figure 2-12 Critical Facilities Point Locations

Once the geographic extents of spatially-discreet hazards were established, the population and asset inventories were then used to generate specific exposure and damage estimations based on the severity of specific hazard event scenarios. The hazards in Santa Cruz County which have known geographic extends and corresponding spatial information, and thus have exposure and damage estimations, are:

Wildfire
SECTION 3.2.1

Flood
SECTION 3.2.2

Earthquake
SECTION 3.2.3

Coastal Hazards
SECTION 3.2.5

Subhazard: Tsunami

Slope Failure
SECTION 3.2.6

Dam Failure
SECTION 3.2.7

Climate Change
SECTION 3.2.10

Subhazard: Sea-Level Rise

Several data sources are necessary to conduct a thorough vulnerability analysis. Figure 2-13 provides an exhibit of the data inputs and outputs used to create the vulnerability analysis results presented in the hazard profiles of Section 3.2.

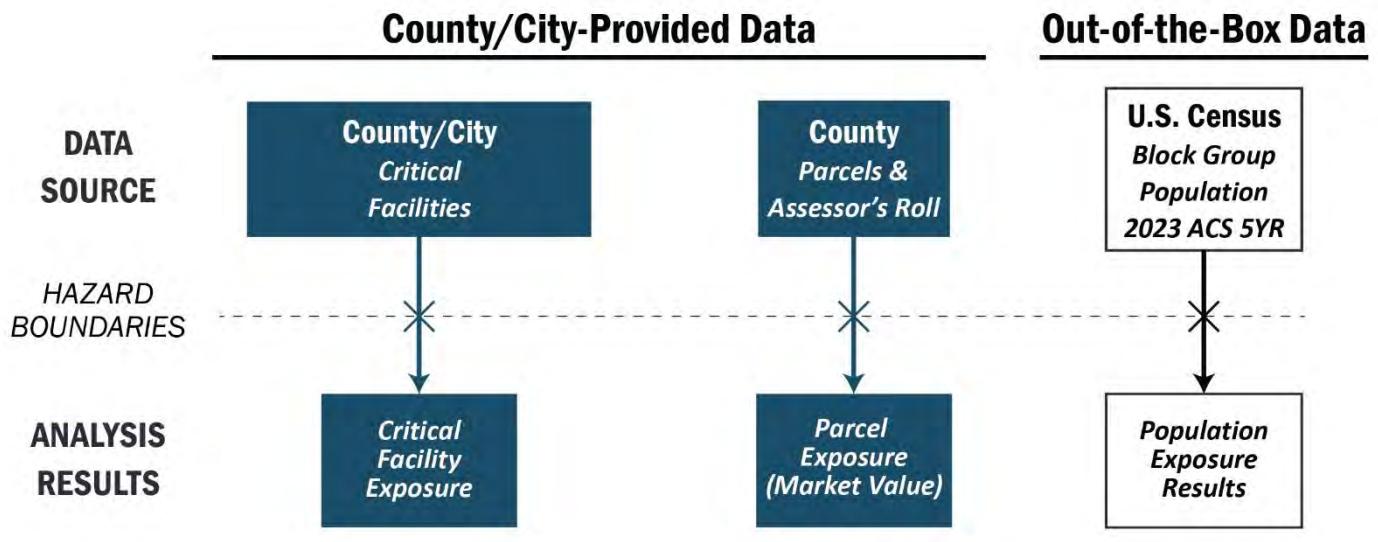


Figure 2-13: Data Inputs and Outputs

Population & Asset Exposure

"Exposure" of assets and population refers to the total counts of people, parcels, facilities, and other assets within the planning area in which a hazard event may occur. A natural hazards overlay was developed to reflect the combination of many known natural hazard spatial footprints. The spatial overlay method enables summarization of building values, parcel counts, population, and critical facility and infrastructure exposure within a hazard's geographic extents. Exposure numbers were generated using Santa Cruz County Assessor information, address points, and parcel data for replacement and content cost estimates. See Figure 2-14 as an hypothetical exposure to flood hazards.



Figure 2-14: Hazard Exposure Explanation Graphic

Damage Estimation (Flood Only)

For flood, specifically, detailed damage assessments were conducted through FEMA's HAZUS software. HAZUS is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS uses GIS technology to estimate physical, economic, and social impacts of disasters. The estimated damage and losses provided by the HAZUS software is a based upon chosen severity of events and provides the ability to understand possible widescale damage to buildings and facilities. At-risk populations, critical infrastructure, improved parcels, and loss results for each hazard category are provided in Section 3.2 to evaluate the percentage of assets exposed to different types of hazards. The side-by-side comparison allows participating jurisdictions to evaluate impacts of potential hazards to prioritize hazard mitigation resources.

In the hypothetical geography shown in Figure 2-15, even though both structures are exposed to flooding, it is expected that the structure with a first-floor height below the depth-of-flooding will receive significantly more damage than the structure with a first-floor height above the expected water depth.



Figure 2-15: HAZUS Damage Estimation Example

2.3 Developing a Mitigation Strategy

This MJHMP was prepared in accordance with DMA 2000 plan update requirements, FEMA's mitigation guidance, Cal OES policies, and the California Office of Planning and Research's (OPR) recommendations. The development of this plan included identifying hazard problems across the planning area, setting goals for a mitigation strategy, assessing existing capabilities, considering the costs and benefits of alternatives, and developing new and improved mitigation actions.

Volume 1, 3.4.4, provides an explicit mitigation strategy and blueprint for reducing potential losses identified in the risk assessment based on the existing capabilities of Santa Cruz County; the same is provided in Volume 2 for each of the other participating jurisdictions.

2.3.1 Identify the Problem

As part of the mitigation action identification process, the HMPT and the jurisdictional planning teams identified areas of concern in and the potential impacts of each of the prioritized hazards, both county-wide and in their respective communities. Specific statements were developed to describe each jurisdiction's hazard problems based on the risk assessment contained in Section 3 and lengthy discussions about unmapped vulnerabilities. These "problem statements" are organized by three major areas of concern, which describe the nature of the consequences or effects of a hazard occurrence on the community and its assets as victim, impact, or threat. This categorization ensures that the identified actions in the mitigation strategy are tailored to each jurisdiction and the specific problems created by various hazard scenarios.

Each hazard problem statement that was developed is addressed by at least one mitigation action; however, most are mitigated with a combination of short- and long-range activities, through planning, regulatory, operational, physical, or other projects. Santa Cruz County's problem statements are identified at the end of

each hazard profile in Section 3.2 and those of other participating jurisdictions are identified in their individual annexes in Volume 2.

The problem statements are also available as part of the Mitigation Action Support Tool (MAST), which is summarized in Section 2.3.4.4 and will be available via the project website throughout the plan's lifecycle to assist the participating jurisdictions in monitoring and improving the mitigation strategy.

Interpreting Areas of Concern (AOCs)

Areas of concern describe how hazards impact different aspects of a community and set the stage for identifying mitigation actions that reduce risk by changing the victims, impacts, or threats of different hazards. Each problem statement identifies which type of hazard problem (i.e., AOC) it concerns the most.



Victim
Who is (most) impacted?

Example Statement
Seniors and people with mobility limitations lack adequate evacuation support during a fast-moving wildfire.



Impact
What are the direct and indirect impacts of hazard events?

Example Statement
Heavy rain events overwhelm aging and inadequate drainage infrastructure such as undersized culverts.



Threat
What local conditions create location-specific risk?

Example Statement
FEMA floodplain maps do not reflect localized or future flood conditions, limiting the ability to plan for or fund effective mitigation.

2.3.2 Identify Mitigation Goals

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards. (44 CFR § 201.6(c)(3)(i)) The county-wide HMPT and jurisdictional planning teams reviewed past mitigation goals from their plan, as applicable, and from the 2021 Santa Cruz County HMP, 2023 California State Hazard Mitigation Plan (SHMP), and other relevant plans to determine their present validity. The teams also reviewed the updated risk assessment (Section 3) and public survey results (Section 2.1.2) in defining the goals for this plan.

The teams ultimately decided to keep and update the 2021 county plan goals, which were found to be consistent with the current policies and goals of participating jurisdictions. The four resulting goals formed the basis for the development of the Mitigation Strategy and specific mitigation projects, which are presented in Section 4.

2.3.3 Conduct Capabilities Assessment

A capabilities assessment is a comprehensive review of participating jurisdictions' existing capabilities to implement the mitigation actions in the MJHMP and tools available to address known issues and weaknesses from identified natural hazards. The Steering Group and planning teams identified their jurisdiction's capabilities to implement the mitigation strategy. These capabilities were also reviewed for future opportunities for integration or enhancement, including the development of new policies, expansion of training programs, and increased collaboration with regional and state partners.

Santa Cruz County's assessment of its capabilities and future opportunities is found in Volume 1, Section 3.5.1; Volume 2 of this plan includes capabilities assessments all other participating jurisdiction as part of their specific annex. For more information on the regulatory environment surrounding each hazard, see the hazard profiles in Section 3.2.

2.3.4 Develop Mitigation Actions

The county-wide HMPT and jurisdictional planning teams developed mitigation actions, as both planning activities and other types of projects, to address identified hazard problems from the risk assessment in line with their capabilities. As part of this process, the teams reviewed and analyzed the status of mitigation actions from previous plans, determining which have been completed, which are no longer relevant, and which need to be updated to reflect current circumstances. Alternative actions considered and the final mitigation action plans adopted are provided as part of the Planning Process Library (Table 2-10).

After reviewing mitigation actions from past hazard plans and priorities, projects, and activities other relevant documents, the planning teams developed potential new actions through interactive exercises and discussions, as outlined in Section 2.1.3. The potential mitigation actions were then further scrutinized based on their relevance to the priority hazards, support from community members, realistic implementation parameters, and alternative measures that could be used to address various aspects of the hazard problems.

2.3.4.1 Public & Stakeholder Input

As part of the mitigation strategy development, Santa Cruz County and the other participating jurisdictions reviewed and incorporated stakeholder feedback and public comments collected throughout the planning process to tailor the goals and mitigation actions toward specific community concerns and needs. Public input was collected on an ongoing basis via an online survey and at major injection points, such as during community outreach events and during the public review period. These results are fully documented in Appendix B and summarized in Section 2.1.2. Section 4 also highlights public and stakeholder input that was specifically used in developing the mitigation strategies.

2.3.4.2 SMARTIE Principles



In developing the mitigation actions for this 2025 MJHMP, the planning teams used the principles of "SMARTIE" to ensure the mitigation strategy was realistic and actionable. These principles provided a framework for defining actions and evaluating their costs and benefits. A mitigation action that meets SMARTIE principles is:

- **Specific:** Clearly defined project scope and goals.
- **Measurable:** Outcomes and milestones can be tracked.
- **Attainable:** Designed to align with the agency's capabilities or those of partners.
- **Relevant:** Tied directly to risks identified in the plan.
- **Timely:** Includes deadlines for completion.
- **Inclusive:** Intentionally involves or benefit diverse populations.
- **Equity Minded:** Acknowledges impacts to access and functional needs populations and other special considerations.

2.3.4.3 Mitigation Alternatives

Once hazard problems were defined (problem statements) and local resources and capabilities accounted for (capabilities assessment), a range of mitigation solutions are identified that could be used to address concerns. These mitigation alternatives are evaluated for their associated costs and benefits to pinpoint which actions provide the greatest risk reduction using available resources and should be made part of the final mitigation strategy. This section describes the process that was used in identifying and evaluating a range of mitigation alternatives to address the hazards prioritized in the risk assessment (Section 3). Alternatives include both structural measures (e.g., flood barriers, firebreaks, seismic retrofitting) and non-structural measures (e.g., zoning changes, public education, early warning systems) and were assessed based on:

- SMARTIE Principles
- Cost-Effectiveness
- Environmental Impact
- Community Acceptance
- Alignment with Mitigation Goals

The Consultant Team drafted many mitigation actions for each jurisdiction to consider, including refined actions from the previous mitigation plan, as applicable, and new alternative actions. FEMA's six broad

mitigation categories, listed below, provide the framework for identifying and evaluating potential mitigation actions. Categorizing mitigation actions in this way ensures a comprehensive approach to mitigation in the county, addressing various facets of vulnerability reduction and resilience enhancement across the community and its natural environment.

- **Prevention (PRV):** Measures aimed at avoiding or minimizing hazard impacts through planning and the implementation of building codes, land use regulations, and other preventative measures.
- **Property Protection (PPRO):** Actions to safeguard individual properties from hazard damage by modifying or relocating existing buildings and structures to enhance resilience.
- **Public Education and Awareness (PE&A):** Efforts to engage and inform community members about hazard risks and effective mitigation strategies to foster preparedness and resilience.
- **Natural Resource Protection (NRP):** Strategies that preserve, restore, or manage natural resources, systems, and functions to reduce hazard impacts.
- **Emergency Services (ES):** Measures that help minimize the impacts of hazard events on people and property by enhancing emergency preparedness and response capabilities.
- **Structural Projects (SP):** Projects to construct, install, or improve infrastructure and systems designed to reduce hazard impacts.

During Breakout Meeting Series #2 and HMPT Meeting #4, the planning teams drafted, evaluated, and refined mitigation actions that considered a wide range of implementation strategies, relevant to both county-wide needs and individual jurisdictions, using FEMA's six broad categories. Early discussions focused on reviewing previous mitigation strategies, identifying current hazard-related challenges, and developing potential actions to address priority hazard concerns. These ideas were then further reviewed and prioritized through collaborative sessions involving input from jurisdictional staff and a diverse group of stakeholders. The planning teams selected the most efficient and cost-effective actions by assessing vulnerabilities, evaluating existing capabilities, and building consensus on how best to address identified problems and meet the community's mitigation goals.

The final mitigation actions selected by each participating jurisdiction's planning team are presented in the Mitigation Action Plan. The Santa Cruz County Mitigation Action Plan is found in Volume 1, Section 4.4; action plans for all other participating jurisdictions are found in the Volume 2 annexes. In addition, the collaborative, County-Wide Mitigation Action Plan presented in Section 4.3 identifies combined efforts to address common hazard problems to increase the overall resilience of the county.

The following subsections provide examples of mitigation actions according to the six FEMA mitigation categories that were considered by the planning teams. This alternatives evaluation process is documented as part of the Planning Process Library discussed in Section 2.1.3 and provided in Table 2-10 (Alternatives Considered) to demonstrate transparency and support future funding applications.

PREVENTION (PRV)

Preventative (PRV) activities keep hazard problems from getting worse and are typically administered through government programs or regulations addressing building and land development. Preventative actions are particularly effective in reducing a community's future vulnerability in areas where development has not yet occurred or where capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning ordinances
- Building codes
- Riverine or fault zone setbacks
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvements programming

Examples of Local PRV Alternatives

- **Update Land Use and Development Regulations:** Revise development codes and standards to better address natural hazards such as wildfire, flood, slope failure, drought, and climate change.
- **GIS and Hazard Mapping Enhancements:** Conduct detailed mapping for hazards such as flood and slope failure and expand GIS capabilities to increase utility of the data.
- **Restrict Development in High-Risk Zones:** Adopt policies to limit new development and capitol investments in coastal and high wildfire risk zones.

PROPERTY PROTECTION (PPRO)

Property protection (PPRO) measures involve the modification, relocation, or removal of existing buildings and structures to help them better withstand the forces of a hazard. Examples include:

- Building elevation
- Retrofitting (e.g., seismic design techniques, etc.)
- Safe rooms, shutters, shatter resistant glass
- Insurance
- Critical facilities protection

Examples of Local PPRO Alternatives

- **Backup Power for Critical Facilities and Services:** Secure backup power supplies for emergency shelters, water treatment plants and pumps, and other critical facilities to ensure continuity of service during outages.
- **Structure Hardening Incentives:** Create a program that incentivizes private property owners to conduct structural improvements to protect homes, such as low-interest loans for elevation above the base flood or rebates for installing flashing and vents in high-risk wildfire zones.

PUBLIC EDUCATION & AWARENESS (PE&A)

Public education and awareness (PE&A) activities advise community members and elected officials about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Measures to educate and inform the public include:

- Outreach projects, including neighborhood and community outreach
- Hazard mapping
- Materials library
- Speaker series/ demonstration events
- Real estate disclosures
- School children educational programs
- Hazard expositions

Examples of Local PE&A Alternatives

- **Hazard Awareness Events:** Develop annual community outreach events and educational activities to increase awareness of local hazards and mitigation strategies.
- **Water Conservation Campaign:** Develop a public outreach campaign to promote water conservation during drought conditions.
- **Flood Insurance Information:** Make National Flood Insurance Program (NFIP) and flood risk information available at public locations, such as libraries, and via a virtual planning desk.

NATURAL RESOURCE PROTECTION (NRP)

Natural resource protection (NRP) activities reduce the impacts of hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples of these measures include:

- Erosion and sediment control
- Floodplain protection
- Vegetation management (e.g., fire-resistant landscaping, fuel breaks)
- Watershed management
- Wetland and habitat preservation/restoration

Examples of Local NRP Alternatives

- **Groundwater Recharge Infrastructure:** Preserve and improve natural areas and ecosystems that support groundwater recharge to enhance water availability during drought conditions and prevent saltwater intrusion.
- **Fuel Management Projects:** Implement vegetation management strategies outlined in the CWPP, including thinning, prescribed burning, and invasive species removal.
- **Slope Stabilization Projects:** Develop a priority list of areas at high risk for slope failures, then implement stabilization projects using natural and engineered techniques to prevent landslides and erosion.

EMERGENCY SERVICES (ES)

Emergency services (ES), while not traditionally categorized as mitigation, play a critical role in minimizing the impacts of natural hazard events on people and property. These services focus on preparedness, response, and recovery efforts to protect lives, reduce damages, and ensure the continuity of critical operations. The measures often include pre-disaster planning, resource staging, and infrastructure improvements to enhance emergency response capabilities. Examples include:

- Warning systems
- Sandbag staging for flood protection
- Identification / construction of evacuation routes
- Installing temporary shutters on buildings for wind protection

Examples of Local ES Alternatives

- **Expand Emergency Shelter Capacity:** Work with partner jurisdictions to expand shelter capacity and improve shelter accessibility and safety across the county.
- **Communications System Improvements:** Improve the reliability and coverage of emergency communications and alter systems to ensure consistent messaging and enhanced interagency coordination during emergencies.

STRUCTURAL PROJECTS (SP)

Structural projects (SP) are intended to lessen the impacts of a hazard by modifying the environment and natural progression of a hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Utility facility / infrastructure upgrades
- Stormwater detention / retention facilities
- Dam Retrofits

Examples of Local SP Alternatives

- **Transportation Infrastructure Improvements:** Evaluate bridges, roads, and other transportation infrastructure located in high-hazard areas and implement improvements as necessary to ensure reliability of emergency access and evacuation routes.
- **Drainage Structure Replacement Program:** Develop an inventory of culverts and other drainage structures and establish a program for replacing and improving inadequate and failure-prone stormwater infrastructure.
- **Electrical Grid Hardening:** Collaborate with utility providers to harden electrical grid infrastructure against hazards such as high wind and wildfire, including burying power lines, installing reinforced poles or protective devices, and managing nearby trees.

2.3.4.4 Cost/Benefit Review

Mitigation action plans must be prioritized according to a cost/benefit analysis of the proposed projects and programs and their associated costs. (44 CFR §2 01.6(c)(3)(iii)) The benefits of proposed actions were weighed against estimated costs as part of the project prioritization process; however, it should be noted that this review does not meet FEMA Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program requirements. A less formal, less costly approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

Cost ratings were defined as follows:

- **High:** Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium:** The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low:** The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High:** Project will provide an immediate reduction of risk exposure for life and property.
- **Medium:** Project will have a long-term impact on the reduction of risk exposure for life and property, or project will not provide an immediate reduction in the risk exposure for property.
- **Low:** Long-term benefits of the project are difficult to quantify in the short-term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) were considered cost-beneficial and prioritized accordingly. For many of the strategies identified in this action plan, the partners may seek financial assistance under the HMGP or PDM programs, both of which require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define "benefits" according to parameters that meet the goals and objectives of this MJHMP.

2.3.4.5 Prioritization Framework

In addition to considering public and stakeholder input and the initial cost/benefit analysis, mitigation actions were prioritized according to four criteria. This prioritization framework was developed by the Steering Group to further focus the individual and county-wide mitigation strategies on those efforts that address the most concerning hazards, can achieve multiple outcomes, will have positive equity impacts,

and align with existing jurisdictional strategies. Action priority was scored on a scale of zero (low) to five (very high) using the following metrics:

- **Hazard Risk (+0-2):** Actions that address high-priority hazards based on the jurisdiction's completed Risk Matrix (medium+0, high+1, or extreme+2) (see Section 3.1.2.2).
- **Multi-Benefit Outcomes (+1):** Actions that achieve multiple beneficial ecological, social, and economic outcomes, including taking public and stakeholder perceptions into account.
- **Equity Impact (+1):** Actions that help reduce disparities in access to opportunities, improve environmental health conditions in disadvantaged neighborhoods, support vulnerable populations, or otherwise reduce socioeconomic barriers to mitigation.
- **Strategic Alignment (+1):** Actions that are in alignment with adopted local, regional, or state plans, policies, and programs.

2.3.5 MAST (Mitigation Action Support Tool)

Development of the mitigation strategy for this 2025 MJHMP was strengthened by using an online platform called MAST, the Mitigation Action Support Tool. MAST is a web-based interactive tool that enables multiple users to search, view, enter, and update mitigation actions, ideas or projects, and other information.

As the planning cycle progresses, MAST will also be used to monitor and revise the mitigation strategy. As a living document, mitigation activities will be updated through this web interface application developed specifically for this 2025 MJHMP.

State & Federal Funding Application Assistance

Using MAST, participating jurisdictions can improve their ability to apply for state and federal funding, including in the initial grant application processes through Cal OES. MAST provides participating jurisdictions and plan reviewers (Cal OES and FEMA) easy access to mitigation action details that can be leveraged to support future risk reduction efforts and specific mitigation projects within the planning area. Additionally, MAST can be used to assist jurisdictions in tracking project progress for grant and other required reporting.

Monitoring & Evaluating the Strategy

As local circumstances change and the plan evolves, mitigation actions will be updated through MAST. The online interface provides jurisdictions the ability to easily record changes and progress and to make adjustments to the strategy as needed. MAST will assist mitigation project managers across all the participating jurisdictions in making adjustments reporting on the status and effectiveness of the mitigation action and overall strategy.

As described in Section 2.4.1, a county-wide advisory team will oversee the collection and review of progress reports on jurisdiction-specific strategies and will develop a county-wide progress report to deliver to the

public and appropriate governing bodies annually. With MAST, updating the status and details of mitigation projects throughout the planning lifecycle will be greatly simplified and consolidated into one location.

2.4 Adopting & Implementing the Plan

Ensuring the MJHMP serves as a practical and accessible tool for Santa Cruz County and other participating jurisdictions is crucial for effective implementation and minimizing community hazard impacts. Section 2.4.2 describes the planning frameworks, maintaining ongoing public engagement, and establishing procedures for implementation, monitoring, evaluation, and regular updates to keep the plan current and responsive to evolving needs. These efforts aim to enhance resilience and safeguard community well-being against hazards.

The County and all participating jurisdictions adopted the plan in compliance with DMA 2000. See Adoptions Records in the Executive Summary of this plan.

2.4.1 Monitoring, Evaluating & Updating

This section describes the strategies for monitoring, evaluating, and updating the 2025 MJHMP throughout its lifecycle. Santa Cruz County and the other participating jurisdictions will monitor and adjust this plan in accordance with all FEMA and Cal OES requirements in order maintain eligibility for federal and state funding opportunities. The strategy includes designating an advisory team, monitoring progress and conducting annual reviews, continuing public and stakeholder engagement, and integrating the plan with other mechanisms to ensure its success.

2.4.1.1 Hazard Mitigation Advisory Team (HMAT)

The Steering Group oversaw the development of the 2025 MJHMP and made decisions on key elements of the plan, including the maintenance strategy; however, a Hazard Mitigation Advisory Team (HMAT) will oversee the implementation phase of the five-year planning cycle. The primary roles of the HMAT in overseeing the implementation of the MJHMP are:

- Acting as a forum for hazard mitigation issues and continuing to solicit community input
- Facilitating interjurisdictional collaboration on hazard mitigation
- Coordinating implementation efforts across jurisdictions and partner agencies
- Reviewing annual progress reports and developing a county-wide progress report
- Tracking county-wide strategy progress and making recommendations on improvements

The HMAT will strive to include representation from all participating jurisdictions, Key Stakeholders and other partner agencies, and members of the public. Keeping the HMAT intact for the duration of the planning cycle will also assist in jump-starting the next plan update.

The HMAT will exist as a subcommittee the Readiness Working Group (RWG), established during the Emergency Operations Plan (EOP) planning process from 2023 to 2024 to leverage existing partnerships relevant to whole community planning.

Duties of the HMAT

The HMAT will coordinate with the participating jurisdictions and other responsible parties for each county-wide mitigation action to assess its effectiveness and make modifications as appropriate. In addition, the HMAT will collect and review annual progress reports from participating jurisdictions and develop a county-wide report to provide input to the Santa Cruz County Board of Supervisors and, as appropriate, elected officials of other participating jurisdictions.

The progress reports will cover possible improvements to the county-wide and jurisdiction-specific strategies and changes to be considered at the next update, in addition to progress on mitigation actions. In evaluating the MJHMP's effectiveness, the following questions should be considered:

- Has the nature or magnitude of hazards affecting the planning area changed?
- Are there new hazards that have the potential to impact the planning area?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the MJHMP?
- Should additional local resources be committed to address identified hazards?

Completion of the individual jurisdiction progress reports will be the responsibility of each participating jurisdiction annually. The reports will also be posted online for public review and released to the media. It will be the HMAT's role to help identify revisions and issues to be addressed by in the next update or other community plans.

The HMAT will also play a key role in preparing for the next MJHMP update by maintaining records and identifying emerging risks. Future updates to the plan will account for any new hazard vulnerabilities, special circumstances, or information or methodologies that become available. Issues that arise or updates made during the interim monitoring and evaluating period will be incorporated into the next update of the MJHMP, and the questions identified above will remain valid during its preparation.

2.4.1.2 Monitoring & Update Schedule

Monitoring the progress of mitigation actions will continue through the five-year period between adoption of this plan and the next update effort. The newly formed HMAT will meet annually, at a minimum, to monitor implementation, develop a progress and improvement report, and deliver that report to the Santa Cruz County Board of Supervisors and other jurisdictional decision-makers, as appropriate. The team's meeting schedule will be posted online, and meetings will be open to the public.

The MJHMP will be updated again after five years, as required by DMA 2000, and the update process will begin at least one year prior to the plan's expiration in 2031. However, should a significant hazard event occur within Santa Cruz County in the meantime, the HMAT will reconvene within 30 days of the disaster to review and update the plan as appropriate. As a DMA 2000 requirement, the County Board of Supervisors and decision-makers of other participating jurisdictions, as appropriate, will adopt any written updates.

Funding Assistance Monitoring

The true worth of any mitigation plan is its implementation and success under grant and other funding programs. This MJHMP was assembled to reduce the risk of natural hazards and also to meet the requirements of DMA 2000 to maintain eligibility under FEMA's Hazard Mitigation Assistance (HMA) grant programs. FEMA's HMA Program is the catalyst that drives increased understanding and supports proactive community action to reduce losses from natural hazards. As discussed further under Section 3.5.2, FEMA administers several programs that provide funding for local agencies with approved mitigation plans, including:

- **Hazard Mitigation Grant Program (HMGP):** Assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration.
- **Flood Mitigation Assistance (FMA):** Provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.

Post-Disaster HMGP Process

Following a disaster, Cal OES and Santa Cruz County officials would perform Preliminary Damage Assessments (PDA) of areas that sustained damage in a joint effort with FEMA. Cal OES then submits the information collected through the FEMA Regional Office, along with a damage estimate to request a declaration from the President. A Presidential Major Disaster Declaration provides for the availability of HMGP funds at the request of the Governor in eligible communities. Figure 2-16 shows a timeline of how projects should be developed and administered by local government and FEMA under the HMGP program. HMGP grant recipients have 36 months from the close of the application period to complete projects.

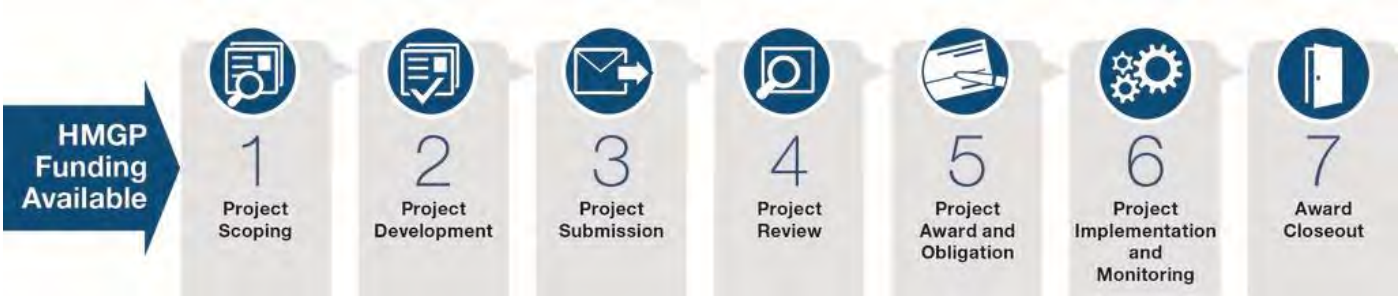


Figure 2-16: HMGP Timeline

Mitigation Action Support Tool (MAST) Updates

Hazard problem statements and mitigation activities will be updated through a web-based interface application developed specifically for the county and other participating jurisdictions, which is available on the project website. This Mitigation Action Support Tool (MAST) will assist jurisdictions in making adjustments to their mitigation strategy as circumstances evolve, and will assist mitigation project managers across all the participating jurisdictions in reporting on the status and effectiveness of the mitigation action and overall strategy. Plan maintenance will be primarily performed through MAST, with most updates to the MJHMP occurring easily through this tool. MAST is further described in Section 2.3.4.4.

2.4.1.3 Continuing Public & Stakeholder Engagement

The strategy for continuing engagement will utilize the same goals and resources as the strategy for developing the 2025 update, as described in Section 2.1.2 and documented in Appendix B. During the five-year planning cycle, the HMAT and individual jurisdictions will continue to involve members of the community in the implementation phase of the process through public gatherings, meetings, and workshops. In addition, the Key Stakeholders involved in this update and other partner organizations will be invaluable resources for supporting continued public engagement, especially with underserved populations.

An electronic copy of the 2025 MJHMP document will be accessible through the Santa Cruz County website and at pre-determined physical locations. Santa Cruz County posts public notices and official information in its county administration building, which can be found at 701 Ocean Street, Santa Cruz, CA 95060.

Information on events related to hazard mitigation or the MJHMP will be announced via the same media tools discussed in Section 2.1.2.1, including jurisdictional and partner websites, social media, and the project website (mitigatehazards.com/santacruzmjhmp) and on the county's webpage.

2.4.2 Plan Integration

For the MJHMP to be successful, the recommendations and underlying principles of the plan should be incorporated into various aspects of local governance, including community planning and development (e.g., capital improvement budgeting) as well as everyday operations. Integration into a variety of departments and roles within the county and participating jurisdictions provides an opportunity to network, identify, and highlight mitigation activities and opportunities at all levels of government. It is also important to monitor resources and opportunities which can be leveraged to implement the mitigation strategy.

As the plan evolves, the following should be considerations for implementing and integrating the mitigation strategy:

1. **Use processes that already exist.** Take advantage of tools and procedures identified in the capability assessment in Section 3.5.1. Leaning on mechanisms already in use and familiar to participating jurisdictions will give the planning implementation phase a strong initial boost.
2. **Update work plans, policies, and procedures.** Incorporating hazard mitigation concepts and activities can help integrate the HMP into daily operations. These changes can include how major development projects are addressed in hazard-prone areas or can ensure that hazard mitigation concerns are considered in the approval of major capital improvement projects.
3. **Revise job descriptions.** Work with department or agency leads to revise job descriptions to include mitigation-related duties. Designating a "mitigation lead" within a department can further institutionalize hazard mitigation with little financial expenditure or programmatic overhaul.

The capabilities assessment for each participation jurisdiction identifies the past and current usage of various planning and regulatory mechanisms relevant to hazard mitigation, and opportunities for their future integration with the MJHMP directly or indirectly. This integration helps to ensure plan alignment with ongoing efforts, identify opportunities for integration, and avoid redundancy. In general, information from this MJHMP will be incorporated into:

- **General Plans:** The MJHMP will provide information that can be incorporated into the safety, land use, and other elements of general plans for the county and municipalities as they are updated, and many jurisdictions will update their safety element to incorporate the MJHMP in compliance with Assembly Bill (AB) 2140. Specific risk and vulnerability information from the MJHMP will also assist in identifying areas where development may be at risk to potential hazards for integration with land use, circulation, economic, and other elements.
- **Land Use and Development Regulations:** The MJHMP provides information that enables the county and other participating jurisdictions to make decisions on appropriate land use and development codes, such as zoning or construction standards which can increase resilience against natural disasters. Some participating jurisdictions' mitigation actions directly recommend updates to or adoption of new regulations to better address hazard risks.

- **Santa Cruz County Strategic Plan:** The Santa Cruz County Strategic Plan & Equity Framework outlines six strategic goals—including health and safety, housing, transportation, and environmental sustainability—that align closely with the objectives of the MJHMP. Both plans prioritize risk reduction, climate resilience, and equity, especially for vulnerable populations. The Strategic Plan's focus on cross-sector collaboration and data-driven outcomes directly supports MJHMP goals to integrate mitigation actions into broader county planning, ensuring a safer, more resilient Santa Cruz.
- **Hazard and Other Specific Plans:** The MJHMP will provide information that can be incorporated into community wildfire plans and other specific or areas plans, and the MJHMP likewise captured mitigation actions derived from these types of documents. The MJHMP will provide risk assessment information that can be included in updates to groundwater, stormwater, floodplain management, and other plans. In addition, the MJHMP may be integrated with capital improvement, operational, maintenance, or emergency response plans with valuable information from this plan such as geospatial hazard footprints, exposure summaries, and damage estimations.

A summary of county-related mechanisms into which hazard mitigation and this 2025 MJHMP have been or could be incorporated is provided in the Capabilities and Opportunities Assessment, Section 3.5.1. Capabilities assessments for other participating jurisdictions are provided in the Volume 2 annexes.

Section 3. Risk Assessment

The risk assessment measures the potential impacts of hazards on life, property, and critical facilities and infrastructure within Santa Cruz County. The intent of a risk assessment is to identify the qualitative and quantitative vulnerabilities of a community to the greatest extent possible given available data. These assessments increase understanding of hazard impacts and provide the foundation to develop and prioritize mitigation actions. In turn, mitigation actions reduce damage from disasters through increased preparedness and focusing resources on areas of the greatest vulnerability.

This risk assessment section evaluates potential losses from a given hazard event by assessing the vulnerabilities of people, buildings, and critical facilities and infrastructure. It identifies the characteristics and potential consequences of hazards, explores how much of the planning area could be affected by a hazard event, and assesses the impacts on county assets, specifically. Assessments for other participating jurisdictions are found in their individual annex in Volume 2, which build upon the hazard profiles in this Volume 1 section and then evaluate those particular jurisdictions.

The process used for the risk assessment is described in Section 2.2 and Appendix A; the approach consists of three main components:

- **Section 1.4, Community Profile:** Providing a geographic and demographic overview of Santa Cruz County as the basis for the assessment, highlighting the populations most vulnerable to hazards in the planning area.
- **Section 3.1, Hazard Identification & Prioritization:** Identifying hazards that pose the most significant threats and prioritizing them based on probability and potential impact in the county and other participating jurisdictions.
- **Section 3.2, Hazard Profiles:** Detailing the characteristics, history, probability, and potential impacts of each hazard, including:
    - **Exposure Analysis:** Mapping the populations, assets, and critical facilities and infrastructure exposed to each hazard.
    - **Vulnerability Analysis:** Assessing how susceptible different populations, structures, and other assets are to hazard impacts.

The Community Profile in Section 1.4 ensures that the needs of underrepresented communities are recognized in developing the mitigation strategy and used in future planning and policymaking to foster more equitable and sustainable environments. This approach not only safeguards the most vulnerable populations but also enhances the overall resilience of the entire community. Each Volume 2 annex contains a similar discussion of that jurisdiction's geographic and demographic characteristics as part of their individual risk assessment.

3.1 Hazard Screening & Prioritization

Per FEMA guidance, the first step in developing the risk assessment is to identify a list of natural hazards that pose a significant threat to Santa Cruz County. Hazard selection is a twofold process. First, early in the process, the county-wide HMPT and each of the jurisdictional planning teams considered and screened a broad set of hazards profiled in local, regional, and statewide hazard planning documents. A crosswalk of select documents reviewed and the results of screening the relevant hazards for the county-wide planning area are outlined in Section 3.1.1 and Table 3-1.

Second, the planning teams reviewed the history of hazard events, particularly over the last 5 years, which impacted the planning area and the potential effects of climate change on the frequency and severity of hazards to inform the prioritization process outlined in Section 3.1.2. The teams also took into account the initial results from public and stakeholder engagement on the community's top hazard concerns, which resulted in the addition of high wind and exclusion of soil hazards from this updated plan, for example (see a summary of this and other key findings from engagement in Section 2.1.2.3). This comprehensive approach ensures that the risk assessment is thorough and accounts for both established and emerging threats, providing a robust foundation for effective hazard mitigation planning.

Following completion of the screening and prioritization exercises for all individual jurisdictions, the HMPT discussed and formed consensus on which county-wide hazards would be included and profiled in the MJHMP. Based on their evaluation, the HMPT decided to profile ten priority hazards, including relevant subhazards as identified in Table 3-5, in this 2025 update.

Wildfire
SECTION 3.2.1



Flood
SECTION 3.2.2



Earthquake
SECTION 3.2.3



Severe Weather
SECTION 3.2.4



Coastal Hazards
SECTION 3.2.5



Slope Failure
SECTION 3.2.6



Dam Failure
SECTION 3.2.7



Drought
SECTION 3.2.8



Extreme Heat
SECTION 3.2.9



Climate Change
SECTION 3.2.10



3.1.1 Potential Hazards

The county-wide HMPT reviewed previously prepared hazard mitigation plans by the participating jurisdictions, as well as plans from regional and state entities, to determine the range of hazards with the

potential to affect the planning area and surrounding region. Table 3-1 provides a crosswalk of hazards identified in select documents reviewed, including the 2021 Santa Cruz County HMP, 2020 Santa Cruz County General Plan Safety Element, and 2023 California State Hazard Mitigation Plan (SHMP).

The crosswalk was used to develop a preliminary hazards list early in the process, providing a framework for HMPT to evaluate which hazards were truly relevant county-wide. For example, volcanoes were considered to have no relevance to Santa Cruz County, while earthquake, flood, and wildfire were indicated in every hazard document. The preliminary hazards list was then used as the basis for prioritizing which hazards should be profiled and analyzed in detail in this 2025 MJHMP, as discussed in Section 3.1.2.

Each participating jurisdiction's planning team also completed this document review and crosswalk identifying potential hazards relevant to their individual planning area, the results of which are reported in the annexes of Volume 2.

Table 3-1: Document Review Crosswalk of Potential County-Wide Hazards

Hazard	2021 Santa Cruz County HMP	2020 Santa Cruz County General Plan Safety Element	2023 California SHMP
Agricultural Pests			■
Avalanche			■
Climate Change	■		■
Coastal	■	■	■
Dam Failure	■	■	■
Drought	■		■
Earthquake / Liquefaction	■	■	■
Extreme Cold	■		■
Extreme Heat	■		■
Extreme Weather / Storms	■	■	■
Flood	■	■	■
Geologic / Mass Movement	■	■	■
Human-Caused		■	■
Insects			■
Levee Failure	■		■
Pandemic Disease			■
Sea-Level Rise	■	■	■
Soil	■	■	■
Subsidence	■		■
Tornado			■
Tsunami / Seiche Wave	■	■	■
Volcano			■
Wildfire	■	■	■

3.1.2 Hazard Prioritization

The hazard prioritization process integrated historical data, future probability and impact potential, local knowledge, and consensus opinions to further evaluate the hazards identified through the hazard planning document crosswalk exercise described in Section 3.1.1. As part of this process, the planning team for each participating jurisdiction participated in their own prioritization exercise using a risk assessment matrix, which was used to determine whether each potential hazard is a medium, high, or extreme priority for the jurisdiction based on its unique characteristics.

The results of the initial hazard prioritization process for Santa Cruz County, before further refinement, are displayed in the completed risk assessment matrix (Figure 3-1); the completed matrixes for all other participating jurisdictions are found in their respective Volume 2 annex and in the Planning Process Library (Table 2-10).

Hazards identified as county-wide priorities were profiled and thoroughly assessed (Table 3-5), as provided in Section 3.2, and these hazards were also the focus of the mitigation strategies, with more deference given to those rated extreme and high.

3.1.2.1 Past Major Hazard Events

An important consideration in identifying and prioritizing hazards is the history of significant events, especially those which have triggered federal or state disaster declarations. The planning teams reviewed and considered past major hazard events affecting the planning area as part of the hazard screening and prioritization process, taking into account the frequency of events and severity of the impacts that were experienced. Further, hazard events occurring outside the planning area can directly or indirectly impact the community; thus, the teams also reviewed these past events. For example, dam failures or wildfires may occur outside Santa Cruz County but either hazard event could affect watersheds that drain into the planning area, resulting in flooding or longer-term watershed health impacts.

Most available information on major past hazard events comes from federal or state disaster declarations since these provide funding opportunities when the severity or magnitude of an event surpasses the abilities of the responsible governing body to respond and recover. State funding assistance can be provided when a local jurisdiction's capacity to respond to a disaster is exceeded and federal when the state's response and recovery capacities are also exceeded. Santa Cruz County had eight federally declared disasters between 2017 and 2024 alone.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and do not include the long-term federal recovery programs that accompany major disaster declarations. The quantity and type of damage are the determining factors. In California, an emergency proclamation authorizes the Governor's Office of Emergency Services (Cal OES) to provide assistance under the California Disaster Assistance Act, among other provisions.

A USDA disaster declaration occurs when agricultural areas, such as the Pajaro Valley, are particularly impacted by an event. This type of declaration certifies that the affected county has suffered at least a 30% loss in one or more crop or livestock areas and provides affected producers with access to low-interest loans and other programs to help mitigate the impacts. Importantly, all counties neighboring those receiving USDA disaster declarations are eligible for the same assistance.

The Santa Cruz County planning area has received 20 federal and 16 state disaster declarations since 1985, some of which were statewide disasters. Multiple hazard events triggered state declarations and were than also declared at the federal level. Table 3-2 and Table 3-3 identify all the federal and state disaster declarations in the county since 1985.

In the past decade, multiple costly hazard events have impacted various parts of, and sometimes the entire, county, and multi-million dollar disasters are hitting the area more frequently than in the past. The winter storms that occurred in late 2016 and early 2017 caused approximately $120 million in damage, and the CZU Lightning Complex Fire in 2020 was an approximately $340 million disaster, with over 86,000 acres burned and 920 homes destroyed. Destructive, climate change-driven winter storms that cause surge, wave run-up, high wind, landslides, flooding, and the occasional tornado are also increasing in frequency and severity and led to declarations in 2023 and 2024.

Table 3-2: Santa Cruz County Federal Disaster Declarations 1985 to Present

Year	Incident Description	Disaster No.
1986	Severe storms & flooding	DR-758-CA
1989	Earthquake (Loma Prieta)	DR-845-CA
1991	Severe freeze	DR-894-CA
1995	Severe storms & flooding	DR-1044-CA
1995	Severe storms & flooding	DR-1046-CA
1997	Severe storms & flooding	DR-1155-CA
1998	Severe winter storms & flooding (El Niño)	DR-1203-CA
2006	Severe storms, flooding, landslides	DR-1646-CA
2006	Severe storms & flooding	DR-1628-CA
2008	Wildfire (Summit Fire)	FM-2766-CA
2008	Wildfire (Martin/Bonny Doon Fire)	FM-2772-CA
2008	Emergency—California Wildfires	EM-3287-CA
2017	Severe winter storms, flooding & mudslides	DR-4301-CA
2017	Severe winter storms, flooding & mudslides	DR-4305-CA
2017	Severe winter storms, flooding & mudslides	DR-4308-CA
2020	COVID-19 pandemic	DR-4482-CA
2020	Wildfires (CZU Lightning Complex)	DR-4558-CA

Year	Incident Description	Disaster No.
2023	Emergency—Severe winter storms	EM-3591-CA
2023	Severe winter storms, flooding, landslides & mudslides	DR-4683-CA
2023	Severe winter storms, flooding, landslides & mudslides	DR-4699-CA
2024	Severe Winter Storms, Tornadoes, Flooding, Landslides, and Mudslides	DR-4769-CA

Source: FEMA Disaster Database

Table 3-3: Santa Cruz County State Disaster Declarations 1985 to Present

Year	Incident Description	Disaster / Executive Order No.
1986	Severe storms & flooding	86-01 (CDAA)
1989	Earthquake (Loma Prieta)	89-01 (CDAA)
1991	Severe freeze	91-01 (CDAA)
1995	Winter storms/flooding	95-01N (CDAA)
1995	Winter storms/flooding	95-03N (CDAA)
1995	Winter storms/flooding	95-04S (CDAA)
1997	Severe storms/flooding	97-01 (CDAA)
1998	El Niño storms/flooding	98-01 (CDAA)
2008	Wildfires (Summit, Martin/Bonny Doon Fire)	2008-02 (CDAA)
2006	Severe storms/flooding	2006-01 (CDAA)
2006	Severe storms/landslides	2006-03 (CDAA)
2017	Severe winter storms, flooding & mudslides	2017-01 (CDAA)
2017	Severe winter storms, flooding & mudslides	2017-02 (CDAA)
2017	Severe winter storms, flooding & mudslides	2017-03 (CDAA)
2021	Winter storms, atmospheric river event	Emergency Proclamation
2022	Extreme heat event	N-15-22, N-14-22
2022-2023	Severe winter storms, atmospheric river events	N-1-23, N-2-23, N-10-23
2023	Winter storms, atmospheric river event	N-6-23, N-7-23, N-9-23, N-10-23
2023-2024	Severe winter storms	Emergency Proclamation
2024	Severe winter storms	Emergency Proclamation
2024	Severe storms	Emergency Proclamation
2024	Major coastal winter storm	2025-03 (CDAA)

Source: Cal OES Disaster Database

3.1.2.2 Probability & Impact

After the county-wide HMPT and each of the jurisdictional planning teams determined the realm of hazards that could affect the planning areas, the teams then completed an initial risk ranking exercise to determine which hazards should be prioritized for assessment in this MJHMP and, consequently, which hazards should be the focus in the mitigation strategy.

The hazard prioritization process combines historical data, local knowledge, climate projects, and consensus opinions to produce a risk matrix that illustrates whether each profiled hazard is an extreme, high, medium, or low priority for the planning area. Criteria for probability verses impact were used to evaluate hazards and identify those that pose the highest risks. Hazards determined to have a minor or limited impact and unlikely or possible probability were generally categorized as low risk and excluded from the risk assessment while those determined to cause more severe impacts and have a higher probability are profiled in detail in Section 3.2.

Impact: What are the anticipated deaths, injuries, damages, or disruptions?

- **Minor:** Very few injuries, if any; only minor property damage and minimal disruption on quality of life; temporary shutdown of critical facilities.
- **Limited:** Minor injuries only; approximately 10% to 25% of property in disaster footprint damaged or destroyed, and complete shutdown of some critical facilities for more than one day.
- **Critical:** Multiple deaths and injuries possible; between 25% and 50% of property in disaster footprint is damaged or destroyed, and complete shutdown of critical facilities for more than one week.
- **Catastrophic:** High number of deaths and injuries possible; more than 50% of property in affected area damaged or destroyed, and complete shutdown of critical facilities for a month or more.

Probability: What is the likelihood of an event?

- **Unlikely:** Less than 1% annual probability, or might occur sometime in your lifetime.
- **Possible:** Between 1% and 10% annual probability, or likely to occur sometime in your lifetime.
- **Likely:** Between 10% and 100% annual probability, or will occur several times in your lifetime.
- **Highly Likely:** 100% annual probability, or likely to occur every year in your lifetime.

Secondary & Compounding Hazard Events

The MJHMP primarily examines the vulnerabilities of hazard events individually within the planning area. However, it is recognized that hazards often occur in combination, leading to compounded effects. Frequently, a secondary hazard is triggered by or occurs following the first event, such as a severe rain event following a wildfire that causes debris flows in the burn scar. Other events are compounded by outside factors, like wildfire evacuations occurring during Public Safety Power Shutoff (PSPS) events. This plan discusses these multi-hazard risks within the hazard profiles of Section 3.2 by highlighting potential secondary and compounding hazards that could result from initial events or intensify impacts.

The plan also considers the implications of pairing hazard events with the need for emergency evacuation or response, particularly in light of experiences during the COVID-19 pandemic. This includes local governments actively considering response and mitigation strategies that address the impacts of multiple hazard events, such as a pandemic occurring alongside other hazards like floods, severe weather, or wildfires.

By understanding the interplay among different hazards and preparing for compounded events, the MJHMP aims to enhance the resilience and preparedness of the planning area against a wide range of potential disaster scenarios.

Climate Change Impacts

Climate change is a global phenomenon that can impact many aspects of society including public health, natural and managed resources, critical facilities, buildings, infrastructure, and services. Projected changes to the climate are dependent on location. In California, the University of California Berkeley Geospatial Innovation Facility developed a platform called Cal-Adapt funded by the California Energy Commission (CEC). This platform provides tools and data on climate change across the state, including for Santa Cruz County, from global scale models that have been localized (downscaled) to 3.7-mile by 3.7-mile grids.

Santa Cruz County is experiencing climate change in various forms, including increasing frequency and severity of severe weather and wildfires, which offer a tangible glimpse of future conditions. Existing conditions combined with predictive modeling indicate that the impacts of climate change will continue to be significant and will increase over time impacting all aspects of the local environment, built and natural. Recent events, including the COVID-19 pandemic, reveal another clear truth: the impacts of climate change will disproportionately be experienced by the most vulnerable and marginalized populations.

Cal-Adapt data combined with information from the California Fourth Climate Change Assessment was used to model future changes in specific types of hazards in the 2022 Santa Cruz County Climate Action and Adaptation Plan (CAAP). Projections in the CAAP are outlined by two separate Representative Concentration Pathways (RCP):

- **RCP 4.5** is a medium emissions scenario where global emissions peak by the year 2040 and then decline.
- **RCP 8.5** is a high emissions scenario in which global emissions continue to rise through the end of the twenty-first century.

The 2022 CAAP outlines the potential impacts of climate change on various hazards and notes that all impacts will disproportionately affect vulnerable populations. Table 3-4 summarizes these projected climate change impacts.

Table 3-4: Climate Change Impacts on Hazards

Hazard	Description of Impacts
Extreme Heat	Annual number of extreme heat days above 90°F increase from 3 days to 19 days. Increases in average maximum temperature also contribute to worsening air quality.
Wildfire	Approximately 20% increased probability of wildfire in a 10-year period. Increases in wildfires also contribute to worsening air quality.
Slope Failure	Increased susceptibility of landslides as precipitation variability increases and wildfires increase in frequency, area, and severity.
Flood	Low-lying areas experiencing more frequent and intense flooding, with the area of flooding potentially expanding. Additionally, increased moisture transport and delivery from atmospheric river storms.
Sea-Level Rise	Up to 6.9 feet of sea level rise by 2100, also contributing to seawater intrusion in freshwater aquifers.
Drought	More frequent and severe periods of drought, challenging drinking water supplies and aquatic species habitat. Precipitation will arrive in more intense storms, increasing runoff and reducing the amount of water recharging local aquifers, further exacerbating the impacts of drought on water supply. Increases in longer periods of drought also contribute to worsening air quality.

Source: 2022 Santa Cruz County CAAP

3.1.2.3 County-Wide Priority Hazards

The results of the initial risk ranking exercise completed by the county-wide HMPT and then refined by the Santa Cruz County Planning Team are identified in the county's completed matrix in Figure 3-1. Table 3-5 provides the final list of priority hazards and subhazards with additional details about why the county-wide priority hazards were chosen and why other hazards were not prioritized. However, it should be noted that many hazards not prioritized for profiling are briefly discussed as secondary or compounding hazards, and subhazards that were profiled and included in the risk assessment are listed specifically.

This prioritization exercise was also completed by all other jurisdictional planning teams, the results of which are described in the jurisdictional annexes of Volume 2 and provided in the Planning Process Library (Table 2-10).

Risk Assessment Matrix Definitions

PROBABILITY RATING

The likelihood of a hazard event occurring within a time period?

PROBABILITY

Highly Likely	**Highly likely** - 100% annual probability. Or Likely to occur every year in your lifetime.
Likely	**Likely** - between 10 & 100% annual probability. Or will occur several times in your lifetime.
Possible	**Possible** - between 1 & 10% annual probability. Or Likely to occur some time in your lifetime.
Unlikely	**Unlikely** - less than 1% annual probability. Or unlikely but possible to occur in your lifetime.

IMPACT RATING

In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs? The impact could be in terms of one hazard event (flooding from a culvert failure) or a large-scale event (multiple rivers flooding) in the same jurisdictional boundary.

IMPACT

Minor	Limited	Critical	Catastrophic

Minor - very few injuries, if any. Only minor property damage & minimal disruption on quality of life. Temporary shutdown of critical facilities.

Limited - minor injuries only. Approx. 10% or less of property in disaster footprint damaged or destroyed. Complete shutdown of critical facilities for more than one day.

Critical - multiple deaths/injuries possible. Between 25% and 50% of property in disaster footprint is damaged or destroyed. Complete shutdown of critical facilities for more than one week.

Catastrophic - high number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.

To concentrate resources, the jurisdictional planning team will focus on "High" and "Extreme" risk hazards. These hazards have the higher probability and greater impact as it relates to the jurisdictions planning area.

Hazard definitions are included in **Vol. 1** of this plan. Some hazards are discussed as subset hazards– e.g., "Dam Failure" within the "Flood" hazard profile. If a hazard is not present on the risk matrix or are grey in color, the jurisdictional planning team felt the hazard had a minimal footprint within their planning area and was not ranked.

Hazard Information / Legend:

CLIMATE CHANGE

Climate Change impacts will be addressed at the end of each hazard section and as a stand alone section for each jurisdiction.
For County and Municipal governments you will be required to address climate change impacts in the Safety Element of your General Plan. Climate change may change the frequency, duration and intensity of hazards listed above.

Santa Cruz County Risk Matrix

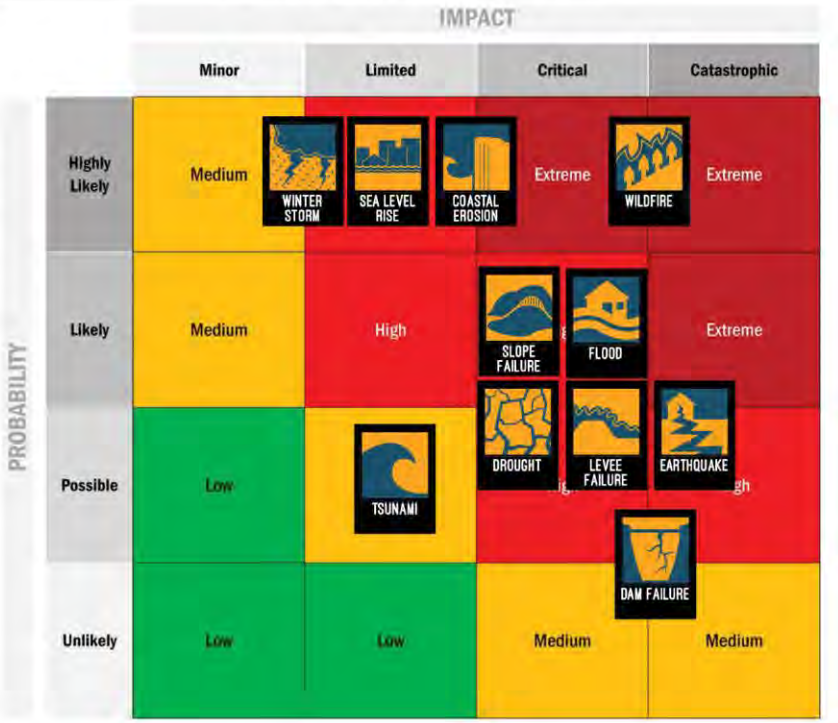


Figure 3-1: Santa Cruz County Risk Assessment Matrix

Table 3-5: County-Wide Hazards Prioritization Summary

Hazard	Priority	Explanation
Wildfire	**Extreme**	Profiled in Section 3.2.1
Coastal	**Extreme**	Profiled in Section 3.2.5, including Coastal Storm, Coastal Erosion, Wave Run-Up and Surge, and Tsunami
Earthquake / Liquefaction	**Extreme**	Profiled in Section 3.2.3, including Liquefaction
Extreme Weather / Storms	**High**	Profiled in Section 3.2.4, including High Wind, Heavy Rain, and Winter Weather
Flood	**High**	Profiled in Section 3.2.2, including Levee Failure
Geologic / Mass Movement	**High**	Profiled in Section 3.2.6 as Slope Failure
Drought	**High**	Profiled in Section 3.2.8
Extreme Cold	**High**	Profiled in Section 3.2.4 under Severe Weather as Winter Weather
Levee Failure	**High**	Profiled in Section 3.2.2 under Flood
Sea Level Rise	**High**	Profiled in Section 3.2.10 under Climate Change
Climate Change	**High**	Profiled in Section 3.2.10, including Sea-Level Rise, and discussed as a compounding hazard in relevant profiles
Dam Failure	**Medium**	Profiled in Section 3.2.7
Extreme Heat	**Medium**	Profiled in Section 3.2.9
Tsunami / Seiche Wave	**Medium**	Profiled in Section 3.2.5 under Coastal Hazards as Tsunami
Agricultural Pests	-	Not a priority due to low impact potential
Avalanche	-	Not a priority due to low probability
Human-Caused	-	Not a priority due to being addressed in other plans
Insects	-	Not a priority due to low impact potential
Pandemic Disease	-	Not a priority due to being addressed in other plans
Soil	-	Not a priority due to low impact potential
Subsidence	-	Not a priority due to low impact potential
Tornado	-	Not a priority due to low probability
Volcano	-	Not a priority due to low probability

3.2 Vulnerability to Specific Hazards

This section contains the profiles for all ten medium to extreme priority hazards that affect Santa Cruz County and other participating jurisdictions and were identified by the county-wide HMPT. The hazard profiles contained in this Volume 1 provide detailed information on hazard characteristics and related local conditions, including:

- Profiled subhazards
- Secondary and compounding hazards
- Policies, plans, and regulations
- Past events and locations
- Frequency and future probability
- Severity
- Warning time
- Population and asset exposure
- Damage assessment (flood only)
- Hazard problem statements

Importantly, the profiles assess vulnerabilities specific to the unincorporated county and how the priority hazards may affect populations, property, and critical facilities and infrastructure within Santa Cruz County's jurisdiction. The same assessment is provided for other participating jurisdictions in the Volume 2 annexes. These risk assessments informed the problem statements that are provided at the end of each hazard profile and within the jurisdictional annexes.

Santa Cruz County's hazard mitigation strategy presented in 3.4.4 responds to the particular vulnerabilities outlined in this section and described in the problem statements. The mitigation strategy provides prescriptions or actions to achieve the greatest reduction of vulnerability, which will result in saved lives, reduced injuries, reduced property and critical facility damage, fewer service disruptions, and protection for the environment in the event of a natural hazard. The process and methods for calculating exposure and loss estimates are described in Section 2.2 and Appendix A.

Wildfire
SECTION 3.2.1



Flood
SECTION 3.2.2



Earthquake
SECTION 3.2.3



Severe Weather
SECTION 3.2.4



Coastal Hazards
SECTION 3.2.5



Slope Failure
SECTION 3.2.6



Dam Failure
SECTION 3.2.7



Drought
SECTION 3.2.8



Extreme Heat
SECTION 3.2.9



Climate Change
SECTION 3.2.10





Wildfire

FEMA DRAFT - 2/27/2026

3.2.1 Wildfire Hazard Profile



A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson. The 2018 California State Hazard Mitigation Plan defines wildfires as:

> *Any free-burning vegetative fire that initiates from an unplanned ignition, whether natural (e.g., lightning) or human-caused (e.g., powerlines, mechanical equipment, escaped prescribed fires), where the management objective is full suppression.*

Wildfires are costly, putting lives and property at risk and compromising watersheds, wildlife habitats, and recreation; agricultural, timber, and range land; historic, cultural, and scenic assets; and local economies. Wildfires can also severely damage critical facilities and infrastructure, including power lines, telecommunications networks, and water supply treatment and distribution systems. Vulnerability to flooding increases due to the destruction of forest and ground cover within watersheds. The potential for significant damage to life and property increases in areas where development is adjacent to densely vegetated areas, known as wildland-urban interface (WUI) areas. While some fires are allowed to burn naturally in order to maintain or restore the health of forest lands, out of control wildfires need to be prevented through land management planning.

Santa Cruz County is defined by a diverse topography, with dense urban development along the coastal terrace and mountainous and heavily forested terrain throughout the Santa Cruz Mountains. These conditions contribute to a heightened risk of wildfire and subsequent urban conflagration—extensive fires that damage or destroy large swaths of land and property. The rugged, steep terrain in the San Lorenzo Valley, Bonny Doon, and the North Coast not only influences wildland fire behavior but also poses significant challenges to fire suppression efforts.

In developed areas such as the City of Santa Cruz, Capitola, and the urban-wildland transition zones of Scotts Valley, the San Lorenzo Valley, Pajaro Valley, and the unincorporated communities of Aptos, Live Oak, and Soquel, ember cast is a primary driver of fire spread. These embers can ignite spot fires in ornamental landscaping, accumulated debris, or untreated wooden structures. Compounding this risk is the presence of dense vegetative fuels within and around urban cores, including greenbelts, riparian corridors, and unmanaged vacant lots. These vegetated areas can serve as ignition points for embers and facilitate rapid fire spread between structures.

As climate change intensifies wildfire season length and fuel aridity, the potential for destructive urban conflagration in Santa Cruz County is likely to increase. Targeted mitigation efforts focused on fuel management, defensible space enforcement, ignition-resistant construction, and coordinated suppression planning are critical to reducing this risk.

Fire Hazard Severity Zones (FHSZ)

To characterize wildfire risk at a landscape-scale, the California Department of Forestry and Fire Protection (CAL FIRE) has developed and maintains Fire Hazard Severity Zones (FHSZ). These zones are established using a statewide fire behavior modeling system that incorporates the following variables:

- Vegetation type and fuel load
- Topography (slope and aspect)
- Historical fire frequency and ignition density
- Weather conditions, including the number of days per year with extreme fire behavior potential
- Spot fire potential and ember cast range

According to the most recent FHSZ data, large areas of unincorporated Santa Cruz County fall within "High" or "Very High" severity zones, as discussed in Section 3.2.1.5 and identified on Figure 3-6, particularly in and around Bonny Doon, the San Lorenzo Valley, and southern areas near Corralitos and Watsonville. These zones correspond closely with regions impacted by recent major wildfires, such as the 2020 CZU Lightning Complex.

3.2.1.1 Secondary & Compounding Hazards

Wildfires can produce a wide range of secondary effects that extend beyond the immediate fire perimeter. These secondary and compounding hazards are briefly discussed in this section in relation to wildfire, and some are discussed in other profiles. In Santa Cruz County, these include slope destabilization from post-fire flooding in the Slope Failure Hazard Profile (Section 3.2.6), high wind in the Severe Weather Profile (Section 3.2.4), drought (Section 3.2.8), and climate change (Section 3.2.10).

Slope Destabilization & Sedimentation

According to the 2025 San Mateo-Santa Cruz Unit Strategic Fire Plan, high-intensity wildfires frequently lead to the loss of vegetation and soil structure, increasing vulnerability to erosion, debris flows, and landslides, particularly on the steep slopes of the Santa Cruz Mountains. Burned areas may also develop hydrophobic soils, which inhibit water infiltration and increase surface runoff. These post-fire conditions heighten the risk of localized flooding and sedimentation during subsequent rain events, sometimes persisting for multiple years after a fire. Ash and sediment from burned watersheds can contaminate streams and reservoirs, degrading water quality and impairing aquatic ecosystems.

High Wind

Wind plays a critical role in exacerbating fire spread. Santa Cruz County is subject to seasonal offshore winds, particularly in the fall, which can rapidly drive fires westward toward populated areas. In addition, local topographic wind effects within narrow canyons and ridgelines intensify fire behavior and contribute to the long-distance transport of embers.

Climate Change & Drought

Fire in western ecosystems is determined by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot, dry spells create the highest fire risk. Drought and increased temperatures intensify wildfire danger by drying out and stressing vegetation. Climate change also may increase winds that spread fires. Faster fires are harder to contain and, thus, are more likely to expand into residential neighborhoods.

Santa Cruz County is already considered to be an area that is at high-risk for wildfires. Climate change is projected to increase this current risk by anywhere from 10% to 20%, and the county will need to continue to adapt to this projected increase and the additional threats it brings to emergency services, roads, water supplies, housing access, and quality of life. For example, in October 2017 Sonoma County lost 5,300 homes, or 2.5% of its housing stock, in an already challenging housing market. (Beacon Economics, 2018)

As climate conditions shift toward longer fire seasons and drier fuels, secondary wildfire effects are expected to increase in both frequency and severity across Santa Cruz County. A changing climate is expected to subject forests to increased stress due to drought, disease, invasive species, and insect pests, such as the shothole borer. These stressors are likely to make forests more vulnerable to catastrophic fire due to increased standing dead biomass. While periodic fires are natural processes and fulfill an important ecological function, catastrophic fire events that cannot be contained or managed can cause serious threats to homes and infrastructure, especially for properties located in or adjacent to the WUI. Moreover, rain events are predicted to become more severe in our changing climate, and post-fire flooding and slope stabilization could worsen as well.

Smoke

Smoke from wildfire events contains high concentrations of fine particulate matter (PM2.5), carbon monoxide, and other harmful compounds. These pollutants can affect air quality across wide areas, even far from the fire source. According to the California Air Resources Board (2020), wildfire smoke poses serious health risks, especially for vulnerable populations such as children, seniors, pregnant individuals, and people with existing respiratory or cardiovascular conditions.

Urban Conflagration

In addition to natural wildland fire behavior, urban conflagration presents a growing hazard in Santa Cruz County. Urban conflagration refers to a large, uncontrolled fire that spreads rapidly through developed areas, often when wildfires enter densely built neighborhoods on the fringe of the WUI and typically fueled by structures and infrastructure rather than wildland vegetation. Unlike wildfires that primarily occur in the WUI and undeveloped areas, urban conflagrations pose unique risks to life and property due to the concentration of buildings, limited defensible space, and complex interdependencies among critical infrastructure systems.

According to FEMA and the National Fire Protection Association (NFPA), an urban conflagration occurs when a structural fire spreads from building to building in a continuous, uncontrollable manner, often involving multiple city blocks. This type of hazard is exacerbated by high winds, limited firefighting access, compromised water supply, and inadequate building separation or fire-resistance standards.

The 2020 CZU Lightning Complex Fire demonstrated the destructive potential of wildfires transitioning into residential zones (Figure 3-2). High winds, dry fuels, and closely spaced structures enabled rapid fire spread, resulting in the loss of nearly 1,000 homes and the displacement of tens of thousands of residents. Key factors contributing to urban conflagration include:

- Flying embers (firebrands) igniting structures and vegetative fuels far ahead of the main fire front
- Limited defensible space around structures
- Combustible building materials
- Narrow, steep, or dead-end access roads that hinder evacuation and response

The risk of urban conflagration is highest in areas with dense housing, limited infrastructure resilience, and poor access for fire suppression, such as parts of Bonny Doon, Boulder Creek, and the San Lorenzo Valley as well as along the urban services boundary adjacent to the unincorporated communities of Aptos, Corralitos, Freedom, Live Oak, and Soquel. As wildfire behavior intensifies due to climate and fuel conditions, the potential for fires to escalate into community-scale conflagrations will remain a critical concern for hazard mitigation and land use planning in Santa Cruz County.



Figure 3-2: 2020 CZU Lightning Complex Fire

Source: Santa Cruz County

3.2.1.2 Policies, Plans & Regulatory Environment

Wildfire Protection Responsibility

Local, state, tribal, and federal organizations all have legal and financial responsibility for wildfire protection. In many instances, two fire organizations have dual primary responsibility on the same parcel of land—one for wildfire protection and the other for structural fire protection. To address wildfire jurisdictional responsibilities, in 1981 the California State Legislature outlined various wildfire responsibilities, described below, in Public Resources Code § 4291.5 and Health and Safety Code § 13108.5:

- **Federal Responsibility Areas (FRAs):** FRAs are fire-prone wildland areas that are owned or managed by a federal agency such as the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary financial and rule-making jurisdictional authority rests with the federal land agency. In many instances, FRAs are interspersed with private land ownership or leases. Fire protection for developed private property is usually not the responsibility of the federal land management agency but of the relevant local government agency. The only FRA in Santa Cruz County is the Cotoni-Coast Dairies National Monument near Davenport.
- **State Responsibility Areas (SRAs):** SRAs are lands in California where the California Department of Forestry and Fire Protection (CAL FIRE) has legal and financial responsibility for wildfire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRA boundaries are those adopted by the California Board of Forestry and are reviewed and updated every five years. Where SRAs contain structures or development, the responsibility for fire protection of those improvements falls to the relevant local government agencies. SRAs are defined as lands that:
    - Are unincorporated county areas;
    - Not federally owned;
    - Have wildland vegetation cover rather than agricultural or ornamental plants; or
    - Have watershed, range, or forage values.
- **Local Responsibility Areas (LRAs):** LRAs include land in cities, cultivated agriculture lands, unincorporated non-flammable areas, and lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city or county fire departments, fire protection districts, or by CAL FIRE under contract to local governments. LRAs may still include areas of flammable vegetation and WUI.

Wildfire Protection Responsibilities in Santa Cruz County

In Santa Cruz County, wildfire protection responsibility is shared by several entities, including CAL FIRE, local fire departments, and property owners. Property owners are responsible for maintaining defensible space around their homes, while CAL FIRE and local agencies focus on larger scale wildfire prevention and response within SRAs and other designated zones.

The Santa Cruz County Fire Department (SCCFD), through a contractual agreement with CAL FIRE San Mateo-Santa Cruz Unit (CZU), provides fire protection and emergency medical services to the

unincorporated areas of Santa Cruz County that are not served by a municipal fire department or fire protection district. The SCCFD has mutual aid agreements with several fire agencies, which are typically available and involved in suppressing wildland fires.

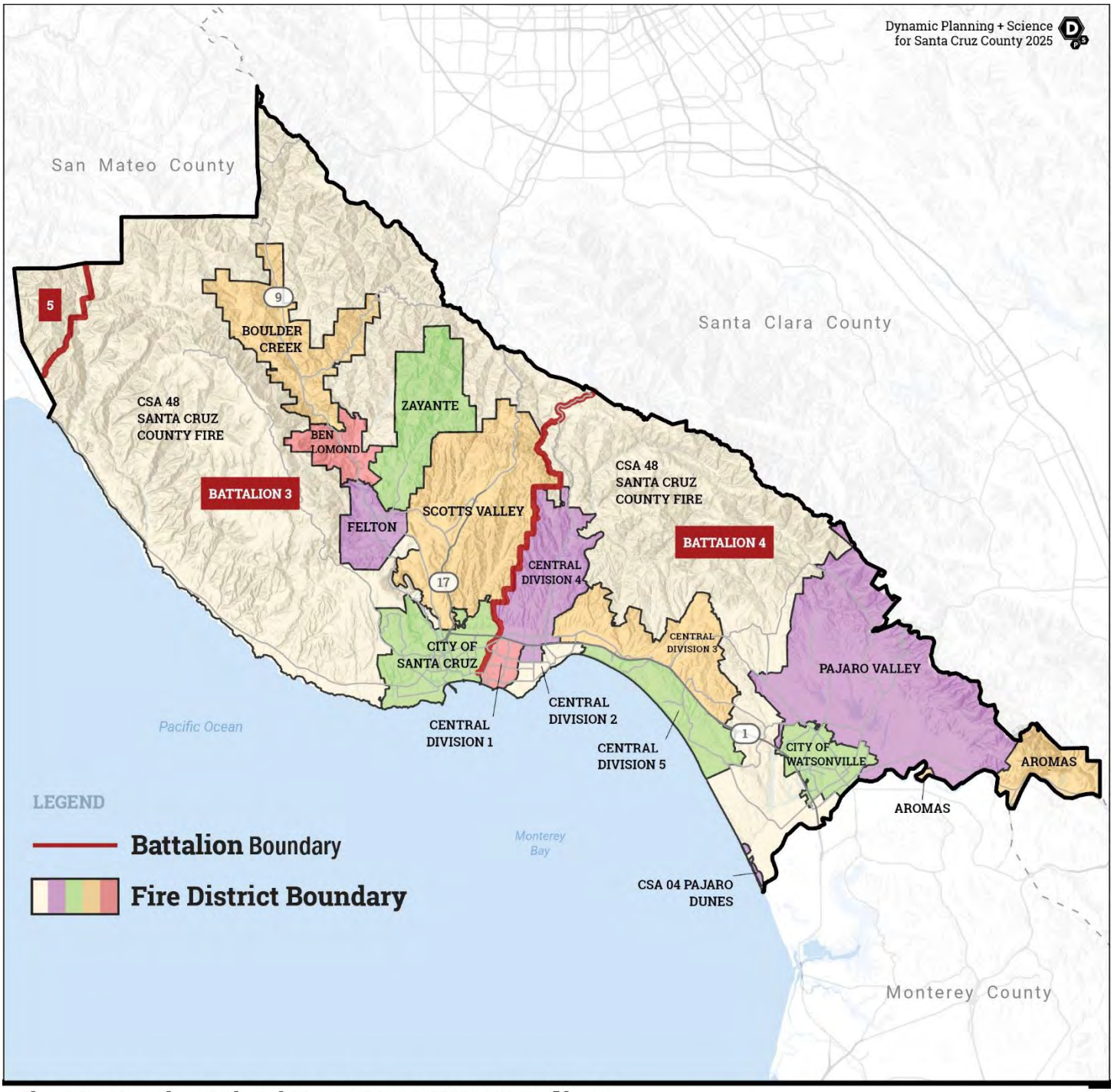
Fire Protection Agencies in Santa Cruz County

- CAL FIRE San Mateo-Santa Cruz Unit
- Aromas Tri-County Fire Protection District*
- Boulder Creek Fire Protection District
- Felton Fire Protection District
- Santa Cruz Fire Department
- Watsonville Fire Department
- Santa Cruz County Fire Department
- Ben Lomond Fire Protection District
- Central Fire District
- Pajaro Valley Fire Protection District
- Scotts Valley Fire Protection District
- Zayante Fire Protection District

*Note: *Limited sphere of influence within county boundaries*

The SCCFD is a combination paid and volunteer department operating out of 12 fire stations, of which three are county-owned, seven are state-owned, and two are owned by volunteer companies or the local community. There are five volunteer fire companies (Companies 29, 32, 36, 37, and 41), four by contract with CAL FIRE through an Amador agreement[3] and one as a full-time career fire company. CAL FIRE and SCCFD operate as an integrated unit. CAL FIRE hires up to 140 seasonal firefighters annually to augment its career staff during the wildland fire season. The boundaries of the fire protection agencies operating in Santa Cruz County are identified on Figure 3-3.

[33] "Amador agreement" refers to a cooperative fire protection agreement, often between CAL FIRE and a county or other local agency, where the local agency funds supplemental staffing and operational costs to maintain fire protection services, particularly during the non-fire season. These agreements ensure year-round fire protection services, often in areas that might otherwise experience reduced staffing during the off-season.



Fire Protection Districts & CAL FIRE Battalions

Source: Santa Cruz County, CAL FIRE

Figure 3-3: Santa Cruz County Fire Protection Agencies Map

Federal Regulatory Environment

Healthy Forests Restoration Act

In 2003, the federal Healthy Forests Restoration Act (HFRA) appropriated specific funding to address five main sub-categories through the National Fire Plan (NFP): preparedness, suppression, reduction of hazardous fuels, burned-area rehabilitation, and state and local assistance to firefighters. Appropriations under this Act continue through the present. The spirit of the HFRA and NFP is reflected in the Santa Cruz County Community Wildfire Protection Plan (CWPP). The CWPP meets the requirements of HFRA by:

1. Identifying and prioritizing fuels reduction opportunities across the landscape;
2. Addressing structural ignitability;
3. Assessing community fire suppression capabilities; and
4. Collaborating with stakeholders.

State Regulatory Environment

California Public Resources Code § 4290

Public Resources Code § 4290 became effective in September of 1991. These regulations require the future design and construction of structures, subdivisions, and developments in SRAs to provide wildfire protection measures for basic emergency access and perimeter. These measures provide for emergency ingress and egress, signing and building numbering, private water supply reserves for emergency fire use, and vegetation modification.

California Public Resources Code § 4291

Public Resources Code § 4291 requires property owners in mountainous areas, forest-covered lands, or any land that is covered with flammable material to create, at a minimum, a 100-foot defensible space buffer around their homes and other structures. Defensible space must at least extend to the property line if a 100-foot buffer cannot be achieved.

California Building Standards Code

The California Building Standards Code, Title 24 of California Code of Regulations, incorporates the California Fire Code and is adopted every three years by order of the California Legislature with supplements published in intervening years. The code mandates specific requirements for new building construction, placing strong emphasis on proper address signage, fire apparatus access and maneuverability, water requirements, and defensible space.

Local Regulatory Environment

San Mateo-Santa Cruz Unit Strategic Fire Plan

The CAL FIRE, San Mateo-Santa Cruz Unit (CZU), is responsible for wildfire protection and forest resource management across San Mateo and Santa Cruz counties, including Battalions 3, 4, and 5 (Figure 3-3). The 2025 CZU Strategic Fire Plan, developed in alignment with the 2018 State Fire Plan framework, provides a comprehensive, locally-informed strategy to reduce wildfire risk through assessment, planning, mitigation, and collaboration.

The CZU plan identifies the region's significant wildfire challenges, including complex topography, a growing WUI, dense vegetative fuels, and increasingly volatile fire weather conditions driven by climate change. The plan emphasizes proactive management and the development of fire-adapted communities—areas where residents, landowners, and agencies work together to prepare for, withstand, and recover from wildfire events. Key components of the CZU Strategic Fire Plan include:

- **Firefighter and Public Safety:** Prioritizing safety through improved access, defensible space compliance, and community evacuation planning.
- **Hazardous Fuel Reduction:** Targeted treatment of high-risk vegetative fuels, including shaded fuel breaks, prescribed burning, and mechanical thinning, particularly in areas like the San Lorenzo Valley, Bonny Doon, and the North Coast.
- **Fire Suppression Preparedness:** Enhancing capabilities for rapid and effective response, supported by pre-attack plans, infrastructure improvements, and real-time fire intelligence systems such as drones.
- **Public Information and Education:** Expanding outreach through programs such as Firewise USA®, Ready, Set, Go!, and Community Emergency Response Teams (CERT), with a focus on homeowner responsibility and structural hardening.
- **Interagency Collaboration:** Strengthening coordination among local fire districts, county emergency services, non-profits, and land management agencies to align priorities and pool resources for mitigation and response.

The CZU Strategic Fire Plan serves not only as a guide for fire service professionals but also as a call to action for residents and community stakeholders to engage in wildfire resilience efforts. By integrating vegetation management, land use planning, and public education, the plan supports the overarching goal of reducing wildfire losses and enhancing the safety and sustainability of Santa Cruz County's communities.

Santa Cruz–San Mateo County Community Wildfire Protection Plan (CWPP)

The 2022 Santa Cruz–San Mateo County Community Wildfire Protection Plan (CWPP) identifies wildfire hazards and priority mitigation strategies for communities in Santa Cruz County, with a strong focus on WUI areas. The plan emphasizes that High and Very High Fire Hazard Severity Zones (FHSZ) are concentrated in the Santa Cruz Mountains, San Lorenzo Valley, Bonny Doon, Corralitos, and upper Soquel Creek watershed. These areas are characterized by steep slopes, narrow canyons, and dense vegetation—including chaparral, mixed hardwood, and conifer forests—that can promote rapid fire spread under

extreme weather conditions. Many WUI neighborhoods have limited access routes or dead-end roads, complicating both evacuation and fire suppression efforts.

To address these risks, the CWPP outlines a coordinated set of priority mitigation strategies. Vegetation and fuel management is central to the approach, including the expansion of shaded fuel breaks, roadside clearance along primary evacuation corridors, targeted mechanical thinning and mastication, and the use of prescribed burning where feasible. The plan also identifies numerous locally developed projects intended to reduce wildfire risk, improve emergency access, and protect life, property, and critical resources in Santa Cruz County. These projects were proposed by local fire safe councils, community groups, public agencies, and private landowners.

To better integrate the CWPP into this MJHMP, the individual proposals have been consolidated into five broad priority themes that capture the major types of wildfire mitigation activities planned or underway in the county. These themes address common needs across multiple communities and planning areas and are summarized in Table 3-6 with representative project locations and example activities based on the 2022 CWPP. Full project descriptions and sponsoring organizations are available in the CWPP's Appendix A.

Table 3-6: 2022 CWPP Priority Mitigation Projects

Project Theme	Representative Locations	Example Activities
Roadside Fuel Reduction & Shaded Fuel Breaks	Bonny Doon, Deer Creek, South Skyline (Hwy 35), Swanton, Laguna Creek, Brown Valley Rd, Geyer Rd, Kings Creek Truck Trail, Ward Rd	Roadside clearance, shaded fuel breaks, ladder fuel removal, contiguous break maintenance
Community Defensible Space & Chipping Programs	Cliffwood Estates, Redwood Drive (Aptos), Prospect Heights (Santa Cruz), Las Cumbres, Bonny Doon neighborhoods	Neighborhood defensible space projects, community chipper days, ongoing vegetation management
Critical Infrastructure Protection	San Lorenzo Valley Water District facilities, City of Santa Cruz infrastructure, UCSC Natural Reserve, Big Creek Lumber truck routes	Defensible space around tanks/pump stations, infrastructure hardening, access improvements
Evacuation Route Improvements	Trabing Fire area, Pilkington Rd–Paul Sweet Rd crossing, multiple private roads in WUI	Road widening, signage upgrades, bridge/turnout improvements
Fuel Management & Habitat Projects	UCSC chaparral, Bonny Doon Ecological Reserve, Land Trust properties	Prescribed fire alternatives, invasive species removal, habitat-compatible fuel reduction

Source: 2022 Santa Cruz–San Mateo County CWPP, Appendix A: Project Proposals, pp. 149–153

Santa Cruz County General Plan Public Safety Element

The Santa Cruz County General Plan Public Safety Element[4] includes comprehensive goals, policies, and implementation measures aimed at minimizing wildfire risks and protecting residents, property, and natural resources from fire hazards. These provisions reflect a longstanding commitment to fire-adapted community planning and resilience in the WUI, but integration of wildfire risk considerations into the element is also a state requirement, particularly in SRAs and Very High FHSZs.

Under Senate Bill (SB) 1241 from 2012 and Government Code § 65302(g)(3), the county must include policies and implementation measures that address wildfire hazards in these high-risk areas. Guidance to support these updates is provided by the Governor's Office of Land Use and Climate Innovation (LCI), which issues wildfire planning recommendations and California Environmental Quality Act (CEQA) checklist updates for local adoption. These requirements are further reinforced by AB 2140 and SB 379, which encourage integration of the local hazard mitigation plan and climate adaptation planning into the safety element. Together, these statutory requirements shape Santa Cruz County's wildfire policies within the General Plan, ensuring alignment with statewide mitigation, land use, and climate resilience goals.

The primary objective stated in the plan regarding fire hazards is to protect the public through citizen awareness, fire risk mitigation, responsible fire protection planning, and built-in systems for fire detection and suppression (Objective 6.7). Key policies and implementation programs in the element include:

- **Policy 6.7.1 Defensible Space:** In the State Responsibility Area and Very High Fire Hazard Severity Zones within the Local Responsibility Area maintain defensible space around structures in compliance with State law, County Fire Code, and local fire district ordinances. The amount of fuel modification necessary shall take into account the flammability of the structure as affected by building material, building standards, location, and type of vegetation. Fuels shall be maintained in a condition so that a wildfire burning under average weather conditions would be unlikely to ignite the structure. This does not apply to single specimens of trees or other vegetation that are well pruned and maintained so as to effectively manage fuels and not form a means of rapidly transmitting fire from other nearby vegetation to a structure or from a structure to other nearby vegetation. The intensity of fuels management may vary in the vicinity of the structure, with the most intense management being immediately around the structure. Consistent with fuels management objectives, steps should be taken to minimize erosion. For the purposes of this policy, "fuel" means any combustible material, including petroleum-based products and wildland fuels.
- **Policy 6.7.2 Defensible Space in Environmental Resource Areas:** Fuel reduction activities that remove or dispose of vegetation are required to comply with all federal, state or local environmental protection laws, including, but not limited to, laws protecting threatened and endangered species, sensitive habitats, water quality, air quality, and cultural/archeological resources, and must obtain any and all required permits.

[4] Santa Cruz County has two versions of the Safety Element: One for the Coastal Zone and the other for areas outside of the Coastal Zone. The referenced polices are from the Safety Element that applies to areas outside the Coastal Zone.

- **Policy 6.7.4 Access Standards:** Establishes detailed minimum design requirements for fire access roads, including width, grade, surface type, turnouts, and clearance. These standards are crucial for enabling fire apparatus access during emergencies and are applied to all new structures and major additions.
- **Policy 6.7.7 Land Division Fire Standards Outside the Urban Services Line:** Limits development density and requires secondary access, compliance with response time standards, vegetation modification, and water storage provisions for land subdivisions in high fire risk areas. When approving subdivisions in SRAs and Very High FHSZs, the county must also make special findings to ensure adequate emergency access and fire protection services, pursuant to Government Code § 66474.02.
- **6.7.8 Standards for New Dead-End Roads:** Prohibit newly constructed dead-end roads without secondary access serving more than one parcel in new minor land divisions or subdivisions which exceed the following distances from an adequate through road unless approved by the applicable fire protection agency, the Department of Public Works, and by the Planning Commission; in no case shall a new dead-end road exceed ½ mile in length.
- **Urban and Suburban General Plan and Local Coastal Program (LCP) Land Use Plan:** Designate 500 feet
- **Rural General Plan and LCP Land Use Plan:** Designate 1,000 feet
- **Mountain General Plan and LCP Land Use Plan:** Designate 1,500 feet
- **Subdivision Regulations:** The standard for new subdivisions of five or more lots shall not exceed 500 feet from a through road unless acceptable to and recommended by the applicable fire protection agencies and the Department of Public Works and approved by the Planning Commission.
- **Policy 6.7.10 Certification of Adequate Fire Protection:** Mandates fire agency certification for adequate protection before approval of new subdivisions, multifamily complexes, or critical infrastructure projects.
- **Policy 6.7.12 Code Consistency:** Ensures all development adheres to current fire and building codes, including the Uniform Fire Code and California Fire Code.
- **Programs D and E Firebreak Planning:** Develops and implements strategic firebreaks to buffer communities from adjacent vegetated areas.
- **Program F Emergency Access Planning:** Aims to provide at least two emergency access routes for all communities.
- **Programs G and H Infrastructure Upgrades:** Prioritizes water system enhancements and fire protection facility expansion within the Urban Services Line.
- **Program L Public Education and Outreach:** Supports educational initiatives on fire prevention and home hardening.
- **Program P Mitigation Funding Tools:** Encourages the use of assessment districts for road improvements, water infrastructure, and vegetation management.

These policies and implementation programs form a critical component of Santa Cruz County's integrated approach to wildfire risk mitigation. In conjunction with the CZU Strategic Fire Plan and CWPP, they guide land use decisions, emergency planning, and public investment in infrastructure resilience.

Building Code

All Santa Cruz County jurisdictions have adopted the 2022 Edition of the California Building Standards Code, including Chapter 7A of the California Building Code (CBC) and Section R337 of the California Residential Code (CRC). As codified in Chapter 12.10 of the county's code, local amendments to the state codes strengthen wildfire resilience in new construction and exterior remodels. These amendments are designed to protect life and property in the county's extensive SRAs and WUI zones.

Title 7A of the California Building Code establishes minimum construction standards for buildings located in designated FHSZs and WUI areas. It aims to reduce wildfire ignition risk by requiring fire-resistant materials and designs for key exterior components, such as Class A roofing, ember-resistant vents, noncombustible siding, tempered windows, enclosed eaves, and ignition-resistant decking. These requirements apply to all new construction and substantial remodels after July 1, 2008, helping prevent structure-to-structure fire spread and improving building survivability during wildfire events.

The county's refinements remove state-level exceptions and expand ignition-resistant construction requirements to a broader range of projects, reinforcing structure hardening and ember resistance. Table 3-7 exhibits how the county codes differ from the baseline state code.

Table 3-7: Santa Cruz County Amendments to California Building Code

Category	California Building Code (CBC / CRC)	Santa Cruz County Amendments (Chapter 12.10)
Applicability of WUI Regulations	CBC Chapter 7A and CRC Section R337 apply to buildings in Very High FHSZs in SRAs or LRAs.	Chapter 7A and R337 standards apply to all new structures, additions, and exterior remodels located in SRAs. *Ref: §12.10.215(C)*
Exceptions to WUI Standards	CBC 7A and CRC R337 allow exceptions (e.g., Exception 1: ≤100 sq ft roof/siding; Exception 2: broken windows; Exception 4: vents; Exception 5: minor deck repair).	Deletes exceptions 1, 2, 4, and 5, effectively removing exemptions for most minor work. Only Exception 3 (for tent structures in campgrounds) is retained. *Ref: §12.10.215(C)(3)*
Trigger Threshold for Compliance	WUI provisions apply only to new buildings or major remodels in mapped Very High FHSZs.	WUI provisions apply to any permit-triggered exterior work, including remodels, alterations, or additions in SRAs. *Ref: §12.10.215(B), §12.10.215(C)(1)*
Required Building Features	Requires ember-resistant vents, Class A roofing, ignition-resistant siding, and tempered windows in designated areas. *Ref: CBC §§705A–708A; CRC §§R337.5–R337.10*	Same standards enforced but required universally in SRAs regardless of project size or partial alterations. *Ref: §12.10.215(B), (C)(1)*
Compliance Documentation	WUI compliance documentation only required for qualifying buildings.	Mandatory submittal of WUI checklist, fire severity map confirmation, and proof of approved materials (e.g., OSFM product listings) for all covered projects. *Ref: §12.10.215(C)(2)*

Category	California Building Code (CBC / CRC)	Santa Cruz County Amendments (Chapter 12.10)
Administrative Responsibility	Discretionary enforcement varies by local Authority Having Jurisdiction..	County Planning and Building Departments are responsible for reviewing and enforcing wildfire standards across SRA permit applications. *Ref: §12.10.215(D)*

Fire Code

Santa Cruz County jurisdictions have adopted the 2022 Edition of the California Fire Code (with local amendments) to safeguard the public from the hazards of fire in new and existing buildings, structures, and premises, and to provide safety and assistance to fire fighters and emergency responders during emergency operations.

The county amendments to the California Fire Code in Chapter 7.92 introduce refinements and stricter standards in several key areas, tailoring fire safety regulations to the county's unique topography, WUI risks, and rural development patterns. Table 3-8 exhibits how the county code differs from and exceeds minimum state requirements.

Table 3-8: Santa Cruz County Amendments to California Fire Code

Topic	California Fire Code	County Amendments
Access Roads	20-ft standard, flexible	20-ft standard, strict grades and turnouts
Dead-End Roads	General guidance	Zoned length limits, secondary access mandates
Bridges	Local standards apply	25-ton load, 10-year certification, 20-ft width
Ember Ignition	Local discretion	Lantern bans, distance rules, firewatch mandates
Appeals	Allowed	Formal board, structured timelines
Signage & Gates	Generic	Specific minimums for signage, clearance, locks

Measure Q: Safe Drinking Water, Clean Beaches, Wildfire Risk Reduction & Wildlife Protection Act

The Santa Cruz County Safe Drinking Water, Clean Beaches, Wildfire Risk Reduction, and Wildlife Protection Act (also known as Measure Q) is codified in Chapter 4.65 of the county code and establishes a special parcel tax of $87 per parcel annually starting fiscal year 2025 to 2026, generating approximately $7.3 million per year. Revenues are deposited into a dedicated fund, overseen by the county's Office of Response, Recovery, and Resilience (OR3) and the County Parks and Open Space Department, with separate subaccounts to support the different types of projects that meet the intent of the act. Within the expenditure categories, wildfire risk reduction is explicitly supported through:

- Fuel treatment programs such as implementation of shaded fuel breaks, hazardous vegetation clearance, and prescribed fire.

- Forest and land stewardship projects targeting defensible space creation, forest health improvement, and wildfire resilience enhancements on public and private lands.
- Infrastructure safety, including clearing debris from emergency access routes to support firefighting and evacuation efforts.

Eligible projects include planning, acquisition, construction, restoration, and long-term maintenance phases.

3.2.1.3 Past Events & Location

Between 1985 and 2024, Santa Cruz County experienced many notable wildfires, including the CZU Lightening Complex Fire, which was the most destructive in county history to date. These incidents occurred across various parts of the county, primarily in forested and mountainous terrain. Figure 3-4 identifies the burn areas of recent wildfires that occurred since the early 2000s and each consumed over 100 acres.

Notable Wildfires in Santa Cruz County

- **1985 – Lexington Fire:** Spanning an estimated 14,500 acres (with partial impact in Santa Cruz County), this regional fire foreshadowed the scale of events now seen more frequently under extreme weather and fuel conditions.
- **1993 – Gazos Fire:** This smaller but notable fire burned 1,450 acres near the San Mateo County line. Although it did not result in significant structure loss, it reaffirmed the region's susceptibility to coastal-range wildfires.
- **2008 – Summit Fire:** The Summit Fire was ignited in May 2008 and burned 4,270 acres in southern Santa Cruz County. The fire destroyed 132 structures and required extensive aerial suppression efforts. Its proximity to residential areas underscored the threat of WUI ignition sources during wind events.
- **2008 – Trabing Fire:** Trabing was a fast-moving fire near Freedom and Aptos that burned 630 acres and destroyed several homes. It highlighted the dangers of rapid fire spread in lowland vegetated corridors adjacent to transportation infrastructure.
- **2009 – Lockheed Fire:** This fire burned 7,817 acres in the Bonny Doon area, destroying 13 structures and causing over 2,000 residents to be evacuated. Lockheed occurred in dense vegetation with limited road access, posing significant challenges for fire suppression and containment.
- **2020 – CZU Lightning Complex Fire:** The most destructive wildfire in county history was ignited by lightning on August 16, 2020. It burned 86,509 acres across Santa Cruz and San Mateo Counties, destroyed nearly 1,500 structures, and led to the evacuation of more than 77,000 residents. The fire caused over $340 million in damages and revealed vulnerabilities in communication systems, evacuation infrastructure, and fuel buildup.

These events collectively demonstrate that wildfire is not an emerging threat but a recurring hazard with escalating impacts due to climate change, fuel accumulation, and continued development in high-risk areas. Mapping of historic fire perimeters (Figure 3-4) shows consistent patterns of ignition and spread,

especially along ridgetops and steep drainages in the San Lorenzo Valley and Bonny Doon areas. Figure 3-6 identifies Moderate, High, and Very High FHSZs, which are mostly within SRAs; although, some fire hazard areas in the county are local responsibility, especially within and near urban centers. Understanding the behavior, scale, and locations of these historic fires and understanding future high fire risk areas are critical for shaping future mitigation strategies.

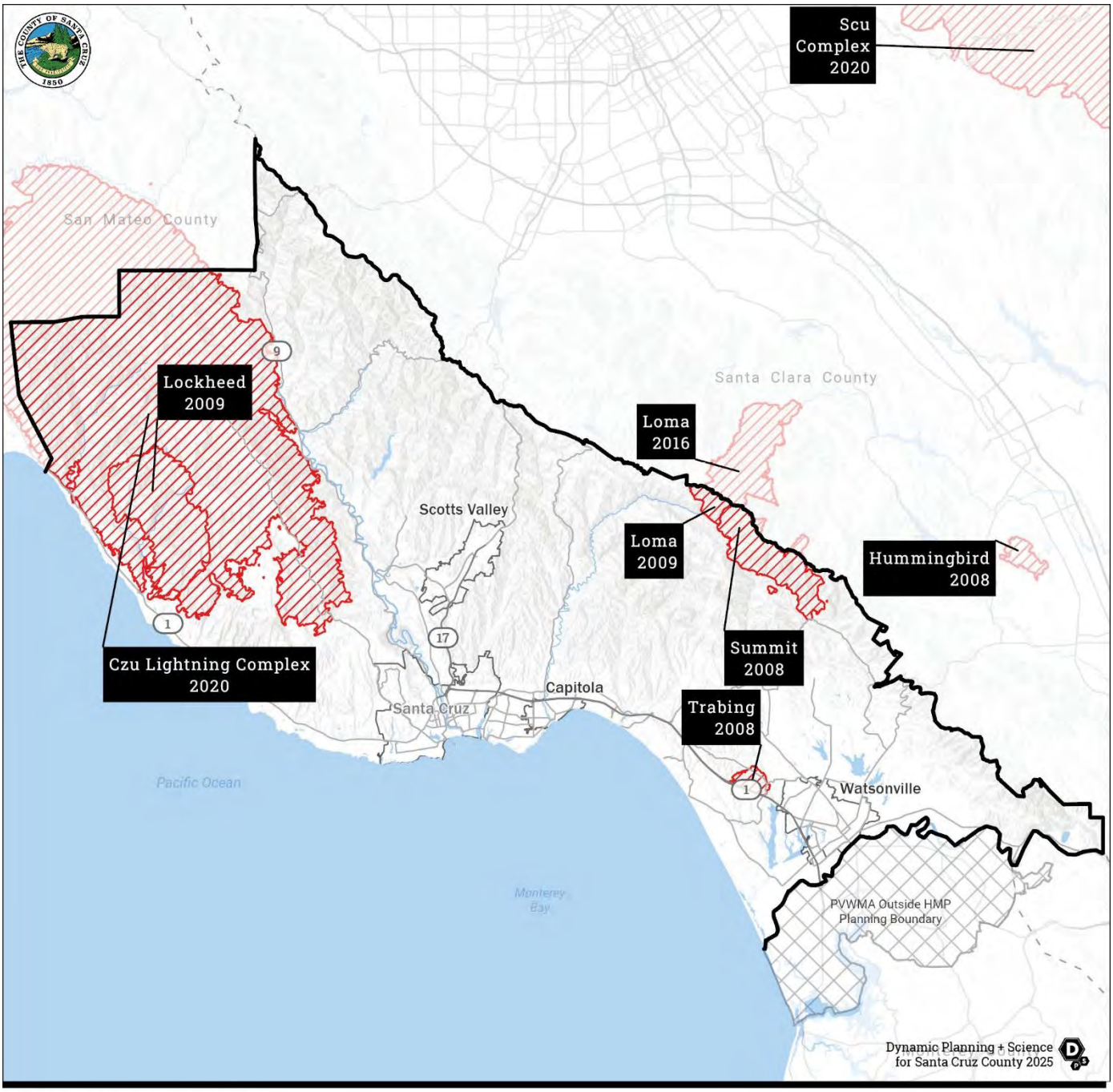


Figure 3-4: County-Wide Historic Large Fires Map

3.2.1.4 Frequency & Probability of Future Occurrences

Wildfires are a regular and recurring hazard in Santa Cruz County. The likelihood of future wildfire events is high, particularly in areas with dense vegetation, steep terrain, and limited access. Based on local fire history and climate conditions, the probability of wildfire occurrence in any given year is classified as "Highly Likely," indicating an annual or near-annual probability of one or more wildfire events.

To better quantify wildfire frequency, the county uses the Mean Fire Return Interval (MFRI), a metric that estimates the average number of years between fires at a given location. See Figure 3-5 for county-wide MFRI. According to the U.S. Geological Survey (USGS) LANDFIRE dataset, much of the unincorporated area of Santa Cruz County has an MFRI between six and 35 years, with some interior ridge and slope areas showing return intervals as short as zero to 12 years, especially in the Santa Cruz Mountains and San Lorenzo Valley. These areas are prone to more frequent fire activity due to fuel type, terrain, and ignition history.

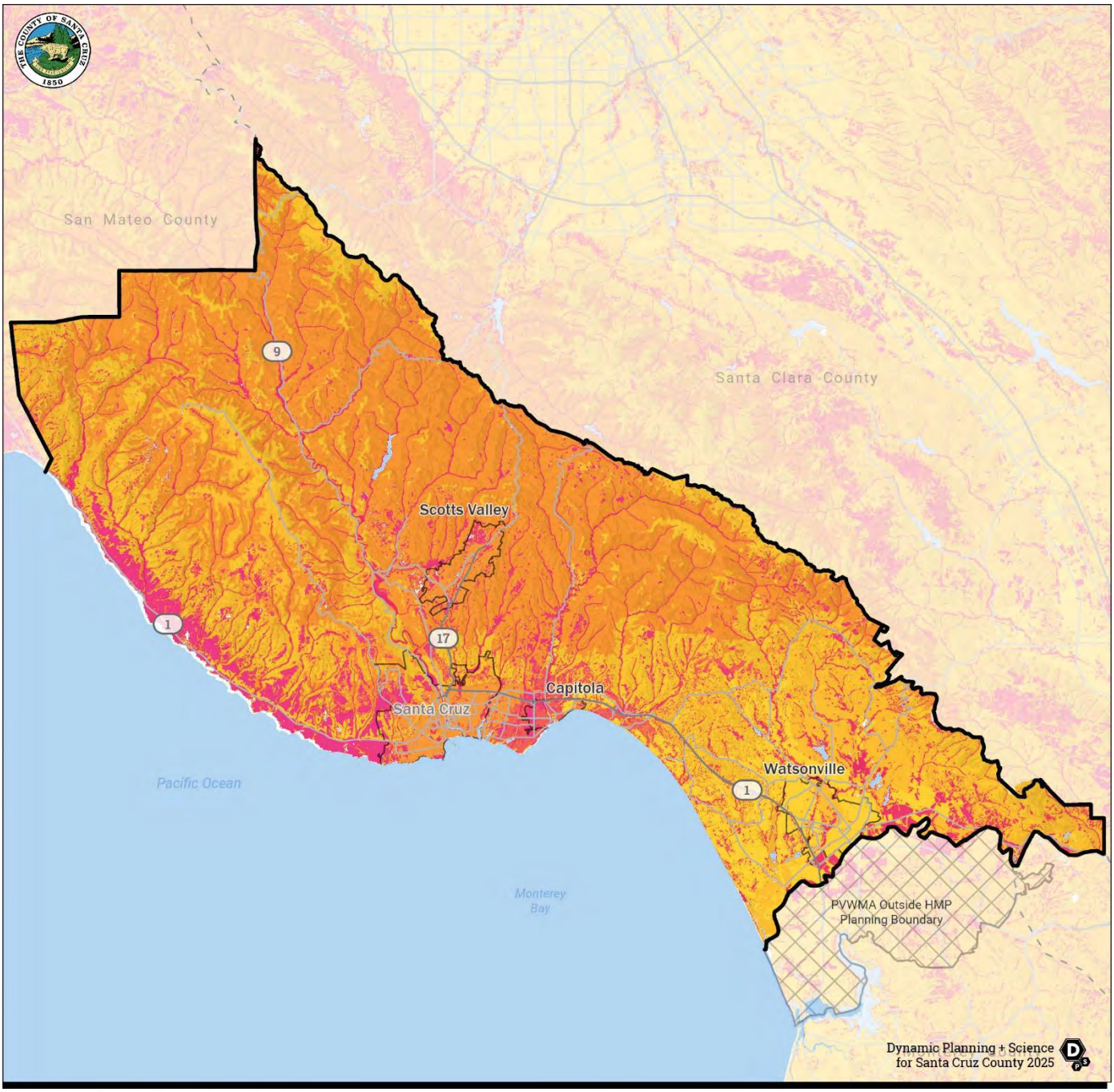
Conversely, coastal and lower valley areas exhibit longer fire return intervals, typically over 50 years, reflecting lower fuel loads and more fragmented wildland vegetation. However, as climate change accelerates fuel drying, increases wind events, and lengthens the fire season, return intervals are expected to shorten in some areas, potentially increasing the number and intensity of wildfire events in the coming decades.

3.2.1.5 Severity

Wildfire severity in Santa Cruz County is driven by several interrelated factors, including vegetation type and density, topography, and fire weather frequency, which correlate with CAL FIRE's Fire Hazard Severity Zones (FHSZ) (Figure 3-6). The county's fuel profile includes coastal scrub, chaparral, oak woodland, Douglas-fir, and redwood forests, many of which support dense surface and ladder fuels. Steep slopes, particularly in the Santa Cruz Mountains, contribute to rapid fire spread and greater flame lengths, especially under dry and windy conditions.

The modeling process for mapping fire severity zones also evaluates potential fire intensity, rate of spread, and ember dispersion based on empirical data and simulations. However, FHSZ designations focus solely on **hazard**, not risk—meaning that **land use, structure hardening, and community-level mitigation efforts** are not factored into zone assignments.

Critical fire weather in Santa Cruz County—defined by a combination of high temperatures, low humidity, and sustained winds—typically occurs from late summer through early fall, with Red Flag Warnings issued several times each year. Under such conditions, fire intensity and spread rates increase significantly, particularly in vegetated canyon systems and along ridgelines.



Mean Fire Return Interval

Unincorporated County

*Data sources: USGS LANDFIRE.

average period between fires (Years)

0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-60	61-70	71-80	81-90	91-100	101-125	126-150	151-200	201-300	301-500	501-1000	>1000

Figure 3-5: County-Wide Mean Fire Return Interval (MFRI) Map

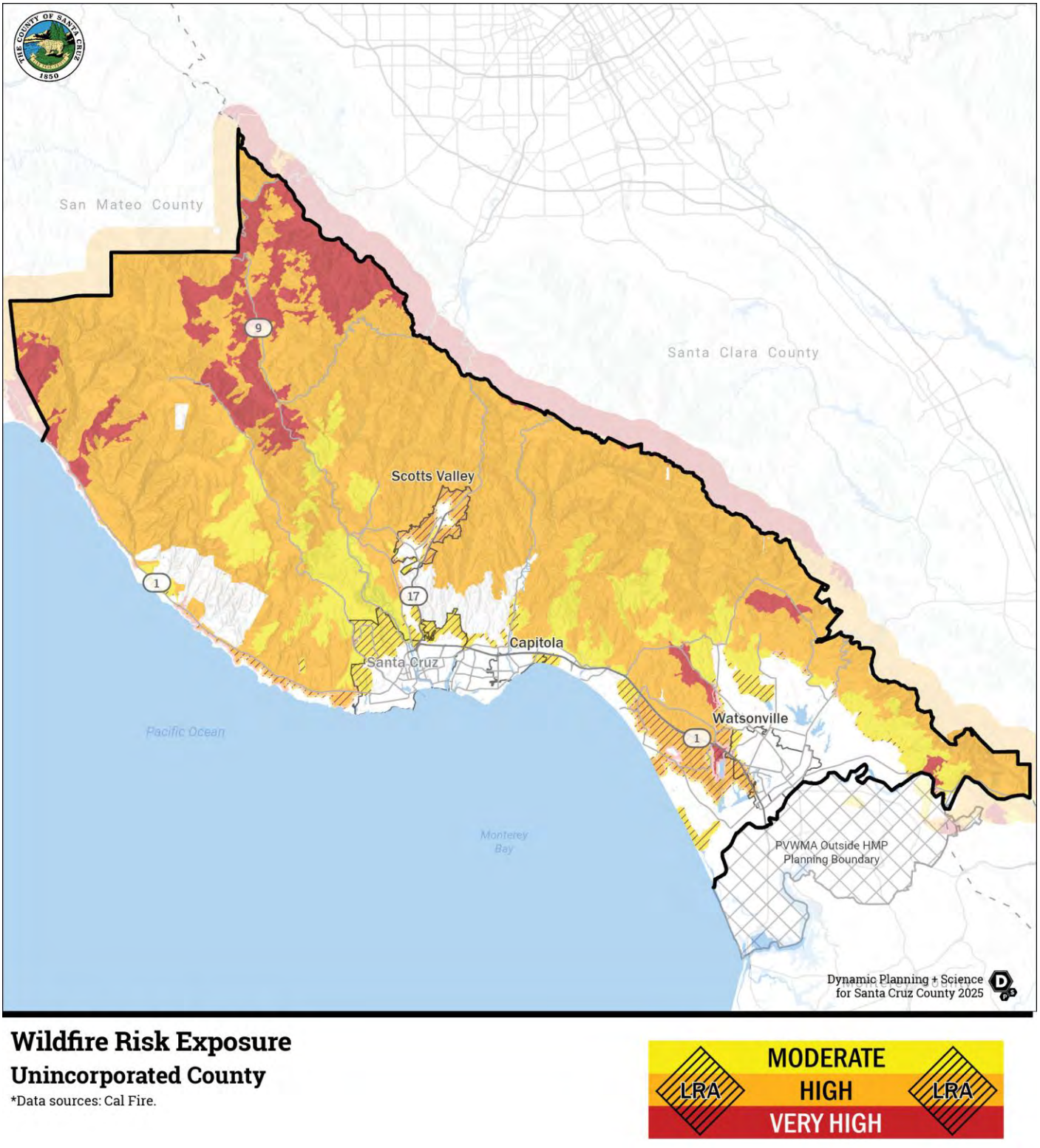


Figure 3-6: County-Wide Fire Hazard Severity Zones (FHSZ) Map

3.2.1.6 Warning Time

Warning time for wildfires in Santa Cruz County can be limited, depending on ignition source, weather conditions, and location. Peak wildfire concern typically coincides with dry seasons and periods of drought, when vegetation becomes more flammable. Wildfires may ignite with little or no advance notice, particularly those caused by human activity such as debris burning, equipment use, or fireworks. The Fourth of July is a period of elevated fire risk due to increased ignition sources from fireworks.

Some wildfires may be preceded by predictable weather conditions, such as dry lightning storms or high-wind events. The National Weather Service provides Red Flag Warnings and lightning forecasts typically 24 to 48 hours in advance of potential ignition events. These forecasts can be used to elevate local readiness and outreach.

Once a wildfire begins, detection and alerting are generally prompt due to expanded communication networks, including cell phones, reverse-911 systems, and emergency radio broadcasts. Wildfire intensity typically peaks in the early- to mid-afternoon, when temperatures are highest, humidity lowest, and fire spread rates are greatest. Depending on fire growth, local conditions, and proximity to the event, evacuation timeframes may range from several hours to merely minutes.

CruzAware Notification System

CruzAware is Santa Cruz County's official alert and notification system. It is administered by the County Office of Response, Recovery and Resilience (OR3) and is designed to provide residents and visitors with timely warnings and information during emergencies. Notifications are sent by text message, telephone, or email and address a range of hazards including wildfire, as well as other public safety threats and evacuation notices.

For wildfire, CruzAware serves as a primary tool for delivering warnings before hazardous conditions develop and notifications during an event. Depending on the situation, alerts may be issued hours or only minutes in advance. These notifications can include evacuation instructions, shelter locations, and road closure information. The system is capable of targeting specific neighborhoods or hazard zones so that alerts are relevant to those directly at risk.

The system works in coordination with other county resources to support comprehensive hazard communication. The county also partners with the National Weather Service (NWS) to disseminate official watches and warnings, including Red Flad Warnings. NWS alerts are automatically issued through the Wireless Emergency Alerts (WEA) system to mobile devices in affected areas, providing rapid notification without the need for prior registration. More information about CruzAware, including how to register, is available at santacruzcountyca.gov/CruzAware.

3.2.1.7 Wildfire Vulnerability Assessment

Santa Cruz County remains vulnerable to wildfire impacts, despite its efforts to reduce risk through planning, policies, and mitigation programs. This section identifies wildfire vulnerability in relation to people, property, and critical facilities and infrastructure. Estimates of population exposure, parcel values, critical facilities, and lifeline infrastructure were developed by overlaying these asset inventories with CAL FIRE's Fire Hazard Severity Zones (FHSZs). Figure 3-7 provides a summary of wildfire exposure across the county. It should be noted that this risk assessment analyzes exposure only, meaning results are based on whether a population, parcel, or facility falls inside or outside of the mapped hazard zones.

It is important to recognize that FHSZs have a regulatory basis; CAL FIRE is charged with their designation under state law, and these zones trigger specific requirements in the California Building and Fire Codes. However, these zones are primarily designed to represent hazards from wildland fuels and do not capture the full scope of wildfire risk, particularly the potential for urban conflagration within the built environment. Additionally, insurance companies rely on proprietary models, often integrating high-resolution data such as LiDAR, drone imagery, and localized site conditions, which may result in different risk designations at the parcel level. Understanding these distinctions is critical for effective planning and risk communication.

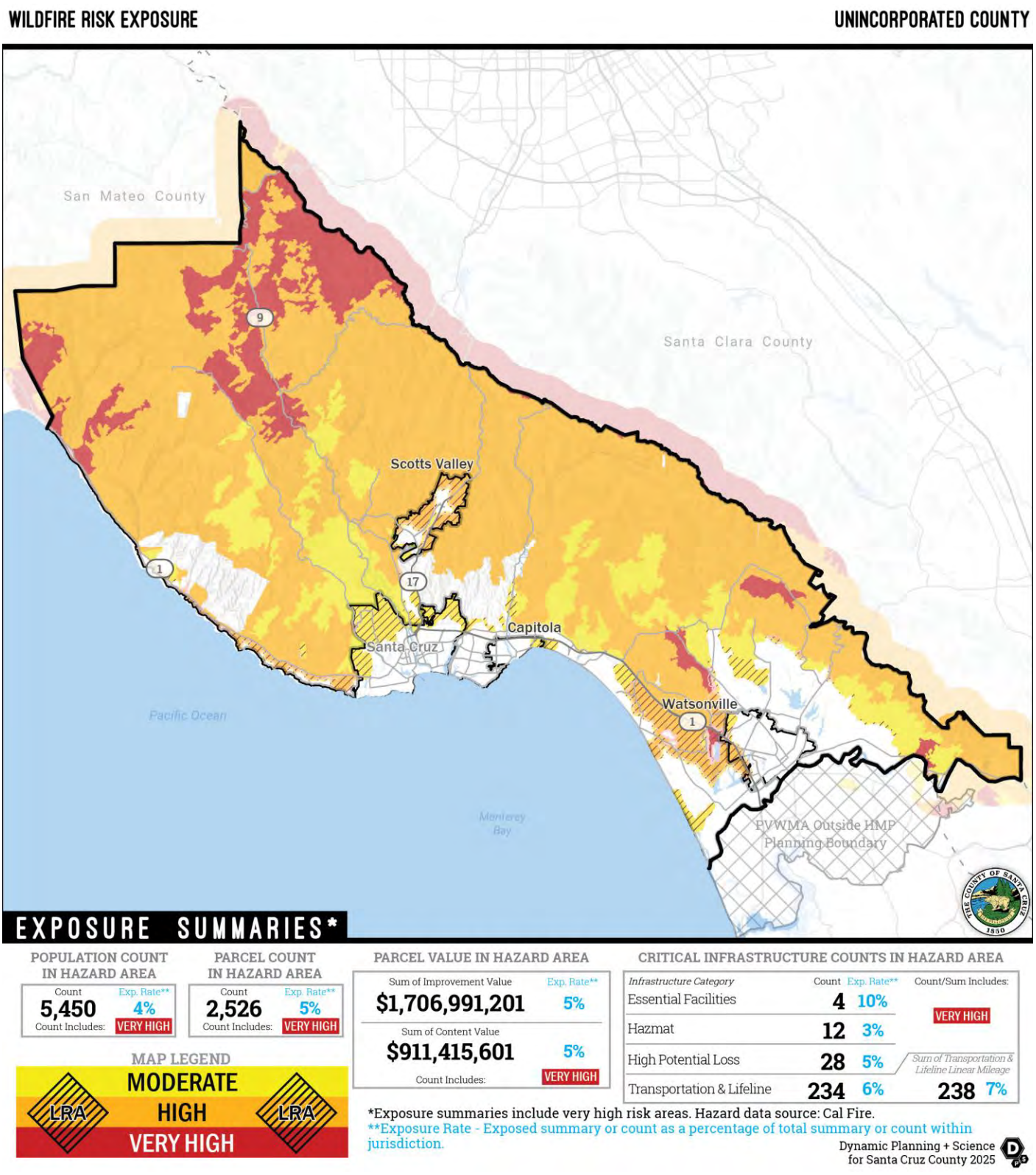


Figure 3-7: Exposure Summary – Santa Cruz County Wildfire Risk

3.2.1.7.1 Population

One way to understand Santa Cruz County's wildfire exposure is through the Fire Hazard Severity Zones (FHSZ) developed by CAL FIRE. Wildfire risk is of greatest concern to populations residing in the High and Very High FHSZs. Roughly two-thirds of the county's population lives in these zones, with the majority in "high" severity areas and a smaller but still significant share in very high zones, as shown in Figure 3-8. This concentration of population in high-risk areas means that large wildfires have the potential to impact a substantial portion of residents, causing infrastructure damage, degrading air quality, and disrupting essential services well beyond the immediate burn area.

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire contain visible and invisible emissions that contain particulate matter such as soot, tar, water vapor, and minerals; gases such as carbon monoxide, carbon dioxide, and nitrogen oxides; and toxins such as formaldehyde and benzene. Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency or temperature of combustion, and the weather. Widespread public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility. First responders likewise are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

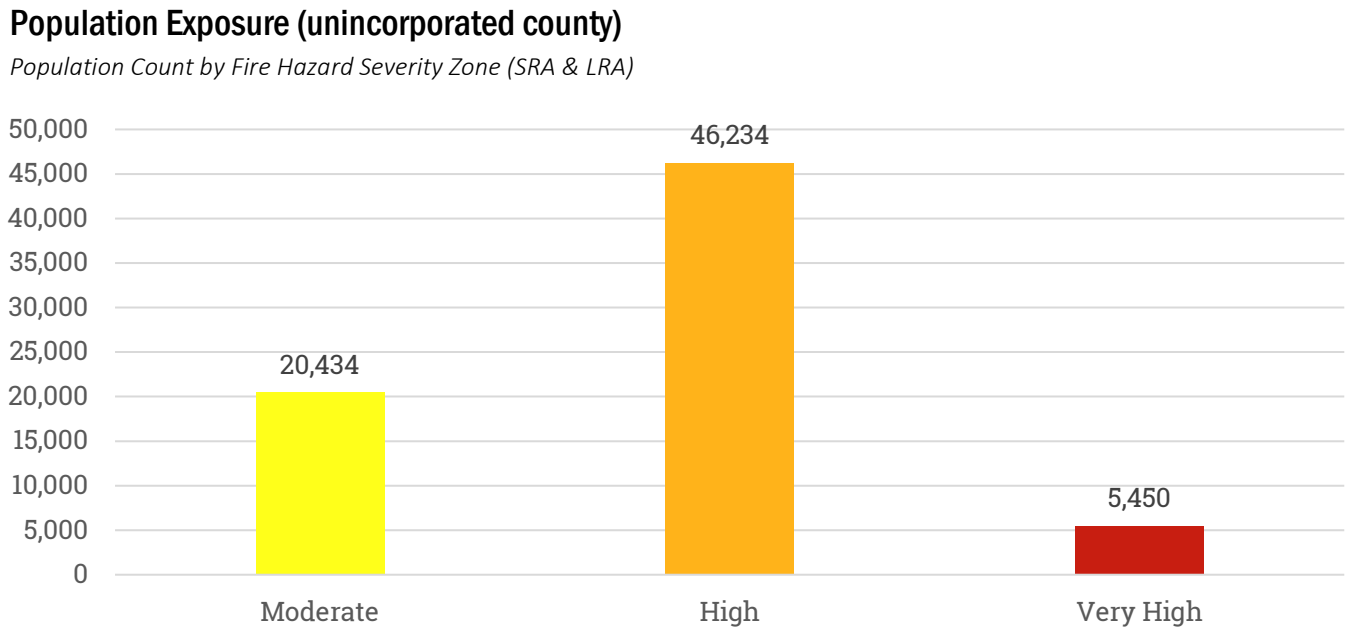


Figure 3-8: Unincorporated County Population Exposed to Wildfire Risk

Table 3-9: Unincorporated County Population in SRA vs. LRA Fire Hazard Severity Zones (LHSZ)

	Total Population
Unincorporated County	131,149

Wildfire Severity Zone (FHSZ)	Population Count	% of Total
Moderate	**20,434**	**15.58%**
LRA Moderate	6,324	*4.82%*
SRA Moderate	14,110	*10.76%*
High	**46,234**	**35.25%**
LRA High	3,895	*2.97%*
SRA High	42,339	*32.28%*
Very High	**5,450**	**4.16%**
LRA Very High	146	*0.11%*
SRA Very High	5,304	*4.04%*
Total	**72,117**	**54.99%**

Agricultural & Outdoor Workers

Wildfire can significantly impact outdoor workers in Santa Cruz County, including those in agriculture, landscaping, construction, and utility services. Agricultural workers—particularly those in the county's strawberry, vegetable, orchard, and vineyard sectors—are especially vulnerable, as peak harvest and planting periods often coincide with the region's highest wildfire risk. Smoke and degraded air quality can create unsafe working conditions, while road closures, evacuation orders, and damaged transportation infrastructure can limit access to fields and worksites. Many agricultural workers live outside the county due to high housing costs and limited affordable housing, increasing their reliance on regional transportation routes that may be disrupted during wildfire events.

3.2.1.7.2 Property

Wildfire risk in Santa Cruz County is not only a matter of population exposure, it also represents a significant concentration of economic value in high-risk areas. County parcel data shows that in the unincorporated county area, the total market value of residential property located within High and Very High FHSZs exceeds $20 billion, accounting for approximately 38% of the county's total market value. This figure reflects current real estate market conditions in Santa Cruz County, where high housing demand, limited supply, and elevated construction costs have driven property values to some of the highest in California.

The financial risk is not theoretical. In the aftermath of the 2020 CZU Lightning Complex Fire, hundreds of property owners encountered existing insurance policy shortfalls, escalating construction and insurance costs in a challenging market environment, and modern building code or development standards. Even if certain development standards can be temporarily suspended by elected officials, the complexity and apparent need to dismiss adopted policies underscores the challenges of rebuilding, especially within

legacy development patterns. The initial destruction from wildfire hazards combined with the many challenges associated with rebuilding compounds the community exposure to this economic insecurity over the long term.

In Santa Cruz County, the destruction of even a small percentage of the housing stock in high or very high severity zones could translate into hundreds of millions of dollars in direct property losses, not including the broader economic and social costs of displacement, infrastructure damage, and loss of taxable property value. Table 3-10 provides a detailed breakdown of parcel counts, market values, and total exposure by FHSZ, underscoring the fiscal stakes associated with wildfire mitigation and preparedness in Santa Cruz County.

Table 3-10: Santa Cruz County Property in SRA vs. LRA Fire Hazard Severity Zones (FHSZ)

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

FHSZ	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Moderate	**8,886**	**18.66%**	**$6,767,219,997**	**$3,638,488,998**	**$10,405,708,995**	**19%**
LRA Moderate	2,507	*5.3%*	$2,101,182,397	$1,176,609,598	$3,277,791,995	*6.0%*
SRA Moderate	6,379	*13.4%*	$4,666,037,600	$2,461,879,400	$7,127,917,000	*13.1%*
High	**16,308**	**34.24%**	**$11,895,609,999**	**$6,137,691,999**	**$18,033,301,998**	**33%**
LRA High	1,610	*3.4%*	$1,207,929,601	$638,923,400	$1,846,853,001	*3.4%*
SRA High	14,698	*30.9%*	$10,687,680,398	$5,498,768,599	$16,186,448,997	*29.8%*
Very High	**2,526**	**5.30%**	**$1,706,991,201**	**$911,415,601**	**$2,618,406,801**	**5%**
LRA Very High	46	*0.1%*	$36,790,000	$26,774,000	$63,564,000	*0.1%*
SRA Very High	2,480	*5.2%*	$1,670,201,201	$884,641,600	$2,554,842,801	*4.7%*
Total	**27,720**	**58.2%**	**$20,369,821,197**	**$10,687,596,598**	**$31,057,417,795**	**57.2%**

3.2.1.7.3 Critical Facilities & Infrastructure

Essential facilities, high-potential-loss sites, and lifeline infrastructure in Santa Cruz County face substantial wildfire risk due to their location within CAL FIRE-designated High and Very High FHSZs. Many of these facilities are constructed with combustible materials or lack adequate defensible space, making them vulnerable to ember intrusion, radiant heat, and direct flame contact.

The exposure in Santa Cruz County is widespread. Several essential facilities such as fire stations, law enforcement facilities, hospitals, and emergency operations centers are located in wildfire-prone areas, meaning that a major fire could impair emergency response when it is most needed. Schools are also notably exposed, with more than 20 school sites in high or very high-hazard zones, creating both evacuation challenges and potential long-term disruption to education and community services.

Critical community infrastructure is also at risk. Transportation and lifeline systems—such as bridges, culverts, substations, and airports—account for the largest number of exposed assets, with over 3,000 such facilities in high and very high-hazard zones, as identified in Table 3-11. Disruption to even a few of these key assets could isolate neighborhoods, delay firefighting operations, and slow recovery.

Many high potential loss facilities, including healthcare and childcare facilities, large mobile home parks, and historic buildings, are also located in wildfire hazard zones. The loss of these sites could cause both significant economic damage and long-term cultural or social impacts.

Hazardous materials facilities, (labeled as Hazardous Waste Tracking System (HWTS)) including hazardous waste treatment and cleanup sites, are present in wildfire hazard zones as well. Wildfire damage to these facilities could create cascading environmental and public health issues that extend far beyond the immediate burn area.

Table 3-11 provides a detailed inventory of these essential facilities and infrastructure assets by wildfire hazard classification, illustrating the scope of potential loss should a large wildfire occur in Santa Cruz County.

Table 3-11: Santa Cruz County Critical Facilities in SRA vs. LRA Fire Hazard Severity Zones (FHSZ)

Critical Infrastructure - Wildfire Severity Zone									
Infrastructure Type	SRA Very High	LRA Very High	Very High Total	SRA High	LRA High	High Total	SRA Moderate	LRA Moderate	Moderate Total
Essential Facilities	4	-	4	15	2	17	6	1	7
Fire Station	3	-	3	13	1	14	5	-	5
Hospital	-	-	-	-	-	-	-	1	1
Law Enforcement	1	-	1	1	1	2	1	-	1
EOC	-	-	-	-	-	-	-	-	-
American Medical Response	-	-	-	1	-	1	-	-	-
High-Potential-Loss	22	6	28	118	25	143	56	54	110
Adult Care Facility	-	1	1	6	2	8	3	2	5
Child Care Center	2	1	3	8	1	9	6	4	10
Cell Tower	8	-	8	42	2	44	11	17	28
County Real Property Asset	3	4	7	21	13	34	12	21	33
Dam	1	-	1	5	-	5	1	-	1
Healthcare Facility	-	-	-	2	-	2	1	2	3
Historic Building	1	-	1	3	1	4	2	-	2
Library	-	-	-	1	-	1	2	-	2
Mobile Home Park	2	-	2	7	2	9	8	4	12
Power Generation	-	-	-	-	1	1	-	1	1
Radio Sites	2	-	2	8	-	8	3	-	3
School	3	-	3	15	3	18	7	3	10
Transportation and Lifeline	222	12	234	2461	104	2565	368	95	463
Airport	-	1	1	1	-	1	-	-	-

Critical Infrastructure - Wildfire Severity Zone									
Infrastructure Type	SRA Very High	LRA Very High	Very High Total	SRA High	LRA High	High Total	SRA Moderate	LRA Moderate	Moderate Total
Substation	-	-	-	4	-	4	-	2	2
NG Station	-	-	-	-	-	-	-	-	-
Church	3	-	3	16	-	16	11	3	14
Stormwater Culvert	208	8	216	2348	95	2443	337	81	418
Parks	3	-	3	19	2	21	8	4	12
Bridge NBI	8	3	11	73	7	80	12	5	17
Hazmat	10	2	12	49	14	63	28	26	54
HWTS Active Facility	9	1	10	47	11	58	25	22	47
Geotracker Cleanup Site	1	1	2	2	3	5	3	4	7
Grand Total	**258**	**20**	**278**	**2643**	**145**	**2788**	**458**	**176**	**634**

*Note: *Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

Wildfires in Santa Cruz County threaten not only buildings and facilities but also critical lifeline and linear infrastructure—the networks that keep communities functioning during both normal operations and emergencies. The county has more than 1,900 miles of key transportation, utility, and service lines within High and Very High FHSZs.

Road networks account for the majority of this exposure, with over 1,400 miles of local streets and state highways traversing wildfire-prone areas. These routes are essential for evacuations, emergency responder access, and delivery of goods and services; loss or obstruction of these corridors during a wildfire could severely hinder response and recovery efforts.

Utility corridors are also exposed. Transmission lines, natural gas pipelines, and sanitation pipelines run through high-risk zones, meaning a major fire could disrupt electricity, gas, water, and wastewater services for thousands of residents. Damage to these systems can compound wildfire impacts, delaying recovery and putting public health at further risk.

Given the county's steep topography and limited ingress/egress routes in many mountain neighborhoods and communities, the vulnerability of lifeline infrastructure underscores the importance of proactive vegetation management, corridor hardening, and redundancy planning to maintain critical connectivity during wildfire events. Table 3-12 provides a detailed inventory of these linear assets by wildfire hazard classification, illustrating the scope of potential loss should a large wildfire occur in Santa Cruz County.

Table 3-12: Santa Cruz County Critical Infrastructure in SRA vs. LRA Fire Hazard Severity Zones

Infrastructure Type (Linear)	Lifelines (miles) - Wildfire Severity Zone					
	Very High		High		Moderate	
	SRA Very High	LRA Very High	SRA High	LRA High	SRA Moderate	LRA Moderate
County Maintained Roads*	32.87	2.42	23.89	262.11	66.08	24.81
Levee	-	-	-	-	-	0.28
Maintained Channel	0.71	0.71	1.94	3.23	4.53	1.79
NG Pipeline	0.04	0.09	12.30	13.18	2.86	2.78
Railroad	-	-	10.64	3.08	4.45	2.51
Sanitation Pipe	1.70	0.67	5.86	11.60	14.25	16.50
All Roads	182.16	9.65	79.81	1213.44	284.70	76.57
Alley	0.43	-	-	0.12	0.07	0.00
Drive	41.13	2.09	23.85	318.39	69.29	19.28
Major Road	18.09	1.37	11.50	170.88	39.64	12.06
Ramp	0.05	1.12	2.40	1.73	1.15	2.38
Street	94.70	1.88	28.04	564.73	151.29	30.52
State Highway	20.35	3.03	11.46	51.96	9.34	6.28
Unnamed	7.42	0.15	2.56	105.63	13.92	6.06
Transmission Line	6.42	0.08	0.56	36.09	12.45	3.56
Total	**223.89**	**13.63**	**135.00**	**1542.74**	**389.32**	**128.80**
					Grand Total	**2433.38**

3.2.1.8 Development Trends

Santa Cruz County's wildfire risk profile is shaped by two parallel forces: the continued enforcement and enhancement of strong wildfire protection regulations, and the existence of older, legacy development patterns in rural and high-risk areas that predate modern codes.

Over the last three decades, the county has significantly strengthened its wildfire resilience framework through a combination of state mandates, local code amendments, interagency plans, and dedicated funding measures. Regulations such as Public Resources Codes §§ 4290 and 4291, the California Building Standards and Fire Codes, and the county's more stringent local amendments ensure that new construction and substantial remodels in FHSZs and WUI areas meet the highest available standards for ignition resistance, defensible space, and emergency access. Complementary policy frameworks—including the county's General Plan Public Safety Element, the CZU Strategic Fire Plan, and the Santa Cruz–San Mateo CWPP—provide a coordinated roadmap for vegetation management, community preparedness, and infrastructure protection.

Santa Cruz County has also introduced innovative funding tools to sustain these efforts over the long-term, most notably Measure Q (the Safe Drinking Water, Clean Beaches, Wildfire Risk Reduction, and Wildlife

Protection Act), which will provide a dedicated annual revenue stream for fuel treatment, forest health, and wildfire safety projects on public and private lands.

Collectively, these policies and programs position the county as a leader in integrating wildfire resilience into land use planning, building design, and public infrastructure investment. New and redeveloped properties are subject to some of the most stringent wildfire safety standards in California, reducing the likelihood of structure loss and improving evacuation safety for residents in the future.

However, widespread requirements for fire-resistant materials and defensible space did not emerge until after major wildfire losses in the 1990s and 2000s and a substantial portion (80 to 90%) of the built environment in unincorporated Santa Cruz was developed before these standards existed. Many neighborhoods, especially in the San Lorenzo Valley, Bonny Doon, Corralitos, and other WUI areas, contain homes, roads, and critical facilities constructed with combustible materials, limited access routes, undersized water infrastructure, and minimal defensible space. These legacy conditions present ongoing vulnerabilities, even as surrounding parcels are upgraded to modern standards.

In addition, while fuel reduction projects and defensible space programs are expanding, the county's dense vegetation, steep topography, and changing climate conditions mean wildfire will remain an ever-present hazard. New development trends, such as rural residential in-fill, remote work-driven population shifts into WUI areas, and continued demand for housing in high-amenity rural landscapes may incrementally increase exposure if not carefully managed.

As Santa Cruz County grows and adapts, the integration of planning, regulation, funding, and on-the-ground mitigation will be essential for safeguarding people, property, and infrastructure against the escalating threat of wildfire. This MJHMP plays a critical role in addressing recognized gaps. By identifying and prioritizing projects that retrofit older structures, improve evacuation infrastructure, expand fuel management into high-priority corridors, and harden critical facilities, the plan ensures that the benefits of modern codes and policies extend to the entire community, not just to new development.

3.2.1.9 Wildfire Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing wildfire-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input.

The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure, essential facilities, economic assets, natural resources, and long-term recovery. They also recognize systemic barriers to effective mitigation, such as fragmented land ownership and post-fire hazards.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with wildfire. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-13 presents the wildfire hazard problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2.

Table 3-13: Santa Cruz County Wildfire Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Wildfire	Victim	ps-WF-SCC-01	Approximately 40% of the population and parcels in unincorporated Santa Cruz County are located in a high or very high wildfire hazard area and face post-fire recovery challenges due to insurance gaps, infrastructure damage, and limited rebuilding support.	ma-WF-SCC-01
Wildfire	Victim	ps-WF-SCC-02	Vulnerable populations living in high wildfire hazard areas -- especially low-income households, isolated seniors, persons with disabilities, and limited / non-English speakers -- face greater barriers to accessing wildfire mitigation and recovery resources as well as emergency communications.	ma-WF-SCC-01
Wildfire	Impact	ps-WF-SCC-03	Wildfires can damage or destroy critical infrastructure and facilities (public and private), including water/wastewater/stormwater conveyance and treatment, hindering emergency response and causing significant service disruptions.	ma-WF-SCC-04
Wildfire	Threat	ps-WF-SCC-04	Fragmented land and road ownership, presence of sensitive habitat, and coordination challenges within WUI areas pose challenges to agency implementation of landscape-scale wildfire risk reduction projects and construction of new egress routes.	ma-WF-SCC-08
Wildfire	Threat	ps-WF-SCC-05	Post-fire erosion and debris flows in the county?s mountainous terrain threaten life safety, watershed health, homes, roads, utilities, drainage courses, and other critical infrastructure.	ma-WF-SCC-06
Wildfire	Threat	ps-WF-SCC-06	Many rural residents rely on private roads for ingress and egress that lack code-compliant fire apparatus access, including inadequate width, insufficient turnarounds, and washout-prone crossings. Limited financing options for road improvements limit mitigation and recovery, increasing challenges for emergency response and evacuation.	ma-AH-SCC-08

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Wildfire	Victim	ps-WF-SCC-07	In wildfire-prone areas, rebuilding after a disaster can be significantly slowed for occupants of older homes due to requirements that did not apply when the structures were originally built, including modern state fire code, septic standards, and local / state regulations for sensitive habitats. Navigating these newer requirements?often in combination with the high cost or limited availability of insurance?can extend permitting timelines, increase expenses, and delay recovery.	ma-WF-SCC-09, ma-WF-SCC-03
Wildfire	Victim	ps-WF-SCC-08	Unmanaged regrowth in the CZU burn scar, as well as the lack of ongoing funding for maintenance in historic fuel treatment areas, can lead to the rapid accumulation of hazardous fuels. In the current fire regime, this increases the likelihood of high-intensity wildfire, threatening nearby communities, critical infrastructure, and ecosystem recovery.	ma-WF-SCC-07
Wildfire	Victim	ps-WF-SCC-09	Smoke from local or regional fires can decrease air quality resulting in health problems or an inability to engage in outdoor activities, especially for sensitive individuals.	ma-WF-SCC-05
Wildfire	Threat	ps-WF-SCC-10	Homeless encampments along riparian corridors and in heavily vegetated and high fuels open space areas create ignition risks, coupled with permitting/sensitive habitat requirements that pose challenges to ongoing fuel reduction and maintenance.	ma-WF-SCC-08

3.2.1.10 Climate Change Impacts & Vulnerable Populations

Wildfire is one of the most significant hazards in unincorporated Santa Cruz County, where approximately 40 percent of the population and parcels are located within high or very high wildfire hazard areas. Climate change is expected to intensify wildfire risk by producing hotter, drier summers, lengthening fire seasons, and increasing vegetation stress. These trends amplify both direct wildfire impacts and secondary hazards such as post-fire erosion, debris flows, and degraded air quality. Vulnerable populations—including low-income households, isolated seniors, persons with disabilities, renters, and limited- or non-English speakers—face the greatest barriers to preparedness, evacuation, and recovery.

Direct Impacts: Wildfires threaten lives, homes, and critical infrastructure, including water, wastewater, and stormwater systems, as well as roads and power lines that support emergency response. Many rural residents depend on private roads for ingress and egress that do not meet fire apparatus access standards, making evacuation and fire suppression more difficult. Populations living in older homes may face delayed recovery due to stricter rebuilding requirements under modern fire and septic codes, habitat protection regulations, and insurance gaps, compounding inequities in recovery timelines.

Secondary Hazards: Post-fire erosion and debris flows in mountainous terrain present significant risks to downstream communities, utilities, and watershed health. In burn scar areas, unmanaged regrowth and the lack of funding for long-term fuel treatment maintenance increase the potential for high-intensity fire recurrence, threatening ecosystem recovery and nearby communities.

Public Health and Social Impacts: Smoke from local and regional fires degrades air quality, creating serious health risks for sensitive populations, including children, seniors, outdoor workers, and individuals with respiratory or cardiovascular conditions. Homeless encampments located in vegetated riparian corridors also contribute to ignition risks, while simultaneously representing populations that are highly exposed to fire and lack access to safe evacuation options.

Climate change is expected to make these challenges more frequent and severe. For unincorporated communities, reducing wildfire risk requires targeted outreach, accessible emergency communication strategies, and coordinated investment in defensible space, vegetation management, and resilient infrastructure. Prioritizing the needs of vulnerable populations will be critical to ensuring equitable wildfire preparedness and recovery across the county.



Flood

FEMA DRAFT - 2/27/2026

3.2.2 Flood Hazard Profile



Flooding is one of the three primary natural hazards in California, along with earthquakes and wildfires, and statewide it represents the second most destructive source of hazard vulnerability and risk. (CalOES, 2018) Flooding is a priority hazard for Santa Cruz County due to its exposure to both riverine and coastal flooding, steep watershed conditions that produce rapid runoff, and the presence of populated areas and critical infrastructure in floodplains.

A floodplain is the low-lying land adjacent to a river, creek, or coastal area that becomes inundated during a flood event. Floodplains may be broad, such as the Pajaro River Valley, or narrow, as seen in the steep canyons of the San Lorenzo River and Soquel Creek. These areas form complex ecological systems that provide habitat improve water quality and reduce downstream flood impacts. When rivers are separated from their floodplains by levees or other control structures these natural benefits are diminished or lost.

In Santa Cruz County, flooding occurs when creeks rivers or coastal areas receive water flows or storm surge that exceed their conveyance capacity, resulting in overflow into adjacent lands. Riverine flooding often results from intense rainfall, particularly during atmospheric river events, while coastal flooding can occur when large storm waves and high tides coincide. Flooding can also be triggered by localized drainage issues, debris blockages, or failure of flood control facilities.

The highest intensity rainfall periods generally occur between December and February, coinciding with peak seasonal river flows and elevated coastal water levels. Storm systems during this period can produce flooding along both inland waterways, such as the San Lorenzo River, Soquel Creek, and Pajaro River, and in low-lying coastal areas subject to tidal influence and wave run-up. Coastal storm flooding affects areas along the Monterey Bay, including low-lying beaches and harbor facilities.

Santa Cruz County's flood hazards are shaped by its geography and climate as well. Orographic rainfall along the Santa Cruz Mountains funnels stormwater into steep watersheds, causing rivers and creeks to rise rapidly, often with very short warning times. Historic development patterns, particularly in the mid-twentieth century, placed homes, businesses, and agricultural uses in low-lying and flood-prone areas.

Definitions & Hazard Area Designations

Flood hazards are mapped and regulated using specific terms and categories established by the Federal Emergency Management Agency (FEMA) through its Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FIS). Understanding these definitions is essential for interpreting flood hazard maps, administering floodplain management regulations, and guiding development in at-risk areas. The terms described in Table 3-14 apply to flood hazard mapping and floodplain management in Santa Cruz County and are consistent with FEMA standards, including inland and coastal hazard area designations.

Table 3-14: Flood Hazard Terms

Term	Description
Special Flood Hazard Area (SFHA)	An area having special flood, mudflow, or flood-related erosion hazards and shown on a Flood Insurance Rate Map (FIRM), including all A and V Zones. The SFHA is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and where the mandatory purchase of flood insurance may apply.
Base Flood	A flood having a 1% chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood." The base flood is the national standard used by the NFIP and all federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development.
100-YR / 1% Annual Chance Floodplain	The boundaries of the 100-year floodplain coincide with the base flood and an annual flood risk of 1%, consisting of both the regulatory floodway and the flood fringe. These areas are identified as various A Zones on FIRMs, depending on the risk and level of study conducted.
Floodway	The channel of a river or other watercourse and the adjacent land areas, where the highest velocities and damage potential are present during a flood, that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations.
Flood Fringe	This is the remaining portion of the 100-year floodplain, excluding the floodway. This zone can be obstructed or developed if certain criteria are met.
500-YR / 0.2% Annual Chance Floodplain	The boundaries of the 500-year floodplain encompass the 100-year floodplain and coincide with an annual risk of 0.2%. The 500-year floodplain is advisory only for NFIP purposes.
Coastal High-Hazard Area (V Zones)	V Zones are areas along open coasts subject to high-velocity wave action from storms or other triggering events. These zones require elevated construction methods and other protective measures that can withstand the additional forces of waves.
Coastal A Zone (CAZ)	Coastal A Zones are within the SFHA, landward of a V Zone or along the open coast, where wave heights are between 1.5 and 3 feet during the base flood event. Structures in CAZs are subject to design and construction standards similar to V Zones.
Limit of Moderate Wave Action (LiMWA)	The Limit of Moderate Wave Action is a line shown on FIRMs that marks the inland limit of wave heights between 1.5 and 3 feet during the base flood event. Areas seaward of the LiMWA face higher risks from wave damage and must meet applicable construction standards.
Base Flood Elevation (BFE)	The elevation of surface water resulting from the base flood that has a 1% chance of equaling or exceeding that level in any given year. BFEs are shown on Flood Insurance Rate Maps (FIRM) for various flood zones where detailed studies have been conducted (e.g., Zone AE and V Zones).
Flood Insurance Rate Map (FIRM)	The official map of a community on which FEMA has delineated the SFHAs, BFEs, and the insurance risk premium zones applicable to a particular community.
Flood Insurance Study (FIS)	A compilation and presentation of flood risk data accompanying the FIRMs for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS report, which contains detailed flood elevation data in flood profiles and tables.
Best Available Map (BAM)	The California Department of Water Resources (DWR) provides Best Available Maps displaying 100-, 200-, and 500-year floodplains across the state as supplemental information to FIRMs.

Floodplain Ecosystems

Floodplains are critical natural systems that support diverse and highly productive ecosystems. These areas often host an abundance of plant and animal species, with densities many times greater than those found along the river channel alone. Periodic flooding replenishes soils with nutrients from decomposed organic material, triggering rapid growth in plants and microorganisms. This productivity attracts a wide range of wildlife, including migratory birds and opportunistic feeders, and sustains agricultural uses due to the fertility of the soil. Vegetation in floodplains and riparian areas is typically adapted to disturbance, with species that are fast-growing and tolerant of saturated soils and root disruption.

Undisturbed or restored floodplains provide important benefits to both human communities and natural environments. When maintained in their natural state, floodplains:

- Slow the rate at which runoff enters streams, reducing peak flows and moderating flood impacts.
- Improve water quality by trapping sediment and filtering pollutants before they reach waterways.
- Recharge groundwater aquifers by allowing water to infiltrate into the soil.
- Provide habitat for a wide variety of plant and animal species, including sensitive and threatened species.

However, like elsewhere in California, floodplains in Santa Cruz County have been heavily affected by human development. Historically, they have been attractive locations for settlement due to proximity to water, fertile farmland, accessible transportation routes, and flat terrain suitable for building. Urbanization, agricultural expansion, and infrastructure construction can disrupt natural floodplain functions, altering drainage patterns, increasing downstream velocities, and reducing the capacity of channels to safely convey floodwaters. These changes can elevate flood risk both locally and downstream.

Responsible land use planning and floodplain management can allow human activity to coexist with floodplain ecosystems. Development within these areas must incorporate design measures that preserve or restore floodplain functions to the greatest extent feasible.

In Santa Cruz County, many areas that provide natural floodplain benefits are designated as wetlands, riparian corridors, open space, or protected lands under the county's General Plan, Local Coastal Program (LCP), and other regulatory measures. These areas are typically shielded from intensive development and, when development is proposed, must comply with the county's floodplain management regulations and the National Flood Insurance Program (NFIP). Maintaining these lands in their current condition helps reduce future flood losses while supporting ecosystem health and resilience.

3.2.2.1 Secondary & Compounding Hazards

Flooding in Santa Cruz County often triggers or contributes to other hazards that can significantly increase the overall impact of an event. One of the most persistent is bank erosion, which can, in some cases, cause more lasting damage than the initial flood. Erosion of riverbanks, stream channels, and coastal bluffs can undermine infrastructure, damage private property, and alter flow patterns, increasing vulnerability to

future floods. These secondary and compounding hazards are briefly discussed in this section in relation to flood; some are further discussed in other profiles, including wildfire burn scars (Section 3.2.1), heavy rain (Section 3.2.4), coastal bluff erosions (Section 3.2.5), slope failure (Section 3.2.6), and climate change (Section 3.2.10).

Slope Failure

Flooding can lead to landslides, mudslides, debris flows, and other types of slope failure, particularly in steep mountain watersheds where saturated soils lose cohesion and fail. These secondary events can block roadways, isolate communities, and further disrupt drainage systems, sometimes creating temporary dams from accumulated debris that can release suddenly and worsen downstream flooding.

Wildfire Burn Scars

The presence of wildfire burn scars can significantly increase flood risk. Loss of vegetation and soil damage from the intense heat produced by severe wildfires reduces the land's ability to absorb rainfall, increasing both the speed and volume of runoff. The combination of rapid runoff and elevated sediment loads can cause severe erosion, degrade water quality, and increase slope failure hazards like debris flows in downstream communities.

Climate Change, Sea-Level Rise & Atmospheric Rivers

Climate change is expected to significantly alter flood hazards in Santa Cruz County by increasing the frequency and intensity of extreme precipitation events, accelerating sea-level rise, and shifting storm patterns toward more intense atmospheric river events. Developed neighborhoods, commercial areas, and critical infrastructure will face higher flood risk and should be prioritized in climate adaptation planning.

Inland, steep watershed systems—such as those draining into the San Lorenzo River, Soquel Creek, and Corralitos Creek—are projected to experience more frequent high-flow events, increasing flood severity in both mapped SFHAs and areas currently outside FEMA's designated flood hazard zones. In low-lying coastal areas like Seacliff, Rio Del Mar, Capitola Village, Beach Drive, and Via Gaviota, higher baseline sea levels will amplify wave run-up and storm surge, overtopping existing seawalls more frequently and eroding protective beaches.

Critical infrastructure, such as road and rail corridors, wastewater treatment facilities, and emergency access routes, located in flood-prone coastal and riverine areas could be increasingly impacted. The Santa Cruz Wastewater Treatment Facility, sections of Highway 1 and the coastal rail line, and low-lying bridges over the San Lorenzo River and Soquel Creek are among the assets that may face greater risk under combined high tide, storm surge, and river flooding scenarios.

These projections underscore the need for integrating climate-informed flood hazard mapping, such as the state's BAMs for 200-year floodplains, into the county's land use, capital improvement, and emergency management planning. Proactive adaptation strategies will be essential to reduce long-term vulnerability.

Hazardous Materials and Sewage Release

Hazardous materials and sewage releases are another secondary concern during a flood event. When floodwaters overtop or breach containment systems, above ground storage tanks, or other facilities storing chemicals, fuels, or other hazardous substances, contaminants or sewage can enter storm drains, streams, or the ocean. These releases create environmental hazards to people and natural ecosystems and further complicate cleanup and recovery efforts.

3.2.2.2 Subhazard: Levee Failure

Levee failure is considered a subhazard associated with both riverine and coastal flooding in Santa Cruz County. Levees are designed to protect low-lying areas from inundation during high-water events by containing river flows or storm surge within a defined channel. While levees reduce flood risk, they do not eliminate it. Failure can occur when water overtops the levee, erodes the structure, seeps through or under the levee embankment, or causes structural collapse due to prolonged saturation or foundation instability.

In Santa Cruz County, the most significant levee systems are located along the Pajaro and San Lorenzo Rivers. The older Pajaro River levee system, which provides flood protection to agricultural lands and major population centers in the City of Watsonville, unincorporated county, and community of Pajaro in neighboring Monterey County, has a documented history of failures during major storm events, including the March 2023 breach that resulted in widespread flooding and evacuations (Figure 3-9). The Pajaro River levee system does not meet current 100-year flood protection standards. This levee system also spans two counties—Santa Cruz and Monterey; hence, the Pajaro River Flood Management Agency was created to address cross-jurisdictional issues.

The San Lorenzo River levee system, completed in 2002, has significantly reduced flood risk to downtown Santa Cruz, but overtopping or structural damage remains possible during extreme events that exceed the levee's design capacity.

Levee failure can cause rapid and severe flooding, often with little warning. In many cases, the speed and depth of inundation from a levee breach can be greater than from natural overbank flooding because stored water is suddenly released. Consequences may include damage or destruction of buildings, infrastructure, and agricultural lands; disruption of transportation networks; loss of utilities; contamination of water supplies; and potential loss of life. Perhaps the most infamous levee failures to occur in U.S. history were those during Hurricane Katrina in August 2005, when over 50 levees and flood walls failed leading to over 1,000 deaths, $160 billion in damage, and the displacement of hundreds of thousands of people in the City of New Orleans and adjacent Saint Bernard Parish.

Factors that can contribute to levee failure include:

- Extreme flood events exceeding the levee's design protection level.
- Deferred maintenance leading to erosion, vegetation overgrowth, or animal burrows that weaken the structure.

- Prolonged high water that causes seepage or internal erosion (piping).
- Seismic shaking that damages embankment stability.
- Wave action and storm surge in coastal levee systems.

Mitigation strategies for levee failure focus on inspection and maintenance programs, structural upgrades to meet modern engineering standards, emergency action planning, and public education regarding residual risk in levee-protected areas. FEMA mapping of levee systems includes analysis of levee accreditation under the NFIP; areas behind non-accredited levees are typically mapped as SFHAs.



Figure 3-9: Pajaro River Levee Breach March 2023

Source: Santa Cruz County

3.2.2.3 Policies, Plans & Regulatory Environment

Federal Regulatory Environment

National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. In most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). This study presents water surface elevations for floods of various magnitudes, including the 1% annual chance or base flood (also known as the 100-year flood) and the 0.2% annual chance flood (or 500-year flood).

Base Flood Elevations (BFE) and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRMs). These maps are the primary tools for identifying the extent and location of flood hazards. FIRMs also designate the regulatory floodway which is the channel of the river or stream and the adjacent land that must remain free from obstruction so that the base flood can be conveyed downstream. For coastal areas, FIRMs depict additional Special Flood Hazard Areas (SFHA) including high-hazard V Zones, Coastal A Zones (CAZ), and the Limit of Moderate Wave Action (LiMWA). FIRMs represent the most detailed and consistent data source available and, in many communities, they define the minimum regulatory area for floodplain management.

The most recent county-wide FIRM for Santa Cruz County became effective on September 29, 2017. This update produced a digital flood insurance rate map (DFIRM) that allows for easier integration with geographic information systems (GIS) and more precise identification of flood risk areas.

Communities that participate in the NFIP must, at a minimum, regulate development in flood hazard areas according to NFIP criteria. Before issuing a permit to build in a mapped floodplain, participating jurisdictions must ensure that:

- New buildings and substantially improved structures are elevated or otherwise protected to resist damage from the base flood.
- New floodplain development does not increase flood hazards or cause additional damage to other properties.
- Floodplain development incorporates reasonable and prudent measures to reduce impacts on natural floodplain functions and ecosystems, including threatened and endangered salmonid species.

Santa Cruz County entered the NFIP on April 15, 1986. Structures permitted or built before that date are classified as "pre-FIRM" and structures built afterward are "post FIRM." Post FIRM buildings generally qualify for reduced flood insurance rates because they were constructed under floodplain management regulations intended to reduce flood damage. Pre-FIRM buildings are often more vulnerable to flooding because they were built before modern construction standards and land use regulations were adopted.

All four incorporated cities in Santa Cruz County—Capitola, Santa Cruz, Scotts Valley, and Watsonville—participate in the NFIP, as does the unincorporated county. Each jurisdiction is currently in good standing

with NFIP requirements. (Refer to the annexes for Capitola, Scotts Valley, and Watsonville for jurisdiction-specific details). Compliance is monitored by FEMA Region 9 and by the California Department of Water Resources (DWR) under contract with FEMA. Maintaining NFIP compliance is a key element of the county's overall flood risk management strategy. All participating jurisdictions have identified ongoing initiatives to maintain their standing in the NFIP and to continue reducing flood risks.

Community Rating System (CRS)

FEMA's Community Rating System (CRS) is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of the CRS: 1) reduce flood losses, 2) facilitate accurate insurance rating, and 3) promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5% according to the community's classification on a scale from ten to one. On this scale, a Class 1 community would receive a 45% premium discount, and a Class 9 community would receive a 5% discount. Class 10 communities are those that do not participate in the CRS and they receive no discount. The CRS classes for local communities are based on 18 creditable activities related to public information, mapping and regulations, flood damage reduction, and flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66% of the NFIP's policy base are communities in the CRS. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including coastal and riverine. Table 3-15 lists NFIP and CRS information for Santa Cruz County, which shows flood insurance claims paid since February 1, 1980.

Table 3-15: Santa Cruz County NFIP Status and Flood Insurance Statistics

Santa Cruz County NFIP Status and Flood Insurance Statistics	
NFIP Status	Participating Since 1986
Community Identification (CID)	060353
CRS Class (Entry Date)	Class 8 (October 2012)
Policies in Force (Total Coverage)	1,114 Policies ($298,140,000 in Coverage)
Policies Inside SFHA / Outside SFHA	485 Inside / 628 Outside
Policies in Coastal Zones (Total Coverage)	85 Policies ($21,484,000 in Coverage)
Total Claims (Total Paid)	1,168 Claims ($17,230,444 Paid)
Repetitive Loss (RL) / Severe Repetitive Loss (SRL) Properties	46 RL / 5 SRL (unmitigated insured)
Repetitive Loss Payments	$8,017,000 for Buildings / $677,000 for Contents

Note: The number of policies is by property and does not count policies for individual buildings. The Privacy Act of 1974 (5 USC 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data is included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data is used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.

The Planning Division within the County plays a central role in Santa Cruz County's flood hazard mitigation program. Its responsibilities include administering regulatory permitting for development in flood-prone areas, ensuring compliance with the NFIP, and managing participation in the CRS program. These functions help guide safe development, maintain eligibility for flood insurance, and provide residents with premium discounts through the CRS program. Together, these activities form a major component of the County's overall strategy to reduce long-term flood risk while supporting resilient growth.

U.S. Army Corps of Engineers (USACE)

The U.S. Army Corps of Engineers (USACE) plans, designs, constructs, and maintains water resources projects, including flood risk management infrastructure. In Santa Cruz County, USACE's role is focused on large-scale flood control, coastal storm damage reduction, and ecosystem restoration projects, often in partnership with local sponsors such as the Santa Cruz County Flood Control and Water Conservation District and the Pajaro Regional Flood Management Agency (PFRMA). Key USACE responsibilities and activities in Santa Cruz County include:

- **Pajaro River at Watsonville Project:** USACE and Pajaro River Flood Management Agency is leading the design and construction of major levee improvements along the Pajaro River and its tributaries in both Santa Cruz and Monterey Counties. This congressionally authorized project will provide a 100-year level of flood protection to urban areas and significantly reduce flood risk to surrounding agricultural lands.
- **Technical Assistance:** The Corps provides hydrologic and hydraulic modeling, sediment transport studies, and engineering design services for local flood protection and restoration projects under programs such as Floodplain Management Services (FPMS) and Planning Assistance to States (PAS). Through the Silver Jackets interagency partnership, USACE also supported the development of a Communications-Focused Emergency Action Plan (EAP) for the Pajaro levee system in 2025, aimed at improving community readiness and coordination during flood emergencies.
- **Coastal Storm Damage Reduction:** USACE conducts studies and implements measures to protect coastal communities from wave run-up, shoreline erosion, and coastal flooding. This includes collaboration on beach nourishment and bluff stabilization projects where feasible and authorized.
- **Ecosystem Restoration:** The Corps works with local partners on multi-benefit projects that restore riparian corridors, wetlands, and estuarine habitats in a way that also reduces flood risk.
- **Emergency Operations:** Under Public Law 84-99 (Flood Control and Coastal Emergencies), USACE can provide direct flood fight assistance to local agencies during major flood events and can perform post-disaster repairs to federally authorized flood control works.

USACE's activities in Santa Cruz County are typically carried out through formal project cooperation agreements with local sponsors, with federal funding often matched by state and local cost-share contributions. These efforts complement the work of FEMA, the California Department of Water Resources (DWR), and local agencies to provide an integrated approach to flood risk reduction.

State Regulatory Environment

California Department of Water Resources (DWR)

The California Department of Water Resources (DWR) is the state agency responsible for managing and protecting California's water resources, including oversight and coordination of flood management programs. While DWR does not directly operate most local flood control infrastructure in Santa Cruz County, it plays an important role in planning, technical assistance, and funding for flood risk reduction projects. In the county, DWR's responsibilities and activities include:

- **Floodplain Mapping and Data:** DWR works with FEMA and local agencies to develop and update flood hazard maps, including the Best Available Mapping (BAM) program, which identifies areas vulnerable to flooding from events, including the 200-year flood level (0.5% annual chance). While the 200-year standard primarily applies to urban levee systems in the Central Valley, DWR's mapping products are used statewide to support planning and hazard awareness. DWR also provides technical support for FEMA FIRM updates and maintains the Awareness Floodplain Mapping Program for unmapped or under-mapped areas.
- **Levee Safety and Inspection:** Through the Division of Flood Management's Levee Safety Program, DWR conducts periodic inspections of levee segments that are part of the State-Federal Flood Control System and maintains the Central Valley Flood Protection Board Levee Database for applicable facilities. In Santa Cruz County, this includes coordination with the Pajaro River at Watsonville Project for levee improvements along the southern county line.
- **Flood Operations Center (FOC):** During major storm events, DWR operates the FOC to provide real-time hydrologic data, reservoir operations information, and technical support to local emergency managers and flood control districts.
- **Grant Funding:** DWR administers grant programs that local agencies can use for planning, design, and construction of flood risk reduction projects, including the Floodplain Management, Protection, and Risk Awareness Program (FMPRA), Urban Flood Risk Reduction Program (UFRR), and Small Communities Flood Risk Reduction Program (SCFRR).
- **Climate Adaptation and Resilience:** DWR supports local adaptation planning through sea-level rise science, hydrologic modeling, and funding for multi-benefit floodplain restoration projects under the FloodSAFE California initiative.

Through these functions, DWR serves as a key partner to the Santa Cruz County Flood Control and Water Conservation District, the county's Public Works Department, and the PRFMA in advancing both structural and non-structural flood mitigation measures.

Local Regulatory Environment

Santa Cruz County Flood Control & Water Conservation District (FCWCD)

The Santa Cruz County Flood Control and Water Conservation District (FCWCD) is responsible for long-range planning and capital investment in the county's designated flood control zones. FCWCD encompasses four

active control zones, described in Table 3-16 and shown on Figure 3-10. Responsibilities include developing and maintaining storm drain master plans for each zone to identify drainage deficiencies, assess system performance, and prioritize needed capital projects. FCWCD manages funding generated through zone assessments and actively pursues state and federal grants to finance flood management improvements.

FCWCD also oversees the design and construction of major flood control infrastructure, such as levees, pump stations, culvert replacements, and channel modifications. In delivering these projects, FCWCD works in close coordination with FEMA, USACE, DWR, and the Regional Water Quality Control Board to ensure regulatory compliance and effective project delivery. Capital improvements are generally designed to provide a 10-year storm conveyance capacity, with higher levels of protection applied where conditions warrant.

Santa Cruz County Flood Control Unit

The Flood Control and Storm Water Unit, housed within the County's Department of Community Development and Infrastructure (CDI), plays a critical role in reducing flood risk and maintaining stormwater infrastructure. The unit is responsible for managing stormwater conveyance systems to reduce flooding, erosion, and water quality impacts associated with pollutants such as oils, fertilizers, and litter. In 2023, responsibilities for maintaining the Pajaro River, Salsipuedes Creek, and portions of Corralitos Creek were formally transferred from Zone 7 to the Pajaro Regional Flood Management Agency (PRFMA), though the County had previously carried out critical levee maintenance and emergency preparation along these waterways. In addition to flood control operations, the unit supports stormwater compliance efforts, emergency response, and coordination with planning staff to integrate flood hazard considerations into development review. Together, these responsibilities strengthen the County's resilience to extreme weather events and climate-driven flood hazards.

Pajaro Regional Flood Management Agency (PRFMA)

The Pajaro Regional Flood Management Agency (PRFMA) is a joint powers authority that includes the County of Santa Cruz, Santa Cruz County Flood Control District, Water Conservation Zone No. 7, the County of Monterey, the Monterey County Water Resources Agency, and the City of Watsonville. Former in 2021, the agency plans, finances, and implements projects and programs to reduce flood risk from the lower Pajaro River and its tributaries in Santa Cruz and Monterey Counties. PRFMA oversees about 24 miles of levees, 12 miles of channels, 15 pump stations, and 85 culverts. These assets protect Watsonville, Pajaro, and surrounding agricultural areas from riverine flooding, although the current system provides only limited protection, estimated at an eight-year flood event.

PRFMA leads the Pajaro River at Watsonville Project, a major upgrade effort with USACE to achieve 100-year flood protection. The agency also oversees regular operations and maintenance, emergency preparedness coordination, and environmental stewardship initiatives that integrate habitat restoration with flood control.

Until these upgrades are complete, the extensive floodplain near Watsonville remains vulnerable, as the levees in this area are not urban-standard structures and do not provide full protection against larger flood events. This exposure is reflected in the county's leveed-areas flood risk analysis, which identifies significant portions of the lower Pajaro River floodplain as remaining at risk despite existing levee protection.

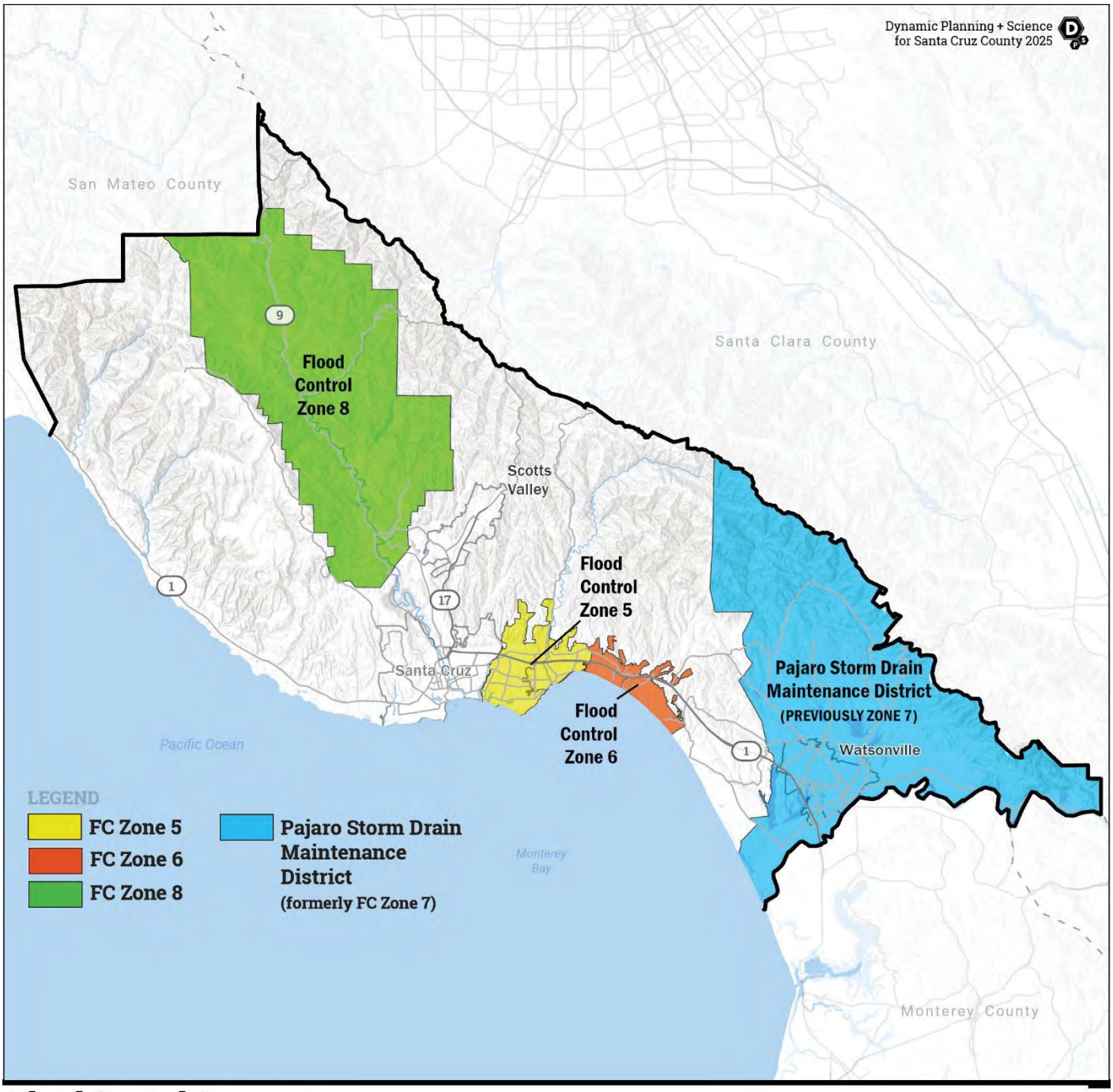
Table 3-16: Santa Cruz County Flood Control Zones

Zone	Boundaries / Service Area	Waterways	Key Infrastructure
Zone 5	Soquel, Capitola, Aptos, and Rio Del Mar area; extends inland to hills above Soquel and Aptos valleys	Soquel Creek, Valencia Creek, Noble Gulch, Aptos Creek, Trout Gulch Creek	Storm drain networks, culverts, roadside ditches, Soquel Creek floodplain improvements, Valencia Creek channel improvements, tide gates and coastal outfalls at Rio Del Mar and Capitola
Zone 6	Live Oak area, east of Santa Cruz City limits, extending to the coastline	Corcoran Lagoon, Rodeo Creek	Storm drain network with direct coastal outfalls, pump stations, tide gates, and sediment control structures
Pajaro Storm Drain Maintenance District (PSDMD) (Previously Zone 7)	Pajaro Valley area in South County; unincorporated areas adjacent to Watsonville; includes Salsipuedes Creek watershed	College Lake, East Branch Salsipuedes Creek	College Lake pump station and outlet structure, agricultural drainage ditches, culverts, flood gates
Zone 8	San Lorenzo River watershed from Santa Cruz City limits upstream into San Lorenzo Valley; includes Boulder Creek, Ben Lomond, Felton	San Lorenzo River, Zayante Creek, Bear Creek, Boulder Creek	San Lorenzo River levee system (downtown Santa Cruz), storm drain systems in valley communities, culverts and bridges, bank stabilization projects

Santa Cruz County Department of Community Development & Infrastructure (CDI), Public Works Division (PWD)

The Santa Cruz County Public Works Department (PWD) provides the operational capacity and technical expertise necessary to implement FCWCD programs. PWD is responsible for the operation and maintenance of drainage facilities across the flood control zones, including storm drains, culverts, roadside ditches, tide gates, and detention basins. The department conducts regular inspections and makes repairs to ensure system integrity, with special emphasis on preparation before and during storm seasons. During high-water events, PWD leads emergency response operations to clear blockages, repair damaged infrastructure, and deploy temporary flood protection measures. Public Works also maintains GIS-based inventories and hydraulic models for the county's storm drain systems and waterways, which support both planning and emergency operations. In addition, the Department ensures regulatory compliance with the the Municipal Separate Storm Sewer System (MS4) stormwater permit under the Clean Water Act.

Together, FCWCD and PWD provide the policy direction, funding mechanisms, long-term capital planning, and day-to-day operational capability required to maintain and improve Santa Cruz County's flood control infrastructure. This integrated approach enables the county to address both immediate maintenance needs and long-term resilience goals in its flood-prone watersheds.



Flood Control Zones

Source: Santa Cruz County

Figure 3-10: Santa Cruz County Flood Control Zones

Santa Cruz County General Plan Public Safety Element

The Santa Cruz County General Plan Safety Element contains one overarching goal of protecting human life, private property, and the environment and a set of targeted policies to address flood hazards. These provisions are intended to protect residents, businesses, public facilities, and natural resources from the damaging effects of flooding while maintaining the beneficial functions of floodplains. In summary, the flood hazard objective in the element is to protect structures in order to minimize economic damages and threats to public health and safety, and to prevent adverse impacts on floodplains, maintaining their beneficial function (Objective 6.6). To meet this objective, the General Plan includes the following key policies:

- **Review Development in Special Flood Hazard Areas (Policy 6.6.2):** Evaluate projects within SFHAs and designated floodways for potential impacts on flood levels and conveyance, and require mitigation for adverse effects.
- **Restrict Development in Flood Hazard Areas (Policy 6.6.4 and Policy 6.6.7):** Prohibit or limit new construction in mapped floodplains unless adequate mitigation measures, such as elevation or floodproofing, are incorporated in accordance with FEMA and county floodplain management standards.

This framework combines preventative measures, such as land use regulation, with protective actions that sustain the structural integrity of flood control facilities. Together, these measures help reduce flood risk across both inland and coastal areas of Santa Cruz County.

Santa Cruz County Local Coastal Program (LCP)

Within the Coastal Zone, the county's certified Local Coastal Program (LCP) applies policies from the Public Safety Element specifically to hazards originating from coastal sources, including storm surge, wave run-up, and sea-level rise. These policies integrate FEMA floodplain regulations and ensure compliance with the California Coastal Act while complementing inland flood hazard management, creating a dual-layer system for managing coastal flood risk in Santa Cruz County.

The components of the county's LCP are defined in Santa Cruz County Code Chapter 18.60 and policies and procedures regulating coastal flooding and related hazards are among them. These regulations establish the procedures and standards for administering the county's LCP in compliance with the California Coastal Act. Santa Cruz County Code Chapter 13.20 sets forth permit review procedures, appeal rights, and coordination requirements with the California Coastal Commission for projects in appealable areas. Through these measures, the Public Safety Element and the Santa Cruz County Code provides the administrative framework to implement coastal flood hazard policies and ensure that new development is compatible with long-term coastal resilience. This program and its administration are discussed further under the local regulatory environment in the Coastal Hazards Profile, Section 3.2.5.

Santa Cruz County Floodplain Management Regulations

Santa Cruz County has participated in the NFIP since 1986 and has adopted the most recent FIRMs and FIS issued by FEMA (dated September 27, 2017) as well as local floodplain development regulations in compliance with the minimum NFIP standards (Chapters 16.10 and 16.13of the County Code). These minimum standards include procedures and provisions for substantial improvements and substantial damages to existing structures, the latter of which are employed by the floodplain administrator and county building inspectors following any hazard event affecting structures located in the flood hazard area in accordance with NFIP requirements. Regulations for substantial or cumulative improvements are enforced via permitting procedures. By code, implementation and enforcement of the County's floodplain regulations are assigned to the Planning Director or their designee.

The provisions of Chapter 16.10 and 16.13 are intended to promote public health, safety, and welfare, and to minimize public and private losses due to flood conditions. The regulations restrict land uses that could increase erosion, obstruct flood flows, or exacerbate flooding; require that new construction and substantial and cumulative improvements over a 5-year period be protected against flood damage at the time of initial construction; limit the alteration of natural floodplains, stream channels, and protective barriers; and avoid development practices that could unnaturally divert floodwaters or increase flood hazards in other areas. County Code Section 16.30 Riparian Corridor and Wetlands Protection provides additional protections for riparian corridors to maintain their natural flood and erosion control functions.

3.2.2.4 Past Events

Flooding has caused significant damage to agriculture, transportation networks, and developed areas in Santa Cruz County in the past. Historic records indicate repeated damaging floods, with notable events in 1955, 1982, 1995, 1997, 1998 and 2023, including the catastrophic Pajaro River levee failure in March 2023 that inundated portions of Pajaro and surrounding agricultural lands in Monterey County. Below is a summary of the historic flooding for the major rivers, creeks, and beaches in Santa Cruz County. The historical information cited below comes from studies and reports completed by the United States Army Corps of Engineers (USACE) and the FEMA Flood Insurance Studies (FIS).

Aptos, Trout & Valencia Creeks

Aptos Creek drainage basin is of small size and limited flood problems. It includes the drainage areas of Valencia Creek, Trout Creek, Bridge Creek and Mangles Gulch. Floods are known to have occurred in 1955, 1963 and 1982, however little information is available prior to 1955. 74

During the four-day period ending December 22, 1955, heavy rains fell over the basin causing Aptos and Valencia Creeks to slightly exceed bank full stages at several points in the lower basin. Agricultural damage was primarily due to scour and erosion of first shelf lowlands planted to pasture, a few orchard crops, and idle croplands. The peak flow was measured at 3,500 cfs and approximately 140 acres were inundated, of which 20 acres were cropland. Non-cropland damages were generally very minor, consisting of eroded

private roads and washed-out culverts. County roads and bridges experienced relatively heavy damages at the Valencia Road crossing. The bridge on Aptos Creek just below the confluence of Aptos and Valencia Creeks sustained a washout of cribbing endangering the bridge structure. Four homes along Moosehead Drive, downstream from the village of Aptos, experienced flooding. The Southern Pacific Railroad sustained minor damage due to undermining of the roadbed at Aptos, which resulted in a seven-day interruption of rail service. The local telephone company sustained minor damages to the undermining of facilities in the floodplain (USACE, Floodplain Information, Aptos, Trout, and Valencia Creeks, 1973).

The January 1982 flood had a peak flow of 3,950 cfs and corresponded to a 40-year recurrence interval based upon stream gauge data in Aptos Creek. Heavy damage occurred from this storm. At least seven homes along Moosehead and Spreckels Drive between Highway 1 and the Spreckels Drive Bridge suffered major damage. Further downstream damage resulted to major portions of two streets paralleling Aptos Creek.

Pajaro River, Salsipuedes Creek & Corralitos Creek

During December 21 through 24, 1955, and April 2 through 4, 1958, the Pajaro Valley experienced flooding. These floods are the two largest on record for the Pajaro River. The associated discharges for these events were 24,000 cfs and 23,500 cfs, respectively, at the Chittenden gauge (USACE, 1963). The estimated recurrence intervals for floods of these magnitudes are 27 years and 26 years, respectively. In comparison, the estimated discharge at Chittenden for a 100-year flood is 43,000 cfs. (FEMA FIS 2006).

In the December 1955 flood, the Pajaro River was maintained within the levees in the Watsonville area, but the levees were breached 2.1 miles upstream of the confluence with Salsipuedes Creek (USACE, 1963). Although no lives were lost, 972 people were evacuated, and $1.12 million damage incurred. Included in these costs were monies spent to repair levees damaged by erosion. Additional levee repairs were required because of the April 1958 flood; however, no other significant damage resulted (USACE, 1963). Significant flooding along Corralitos and Salsipuedes Creeks also occurred in December 1955 and April 1958. Peak discharges for Corralitos Creek at Green Valley Road have been estimated from high-water elevations (USACE, 1956). The estimated discharges for the 1955 and 1958 floods are 3,620 cfs and 2,680 cfs, which correspond to recurrence intervals of 12 and 7 years, respectively. The overflow of Corralitos Creek upstream of the leveed section on Salsipuedes Creek flooded 29 blocks within the City of Watsonville during the December 1955 flood (USACE, 1963).

The Pajaro Valley experienced only minor damage from the January 1982 flood. (FEMA FIS, 2006). In 1995, a major flood event breached the Pajaro River levees and the Town of Pajaro was flooded.

Most recently, in March 2023, a powerful atmospheric river event caused the Pajaro River levee to fail, resulting in widespread flooding of the Town of Pajaro in Monterey County and adjacent agricultural areas. Significant overbank flooding also occurred along Salsipuedes and Corralitos Creeks, which contributed to localized inundation in Watsonville and surrounding communities. These impacts triggered a federal disaster declaration and highlighted the persistent vulnerabilities of the lower Pajaro River watershed to

major storm events, underscoring the critical need for comprehensive levee improvements and watershed-scale flood mitigation.

San Lorenzo River

The San Lorenzo River basin is the largest drainage basin contained entirely within the county. Few records exist of flooding in the San Lorenzo Basin (outside of the City limits) prior to 1940. However damaging storms are known to have occurred in 1940, 1955, 1958, and 1982.

December 1955 was the highest historic flood along the San Lorenzo River and had a peak discharge of 30,400 cfs, which equates to approximately a 30-year recurrence interval. The most intensive rainfall fell during a four-day period from December 21-24. In the central part of the basin, known as the Ben Lomond area, the San Lorenzo River exceeded bank full stage. Local reports indicate previous maximum stages of record were exceeded along Kings, Boulder, Two Bar, and Zayante Creeks in the upper basin. Overflows occurred from the headwaters to the mouth, resulting in the maximum flood of record. The heavy rains and overflows loosened and scoured out large trees and floated them downstream where they became lodged at channel points of constriction, impounding flow, causing extremely severe local flooding. The numerous log jams and other channel obstructions diverted the high-velocity flows, causing the streams to change from the normal alignment, undercut and scour out numerous bridges, road fills, channel dams and private developments. It is estimated that at least 388 acres were flooded. Seven people (five within the Santa Cruz City limits, two outside) lost their lives as a result of the flood. It is estimated that 390 people outside the City limits were displaced by the floodwaters. Numerous houses, roads, parks, and commercial properties were damaged or destroyed in the Boulder Creek, Ben Lomond, Felton, and Paradise Park areas. (USACE, 1973)

The April 1958 flood was minor in comparison to the 1955 flood, but still saw erosion, creek bank failures and damage and loss of houses.

The magnitude of the January 1982 flood was similar to the December 1955 flood and had a peak discharge of 19,700 cfs. Damage upstream of the City of Santa Cruz was extensive. The damage was most extensive in the area between the upstream limits of Felton and in the areas of Paradise Park, Gold Gulch and Felton Grove. In the Felton Grove area, floodwaters in the overbanks reached three to seven feet and inundated 50 homes and cabins. An additional 60 to 70 homes were flooded between Felton and Ben Lomond. It is estimated that the 1982 flood had a recurrence interval along the San Lorenzo River of approximately 30 years. (FEMA FIS, 2006)

Felton Grove also saw numerous evacuations during the 2023 atmospheric river events and storm season due to overtopping of the San Lorenzo River. During these events, the biggest impacts of flooding, rain, and mudslides were on the Central Coast, with a peak discharge of 17,400 CFS.

Beach & Coastal Flooding

Flooding along the Pacific coast of Santa Cruz is typically associated with the simultaneous occurrence of high tides, large waves, and storm swells during the winter. Significant storms, with associated damage,

strike the Monterey Bay communities with regular frequency. As a result, ocean front development has not been compatible with the natural instability of the shoreline and intense winter weather conditions. (FEMA FIS, March 2, 2006).

The most severe storms on record to hit the California coast occurred in 1978 and 1983 when high water levels were accompanied by very large storm waves (FEMA FIS, 2006).

In 1978, a series of storms emanated from a more southerly direction, than normal. Consequently, some of the more protected beaches were damaged. Jetties and breakwater barriers were overtopped, and in some cases, undermined. Direct wave damage occurred to many beachfront homes and seawalls, especially in the more populated beachfront areas such as at Seacliff Beach and Rio Del Mar Beach. (FEMA FIS, 2006).

In 1983 a similar storm hit the Santa Cruz Coast. During this storm, a new 3,500-foot seawall was destroyed and in Seacliff Beach 19 of 21 homes were significantly damaged when the existing riprap protection was overtopped. (FEMA FIS, 2006).

The Pajaro Dunes area of the County that is fronted by dunes has also been subject to severe damage to structures as well as rapid beach retreat in 1968, 1969, 1978 and also in 1983. (FEMA FIS, 2006).

Powerful wave events and coastal flooding have occurred since the previous county plan was adopted, most notably during the 2023 atmospheric river events and the December 2024 storm. These events, combined with high winds, caused major damage to wharfs and coastal access points, significant debris accumulation along beaches, and flooding of homes in repetitive loss areas such as Las Olas and Beach Drive.

Significant storms and associated damage from flooding strike the Monterey Bay communities with a frequency of one large storm every three to four years. A 100-year flood has a one percent probability of occurring in any given year and while considered to be a severe flood, it still has a reasonable possibility of regular occurrence. For the purposes of the protection of property, life and safety, floods of other magnitudes and occurrence intervals should also be considered in mitigation efforts.

Floods are gauged by their cresting elevation, the area of inundation or damages and either the size of the event or the probability of occurrence. The size and depth of the floodplain area is computed using mathematical models of precipitation, slope, runoff, soil type and cross-section. Flood depths are calculated at intervals along a stream or channel corridor and then mapped and interpolated between sections. This results in the floodplain map.

Notable Recent Flood Events

More recent events underscore the county's continuing vulnerability. While Santa Cruz County has experienced numerous flood events over the last two decades, three events stand out for their scale, impacts, and role in shaping current mitigation priorities:

- **2006 Floods:** Following record rainfall in late December 2005, the San Lorenzo River and several tributaries overtopped their banks. Flooding was widespread in Felton and low-lying agricultural areas. Property damage countywide was estimated at $115 million, with crop losses exceeding $32 million.
- **2017 Winter Storms:** In February 2017, a series of atmospheric river events brought record rainfall and saturated soils, causing flooding along Soquel Creek, Corralitos Creek, and the San Lorenzo River. The storms damaged levees, bridges, culverts, and private property, while triggering numerous landslides and road closures.
- **2023 Pajaro River Levee Failure:** In March 2023, a major levee breach along the Pajaro River on the Monterey County side inundated hundreds of homes and extensive agricultural areas, displaced thousands of residents, and caused hundreds of millions of dollars in losses to homes, businesses, and crops. Multiple flood events occurred over a 3-month period including flooding from Corralitos Creek and overtopping. The flood events caused an estimated $300 million in property damage and $200 million in crop damage, marking it as one of the most damaging flood events in county history.

These events underscore the county's vulnerability to both riverine and coastal flood hazards and highlight the importance of structural and non-structural mitigation strategies, including levee rehabilitation, stormwater system upgrades, and land use controls in flood-prone areas.

3.2.2.5 Location

Flooding in Santa Cruz County occurs in both inland and coastal areas and can result from riverine overflow, coastal storm surge, tidal inundation, and localized stormwater drainage issues. FEMA mapping in Figure 3-11 shows Special Flood Hazard Areas (SFHA) in the unincorporated county, which are concentrated along the San Lorenzo River, Soquel Creek, Aptos Creek, Corralitos Creek, and the Pajaro River, as well as low-lying coastal areas exposed to wave run-up and high tides.

The county's largest riverine floodplain is associated with the Pajaro River, which forms the southern boundary with Monterey County. This area includes extensive agricultural lands and residential neighborhoods in the vicinity of Watsonville, where levee overtopping or failure can cause catastrophic flooding. In March 2023, a levee breach in this area inundated hundreds of homes and thousands of acres of farmland.

Other riverine systems can be characterized by rapid rise in river stage depending on precipitation patterns. These systems include:

- **San Lorenzo River:** The primary drainage for the Santa Cruz Mountains, flowing through Boulder Creek, Felton, and downtown Santa Cruz before discharging into Monterey Bay. Several tributaries, such as Zayante Creek and Branciforte Creek, contribute to flash flooding in urbanized reaches.
- **Soquel Creek:** Recurrent flash flooding occurs along Soquel Creek, most notably at the intersection of Main Street and Soquel Drive in Soquel Village, where consecutive years of inundation have impacted several businesses and a nearby mobile home park. Further downstream, Capitola Village and adjacent

neighborhoods are subject to flooding during intense winter storms, often worsened by tidal influences at the creek's outlet to Monterey Bay.

- **Aptos and Valencia Creeks:** Drain lowland areas of Aptos, where limited channel capacity and tidal influences can combine to cause flash flooding.
- **Corralitos and Salsipuedes Creeks:** Major Pajaro River tributaries that drain agricultural and residential areas in the southeastern portion of the county.

DWR Flood Hazard Mapping

In addition to FEMA-designated SFHAs, the California Department of Water Resources' (DWR) Best Available Mapping (BAM) program identifies Flood Awareness Zones (Figure 3-12) where flood risk is present but not captured in FEMA's detailed studies. These areas include upper watershed channels and smaller tributaries where historical flooding has been documented, and where future development or land use changes could exacerbate downstream flood hazards.

As shown in the BAM data for Santa Cruz County, Flood Awareness Zones extend along many steep, upper watershed tributaries such as Bean Creek, Carbonera Creek, Branciforte Creek, and Soquel Creek in the central portion of the county, as well as Zayante Creek, Fall Creek, and tributaries to the San Lorenzo River in the north. To the east, smaller creeks draining the Santa Cruz Mountains; such as Aptos Creek, Valencia Creek, and Trout Gulch Creek, also show mapped flood awareness extents.

While these zones are not part of FEMA's Special Flood Hazard Areas, their identification highlights potential exposure for hillside and canyon communities (e.g., Boulder Creek, Ben Lomond, Felton, Scotts Valley, Soquel, Aptos). Flooding in these tributaries can occur rapidly during intense rainfall due to steep slopes, shallow soils, and confined channels, resulting in localized flash flooding, debris flows, and downstream impacts.

The presence of these BAM-identified zones underscores the importance of monitoring watershed conditions, maintaining riparian corridors, and carefully managing development in headwater areas. Even modest land use changes in these upper basins can increase runoff volumes and velocities, compounding hazards for downstream residents and infrastructure.

Coastal Hazard Locations

Coastal flood hazards are most pronounced along low-lying beaches, lagoons, and estuaries, including areas at the mouths of the San Lorenzo River, Soquel Creek, Pajaro River, Aptos Creek, and along Beach Drive in Rio Del Mar. These locations are susceptible to flooding from a combination of high tides, wave run-up, and storm surge, which can be amplified during El Niño events or periods of elevated sea level.

All lands within mapped SFHAs and BAM awareness zones along rivers, creeks, and the coast are subject to inundation under severe storm conditions. Damage potential is exacerbated in areas where levees, floodwalls, or stormwater systems are aging or undersized for current and projected hydrologic conditions.

Mitigation measures to reduce flood risk include maintaining and upgrading levees, improving bridge and culvert capacity, restoring riparian corridors, and adopting land use practices that limit exposure of new development to flood hazards.

Levee Systems

In Santa Cruz County, there are two primary levees systems, one on the San Lorenzo River through the City of Santa Cruz and the other along the Pajaro River (Figure 3-13 and Figure 3-14). The most significant levee systems are located along the lower Pajaro River and its tributaries, maintained by PRFMA. These levees protect developed lands in unincorporated Santa Cruz County and the City of Watsonville, the unincorporated community of Pajaro in Monterey County, and extensive surrounding agricultural lands. However, unlike urban-protecting levees built to withstand major events, the Pajaro River levees currently provide only a low level of protection, estimated at about an eight-year flood event. This means the floodplain near Watsonville remains extensive, and thousands of acres of agricultural land, roadways, and other assets remain at significant risk during large storms.

This vulnerability was underscored during the March 2023 Pajaro River levee breach, which caused widespread flooding, prolonged evacuations, and substantial economic losses. Flood hazard mapping of leveed-areas in Santa Cruz County in Figure 3-11 illustrates the extent of flood risk should the levees overtop or fail. While planned upgrades through the Pajaro River at Watsonville Project aim to achieve 100-year flood protection, until those improvements are complete, the potential for damaging floods remains high.

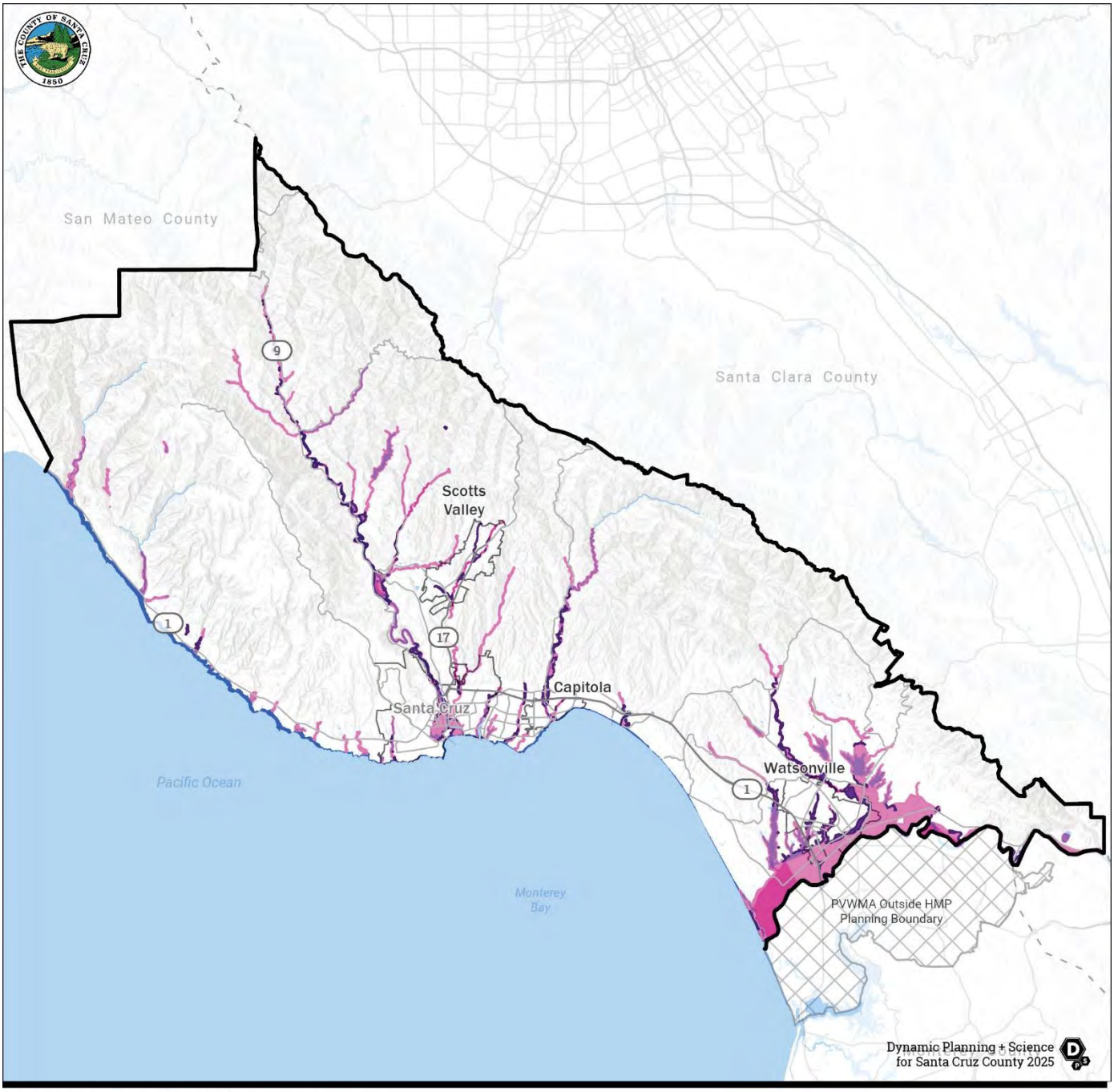


Figure 3-11: County-Wide FEMA Flood Hazard Zones Map

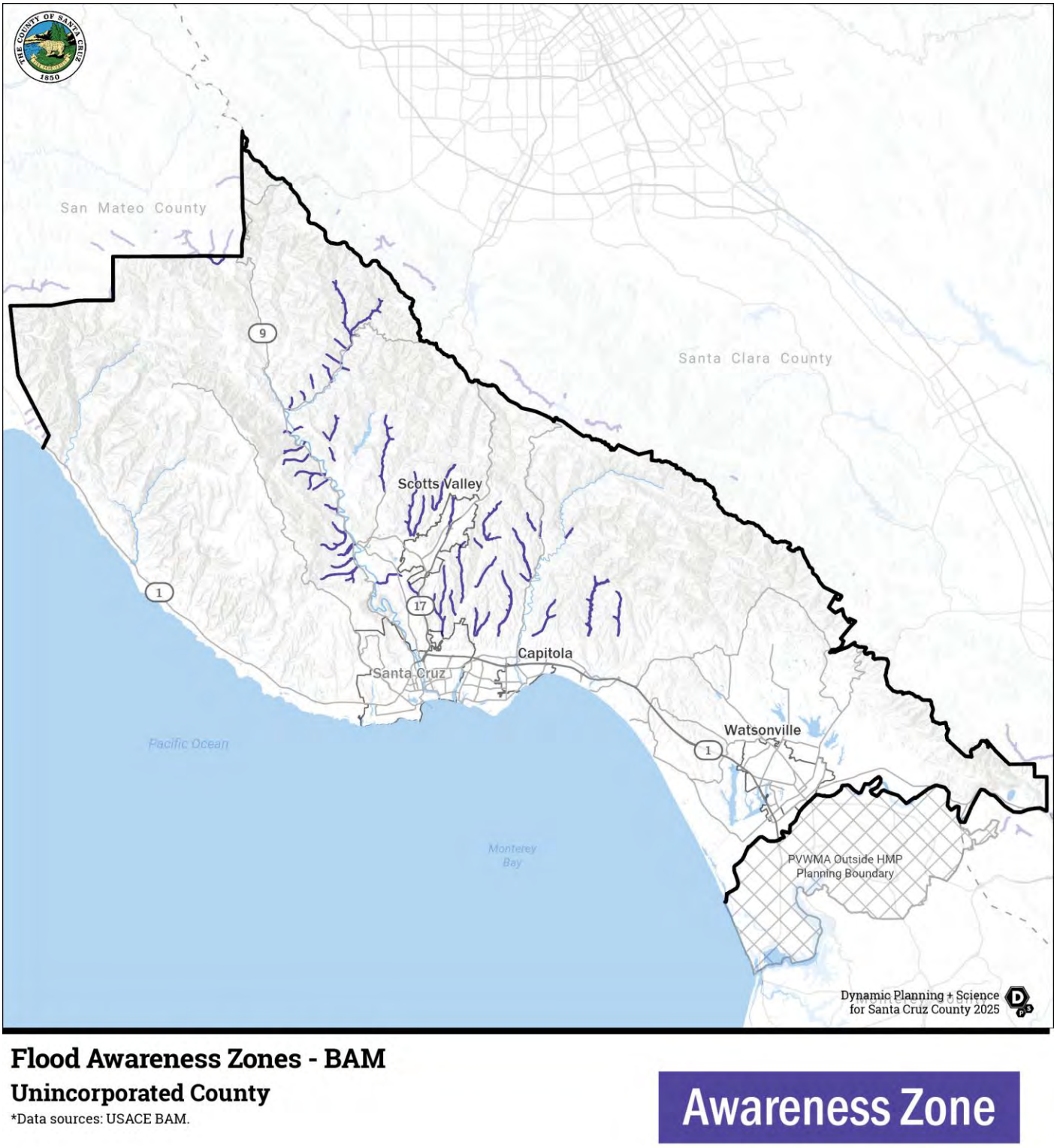
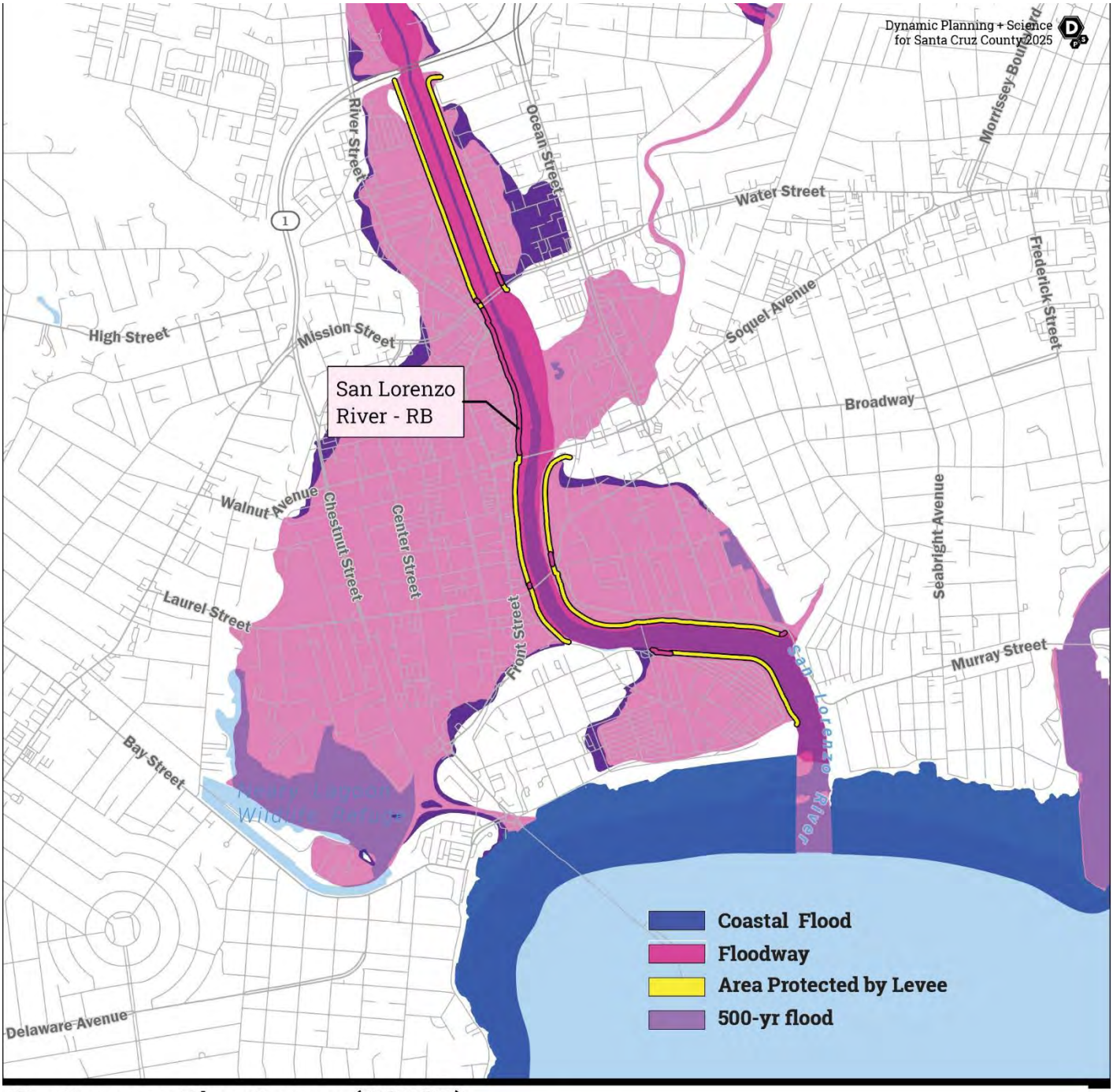


Figure 3-12: County-Wide DWR Flood Awareness Zones Map

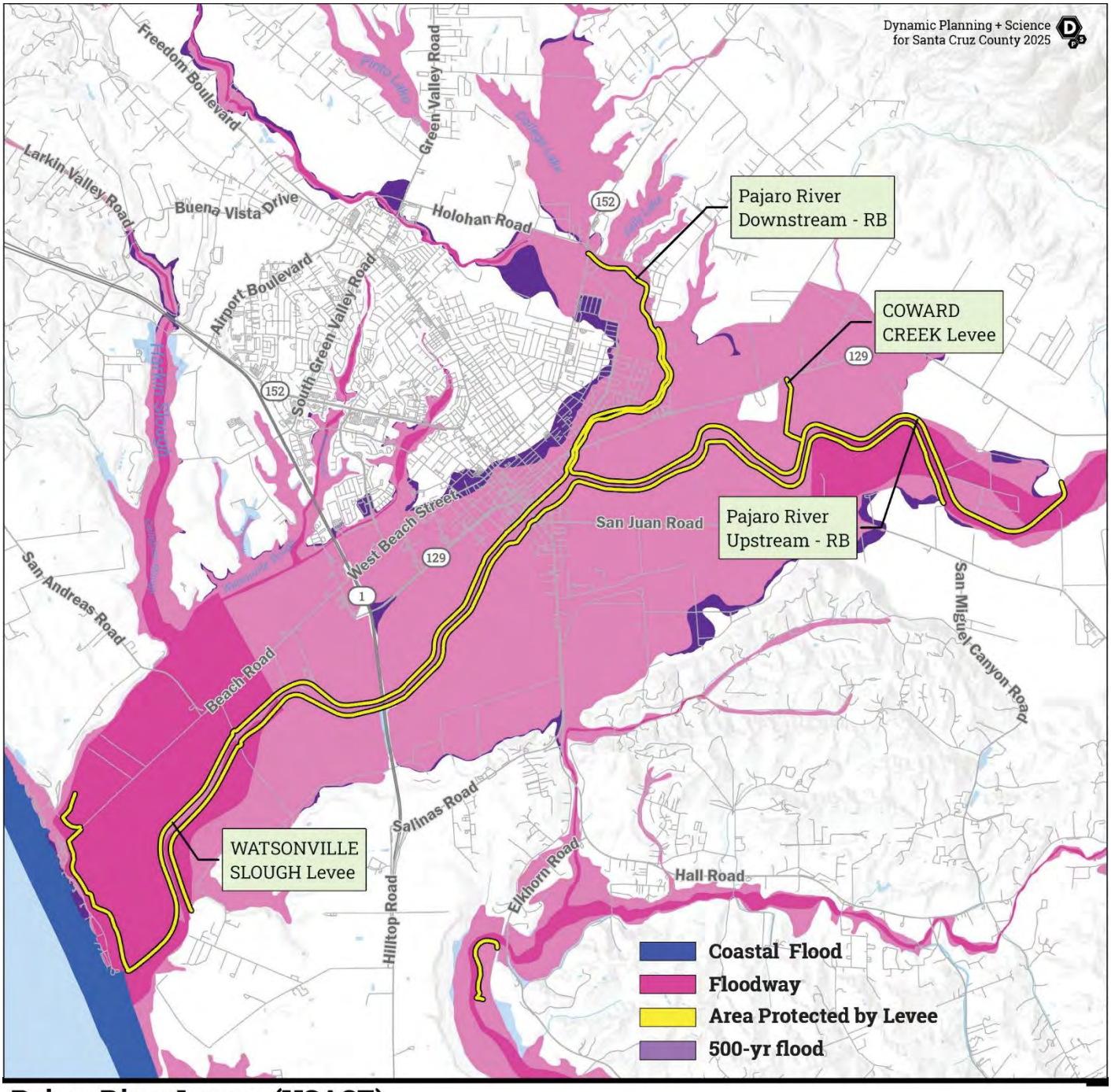


San Lorenzo River Levees (USACE)

Levees Along San Lorenzo River in Santa Cruz County

Source: USACE, FEMA

Figure 3-13: San Lorenzo River Levees



Pajaro River Levees (USACE)

Levees Along The Pajaro River in Santa Cruz County

Source: USACE, FEMA

Figure 3-14: Pajaro River Levees

3.2.2.6 Repetitive Loss (RL)

A repetitive loss (RL) property is a FEMA designation, defined as an insured property that has made two or more claims of more than $1,000 in any rolling 10-year period since 1978. The term "rolling 10-year period" means that both qualifying claims happen within 10 years of each other. For example, a property would be designated as RL if there was a claim of $1,500 in January 2006 and another claim for $2,000 in December 2015, but not if the second claim occurred after January 2016. Claims must be at least 10 days apart but within 10 years of each other.

RL properties may be classified as Severe Repetitive Loss under certain conditions. A Severe Repetitive Loss property (SRL) has had four or more claims of at least $5,000, or at least two claims that cumulatively exceed the buildings reported value. A property that sustains repetitive flooding may or may not be on Santa Cruz County's RL property list for a number of reasons:

- Owners who have completed the terms of the mortgage or who purchased their property outright may not choose to carry flood insurance and instead bear the costs of recovery on their own.
- The owner of a flooded property that does carry flood insurance may choose not to file a claim.
- Even insured properties that are flooded regularly with filed claims may not meet the $1,000 minimum threshold to be recognized as an RL property.
- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat and the RL list (in accordance with FEMA's mitigation reporting requirements).

A property does not have to be currently carrying a flood insurance policy to be considered a RL or SRL property. Often homes in communities are not carrying flood insurance but are still on the community's RL list. The RL designation follows a property from owner to owner, from insurance policy to no insurance policy, and even after the property has been mitigated. Having an insurance policy and making claims that fall into the repetitive loss criteria will put a property on the RL list. Even after the policy on a property has lapsed or been terminated, the property will remain on the county's RL list.

Extensive FEMA NFIP databases are used to track claims for every participating community, including unincorporated Santa Cruz County. It is important to note that FEMA's RL inventory for Santa Cruz County includes SRL properties; therefore, RL totals presented in this section represent the combined number of RL and SRL properties.

As of July 2025, unincorporated Santa Cruz County has 103 total RL/SRL properties, including both insured and uninsured structures that have not been mitigated, under its jurisdiction (91 RL and 12 SRL). According to NFIP records, these properties have received around $8,017,000 in building claims and $677,000 in contents claims, making the total combined NFIP payout almost $8.7 million.

Since 2010, Santa Cruz County has successfully mitigated several RL/SRL properties, primarily through elevation and relocation to reduce exposure in certain repetitive loss areas (RLA). However, **51 properties remain unmitigated and insured** under the NFIP which continue to generate claims during significant flood events. Addressing these remaining properties through cost-effective mitigation measures remains a

priority in the county's flood risk reduction strategy. Loss statistics under the NFIP are presented in Table 3-15 in Section 3.2.2.3.

3.2.2.6.1 Repetitive Loss Areas Analysis (RLAA)

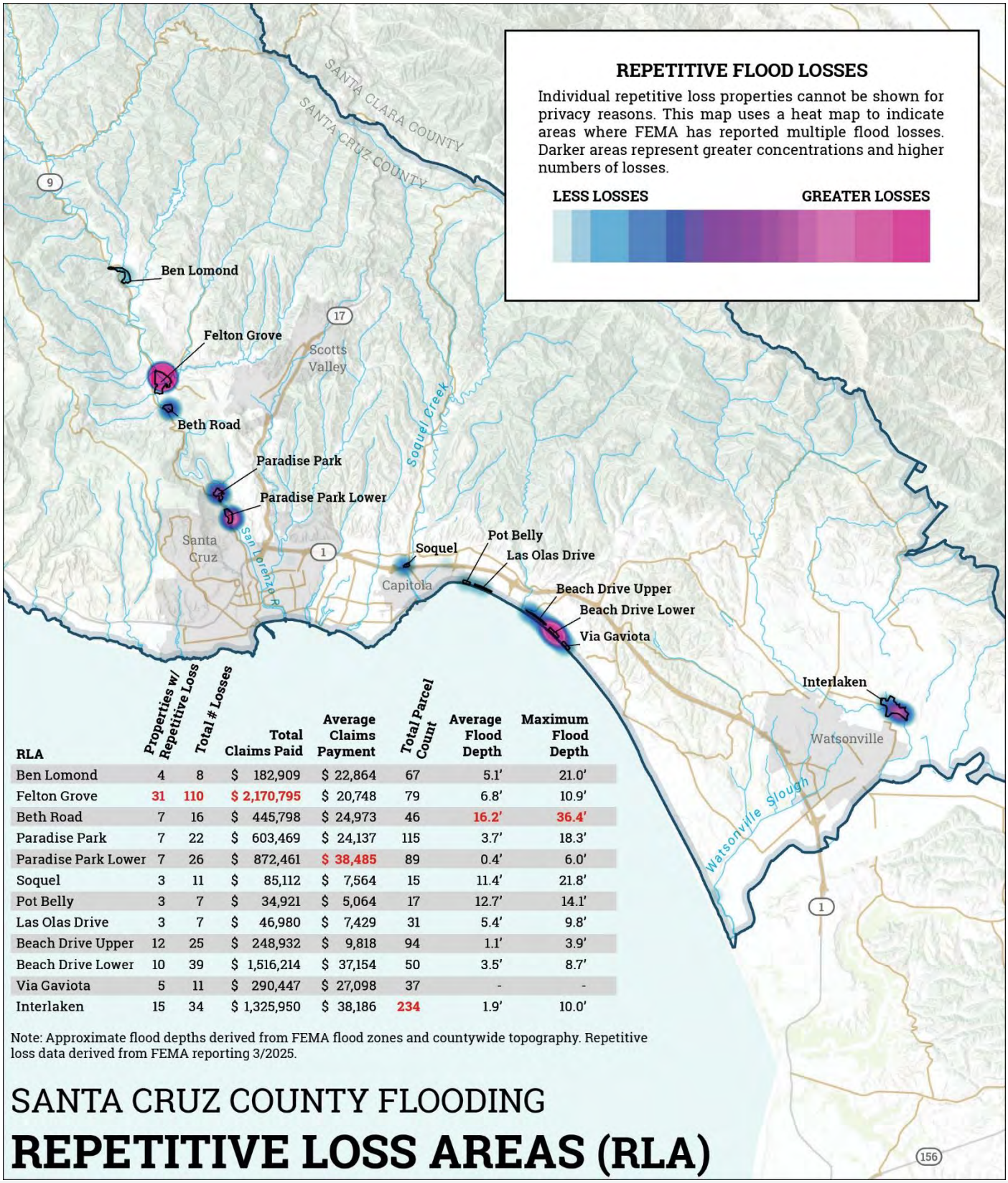
A Repetitive Loss Areas Analysis (RLAA) identifies clusters of RL and SRL properties located in close proximity and subject to similar flood hazard conditions. These repetitive loss areas (RLA) typically share the same flooding source—such as a river, creek, or coastal reach—and are susceptible to repetitive damage during high-water events. In unincorporated Santa Cruz County, repetitive loss properties are concentrated in two primary hazard environments: riverine corridors like the San Lorenzo River and its tributaries and costal lowlands such as Capitola Village.

The county-wide repetitive loss areas map in Figure 3-15 depicts all 12 identified RLAs in unincorporated Santa Cruz County. Each RLA represents a geographic cluster of RL and SRL properties that share similar flooding sources and conditions. The boundaries are based on FEMA NFIP claim records, spatial clustering of affected parcels, and local knowledge of flood hazard patterns. These areas capture the most concentrated repetitive flooding risks in the county, occurring in both riverine and coastal environments:

- **Riverine RLAs** are concentrated along the San Lorenzo River, Zayante Creek, Soquel Creek, Aptos Creek, Corralitos Creek, and the Pajaro River.
- **Coastal RLAs** occur in low-lying beachfront neighborhoods such as Seacliff, Beach Drive, and New Brighton, which experience flooding from wave run-up, tidal inundation, and coastal storms.

The RLA map series prepared for this plan delineates these clusters and provides aggregated data on claim history, historic losses, and current property values for each identified RLA. These RLAs represent the most concentrated geographic expression of repetitive flooding in the county and are the logical focus for targeted mitigation actions such as structure elevation, acquisition, or floodproofing. Each RLA is profiled individually in this section, contains a summary of its location, flood source, historical flooding patterns, NFIP claims history, known mitigation actions, and recommended strategies for reducing RL exposure.

Under the Privacy Act of 1974 (5 U.S.C. 552a), FEMA restricts public release of flood insurance policy and claims data. Individual property-level information can only be shared with state and local governments for floodplain management, mitigation, or research purposes. Accordingly, this plan presents only aggregated information for each RLA and does not identify specific properties or individual claim records. Other sources used to inform the RLAA and recommended mitigation measures include: 2021 Santa Cruz County HMP, 2025 Santa Cruz County Climate Adaptation and Vulnerability Assessment (CAVA), 2018 California Coastal Commission Sea-Level Rise Guidance, 2013 Zone 5 Master Plan, 2023 Zone 5 Storm Drainage Master Plan (SDMP), Zone 7 Master Plan, 2016 FEMA Flood Insurance Study (FIS), and 2013 FEMA Mitigation Ideas.



RLA	Properties w/ Repetitive Loss	Total # Losses	Total Claims Paid	Average Claims Payment	Total Parcel Count	Average Flood Depth	Maximum Flood Depth
Ben Lomond	4	8	$ 182,909	$ 22,864	67	5.1′	21.0′
Felton Grove	31	110	$ 2,170,795	$ 20,748	79	6.8′	10.9′
Beth Road	7	16	$ 445,798	$ 24,973	46	16.2′	36.4′
Paradise Park	7	22	$ 603,469	$ 24,137	115	3.7′	18.3′
Paradise Park Lower	7	26	$ 872,461	$ 38,485	89	0.4′	6.0′
Soquel	3	11	$ 85,112	$ 7,564	15	11.4′	21.8′
Pot Belly	3	7	$ 34,921	$ 5,064	17	12.7′	14.1′
Las Olas Drive	3	7	$ 46,980	$ 7,429	31	5.4′	9.8′
Beach Drive Upper	12	25	$ 248,932	$ 9,818	94	1.1′	3.9′
Beach Drive Lower	10	39	$ 1,516,214	$ 37,154	50	3.5′	8.7′
Via Gaviota	5	11	$ 290,447	$ 27,098	37	-	-
Interlaken	15	34	$ 1,325,950	$ 38,186	234	1.9′	10.0′

Note: Approximate flood depths derived from FEMA flood zones and countywide topography. Repetitive loss data derived from FEMA reporting 3/2025.

SANTA CRUZ COUNTY FLOODING

REPETITIVE LOSS AREAS (RLA)

Figure 3-15: Santa Cruz County Repetitive Loss Areas (RLAs)

Ben Lomond

The Ben Lomond RLA lies along the San Lorenzo River in the town center, where the channel's narrow floodplain and close proximity to development create persistent flood risk (Figure 3-16). Steep upstream watersheds in the Santa Cruz Mountains can generate rapid rises in river levels during intense winter storm events, particularly between December and February. Limited floodplain width, aging bridge crossings with low clearance, and high-velocity flows have historically contributed to bank overtopping and flooding during significant rain events.

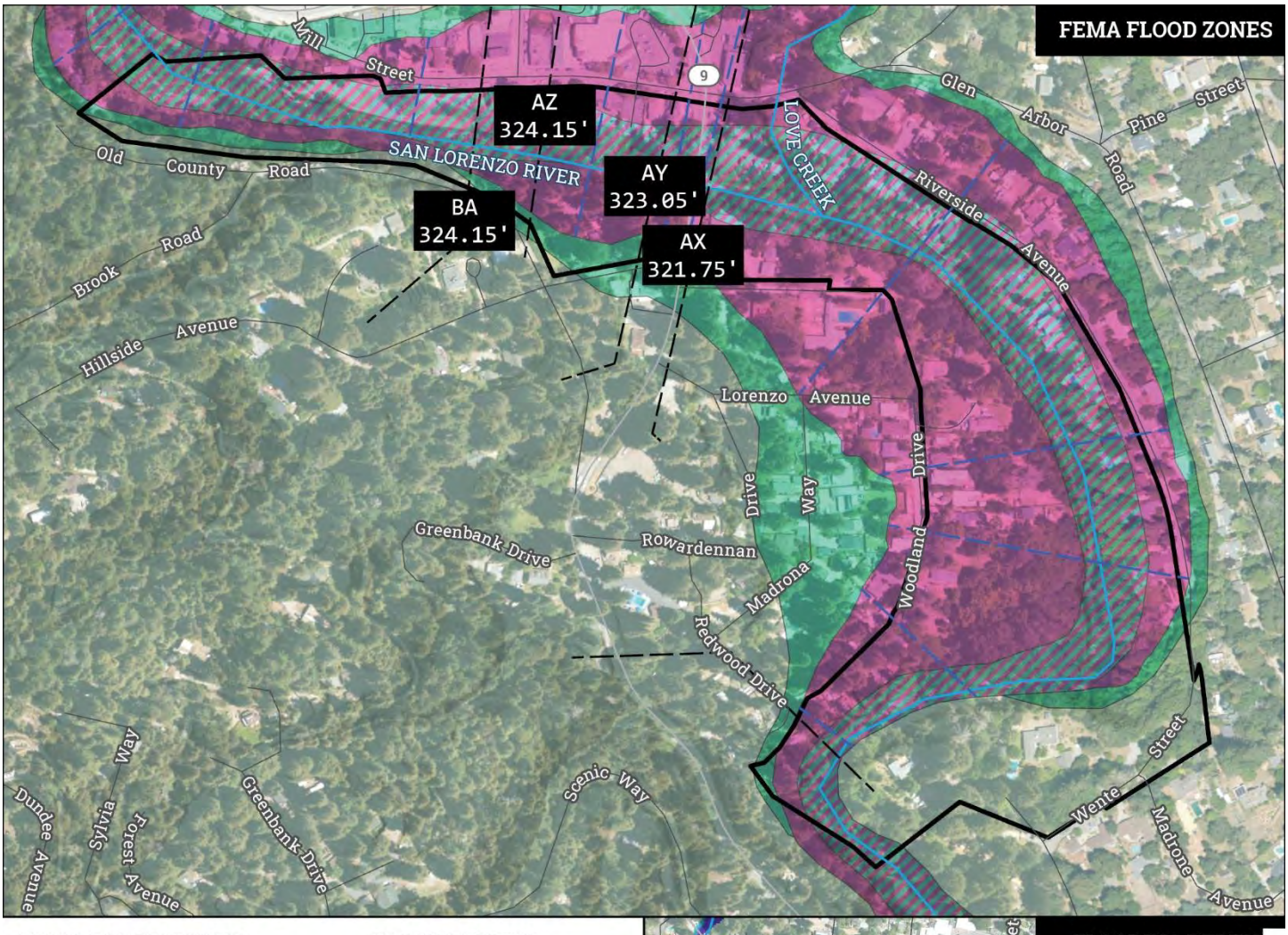
Historical flood impacts have included inundation of ground floors, roadway closures, and erosion of riverbanks adjacent to residential parcels. Debris accumulation in culverts and at bridge crossings during storms can exacerbate backwater effects, raising flood elevations in the downtown area.

Past mitigation measures have included selective vegetation management along the river corridor and targeted debris removal to improve flow conveyance. Bridge and culvert upgrades are under discussion to increase hydraulic capacity, though no large-scale capital flood control projects have been completed. Individual property owners have elevated utilities and installed site-specific drainage improvements to reduce localized damage.

Mitigation options are constrained by the legacy pattern of development, where structures were built with limited setbacks from the river's edge. These siting limitations restrict opportunities for large-scale channel modifications, emphasizing the importance of property-level mitigation and ongoing monitoring of bank stability.

Future recommendations for the Ben Lomond RLA include:

- Advancing design and funding for bridge and culvert replacement to increase flow capacity and reduce backwater effects.
- Continuing vegetation and debris management to maintain conveyance during peak stormflows.
- Encouraging participation in FEMA mitigation programs for property elevation and floodproofing.



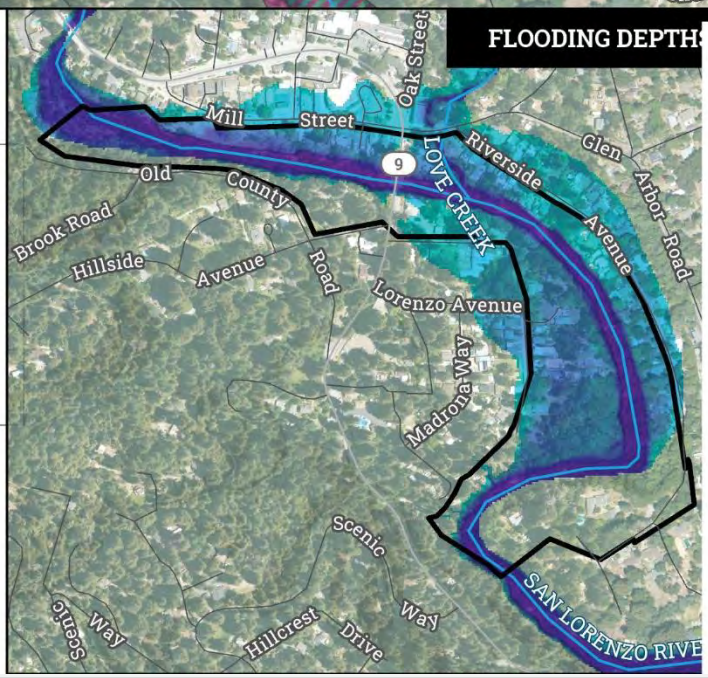
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'

0'



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
4	8	$182,909	$22,864

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
67	5.1'	21.0'

REPETITIVE LOSS AREA (RLA)

BEN LOMOND

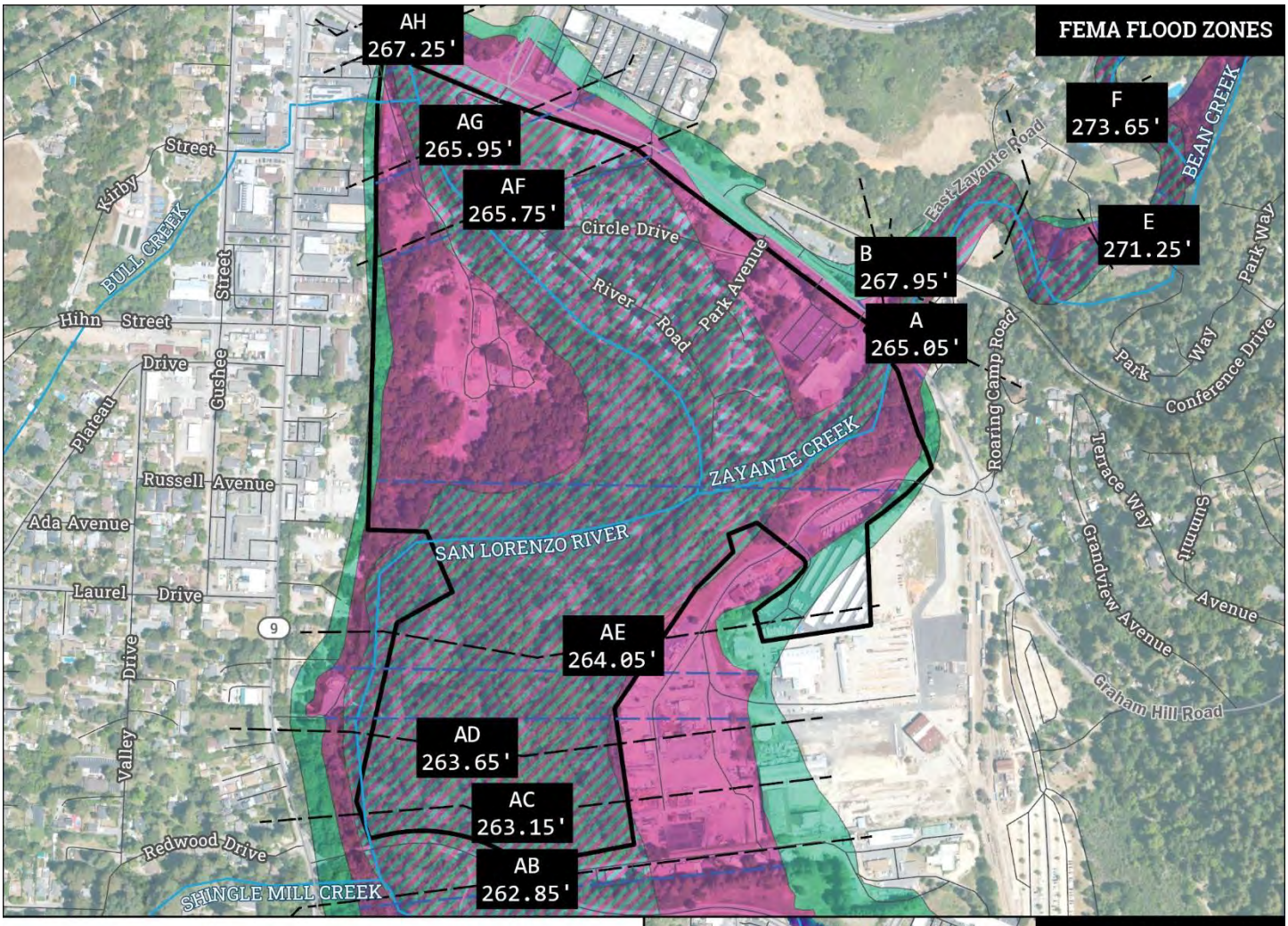
Figure 3-16: Ben Lomond Repetitive Loss (RL) Area

Felton Grove

The Felton Grove RLA is located in Felton, centered on the historic covered bridge crossing of the San Lorenzo River (Figure 3-17). Flooding in this neighborhood occurs frequently, with much of the area situated within the three-year floodplain. FEMA SFHA mapping confirms that much of this RLA is also within the 1% annual chance floodplain, with modeled depths exceeding two feet in portions of the neighborhood. Contributing factors may include the cement sill at the Felton Diversion Dam, which prevents scour and has been raised in past litigation but was ultimately not determined to be a primary cause of flooding. In addition, the confluence with Zayante Creek can exacerbate flood conditions when high flows and sediment loads coincide with San Lorenzo River peaks. Atmospheric river events and prolonged winter rains can further elevate flood risk in this reach.

Past mitigation measures have included periodic debris removal at the bridge to maintain flow capacity, as well as structure elevation and the installation of low floodwalls by individual property owners. The 2021 county HMP identified potential long-term strategies, such as retrofitting the bridge approaches and improving channel conveyance, though the bridge's cultural and historic values present constraints to large-scale structural modifications. Future recommendations for the Felton Grove RLA include:

- Continuing and expanding debris management programs to maintain bridge conveyance capacity during major storm events.
- Evaluating feasibility of targeted channel modifications upstream to reduce backwater effects while preserving historic integrity.
- Enhancing flood warning and emergency response systems for the surrounding community.
- Encouraging FEMA-funded property-level mitigation, including structure elevation and dry floodproofing.

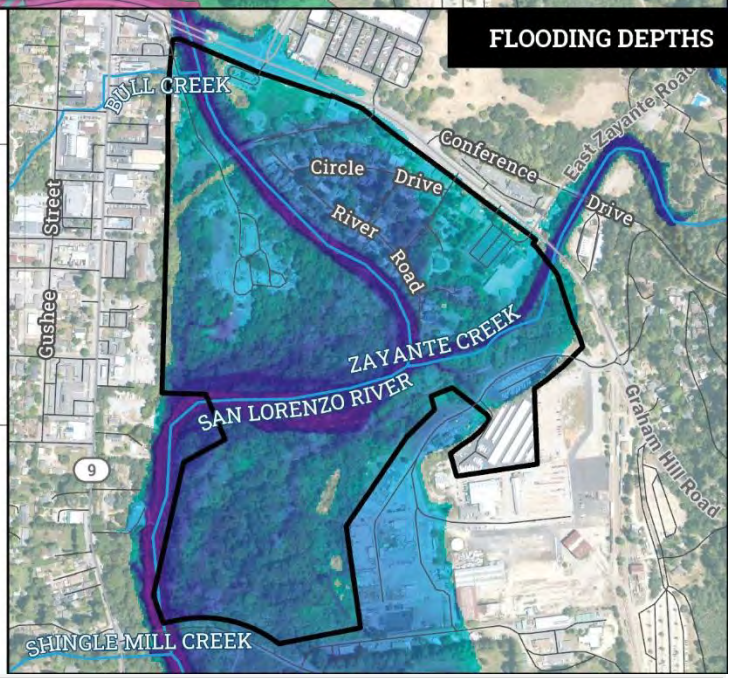


FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'
0'



REPETITIVE LOSS STATISTICS WITHIN RLA
PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
31	110	$2,170,795	$20,748

PARCEL COUNT AND EXPECTED FLOOD DEPTHS
FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
79	6.8'	10.9'

REPETITIVE LOSS AREA (RLA)

FELTON GROVE

Figure 3-17: Felton Grove Repetitive Loss (RL) Area

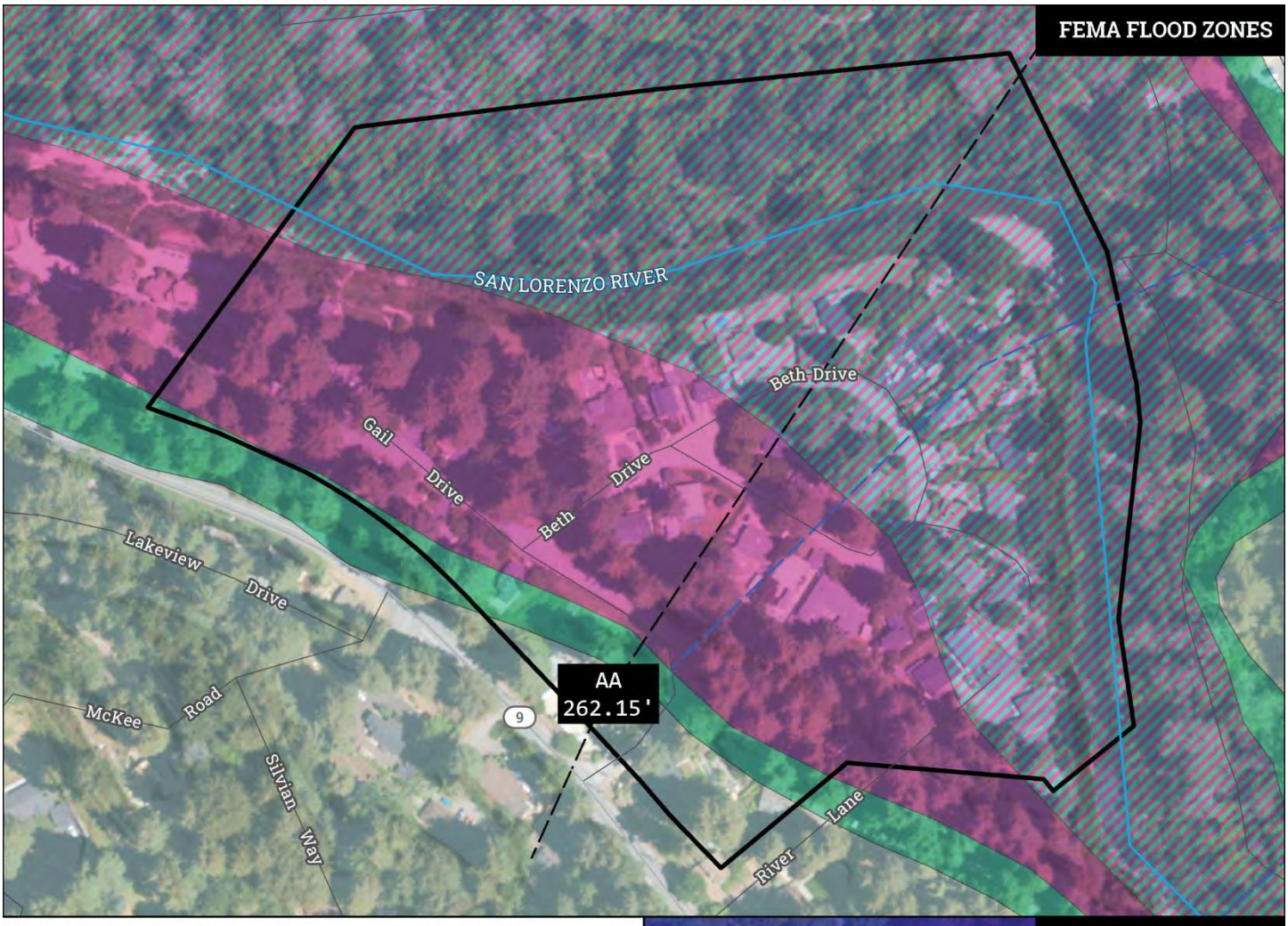
Beth Road

The Beth Road RLA is located along a broad meander of the San Lorenzo River, where the floodplain widens slightly but remains tightly bordered by residential development (Figure 3-18). This geometry allows floodwaters from upstream winter storm events, particularly atmospheric rivers, to spread laterally into low-lying parcels. The steep upper watershed of the San Lorenzo delivers high-velocity, debris-laden flows that can cause rapid inundation during prolonged rainfall.

Historical flood events in this area, documented in the FEMA Flood Insurance Study (FIS) and 2021 HMP, have produced depths sufficient to inundate first floors, damage utilities, and deposit sediment across yards and roadways. The FEMA SFHA mapping shows much of the RLA subject to the 1% annual chance flood, with portions experiencing modeled depths exceeding three feet.

Past mitigation actions in the Felton RLA have included drainage ditch regrading to improve overland flow routing; localized levee berm repairs along sections of the riverbank; and private property measures such as elevation of structures, utility relocation, and floodproofing of basements or crawl spaces. The 2021 HMP recommended coordinated riparian vegetation management to maintain channel conveyance. Additional considerations include enhanced early warning systems and better integration of community evacuation planning with upstream flow monitoring. Future recommendations for the Beth Road RLA include:

- Expanding property owner education programs through the County or the Resource Conservation District (RCD).
- Encouraging FEMA-funded property-level mitigation, including structure elevation.



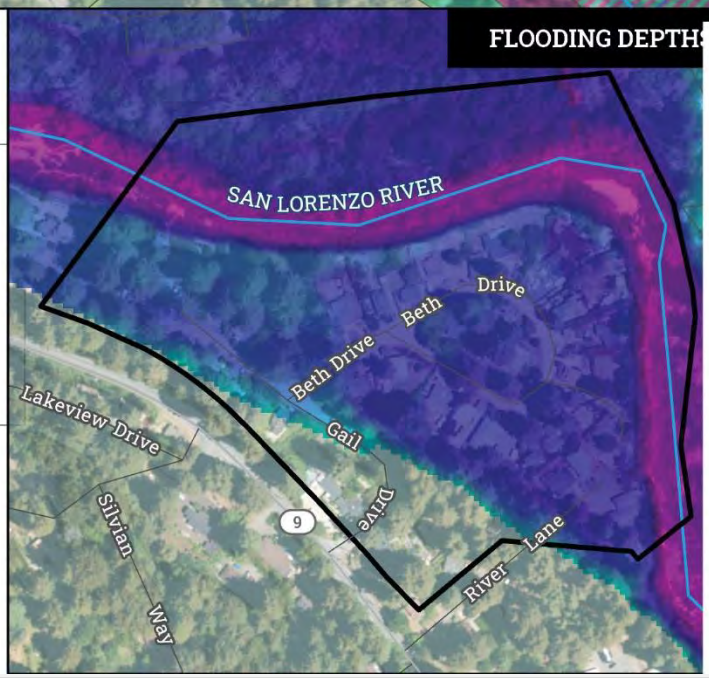
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'

0'



REPETITIVE LOSS STATISTICS WITHIN RLA
PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
7	16	$445,798	$24,973

PARCEL COUNT AND EXPECTED FLOOD DEPTHS
FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
46	16.2'	36.4'

REPETITIVE LOSS AREA (RLA)

BETH ROAD

Figure 3-18: Beth Road Repetitive Loss (RL) Area

Paradise Park

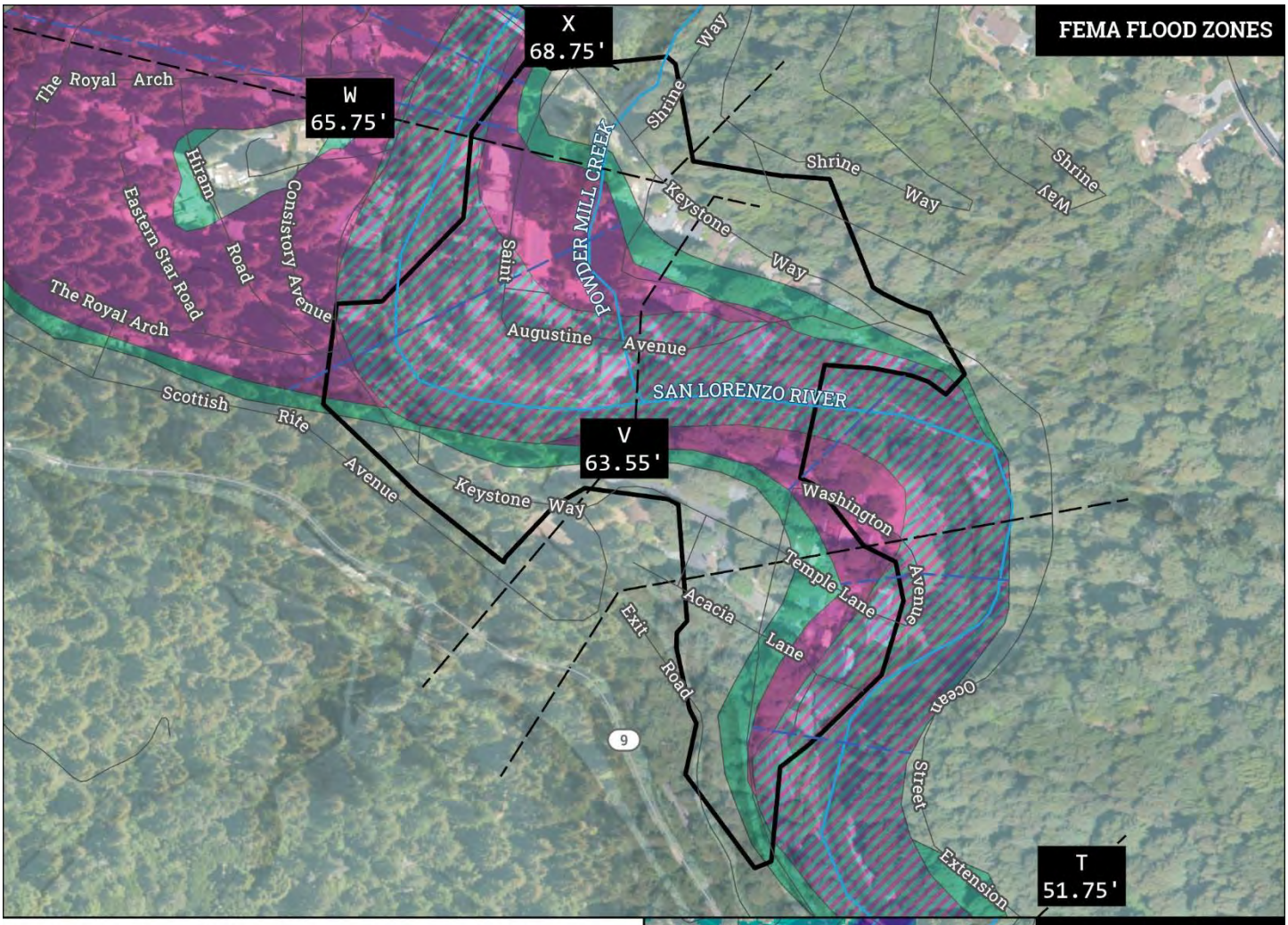
The Paradise Park RLA is located along a sharp bend in the San Lorenzo River near Highway 9, where the river's curvature concentrates high-velocity flows against the outer bank during winter storm events (Figure 3-19). The combination of steep upstream tributaries, narrow channel width, and confined floodplain causes rapid-onset flooding during prolonged rainfall or atmospheric river conditions.

Historical flooding has been characterized by deep, fast-moving water capable of causing bank erosion, undermining structures, and depositing debris in residential areas. The FEMA FIS identifies much of the RLA as SFHA, with modeled depths exceeding three feet in the 1% annual chance event. Past mitigation actions include:

- Bank stabilization projects using riprap and native vegetation to reduce erosion.
- Private property improvements such as structure elevation and installation of floodproofing measures for basements and ground floors.
- Targeted erosion control maintenance by the County to protect infrastructure.

Future recommendations for the Paradise Park RLA include:

- Coordinating with the Paradise Park HOA to explore feasible property-level mitigation strategies given height limitations that complicate compliance with elevation requirements.
- Continuing monitoring of channel migration and periodic inspection of stabilization structures (per 2021 HMP).
- Expanding riparian buffer zones to slow bank erosion and enhance natural floodplain function. (per 2021 HMP).
- Exploring potential funding for small-scale floodwalls or berms to protect the most vulnerable parcels. (per 2021 HMP).



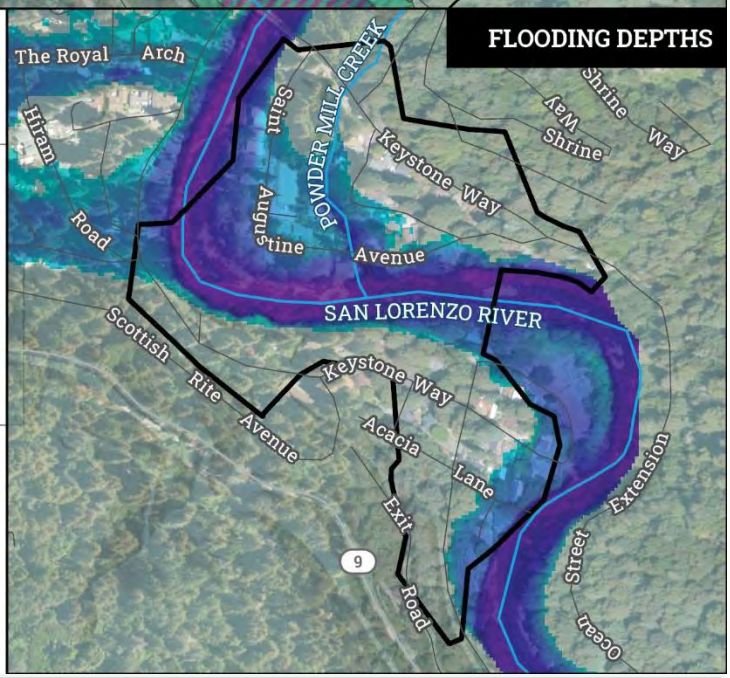
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'

0'



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
7	22	$603,469	$24,137

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
115	3.7'	18.3'

REPETITIVE LOSS AREA (RLA)

PARADISE PARK

Figure 3-19: Paradise Park Repetitive Loss (RL) Area

Paradise Park Lower

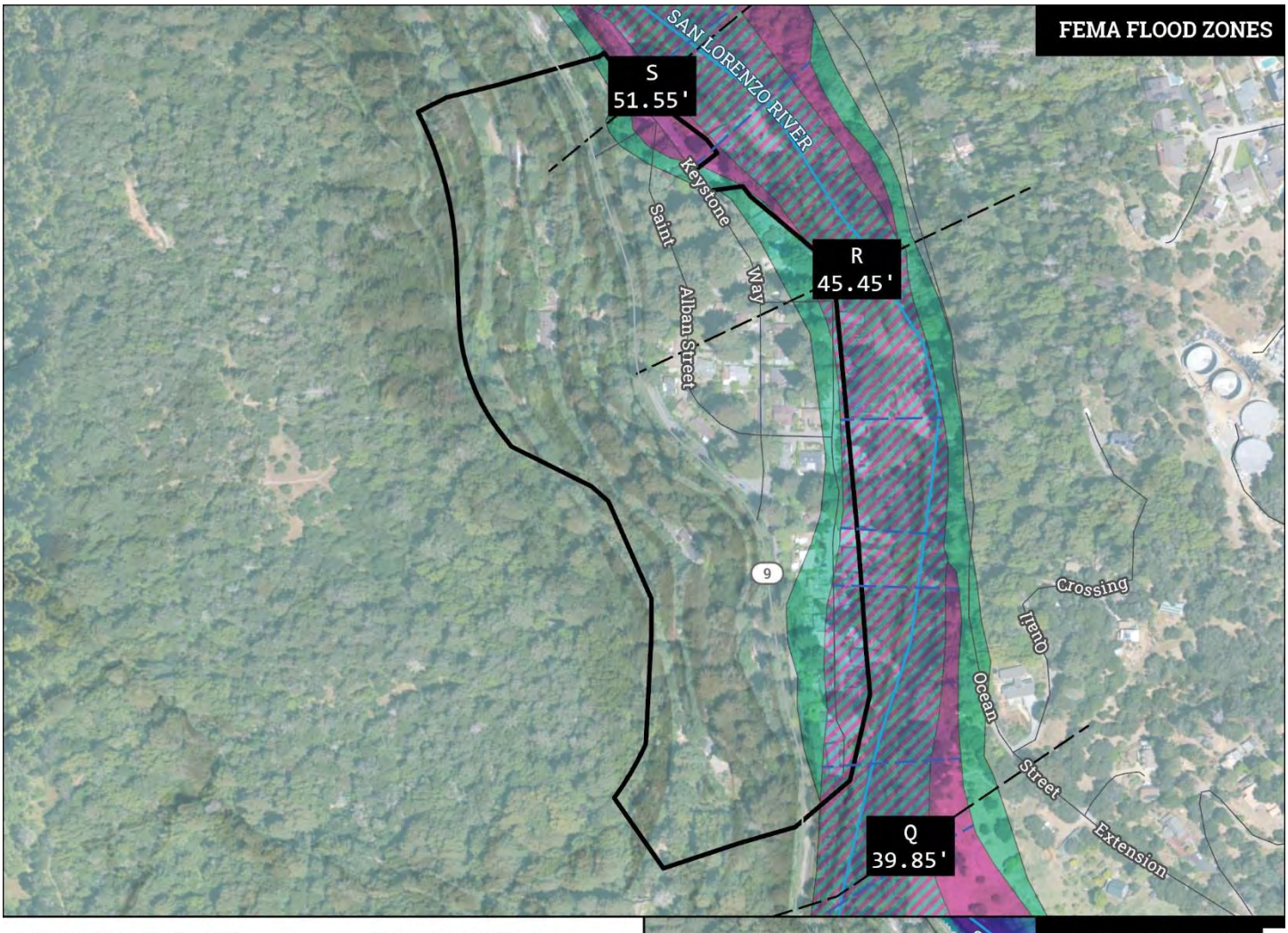
The Paradise Park Lower RLA lies in a large meander loop of the San Lorenzo River, southwest of Highway 9 (Figure 3-20). The community's location within the mapped floodway exposes it to high-flow velocities and deep inundation during major winter storms. Flooding is most frequent between December and February when atmospheric river events drive rapid river rises, with limited overbank storage to slow flows.

Historic events have caused water to overtop banks and flood multiple homes, along with Paradise Park's community facilities. FEMA SFHA mapping shows much of the RLA in the regulatory floodway, with modeled depths exceeding four feet in the 1% annual chance event. The narrow channel and tight meander bend also concentrate hydraulic forces, increasing erosion risk along outer banks. Past mitigation actions in Paradise Park include:

- Elevating key community buildings, such as the clubhouse and maintenance facilities.
- Drainage improvements to reduce ponding in interior streets.
- Ongoing coordination between the Paradise Park Masonic Club and Santa Cruz County for emergency evacuation planning.

Due to its location in the floodway, structural flood control measures are limited by regulatory and environmental constraints. The 2021 HMP and the county's Climate Adaptation and Vulnerability Assessment recommend focusing on non-structural measures, including emergency planning, early and warning system. Future recommendations for the Paradise Park Lower RLA include:

- Coordinating with the Paradise Park HOA to explore feasible property-level mitigation strategies given height limitations that complicate compliance with elevation requirements.

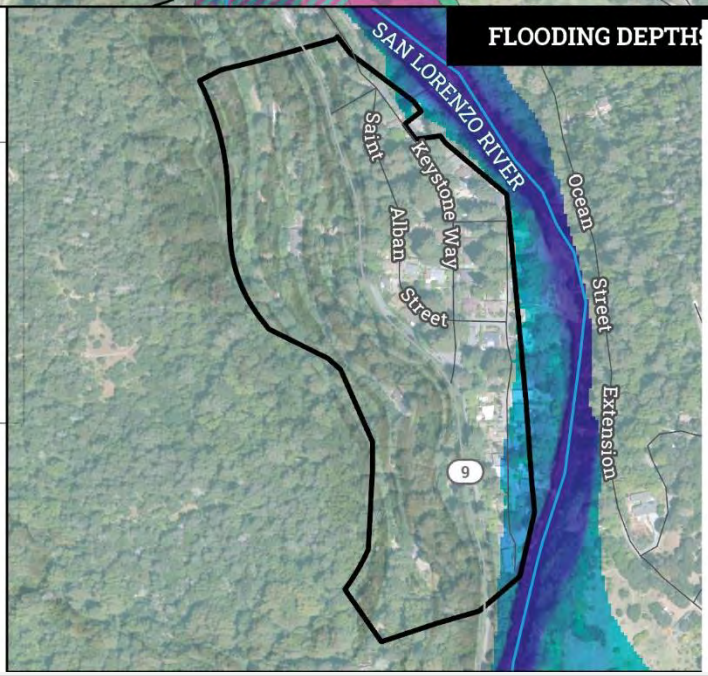


FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′
0′



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
7	26	$872,461	$38,485

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
89	0.4′	6.0′

REPETITIVE LOSS AREA (RLA)

PARADISE PARK LOWER

Figure 3-20: Paradise Park Lower Repetitive Loss (RL) Area

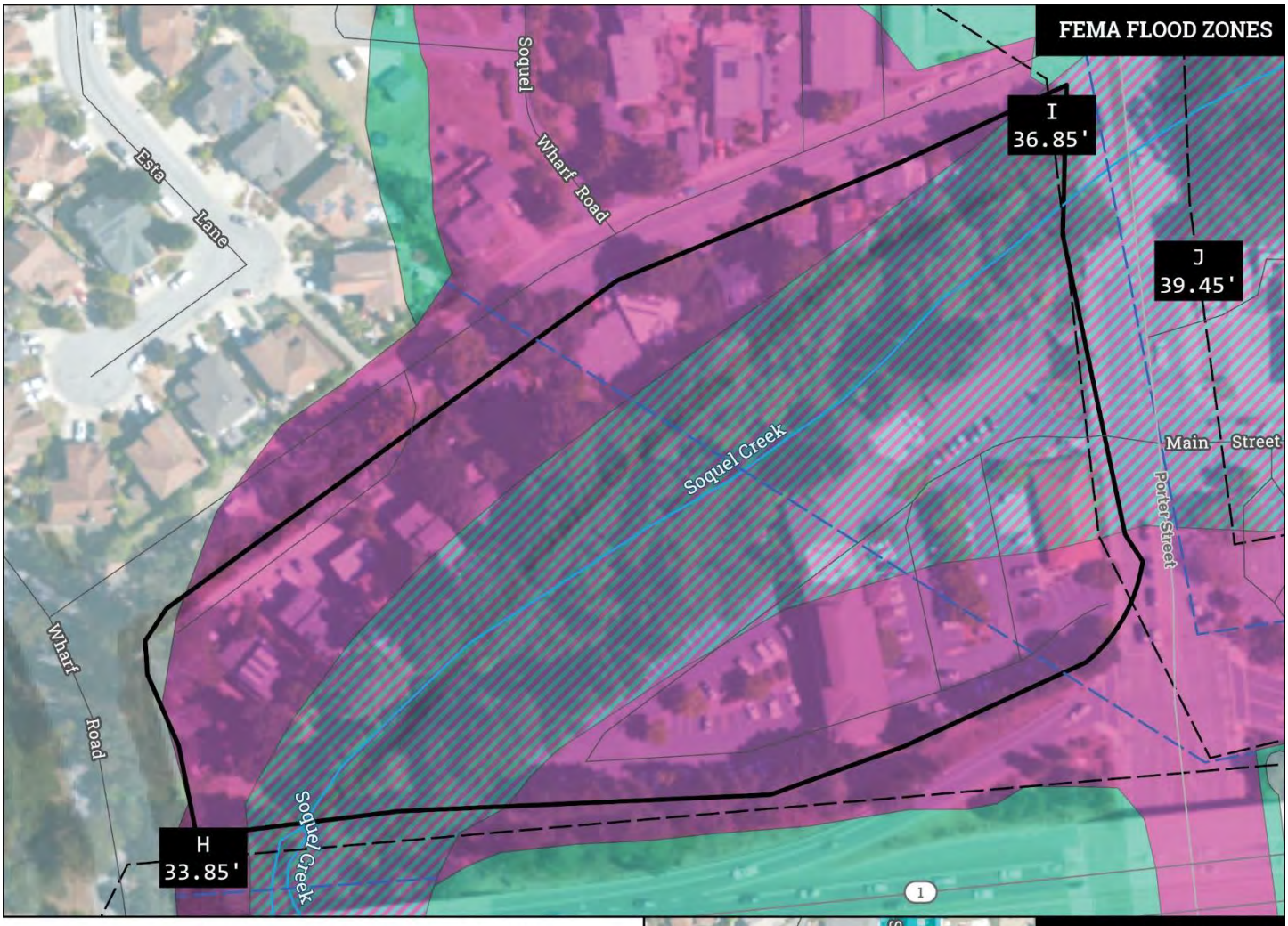
Soquel

The Soquel RLA encompasses properties adjacent to Soquel Creek, a dynamic coastal stream with a history of overtopping its banks during extended winter storm events (Figure 3-21). Flooding risk in this reach is heightened when heavy rainfall coincides with high tide conditions in Monterey Bay, which can slow downstream outflow and back water into developed areas. The narrow floodplain through Soquel Village and downstream neighborhoods constrains floodwaters, while sediment deposition in the lower channel further reduces conveyance capacity.

Historically, Soquel Creek has experienced damaging flood events linked to atmospheric river storms, which deliver intense rainfall over the steep upper watershed. These storms can mobilize large quantities of sediment and debris, contributing to localized blockages at bridges and culverts. Notable flood impacts have included inundation of commercial properties in Soquel Village and residential structures along downstream reaches.

Mitigation actions in the Soquel RLA have included sediment removal and targeted bank stabilization projects undertaken through the Santa Cruz County Flood Control and Water Conservation District (FCWD), Zone 5. The Zone 5 Master Plan also identifies the need for channel capacity improvements in the lower reaches, particularly between State Route 1 and the creek's mouth, and has called for continued maintenance of tide gates and outfall structures to reduce backwater flooding. Several property owners have pursued NFIP-funded elevation projects and implemented floodproofing measures for utilities and ground floors. Future recommendations for the Soquel RLA include:

- Advancing feasibility studies for downstream channel widening or benching to improve flood conveyance while preserving habitat.
- Increasing maintenance of sediment-prone reaches upstream of key bridges.
- Continuing seasonal inspections and repairs to tide gates to maintain full functionality during storm events.



FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'

0'

REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
3	11	$85,112	$7,564

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
15	11.4′	21.8′

REPETITIVE LOSS AREA (RLA)

SOQUEL

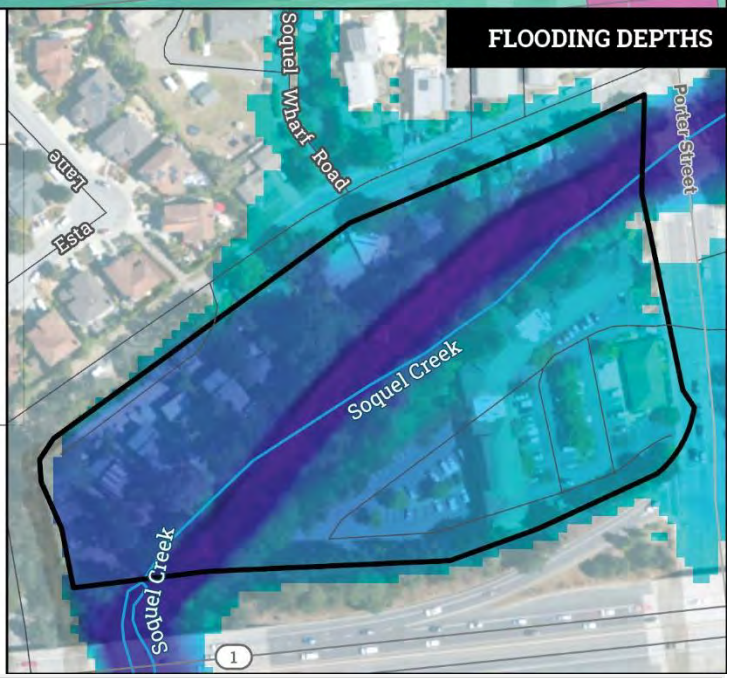


Figure 3-21: Soquel Repetitive Loss (RL) Area

Pot Belly

The Pot Belly RLA is situated along the Monterey Bay shoreline near New Brighton State Beach on Pot Belly Beach Road (Figure 3-22). This area is subject to coastal flooding driven by wave run-up, storm surge, and high tides, particularly during winter atmospheric river events. Long-period swells and storm-driven waves can overtop the beach berm, sending water inland toward properties and infrastructure. The area's low elevation relative to ocean water levels increases susceptibility to flooding during king tides, especially when combined with storm conditions.

Historical flood impacts here have primarily occurred during severe Pacific storms when elevated water levels and energetic surf coincide. Coastal erosion is an ongoing hazard, gradually reducing the natural protective capacity of the beach and dune system. Shoreline retreat can expose infrastructure to direct wave attack, further increasing the frequency of flood-related losses.

Mitigation actions have included rebuilding and improvement of rip rap revetments and home elevation. . Some property owners have constructed private seawalls or elevated ground-floor living areas to meet or exceed projected water elevations of the 1% annual chance flood. The 2021 HMP also notes the importance of continued monitoring of shoreline change rates to anticipate and adapt to erosion-related flood risk. Future recommendations for the Pot Belly RLA include:

- Evaluating feasibility of dune restoration or hybrid nature-based coastal defenses to supplement hard infrastructure.
- Re-stacking the recovered rip rap on the revetment;
- Monitoring and updating flood hazard mapping to incorporate sea-level rise projections.
- Technical assistance and information



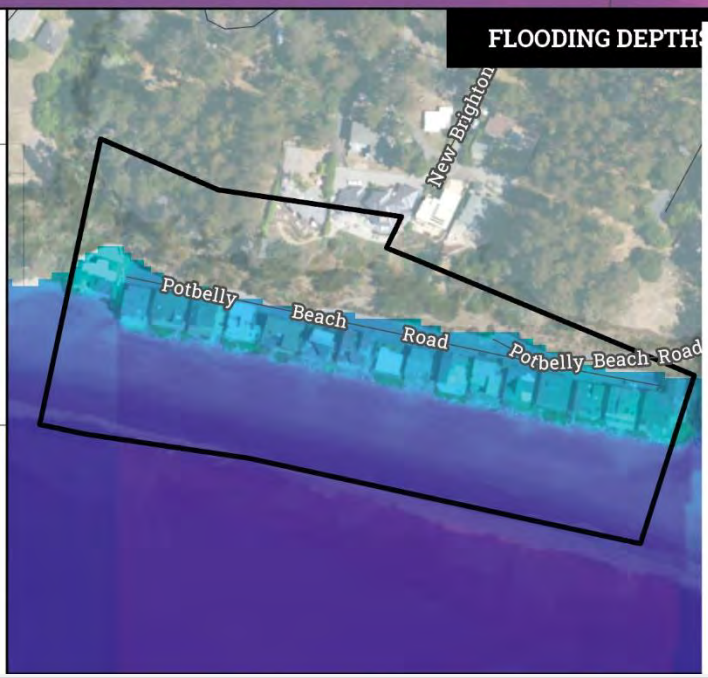
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′

0′



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
3	7	$34,921	$5,064

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
17	12.7′	14.1′

REPETITIVE LOSS AREA (RLA)

POT BELLY

Figure 3-22: Pot Belly Repetitive Loss (RL) Area

Las Olas Drive

The Las Olas Drive RLA extends along the bluff-backed shoreline near Seacliff State Beach, an area highly exposed to direct Pacific Ocean wave attack, storm surge, and coastal erosion (Figure 3-23). During major winter storms, particularly atmospheric river events coinciding with king tides, wave run-up and overtopping can rapidly flood the narrow strip of development situated directly landward of the shoreline. Flooding in this RLA is often accompanied by erosion damage to seawalls, bluff faces, and adjacent infrastructure.

Historical flood impacts have been driven by high-energy wave events during El Niño winters and strong coastal storms, which elevate water levels and reduce the protective function of the beach berm. The bluffs provide some protection from wave energy; however, where development is sited at lower elevations or adjacent to creek mouths, floodwaters can directly impact ground floors and utilities.

Mitigation measures implemented to date include construction and reinforcement of seawalls and riprap armoring along vulnerable reaches. The county and State Parks have also explored beach nourishment as a supplementary measure, though funding and permitting challenges have limited large-scale implementation. Private property owners have elevated utilities and applied wave-impact-resistant materials to ground-floor levels. Future recommendations for the Las Olas Drive RLA include:

- Coordinating with the California Coastal Commission on hybrid natural–structural coastal protection strategies.
- Evaluating long-term retreat or elevation strategies for the most at-risk parcels, incorporating projected sea level rise impacts.
- Providing technical guidance and outreach to homeowners on how to elevate existing structures in coastal and flood-prone areas, in alignment with FEMA best practices and in coordination with local permitting requirements.



FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′

0′

REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
3	7	$46,980	$7,429

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
31	5.4′	9.8′

REPETITIVE LOSS AREA (RLA)

LAS OLAS DRIVE

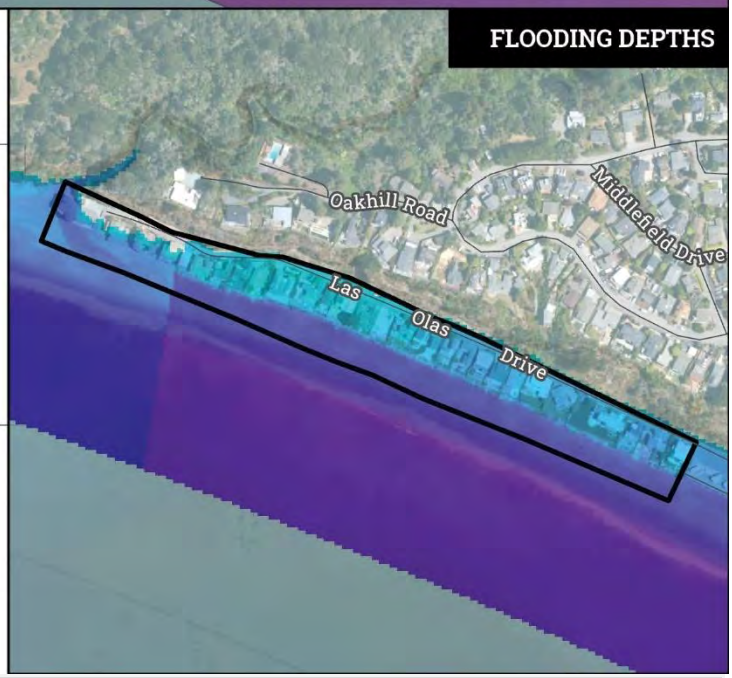


Figure 3-23: Las Olas Drive Repetitive Loss (RL) Area

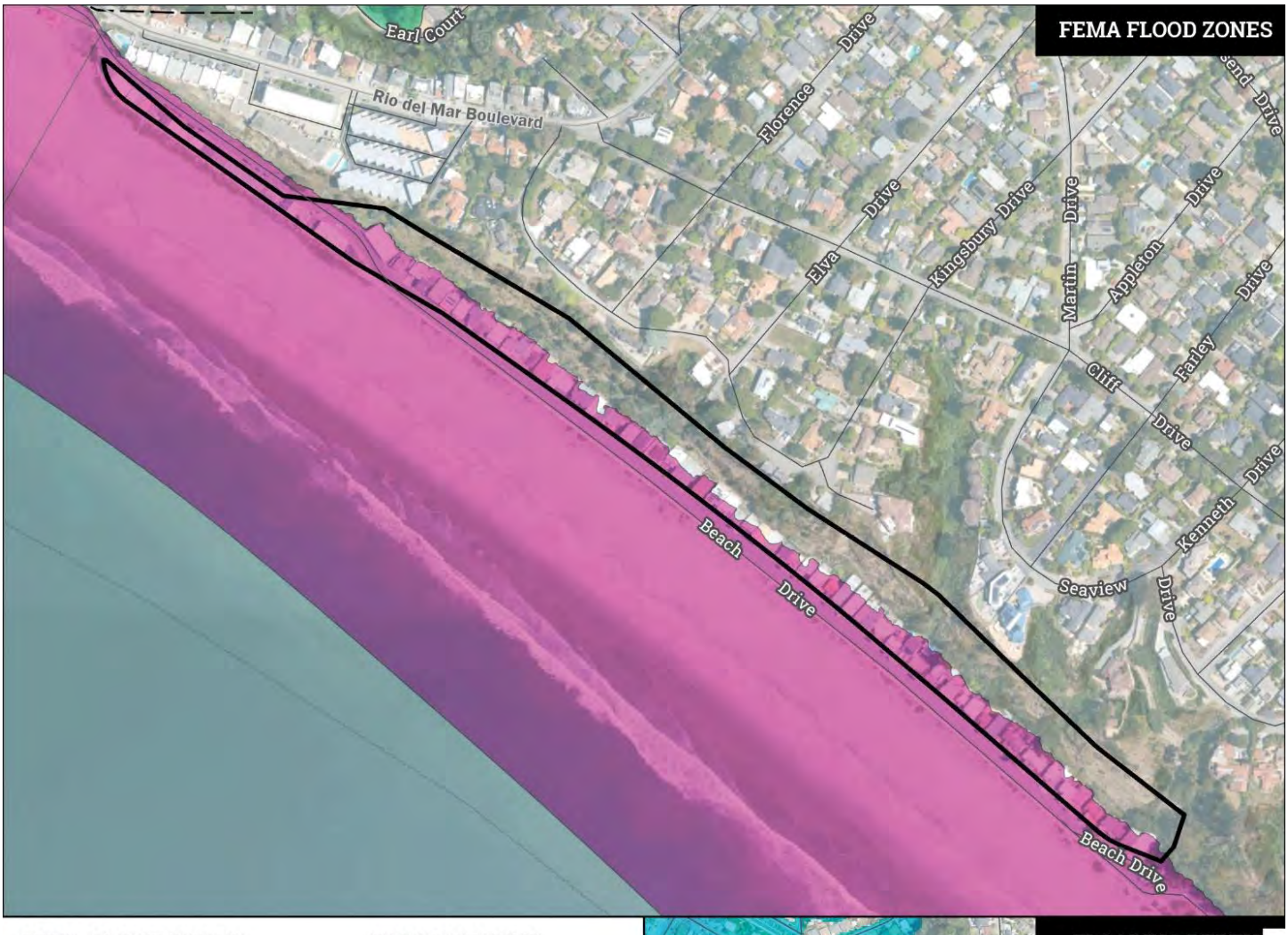
Beach Drive Upper

The Beach Drive Upper RLA is located along the narrow oceanfront in Rio Del Mar, directly exposed to Pacific Ocean wave attack, storm surge, and coastal erosion (Figure 3-24). During major winter storms—particularly atmospheric river events coinciding with king tides—wave run-up and overtopping can inundate properties situated directly behind the seawall. Flooding in this RLA is typically rapid-onset, with waves breaking against structures, leading to saltwater intrusion, erosion of foundations, and damage to utilities and lower floors.

Historical flood impacts have been driven by high-energy swell events during El Niño winters and strong coastal storms, which combine elevated water levels with reduced beach berm protection. Long-term shoreline erosion has gradually diminished the berm's buffering capacity, increasing vulnerability to overtopping and flood damage.

Mitigation measures implemented to date include seasonal placement of temporary sand berms and reinforcement of existing seawall structures prior to winter storms. Several property owners have elevated utilities, reinforced ground floors with wave-impact-resistant materials, and installed removable storm barriers. Future recommendations for the Beach Drive Upper RLA include:

- Pursuing coordinated beach nourishment and sediment management to rebuild the berm and maintain a buffer against wave energy.
- Evaluating the feasibility of increasing seawall height or incorporating hybrid natural–structural solutions.
- Providing technical guidance and outreach to homeowners on how to elevate existing structures in coastal and flood-prone areas, in alignment with FEMA best practices and in coordination with local permitting requirements.



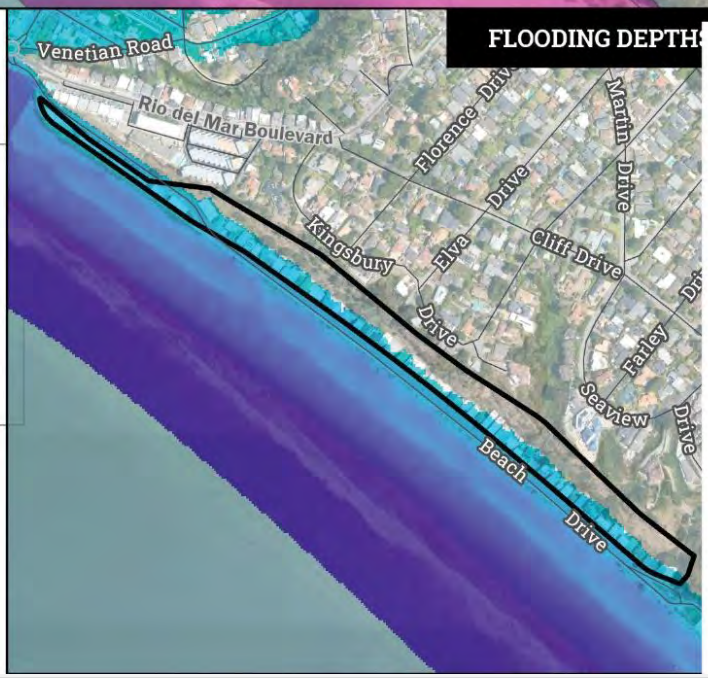
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′

0′



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
12	25	$248,932	$9,818

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
94	1.1′	3.9′

REPETITIVE LOSS AREA (RLA)

BEACH DRIVE UPPER

Figure 3-24: Beach Drive Upper Repetitive Loss (RL) Area

Beach Drive Lower

The Beach Drive Lower RLA is located along the southern segment of Rio Del Mar's narrow beachfront, immediately landward of the Pacific Ocean and within the direct wave impact zone (Figure 3-25). The area is highly vulnerable to flooding from wave run-up, storm surge, and coastal erosion during intense winter storms, particularly when atmospheric river systems coincide with king tides. Due to its orientation and exposure, overtopping waves can rapidly inundate residences, leading to structural damage, saltwater corrosion, and erosion of the beach berm.

Historical flooding in this RLA has been linked to El Niño winters and high-energy Pacific swell events, which generate elevated water levels and powerful waves capable of breaching seasonal berms and overtopping seawalls. Long-term shoreline retreat has further reduced natural flood protection.

Mitigation measures undertaken include seasonal construction of temporary sand berms, maintenance and reinforcement of existing seawalls, and installation of removable flood barriers at property entrances. Some homeowners have elevated utilities and reinforced lower levels with wave-resistant materials. Future recommendations for the Beach Drive Lower RLA include:

- Providing technical guidance and outreach to homeowners on how to elevate existing structures in coastal and flood-prone areas, in alignment with FEMA best practices and in coordination with local permitting requirements.
- Evaluation of seawall height increases or incorporation of hybrid natural–structural coastal defenses.
- Development of a long-term adaptation strategy considering projected sea level rise and increased storm frequency.



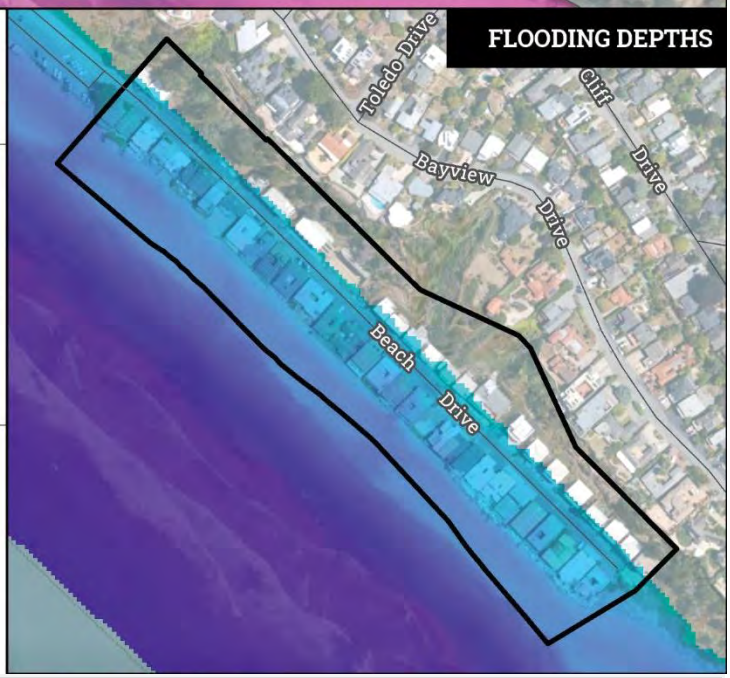
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′

0′



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
10	39	$1,516,214	$37,154

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
50	3.5′	8.7′

REPETITIVE LOSS AREA (RLA)

BEACH DRIVE LOWER

Figure 3-25: Beach Drive Lower Repetitive Loss (RL) Area

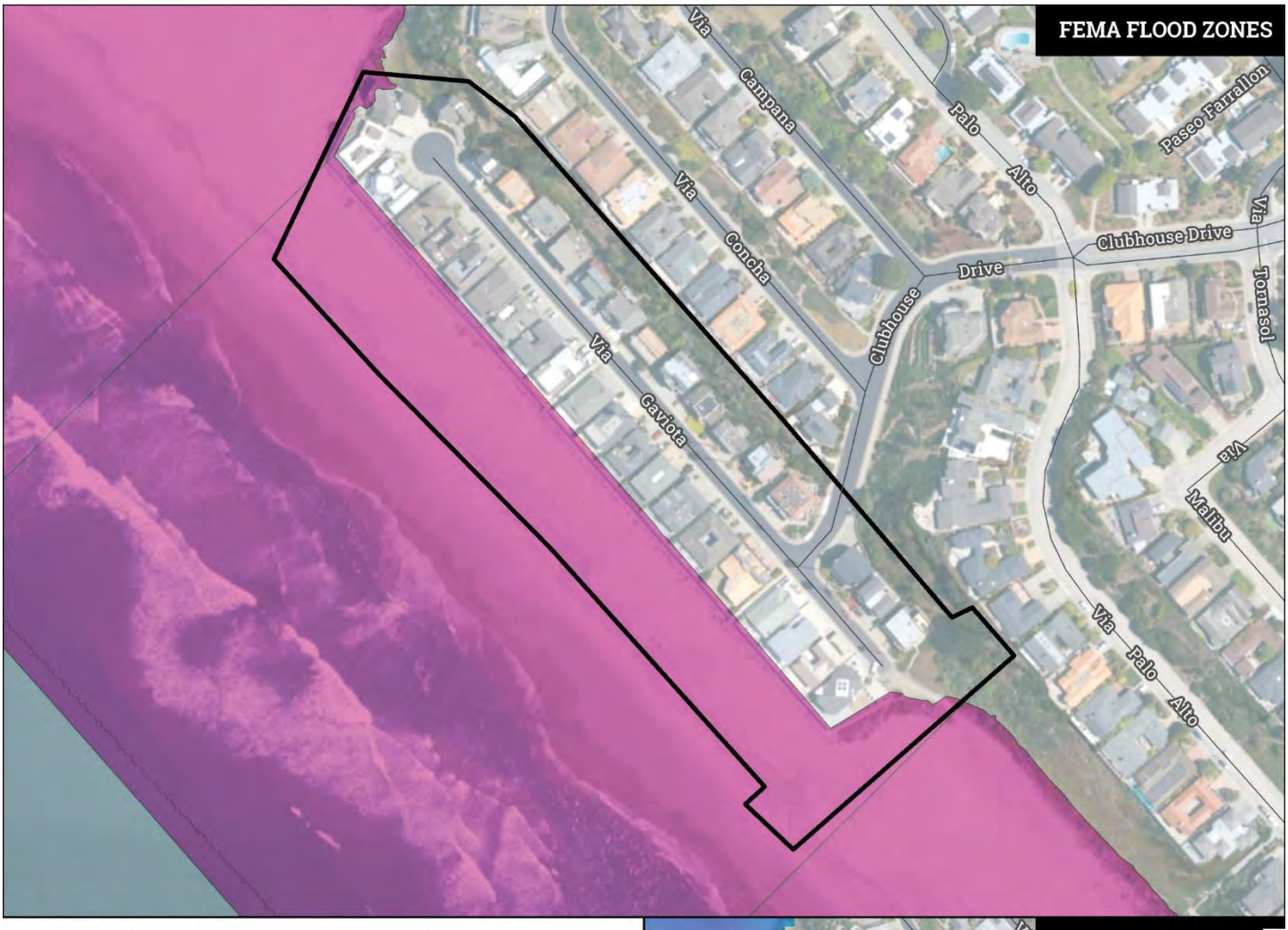
Via Gaviota

The Via Gaviota Repetitive Loss Area encompasses a narrow stretch of beachfront development in Rio Del Mar, directly fronting the Pacific Ocean and subject to high-energy wave action, storm surge, and coastal erosion (Figure 3-26). Due to the street's immediate proximity to the shoreline, wave overtopping during major winter storms, especially atmospheric river events coinciding with king tides, can result in rapid flooding of residences and public access ways.

Historic flood events in this RLA have been tied to El Niño winters and large Pacific swell episodes that elevate water levels, drive wave run-up beyond the natural berm, and cause structural damage to seawalls and private property. Erosion trends have incrementally reduced the width and height of the beach berm, increasing exposure to direct wave impact.

Mitigation measures implemented to date include seasonal sand berm construction, reinforcement of seawall segments, and installation of removable flood panels at building entrances. Several homeowners have elevated utilities and reinforced lower-level walls with impact-resistant materials. Future recommendations for the Via Gaviota RLA include:

- Providing technical guidance and outreach to homeowners on how to elevate existing structures in coastal and flood-prone areas, in alignment with FEMA best practices and in coordination with local permitting requirements.
- Exploration of hybrid coastal defense strategies, combining engineered armoring with dune or berm restoration.
- Development of a long-term adaptation framework incorporating projected sea level rise and potential relocation or elevation of the most vulnerable structures.



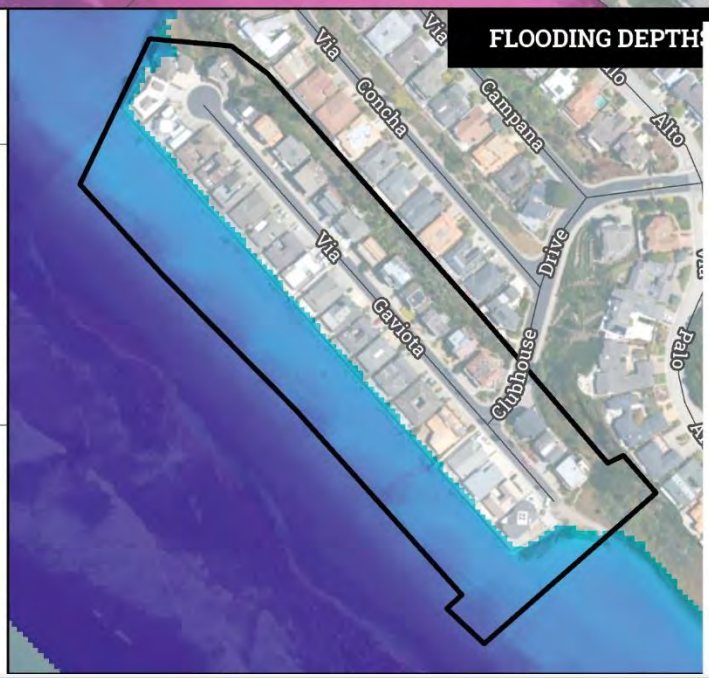
FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87′

0′



REPETITIVE LOSS STATISTICS WITHIN RLA

PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
5	11	$290,447	$27,098

PARCEL COUNT AND EXPECTED FLOOD DEPTHS

FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
37	-′	-′

REPETITIVE LOSS AREA (RLA)

VIA GAVIOTA

Figure 3-26: Via Gaviota Repetitive Loss Area

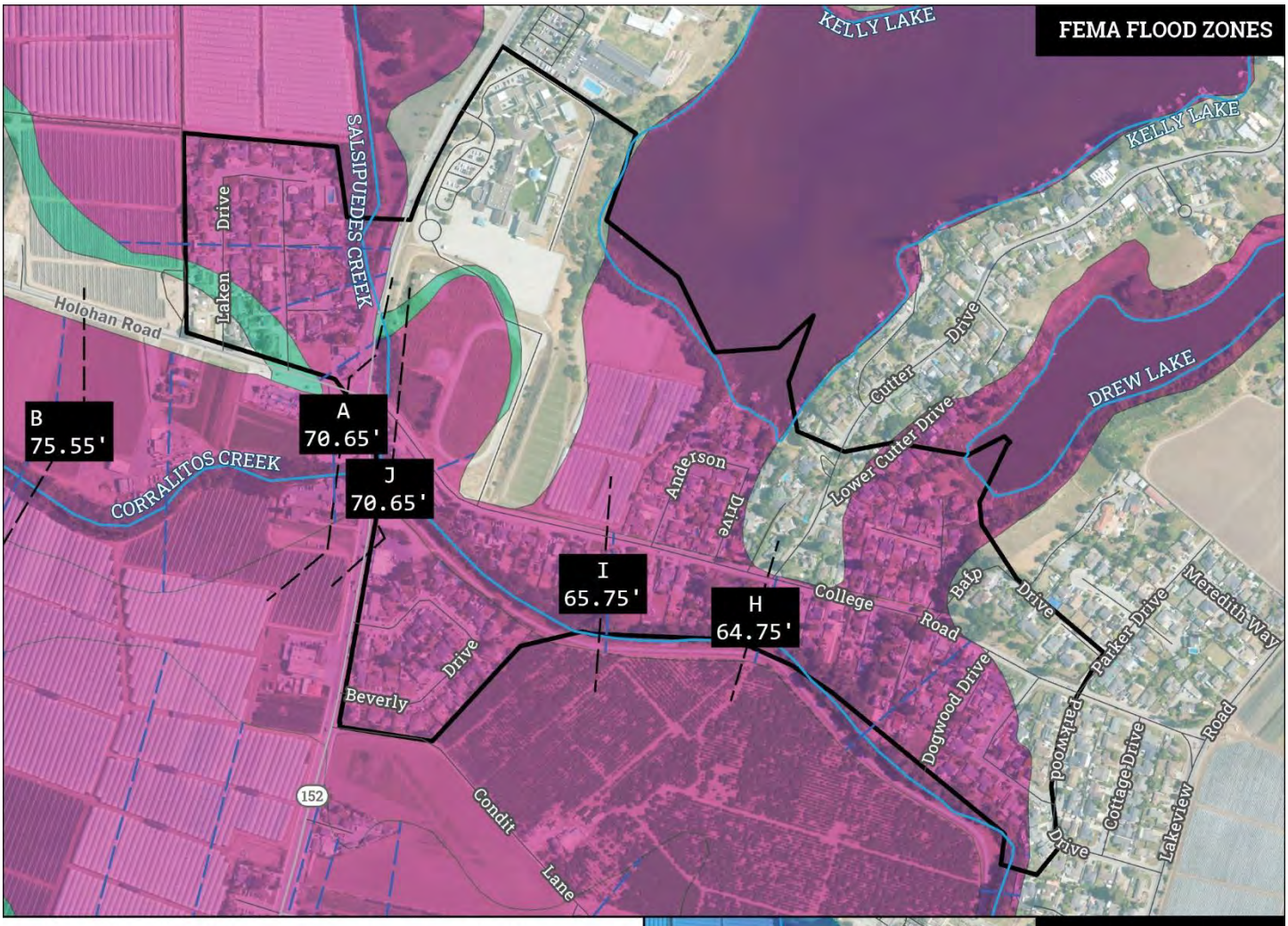
Interlaken

The Interlaken RLA is located near the confluence of the Salsipuedes Creek and Corralitos Creek tributaries to the Pajaro River near College Lake, Kelley Lake, and Drew Lake. Residential properties in this area are currently not protected by levees, which do not exist along Corralitos Creek or the eastern reach of Salsipuedes Creek. These areas flood from a combination of overtopping of Corralitos Creek northwards across Holohan Road as well as flooding influences from these lakes and stormwater capacity issues (Figure 3-27). The surrounding watershed drains toward the lake, and prolonged rainfall, especially during atmospheric river events, can raise lake levels enough to overtop banks or overwhelm local drainage systems. Backwater effects from saturated soils and limited outlet capacity further increase flood durations.

Historical flood impacts have included inundation of ground floors, septic system failures, and damage to multiple structures and outbuildings. The area's relatively shallow groundwater table exacerbates flooding during wet winters, as soils quickly reach saturation.

Mitigation measures implemented to date include targeted ditch regrading to improve surface runoff, localized pump installations, and elevation of select utilities above historic high-water marks. The county, in coordination with Zone 7 Flood Control and Water Conservation District (FCWD) (now PRFMA), has assessed outlet control improvements to better regulate lake levels during high inflow periods, though no major structural projects have been completed. Future recommendations for the Lake View RLA include:

- Conducting a detailed hydrologic and hydraulic study to assess lake outlet improvements and stormwater detention options.
- Expanding participation in FEMA hazard mitigation programs through outreach efforts.
- Providing technical guidance and outreach to homeowners on how to elevate or flood proof structures in in alignment with FEMA best practices and in coordination with local permitting requirements.
- Coordinating with regional partners to improve watershed-scale runoff management upstream of Pinto Lake.

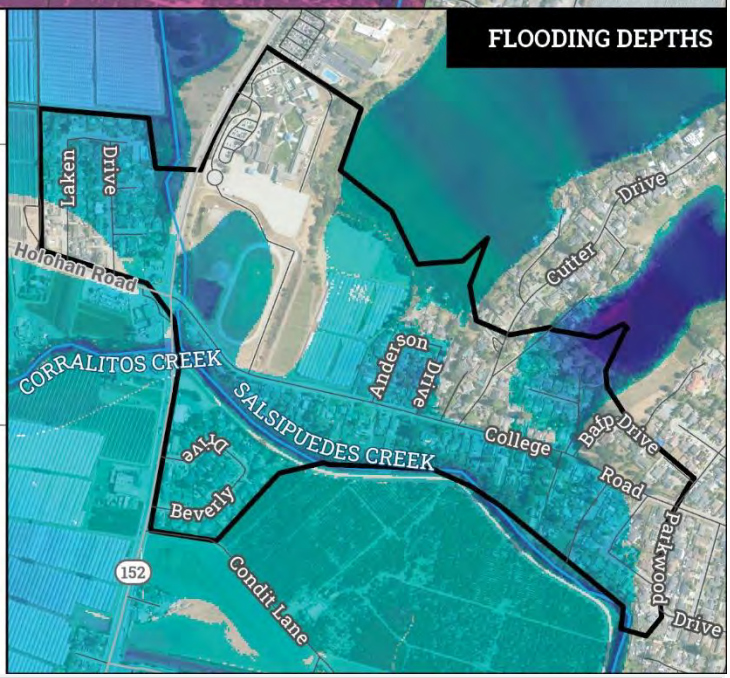


FEMA FLOOD ZONES

- 100-Year
- Floodway
- 500-Year
- Cross Section
  Base Flood Elevation Labeled

FLOOD DEPTHS

87'
0'



REPETITIVE LOSS STATISTICS WITHIN RLA
PROPERTIES EXPERIENCING REPETITIVE LOSS

PROPERTIES W/ LOSSES	TOTAL LOSSES IN RLA	TOTAL CLAIMS PAYMENTS	AVERAGE CLAIM PAYMENT
15	34	$1,325,950	$38,186

PARCEL COUNT AND EXPECTED FLOOD DEPTHS
FLOODING DEPTH BASED ON FEMA FLOOD ZONES

PARCEL COUNT IN RLA	AVERAGE FLOODING DEPTH	MAXIMUM FLOODING DEPTH
234	1.9'	10.0'

REPETITIVE LOSS AREA (RLA)

INTERLAKEN

Figure 3-27: Lake View Repetitive Loss (RL) Area

3.2.2.7 Frequency & Probability of Future Occurrences

Flood frequency terms like "100-year flood" can be misleading, giving the false impression that such events happen only once a century. When we talk about the "1% annual chance" flood—often called the 100-year flood—it does not mean flooding happens only once every hundred years. Instead, it means that in any given year, there's a one in 100 (or 1%) chance that such a flood will occur. Over the course of a 30-year mortgage, that works out to roughly a 26% chance, higher than the odds of experiencing a major house fire. And just like lightning, it can strike more than once in quick succession; two or more "100-year" floods can happen in back-to-back years.

Even properties outside FEMA's mapped 1% annual chance flood zones are not immune; localized flooding can occur when intense rainfall, debris blockages, or wave-driven surge overwhelm drainage systems or overtop natural barriers. This is why understanding flood probability is important for residents, planners, and decision-makers. In Santa Cruz County, steep mountain watersheds, short and flashy river systems, and exposure to Pacific storms mean that damaging floods can occur more often than these averages suggest.

Table 3-17 below shows how flood probabilities are expressed, what they mean over a 30-year period, and how they can be understood in plain language.

Table 3-17: Flood Probability Annually and Over 30-Year Period

Annual Chance	Common Name	30-Year Chance of Occurrence	Example
0.2%	500-YR Flood	**6%**	Like rolling a 100-sided die each year for 30 years, you have about a 1-in-16 chance of getting a "flood" roll.
1%	100-YR Flood	**26%**	Each year over a 30-year period, you have about a 1-in-4 chance of a flood roll.
2%	50-YR Flood	**45%**	Nearly even odds for each yearly die roll over the span of 30 years.
10%	10-YR Flood	**96%**	Almost certain to get a flood roll at least once, if not multiple times, in 30 years.
50%	2-YR Flood	**100%**	Expected to get a flood roll many times during a 30-year period.

In Santa Cruz County, flooding can and does happen annually, especially during the winter storm season (November through March) when atmospheric rivers bring intense, sustained rain. Steep mountain watersheds, like those feeding the San Lorenzo River, Soquel Creek, and Corralitos Creek, can funnel rainfall into narrow channels, producing fast-moving, debris-laden floods. Coastal areas such as Seacliff, Beach Drive, and Via Gaviota face additional threats from wave overtopping during high tides and winter storms. Some locations, such as New Brighton, experience a mix of both river and coastal flooding, making them especially vulnerable.

While FEMA's SFHA maps outline where 1% annual chance flooding is most likely, real-world storms do not always follow these boundaries. In recent years, atmospheric rivers have caused damaging floods outside mapped floodplains, often triggered by culverts clogged with debris, eroding streambanks, or temporary storm surge effects. Combined with projected sea level rise, this means flooding in Santa Cruz County could become more frequent and more severe, even in places that have not historically flooded.

3.2.2.8 Severity

The severity of a flood event in Santa Cruz County depends on a combination of water depth, flow velocity, and the amount of debris carried by the water. While deep flooding can submerge structures and infrastructure, even relatively shallow flows can cause severe damage if the water is moving quickly. High-velocity flows have greater force and can erode foundations, undermine roads, and carry large debris such as trees or boulders, amplifying impacts.

This is particularly relevant in Santa Cruz County's steep mountain watersheds—such as the upper San Lorenzo River, Soquel Creek, and Corralitos Creek—where intense rainfall from atmospheric rivers can quickly generate swift-moving floods. In broader valley areas, slower but deeper inundation can still result in substantial property damage, crop loss, and long-term disruption to communities.

Coastal flooding adds another layer of hazard. Wave run-up and overtopping during winter storms can produce floodwaters with strong currents, especially where waves breach dunes or seawalls. In places like Beach Drive, Via Gaviota, and Seacliff, this combination of depth and velocity often causes structural damage to buildings, roadways, and utilities.

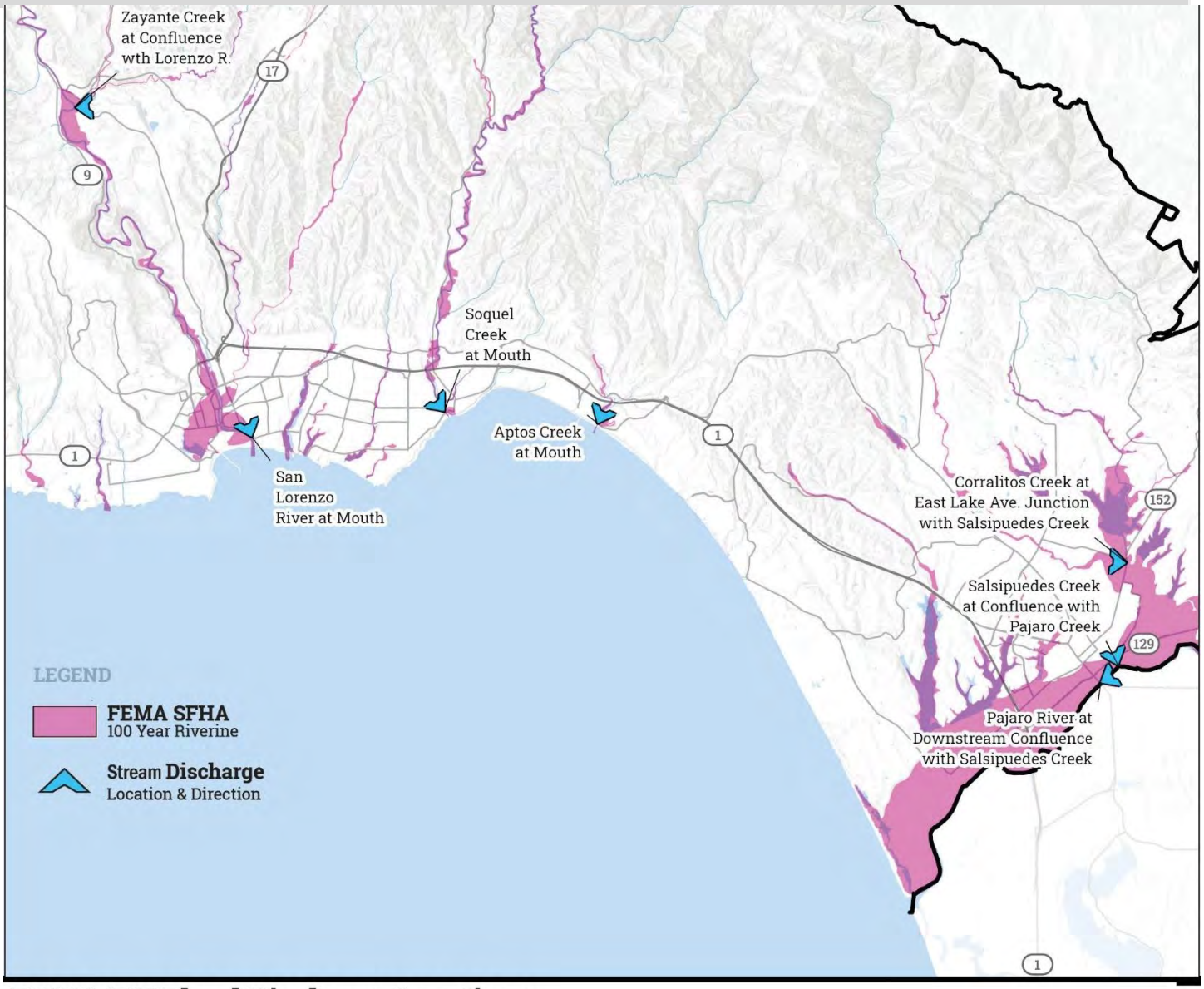
FEMA's Flood Insurance Study (FIS) for Santa Cruz County provides modeled water surface elevations and flow velocities for the 1% annual chance flood event. These models help estimate the likely severity of flooding in mapped SFHAs and are used for both regulatory purposes and mitigation planning. Table 3-18 lists the modeled peak discharges in cubic feet per second (cfs) for key Santa Cruz County streams and rivers, which represent the flow rates used in FEMA's mapping of the SFHAs. Figure 3-28 provides stream river locations identified in the table.

Table 3-18: Santa Cruz County Modeled Peak Discharges for 1% Annual Chance Flood

			Peak Discharge (CFS)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Source	Location	Drainage Area (Square Miles)	10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
Pajaro River	*Downstream confluence with Salsipuedes Creek*	1275.0	14,250	32,500	43,600	76,200
San Lorenzo River	*At mouth*	136.0	23,700	42,300	50,600	70,100
Salsipuedes Creek	*At confluence with Pajaro Creek*	46.0	2,000	4,500	5,950	12,500
Soquel Creek	*At mouth*	42.8	8,310	14,700	17,500	24,300

			Peak Discharge (CFS)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Source	Location	Drainage Area (Square Miles)	10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
Zayante Creek	*At confluence with San Lorenzo River*	26.2	6,250	10,100	11,800	15,600
Aptos Creek	*At mouth*	24.5	3,110	6,550	8,280	12,700
Corralitos Creek	*East Lake Ave junction w Salsipuedes Creek*	24.2	3,300	6,640	7,930	11,730

Source: FEMA 2016 Flood Insurance Study (FIS) for Santa Cruz County, CA (06087CV001C)



FEMA FIS Flood Discharge Locations

Source: FEMA, Santa Cruz County

Figure 3-28: Santa Cruz County Waterway Discharge Locations

3.2.2.9 Warning Time

In Santa Cruz County, the speed at which flooding develops depends on both geography and flood source. In inland mountain watersheds, such as the upper San Lorenzo River and its tributaries, steep slopes and small drainage basins mean that heavy rainfall can cause rapid rises in water levels, sometimes within just a few hours. This "flashier" response contrasts with larger watersheds, such as the Corralitos Watershed, where drainage areas are broader and flood peaks may take longer to develop. The flashier systems leave little time for protective actions, making close coordination with real-time gage data and weather alerts critical.

In contrast, coastal flooding from wave overtopping, storm surge, and king tide events generally develops over longer periods, often allowing for one or more days of warning. However, storm timing, wind direction, and wave height can change quickly, reducing available lead time for vulnerable communities like Seacliff, Beach Drive, and Via Gaviota.

The county integrates multiple data sources for flood warning, including:

- **Rainfall and Stream Gauges:** Real-time rainfall and stream gauges operated by county Public Works, USGS, and NWS, including sites on the San Lorenzo River, Scott Creek, and the Pajaro River.
- **Weather Radar:** The county now operates a high-resolution X-band radar in Live Oak, supplementing the regional NWS Doppler radar at Mount Umunhum. This system provides near real-time rainfall intensity updates, improving detection of localized heavy rain and filling gaps in low-elevation coverage.
- **Forecast Modeling:** The California–Nevada River Forecast Center (CNRFC) provides projected riverine flood stages for the county.
- **Tide and Surf Advisories:** The NWS Monterey Office issues advisories for high surf, king tides, and storm surge along the county's coastline.

This integrated network supports both rapid warnings for flashier inland floods and multi-day outlooks for coastal hazards, enabling emergency managers to better position resources and issue timely alerts.

Flood Awareness Tools & Dashboards

Santa Cruz County maintains several online platforms that provide emergency managers, residents, businesses, and visitors with timely, actionable information about flood hazards. These systems are intended to complement official alerts, offering both real-time monitoring and situational awareness before, during, and after storm events. Together, they improve the community's ability to anticipate changing conditions, prepare appropriately, and respond effectively.

OneRain System

The county operates a real-time rainfall and stream gauge platform powered by OneRain, available at santacruz.onerain.com. This system integrates data from ground sensors such as rain gauges and river-stage monitors with other weather feeds to display current and historical rainfall totals, stream levels, and modeled flood conditions. Users can view data over various time intervals, such as 15-minute, hourly, daily, or weekly trends, to better understand storm intensity and watershed response. During heavy rain or flash flood situations, the platform supports faster recognition of rising water levels and more informed decision-making on road closures, evacuations, and other protective actions.

Situational Awareness for Emergency Response (S.A.F.E.R.)

Santa Cruz County's Situational Awareness for Emergency Response (S.A.F.E.R.) platform is an ArcGIS-based online tool that consolidates hazard and response information into a single location for public and emergency management use. While S.A.F.E.R. covers multiple hazards, flood awareness is a central feature. In its flood maps section, users can view FEMA-designated flood zones, identify areas susceptible to stormwater flooding, and locate sandbag distribution sites. This section also links to tsunami hazard maps for coastal communities. By combining mapped hazard data with real-time information on weather, transportation, and other incidents, S.A.F.E.R. allows residents to quickly assess their risk and take early action. In a county where both riverine and coastal flooding can develop rapidly, this platform's accessibility is an important tool for maintaining public readiness.

CruzAware Notification System

CruzAware is Santa Cruz County's official alert and notification system. It is administered by the County Office of Response, Recovery and Resilience (OR3) and is designed to provide residents and visitors with timely warnings and information during emergencies. Notifications are sent by text message, telephone, or email and address a range of hazards including floods and coastal storms, as well as other public safety threats and evacuation notices.

For flood preparedness, CruzAware serves as a primary tool for delivering warnings before hazardous conditions develop. Depending on the situation, alerts may be issued hours or only minutes in advance. These notifications can include evacuation instructions, shelter locations, sandbag distribution sites, and road closure information. The system is capable of targeting specific neighborhoods or hazard zones so that alerts are relevant to those directly at risk.

The system works in coordination with other county resources, such as the S.A.F.E.R. dashboard and real-time weather monitoring systems, to support comprehensive hazard communication. The county also partners with the NWS to disseminate official watches and warnings, including Flood Watches, Flood Warnings, and Coastal Flood Advisories. NWS alerts are automatically issued through the Wireless Emergency Alerts (WEA) system to mobile devices in affected areas, providing rapid notification without

the need for prior registration. More information about CruzAware, including how to register, is available at santacruzcountyca.gov/CruzAware.

Annual Public Flood Risk Outreach

In addition to real-time alerts, Santa Cruz County conducts annual flood risk notification for property owners and renters in mapped SFHAs. This outreach, coordinated through the county's Floodplain Management Program and NFIP and CRS activities, typically includes:

- Letters or brochures explaining the property's location within the SFHA and the associated flood risk.
- Guidance on purchasing or maintaining flood insurance.
- Information on flood preparedness, evacuation routes, and property protection measures.
- Updates on recent flood events, ongoing mitigation projects, and changes to FEMA flood maps.

The county also leverages its website, social media channels, and community meetings to share seasonal reminders before the winter storm season, emphasizing steps residents can take to prepare.

By combining immediate warning capabilities with recurring risk communication, Santa Cruz County helps ensure that residents are aware of both their long-term vulnerability and any short-term threats from developing storms.

3.2.2.10 Flood Vulnerability Assessment

Santa Cruz County remains at risk from flood impacts despite ongoing efforts to reduce exposure through land use planning, policy measures, and targeted mitigation projects. This section assesses vulnerability by examining the relationship between flood hazards and the county's population, property, and critical facilities and infrastructure.

Population exposure, parcel values, critical facilities, and lifeline infrastructure were evaluated by overlaying the county's asset inventory, discussed in Section 2.2.2, with FEMA SFHAs and DWR BAM awareness zones for 100- to 500-year floodplains (or 1% and 0.2% annual chance flood hazard areas). Figure 3-29 and Figure 3-30 summarize flood exposure county-wide. Detailed results for each vulnerability category are provided in the subsections that follow.

In addition to assessing risk through hazard exposure, damage estimates were also generated for flood, specifically, using a Level 2 HAZUS-MH analysis. This dual approach ensured the assessment captured both mapped hazard exposure and modeled loss potential for the county. The HAZUS analysis integrates GIS-based 100-year flood depth grids from FEMA A zones with BFE. Parcel data described in Section 2.2.2 was imported into HAZUS as User Defined Facilities (UDF), forming the basis for estimating building replacement costs, contents values, and associated losses.

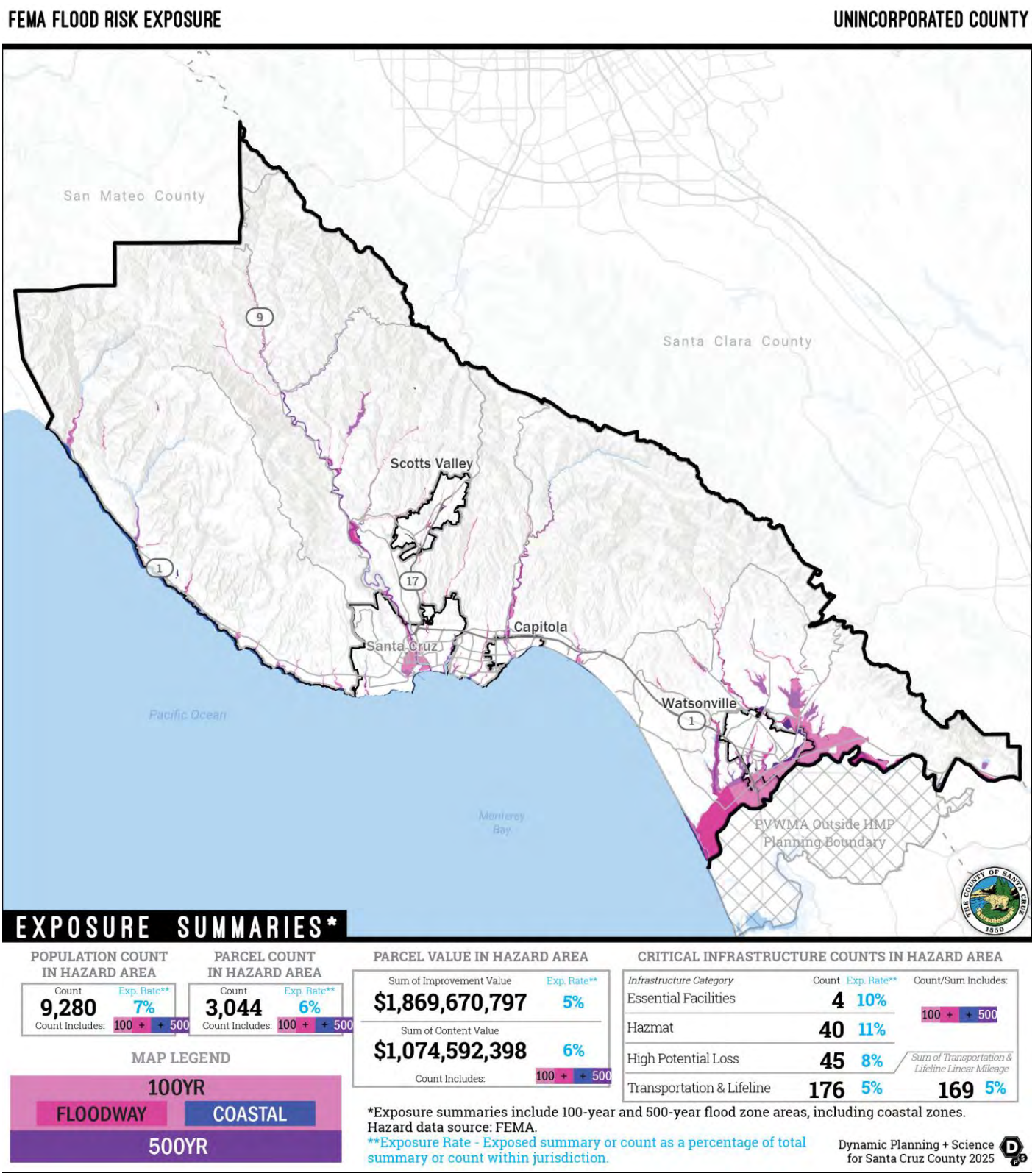


Figure 3-29: Exposure Summary – Santa Cruz County Flood Risk (FEMA Zones)

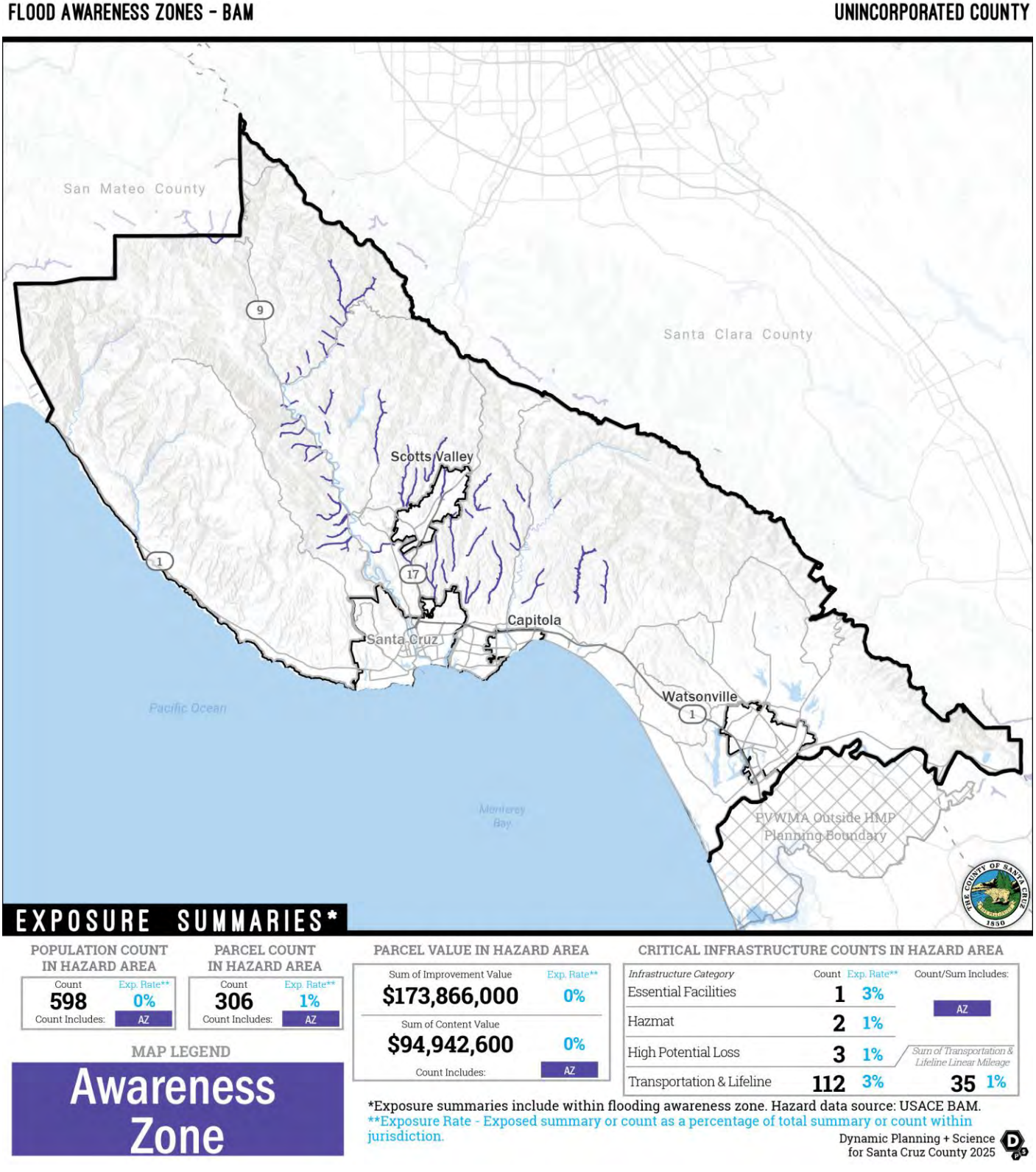


Figure 3-30 Exposure Summary – Santa Cruz County Flood Risk (DWR Awareness Zones)

3.2.2.10.1 Population

Population at risk from flooding in Santa Cruz County was estimated by intersecting FEMA's 100-year (1% annual chance) and 500-year (0.2% annual chance) floodplain boundaries with U.S. Census Bureau population data. Using GIS, census blocks, and tracts, populations were weighted according to the percentage of each block lying within the mapped flood hazard areas.

The results show that a substantial share of the county's population resides within areas that could experience significant flooding during a 100-year event, with additional residents located in areas subject to the less frequent but still damaging 500-year flood. Most at-risk residents are in the broader flood fringe, with smaller portions in high-velocity floodways and low-lying coastal areas vulnerable to storm surge and wave overtopping.

Using this approach, it was estimated that more than nine thousand county residents are exposed to some sort of FEMA-identified flood risk, in either 100-year or 500-year floodplains, as shown in Figure 3-31 and Table 3-19.

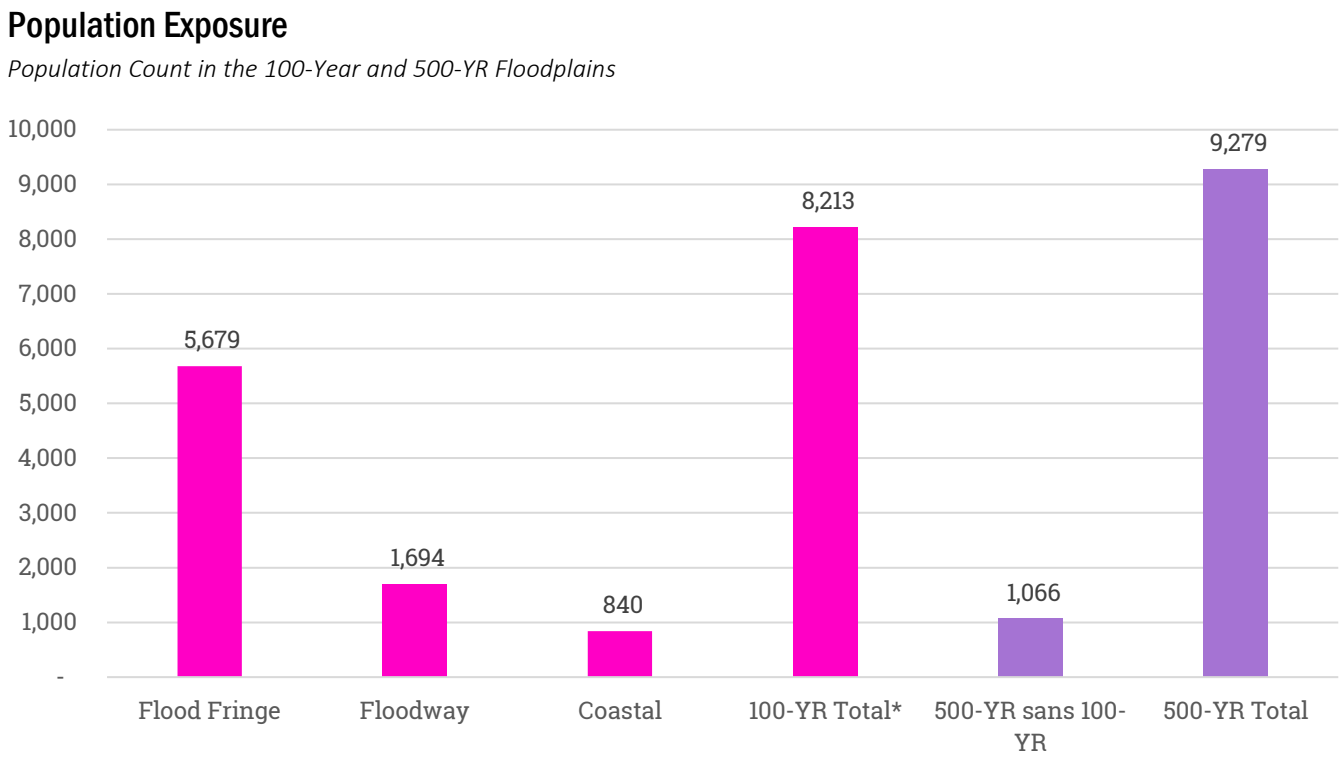


Figure 3-31: Santa Cruz County Population Exposed to Flood Risk

Table 3-19: Santa Cruz County Population Exposed to Flood Risk

	Total Population
Unincorporated County	131,149

Flood Hazard Zone	Population Count	% of Total
Flood Fringe	5,679	*4.33%*
Floodway	1,694	*1.29%*
Coastal	840	*0.64%*
100-YR Total*	8,213	*6.26%*
500-YR sans 100-YR	1,066	*0.81%*
500-YR Total	9,279	*7.08%*

**Special Flood Hazard Area (SFHA)*

Population exposure to flood hazards in Santa Cruz County is concentrated along the county's major waterways and low-lying coastal zones. Communities in the San Lorenzo River, Soquel Creek, and Pajaro River corridors show some of the highest concentrations of residents within FEMA-mapped floodplains, along with portions of Watsonville, Capitola, and Santa Cruz. Smaller but notable clusters occur in mountain valleys such as Boulder Creek, Ben Lomond, and Lompico, where narrow channels and steep slopes increase flood risk. Coastal neighborhoods, particularly in Capitola, Seacliff, La Selva Beach, and Pajaro Dunes, also host significant populations in flood-prone areas. These patterns reflect a mix of historical settlement along rivers and the coast, as well as the concentration of housing in valleys and floodplains where developable land has been available.

3.2.2.10.2 Property

Table 3-20 summarizes parcel exposure to flood hazards in Santa Cruz County. Within the 100-year floodplain, almost $1 billion in combined assets are at risk. Of this, more than $700 million in assets are associated with riverine flooding along inland waterways, while over $200 million is tied to coastal flooding areas exposed to waves, storm surge, and high tides. Additional parcels in the 500-year floodplain raise the total exposure to approximately $3 billion in combined structure and content value. These figures underscore the substantial economic stakes of both riverine and coastal flooding, reinforcing the need for ongoing mitigation and preparedness efforts.

The highest concentration of at-risk assets follows the county's major inland waterways, particularly along the San Lorenzo River corridor from Boulder Creek through Ben Lomond, Felton, and into the City of Santa Cruz. Clusters are also visible along Soquel Creek in Capitola, Aptos Creek in Aptos Village, and Corralitos Creek near Freedom.

On the coast, assets are concentrated in low-lying shoreline neighborhoods such as Seacliff, Rio Del Mar, La Selva Beach, and Pajaro Dunes, where ocean waves, storm surge, and high tides drive coastal flooding.

Significant asset exposure exists in the Pajaro River floodplain, which spans Watsonville and extends into neighboring Monterey County.

Overall, the distribution reflects a mix of riverine and coastal hazard zones, including river valleys with dense development and coastal areas where residential and commercial properties sit at or near sea level. These patterns reinforce the need for both inland and shoreline flood mitigation strategies in the county.

Table 3-20: Santa Cruz County Parcels Exposed to Flood Risk

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Flood Hazard Zone	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Flood Fringe	1,446	*3.0%*	$900,474,800	$537,620,000	$1,438,094,799	*2.6%*
Floodway	532	*1.1%*	$304,682,400	$184,615,800	$489,298,199	*0.9%*
Coastal	673	*1.4%*	$427,509,997	$213,754,999	$641,264,996	*1.2%*
100-YR Total	2,651	5.6%	$1,632,667,197	$935,990,798	$2,568,657,995	4.7%
500-YR sans 100-YR	393	*0.8%*	$237,003,600	$138,601,600	$375,605,200	*0.7%*
500-YR Total	3,044	6.4%	$1,869,670,797	$1,074,592,398	$2,944,263,195	5.4%

Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay and Santa Cruz County Assessor data.

Damage Estimation

Unlike the exposure analyses presented in other hazard profiles of this MJHMP—which simply identify assets located within mapped hazard areas—this section presents damage estimations for flood hazards based on modeled flood depths. Using FEMA's HAZUS software, losses to structures and their contents are calculated by combining flood depth data with structure type, occupancy, and replacement value. HAZUS applies established damage functions, developed from historical flood insurance claims, to estimate the percentage of damage for each property.

For this study, local parcel-level market value data for all non-vacant parcels was used in place of HAZUS's default national dataset, providing a more accurate reflection of potential economic losses in Santa Cruz County. Results are provided separately for riverine flooding, which affects inland waterways and floodplains, and for coastal flooding, which includes storm surge and wave impacts. These estimates offer insight into the potential scale of structural and content damage during a 100-year flood event, supporting more informed mitigation, planning, and response strategies.

Riverine Flood Damage

HAZUS modeling for the 100-year riverine flood scenario shows that losses are not evenly distributed across building types. Residential structures account for the majority of total damages, driven largely by content losses in addition to building damage. Commercial properties show a higher proportion of content loss relative to building loss, reflecting the high value of goods, equipment, and inventory stored in these structures. Industrial facilities experience a similar pattern, though their overall share of the county-wide loss is smaller. Public, religious, and government buildings contribute a comparatively minor portion of the total damages but may still represent critical community services and functions.

In total, a 100-year riverine flood is estimated to cause more than $785 million in combined building and content losses across all property types, representing about 1.4% of the total value in the 100-year floodplain. Table 3-21 and Figure 3-32 shows the 100-year flood loss estimation (based on depth-of-flooding).

Table 3-21: Santa Cruz County 100-YR Riverine Flood Damage Estimates

Building Type	Building Damage ($)	Building Damage (% of total loss)	Content Damage ($)	Content Damage (% of total loss)	Total Damage ($)	Proportion of Loss (%)
Agriculture	$1,980,000	0.3%	$5,473,000	0.7%	$7,453,000	1%
Commercial	$95,763,000	12.2%	$300,620,000	38.3%	$396,383,000	50%
Education	$5,442,000	0.7%	$21,445,000	2.7%	$26,887,000	3%
Government	$1,551,000	0.2%	$7,945,000	1.0%	$9,496,000	1%
Industrial	$12,568,000	1.6%	$30,688,000	3.9%	$43,256,000	6%
Religion	$2,696,000	0.3%	$17,633,000	2.2%	$20,329,000	3%
Residential	$174,763,000	22.3%	$106,723,000	13.6%	$281,486,000	36%
Total					**$785,290,000**	

Note: Total Inventory Values
1 - Building Replacement Costs = $19,116,504,796
2 - Content Replacement Costs = $35,189,614,790
3 - Total Value = $54,306,119,586

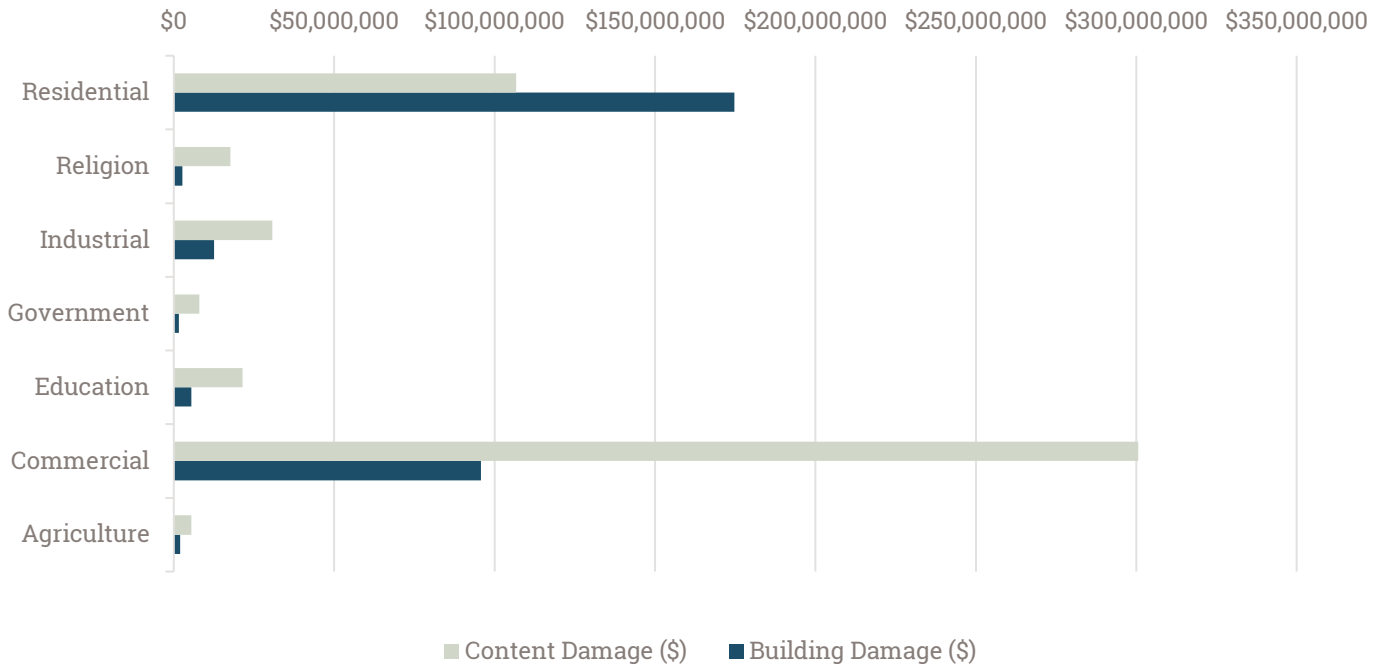


Figure 3-32: Santa Cruz County 100-YR Riverine Flood Damage Estimates by Building Type

Coastal Estimated Flood Damage

HAZUS modeling for the 100-year coastal flooding scenario indicates that predicted damages vary significantly by building type. Residential properties represent the largest share of total losses, with damages driven by a combination of building impacts and substantial content losses. Commercial buildings account for a smaller portion of total damages but show a higher ratio of content to building loss, reflecting the high value of goods, inventory, and equipment typically stored in these structures. Industrial facilities display a similar pattern of proportionally greater content losses but contribute only a small fraction of overall damages. Education, government, and religious facilities show minimal predicted damage in the coastal flooding scenario compared to other occupancy types.

In total, the model estimates more than $93 million in combined building and content losses for the unincorporated county in a 100-year coastal flood event. This represents a small fraction of the total value within the 100-year coastal floodplain, but it underscores that impacts can be highly concentrated in certain property types. Table 3-22 and Figure 3-33 present the detailed loss breakdown by occupancy type, based on depth-of-flooding analysis.

Table 3-22: Santa Cruz County 100-YR Coastal Flood Damage Estimates

Building Type	Building Damage ($)	Building Damage (% of total lossl)	Content Damage ($)	Content Damage (% of total loss)	Total Damage ($)	Proportion of Loss (%)
Agriculture	$59,000	0.1%	$101,000	0.1%	$160,000	1%
Commercial	$5,768,000	6.2%	$23,246,000	25.0%	$29,014,000	50%
Education	$21,000	0.0%	$103,000	0.1%	$124,000	3%
Government	$0	0.0%	$6,000	0.0%	$6,000	1%
Industrial	$355,000	0.4%	$441,000	0.5%	$796,000	6%
Religion	$55,000	0.1%	$197,000	0.2%	$252,000	3%
Residential	$38,198,000	41.0%	$24,613,000	26.4%	$62,811,000	36%
Total					**$93,163,000**	

Note: Total Inventory Values
1 - Building Replacement Costs = $19,116,504,796
2 - Content Replacement Costs = $35,189,614,790
3 - Total Value = $54,306,119,586

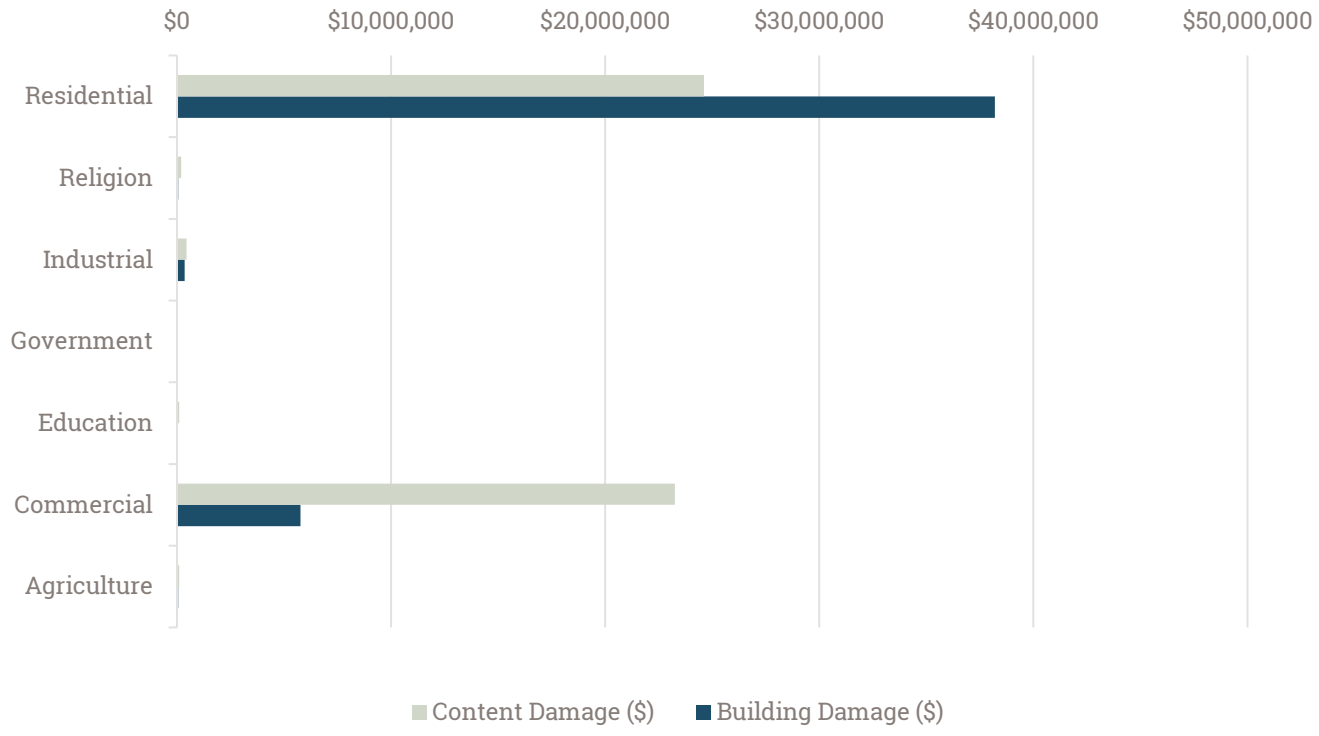


Figure 3-33: Santa Cruz County 100-YR Coastal Flood Damage Estimates by Building Type

3.2.2.10.3 Critical Facilities & Infrastructure

Essential facilities, high-potential-loss sites, and lifeline infrastructure in Santa Cruz County face notable flood risks due to their location within FEMA-mapped 100-year and 500-year floodplains. Unlike with parcel values, this assessment analyzes exposure only, meaning results are based on whether a facility falls inside or outside of mapped hazard zones. No first floor elevation or flood depth data was available, so these findings should be interpreted as indicators of potential risk rather than predictions of actual damage.

Flood exposure is dispersed throughout the county. Several fire stations, law enforcement facilities, hospitals, and emergency operations centers are situated within mapped flood hazard areas. Importantly, one fire station is located within a designated floodway, where flood flows are deepest and fastest, increasing the likelihood of operational disruption during an event. Schools are also represented in these zones, creating potential evacuation and continuity-of-operations challenges for education and community services.

Transportation and utility lifeline systems make up a substantial portion of the at-risk infrastructure. Roads, bridges, culverts, utility substations, and rail corridors in floodplains are vulnerable to damage or service interruption, impacts that could isolate neighborhoods, delay emergency response, and slow recovery.

High-potential-loss facilities, such as large mobile home parks, healthcare centers, and historic properties, are also present in flood-prone areas, where damage could carry significant economic, cultural, and social consequences. Hazardous materials facilities, including storage and treatment sites, are likewise at risk; flooding at these locations could cause environmental contamination and public health hazards extending well beyond the flooded area.

Table 3-23 details the critical facilities and infrastructure intersecting with the 100-year and 500-year floodplains, illustrating the scope of public assets that could be affected in a major flood event.

Table 3-23: Santa Cruz County Critical Facilities Exposed to Flood Risk

Critical Infrastructure - Flood Exposure							
Infrastructure Type	Flood Fringe	Floodway	Coastal	100-YR Total[2]	500-YR sans 100-YR	500-YR Total	BAM[3] Awareness Zone
Essential Facilities	3	1	-	4	-	4	1
Fire Station	2	1	-	3	-	3	1
Hospital	-	-	-	-	-	-	-
Law Enforcement	-	-	-	-	-	-	-
EOC	-	-	-	-	-	-	-
American Medical Response	1	-	-	1	-	1	-
High-Potential-Loss	23	11	3	37	8	45	3
Adult Care Facility	1	-	-	1	1	2	-
Child Care Center	1	2	-	3	1	4	-
Cell Tower	-	-	-	-	-	-	-

Critical Infrastructure - Flood Exposure							
Infrastructure Type	Flood Fringe	Floodway	Coastal	100-YR Total[2]	500-YR sans 100-YR	500-YR Total	BAM[3] Awareness Zone
County Real Property Asset[1]	15	5	3	23	5	28	1
Dam	1	-	-	1	-	1	-
Healthcare Facility	-	-	-	-	-	-	1
Historic Building	-	-	-	-	-	-	-
Library	-	-	-	-	-	-	1
Mobile Home Park	5	1	-	6	1	7	-
Power Generation	-	-	-	-	-	-	-
Radio Sites	-	1	-	1	-	1	-
School	-	2	-	2	-	2	-
Transportation and Lifeline	119	36	7	162	14	176	112
Airport	-	-	-	-	-	-	-
Substation	-	-	-	-	-	-	-
NG Station	-	-	-	-	-	-	-
Church	6	-	-	6	1	7	1
Stormwater Culvert	67	15	1	83	11	94	102
Parks	5	3	5	13	-	13	2
Bridge NBI	41	18	1	60	2	62	7
Hazmat	27	8	1	36	4	40	2
HWTS Active Facility	22	8	1	31	4	35	2
Geotracker CleanupSite	5	-	-	5	-	5	-
Grand Total	**172**	**56**	**11**	**239**	**26**	**265**	**118**

1Real Property Assets are digitized insurance rolls and other asset lists for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.
2Special Flood Harzard Area (SFHA)
3Best Available Mapping

Lifeline infrastructure in Santa Cruz County, including transportation corridors, utilities, and flood control systems, faces notable flood risk due to their location within FEMA-mapped 100-year and 500-year floodplains. County-maintained roads make up the largest share of exposed linear infrastructure. Many of these routes pass through low-lying river valleys, cross floodplains, or run adjacent to coastal areas. Flooding on these roadways can quickly isolate communities, block access for emergency responders, and delay recovery efforts. Even short-term closures on these primary routes can disrupt mobility across large portions of the county. Other at-risk transportation lifelines include state highways, local streets, and railroads. Flood damage or blockage to these systems can halt the movement of people and goods, with ripple effects for emergency response and the local economy.

Utility lifelines, including water and sewer pipelines, natural gas pipelines, and electric transmission lines, are also present in flood-prone areas. Damage to these systems could result in water contamination,

wastewater backups, extended outages, and safety hazards. Flood control features, such as levees and maintained channels, are themselves vulnerable; overtopping or failure could inundate the very areas they are intended to protect.

While exposure is widespread, the concentration of county-maintained roads in flood hazard zones underscores the importance of resilient design, maintenance, and emergency detour planning. Table 3-24 provides a detailed breakdown of lifeline features by flood hazard classification, illustrating the breadth of infrastructure that could be affected during a major flood event in Santa Cruz County.

Table 3-24: Santa Cruz County Critical Infrastructure Exposed to Flood Risk

Lifelines (miles) - Flood Risk Exposure						
Infrastructure Type (linear)	Flood Fringe	Floodway	Coastal	100-YR Total	500-YR sans 100-YR	Grand Total
County Maintained Roads*	17.3	6.1	0.9	24.3	3.4	27.7
Levee	14.6	4.1	-	18.7	-	18.7
Maintained Channel	14.8	13.0	-	27.8	28.6	56.4
NG Pipeline	1.7	0.1	-	1.8	0.1	1.8
Railroad	1.6	0.5	-	2.1	0.0	2.1
Sanitation Pipe	5.4	1.4	5.2	12.1	1.5	13.6
All Roads	48.1	12.7	2.9	63.7	9.1	72.8
Alley	0.4	0.3	-	0.7	0.0	0.8
Drive	9.3	2.2	0.0	11.5	1.7	13.1
Major Road	9.8	3.5	0.2	13.4	1.8	15.2
Ramp	0.1	0.0	-	0.2	0.6	0.8
Street	19.9	5.5	2.6	27.9	4.2	32.2
State Highway	5.1	0.9	0.1	6.2	0.6	6.8
Unnamed	3.6	0.2	-	3.8	0.2	4.0
Transmission Line	3.3	0.4	-	3.8	0.3	4.1
Grand Total	**106.9**	**38.3**	**9.0**	**154.2**	**15.2**	**169.4**

**Partially Overlaps "All Roads".*

3.2.2.11 Development Trends

Santa Cruz County faces ongoing challenges in balancing development pressures with the realities of flood hazards, particularly as climate change and sea level rise increase the extent and frequency of flooding. Unlike some inland counties, Santa Cruz flood risks are driven by both riverine and coastal processes. Future development in low-lying areas must account for multiple hazard pathways, including extreme rainfall, storm surge, and wave overtopping.

Large-scale flood control structures such as levees are limited in the county, with flood protection instead relying on a mix of localized channel improvements, stormwater infrastructure upgrades, and natural shoreline features. Existing levees along the Pajaro River and Salsipuedes Creek provide partial protection, but much of the inland floodplain remains susceptible to high-water events. Coastal neighborhoods, particularly in Capitola, Aptos, and Rio del Mar, have limited options for hard protection due to permitting constraints and environmental considerations, making adaptive design and elevation strategies more important over time.

Future growth in Santa Cruz County is guided by its General Plan policies and Local Coastal Programs that restrict new development in mapped flood hazard zones and require mitigation measures such as elevating structures or improving drainage capacity when redevelopment occurs. The county, as well as the other municipalities that participated in this MJHMP, have integrated flood hazard considerations into their general plan safety elements and committed to aligning land use decisions with this plan.

Looking ahead, projected sea level rise, more intense atmospheric river events, and ongoing watershed changes including post-wildfire hydrology will likely expand the extent of both coastal and riverine flood hazards. This will require continued investment in hazard mapping, early warning systems, and resilient infrastructure, as well as proactive land use planning to ensure that new development does not exacerbate existing flood risks.

3.2.2.12 Flood Hazard Problem Statements

As part of the flood mitigation planning process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing flood-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input.

The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure, essential facilities, economic assets, natural resources, and long-term recovery. They also acknowledge systemic barriers to effective flood mitigation, such as aging infrastructure, limited funding for maintenance, and incomplete data on flood depths and first-floor elevations.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with flood. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-25 presents the flood problem statements for Santa Cruz County, along with their associated area of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2

Table 3-25: Santa Cruz County Flood Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description
Flood	Victim	**ps-FL-SCC-01**	Severe flooding in low-lying areas of unincorporated South County disproportionately affects low-income agricultural communities.
Flood	Impact	**ps-FL-SCC-02**	Moderate to severe flooding within the Pajaro Valley region damages crops, irrigation systems, and farm access roads, causing downstream economic impacts for agricultural workers, growers, and the local economy.
Flood	Threat	**ps-FL-SCC-03**	There are numerous NFIP-defined repetitive loss areas in the county where properties continue to experience preventable damages during flood events due to lack of elevation, floodproofing, or acquisition options.
Flood	Threat	**ps-FL-SCC-04**	Many flood-prone areas, including low-lying neighborhoods along the Pajaro River and its tributaries, Aptos Creek, Soquel Creek, and the San Lorenzo River, lack reliable all-weather access routes. Seasonal flooding and storm damage can wash out or inundate roadways, hindering evacuation and cutting off access to emergency services and critical resources.
Flood	Threat	**ps-FL-SCC-05**	Many areas of the County face unmapped or under-mapped flood risks, particularly in small, flashy watersheds. Localized threats—such as debris and large woody material in streams—can cause rapid flooding that is not captured in existing FEMA or local flood hazard maps, limiting the County's ability to fully characterize risk and prioritize mitigation.
Flood	Threat	**ps-FL-SCC-06**	While the County has completed an inventory of culverts, pump stations, and other storm drainage infrastructure, many assets are in poor condition or vulnerable to damage during high-flow events. Aging materials, undersized designs, and limited capacity to handle debris can contribute to roadway washouts, localized flooding, and prolonged seasonal closures.
Flood	Threat	**ps-FL-SCC-07**	Many flood-prone or low-lying areas will be subject to greater or more frequent flood risk due to more severe rainfall associated with climate change.
Flood	Impact	**ps-FL-SCC-08**	Some county sewer infrastructure is located in low-lying areas subject to flood inundation, making the infrastructure inaccessible and causing infiltration into the system, potentially overwhelming it and resulting in a sewage spill. A critical wastewater pump station near Arana Gulch is located in a low-lying area and subject to flooding, which could disrupt sanitation services and cause damage.
Flood	Victim	**ps-FL-SCC-09**	Many mobile home parks are located in flood-prone areas and rely on vulnerable underground drainage systems. Limited resources for protective measures put this important source of affordable housing at heightened risk of damage and displacement.
Levee Failure	Threat	**ps-LV-SCC-01**	A moderate to severe flood event could overtop or cause failures in the Pajaro levee system which was not designed for today's hydrologic conditions, exposing thousands of residents and agricultural lands to damage.

3.2.2.13 Climate Change Impacts & Vulnerable Populations

Flooding is one of the most persistent and costly hazards in unincorporated Santa Cruz County, with disproportionate impacts on vulnerable populations. Climate change is projected to increase the frequency and intensity of atmospheric river events, leading to heavier rainfall, rising flood stages, and compounding risks for low-lying neighborhoods, agricultural lands, and critical infrastructure. Vulnerable populations—including low-income agricultural workers, renters in mobile home parks, isolated seniors, and limited-English households—face disproportionate risks due to their geographic location, limited access to recovery resources, and higher likelihood of displacement.

Direct Impacts: Severe flooding in South County disproportionately affects agricultural communities, where workers and families often live in flood-prone areas near the Pajaro River and its tributaries. Flooding damages housing, disrupts employment, and reduces access to essential services. Mobile home parks located in low-lying areas are particularly vulnerable, with limited resources to elevate structures, retrofit drainage systems, or recover from repeated events.

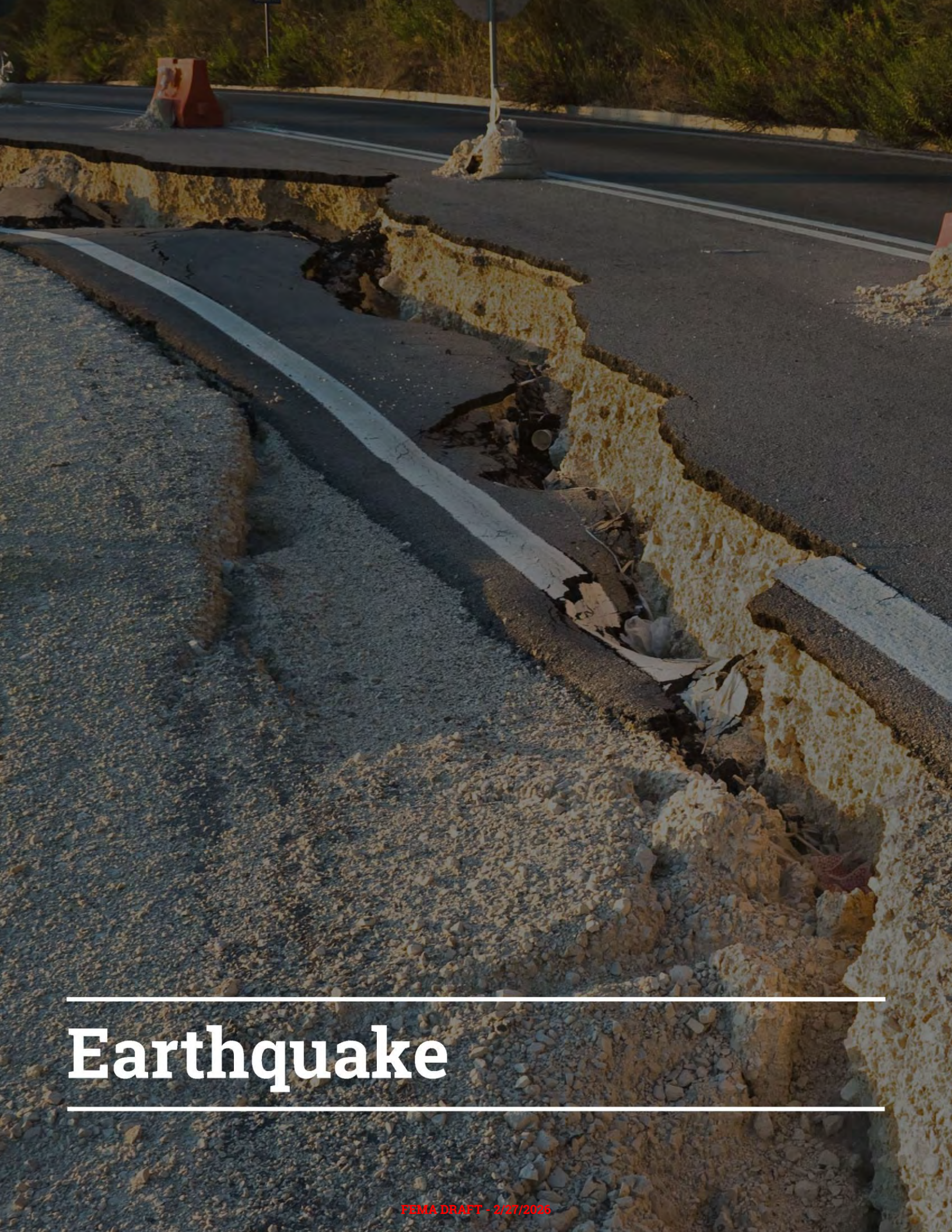
Critical Infrastructure and Access: Flooding frequently damages crops, irrigation systems, sewer networks, and storm drainage infrastructure, resulting in cascading impacts for the agricultural economy and public health. County stormwater infrastructure—including culverts, pump stations, and drainage networks—is aging and undersized, leaving communities vulnerable to road washouts and prolonged closures. Seasonal flooding along Pajaro River, Aptos Creek, Soquel Creek, and the San Lorenzo River can cut off evacuation routes, hindering emergency response and stranding vulnerable populations. Wastewater infrastructure in low-lying areas, such as the Arana Gulch pump station, faces heightened risk of inundation, which could cause sanitation service interruptions or contamination.

Systemic Challenges: Numerous repetitive loss areas remain in the county, where homes continue to flood due to limited access to elevation, acquisition, or floodproofing resources. Many smaller watersheds also remain unmapped or under-mapped, leaving localized threats from debris flows and flashy storms unaccounted for in planning. This limits the County's ability to fully characterize flood risks, prioritize mitigation, and direct resources to the most vulnerable neighborhoods.

Climate Change Trends: Climate change is expected to exacerbate these risks by driving more severe rainfall events, higher river stages, and compound flooding where fluvial, tidal, and coastal processes intersect. This will further strain the Pajaro levee system, which was not designed for current or projected hydrologic conditions. A levee failure would expose thousands of residents and extensive agricultural acreage to catastrophic losses, with disproportionate impacts on farmworker communities, many of whom lack flood insurance and face barriers to recovery assistance.

By following the mitigation strategy in this plan, Santa Cruz County will reduce flood risk in unincorporated areas by investing equitably in resilient infrastructure, updating flood maps, and improving outreach to vulnerable populations. The mitigation strategy addresses targeted needs for mobile home parks, agricultural communities, and repetitive loss areas to reduce disparities and enhance community-wide flood resilience.

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Earthquake

FEMA DRAFT - 2/27/2026

3.2.3 Earthquake Hazard Profile

Earthquake is the sudden shaking of the ground caused by the passage of seismic waves through Earth's rocks. Seismic waves are produced when some form of energy stored in Earth's crust is suddenly released, usually when masses of rock straining against one another suddenly fracture and "slip." Earthquakes associated with this type of energy release are called tectonic earthquakes. The energy also can be released by elastic strain, gravity, chemical reactions, or even the motion of massive bodies. Earthquakes occur most often along geologic *faults*, narrow zones where rock masses move in relation to one another. The seismic conditions in Santa Cruz County include the San Andreas Fault Zone and major companion traces including the Zayante and San Gregorio Fault Zones.

Earthquakes have different properties depending on the type of fault that causes them (Figure 3-34). The usual fault model has a "strike" (the direction from north taken by a horizontal line in the fault plane) and a "dip" (the angle from the horizontal shown by the steepest slope in the fault). The lower wall of an inclined fault is called the footwall. Lying over the footwall is the hanging-wall. When rock masses slip past each other parallel to the strike, the movement is known as strike-slip faulting. Movement parallel to the dip is called dip-slip faulting. In dip-slip faults, if the hanging-wall block moves downward relative to the footwall block, it is called "normal" faulting; the opposite motion, with the hanging-wall moving upward relative to the footwall, produces reverse or thrust faulting.

As a fault rupture progresses along or up the fault, rock masses are flung in opposite directions and thus spring back to a position where there is less strain.

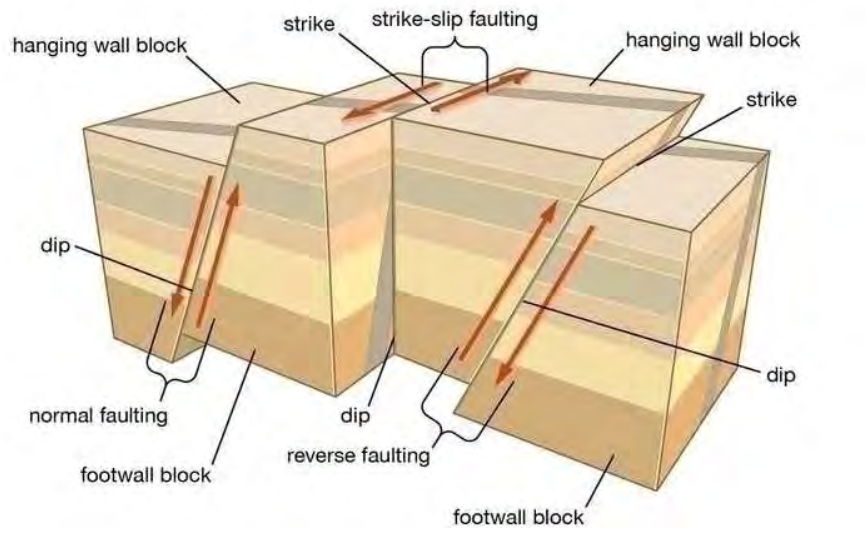


Figure 3-34: Earthquake Faulting

Earthquake Classifications

Earthquakes are typically classified in one of two ways: by the amount of energy released, measured as **magnitude**; or by the impact on people and structures, measured as **intensity**. The most common method is magnitude. While the majority of scientists now use either the Moment Magnitude (Mw) Scale or Modified Mercalli Intensity (MMI) Scale to measure an earthquake, the Richter scale is the most well-known; however, the Richter scale has been largely replaced with the more accurate Mw and MMI scales.

Magnitude

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. Table 3-26 summarizes the seven earthquake magnitude classes on the Mw scale, ranging from micro to great. A magnitude class of great can cause tremendous damage to infrastructure, compared to a micro class, which results in minor damage to infrastructure.

Table 3-26: Moment Magnitude (Mw) Scale

Magnitude Class	Magnitude Range (M = Magnitude)	Description
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage.
Micro	M < 3	Minor damage

Intensity

The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake. The MMI value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at that place.

The **lower** numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The **higher** numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above. Table 3-27 is an abbreviated description of the levels of MMI.

Table 3-27: Modified Mercalli Intensity (MMI) Scale

Intensity	Shaking	Description/Damage
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS, Abridged from The Severity of an Earthquake, USGS General Interest Publication 1989-288-913

Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most commonly-mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code (IBC). Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA

values are directly related to these lateral forces that could damage "short period structures" such as single-family dwellings. Longer-period response components determine the lateral forces that damage larger structures with longer natural periods such as apartment buildings, factories, high-rises, and bridges. Table 3-28 lists damage potential and perceived shaking by PGA factors, compared to the MMI scale.

Table 3-28: Modified Mercalli Intensity (MMI) Scale and Peak Ground Acceleration (PGA)

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

Note: PGA is measured in percent of g, where g is the acceleration of gravity.

Source: USGS, 2008; USGS, 2010

Artificial Induction

Earthquakes are sometimes caused by human activities, including the injection of fluids into deep wells, pumping of ground water, the excavation of mines, and the filling of large reservoirs. In fluid injection, the slip is thought to be induced by premature release of elastic strain, as in the case of tectonic earthquakes, after fault surfaces are lubricated by the liquid.

3.2.3.1 Secondary & Compounding Hazards

Earthquakes can trigger secondary hazards that compound impacts, including soil liquefaction, tsunamis, dam failures, fires, and slope failure. Due to Santa Cruz County's elevated exposure, liquefaction is profiled as a specific subhazard to earthquake. Other secondary hazards relevant to Santa Cruz County are discussed in their respective profiles. These include tsunami in the Coastal Hazards Profile (Section 3.2.5), dam failure (Section 3.2.7), wildfire (Section 3.2.1), and slope failure (Section 3.2.6).

Urban Fires

Gas leaks, explosions, and fires are common after an earthquake, especially in urban areas. As seen during the 1906 San Francisco Earthquake, the damage from an earthquake is not usually the end of the devastation. The fires that ensued following this event, which resulted from and were fueled by broken gas

lines and a lack of water pressure, caused additional impacts. According to the Earthquake Country Alliance, around one in four fires after an earthquake is related to a gas leak.

3.2.3.2 Subhazard: Liquefaction

Liquefaction is a process by which sediments below the water table temporarily lose strength during an earthquake and behave as a viscous liquid rather than a solid. Liquefaction is restricted to certain geologic and hydrologic environments, primarily recently deposited sand and silt in areas with high groundwater levels, where these soils tend to be saturated, low-density, and loose. The process of liquefaction involves seismic waves passing through saturated granular layers, distorting the granular structure, and causing the particles to collapse. This causes the granular layer to behave temporarily as a liquid, resulting in liquefaction.

Saturated or partially-saturated soil substantially loses strength and stiffness in response to an applied stress, such as ground shaking or other sudden changes in stress condition. Loose sand has a tendency to compress when a load is applied. Dense sands, by contrast, tend to expand in volume or 'dilate'. If the soil is saturated by water, which often occurs when soil is below the water table or sea level, then water fills the pore spaces between soil grains.

Liquefaction can cause the soil beneath a structure to lose strength, spread laterally, or lurch in the direction of an opening. Lateral spreading is lateral ground movement, with some vertical component, caused by liquefaction. In effect, the soil rides on top of the liquefied layer. Lateral spreading can occur on relatively flat sites with slopes less than 2%, under certain circumstances, and can cause ground cracking and settlement. Lurching is the movement of the ground surface toward an open face when the soil liquefies. An open face could be a graded slope, stream bank, canal face, gully, or other similar feature.

Severe property damage can be caused by soil liquefaction, including damaging pipes, compromising building foundations, and bucking roads and airport runways. For buildings, liquefaction may result in the loss of foundation-bearing capacity. This loss of strength commonly causes the structure to settle or tip. Loss of bearing strength can also cause light buildings with basements, buried tanks, and foundation piles to rise buoyantly through the liquefied soil. Soil liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world.

3.2.3.3 Policies, Plans & Regulatory Environment

Federal Regulatory Environment

National Earthquake Hazards Reduction Program (NEHRP)

The National Earthquake Hazards Reduction Program (NEHRP) was established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law 95–124. In establishing the NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and

construction methods and practices; land use controls and redevelopment; prediction techniques and early warning systems; coordinated emergency preparedness plans; and public education and involvement programs. The four basic goals of NEHRP remain unchanged:

1. Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
2. Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
3. Improve earthquake hazards identification and risk assessment methods and their use.
4. Improve the understanding of earthquakes and their effects.

State Regulatory Environment

California Alquist-Priolo Earthquake Fault Zoning Act & Seismic Hazards Mapping Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code [PRC] Sections 2621 to 2630) was passed in 1972 to provide a statewide mechanism for reducing the hazard of surface fault rupture to structures used for human occupancy. The main purpose of the Act is to prevent the siting of buildings used for human occupancy across the traces of active faults. It should be noted that the Act addresses the potential hazard of surface fault rupture and is not directed toward other earthquake hazards, such as seismically induced ground shaking or landslides.

The law requires the State Geologist to identify regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and to depict these zones on topographic base maps, typically at a scale of one inch to 2,000 feet. Earthquake fault zones vary in width, although they are often 0.75-mile wide. Once published, the maps are distributed to the affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. With the exception of single-family wood-frame and steel-frame dwellings that are not part of a larger development (i.e., four units or more), local agencies are required to regulate development within the mapped zones. In general, construction of new buildings within 50 feet of an active fault zone is prohibited.

California Building Standards Code

The California Building Code (CBC), adopted by Santa Cruz County, is another name for the body of regulations known as the California Code of Regulations, Title 24, Part 2, which is a portion of the California Building Standards Code. The CBC incorporates by reference the International Building Code (IBC) requirements with necessary California amendments. Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards.

Compliance with the CBC requires (with very limited exceptions) that structures for human occupancy be designed and constructed to resist the effects of earthquake motions. The Seismic Design Category for a structure is determined in accordance with either CBC Section 1613, Earthquake Loads, or the American Society of Civil Engineers Standard No. 7-05, Minimum Design Loads for Buildings and Other Structures. In brief, based on the engineering properties and soil types of a proposed site, plus location-specific ground

acceleration information, a Seismic Design Category is assigned ranging from A to F, of which D, E, and F represents the most severe conditions.

The Code also requires that a geotechnical investigation be prepared for projects on sites categorized C or greater, all new buildings that are 4,000 square feet or larger, and new smaller buildings if they meet certain criteria. A California registered Geotechnical Engineer must determine design categories and prepare geotechnical investigations, as well as determine requirements for geotechnical designs necessary to meet standards for reducing exposure to geological hazards.

Benchmark Years

Revisions to the Uniform Building Code (UBC) and California Building Code (CBC) mark important milestones in the evolution of seismic design standards. These benchmarks are critical for understanding the vulnerability of Santa Cruz County's building stock, much of which was constructed before modern seismic requirements.

Table 3-29 summarizes the major revisions to the Uniform Building Code (UBC), California Building Code (CBC), and International Building Code (IBC) that shaped modern seismic design standards. These benchmarks highlight the evolution from the first voluntary seismic regulations in 1927 to the adoption of comprehensive, strength-based seismic design provisions in the late 20th century, and ongoing refinements through updated seismic hazard maps.

This context is critical for Santa Cruz County because much of the existing housing stock was constructed prior to these milestones, leaving many buildings without essential seismic safety features. Structures built before 1978 (prior to Title 24) and especially those constructed before 1997 (prior to the modern overhaul of seismic design provisions) are considered more vulnerable to earthquake damage. Buildings constructed after adoption of the CBC/IBC framework benefit from more rigorous seismic standards; however, ongoing updates underscore the continued need for seismic retrofits and strict code compliance to reduce risk in older structures.

Table 3-29: Seismic Benchmark Years

Year(s)	Code / Reference	Key Seismic Change
1927	**UBC**	First voluntary seismic regulations introduced following the 1925 Santa Barbara earthquake.
1933	**UBC / State Law**	Field Act (schools) and Riley Act (all buildings) mandated seismic design statewide after the Long Beach earthquake.
1967 & 1976	**UBC**	Requirements added to limit building drift and reduce damage to non-structural components.
1978	**CBC**	Enactment of Title 24, unifying California's building standards and incorporating seismic provisions.
1988	**UBC**	Establishment of benchmark base shear values, used as reference in later seismic codes.

Year(s)	Code / Reference	Key Seismic Change
1997	UBC	Final UBC edition; major overhaul with near-source effects, soil amplification factors, redundancy/reliability factors, and strength-based seismic design.
2000	IBC / NEHRP	International Building Code (IBC) introduced, incorporating NEHRP provisions; CBC amended from the IBC.
2007 & 2017	IBC / CBC	Major updates to seismic hazard maps based on new research, refining design requirements.

Local Regulatory Environment

Santa Cruz County General Plan Public Safety Element

The Public Safety Element of the Santa Cruz County General Plan sets forth several policies relevant to earthquakes under the seismic hazard objective to reduce the potential for loss of life, injury, and property damage resulting from earthquakes by regulating the siting and design of development in seismic hazard areas; encouraging open space, agricultural or low-density land use in the fault zones; and increasing public information and awareness of seismic hazards (Objective 6.1). Seismic hazard policies include the following:

- **Policy 6.1.1 Geologic Review for Development in Designated Fault Zones:** Require a review of geologic hazards for all discretionary development projects, including the creation of new lots, in designated fault zones. Fault zones designated for review include the Butano, Sargent. Zayante, and Corralitos complexes, as well as the State-designated Seismic Review Zones.
- **Policy 6.1.2 Geologic Reports for Development in Alquist-Priolo Zones:** Require a preliminary geologic report or full engineering geology report for development on parcels within Alquist-Priolo State-designated seismic review zones.
- **Policy 6.1.4 Site Investigation Regarding Liquefaction Hazard:** Require site-specific investigation by a certified engineering geologist and/or civil engineer of all development proposals of more than four residential units in areas designated as having a high or very high liquefaction potential, and all other projects shall be reviewed for liquefaction hazard through environmental review and/or geologic hazards assessment.
- **Policy 6.1.11 Setbacks from Faults:** Exclude from density calculations for land divisions, land within 50 feet of the edge of an active or potentially active fault trace. In addition, all new habitable structures shall be set back a minimum of 50 feet from the edge of an active or potentially active fault trace (may be reduced to 25 feet based upon paleo-seismic studies). Critical structures and facilities shall be set back a minimum of 100 feet from the edge of an active or potentially active fault trace.

Santa Cruz County Geologic Hazards Ordinance

Santa Cruz County Code Chapter 16.10 contains the Geologic Hazards Ordinance. The ordinance: 1) implements the policies of the State of California Alquist-Priolo Earthquake Fault Zoning Act, the Santa Cruz

County General Plan, and the Land Use Plan of the LCP; 2) seeks to minimize injury, loss of life, and damage to public and private property caused by the natural physical hazards of earthquakes, floods, landslides, and coastal processes; 3) sets forth standards for development and building activities that will reduce public costs by preventing inappropriate land uses and development in areas where natural dynamic processes present a potential threat to the public health, safety, welfare, and property; and 4) ensures that potential buyers are notified of property located in an area of geologic and coastal hazard, and to ensure that those who occupy areas of geologic and coastal hazard assume responsibility for their actions.

3.2.3.4 Past Events

This section describes previous earthquake events, including dates, severity, level of damage, duration, sources of information used, and maps (where available). While Santa Cruz County has sustained numerous earthquakes throughout its history, the two most destructive ones were the 1906 San Francisco earthquake and the 1989 Loma Prieta earthquake.

Moderate-Sized Earthquakes Before 1906

Four moderate-sized earthquakes estimated at magnitude (M) 6 to 6.5 were recorded in Santa Cruz County between 1864 and 1890 on the historical Richter scale. Three of these earthquakes were centered in the Santa Cruz Mountains, including a M6 earthquake on February 26, 1864; M6.5 earthquake on October 8, 1865; and M6 earthquake on March 26, 1884. In addition, a M6.25 earthquake was recorded in the Pajaro Gap on April 24, 1890. All of these, together, indicate that a pattern of earthquakes nearly the same size of the Loma Prieta earthquake have occurred in the recent past. Each of these earthquakes caused some damage and would cause damage to homes today (all magnitudes cited are estimates based on descriptions of the damage which occurred).

1906 San Francisco Earthquake

The devastating April 18, 1906, earthquake that hit San Francisco was recorded at M8.3 on the Richter scale and is estimated to have been a VIII on the MMI scale with severe shaking. Impacts extended along the California coast, into the Santa Cruz Mountains. Although there were no recorded deaths in Santa Cruz County, the old courthouse partially collapsed and about one-third of the chimneys within the City of Santa Cruz were destroyed or damaged. Landsliding was observed throughout the Santa Cruz Mountains, and fault rupture was nearly continuous along the San Andreas fault zone for nearly 300 miles. Infrastructure in the county, including bridges, were destroyed, and broken mains and pipes shut off the water supply.

October 1926 Earthquakes

Two large earthquakes occurred in 1926, recorded as M6.1 on the Richter scale. Three of the aftershocks cracked plaster in Santa Cruz, almost bringing down the chimneys of numerous buildings. The shaking broke plate glass windows along Pacific Avenue, the city water main broke at Laguna Creek, and articles fell from shelves at stores.

1989 Loma Prieta Earthquake

At 5:04 p.m. on October 17, 1989, the M7.1 Loma Prieta Earthquake rocked the Monterey and San Francisco Bay regions. The initial quake lasted only 22 seconds; although, in the following two weeks, more than 4,000 aftershocks were recorded, 20 of which were greater than M5. The epicenter of the earthquake was about 10 miles east-northeast of the City of Santa Cruz in the Forest of Nisene Marks State Park on top of the San Andreas Fault. In Santa Cruz County, 674 dwellings, 32 mobile homes, and 310 businesses were destroyed. The Loma Prieta Earthquake was the largest to strike California since 1906, causing 62 deaths and 3,757 injuries. More than 12,000 people were left homeless, and transportation, utilities, and communications were disrupted. There was more than $6 billion in property damage.

3.2.3.5 Location

There are at least six major faults and fault systems within or near Santa Cruz County, placing it in an area of high seismic risk, and past experience has shown that the entire county is vulnerable to earthquake hazards. Fault zones designated for review under county regulations include the Butano, Sargent, Zayante, and Corralitos complexes. State-designated seismic review zones include the San Andreas, San Gregorio, and portions of the Zayante and Butano complexes. No new active or potentially active faults were identified in the county for this plan update.

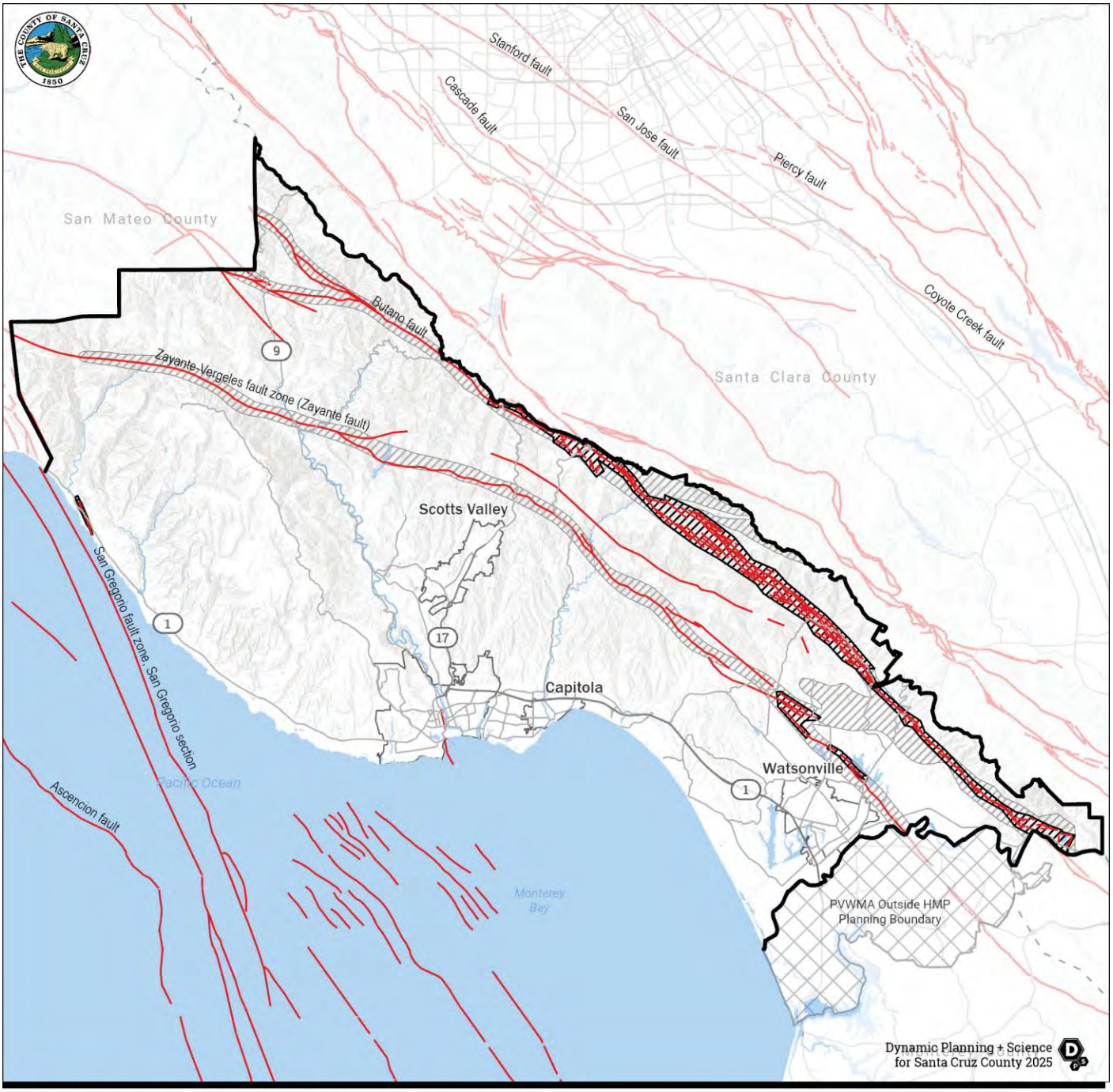
Because earthquakes can cause severe damage over a long distance, the Santa Cruz area remains at risk from continued seismic activity along the many faults in the greater San Francisco Bay region. The reduction of seismic stresses that occurred in the Loma Prieta earthquake did nothing to relieve, and possibly increased, stresses within other faults, including other sections of the San Andreas Fault.

According to the U.S. Geological Survey (USGS), the primary faults most likely to generate strong ground shaking in Santa Cruz County include the San Andreas Fault, which runs along the county's northeastern boundary, and the Zayante-Vergeles, Sargent, and Butano faults, which trend through the central and southern portions of the county. Additional nearby faults such as the San Gregorio Fault offshore to the west also contribute to regional seismic risk. Figure 3-35 identifies Quaternary faults located within or directly adjacent to the county, as well as designated Earthquake Fault Zones of Required Investigation established under the Alquist-Priolo Earthquake Fault Zoning Act and county regulations.

Liquefaction

Liquefaction in Santa Cruz County is most likely to occur in areas with high groundwater levels and loose, unconsolidated soils (i.e., sandy). Hence, coastal areas and areas along rivers and creeks are most susceptible to liquefaction and liquefaction-related phenomena, as shown in Figure 3-36.

Liquefaction potential varies significantly, and site-specific analysis is needed to accurately determine liquefaction potential in earthquake prone areas. Most of the valley bottoms in the southern regions of the county are underlain by alluvium and are considered at very high, high, or moderate risk for liquefaction potential. Coastline regions also have low to very high liquefaction potential.



Fault Zone Areas of Required Investigation

Unincorporated County

*Data sources: CGS.

Quaternary Faults (USGS)

Earthquake Fault Zone of Required Investigation (CGS)

State - Regulatory

County Defined

Figure 3-35: Santa Cruz County Fault Zone Areas of Required Investigation

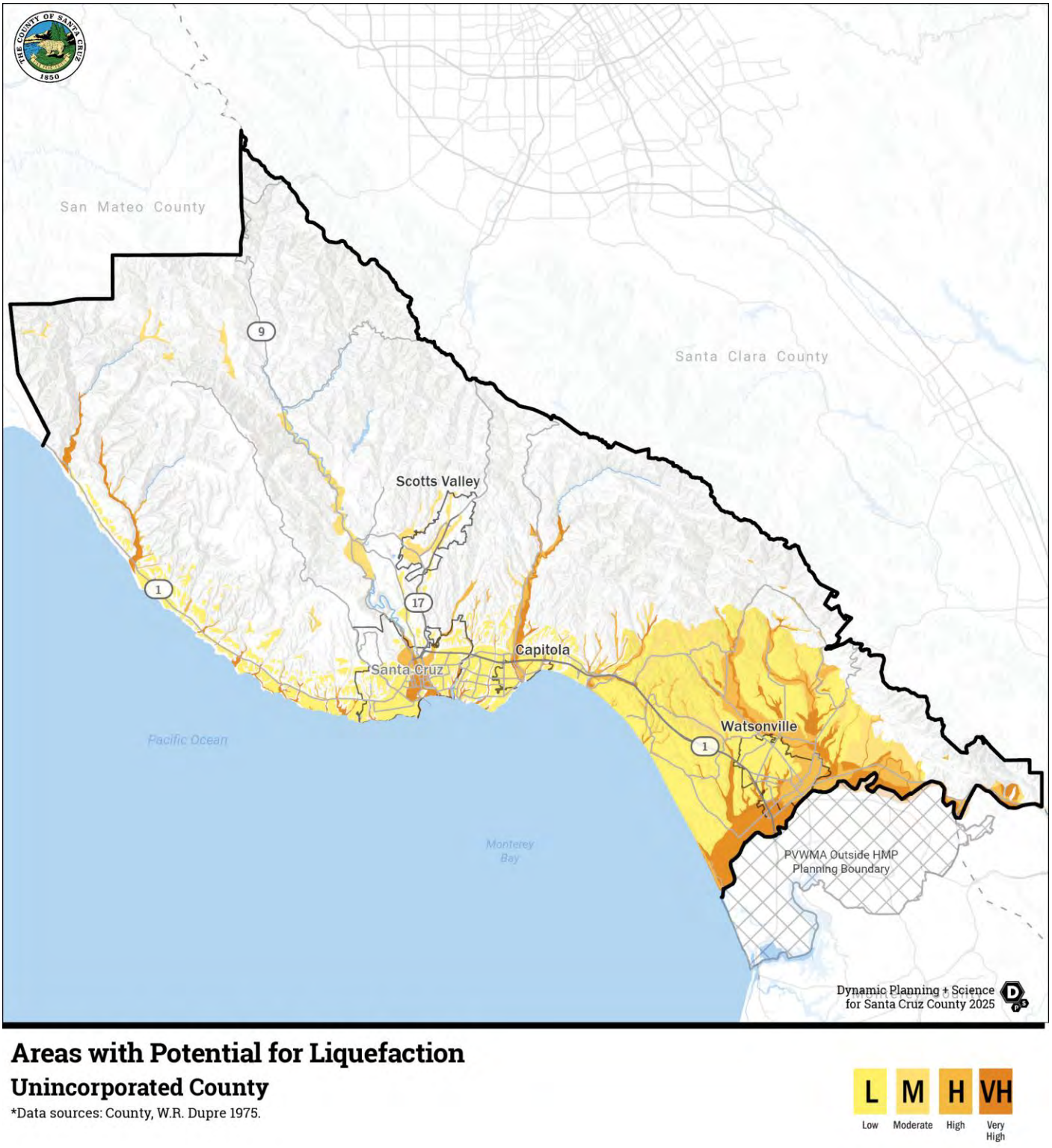


Figure 3-36: Santa Cruz County Areas with Potential for Liquefaction

3.2.3.6 Frequency & Probability of Future Occurrences

According the California State Hazard Mitigation Plan, earthquakes large enough to cause moderate damage to structures—those of M5.5 or larger—occur three to four times a year statewide. Strong earthquakes of M6 to 6.9 strike on an average of once every two to three years, and major earthquakes of M7 to 7.9 occur in California about once every decade. The probability of an earthquake occurring in Santa Cruz County is likely (between 10 and 100% annual probability).

30-Year Earthquake Probability (UCERF3)

To clarify the extent of future earthquake risk, a partnership of the USGS, the California Geologic Survey (CGS), and the Southern California Earthquake Center, known as the Working Group on California Earthquake Probabilities, evaluated, and systemized currently available historic and paleo-seismic information to produce a probabilistic seismic hazards analysis to indicate the type of future earthquakes. The resulting model, the Uniform California Earthquake Rupture Forecast Version 3 (UCERF3),[5] is a comprehensive model of earthquake occurrence for California and represents the best available science for estimates of the magnitude, location, and likelihood of potentially damaging earthquakes (M6.7 or greater). This rupture forecast model tells us where and when the Earth might slip along the state's many faults.

The results of the UCERF3 for the San Francisco region are shown in Table 3-30. The table indicates the average time between earthquakes and the likelihood of having one or more such earthquakes in the next 30 years (starting from 2014). It is important to note that the repeat times are averages and actual repeat times will certainly vary significantly. The fault systems producing these earthquakes are located throughout the San Francisco region and near Santa Cruz County.

According to UCERF3, the North San Andreas fault, which traverses the Santa Cruz Mountains, has a 33% probability of producing an M6.7 or greater earthquake in a given 30-Year period.

Table 3-30: 30-Year Probability of Earthquakes in the San Francisco Region

Magnitude	30-Year Probability	Average Repeat Time
5	**100%**	1.3 Years
6	**98%**	8.9 Years
6.7	**72%**	29 Years
7	**51%**	48 Years
7.5	**20%**	124 Years
8	**4%**	825 Years

Source: UCERF3

[5] Quaternary faults are those active faults that have been recognized at the surface and which have evidence of movement in the past 1.6 million years (the duration of the Quaternary Period).

3.2.3.7 Severity

Damage from earthquakes varies with the local geologic conditions, the quality of construction, the energy released by the earthquake, the distance from the earthquake's focus, and the type of faulting that generates the earthquake. Ground motion is the primary cause of damage and injury during earthquakes and can result in surface rupture, liquefaction, landslides, lateral spreading, differential settlement, tsunamis, building failure and broken utility lines, leading to fire and other collateral damage. Typically, areas underlain by thick, water-saturated, unconsolidated material will experience greater shaking motion than areas underlain by firm bedrock, but in some cases, relief may intensify shaking along ridge tops.

Movement along local faults can cause fault-related surface deformation (e.g., surface fault rupture) where the fault reaches the surface of the ground. Within the mapped fault zones in the county, it is likely that movement along these faults will damage structures, roads, utilities, and other fixed facilities. The mapping of these zones has not changed for this plan update.

In addition to these zones, other ground cracking was observed during the 1989 Loma Prieta earthquake and the 1906 San Francisco earthquake. Many of these ground cracks can be attributed to movement or consolidation of large and moderate-sized landslides while other ground cracks were most likely related to ridge spreading. Although much of the ground cracking was found near the fault zones and in the summit area of the county, other ground cracking was found on ridge tops throughout Santa Cruz County.

As demonstrated during past events, even a "moderate" earthquake occurring in or near the Santa Cruz County region could result in deaths, casualties, property and environmental damage, and disruption of normal services and activities. The severity of the event could be aggravated by collateral emergencies such as fires, hazardous material spills, utility disruptions, landslides, and transportation emergencies.

3.2.3.8 Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location, but research is being done with warning systems that use the low energy waves that precede major earthquakes. Currently, these systems are able to provide seconds and sometimes minutes of advance warning, which can allow people and systems to take actions to protect life and property from destructive shaking. Even a few seconds of warning can enable protective actions such as:

- **Public:** Individuals, including schoolchildren, drop, cover, and hold on; turn off stoves; and safely stop vehicles.
- **Businesses:** Personnel move to safe locations; automated systems ensure elevator doors open; production lines are shut down; and sensitive equipment is placed in a safe mode.
- **Medical Services:** Surgeons, dentists, and others stop delicate procedures.
- **Emergency Responders:** Open firehouse doors; personnel prepare and prioritize response decisions.
- **Power Infrastructure:** Protect power stations and grid facilities from strong shaking.

CruzAware Notification System

CruzAware is Santa Cruz County's official alert and notification system. It is administered by the County Office of Response, Recovery and Resilience (OR3) and is designed to provide residents and visitors with timely warnings and information during emergencies. Notifications are sent by text message, telephone, or email and address a range of hazards, including early warnings for earthquakes, as well as other public safety threats and evacuation notices.

The system works in coordination with other county resources to support comprehensive hazard communication. More information about CruzAware, including how to register, is available at santacruzcountyca.gov/CruzAware.

3.2.3.9 Earthquake Vulnerability Assessment

The vulnerability of a community to earthquake is based on a variety of factors, including proximity to active and inactive faults; the age and construction materials of structures; the density of the population and development; and the location of critical facilities. Recent history indicates that Santa Cruz County has a very high vulnerability to earthquakes due to proximity to faults, density of population, and development within the floodplains of many creeks and rivers, which are subject to liquefaction.

One or more moderate to large sized earthquakes (M6.5 to 7.5) will likely shake the entire County of Santa Cruz during the life span of most residents. Many older homes that were damaged but not destroyed in 1989 were improved seismically but are still at a higher risk than newer construction using the latest building code standards. Modern homes will normally fare better in earthquakes but 1989 showed that this is not necessarily the case. Some older homes fared better than newer ones due to location and design.

A major earthquake on the San Andreas Fault or other major fault in the regional will:

- Damage roads, bridges, and critical structures, and could severely damage most homes in the county.
- Trigger liquefaction along alluvial areas such as Pajaro Valley, parts of Capitola and Santa Cruz, and along streams throughout the county, such as Corralitos Creek and the San Lorenzo River.
- Potentially cause ruptures and ground cracking around the major faults and through nerby hillslopes.
- Potentially activate landslides and cause coastal bluff failure.

The following subsections summarize the population, property, and critical infrastructure and facilities exposed to earthquake hazards. Figure 3-37 summarizes the potential exposure of the population and these assets to a hypothetical M7.1 earthquake on the San Andreas Fault, and Figure 3-38 and Figure 3-39 summarize exposure to fault zones of required investigation and liquefaction, respectively.

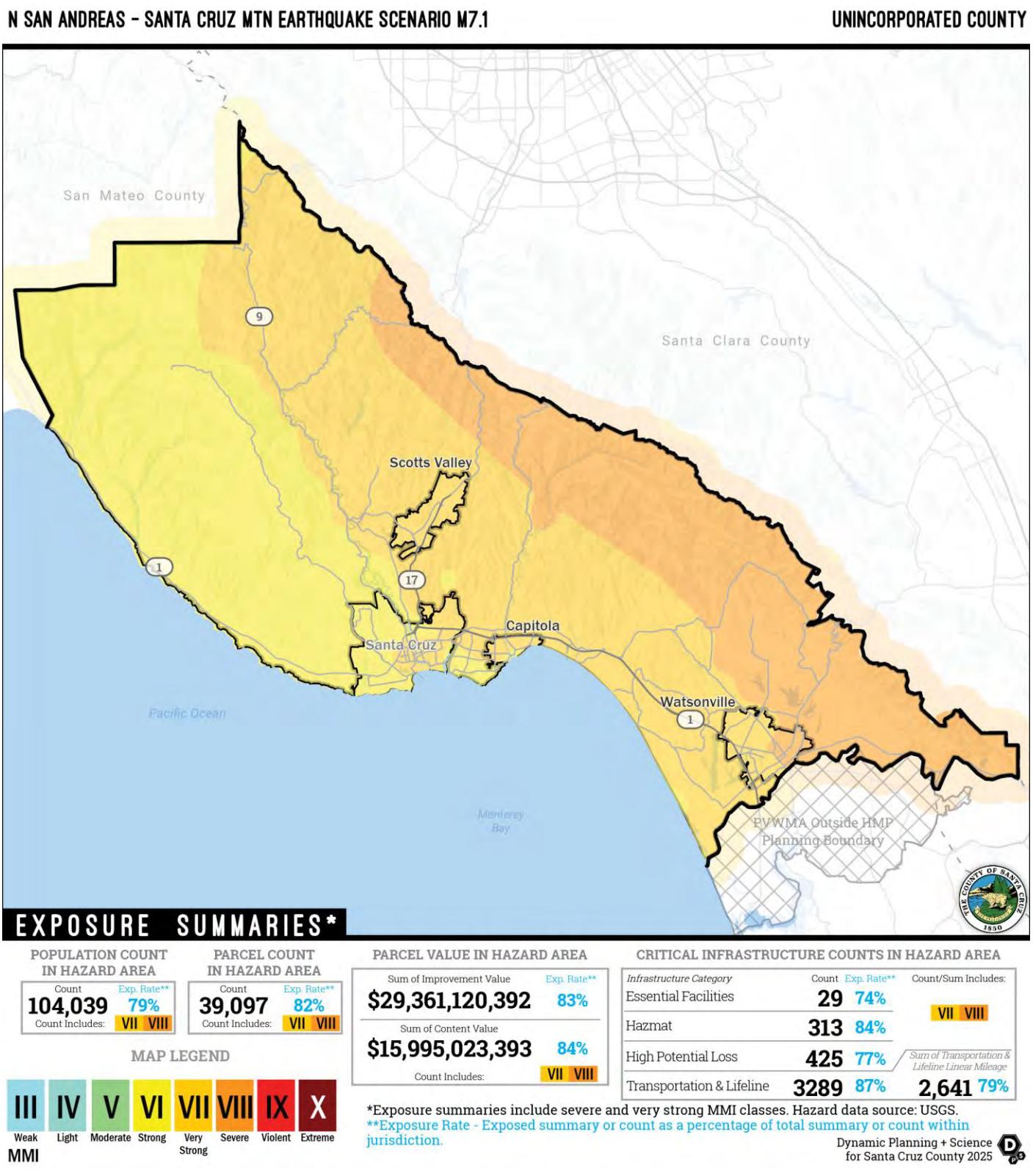


Figure 3-37: Exposure Summary - Santa Cruz County San Andreas Earthquake Scenario M7.1

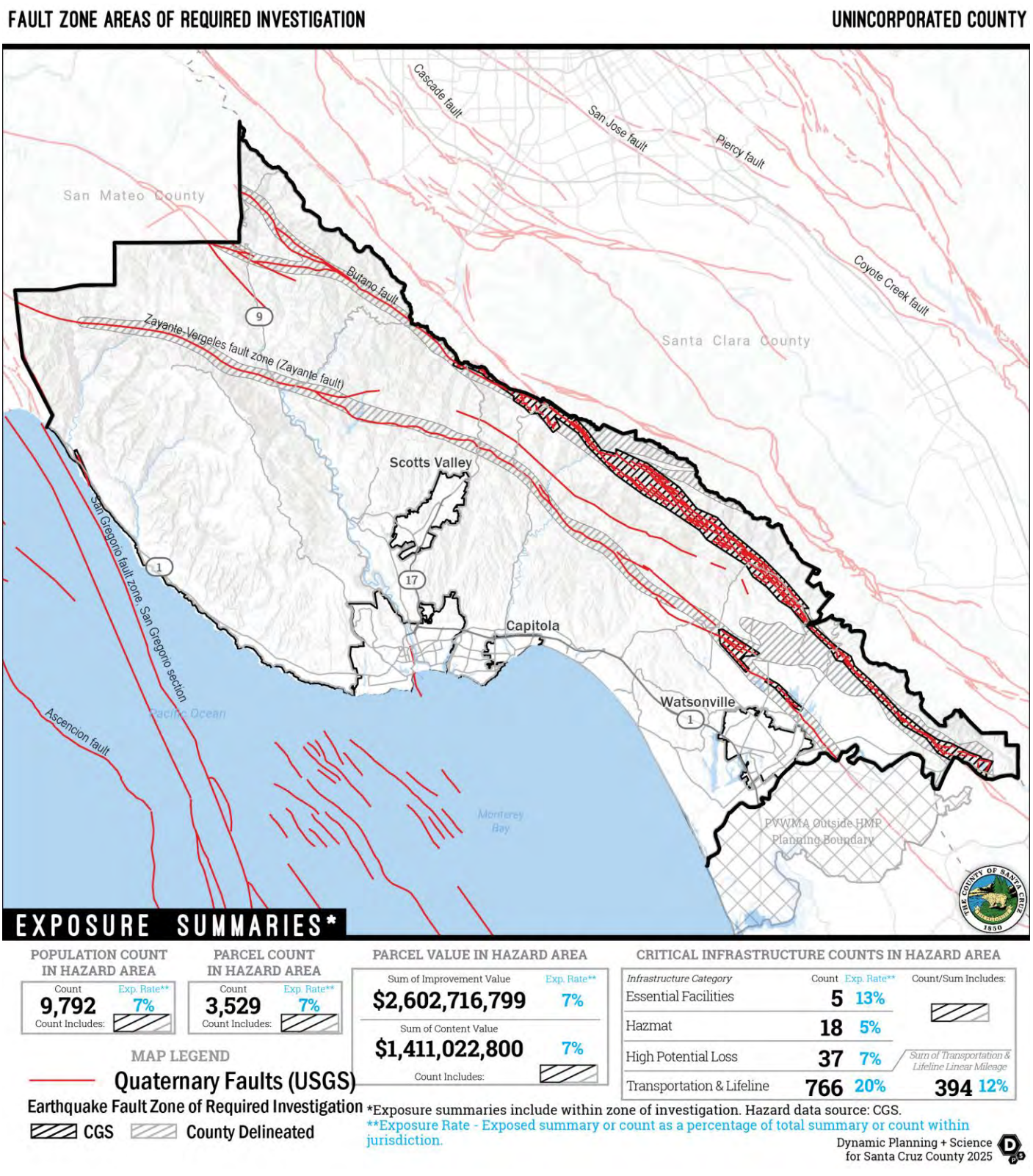


Figure 3-38: Exposure Summary - Santa Cruz County Fault Zone Areas of Required Investigation

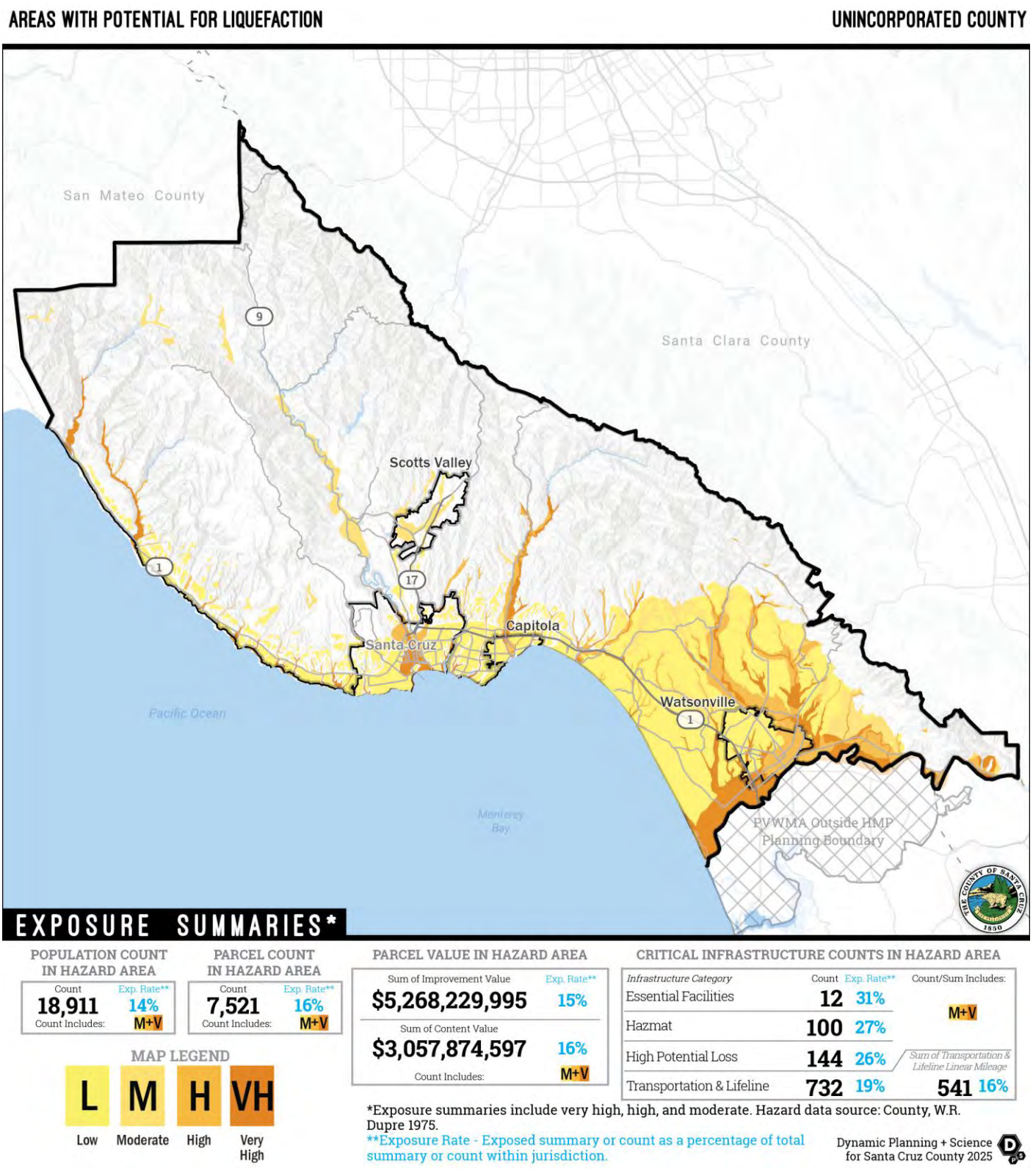


Figure 3-39: Exposure Summary - Santa Cruz County Areas with Potential for Liquefaction

3.2.3.9.1 Population

The entire population in Santa Cruz County would be exposed to shaking during a damaging earthquake. Over 16% of the county population would be exposed to severe shaking during a M7.1 earthquake on the San Andreas fault, with the remaining 84% exposed to strong or very strong shaking. More than 50% of the county population would also be exposed to liquefaction, including about 10% in high and very high susceptibility areas. Over 7% of the population would be exposed to potential ruptures in state or county fault zones of required investigation.

Table 3-31 summarizes the population susceptible to shaking during the M7.1 San Andreas Earthquake scenario, and Table 3-32 summarizes the population susceptible to fault zones and liquefaction.

Table 3-31: Santa Cruz County Population Susceptible to Earthquake Scenario Shaking

	Total Population
Unincorporated County	131,149

Shake Severity Zone	Population Count	% of Total
VIII - Severe	21,333	16.27%
VII - Very Strong	82,706	63.06%
VI - Strong	27,110	20.67%
Total	**131,149**	**100.00%**

Table 3-32: Santa Cruz County Population Susceptible to Faults and Liquefaction

	Total Population
Unincorporated County	131,149

Fault Zone of Required Investigation	Population Count	% of Total
County Delineated Fault	7,688	*5.86%*
State Regulatory Fault	2,104	*1.60%*
Liquefaction Susceptibility		
Low	51,004	*38.89%*
Moderate	5,815	*4.43%*
High	6,667	*5.08%*
Very High	6,429	*4.90%*
Total	**69,915**	**53.31%**

3.2.3.9.2 Property

All parcels within Santa Cruz County would be exposed to shaking during a damaging earthquake, which equates to approximately $54.3 billion in assessed assets. In areas projected to receive severe shaking during such an event, there is almost $7.5 billion in total exposure to a M7.1 earthquake on the San Andreas fault. A total of approximately 3,500 parcels and $4 billion in improvements are also exposed to fault rupturing in state or county zones of required investigation, and almost 60% of all properties in the county—accounting for $3.2 billion in assets—would be exposed to liquefaction during a major earthquake event.

Table 3-33 summarizes the parcels susceptible to shaking during the M7.1 San Andreas Earthquake scenario, and Table 3-34 summarizes the parcels susceptible to fault zones and liquefaction.

Table 3-33: Santa Cruz County Parcels Susceptible to Earthquake Scenario Shaking

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Shake Severity Zone	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
VI - Strong	8,533	17.9%	$5,828,494,398	$3,121,481,403	$8,949,975,801	16.5%
VII - Very Strong	33,014	69.3%	$24,575,046,395	$13,339,121,797	$37,914,168,192	69.8%
VIII - Severe	6,083	12.8%	$4,786,073,996	$2,655,901,597	$7,441,975,593	13.7%
Total	**47,630**	**100.0%**	**$35,189,614,790**	**$19,116,504,796**	**$54,306,119,586**	**100.0%**

Table 3-34: Santa Cruz County Parcels Susceptible to Faults and Liquefaction

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Zone of Investigation						
County Delineated	2,795	*5.9%*	$2,044,589,599	$1,122,743,400	$3,167,333,000	*5.8%*
State Delineated	734	*1.5%*	$558,127,200	$288,279,400	$846,406,600	*1.6%*
Liquefaction Susceptibility						
Low	20,315	*42.7%*	$15,534,149,599	$8,695,116,200	$24,229,265,798	*44.6%*
Medium	3,221	*6.8%*	$2,194,385,999	$1,251,251,400	$3,445,637,398	*6.3%*
High	2,397	*5.0%*	$1,728,138,396	$986,421,197	$2,714,559,593	*5.0%*
Very High	1,903	*4.0%*	$1,345,705,600	$820,202,000	$2,165,907,600	*4.0%*
Total	**27,836**	**58.4%**	**$20,802,379,593**	**$11,752,990,797**	**$32,555,370,390**	**59.9%**

Benchmark Years

According to the Santa Cruz County Assessor's Office, large portions of the county's housing stock were constructed in the 1960s through 1980s, before the 1997 UBC overhaul (Table 3-35). This means that a significant share of local housing was built before 1997, when modern seismic design became codified, and many homes predate even the 1978 establishment of Title 24. As a result, older housing stock in Santa Cruz County is particularly vulnerable to earthquake damage unless it has been retrofitted.

Table 3-35: Building Stock and Benchmark Years

Construction Era	Seismic Code Context	Approx. Share of Housing Stock	Vulnerability Notes
Pre-1978	Built before Title 24 unified California's building standards; many predate seismic codes entirely	~40%	High vulnerability — limited lateral force resistance; retrofits are a priority
1978–1997	Title 24 adopted, but before the 1997 UBC overhaul; incremental seismic improvements	~35%	Moderate vulnerability — stronger than pre-1978 but lacks modern soil/near-source design
Post-1997	Built under modern UBC (1997) and later IBC/CBC seismic provisions	~25%	Lower vulnerability — incorporates strength design, drift limits, redundancy, updated hazard maps

Source: Santa Cruz County Assessor's Roll; Seismic Code Benchmarks from UBC/CBC/IBC history

Newer construction under CBC/IBC standards provides stronger protection against seismic forces. For the large share of older structures that predate modern code requirements, the County's role will focus on public education, outreach, and incentives to encourage homeowners to pursue voluntary retrofits. By providing information on available programs, technical guidance, and potential funding opportunities, the County can help reduce seismic vulnerability in existing housing stock while ensuring new development continues to meet updated code standards.

3.2.3.9.3 Critical Facilities & Infrastructure

All of the critical facilities and infrastructure in the county would be exposed to strong, very strong, or severe shaking during a major earthquake, such as the M7.1 San Andreas Earthquake scenario. Notably, a significant portion of essential, high-potential-loss, and hazardous materials facilities would be subject to severe shaking during such an event, including five fire stations and two dams, potentially driving up casualties and damage due to disruptions to emergency services and the triggering of secondary hazards like dam failures or hazardous material releases. In addition, over 3,000 miles of critical infrastructure is exposed to shaking, including roadways, transmission lines, sewer lines, and natural gas pipelines. Damage to these systems would not only disrupt mobility and emergency response during and after the event but could also contribute to additional hazards such as downed power lines, urban fires, and environmental contamination.

During a major earthquake event, many facilities and miles of infrastructure would also be exposed to fault rupturing and liquefaction, adding significant ground-failure risk under the assets needed for response and

recovery. About 900 miles of lifelines and almost 1,000 critical facilities lie in moderate to very high liquefaction areas, including roads, bridges, and sewer lines and nine fire stations. Within fault zones of required investigation, almost 300 miles of lifelines and about 450 facilities fall in county delineated areas, and over 100 miles of lifelines and a little under 400 facilities in state regulatory areas.

By virtue of Santa Cruz County's unique geographic attributes, there is the possibility of the county becoming an "island" after a major seismic event. For example, if State Routes 1, 9, 17, 129, and 152 were to be shut down due to earthquake damage (e.g., landslides), the county would affectively be isolated. This would be further exacerbated if the main water treatment facilities in Santa Cruz and Watsonville sustained significant damage and went offline, as Santa Cruz County is entirely reliant on local water supplies.

The exposure of levees to earthquake is notably intense, with 19 miles exposed to very strong or severe shaking during the M7.1 San Andreas earthquake scenario as well as high or very high liquefaction, and 3.6 miles in county fault zones where ground rupture may occur.

These exposures indicate a large portfolio where geotechnical investigation, seismic detailing (e.g., flexible joints, ground improvement), and retrofit prioritization will be required to maintain lifeline function and prevent secondary hazards such as dam or levee failure after a major event. Table 3-36 and Table 3-37 summarize the critical infrastructure and facilities susceptible to shaking during the M7.1 San Andreas Earthquake scenario. Table 3-38 and

Table 3-39 summarize the exposure of county assets susceptible to fault zones and liquefaction.

Table 3-36: Santa Cruz County Critical Infrastructure Susceptible to Earthquake Scenario Shaking

Lifelines (miles) - M7.1 N. San Andreas Santa Cruz Mtn			
Infrastructure Type (Linear)	VI-Strong	VII-Very Strong	VIII-Severe
County Maintained Roads*	106.4	336.3	145.1
Levee	-	8.8	10.0
Maintained Channel	2.5	33.9	15.3
NG Pipeline	11.5	26.8	2.7
Railroad	15.9	15.2	-
Sanitation Pipe	50.0	155.3	10.9
All Roads	476.5	1,291.6	517.3
Alley	1.0	1.5	-
Drive	135.4	329.4	124.4
Major Road	70.0	173.9	96.1
Ramp	0.3	14.5	0.1
Street	187.5	641.1	225.8
State Highway	31.9	60.7	28.9
Unnamed	50.5	70.5	41.9
Transmission Line	20.0	46.5	25.4

Grand Total	**682.7**	**1,914.5**	**726.7**

Table 3-37: Santa Cruz County Critical Facilities Susceptible to Earthquake Scenario Shaking

Critical Facilities - N. San Andreas Santa Cruz Mtn			
Facility Type	VIII - Severe	VII - Very Strong	VI - Strong
Essential Facilities	6	23	10
Fire Station	5	15	9
Hospital	-	2	-
Law Enforcement	1	4	1
EOC	-	1	-
American Medical Response	-	1	-
High-Potential-Loss	58	366	125
Adult Care Facility	8	22	7
Child Care Center	3	39	8
Cell Tower	16	61	24
County Real Property Asset	14	118	47
Dam	2	1	4
Healthcare Facility	-	14	1
Historic Building	-	6	1
Library	-	4	1
Mobile Home Park	2	41	20
Power Generation	-	1	1
Radio Sites	3	11	4
School	10	48	7
Transportation and Lifeline	1276	2013	477
Airport	-	1	2
Substation	1	8	6
NG Station	-	-	2
Church	4	46	7
Stormwater Culvert	1242	1819	414
Parks	7	42	26
Bridge NBI	22	97	20
Hazmat	42	271	58
HWTS Active Facility	38	250	50
Geotracker Cleanup Site	4	21	8
Grand Total	**1382**	**2673**	**670**

*Notes: *Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

Table 3-38: Santa Cruz County Critical Infrastructure Susceptible to Faults and Liquefaction

	Liquefaction Susceptibility				Zone of Investigation County Delineated	Zone of Investigation State Regulatory
Infrastructure Type (Linear)	Very High	High	Moderate	Low		
County Maintained Roads*	30.2	45.0	41.7	170.9	49.4	32.6
Levee	17.7	0.7	-	0.3	3.6	-
Maintained Channel	22.9	10.2	2.9	7.4	8.3	0.4
NG Pipeline	2.1	2.7	3.1	25.9	0.9	-
Railroad	2.6	0.7	1.7	17.0	-	-
Sanitation Pipe	10.1	15.5	3.9	149.5	4.6	1.5
All Roads	79.7	116.9	116.8	497.9	195.4	83.8
Alley	0.8	0.1	0.5	0.9	-	-
Drive	15.0	33.0	27.4	132.5	46.7	18.4
Major Road	21.5	37.3	17.7	72.8	35.7	22.6
Ramp	3.4	2.0	-	6.9	-	0.0
Street	23.2	30.8	54.8	226.3	83.9	31.8
State Highway	10.0	7.5	9.2	25.2	13.0	3.9
Unnamed	5.8	6.2	7.2	33.3	16.0	7.1
Transmission Line	4.3	6.1	3.3	25.3	10.1	3.4
Grand Total	**169.5**	**197.8**	**173.4**	**894.3**	**272.1**	**121.7**

Table 3-39: Santa Cruz County Critical Facilities Susceptible to Faults and Liquefaction

	Liquefaction Susceptibility				Zone of Investigation County Delineated	Zone of Investigation State Regulatory
Facility Type	Very High	High	Moderate	Low		
Essential Facilities	2	4	6	11	3	2
Fire Station	2	3	4	5	3	2
Hospital	-	-	-	2	-	-
Law Enforcement	-	1	2	3	-	-
EOC	-	-	-	1	-	-
American Medical Response	-	-	-	-	-	-
High-Potential-Loss	28	62	54	246	23	14
Adult Care Facility	2	3	1	25	3	2
Child Care Center	4	3	7	25	-	-
Cell Tower	1	5	3	38	6	6
County Real Property Asset	16	35	16	76	9	1
Dam	-	2	-	-	-	2
Healthcare Facility	-	1	1	10	-	-

Historic Building	-	1	2	2	-	-
Library	-	-	1	1	-	-
Mobile Home Park	2	3	13	30	1	-
Power Generation	-	-	-	1	-	-
Radio Sites	1	1	1	5	1	1
School	2	8	9	33	3	2
Transportation and Lifeline	177	322	233	526	413	353
Airport	-	-	-	2	-	-
Substation	-	1	-	10	1	-
NG Station	-	-	-	-	-	-
Church	6	5	16	17	3	1
Stormwater Culvert	133	302	193	457	389	349
Parks	10	2	6	32	6	1
Bridge NBI	28	12	18	8	14	2
Hazmat	36	25	39	201	15	3
HWTS Active Facility	31	24	38	181	14	3
Geotracker Cleanup Site	5	1	1	20	1	-
Grand Total	**243**	**413**	**332**	**984**	**454**	**372**

**Real Property Assets are digitized asset lists for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

3.2.3.10 Development Trends

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides and many rural villages and towns. As dictated by the 1978 Growth Management Ordinance, Measure J, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs has resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available; other development is mostly in-fill or reuse development, and development of existing rural residential properties.

Growth management policies including the Geologic Hazards Ordinance limit development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards. Seismic safety standards are a requirement for all building permits, and as infrastructure is repaired or replaced, updated seismic safety standards are incorporated. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks and other requirements to mitigate potential impacts from earthquake and liquefaction hazards. The Environmental Planning Section of the Planning Department, staffed by resource planners, specializes in reviewing each application for new residential and commercial structures to ensure that new development does not occur in earthquake and liquefaction hazards and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified earthquake and liquefaction hazards.

No changes in these development regulations or patterns occurred that would affect the county's overall vulnerability since the previous plan was adopted. As noted above, most new development of residential structures and virtually all new development of commercial structures occurs within the urban services line, and always outside of the highest risk earthquake hazard areas.

3.2.3.11 Earthquake Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing earthquake-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with earthquake. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-40 presents the earthquake hazard problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in in Table 4-1 and Table 4-2

Table 3-40: Santa Cruz County Earthquake Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Earthquake	Victim	ps-EQ-SCC-01	With no major earthquake since 1989, many residents lack urgency or awareness about seismic risks and are unprepared with basic safety knowledge, emergency supplies, or gas shutoff procedures.	ma-AH-SCC-09
Earthquake	Victim	ps-EQ-SCC-02	Residents of mobile homes face outsized seismic vulnerability. Units are often unsecured, lack seismic bracing, and house low-income or elderly residents with limited preparedness resources.	ma-EQ-CPT-02
Earthquake	Impact	ps-EQ-SCC-03	A major seismic event could damage bridges and hillside roads, particularly in slope failure?prone areas, cutting off access, isolating entire neighborhoods, and impeding emergency response. Coastal and hillside zones with soft soils or steep terrain are also at risk for liquefaction and slope failure during seismic shaking.	ma-EQ-CPT-03
Earthquake	Impact	ps-EQ-SCC-04	A major earthquake could damage essential County-owned and operated facilities, many of which are in need of seismic retrofit including emergency shelters, fire stations, jails, and communications infrastructure, disrupting critical services delivery.	ma-EQ-CPT-01

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Earthquake	Threat	ps-EQ-SCC-05	Many older residential and commercial buildings throughout the county have not been seismically upgraded, posing threats to occupants and adjacent properties during strong earthquakes.	ma-EQ-CPT-02
Earthquake	Threat	ps-EQ-SCC-06	A major seismic event could disrupt aging water, sanitation, and stormwater infrastructure, including above- and below-ground lines, storage tanks, pump stations, treatment facilities, and septic systems.	ma-AH-SCC-06
Earthquake	Threat	ps-EQ-SCC-07	The county?s water systems are vulnerable to disruption during a major earthquake, with no connection to the State Water Project and only two large capacity treatment facilities, each with limited intertie capacity (Watsonville and Graham Hill). These constraints highlight the need for stronger planning and coordination, as existing interties and treatment capacity are insufficient to ensure service continuity in a widespread seismic event.	ma-AH-SCC-06, ma-AH-SCC-08

3.2.3.12 Climate Change Impacts & Vulnerable Populations

Unlike hazards such as flooding, wildfire, and drought, earthquakes are not directly influenced by climate change. However, climate change can compound earthquake impacts by stressing the same populations and systems that are most vulnerable to seismic risk. Residents living in older, unretrofitted housing, mobile homes, or low-income communities already face disproportionate earthquake risks, and these same groups are often more exposed to climate-driven hazards like extreme heat, wildfire smoke, or flooding. Repeated climate stressors can erode financial stability, limit access to insurance or retrofitting resources, and reduce community capacity to prepare for and recover from seismic events. In this way, climate change intensifies underlying social vulnerabilities, making recovery from earthquakes more difficult for disadvantaged and dependent populations.



Severe Weather

3.2.4 Severe Weather Hazard Profile



Severe weather refers to any hazardous atmospheric event with the potential to cause physical damage, social disruption, or loss of life. This includes thunderstorms, downbursts, heavy rain, snowstorms, ice storms, strong winds, and other extreme weather conditions. Winter weather, such as freezing temperatures, snow accumulation, and black ice, is a key component of severe weather in Santa Cruz County, particularly in higher elevation areas.

Severe weather events can be categorized into two types. Those that affect broad geographic regions, such as Pacific Northwest windstorms or large-scale winter storms, are classified as general severe weather. Events with a more confined area of impact, such as isolated thunderstorms or localized snow squalls, are considered localized severe weather.

The most significant secondary hazards associated with severe weather in the planning area include flooding, downed trees, landslides, power outages, and, in some cases, increased wildfire risk following wind-driven damage or infrastructure failure.

3.2.4.1 Subhazards

For Santa Cruz County, there are specific subhazards of severe weather that are more relevant to the planning area than others. This includes high wind, heavy rain and winter weather, which are profiled as part of this section, but it also includes mention of thunderstorms, hail and tornadoes.

High Wind

Damaging winds are classified as those exceeding 60 mph. Damage from such winds accounts for half of all severe weather reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can exceed 100 miles per hour (mph) and can produce a damage path extending for hundreds of miles. There are seven types of damaging winds:

- **Straight-Line Wind:** Any thunderstorm wind that is not associated with rotation; this term is used primarily to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- **Downdraft:** A small-scale column of air that rapidly sinks toward the ground.
- **Downburst:** A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microburst:** A small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are both wet and dry microbursts:. A wet microburst is

accompanied by heavy precipitation. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.

- **Gust Front:** A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- **Derecho:** A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of the boundary formed by horizontal spreading of thunderstorm-cooled air. The word "derecho" is of Spanish origin and means "straight ahead." Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.
- **Bow Echo:** A bow echo is a linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

Wind is classified by the National Renewable Energy Laboratory (NREL) based on average speeds across the ground at different elevations in meters per second (m/s) and the amount of power it is capable of producing (wind power density), as provided in Table 3-41. The same wind event exhibits various speeds depending on elevation because of differences in the amount of friction encountered in proximity to the Earth's surface; this is most often measured at 10 and 50 meters above grade, or 33 and 164 feet, respectively. According to the Rayleigh wind speed distribution principle, speed increases 3% per 1,000 meters in elevation (or 5% per 5,000 feet). Power density is measured in the amount of watts (W) that can be produced per square meter (m^2) of surface area on the blades of a wind turbine.

Table 3-41: Classes of Wind Power

Wind Power Class	10 m (33 ft)		50 m (164 feet)[1]	
	Wind Power Density W/m^2	Mean Speed[2] m/s (mph)	Wind Power Density W/m^2	Mean Speed[2] m/s (mph)
1	≤ 100	4.4 (9.8)	≤ 200	5.6 (12.5)
2	100-150	5.1 (11.5)	200-300	6.4 (14.3)
3	150-200	5.6 (12.5)	300-400	7.0 (15.7)
4	200-250	6.0 (13.4)	400-500	7.5 (16.8)
5	250-300	6.4 (14.3)	500-600	8.0 (17.9)
6	300-400	7.0 (15.7)	600-800	8.8 (19.7)
7	>400	9.4 (21.1)	>800	11.9 (26.6)

Notes: [1]Vertical extrapolation of wind speed based on the 1/7 power law. [2]Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density and is for standard sea level conditions.

Source: NREL, 2007

Heavy Rain

As storms arrive onto land from the Pacific and rise over the mountains and ridges that border the eastern boundaries of the county, the air associated with those storms cools and that cooling results in large amounts of precipitation, also known as orographic lift. The topography of the Santa Cruz Mountains provides fairly steep and well-defined watershed areas to funnel the falling rain into runoff tributaries and potentially trigger flood hazards.

Heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction, and landslides can occur when the soil on slopes becomes oversaturated and fails. In Santa Cruz County, heavy rain events are common from November to April. These heavy rainstorms, often associated with an "atmospheric river" event, can deliver over one inch of rain per hour for extended time frames.

Atmospheric rivers are relatively long, narrow regions in the atmosphere (i.e., rivers in the sky) that transport water vapor, mostly from the tropics. While these rivers can vary greatly in size and strength, the average atmospheric river carries an amount of water vapor roughly equivalent to the average flow of the Mississippi River, but exceptionally strong rivers can transport up to 15 times that amount. When the atmospheric rivers make landfall, it typically releases this water vapor in the form of rain or snow. These events can disrupt travel, induce slope failures, and cause damage to life and property. A well-known referential terms for this phenomenon is the "Pineapple Express," which is a strong atmospheric river that brings moisture from the tropics near Hawaii to the West Coast. A singular or series of atmospheric rivers can cause significant damage and flooding. In 2023, more than two dozen atmospheric rivers caused two federally declared disasters. In 2024 it was one major atmospheric river that caused a federally declared disaster

Flash floods are the leading cause of heavy rain-related fatalities. Further, the presence of burn scars from



Figure 3-40: Flooding from February 2024 Severe Weather Event
Source: Santa Cruz County

previous wildfires, such as those left by the 2020 CZU Lightening Complex Fires, increases runoff and flood risks in vulnerable areas. Heavy rain and flash flooding can affect vulnerable populations such as residents living near burn scars or in low-lying areas and tourists and hikers unaware of flash flood risks in remote, mountainous areas. Impacts on property and critical infrastructure include temporary road closures as well as damage to roads, bridges, and structures. Water treatment plants and electrical substations located near waterways are particularly vulnerable.

For more information on the secondary impacts caused by heavy rain, such as flooding, refer to the Flood and Slope Failure Hazard Profiles in Sections 3.2.2 and 3.2.6, respectively.

Winter Weather

Although infrequent, winter weather events do occur in Santa Cruz County and can pose significant hazards, particularly in the higher elevations of the Santa Cruz Mountains. These events are typically associated with the passage of cold frontal systems or incursions of Arctic air masses that result in overnight temperatures dropping below freezing. Impacts may include frost, black ice, freezing rain, and, in rare cases, light snowfall.

Despite their rarity, freezing conditions have historically caused hazardous travel conditions, infrastructure stress, and public health risks. Black ice has led to roadway closures on major routes such as Highway 17, and extreme cold has contributed to life-threatening situations, especially among vulnerable populations lacking adequate heating. These low-probability but high-impact events highlight the need to include winter weather in the county's hazard mitigation strategy.

Other Subhazards

Severe Thunderstorms

Severe thunderstorms can cause both high wind and heavy rain, as well as hail and tornadoes; however, they are not highlighted as a severe weather subhazard in this profile since the primary impact of thunderstorms in Santa Cruz County is the potential spread of wildfire, which is described in more detail in Section 3.2.1.

Hail

Hail is a form of precipitation consisting of solid ice that is formed inside the updraft of a thunderstorm. Small ice particles and supercooled water droplets that are lifted into a thunderstorm by its updraft can combine before falling into the storm's downdraft. Then, if the updraft is strong enough, these hail stone "seeds" can be recycled back up above the freezing level in the storm to accumulate additional ice and water. It is the repeating of this process numerous times that produces larger and larger hail stones. Once a stone is too big for the updraft to hold it up in the storm, it will fall to the ground. To be categorized as severe, hail must reach a size of one inch in diameter or larger.



Figure 3-41: December 2024 Scotts Valley Tornado Damage along Mt. Herman Road

Source: National Weather Service

Hail is a dangerous product of thunderstorms, with stones as large as grapefruit in supercell thunderstorms. Large hail can damage aircraft, homes and cars, and can be deadly to livestock and people. Hail is categorized between a quarter-inch diameter or "pea" size, up to grapefruit at four-and-a-half inches. Hail is extremely rare in Santa Cruz County but has occurred in the past, such as an event in 2017 that caused $5 million in property damage.

Tornado

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground and is visible only if it forms a condensation funnel made up of water droplets, dust, and debris. The Enhanced Fujita (EF) Scale is used to classify tornado intensity based on the damage they cause. It ranges from EF0 (no damage) to EF5 (extensive damage), with each category defined by specific wind speed ranges and the corresponding damage expected at those wind speeds to particular types of construction. However, this classification system fails to capture the strength of tornadoes that do little to no structure damage, even when they might otherwise be categorized high on the scale.

Although tornadoes are a rare event in Santa Cruz County, they do occur. On December 14, 2024, an EF1 tornado with peak winds estimated at 90 mph struck in the Scotts Valley area, causing significant damage and several injuries (Figure 3-41).

3.2.4.2 Policies, Plans & Regulatory Environment

There are very few formal regulations that pertain directly to severe weather events. The California Building Standards Code, adopted by the county and other participating jurisdictions, is generally adequate to properly address development impacts from severe weather events.

California Building Standards Code

The California Building Code (CBC), adopted by Santa Cruz County, is another name for the body of regulations known as the California Code of Regulations, Title 24, Part 2, which is a portion of the California Building Standards Code. The CBC incorporates by reference the International Building Code (IBC) requirements with necessary California amendments.

3.2.4.3 Past Events

Severe weather events between 2000 and 2025 are summarized in Figure 3-42, as recorded by the National Oceanic and Atmospheric Administration (NOAA) through news reports, law enforcement officials and trained weather spotters. The most common severe weather event in Santa Cruz County is high or strong wind, followed by hail and dense fog. However, impacts from heavy rain in the county are more accurately captured as flooding, including localized urban flooding due to inadequate drainage systems as well as riverine and coastal. See the Flood Hazard Profile in Section 3.2.2 for records of past flood events.

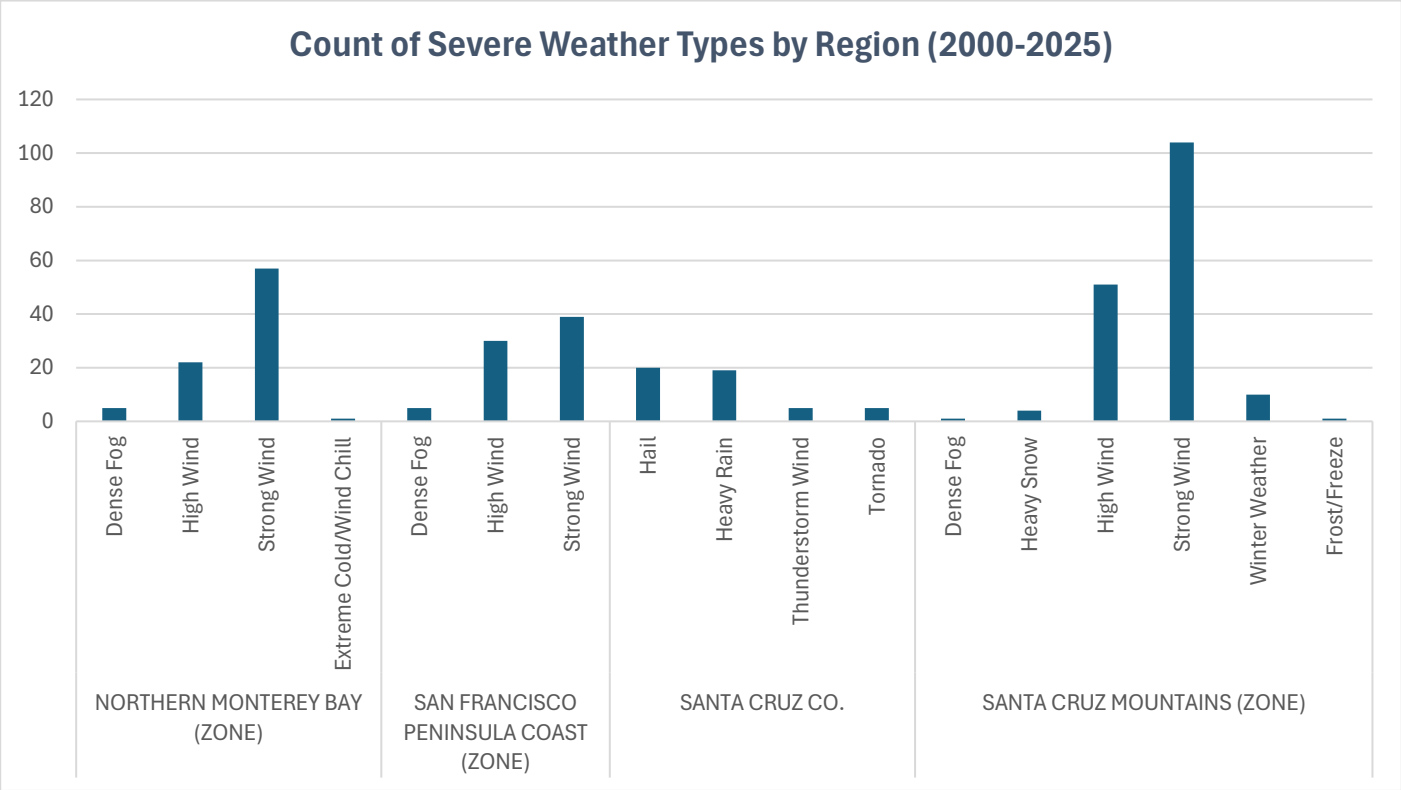


Figure 3-42: Severe Weather Events Recorded by NOAA

Source: NOAA Storm Events Database

High Wind & Tornado Events

- 2016–2018 – Tornadoes and funnel clouds reported near Santa Cruz; scattered severe thunderstorms produced hail, strong winds, and minor flooding.
- 2017–2019 – Offshore wind events produced gusts >100 mph (Mt. St. Helena, Santa Cruz Mountains). The Kincade Fire (2019) driven by 102 mph gusts forced massive evacuations.
- 2020 – Rare August lightning storms triggered hundreds of wildfires, producing the worst air quality in the world at one point.
- 2021 – Unusual January offshore wind event produced gusts up to 90 mph in the Santa Cruz Mountains, sparking winter wildfires.
- 2022 – September heat dome brought record-breaking temps (110°F+) and widespread outages; cooling centers opened across Santa Cruz County.
- 2023–2024 – Multiple high wind warnings associated with cyclones and atmospheric rivers (ARs), causing widespread tree damage and outages.
- 2024 – Confirmed EF1 tornado in Scotts Valley (Dec 14), the first in decades; coincided with bomb cyclone impacts.

Heavy Rain & Atmospheric Rivers

- 2017 – Series of three atmospheric rivers (Jan 2–23): widespread flooding, debris flows, wind, hail, lightning, snow >2500 ft, reservoir overtopping.
- 2019 – Multiple atmospheric rivers with heavy rain, 10"+ in Santa Cruz Mountains; fatalities from downed trees (Highway 17) and car accidents.
- 2021 – atmospheric rivers (Jan 26–29): 15–20" rainfall, Highway 1 collapse at Rat Creek, widespread flooding, power outages, millions in damages in Santa Cruz County.
- 2022–2023 – atmospheric rivers (Dec 26–31 (2022) and Jan–Mar (2023)) led to repeated flooding, debris flows, landslides, widespread power outages (180,000+ customers).
- 2024–2025 – Successive atmospheric rivers and bomb cyclones caused record rainfall and flooding, school closures, evacuations, and large-scale power outages.

Winter Weather Events

- 2009 – Freezing conditions from a winter storm caused black ice and hazardous road conditions in the Santa Cruz Mountains. The southbound lane of Highway 17 near Bear Creek Road was closed due to black ice. A cold air mass led to freezing overnight temperatures, tying or setting record lows at Santa Cruz, Salinas, San Rafael, and Moffett Field.
- 2013 – A prolonged stretch of cold weather brought consecutive days of sub-freezing temperatures across the region. One fatality occurred due to carbon monoxide poisoning from improper indoor heating during the cold snap.
- 2019 – A strong winter storm brought low snow levels and rare snowfall to lower elevation peaks in the Santa Cruz Mountains. Road closures were reported at Empire Grade and Ice Cream Grade due to accumulating snow. Rain and snow mix triggered localized roadway flooding and debris flows.

- 2023 – A strong occluded front caused widespread precipitation and unusually low snow levels, with snow accumulating as low as 1,000 feet. Highway 17 was closed for over 12 hours due to heavy snow, fallen trees, and a jackknifed truck. Snow accumulations reached 10–12 inches in higher elevations.
- 2024 – Winter storms associated with cold fronts brought snow, graupel, and icy road conditions to elevations below 2,500 feet. Multiple transportation disruptions occurred, including delayed school openings and traffic collisions due to slick roads.

3.2.4.4 Location

Severe weather events have the potential to happen anywhere in the planning area and have historically occurred in all parts of the county; although, the types of events and their impacts are not evenly distributed. Local topography and microclimates, especially within the Santa Cruz Mountains, can cause the same storm system to produce different hazardous conditions as it moves across an area and encounters more or less moisture, various temperatures, and orographic lift, which can all influence its behavior. High wind events are most damaging to areas that are heavily wooded, while heavy rain impacts are typically seen over steep terrain and in low-lying urban areas. Additionally, the trajectory of storm systems plays a significant factor. Storms coming in directly off the Pacific Ocean tend to bring more moisture, while storms coming in from the south over the Santa Lucia Range in Monterey County tend to bring less moisture.

Figure 3-44 shows the distribution of average annual rainfall in Santa Cruz County, and Figure 3-45 depicts average annual wind speed by power class (refer to Table 3-41).

Winter weather impacts in Santa Cruz County are most prevalent in the higher elevation areas of the Santa Cruz Mountains, including communities such as Ben Lomond, Boulder Creek, and Lompico. These regions regularly experience overnight temperatures at or below freezing during winter months, occasionally resulting in snow, frost, or black ice. Lower elevation areas, including Watsonville and coastal zones, experience freezing temperatures far less frequently but are still vulnerable during cold snaps.

Analysis of local weather station data from 2000 to 2023 shows that Ben Lomond consistently records more days with minimum temperatures below 34°F than Watsonville, confirming the higher susceptibility of inland mountain communities to extreme cold (See Figure 3-43). In some years (e.g., 2007–2008), Ben Lomond recorded more than 35 freezing days, while Watsonville had significantly fewer. The annual minimum temperatures at both stations also reflect this trend, with colder extremes observed consistently in Ben Lomond.

The County uses 34°F as the threshold for activating warming centers, prioritizing the safety of unsheltered and vulnerable populations. This threshold is routinely met or exceeded in mountain communities during the winter season, reinforcing the importance of localized cold-weather preparedness efforts in these areas.

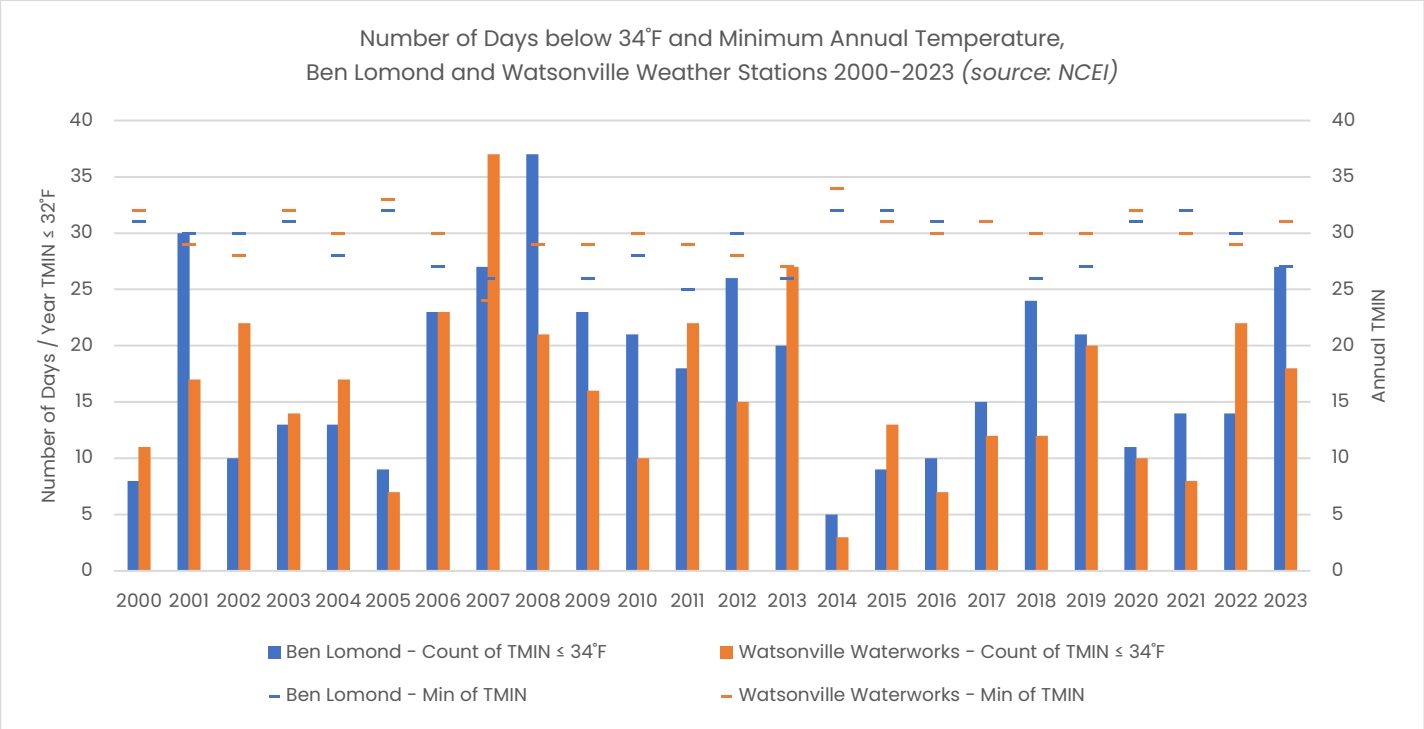


Figure 3-43: Minimum Annual Temperatures

3.2.4.5 Frequency & Probability of Future Events

Severe weather events for Santa Cruz County are most often related to high winds, heavy rain, and hail, as shown Figure 3-42. These events occur regularly throughout a typical year and will continue to occur in the county. However, as demonstrated over the past decade, climate change is driving an increased frequency in more extreme weather events. This is especially true in Santa Cruz due to its location on the coast and influences from a warming Pacific Ocean, as discussed in more detail in the Climate Change Hazard Profile (Section 3.2.10).

3.2.4.6 Severity

Severe weather poses significant hazards in Santa Cruz County, particularly during the winter months. While tornadoes are extremely rare, the region is regularly affected by damaging winds, heavy rain, hail, and winter weather, including extreme cold, black ice, and occasional snowfall at higher elevations. These hazards can lead to property damage, widespread power outages, and significant transportation disruptions. The most common impacts include loss of utilities and restricted mobility. Roads may become impassable due to flooding, downed trees, snow accumulation, or slope failures triggered by intense rainfall or high winds. Although fatalities are uncommon, they can occur, especially during extreme cold events or hazardous driving conditions.

High Wind

The most common impact of high wind is power outages due to downed or damaged power lines, causing interruptions to critical services, such as emergency response, or to utilities lacking backup power, such as water or communications. These impacts can be localized or widespread, depending on the type of event.

High-wind events occur multiple times per year, particularly along the coast, in exposed valleys, and in constricted canyons and mountain passes. Windstorms in the county are rarely life-threatening but do disrupt daily activities. Strong winds can cause significant damage, uprooting trees and causing power outages and structural damage to buildings. Wind-driven wildfires are also a major concern, as high winds can rapidly spread flames. Other impacts of high winds can be erosion, crop damage, and building damage, primarily to roofs. It is important to note that the predicted wind speed given in wind warnings issued by the NWS is for a one-minute average; gusts may be 25 to 30% higher.

The highest wind gusts to occur in Santa Cruz County were during a major windstorm in March 2023, recorded at a maximum of 97 mph at a weather station on top of Loma Prieta, the highest peak in the Santa Cruz Mountains.

Heavy Rain

Heavy rain alone is rarely life-threatening, but it often triggers other hazard events that can cause serious injury or death and extensive property damage, such as slope failures and localized flash flooding, particularly in burn scar areas from previous wildfires. Of particular concern in Santa Cruz County is heavy rain's impacts on urbanized areas with inadequate drainage infrastructure, mountainous terrain susceptible to slope failure, and erosion and sedimentation within vulnerable watersheds.

One of the heaviest rain events recorded in recent years in Santa Cruz County was during an atmospheric river event in October of 2021, which dumped 9.6 inches of precipitation over a 48-hour period in the Ben Lomond area of the mountains in the northern part of the county. A parade of atmospheric rivers between December 2022 and January 2023 deposited about half of the county's typical annual precipitation in the span of just a few weeks, with total accumulation ranging from 13.8 inches in the southern portion of the county to 36.2 inches in the Boulder Creek watershed. (NWS, 2023) Both of these heavy rain events triggered secondary hazards, including debris flows, erosion, and other slope failures, within the 2020 CZU Lighting Complex Fire's 85,000-acre burn scar underlying the areas that received the most rainfall.

Winter Weather

Winter weather in Santa Cruz County is typically moderate in severity but can lead to high localized impacts, particularly in the Santa Cruz Mountains. Events involving snow, black ice, and freezing temperatures have caused road closures, power outages, and hazardous driving conditions. While widespread damage is uncommon, impacts to transportation and utilities are routine during major storms. Extreme cold can also pose health risks, especially to unsheltered or vulnerable populations. Overall, winter weather is rated as moderate in severity, with periodic high-consequence events in elevated areas.

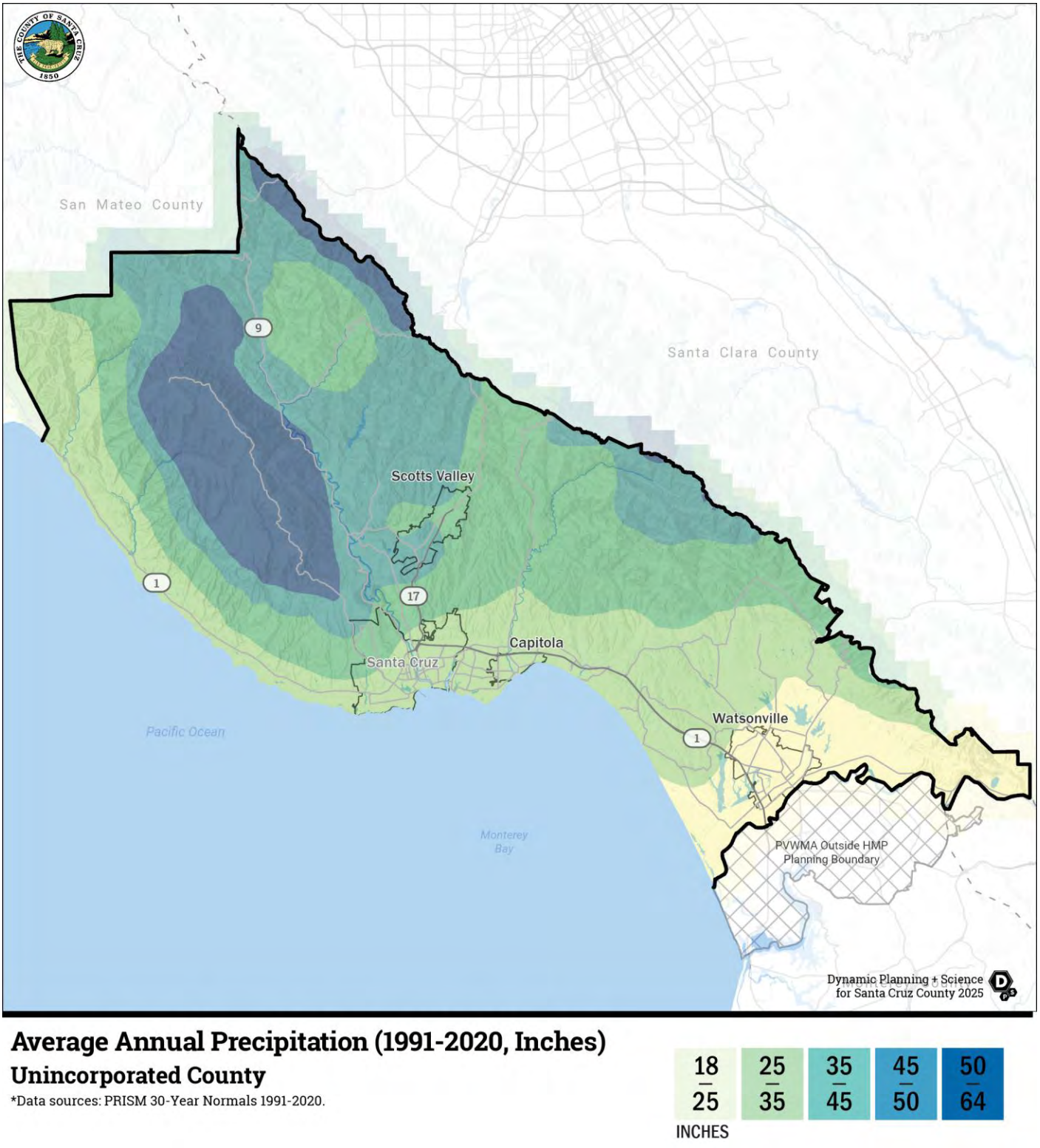


Figure 3-44: Santa Cruz County Average Annual Precipitation, 1991-2020

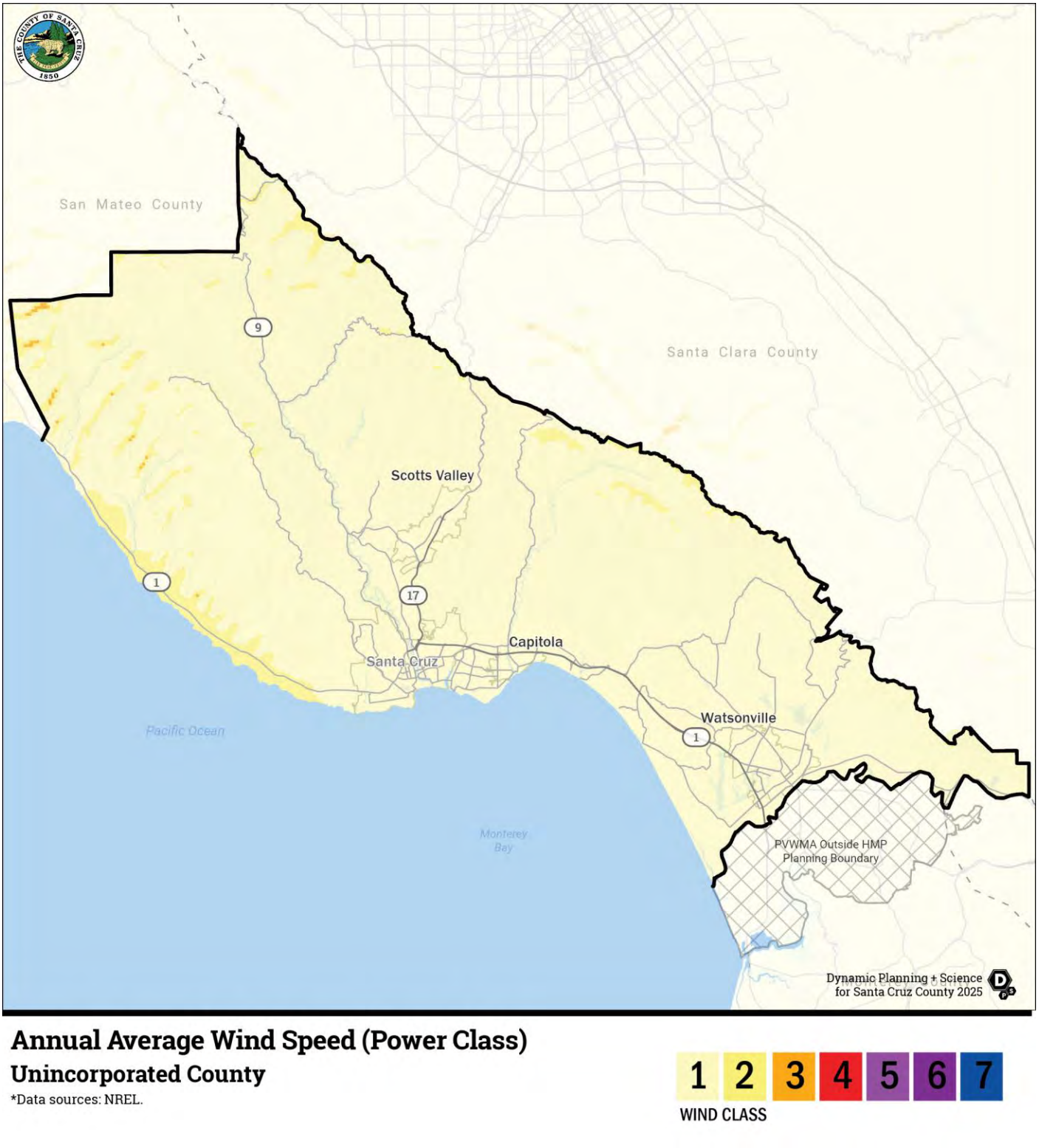


Figure 3-45: Santa Cruz County Annual Average Wind Speed

3.2.4.7 Warning Time

Meteorologists can often predict the likelihood of a severe storm up to 10 days in advance. This can give several days of warning time. However, weather systems can stall or shift trajectory, thus making it difficult to predict total precipitation at specific locations. Further, some storms may come on more quickly and have only a few hours of warning time. High wind and heavy rain events can typically be predicted a few hours to a few days in advance, depending on the characteristics of the underlying severe weather system.

The ability to provide early warning for severe weather hazards in Santa Cruz County depends on monitoring systems, weather radar, and alert services. The region benefits from forecasting tools provided by the NWS, NOAA, and local emergency management agencies, which use weather stations, stream gauges, weather radar, and satellite data to issue timely warnings for hazards.

Santa Cruz County is served by the NWS San Francisco Bay Area/Monterey forecasting office located next to the Monterey Regional Airport and Naval Research Laboratory in Monterey County (Figure 3-46). The office serves a total of 11 counties throughout the San Francisco and Monterey Bay regions with a population of more than eight million residents. Radar coverage in Santa Cruz County is primarily provided by an NWS-operated, next generation WSR-88D radar (KMUX) located on Mount Umunhum northeast of the county just south of the San Jose Metro Area. In addition, the county operates a high-resolution X-band radar in Live Oak, filling gaps in low-elevation coverage and improving detection of localized heavy rain by providing near real-time rainfall intensity updates.

Even with the proximity of the two radars, weather prediction and real-time observation in the county face challenges due to its mountainous terrain. To further close gaps in severe weather prediction, the county



Figure 3-46: NWS San Francisco Bay Area/Monterey Forecasting Office

integrates several other data sources for warnings, especially heavy rain, including real-time rainfall and stream gauges operated by county Public Works Department, USGS, and NWS on the San Lorenzo River, Scott Creek, and Pajaro River. The California–Nevada River Forecast Center (CNRFC) also provides projected riverine flood stages, and the NWS Monterey office issues alerts for high surf, king tides, and storm surge.

CruzAware Notification System

CruzAware is Santa Cruz County's official alert and notification system. It is administered by the County Office of Response, Recovery and Resilience (OR3) and is designed to provide residents and visitors with timely warnings and information during emergencies. Notifications are sent by text message, telephone, or email and address a range of hazards including high wind or flooding from heavy rain, as well as other public safety threats and evacuation notices.

For severe weather, CruzAware serves as a primary tool for delivering warnings before hazardous conditions develop. Depending on the situation, alerts may be issued hours or only minutes in advance. These notifications can include evacuation instructions, shelter locations, sandbag distribution sites, and road closure information. The system is capable of targeting specific neighborhoods or hazard zones so that alerts are relevant to those directly at risk.

The system works in coordination with other county resources, such as the S.A.F.E.R. dashboard and real-time weather monitoring systems, to support comprehensive hazard communication. The county also partners with the NWS to disseminate official watches and warnings. NWS alerts are automatically issued through the Wireless Emergency Alerts (WEA) system to mobile devices in affected areas, providing rapid notification without the need for prior registration. More information about CruzAware, including how to register, is available at santacruzcountyca.gov/CruzAware.

One Rain System

The county operates a real-time rainfall and stream gauge platform powered by OneRain, available at santacruz.onerain.com. This system integrates data from ground sensors such as rain gauges and river-stage monitors with other weather feeds to display current and historical rainfall totals, stream levels, and modeled flood conditions. Users can view data over various time intervals, such as 15-minute, hourly, daily, or weekly trends, to better understand storm intensity and watershed response. During heavy rain or flash flood situations, the platform supports faster recognition of rising water levels and more informed decision-making on road closures, evacuations, and other protective actions.

3.2.4.8 Severe Weather Vulnerability Assessment

Recent history indicates that Santa Cruz County has a high vulnerability to severe weather events due to its proximity to the Pacific Ocean and mountainous topography. Severe weather will continue to impact the people, properties, and critical facilities and infrastructure all across the county to varying degrees, causing damage and potentially threatening lives.

3.2.4.8.1 Population

It can be assumed that the entire planning area is exposed to some degree of severe weather events. However, certain locations face greater risk due to their geographic setting and local climate conditions.

Vulnerable population groups such as older adults, people living in older housing, low-income households, individuals who speak limited English, those with serious health conditions, and residents in areas with restricted access are at the highest risk of severe weather impacts. Extended power outages can pose life-threatening risks for individuals who rely on electricity for medical support, and cold temperatures can endanger those without reliable shelter or heating. Isolation of these populations during winter storms is a significant concern, as it may hinder access to warming centers, emergency services, and life-sustaining resources.

Winter Weather

Populations living at higher elevations, such as those in the Santa Cruz Mountains which reach to over 3,000 feet above mean seal level., are more susceptible to winter weather, including freezing temperatures, snowfall, and icy road conditions, as well as power outages during winter storms from high wind. Mountain communities located in northern Santa Cruz County and along the Santa Clara County border receive upwards of 45 inches of precipitation annually, which can occasionally fall as snow, sleet, or freezing rain due to the elevation. These consist of the City of Scotts Valley and the unincorporated communities of Ben Lomond, Bonny Doon, Boulder Creek, Felton, Lompico, and Mount Hermon. Especially since winter weather is infrequent in the county, its impacts are outsized compared to communities that receive snowfall regularly. In addition, those without adequate shelter are especially vulnerable to winter weather. Services for these populations are concentrated in incorporated areas with warming shelter capabilities under a memorandum of understanding with the county, with specific temperature thresholds for activation.

Heavy Rain

Populations in low-lying areas and steep mountain terrain are most exposed to flooding and slope failures caused by heavy rainfall and saturated soils. These include communities located in the San Lorenzo River, Soquel Creek, and Pajaro River corridors, along with portions of Watsonville, Capitola, and Santa Cruz, which are vulnerable to various types of flooding from intense rainfall. The narrow channels and steep slopes of mountain valley communities such as Boulder Creek, Ben Lomond, and Lompico, are exposed to flood risk as well as increased landslide susceptibility during heavy rain events. Coastal neighborhoods, particularly in Capitola, Seacliff, La Selva Beach, and Pajaro Dunes, also host significant populations in low-lying areas susceptible to rain-induced flooding, especially when combined with other coastal hazard impact. Homes located near steep slopes or within wildfire burn scars, such as those from the CZU Lightening Complex Fire, face an increased risk of landslides and debris flows, and remote areas with limited evacuation routes may experience higher vulnerability, particularly in cases of sudden slope failures triggered by heavy rainfall.

High Wind

High wind occurs in every part of the county, but the greatest impacts are seen in communities that are heavily wooded, such as those in the mountains, and among populations most sensitive to power failures. The areas of the county that receive the highest average annual wind speeds are the northern county coastline and along mountain ridges. Although much of the northern county has a low population density, communities in the San Lorenzo Valley are highly exposed to windstorms and their impacts. In these rural areas, populations may be cut off from essential services for extended periods by downed trees or power lines in limited access neighborhoods, including from severed power, communications, and transportation infrastructure.

3.2.4.8.2 Property

All property is vulnerable during a severe weather event, but structures in poor condition or located in particularly exposed areas face a greater risk of damage. Buildings situated at higher elevations, along ridgelines, or within narrow canyons where wind is funneled are more likely to experience damage from strong winds or falling trees. Winter weather can intensify these risks, as freezing temperatures and snow accumulation may weaken structures, increase ice buildup on power lines, and contribute to hazardous conditions.

Heavy rain can saturate soils, increasing the likelihood of trees being uprooted and falling onto buildings or infrastructure. Localized flooding and slope failures can damage foundations, roads, and access points. Agricultural property is also at risk, as strong winds and heavy rainfall can damage crops, erode topsoil, and disrupt growing cycles. Winter storms that combine cold temperatures with precipitation further elevate risks for both built and natural environments.

According to the Santa Cruz County Assessor's Office, about three-quarters of the properties within the county were developed in the 1960s through 1980s, before modern building codes (Table 3-35). This means that a significant share of structures may be particularly vulnerable to severe weather damage, unless otherwise hardened. Properties located along waterways throughout the unincorporated county were often developed prior to modern setback requirements, placing structures closer to areas prone to flooding and slope failure, mainly streambank collapse, during heavy rain events.

3.2.4.8.3 Critical Facilities & Infrastructure

All critical facilities are exposed to severe weather events. Facilities located on elevated terrain or within forested areas are more susceptible to wind damage, either directly or from falling trees. However, the most significant concern during severe weather is not the structural vulnerability of facilities themselves, but rather the potential for damage to roads, utilities, communications systems, and other essential infrastructure that support facility operations.

The most frequent issues during severe weather events include power outages and the resulting cascading impacts on utility systems. Downed power lines can lead to widespread blackouts, leaving entire communities without electricity. Loss of power can also disrupt phone service, water supply, and

wastewater systems. Roads may become blocked or impassable due to flooding, fallen trees, or landslides triggered by heavy rainfall. High winds can bring down trees and power lines, obstructing transportation routes, delaying emergency response, and isolating communities.

Roadways that serve isolated areas and vulnerable populations are of particular concern, as access may be compromised during or after a storm. In addition, power and communication outages can have a disproportionate effect on seniors, individuals with medical conditions, and others who may be unable to seek help without functioning phone or transportation services. Prolonged closures of major routes can interrupt the flow of goods and services, disrupting the regional economy and delaying recovery efforts. Large, long-lasting storms can result in significant economic losses and strain on public resources.

Facilities and infrastructure in the San Lorenzo Valley and similar rural communities are the most affected by severe weather events, with these areas often going days without power or communications after a major storm. High wind events following heavy rain are particularly impactful, causing increased downed trees from flash floods, slope failure, and the failure of saturated soils, causing debris accumulations in waterways and drainage infrastructure.

Planning for power and communications backups is necessary in these areas to mitigate cascading impacts on facilities and infrastructure. Aging road and drainage infrastructure further compounds severe weather risks during heavy rainfall, and the county has undergone a culvert conditions assessment to prioritize mitigation resources to address transportation network concerns.

3.2.4.9 Development Trends

All current and future development will be affected by severe weather. However, older existing development is more susceptible than more recent development which complies with current standards.

The ability to withstand impacts lies in the consistent application and enforcement of codes and regulations for new construction. The county and other participating jurisdictions have adopted and comply with the mandated California Building Code, which is equipped to deal with the threats of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts triggered by high wind or heavy rain, such as flood and landslide. However, not unlike wildfire, the proximity of residents to forested and steep slope areas places them at elevated risk of landslides and tree fall during severe weather. These localized risks, which persist despite code requirements, underscore that regulatory tools alone do not make the community fully equipped to manage all consequences of future growth and severe weather events.

3.2.4.10 Severe Weather Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing severe weather-related vulnerabilities and challenges. The problem statements were developed based on the updated risk

assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with severe weather. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-42 presents the severe weather hazard problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2

Table 3-42: Santa Cruz County Severe Weather Hazard Problem Statements

Hazard	Sub-Hazard	Area of Concern	Problem IS	Description	Related Mitigation Actions
Severe Weather	Heavy Rain	Threat	ps-HR-SCC-01	Heavy rainfall events driven by atmospheric rivers are becoming more intense and prolonged due to climate change, overwhelming aging culverts and stormwater conveyance systems leading to road washouts, localized flooding, and infrastructure wear.	ma-HR-WTS-01
Severe Weather	High Wind	Impact	ps-HW-SCC-01	High winds frequently down trees that block critical access routes and damage power and communications infrastructure, causing extended outages and disrupting emergency and other services, while also damaging private property and creating future fire risk from downed vegetation.	ma-HW-CPT-01
Severe Weather	All	Victim	ps-SW-SCC-01	Long-duration power outages from severe weather events disproportionately affect low-income, disabled, and elderly residents who lack back-up power or access to transportation.	ma-SW-SCC-02
Severe Weather	All	Impact	ps-SW-SCC-02	Key critical lifeline facilities such as fire stations, emergency shelters, and wastewater pump stations are not consistently hardened against high wind or heavy rain events or lack reliable backup power generation, which has resulted in structural damage, service disruption, and temporary closures.	ma-SW-SCC-01

Hazard	Sub-Hazard	Area of Concern	Problem IS	Description	Related Mitigation Actions
Severe Weather	All	Threat	ps-SW-SCC-03	Localized microclimates and the interaction of weather systems with coastal mountains complicate notifications and limit advance coordination during fast-moving severe weather events, reducing situational awareness and hindering damage assessment.	ma-AH-WTS-01
Severe Weather	Winter Weather	Victim	ps-WW-SCC-01	Seniors, those with underlying health conditions, and people experiencing homelessness face heightened, and sometimes life-threatening, risks during cold winter weather events, particularly when compounded by underlying health conditions or limited access to medical care.	ma-AH-WTS-01
Severe Weather	Winter Weather	Impact	ps-WW-SCC-02	Winter weather events can cause hazardous travel conditions and stress on infrastructure from freezing rain, black ice, and sometimes snow.	ma-AH-WTS-01

3.2.4.11 Climate Change Impacts & Vulnerable Populations

Severe weather in unincorporated Santa Cruz County, including atmospheric river storms, prolonged heavy rainfall, and high wind events, is intensifying due to climate change. Warmer ocean conditions and shifting precipitation patterns increase both the frequency and severity of winter storms, while strong winds compound damage and prolonged outages. These climate-driven changes amplify risks to infrastructure, essential services, and vulnerable populations who already face barriers to preparation and recovery.

Direct Impacts: Severe weather damages lifeline infrastructure such as culverts, stormwater systems, and overhead utilities. Heavy rainfall overwhelms drainage systems, causing localized flooding and road washouts that isolate communities. Strong winds topple trees and power lines, blocking critical access routes and disrupting communications and electricity. Critical facilities such as fire stations, emergency shelters, and wastewater pump stations are not consistently hardened against these events and often lack reliable backup power, increasing the likelihood of service disruption.

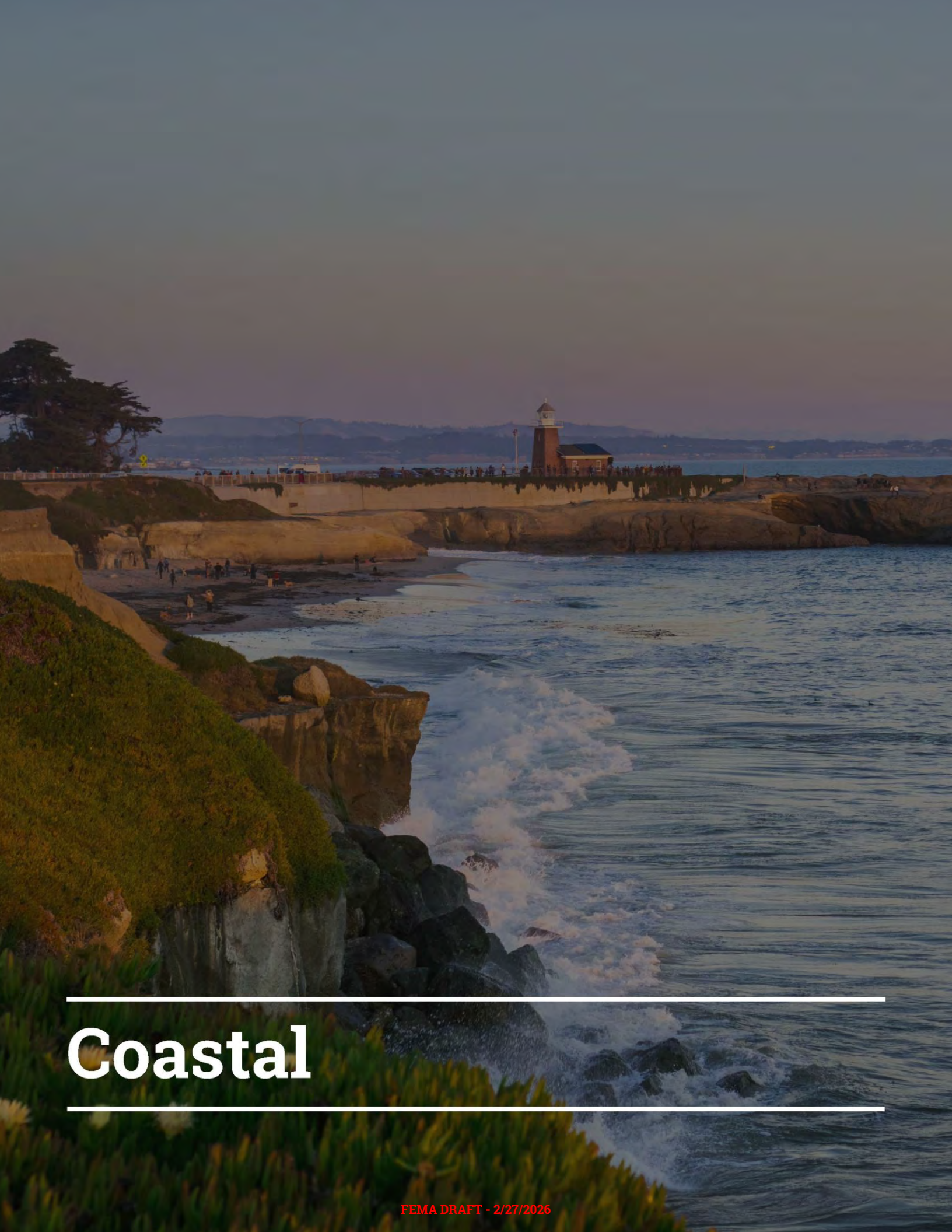
Secondary Hazards: Severe weather can also trigger cascading impacts. Atmospheric river storms increase slope instability and debris flows in steep terrain, isolating neighborhoods and damaging water and wastewater infrastructure. Fallen trees and debris left by storms add to fuel loads for future wildfire events. Extended outages further undermine the continuity of emergency operations, creating compounding risks across multiple hazard types.

Public Health and Social Impacts: Severe weather disproportionately affects vulnerable populations. Low-income households often lack resources to invest in backup power, flood protection, or temporary relocation. Elderly residents, people with disabilities, and those reliant on electricity for medical equipment

face heightened health risks during long outages. Limited-English households may not receive or understand emergency alerts, while rural residents can become stranded by road closures or prolonged service disruptions. These disparities magnify the health, safety, and financial consequences of storm events.

The mitigation strategy addresses these challenges by investing in stronger stormwater infrastructure, expanding backup power capacity at critical facilities, and improving outreach and emergency communication for vulnerable populations. Linking climate change projections to the needs of at risk groups is essential for reducing inequities and building community-wide resilience against increasingly severe storms.

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Coastal

3.2.5 Coastal Hazards Profile



Due to Santa Cruz County's location on the Pacific Coast, it is exposed to many coastal hazards, including coastal storms, erosion, wave run-up and surge, and tsunami. Coastal hazards present very similar risks to flood hazards, which are discussed in Section 3.2.2, with secondary and compounding impacts from inundation and erosion. Coastal storms can cause increases in tidal elevations (called storm surge), wind speed, wave attack, coastal erosion, and debris flows, as well as flooding. During a coastal storm, excess water from rainfall can combine with coastal storm surge to overwhelm and overtop the channels of creeks and rivers onto the banks and adjacent floodplains and inundates beaches.

3.2.5.1 Compounding Hazards

Coastal hazards are heavily influenced by ocean conditions, including changing sea levels. While sea level rise will remain an important long-term driver of risk, within the timescale of this report the more immediate compounding hazard is the increased intensity of climate change-driven coastal storms. These storms can accelerate coastal erosion, expand coastal inundation, and magnify wave impacts, particularly during El Niño and atmospheric river events. When such storms coincide with extreme king tide conditions—where high tides, large waves, and storm surge occur simultaneously; the resulting flooding and erosion can be especially damaging to coastal infrastructure, transportation assets, and adjacent development (Santa Cruz County Regional Transportation Commission, 2, 2025).

From the State of California Sea Level Rise Guidance: 2024 Science and Policy Update, the Monterey tide gauge is at a high risk of sea level rise of approximately one foot by the year 2050, with a moderate risk rating of rising two feet and an extremely low risk of risk up to 2.7 feet over the same time period. By the year 2100, the report projects a low risk of between 2.3 and 3.3 feet of sea level rise, a moderate risk of between 5.5 and 6.9 feet, and an extremely low risk of up to 10 feet of sea level rise. However, any amount of sea level rise will significantly compound coastal hazards. Sea level rise is profiled as a subhazard of climate change and discussed further in Section 3.2.10.

3.2.5.2 Subhazards

For Santa Cruz County, there are specific types of coastal hazards that are more relevant to the planning area than others. This includes coastal storm, coastal erosion, wave run-up and surge, and tsunami, which are profiled as part of this section.

Coastal Storm

As storms arrive onto land from the Pacific and rise over the mountains and ridges that border the eastern boundaries of the county, the air associated with those storms cools and that cooling results in large

amounts of precipitation, also known as orographic lift. The topography of the Santa Cruz Mountain provides fairly steep and well-defined watershed areas to funnel the falling rain into runoff tributaries and potentially trigger flood and other hazards.

Coastal storms often cause flooding along the heavily developed Monterey Bay coastline of Santa Cruz County and may simultaneously bring large waves and storm swells, especially during the winter months (Figure 3-47). Storm centers from the southwest direction produce the type of storm pattern most commonly responsible for the majority of severe coastline flooding. The strong winds combined with high tides that create storm surges are usually accompanied by heavy rains. When storms occur simultaneously with high tides, flood conditions, particularly flooding at the mouth of the Pajaro River and Aptos Creek, are exacerbated.



Figure 3-47: Damage in the Santa Cruz Harbor during December 23, 2024, Storm Surge Event

Source: Santa Cruz Port District

Wave Run-Up & Surge

Wave run-up determines the extent over which waves act. Wave run-up is specifically defined as the landward extent of wave uprush measured vertically from the still water level and consists of two parts: wave setup which is a mean (averaged over time) water surface elevation and swash.

Wave run-up an important parameter to determine inundation from coastal storms. Cross-shore and long-shore sediment transport are a function of the hydrodynamics on the beach and are therefore related to wave run-up. Wave run-up is required to determine the crest height of coastal structures that will prevent overtopping. In 2024 a long-period high-energy winter storm caused significant damage to the Santa Cruz Wharf and Port District.

Coastal Erosion

Coastal erosion is the wearing away of coastal land from forces such as wave action, wind, and rain. It is commonly used to describe the horizontal retreat of the shoreline along the ocean. Erosion can be measured as a rate, with respect to either a linear retreat (feet of shoreline recession per year) or volumetric loss (cubic yards of eroded sediment per linear foot of shoreline frontage per year).

Erosion rates are not uniform and vary over time at any single location. Annual variations are the result of seasonal changes in wave action and water levels. Erosion is caused by coastal storms and flood events, changes in the geometry of tidal inlets and bays, and human activities such as development and dredging. Further, activities aiming to protect the shoreline and improvements thereupon often actually lead to additional erosion.

Coastal erosion includes cliff, bluff, and beach erosion and is a result of both normal, constant wave action and intense wintertime wave attack associated with coastal storms. Beaches change seasonally in response to changes in wave conditions. Winter storm waves are larger, steeper, and contain more energy, and typically move significant amounts of sand from the beaches to offshore bars, creating steep, narrow beaches. In the summer, lower, less energetic waves return the sand, widening beaches and creating gentle slopes. During the winter months when beaches are narrow, or absent altogether, the storm waves attack the cliffs and bluffs more frequently.

Bluff failure takes place through processes related to the sea (mainly those that affect wave action) and to the land (rainfall and runoff, weathering, earthquakes), although the terrestrial processes are less often appreciated than the marine processes. Wave attack during periods of high tides or otherwise elevated sea level (e.g. El Niño or storm surge) is one of the most common mechanisms of episodic cliff failure. El Niño increases storm frequency, elevated sea levels, wave height and rainfall.

There are many factors involved in coastal erosion, including human activity, climate change and sea level rise, and seasonal fluctuations; consequently, sand movement is not consistent year after year in the same location. Wind, waves, and the long-shore currents are some of the driving forces behind coastal erosion. The removal and deposition of sand creates long-term changes to beach shape and structure. Sand may be transported to landside dunes, deep ocean trenches, other beaches, and deep ocean bottoms.

Tsunami

A tsunami is a series of waves generated by an impulsive disturbance in a large body of water like the Pacific Ocean. Tsunamis are produced when movement occurs on faults in the ocean floor, usually during very large earthquakes. Sudden vertical movement of the ocean floor by a fault, landslide, or similar mass movement displaces the overlying water, creating a wave that travels outward from the source. The waves can travel across oceans and maintain enough energy to damage distant shorelines.

The hazard posed by tsunamis came to the attention of the world during the 2004 Indian Ocean tsunami that killed as many as 300,000 people who lived more than a thousand miles from the source of the earthquake. An earthquake anywhere in the Pacific Ocean can cause tsunamis around the entire Pacific basin, including the coastline of Santa Cruz County.

3.2.5.3 Policies, Plans & Regulatory Environment

Federal Regulatory Environment

Coastal Zone Management Act (CZMA) & Programs

In 1972, the U.S. Congress recognized the importance of addressing challenges presented by continued growth along the nation's coastlines by passing the Coastal Zone Management Act (CZMA). This act, administered by the National Oceanic and Atmospheric Administration (NOAA), provides for the management of the nation's coastal resources. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."

The CZMA outlines three national programs, the National Coastal Zone Management Program, the National Estuarine Research Reserve System, and the Coastal and Estuarine Land Conservation Program (CELCP). The National Coastal Zone Management Program aims to balance competing land and water issues through state and territorial coastal management programs, the reserves serve as field laboratories that provide a greater understanding of estuaries and how humans impact them, and CELCP provides matching funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements.

One of the most significant provisions of the CZMA gives state coastal management agencies regulatory control (federal consistency review authority) over all federal activities and federally licensed, permitted or assisted activities, wherever they may occur if the activity affects coastal resources. Examples of such federal activities include: outer continental shelf oil and gas leasing, exploration, and development; military projects at coastal locations; U.S. Army Corps of Engineers fill permits; and commercial space launch projects on federal lands. Federal consistency is an important coastal management tool because it is often the only review authority over federal activities affecting coastal resources given to any state agency.

National Flood Insurance Program (NFIP)

As detailed in the Flood Hazard Profile, Section 3.2.2, the National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities according to localized flood hazard maps and studies. Flood Insurance Rate Maps (FIRM) are the primary tools for identifying the extent and location of flood hazards, including along the coast. FIRMs designate Special Flood Hazard Areas (SFHA) and specific flood zones based on type and level of risk. For coastal areas, FIRMs depict high-hazard V Zones, Coastal A Zones (CAZ), and the Limit of Moderate Wave Action (LiMWA) within the SFHA. The most recent county-wide FIRM for Santa Cruz County became effective on August 3, 2016, and is used to apply regulatory requirements to all SFHAs, including coastal flood hazard zones.

U.S. Army Corps of Engineers (USACE)

The U.S. Army Corps of Engineers (USACE) plans, designs, constructs, and maintains water resources projects, including coastal storm damage reduction measures and infrastructure. In Santa Cruz County, USACE conducts studies and implements measures to protect coastal communities from wave run-up, shoreline erosion, and coastal flooding. This includes collaboration with the Coastal Commission on beach nourishment and bluff stabilization projects where feasible and authorized.

State Regulatory Environment

California Coastal Act

The California Coastal Act of 1976 is a landmark state law that guides coastal development and resource management in California's designated Coastal Zone with the primary goals of balancing economic development with conservation, protecting and preserving natural coastal resources, and maximizing public access. The Act established the California Coastal Commission, which oversees Local Coastal Programs (LCPs) developed by local governments to regulate development through a permit process, ensuring that projects are consistent with the Act's goals. The Coastal Act includes specific policies that address issues such as public shoreline access and recreation; lower cost visitor accommodations; terrestrial and marine habitat and scenic protections; agricultural, commercial, and industrial uses including fisheries; and ports and transportation.

California Coastal Commission

The California Coastal Commission was established by voter initiative in 1972 (Proposition 20)—later made permanent by the State Legislature through adoption of the California Coastal Act—and is one of California's three designated coastal management agencies for purposes of administering the federal Coastal Zone Management Act (CZMA). The Commission is an independent, quasi-judicial state agency composed of 12 voting members, appointed equally (four each) by the Governor, the Senate Rules Committee, and the Speaker of the Assembly. Six of the voting commissioners are locally elected officials and six are appointed from the public at large. Three ex officio (non-voting) members represent the Resources Agency, the California State Transportation Agency, and the State Lands Commission.

In partnership with coastal cities and counties, the Commission plans and regulates the use of land and water in the established Coastal Zone. The Coastal Zone, which was specifically mapped by the Legislature under the Coastal Act, covers an area larger than the State of Rhode Island along the California coastline, excluding the San Francisco Bay which is regulated separately. Offshore the zone includes a three-mile-wide band of ocean, and on land the Coastal Zone varies in width from several hundred feet in highly urbanized areas up to five miles in certain rural areas.

Development activities within the Coastal Zone generally require a permit from either the Coastal Commission or the local government. These activities are broadly defined by the Coastal Act to include

construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, among others.

California Coastal Conservancy

The California Coastal Conservancy is a non-regulatory state agency designated for purposes of administering the federal Coastal Zone Management Act alongside the Coastal Commission to protect and restore coastal resources, help people get to and enjoy the coast, and enhance climate resilience. The Conservancy works along the entire length of California's coast and within the watersheds of rivers and streams that extend inland from the coast implementing statewide and regional resource plans through various projects.

In addition, the Conservancy provides technical assistance and grant funding to local communities, non-profit organizations, tribes, and public agencies to implement multi-benefit projects that help accomplish its main goals of protecting the natural and scenic beauty of the coast; enhancing wildlife habitat and water quality; employing nature-based solutions; facilitating public access and enjoyment of coastal resources; revitalizing working waterfronts; and preparing communities for the impacts of climate change.

Local Regulatory Environment

Sana Cruz County General Plan/Local Coastal Program (LCP) Public Safety Element

The Santa Cruz County General Plan Public Safety Element sets forth objectives and policies relevant to coastal hazards, including to reduce hazards and property damage caused by coastal erosion and bluff retreat (Objective 6.2) and to minimize damages and threats to public health and safety and prevent adverse impacts to floodplain functions and ecologies (Objective 6.4). To meet these objectives, the General Plan includes the following key policies:

- **Policy 6.2.12 Setbacks from Coastal Bluffs:** All development activities, including those which are cantilevered, and non-habitable structures for which a building permit is required, must be set back from the edge of a bluff sufficiently to provide a stable building site over a 100-year lifetime of the structure, or a minimum of 25 feet, as determined through geologic and/or soil engineering reports.
- **Policy 6.2.17 Prohibit New Building Sites in Coastal Hazard Areas:** Does not allow the creation of new building sites, lots, or parcels in areas subject to coastal hazards, or where development would require the construction of public facilities or infrastructure within coastal hazard areas, or in the area necessary to ensure a stable building site for the minimum 100-year lifetime.
- **Policy 6.2.20 Reconstruction of Damaged Structures on Coastal Bluffs:** Limits the reconstruction of structures on or at the top of a coastal bluff which have been substantially damaged (beyond 50% of the market value) and encourages relocation landward of the previous site.
- **Policy 6.4.3 Development on or Adjacent to Coastal Bluffs and Beaches:** Allows development in areas immediately adjacent to coastal bluffs and beaches only if a geologist determines that wave action, storm

swell, and tsunami inundation are not a hazard to the proposed development or that such hazard can be adequately mitigated.

Local Coastal Program (LCP) Administration

The Santa Cruz County Code addresses coastal flooding and related hazards through the Local Coastal Program (LCP) Administration provisions in Chapter 18.60. These regulations establish the procedures and standards for administering the county's certified LCP in compliance with the California Coastal Act. The Public Safety Element and the Santa Cruz County Code govern the review and permitting of development within the Coastal Zone, ensuring that projects are consistent with certified LCP policies, including those related to coastal flooding, wave run-up, bluff erosion, and sea level rise. Santa Cruz County Code Chapter 16.10 requires that development in areas subject to coastal hazards be sited, designed, and constructed to minimize risks to life and property, avoid the use of protective structures where feasible, and preserve public access and natural shoreline processes. Santa Cruz County Code Chapter 13.20 also sets forth permit review procedures, appeal rights, and coordination requirements with the California Coastal Commission for projects in appealable areas. Through these policies and procedures, the LCP provides the administrative framework to implement coastal flood hazard policies and ensure that new development is compatible with long-term coastal resilience.

3.2.5.4 Past Events

Over the past several decades it has been discovered that coastal wave climate and storm frequency are related to larger scale climatic oscillations that affect the entire Pacific Ocean. During the time period from about 1945 to 1978, the California coast was characterized by a fairly calm climate, few large storms, less rainfall and less coastal erosion and storm damage. Beginning in 1978 and continuing until 1998, California experienced a period of more frequent and severe El Niño events with associated elevated sea levels, large waves, heavier rainfall, and more extensive coastal storm damage and erosion.

Coastal hazard events continue to impact Santa Cruz County, sometimes causing deaths, injuries, and property damage. Figure 3-48 summarizes past coastal hazard events since 2000. The most significant singular coastal evnet was the March 11, 2011, tsunami that caused more than $26 million in damage.

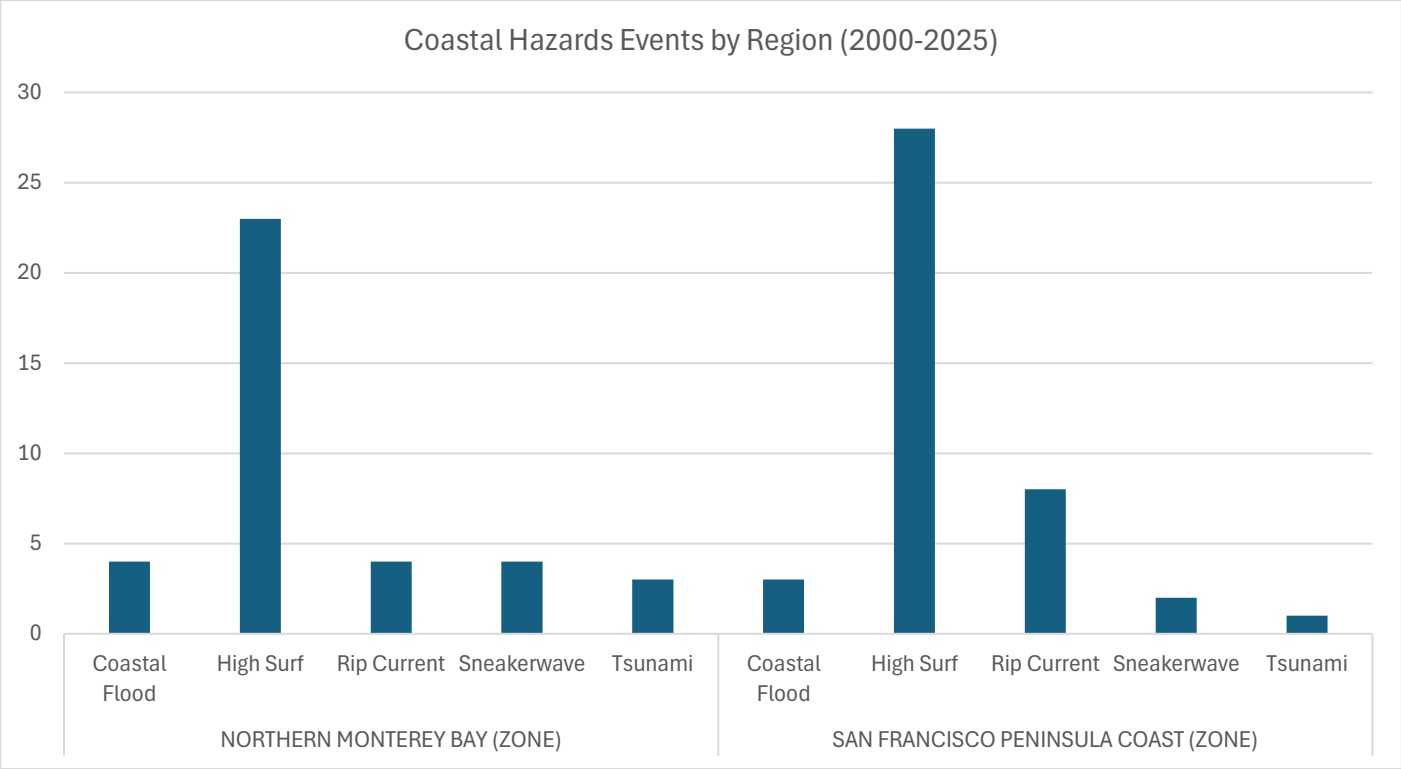


Figure 3-48: Santa Cruz County Coastal Hazard Events, 2000 -Present

Source: NOAA Storm Events Database

Coastal Storm, Wave Run-Up & Surge

Significant coastal storms, with associated damage, strike Santa Cruz County and other Monterey Bay communities with regular frequency. As a result, ocean front development has not been compatible with the natural instability of the shoreline and intense winter weather conditions.

The most severe storms on record to hit the California coast occurred in 1978 and 1983 when high water levels were accompanied by very large storm waves. (FEMA FIS, 2006) In 1978, a series of storms emanated from a more southerly direction than normal, which can act as an exacerbating factor. Consequently, some of the usually more protected beaches were damaged. Jetties and breakwater barriers were overtopped, and in some cases, undermined. Direct wave damage occurred to many beachfront homes and seawalls, especially in the more populated beachfront areas such as at Seacliff Beach and Rio Del Mar Beach.

In 1983 a similar storm hit the Santa Cruz coastline. During this storm, a new 3,500-foot seawall was destroyed and 19 of 21 homes in Seacliff Beach were significantly damaged when the existing riprap protection was overtopped. (*Id.*) The Pajaro Dunes area of the county that is fronted by dunes has also been subject to severe damage to structures as well as rapid beach retreat in 1968, 1969, 1978, and 1983. (*Id.*)

Between December 2022 and March 2023, Santa Cruz County experienced a series of destructive coastal storms fueled by successive atmospheric river events and strong low-pressure systems. On December 27, 2022, intense rainfall caused Aptos Creek to overflow, flooding streets in Rio Del Mar and trapping residents in their homes. Just days later, on December 31, another atmospheric river stalled over the region, producing record rainfall, widespread flooding, mudslides, and wind damage. In Soquel, floodwaters inundated the Old Mill Mobile Home Park, forcing evacuations. On January 4–5, 2023, a powerful atmospheric river combined with a bomb cyclone, generating damaging surf that broke the Capitola Wharf in half and battered coastal infrastructure. The storm cycle continued into February and March with multiple high wind events: on February 21, a strong upper-level low produced gusts exceeding 60 mph and toppled trees, injuring residents in Boulder Creek. In early March, subtropical moisture plumes delivered torrential rainfall, widespread flooding, and landslides, including the washout of North Main Street in Soquel on March 10. Later in March, rapidly intensifying cyclones brought hurricane-force wind gusts above 80 mph, cutting off communities like Ben Lomond and Boulder Creek, injuring residents, and leaving over 100,000 customers without power. These events highlighted the county's vulnerability to compounding coastal storm hazards, where extreme rainfall, high surf, flooding, and damaging winds intersected to cause widespread impacts to communities, infrastructure, and natural systems.

UC Santa Cruz Earth & Planetary Professors Gary Griggs and Lida Davar authored a research paper that was published in the Journal of Coastal Research that estimated coastal storms resulted in $4.7 billion in economic losses in California between December 2022 and March 2023.

More recently, the Santa Cruz Harbor was impacted by wave run-up and surge event on December 23, 2024. The surge event caused approximately $11 million in damage to boats and harbor facilities and also caused a portion of the Santa Cruz Wharf to fall into the Pacific Ocean (Figure 3-49).

Coastal Erosion

Nearly the entire California coast is actively eroding due to complex oceanographic and geologic conditions, and human activities that affect the delivery and movement of sand along the coast. Studies have been performed on El Niño, storm frequency, and coastal erosion history for the central California coast from 1910 to 1995. This research indicated that the majority of documented coastal erosion occurred during El Niño storms that originated from the southwest.

During the severe El Niño winters of 1983 and 1997 to 1998, sea levels were further elevated and storm damage along the coastal area was extensive.



Figure 3-49: Part of the Santa Cruz Warf Following its Collapse During a Storm Surge Event on December 23, 2024 Source: City of Santa Cruz

Tsunami

California is at risk from both local and distant-source tsunamis. Over 80 possible or confirmed tsunamis have been observed or recorded in California during historic times. Most of these events were small and only detected by tide gauges, but 11 were large enough to cause damage and four events resulted in deaths. Some of the most notable tsunamis to hit the county occurred in 1896, 1946, 1964, and 2011.

- **1896 Japan Tsunami:** The first recorded tsunami was a far-field tsunami that initiated from an earthquake near Japan on June 15, 1896. In Japan, the death toll was approximately 20,000 people, but in Santa Cruz the tsunami was only a meter and a half high and there is little record of damage.
- **1946 Aleutian Trench Tsunami:** A more significant tsunami occurred on April 1, 1946, when a M8.1 earthquake in the Aleutian Trench produced a 130-foot wave that struck Unimak Island, Alaska, in the Aleutian Islands 90 miles to the north, destroying the Scotch Cap lighthouse and killing five Coast

Guardsmen. (UAF, 2015) The wave was observed all along the west coast and in Hawaii, where it was 56 feet high and killed 173 people. In Santa Cruz County, a man drowned, and minor damage was done by 10-foot waves; however, it should be noted that scientific observations place the 1946 tsunami run-up at 1.5 meters.

- **1964 Good Friday Tsunami:** On March 27, 1964, Santa Cruz County was hit by a similar sized tsunami to the one in 1946, generated by the Good Friday Earthquake. Reports vary, indicating heights between 1.5 and 3.3 meters.
- **2011 Japan Tsunami:** The 2011 Japan Tsunami occurred as a result of a M9.0 earthquake in Japan on March 11, 2011. In Japan, nearly 16,000 deaths occurred as a result of the earthquake and tsunami, which generated a wave of water up to 113 feet in height traveling inland up to six miles. This tsunami hit the Santa Cruz Harbor with waves estimated to be several feet combined with swift and chaotic currents causing more than $26 million in damage.
- **2022 Tonga Tsunami:** The 2022 Tonga Tsunami occurred as a result of an undersea volcanic eruption in the South Pacific Ocean on January 15, 2022. Tsunami waves also struck shores around the Pacific, including Santa Cruz County where $9.5 million in property damage was reported.

3.2.5.5 Location

Santa Cruz County is bounded on one side by the Pacific Ocean and, by definition, coastal hazards happen along the coast. Hence, coastal areas in Santa Cruz County from Swanton in the north to Pajaro Dunes in the south are susceptible to these hazards. All areas along the county's coastline have experienced impacts at some point in the past from coastal storms, wave run-up and surge, erosion, and tsunami.

Coastal Erosion, Wave Run-Up & Surge

The entire coastal edge of the county is or can be affected by coastal erosion, wave run-up, and storm surge. On the north coast, where there are few structures near the coastline, the risk to risks to development are relatively limited compared to the central and southern coastlines, where homes, businesses, and transportation infrastructure are concentrated near the water's edge. Vulnerabilities differ by setting: cliff backed segments of the coast, such as those between the Santa Cruz Harbor and Pleasure Point, Opal Cliffs, and portions of East Cliff Drive, are most exposed to chronic erosion and episodic bluff failures. In contrast, low-lying areas near river mouths, lagoons, and beaches including Pajaro Dunes, Capitola, Rio Del Mar, downtown Santa Cruz, East Cliff at Moran Lake, and the Corcoran Lagoon area are particularly susceptible to storm surge, wave overtopping, and coastal inundation during extreme events.

Most of the significant cliff, bluff, dune, and beach erosion occurs in the area of the county from Live Oak to the Monterey County line during major coastal storms and especially during very high tides. The bluffs in the Live Oak area and eastward to Rio Del Mar are underlain by the younger Purisima formation capped by terrace deposits that are also sensitive to coastal erosion and which have been estimated to be retreating at a rate of six inches to one to two feet per year.

The north coast area of the county also experiences coastal erosion, but to a lesser degree. The north coast area of the county, from the City of Santa Cruz to the San Mateo County line, is underlain by the geologically older Santa Cruz Mudstone formation, which is less susceptible to coastal erosion than areas to the south.

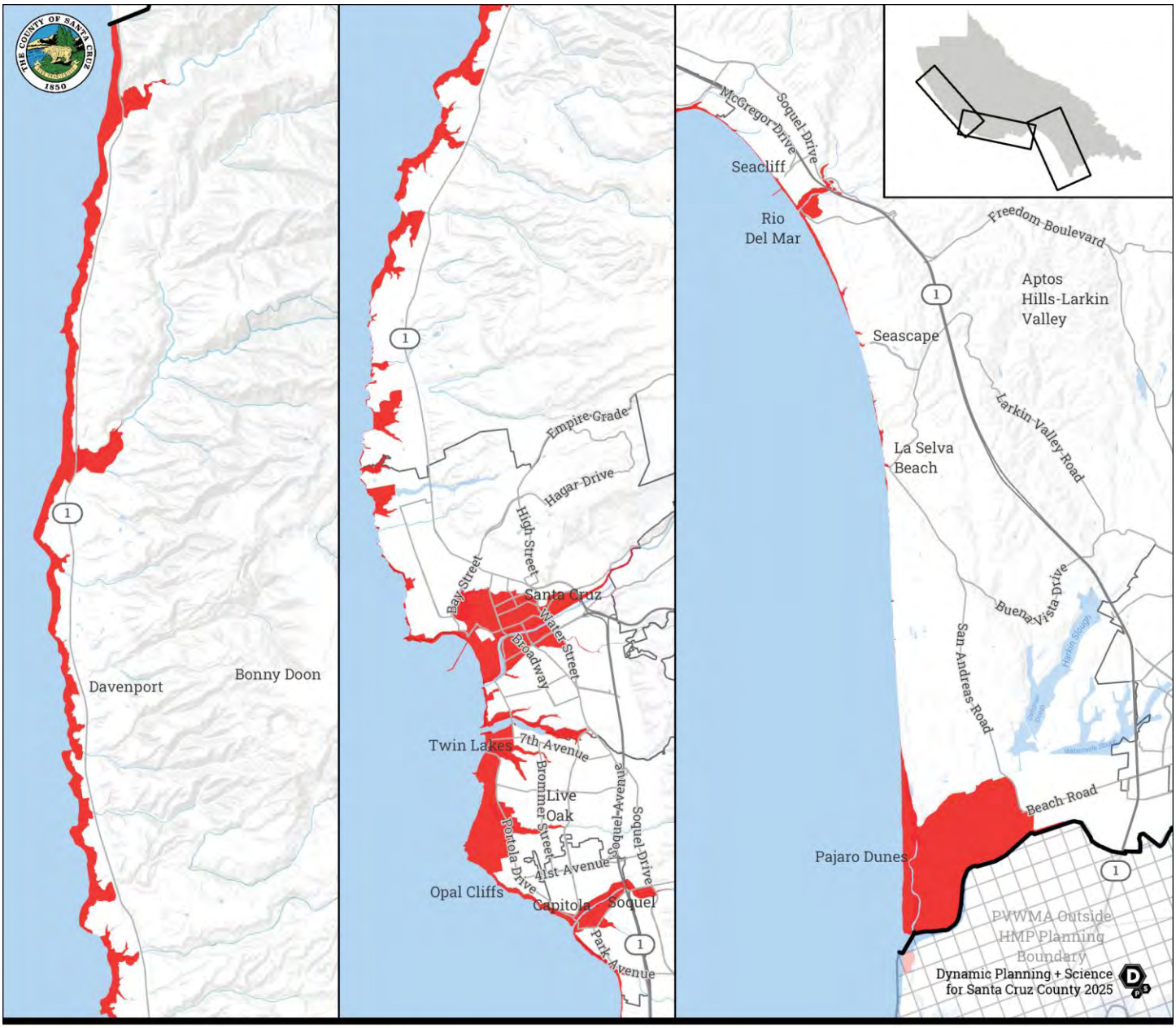
Figure 3-11 in the Flood Hazard Profile (Section 3.2.2) depicts coastal flood zones as mapped by FEMA, in addition to other flood hazard areas in the county. Coastal flood zones are used to evaluate the extent of wave run-up, storm surge, and coastal erosion hazards. Coastal V Zones in the Special Flood Hazard Area indicate the potential for damaging wave attack, which triggers accelerated erosion along the affected coastline.

Tsunami

There are two primary types of tsunami vulnerability in Santa Cruz County: local-source, originating from nearby seismic activity, and tele-tsunami (distant-source) from elsewhere in the Pacific Ocean. Santa Cruz County is located on Monterey Bay, and several active and potentially active earthquake faults are located within or near the county. An earthquake occurring in or near any of the nearby faults could result in local-source tsunamis from submarine landsliding in the Monterey Submarine Canyon.

Additionally, distinct-source tsunamis from the Cascadia Subduction Zone to the north, or tele-tsunamis from elsewhere in the Pacific Ocean, are also capable of causing significant destruction. The Pacific Rim is highly seismically active, and tsunamis are not uncommon but historically have been only a few meters in height. Dangerous tsunamis would most likely originate in the Aleutian and Chilean trenches, the eastern coast of Japan, or the Pacific Islands.

Figure 3-50 is a map of potential tsunami inundation areas in Santa Cruz County.



Tsunami Runup Area Exposure

Unincorporated County

*Data sources: County.

Figure 3-50: Santa Cruz County Tsunami Run-Up Areas

3.2.5.6 Frequency & Probability of Future Occurrences

Santa Cruz County will continue to be impacted by coastal hazards each year, especially during the winter months when ocean conditions tend to produce coastal storms with wave run-up and storm surge contributing to coastal erosion. However, predicting the frequency and probability of future tsunamis is more similar to predicting earthquakes, as discussed in the earthquake hazard profile.

Coastal Storms, Erosion, Wave Run-Up & Surge

Significant storms and associated damage from surge, wave action, flooding, and erosion strike the Monterey Bay communities with a frequency of one large storm every three to four years. (Ott Water Engineers, Inc., 1984) This equates to a 25% to 33% chance of a large coastal storm occurring in Santa Cruz County in a given year. However, significant coastal storms have occurred in Santa Cruz County three years in a row between 2022 and 2024

Based on its coastal location, bluff and shoreline erosion will continue to occur in Santa Cruz County in the future. The amount of erosion will be dependent on the intensity of future storms and whether or not corrective actions are taken to protect shoreline areas by reducing erosion rates. With regard to beach erosion and bluff failure, it is less a matter of whether or not the hazard will occur and more a matter of the rate in which the hazard will cause additional damage (i.e. structural failure).

Wave attack combined with a global rise in sea level over the past 18,000 years has led to the continued migration of the shoreline. At the end of the last Ice Age, about 18,000 years ago, the coastline at Santa Cruz was about 10 miles offshore. As the ice sheets and glaciers melted, sea level gradually rose and continues to rise today a process that is accelerating due to climate change. Sea levels are rising globally at an accelerating rate. However, the rate of local sea level rise varies depending upon the regional geologic setting and whether the coastline is stable, rising, or sinking.

In 2017, the Central Coast Wetlands Group conducted a study of future sea level rise impacts along the Santa Cruz County coast. The study evaluated how various sea level rise scenarios would impact coastal hazards and especially coastal erosion, and the results identified areas, facilities, infrastructure, and properties vulnerable to inundation and erosion in the future with sea levels from 10 to 159 centimeters by the year 2100. This study is further discussed under sea level rise in the Climate Change Hazard Profile (Section 3.2.10).

Tsunami

Tsunamis are caused by large offshore earthquakes and ocean landslides and, since scientists cannot predict precisely when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. Anticipating the extent of future tsunami hazard is difficult because the historic record is limited, as is our understanding of the source mechanisms and influence of offshore geometry on the impact of tsunami in Santa Cruz County.

Studies have recently been undertaken through the Governor's Office of Emergency Services (Cal OES) and the Department of Civil Engineering at the University of Southern California, Los Angeles. The studies resulted in tsunami inundation maps for the entire state coastline based on worst-case scenario events, which are only to be used for emergency preparedness and evacuation planning.

Pre-1994 inundation computations underestimated tsunami inundation height, but newer inundation models are capable of modeling extreme events more accurately. These new models (known as Method of Splitting Tsunami (MOST)) permit quantitative evaluation of inundation from nearfield tsunamis, provided accurate regional tectonic models and high-resolution bathymetry exist. Even using state-of-the-art inundation prediction tools, California presents unique challenges in assessing tsunami hazards because:

- There is an extremely limited historic record of tsunamis in the state, with no known records before the 19th century. Some paleo-seismic investigations have revealed evidence of pre-historic tsunamis, but not in Santa Cruz County.
- Most of the geologic work in the state has concentrated on identifying the risks associated with onshore faults and there is scant available information on offshore faults or landslide and slump scars suggestive of past submarine mass movements.
- Earlier estimates of tsunami hazards created the impression among planners and the public that the tsunami hazard was remote. However, tsunami events from the past 15 years (e.g., Japan and Tonga) have demonstrated that the hazard has a very real likelihood of occurring.
- Nearshore seismic events may trigger tsunamis arriving within less than 20 minutes from peroration, allowing little time for evacuation.
- Shorelines and shoreline platforms vary significantly throughout the state, which modify tsunami run-up and the corresponding potential damage.

3.2.5.7 Severity

As demonstrated by past events, coastal hazards regularly impact Santa Cruz County, often causing deaths, injuries, and extensive property damage. Coastal storms frequently cause flooding along the heavily developed Monterey Bay coastline of the county and may simultaneously bring storm surges and damaging waves. When storms occur simultaneously with high tides, flood conditions and erosion are exacerbated. In addition, although tsunamis have not historically caused catastrophic impacts to the Santa Cruz County coast,

Coastal Storm, Erosion, Wave Run-Up & Surge

Coastal storms can cause extensive damage along coastlines, as seen during past events when storm surge and wave attack, combined with high tide conditions, overtopped and undermined shoreline protections like seawalls, jetties, riprap, and breakwater barriers; damaged beachfront homes; and led to rapid erosion and beach retreat. In 2023 Coastal storms pushed a home off its foundation and floated it back onto the street behind the home. In December of 2024, the Santa Cruz Harbor was impacted by a wave run-up and surge event associated with a coastal storm, which caused approximately $11 million in damage to boats

and harbor facilities and also caused a portion of the Santa Cruz Wharf to fall into the Pacific Ocean (Figure 3-49).

Seasonal erosion cycles along the county's coast also cause damage to property and infrastructure, including roads, utilities, and beach facilities. Without appropriate intervention, these annual processes will be exacerbated by climate change-driven sea level rise, as discussed in Section 3.2.10. Roads at the top edge of coastal bluffs are most vulnerable to damage because the rate of retreat of unprotected coastal bluffs is expected to increase in response to increased exposure to storm waves and intense rain events. Roads at low elevations at the back beach and the subsurface infrastructure within the roads are also particularly vulnerable to coastal erosion.

Tsunami

Tsunamis create many risks similar to riverine and coastal flooding and the tsunami and coastal flood inundation areas are similar. However, tsunamis also produce a wave run-up that can be much more extensive than the run-up that occurs with typical coastal storms and flooding. Tsunamis are not like typical ocean waves produced by wind; they do not have a face, do not curl and break, and are full of hazardous debris.

A tsunami can be very dangerous to coastal life and property. These events can produce unusually strong currents, rapidly flood land, and cause great devastation. The flow and force of the water and the debris it carries can cause injuries and deaths; destroy ports and harbors, boats and vehicles, and buildings and other structures; and damage critical infrastructure and disrupt essential services. It only takes six inches of fast-moving water to knock over an adult and two feet of fast-moving water to carry away most vehicles. The water from a tsunami can be just as threatening—if not more so—as it returns to the sea, taking debris and people with it. Flooding and dangerous currents triggered by a tsunami can last for days, and even small tsunamis can pose a risk. Strong currents can injure and drown swimmers and damage and destroy boats in harbors.

The most damaging tsunami on record to hit Santa Cruz County was on March 11, 2011, and cost more than $26 million in damage. The second most damaging tsunami to hit Santa Cruz County occurred on January 15, 2022 and caused more than $15 million in damage. In determining the extent of tsunami damage, an estimate must be made of the extent of the inundation. Current mapping of tsunami run-up areas, as shown in Figure 3-50, is not meant to be measured against parcel level information and therefore is a rough estimate of damage and loss in a worst-case scenario.

3.2.5.8 Warning Time

Many coastal hazards, including storms, acute erosion, and wave run-up and surge, have advance warning of days to over a week. However, tsunamis may only have hours or minutes of warning time, depending on their source.

Coastal Storm, Wave Run-Up & Surge

Similar to severe weather hazards, coastal storms and associated wave run-up, surge, and acute erosion can be predicted by the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) up to 10 days in advance. This can give several days of warning time; however, meteorologists cannot predict the exact time of onset or severity of coastal storms.

The ability to provide early warning for coastal storms in Santa Cruz County depends on monitoring systems, weather radar, and alert services. The region benefits from forecasting tools provided by the NWS, NOAA, and local emergency management agencies, which use a variety of tools to issue timely warnings. These forecasting and warning systems are discussed in more detail in the Severe Weather Hazard Profile (Section 3.2.4).

Santa Cruz County is served by the NWS San Francisco Bay Area/Monterey forecasting office located in Monterey County Radar coverage in Santa Cruz County is primarily provided by an NWS-operated, next generation WSR-88D radar (KMUX) located on Mount Umunhum. In addition, the county operates a high-resolution X-band radar in Live Oak, filling gaps in low-elevation coverage and improving detection of localized heavy rain by providing near real-time rainfall intensity updates. To further close gaps in severe weather prediction, the county integrates several other data sources for warnings, including real-time rainfall and stream gauges. The NWS Monterey office issues alerts for high surf, king tides, and storm surge.

Additionally, there is a buoy network and tidal gauges that can provide warning of wave events. However, nearshore impacts can be hard to predict because of interactions with wave height and period, and nearshore bathymetry and sand movement.

Coastal Erosion

Beyond the coastal erosion that occurs during acute storm and wave events, there are cyclical erosive forces that occur, though imprecise as to location, extent, and severity. There are many factors involved in coastal erosion, including seasonal fluctuations as well as human activity, climate change, and sea level rise; consequently, sand movement is not consistent year after year in the same location.

Beaches change seasonally in response to changes in wave conditions. Wintertime waves typically move significant amounts of sand from the beaches to offshore bars, while summertime wave action return sand. During the winter months when beaches are narrow, or absent altogether, the waves attack the cliffs and bluffs more frequently. However, coastal erosion is worsening as sea levels rise, increasing the extent and severity of wave action on the coastline. As discussed in the Climate Change Hazard Profile (Section 3.2.10), the State of California Sea Level Rise Guidance: 2024 Science and Policy Update provides sea level rise projections. For the Monterey tide gauge there is a high risk of sea level rise of approximately one foot by the year 2050. By the year 2100, the report projects a moderate risk of between 5.5 and 6.9 feet of sea level rise.

Tsunami

Tsunami hazards are highly dependent on the location of the triggering event (i.e., an earthquake). Depending on where the earthquake is epicentered, the National Tsunami Warning Center can issue tsunami watches and announcements minutes to hours in advance of inundation.

There are two primary types of tsunami vulnerability in Santa Cruz County: local-source originating from nearby seismic activity and tele-tsunami (distant-source) from elsewhere in the Pacific Ocean. Both types of tsunami are capable of causing significant destruction in Santa Cruz County, but a tele-tsunami would usually allow time for the Tsunami Warning System for the Pacific Ocean to warn threatened coastal areas in time for evacuation, such as the 2011 Santa Cruz Harbor tsunami that originated from an earthquake in Japan.

The more vulnerable risk to Santa Cruz County is a tsunami generated as the result of an earthquake along one of the many earthquake faults in the region. Even a moderate earthquake could cause a local-source tsunami from submarine landsliding in Monterey Bay, which would arrive just minutes after the initial shock. The lack of warning time from such a nearby event would result in higher causalities than if it were a tele-tsunami. Past experience has not resulted in extensive damage from nearby tsunamis, but proximity to faults does create the possibility as a result of future earthquakes.

CruzAware Notification System

CruzAware is Santa Cruz County's official alert and notification system. It is administered by the County Office of Response, Recovery and Resilience (OR3) and is designed to provide residents and visitors with timely warnings and information during emergencies. Notifications are sent by text message, telephone, or email and address a range of hazards including coastal storms and tsunamis, as well as other public safety threats and evacuation notices.

For coastal hazards, CruzAware serves as a primary tool for delivering warnings before hazardous conditions develop. Depending on the situation, alerts may be issued hours or only minutes in advance. These notifications can include evacuation instructions, shelter locations, sandbag distribution sites, and road closure information. The system is capable of targeting specific neighborhoods or hazard zones so that alerts are relevant to those directly at risk.

For coastal events in particular, the County must balance the urgency of public messaging with the risk of unintentionally attracting visitors to the shoreline during dangerous conditions such as storm surge or large wave events. Messaging strategies therefore also consider seasonal visitor populations, with coordination efforts directed toward hotels, vacation rentals, and other visitor-serving accommodations to ensure non-local populations receive timely and accurate warnings. In addition, WEAs may be used to reach both residents and visitors in affected areas.

The system works in coordination with other county resources, such as the S.A.F.E.R. dashboard and real-time weather monitoring systems, to support comprehensive hazard communication. The county also

partners with the NWS to disseminate official watches and warnings, including coastal flood and marine advisories. More information about CruzAware, including how to register, is available at santacruzcountyca.gov/CruzAware.

3.2.5.9 Coastal Hazards Vulnerability Assessment

The entire Santa Cruz County coastline, from Swanton in the north to Pajaro Dunes in the south, remains at risk from coast hazards despite ongoing efforts to reduce exposure through land use planning, policy measures, and targeted mitigation projects. This section assesses vulnerability by examining the relationship between coastal hazards and the county's population, property, and critical facilities and infrastructure.

Tsunami is the only coastal hazard for which there is a pre-defined geographic extent. Population exposure, parcel values, critical facilities, and lifeline infrastructure were evaluated by overlaying the county's asset inventory, discussed in Section 2.2.2, with tsunami run-up areas. Figure 3-51 summarizes tsunami exposure county-wide. Detailed results for each vulnerability category are provided in the subsections that follow.

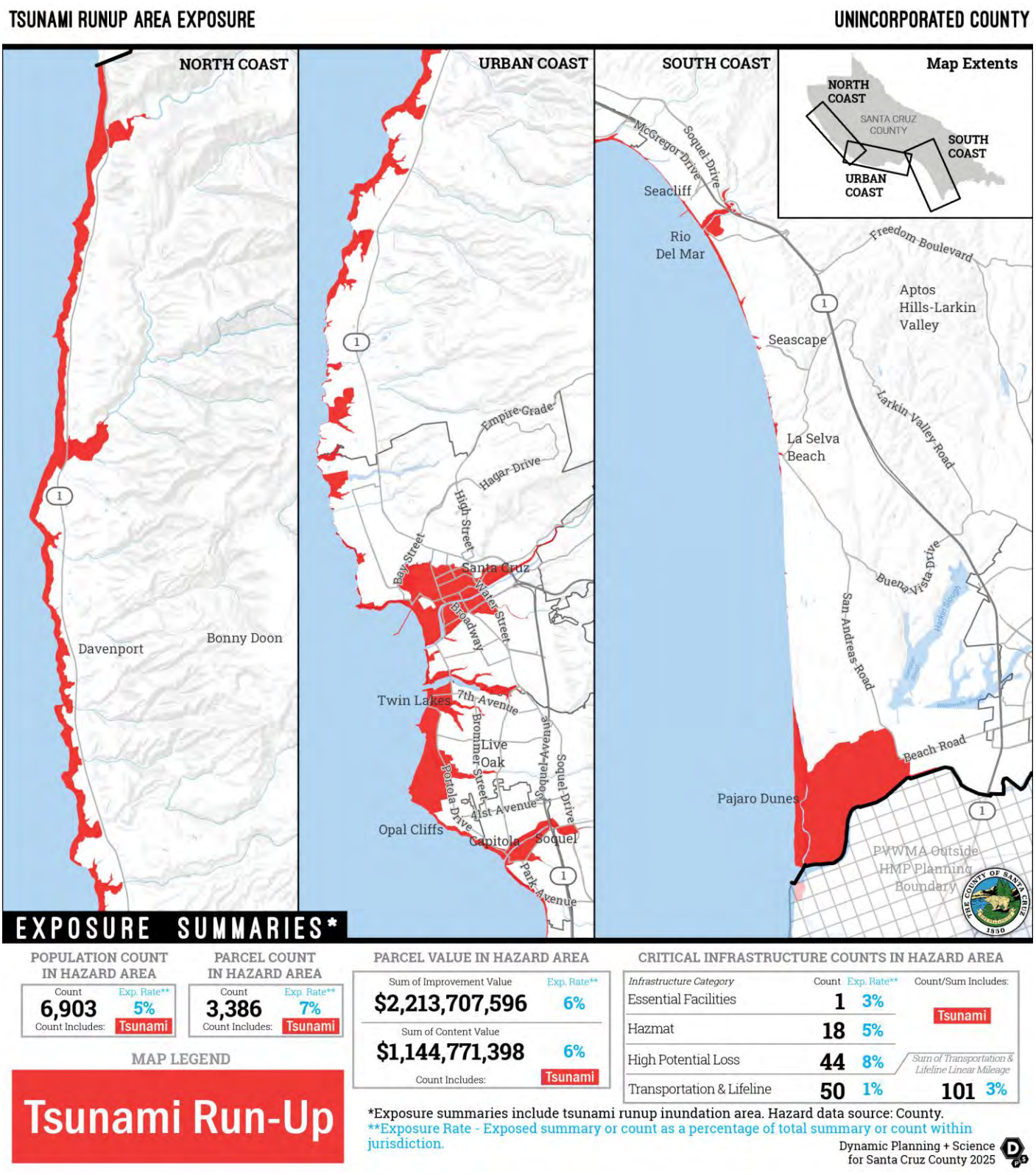


Figure 3-51: Exposure Summary - Santa Cruz County Tsunami Run-Up Areas

3.2.5.9.1 Population

The populations at risk from coastal hazards in Santa Cruz County are assumed to be those living, working, and playing along the county's coastline. The exposure to coastal storms, erosion, wave run-up and surge is similar to the exposure to flood hazards discussed in Section 3.2.2, except concentrated along the shore. The total population located within FEMA-designated coastal flood hazard zones is 840, less than 1% of the county's total population (Table 3-19). However, this may not reflect the full extent of vulnerability to storm surge, wave attack, or erosion hazards, in particular, since these coastal hazards do not always align with mapped flood hazard areas and are highly dependent on individual events. Even so, the population exposed to coastal flooding provides a vulnerability baseline.

A larger portion of the county population—over 5% at almost 7,000 people—is exposed to tsunami inundation, demonstrating the potential challenges in evacuating these areas if a local-source event should occur with little or no warning time. Table 3-43 summarizes the population exposed to tsunami risk. Note that these population numbers reflect permanent residents; daytime visitors during peak season would be additive to these population numbers.

Table 3-43: Santa Cruz County Population Exposed to Tsunami Risk

	Total Population
Unincorporated County	131,149

Tsunami Run-up Area	Population Count	% of Total
Within Risk Zone	6,903	*5.26%*

3.2.5.9.2 Property

The parcels at risk from coastal hazards in Santa Cruz County are assumed to be those located along the county's coastline. The exposure to coastal storms, erosion, wave run-up and surge is similar to the exposure to flood hazards discussed in Section 3.2.2, except concentrated along the shore. The number of parcels located within FEMA-designated coastal flood hazard zones is a little less than 700 with a total exposure value of over $641 million (Table 3-20).

From the HAZUS modeling conducted as part of the flood hazard risk assessment, the 100-year coastal flooding scenario indicates that predicted damages vary significantly by building type (Table 3-22 and Figure 3-33). Residential properties represent the largest share of total losses, while commercial, industrial, and institutional buildings account for much smaller portions of overall damages. In total, the model estimates more than $93 million in combined building and content losses for the unincorporated county in a 100-year coastal flood event, underscoring that coastal hazard impacts can be highly concentrated in certain property types.

The actual number of structures subject to coastal erosion would also include structures on coastal cliffs and bluffs outside of the flood hazard zone, but still subject to erosive forces.

About 7% of all county parcels are exposed to tsunami inundation, accounting for almost $3.4 billion in total exposure value. While many properties in the northern areas of the county are exposed to tsunami risk, few are developed. In contrast, there is a significant amount of improved parcels located in the southern half of the county, from the City of Santa Cruz to the Monterey County line, that are at risk of tsunami run-up and damage. Areas of concentrated development along the coast would experience the largest losses, including Pajaro Dunes, Rio del Mar, New Brighton, and Live Oak, as well as the cities of Capitola and Santa Cruz. Table 3-44 summarizes parcels in the unincorporated county that are susceptible to tsunamis.

Table 3-44: Santa Cruz County Parcels Exposed to Tsunami Risk

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Tsunami Run-up Area	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Within Risk Zone	3,386	*7.1%*	$2,213,707,596	$1,144,771,398	$3,358,478,994	*6.2%*

3.2.5.9.3 Critical Facilities & Infrastructure

The critical facilities and infrastructure at risk from coastal hazards in Santa Cruz County are assumed to be those located along the county's coastline. The exposure to coastal storms, erosion, wave run-up and surge is similar to the exposure to flood hazards discussed in Section 3.2.2, except concentrated along the shore. The critical facilities and infrastructure located within FEMA-designated coastal flood hazard zones mostly includes parks, roads, and sanitary sewer lines (Table 3-23 and Table 3-24).

As presented in Table 3-23 in the flood hazard vulnerability assessment, there are few critical facilities located in coastal flood hazard zones. A hazardous materials facility and five county-owned parks make up the bulk of the assets exposed to coastal flooding. However, transportation and utility lifeline systems make up a substantial portion of the at-risk county infrastructure along the coastline, with about three miles of roadway, one bridge, and over five miles of sanitation pipe vulnerable to damage or service interruption (Table 3-24). However, the footprint of impacts on these critical facilities and lifelines from coastal storms, erosion, and wave run-up and surge could extend far beyond the boundaries of coastal flood zones, resulting in isolated neighborhoods, delayed emergency response, environmental contamination, and slow recovery.

The exposure of county assets to tsunami run-up is substantial. As presented in Table 3-45, almost 40 miles of roads are exposed to inundation during a major event, complicating evacuation and potentially cutting off heavily impacted areas from emergency services. The potential for wastewater backups, leakages, or other system failures is also high due to over 30 miles of sanitary pipe being within the tsunami risk area. Further, over four miles of levees are exposed to damage from a significant tsunami event, which could trigger additional flooding.

Table 3-46 summarize the critical facilities susceptible to tsunamis, including one fire station, three schools, and three childcare centers. There are also eight large mobile home parks within the tsunami inundation

area. Together, these facilities demonstrate the potential for mass casualties if a major tsunami hit the county from a local or regional source with little or no warning time and underscore the need for a highly coordinated, rapid evacuation plan. Additionally, there are 18 hazardous materials facilities within the risk area that, if damaged, could cause significant environmental harm, hinder emergency response, and complicate recovery.

Table 3-45: Santa Cruz County Critical Infrastructure Exposed to Tsunami Risk

Lifelines (miles) - Tsunami Run-up Area	
Infrastructure Type (Linear)	Within Run-Up Zone
County Maintained Roads*	19.8
Levee	4.3
Maintained Channel	6.1
NG Pipeline	0.7
Railroad	0.4
Sanitation Pipe	31.2
All Roads	38.5
Alley	1.6
Drive	3.0
Major Road	7.7
Ramp	-
Street	21.7
State Highway	1.3
Unnamed	3.3
Transmission Line	0.1
Grand Total	**100.9**

Table 3-46: Santa Cruz County Critical Facilities Exposed to Tsunami Risk

Critical Facility - Tsunami Run-up Area	
Facility Type	Within Risk Zone
Essential Facilities	1
Fire Station	1
Hospital	-
Law Enforcement	-
EOC	-
American Medical Response	-
High-Potential-Loss	44
Adult Care Facility	-
Child Care Center	3
Cell Tower	3

County Real Property Asset	26
Dam	-
Healthcare Facility	-
Historic Building	-
Library	1
Mobile Home Park	8
Power Generation	-
Radio Sites	-
School	3
Transportation and Lifeline	50
Airport	-
Substation	-
NG Station	-
Church	1
Stormwater Culvert	26
Parks	14
Bridge NBI	9
Hazmat	18
HWTS Active Facility	18
Geotracker CleanupSite	-
Grand Total	**113**

**Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

3.2.5.10 Development Trends

Every coastal community in California is dealing with the issues of coastal hazards compounded by sea level rise, and how this affects and is affected by development and redevelopment along the coast becoming increasingly controversial and contentious. Since seawalls now protect so much of the developed portion of Santa Cruz County coastline, the controversy centers on improving these walls and on their impacts. These issues will be addressed in the updated LCP.

Santa Cruz County's shoreline is located on Monterey Bay, which will also influence development trends along the Santa Cruz coast. The majority of undeveloped areas along the coastline are farmland or other areas currently protected from development and, along the north coast of Santa Cruz County, regulations have limited development and structures have been constructed in very limited locations. Further, the county's growth management policies prevent development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards. This is especially true under the constraints imposed by local and state coastal development regulations. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks, structural elevation, floodproofing, erosion control, and other requirements to mitigate potential impacts from coastal hazards.

New development within coastal flood hazard areas, which somewhat overlap with the impact areas of coastal hazards, is subject to strict regulations. No new development is allowed within the 100-year floodway, and all new or substantially improved structures within Special Flood Hazard Areas (SFHA) must be elevated or floodproofed, as dictated by FEMA guidelines and regulations. Although FEMA floodplain development regulations may protect against coastal flooding from storms, wave run-up and surge, these standards are inadequate for protection against tsunamis since these phenomena have a different direction of force and energy and can inundate areas that are not affected by riverine or coastal flooding.

The current trend in development along the coastline in Santa Cruz County is in-fill within already developed areas and reconstruction of existing structures and infrastructure. No changes in these development regulations or patterns occurred that would affect the county's overall vulnerability since the 2021 HMP.

Coastal Erosion

Coastal erosion poses many problems to coastal communities in that valuable property is frequently lost to this dynamic beach-ocean system. Additionally, human activity may modify the process of coastal erosion with uncertain results.

Much of the Santa Cruz County coastline, particularly in the developed areas, has some level of coastal armoring, such as seawalls, jetties, and riprap. The majority of the protection structures were installed within the last 40 years and have varying levels of adequacy and performance. While these protection structures help protect buildings and infrastructure during coastal storms and wave attack, they are still vulnerable to failure during larger storm events and may not provide full protection. Riprap structures along the coastline are particularly vulnerable to failure and require more maintenance and upgrading over time than concrete seawalls.

The area from the Santa Cruz Harbor to Pleasure Point contains numerous homes on the coastal bluff as well as roads and other infrastructure, particularly near the coastal lagoons, that are vulnerable to coastal erosion. There are also several sea caves that may affect the integrity of homes and infrastructure in this area as well. The primary type of coastal armoring here is riprap. It is not uncommon for East Cliff Drive to be closed or damaged where it crosses Schwann Lake, Corcoran Lagoon, and Moran Lake during winter, coastal storms.

The area from Pleasure Point to Opal Cliffs also contains numerous homes on the costal bluff as well as roads and other infrastructure that are vulnerable to coastal erosion. The coastal armoring in this area is a combination of riprap and concrete seawalls. A seawall was constructed in 2009 in the Pleasure Point area along East Cliff Drive that should greatly reduce potential damage from coastal erosion to the roadway as well as the homes on the landward side.

The area south of New Brighton Beach to the southern Santa Cruz County line contains numerous homes on the bluffs, at the base of the bluffs, on the beach. There is also critical infrastructure on the beach and

bluffs that may be affected by coastal erosion, including county roads. Many of the homes along and above both Las Olas Drive and Beach Drive will experience the continuing effects of coastal erosion. There are also several other communities, including Seascape, La Selva Beach, Sunset Beach and Pajaro Dunes, that are vulnerable to coastal erosion.

Many of the homes that exist along the coast in these areas, although somewhat protected, may be subject to further coastal erosion as sea levels rise, earthquakes occur, and waves and rainfall impact the shoreline. The county's Geologic Hazards Ordinance requires development on coastal bluffs and beaches to be reviewed by the County Geologist. The ordinance also requires development to be setback at least 25 feet from the top of a coastal bluff, or the distance required to provide 100-year stability, whichever is greater. Shoreline protection structures are subject to the ordinance and review by the County Geologist. Most current seawall permits are for maintenance and improvement of existing walls, which allows the county to require modifications that reduce the walls' impacts.

Although seawalls reduce or delay coastal erosion processes as long as they remain functioning, ultimately coastal erosion continues, and the best seawalls need maintenance. While seawalls remain in place, they modify coastal erosion through the reduction of wave erosion energy, or reflection or refraction of wave energy. Focused erosion can occur at the ends of the seawalls. While seawalls are helpful in protecting against coastal erosion, proper setbacks from the brow of bluffs, drainage control, and special construction are all necessary to protect structures, roadways, and utilities from damage.

Modern seawall construction, such as the structures constructed in 2009 in the Pleasure Point area, can also be designed to improve coastal access by incorporating stairways and viewing platforms, and removal of debris from previous attempts at coastal protection that block lateral access along the shoreline.

3.2.5.11 Coastal Hazards Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing coastal hazard-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with coastal hazards. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-47 presents the coastal hazards problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2

Table 3-47: Santa Cruz County Coastal Hazard Problem Statements

Hazard	Sub-Hazard	Area of Concern	Problem IS	Description	Related Mitigation Actions
Coastal Hazards	Coastal Erosion	Threat	ps-CE-SCC-01	Accelerated coastal bluff retreat is threatening the long-term stability of transportation routes, low-lying / underground storm drainage and wastewater infrastructure, and public coastal access points.	ma-CE-SCC-01
Coastal Hazards	All	Victim	ps-CH-SCC-01	Coastal hazards disproportionately impact lower-income residents, including reducing access to low-cost recreational opportunities along the coastline as a result of sea level rise combined with coastal erosion and armoring removing beaches.	ma-CH-SPD-01
Coastal Hazards	All	Threat	ps-CH-SCC-02	Residential and commercial properties along the County?s urban coastline face increasing coastal flooding and erosion risks from seasonal storms and high tides, especially older structures with no elevation, floodproofing, or relocation strategy.	ma-AH-SCC-04
Coastal Hazards	Coastal Storm	Impact	ps-CS-SCC-01	Severe coastal storms can produce hazardous surf, flooding, and debris flows onto roadways and public spaces, posing direct risks to public safety, including unsuspecting year-round visitors engaged in coastal recreation, and limiting emergency access.	ma-AH-SCC-07
Coastal Hazards	Coastal Storm	Impact	ps-CS-SCC-02	Increasingly intense coastal storms are causing more frequent flooding and wave damage to public infrastructure, private property, and coastal businesses, leading to higher repair costs and lost economic activity during peak visitor seasons.	ma-AH-SCC-02
Coastal Hazards	Tsunami	Impact	ps-TS-SCC-01	A major tsunami could damage or destroy coastal infrastructure, including ports, roads, utilities, and public facilities, causing long-term disruption to transportation, commerce, and essential services.	ma-AH-SCC-06
Coastal Hazards	Tsunami	Threat	ps-TS-SCC-02	A tsunami could require rapid, large-scale evacuation of residents and visitors from low-lying coastal areas, where limited routes and high seasonal population density may hinder timely clearance.	ma-TS-SPD-01

3.2.5.12 Climate Change Impacts & Vulnerable Populations

Santa Cruz County's coastline faces increasing risks from coastal erosion, sea level rise, coastal storms, and tsunamis. Climate change is accelerating bluff retreat, increasing storm surge intensity, and raising baseline sea levels, all of which compound risks to people, property, infrastructure, and ecosystems. These hazards threaten both immediate safety and long-term resilience, with disproportionate impacts on vulnerable populations who rely on coastal resources for housing, recreation, and livelihood.

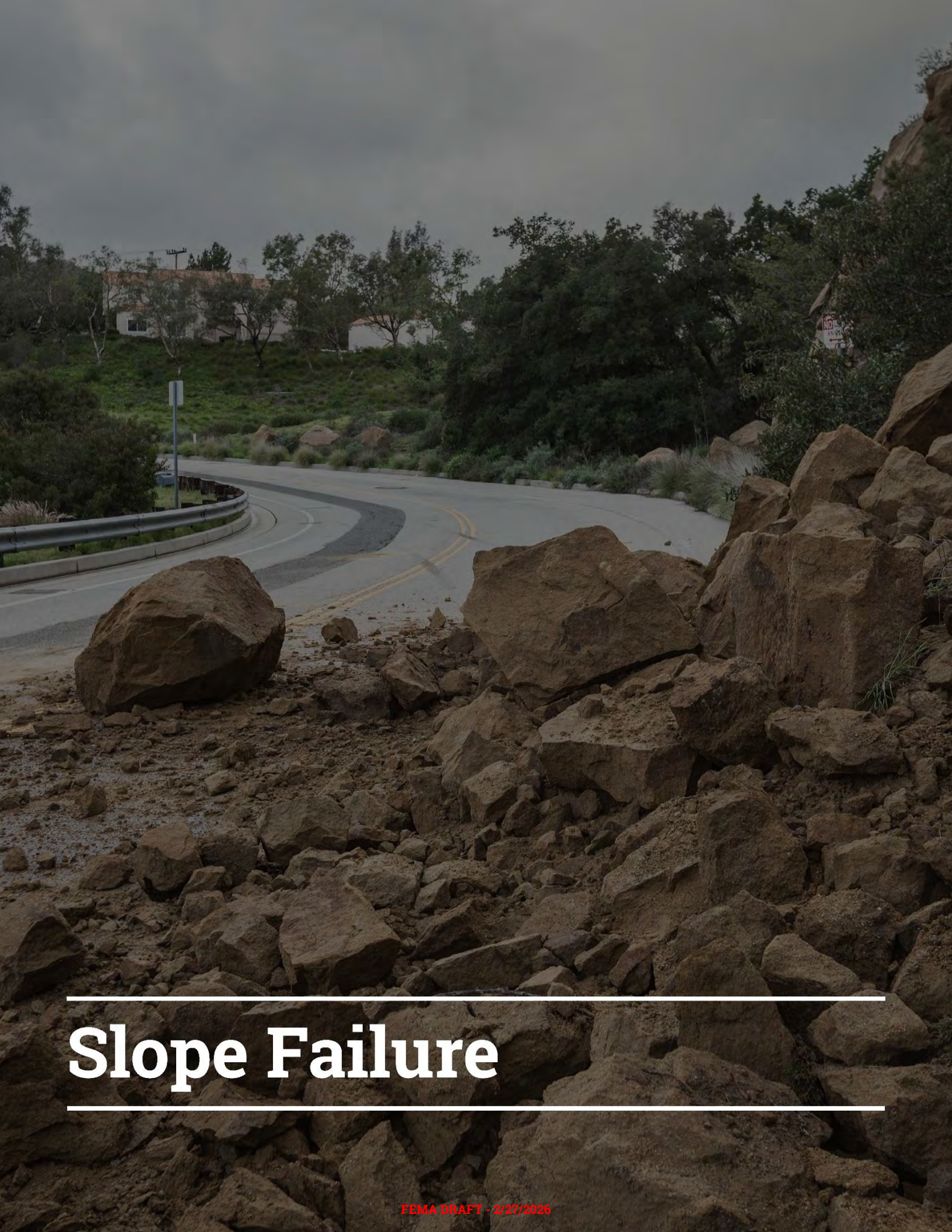
Direct Impacts: Accelerated bluff erosion undermines transportation routes, storm drainage systems, and wastewater infrastructure, while also threatening public coastal access points. Severe coastal storms bring flooding, hazardous surf, and debris flows onto roadways, disrupting emergency access and creating safety risks for both residents and visitors. Residential and commercial properties along the urbanized coastline, particularly older buildings lacking floodproofing or elevation, are at increasing risk from seasonal storms, high tides, and erosion. Tsunami events, though infrequent, could cause catastrophic damage to ports, utilities, and transportation networks, disrupting commerce and essential services for months or years.

Secondary Hazards: Coastal armoring intended to protect infrastructure often accelerates beach loss, leading to coastal squeeze where natural shorelines are reduced or eliminated. Rising seas increase the likelihood of compound flooding when high tides coincide with riverine flooding or storm surge, magnifying inundation depths and damages. Erosion of dunes, bluffs, and wetlands also reduces natural buffering capacity, further exposing inland areas to future hazard events.

Public Health and Social Impacts: Coastal hazards disproportionately impact lower-income residents and vulnerable populations. Loss of beaches and coastal access points reduces affordable recreational opportunities, particularly for households without means to travel outside the region. Coastal flooding places renters and residents of older housing stock at elevated risk of displacement, as many lack flood insurance or resources to rebuild. Tourists and seasonal visitors, who may be unfamiliar with evacuation routes, face increased danger during coastal storms and tsunami events. For seniors, people with disabilities, and limited-English residents in low-lying areas, evacuation during fast-moving events remains a significant challenge.

The mitigation strategy addresses these issues by advancing coordinated shoreline management, strengthening natural and built coastal defenses, and enhancing evacuation planning for vulnerable coastal populations. Integrating climate projections with equity focused outreach and infrastructure investment is essential to sustaining community resilience along the Santa Cruz County coastline.

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Slope Failure

3.2.6 Slope Failure Hazard Profile



Slope failure is a general term that describes a wide variety of mass downslope movements of soil and rock in response to gravity, including many types of landslide. Slope failures occur in a variety of ways, as falls, topples, slides, spreads, flows, and a combination of these categories, and may change from one form of failure to another during their movement. Factors that contribute to slope failures include the soil and rock strengths, orientation and steepness of elements on the slope, weathering and erosion, moisture content, recent fire activity, and human activities such as the removal of vegetation and inappropriate grading. Slope failures are a worldwide hazard, but Santa Cruz County's unique geologic conditions make large portions of the planning area particularly susceptible to many forms of slope failure. Factors that contribute to the county's slope failure susceptibility include:

- Local climatology and weather patterns that include wet winters and coastal storms;
- Terrain, geology, and weather patterns that cause significant erosion;
- High seismicity in the region;
- Wildfire susceptibility in the mountainous areas and burn scars on steep terrain; and
- Human activities such as vegetation removal and grading in areas of slope instability.

Slope failures can also be caused by land or aging stormwater infrastructure, particularly in the county's mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation will initiate failures. The deterioration of old timber harvest roads may also result in concentration of drainage that induces slope failure.

Although they can sometimes present a threat to human life, slope failures often result in a disruption of everyday services, including emergency response capabilities, blocking transportation routes, and impacting water supplies. When slope failure hazards affect transportation routes, which is one of the most common impacts, they are frequently expensive to clean up and can have significant economic consequences to the county. In 2023 a slope failure incident, closed State Route 9 for months requiring diverting traffic onto local road network, significantly impacting residents, commerce, and emergency services response times.

3.2.6.1 Compounding Hazards

There are some hazards that can trigger or exacerbate slope failure; namely, wildfire and flooding. These compounding hazards are briefly discussed in this section in relation to slope failure and detailed in their respective profiles, in Sections 3.2.1 and 3.2.2. Further, both wildfire and flood hazards are exacerbated by climate change (Section 3.2.10); consequently, slope failure is also compounded by climate change to this extent.

Heavy Rain & Flooding

Heavy rain and associated flood events can lead to landslides, mudslides, debris flows, and other types of slope failure, particularly in steep mountain watersheds where saturated soils lose cohesion and fail, as well as stormwater infrastructure exceeding capacity or culverts failing. Flood events can undercut the toe of a slope which can remove the support for the slope and cause a landslide or rockfall. Heavy rain events are common from November to April in Santa Cruz County. These heavy rainstorms, often associated with an "atmospheric river" event, can deliver over one inch of rain per hour for extended time frames and trigger flash floods in the county's steep, mountainous terrain. Atmospheric rivers are discussed in detail in the Severe Weather Profile (Section 3.2.4).

Wildfires

Wildfires can create short-term and long-term impacts on landscapes by altering the soil structure, impeding its ability to absorb moisture, and destroying vegetation that binds the soil with roots and absorbs rainfall and runoff. Post-wildfire, even small rain events can create devastating mudflows, debris flows, and landslides. Areas that are currently mapped as low to moderate risk of slope failure may have elevated risk following a wildfire.

Coastal Hazards & Erosion

Coastal hazards, including coastal storms and wave run-up and surge, along with the cyclical forces of wind and water lead to erosion and slope failures. Erosion is the wearing away of coastal land from forces such as wave action, wind, and rain, causing the horizontal retreat of the shoreline along the ocean. In Santa Cruz County, these coastal hazards contribute to the failure of the coastline's steep sea bluffs and cliffs.

Erosion rates are not uniform and vary over time at any single location. Annual variations are the result of seasonal changes in wave action and water levels. Erosion is caused by coastal storms and flood events, changes in the geometry of tidal inlets and bays, and human activities such as development and dredging. Coastal erosion includes cliff, bluff, and beach erosion and is a result of both normal, constant wave action and intense wintertime wave attack associated with coastal storms.

Beaches change seasonally in response to changes in wave conditions. Winter storm waves are larger and contain more energy, capable of moving significant amounts of sand from beaches to offshore bars. Although lower, less energetic waves return sand during the summer, the beaches are narrow and sometimes absent altogether during the winter months when storm waves attack the cliffs and bluffs more frequently, leading to slope failure. Wave attack during periods of high tides or otherwise elevated sea level (e.g. El Niño or storm surge) is one of the most common mechanisms of episodic bluff and cliff failure.

3.2.6.2 Types of Slope Failure

FEMA NRI ranked Santa Cruz County as the most landslide-prone county in the state in terms of hazard exposure. Local geology (i.e., geologically young coastal mountains with high annual precipitation) as well

as significant development within areas with slopes (e.g., the Santa Cruz Mountains) are the two primary factors for why Santa Cruz County is highly susceptible to slope failure.

In Santa Cruz County, there are three primary types of slope failure that pose significant threats to people, property, and critical facilities and infrastructure. Landslide and debris flow were identified as the main slope failure concerns in Santa Cruz County and are briefly described in this section.

It is important to note that bluff failure, while discussed as a type of slope failure in this profile, is intimately related with coastal hazards and coastal erosion, in particular; thus, it is discussed in additional detail in the Coastal Hazards Profile (Section 3.2.5).

Landslide

Landslides are the downward and outward movement of slopes composed of natural rock, soils, artificial fills, or combinations thereof and are classified into many different types based on the nature of the slope materials, type of movement, and speed of the failure. They range from slow-moving rotational slumps and earth flows, which can slowly distress structures but are less threatening to personal safety, to fast-moving rockfalls and debris flows that are a serious threat to structures and have been responsible for the most slope failure-related fatalities. Many large landslides are complex and a combination of more than one landslide type (Figure 3-52). (CalOES, 2018)

Debris Flow

According to NOAA, debris flows—also known as mudslides, mudflows, or debris avalanches—are the most common type of slope failure in Santa Cruz County. These fast-moving landslides occur when slope material becomes saturated with water. As such, they typically occur during or after intense rainfall.

Debris flows originate on steep hillsides as liquefied, shallow flows that become concentrated in steep canyons. They can accelerate from approximately 10 miles per hour to over 35 miles per hour and carry a variety of materials such as boulders, trees, and even vehicles. Debris flows vary in consistency from watery mud to thick, rocky mud with entrained debris, and can severely damage road surfaces and structures. As debris flows converge from adjacent channels, they accumulate more materials and muddy water, thus increasing in destructive force. From a geologic perspective, there are generally two types of debris flows.

- **Shallow Landslide Debris Flows:** These debris flows occur due to soil failure from oversaturation, causing the soil to liquify and run downhill. This type of debris flow generally results from a shallow landslide (less than 15 feet deep) and has a discrete initiation zone depositional area. Shallow landslides tend to occur in winter but are most likely after prolonged periods of heavy rainfall when soil materials are saturated.
- **Post-Wildfire Debris Flows:** This type of debris flow is a result of post-wildfire conditions, where burned and baked soil surfaces increase rainfall runoff that concentrates in a channel and picks up debris as it moves. Under extreme wildfire conditions, soils can be damaged to the point of becoming hydrophobic,

preventing water absorption or infiltration over large areas where the fire was most intense, such as steep hillsides and drainages with dense vegetation. Post-wildfire debris flows have a less discrete initiation zone but are otherwise similar in form to a debris flow derived from hillslopes.

An example of a catastrophic post-fire debris flow is the event that occurred in Santa Barbara County on January 9, 2018, when, after the Thomas Fire, numerous canyons deposited debris flows onto urbanized alluvial fans in Montecito and Carpinteria with little warning time resulting in significant fatalities. (CalOES, 2018)

Bluff Failure

Coastal bluff failure results from both marine and terrestrial processes. Marine forces such as wave action and coastal storms drive much of the erosion, while terrestrial forces—including rainfall, runoff, weathering, and earthquakes—are also contributing factors, though less recognized. Wave attack during periods of high tide or elevated sea level (e.g., during storm surge) is one of the most common triggers of episodic bluff and cliff failure. Climate patterns such as El Niño can intensify these drivers by increasing storm frequency, wave height, rainfall, and temporary sea level rise.



Figure 3-52: Landslide on Highway 9 Triggered by Heavy Rain in February 2023

Source: Santa Cruz County

A more extensive description of bluff failure and the coastal hazards that contribute to it can be found in Section 3.2.5, Coastal Hazards Profile, including discussions of the regulatory environment, past events, locations, frequency and probability, and severity, as well as an assessment of bluff failure vulnerabilities.

Bank Failure

Bank failure refers to the collapse or erosion of a stream or riverbank caused by hydraulic forces, geologic instability, or loss of vegetative cover. Failures can occur gradually through chronic undercutting and slumping, or suddenly during high-flow events when saturated soils give way. This hazard specifically includes stream bank failure, which is of particular concern in Santa Cruz County where many homes, businesses, and roads were developed prior to modern setback requirements. Development constructed close to streams, as well as roadways built directly along stream corridors, are especially vulnerable to erosion and failure, with numerous examples distributed throughout the county.

3.2.6.3 Policies, Plans & Regulatory Environment

Santa Cruz County General Plan

The Santa Cruz County General Plan sets forth objectives and policies relevant to slope failure in the Public Safety and Built Environment Elements, including to site and design development with the environment (Objective BE-4.2), and to reduce hazards and property damage caused by landslides and other ground movements affecting land use activities in areas of unstable geologic formations, potentially unstable slopes, and coastal bluff retreat (Objective 6.2). To meet these objectives, the General Plan includes the following key policies:

- **BE-4.2.2 Site Design for Environmental Protection:** Requires the siting and design of new development to minimize grading, avoid or provide mitigation for geologic hazards, conform to the physical constraints and topography of the site, and maintain natural drainage patterns.
- **Policy 6.2.1 Geologic Hazards Assessments for Slope Development:** Requires a geologic hazards assessment of all development, including grading permits, that is potentially affected by slope instability.
- **Policy 6.2.6 Location of Structures and Drainage Considerations in Unstable Areas:** Requires the location and clustering of structures away from potentially unstable slopes whenever feasible, and requires drainage plans that direct runoff away from unstable slopes.
- **Policies 6.2.12, 6.2.17, 6.2.20, and 6.4.3 Concerning Development on Coastal Bluffs:** These policies include requirements for coastal bluff setbacks and geologic hazard review, as well as limitations on the reconstruction of substantially damaged buildings and creation of new parcels in coastal hazard areas. These policies are discussed in more detail in the Coastal Hazards Profile (Section 3.2.5).

Santa Cruz County Code Title 16

Sana Cruz County Code Title 16, in combination with the California Building Standards Code adopted under Title 12, regulates geologic hazards including slope failure, both within and outside of coastal hazard areas,

as well as grading and erosion control. The title implements the policies of the General Plan relevant to geologic hazards, including requirements for geologic and geotechnical assessments to identify slope failure hazards and appropriate mitigation measures, limitations on reconstruction of substantially damaged structures and the creation of new parcels, adjustments to allowed density in high-hazard areas, and siting and design requirements for new development. Slope failures may be triggered not only by intense rainfall and erosion but also by earthquake ground shaking, which can destabilize steep hillsides and stream banks, further underscoring the need for design standards.

3.2.6.4 Past Events

Slope failures are a common occurrence in the Santa Cruz Mountains. The intense winter storms that often bring high rainfall amounts, especially during El Niño weather patterns, and steep terrain are conducive to landsliding. Earthquake activity also contributes to this hazard, as illustrated by the 1906 earthquake which set off dozens of large landslides in the mountains, some of which claimed human lives.

Most recent landslides in the Santa Cruz Mountains have been caused by a combination of human activity and natural factors. Human activities that can further destabilize slopes include old timber harvest roads and skid trails, conversion of land from forest to residential and agricultural uses, road building, grading and other construction, and any activity that alters normal drainage patterns or concentrates runoff. The likelihood that any of these factors will contribute to slope failure is dependent upon the existing conditions and also on the care with which activities are conducted in these locations.

Several periods of increased slope failure have occurred in Santa Cruz County in recent history. Some of the better-documented events include:

- **Mount Hermon Landslide:** The Mountain Hermon landslide moved in the late 1950s after the El Niño year of 1957 to 1958. This slope failure occurred in an area of suspected older landsliding and the new movement extended from the Kaiser Quarry to the bottom of Bean Creek, blocking Conference Drive and spurring the construction of the Mount Hermon bypass. At the time of the event, there was some concern that the quarry (and a small earthquake) may have contributed to the re-initiation of the older landslide.
- **Deadly 1982 Landslides and Debris Flows:** Severe storms in the winter of 1982 caused multiple slope failures throughout the Bay Area and especially in the Santa Cruz Mountains. One very large composite landslide along Love Creek, west of Loch Lomond Reservoir, killed ten people. This landslide was and continues to be an indicator of the potential severity of slope failure activity and the need for observation and mitigation. Other slope failures that occurred as a result of the winter storms that year included debris flows and destroyed 135 homes, damaged 300 homes, and killed five more people. In addition to damage to homes, widespread landslide damage occurred to roadways, driveways, and stream channels.
- **Loma Prieta Earthquake Landslides:** Landslides occurred throughout Santa Cruz County during and after the Loma Prieta earthquake on October 17, 1989. Most of the larger landslides moved only during the actual shaking, but others continue to creep even today. Smaller landslides were also triggered by the shaking along coastal bluffs and ridge tops.

- **El Niño Slope Failures of 1986, 1998, and 2005:** Severe winter storms formed during El Niño patterns in the years of 1986, 1998, and 2005 caused multiple slope failures, particularly debris flows, throughout the Santa Cruz Mountains. During the 1998 winter storms, many homes were affected by slope failures and several roadways were damaged including Highway 9, Branciforte Road, and Amesti Road. Winter rains also induced landsliding within the quarries throughout the county.
- **2017 Debris Flows:** In Winter 2017, 26 debris flow events were reported throughout Santa Cruz County. These events coincided with multiple atmospheric river events and resulted in road closures, both short-term and long-term.
- **2021 CZU Burn Scar Debris Flows:** In January and October of 2021, following the devastating CZU Lightening Complex Fire the previous August that burned more than 85,000 acres across Santa Cruz and San Mateo Counties (Figure 3-53), atmospheric river events delivered parades of severe storms and heavy rain to the burn scar area. In anticipation of both events, many mountain communities on the North Coast and in the San Lorenzo Valley areas of the county were ordered to evacuate. Although very few debris flows occurred in the county as a result of these events, some areas in the Santa Cruz Mountains picked up more than six inches of rain and damaging slope failures were triggered in neighboring counties.
- **2022-2023 Landslides:** Between December 27, 2022, and January 31, 2023, numerous landslides occurred in Santa Cruz County as a result of multiple atmospheric rivers. Prolonged and intense rainfall saturated soils across steep terrain, leading to widespread slope failures that blocked major transportation routes, damaged homes, and threatened utilities. Roadways in the Santa Cruz Mountains were particularly hard hit, with Highway 9, Soquel San Jose Road, and numerous local roads closed for extended periods due to slides and debris flows. These events underscored the county's high vulnerability to rainfall-induced slope failures during sequential storm systems.
- **2024 Mountain Charlie Road Landslide:** On February 26, 2024, the county became aware of a deep-seated landslide on Mountain Charlie Road in northern Santa Cruz County. The slide impacted dozens of households served by the road and was active for months, moving one foot per week on average during its peak, before the county was able to construct a temporary alternative access route.



Figure 3-53: Potential Debris Flow Area in CZU Lightening Complex Fire Burn Scar

Source: Santa Cruz County

3.2.6.5 Location

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past slope failures can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles, show no evidence of recent movement, and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

Recognizing ancient dormant mass movement sites is important to identify current areas susceptible to flows and slides, because they can be reactivated by earthquakes or exceptionally wet weather. Those ancient scars also consist of broken materials, frequently involve disruption of groundwater flow, and are vulnerable to construction-triggered sliding.

Slope failures occur throughout Santa Cruz County but are centered primarily along the steeper slopes in the hills and mountains, along stream corridors, and along coastal bluffs and inlets. Large areas of the county are subject to slope failure, as indicated in Figure 3-54, but isolated failures occur throughout the county. The locations and types of slope failures that occur in Santa Cruz can be summarized as follows:

- Coastal bluffs along the coastline experience shallow landslides, debris flows, and topples (locations prone to bluff failure are identified in the Coastal Hazards Profile, Section 3.2.5)
- Rivers and streams throughout the county experience shallow and rotational landslides and lateral spreading
- Steep slopes and drainages in the Santa Cruz Mountains experience large, deep composite landslides and debris flows

Figure 3-54 shows low, moderate, and high landslide susceptibility in Santa Cruz County from the California Geological Survey (CGS), and Table 3-48 describes these classifications. Most of the high susceptibility areas are in the Santa Cruz Mountains. However, this map should be used with caution, as site-specific conditions can make some locations in low to moderate instability areas highly unstable and some high instability locations more stable with the use of appropriate mitigation measures. Geologic or geotechnical investigation is often required to determine the stability of a given site.

Table 3-48: Slope Failure Susceptibility Classifications

Susceptibility	Native Class	Description
Low	**1-5**	These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks.
Medium	**6-7**	Very high landslide susceptibility, classes VIII, IX, and X, includes moderate and steep slopes in hard rocks and weak rocks.
High	**8-10**	Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks.

Source: CGS Susceptibility to Deep-Seated Landslides in California

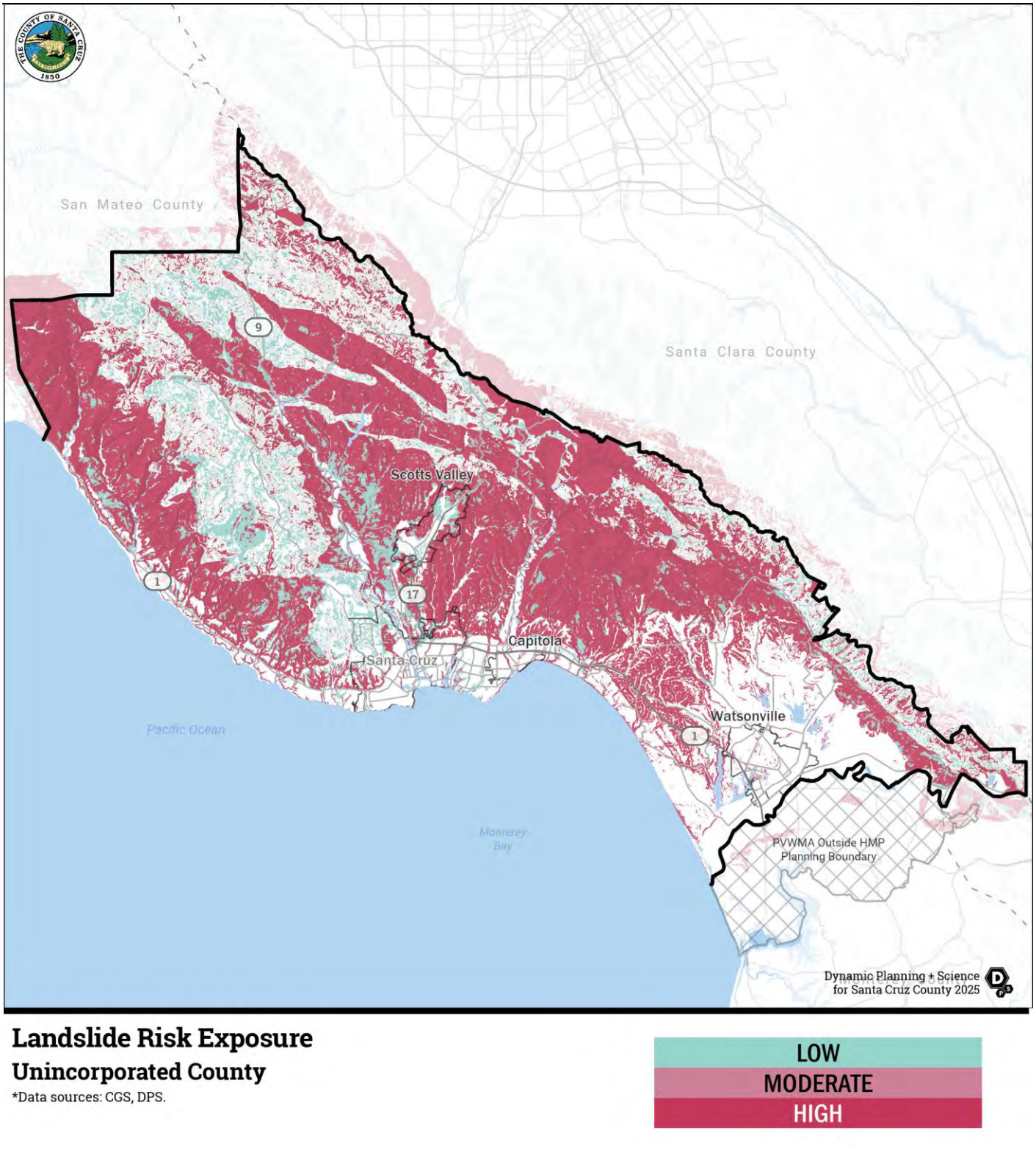


Figure 3-54: Santa Cruz County Slope Failure Risk

3.2.6.6 Frequency & Probability of Future Occurrences

Measuring the frequency and probability of slope failure hazards requires a combination of historical data analysis, geologic mapping, climate trends, and probabilistic modeling, as these hazards are influenced by factors such as precipitation, seismic activity, topography, and human development. To assess hazard frequency, researchers examine past events recorded in geological surveys, historical documents, and remote sensing data. For example, slope failure occurrences in Santa Cruz County are often linked to intense rainfall, and analyzing past precipitation patterns and climate change models helps estimate future probabilities. Probabilistic models, such as landslide susceptibility mapping, incorporate variables like slope gradient, soil composition, and vegetation cover to predict the likelihood of future events.

Slope failures are most frequently triggered in periods of high rainfall during the winter months, November to April, in Sana Cruz County. The hazard is greatest in steeply sloped areas, although slides may occur on slopes of 15% or less if the conditions are right. Slope steepness and underlying soils are the most important factors affecting the landslide hazard. However, surface and subsurface drainage patterns also affect the hazard, and vegetation removal can increase the likelihood of slope failure. Human activities contribute to instability through grading of steep slopes, overloading with artificial fill, extensive irrigation, construction of impermeable surfaces, and excessive groundwater withdrawal. (USGS, 2020)

As discussed in Section 3.2.6.1, other natural hazards such as earthquakes, heavy rain, flood, or wildfire, can also trigger slope failures or compound their impacts. As such, slope failure frequency is often related to the frequency of these other hazards. Seismic hazards, including fault movements and ground shaking, are assessed using data from the USGS and other monitoring networks. The probability of debris flows is often measured through field assessments and computer simulations that consider factors such as freeze-thaw cycles, extreme weather events, and wildfire burn scars, like the CZU Lightening Complex Fire, which has increased erosion and debris flow risks in affected areas.

Slope failures will continue to affect the county, especially during El Niño weather patterns and atmospheric river events. El Niño weather patterns will continue approximately every seven years, and the San Andreas Fault, as well as other faults, will generate earthquakes, which will contribute to the formation of landslides. The probability of slope failure occurring in Santa Cruz County is likely (between 10% and 100% annual probability). Failure is more likely in areas that have recently experienced flooding or wildfires, but it can occur on any susceptible terrain given the right conditions—such as “ideal” underlying geology, steeper slopes, and saturation. Areas with unstable conditions, like over-steepened slopes, may regularly experience debris flows during heavy rainfall. Additionally, decadal variance and climate change driving increase in frequency and intensity of heavy rain events as well as changes in vegetation composition and wildfire, which could impact slope stability in unpredictable ways.

3.2.6.7 Severity

Slope failures, including landslides, debris flows, and bluff failures, pose significant hazards in Santa Cruz County, often disrupting essential services and emergency response capabilities. The severity of slope

failure hazards depends on local geologic and soil conditions, including moisture content, slope, and vegetation cover.

The primary impacts from slope movement are on roads and any underlying or aboveground utilities including water and sewer infrastructure. While landslides occasionally threaten human life, their more common impact lies in blocking transportation routes, damaging buildings and infrastructure, damming creeks, and contaminating water supplies. The cleanup of these hazards on transportation routes can be costly and have substantial economic repercussions for the county. In coastal areas, transportation and utility infrastructure located at the top edge of coastal bluffs are highly vulnerable to damage because the rate of erosion and bluff retreat in unprotected areas, which is expected to increase in response to increased exposure to storm waves and intense rain events.

A significant amount of linear infrastructure (or lifelines) are exposed to slope failure, as further discussed in the vulnerability assessment section. Impacts to these lifelines can include:

- **Roads:** Access to major roads is crucial to life-safety, response, and recovery operations after a disaster event. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can also result in economic losses for businesses.
- **Bridges:** Landslides can significantly impact bridges, by knocking out bridge abutments or weakening the soil supporting them. Debris flows can also clog drainages at choke points such as bridges with downed trees, boulders, and other materials picked up along their path, triggering additional flooding impacts.
- **Power Lines:** Power lines are generally elevated above steep slopes, but the towers and poles supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath support structures, causing them to collapse and rip down the lines. Power and communication failures due to landslides can create problems for first responders, vulnerable populations, and businesses.

3.2.6.8 Warning Time

Some slope failure hazards occur slowly, including creeping slides and bluff erosion, but can have significant property or health consequences. Identifying these hazards generally requires site-specific analysis to determine if the site's soil and geology are susceptible to failure and to identify the most relevant and prudent mitigation measures. For these types of slope failure hazards, warning time is long.

However, for other types of slope failure, such as sudden and fast-moving debris flows, warning time is often very short. Identifying areas with known hazards (i.e., where past events have occurred) or with characteristics conducive to these hazards can help with preparedness when triggering events like prolonged or intense rainfall occur. Post-fire debris flow mapping is one of the primary ways in which Santa Cruz County has worked to identify potential hazard areas for proactive mitigation and evacuation ahead compounding events like atmospheric rivers. While this identification does not increase the warning time

for an actual failure event, it does enhance proactive responses to potential triggers, save lives, and help prevent damage. (Manconi, 2016)

3.2.6.9 Slope Failure Vulnerability Assessment

Past experience has shown that many areas of the county are susceptible to the effects of slope failures. Most of the damage caused by landslides has been to privately-owned structures; although, a fair number of county roads are also at risk. Santa Cruz County's underlying seismic activity and diverse topography, which includes mountainous terrain, deep canyons, and steep coastal bluffs, makes certain communities and infrastructure particularly vulnerable to slope failure hazards. The exposure of both population and assets to these hazards depends on factors such as development patterns, land use, and the presence of critical facilities and infrastructure in high-risk areas. The 2025 Santa Cruz County Climate Adaptation and Vulnerability Assessment provides additional slope failure vulnerability assessment.

Figure 3-55 displays slope failure susceptibility for Santa Cruz County. Most of the unincorporated county is susceptible to landslides.

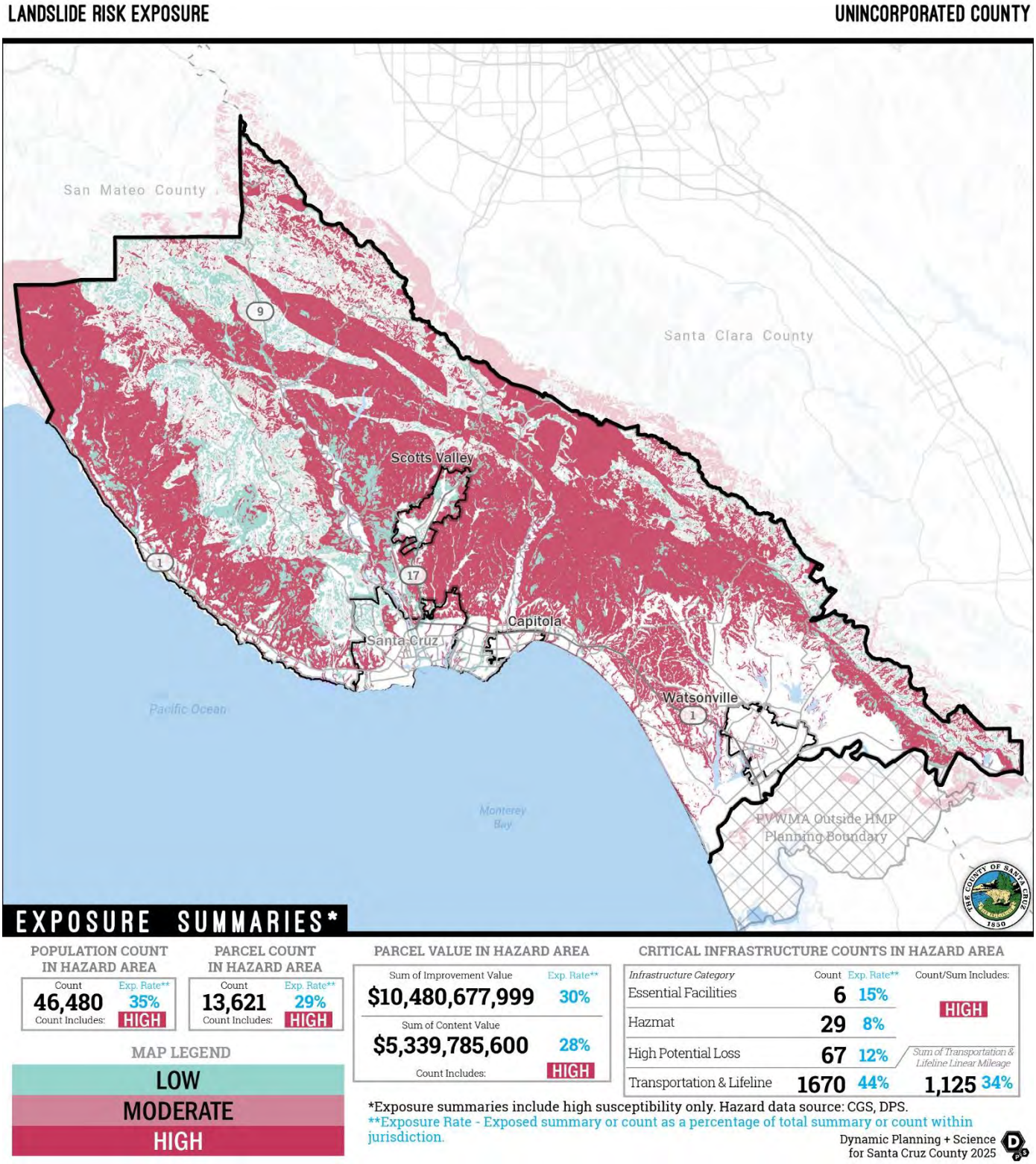


Figure 3-55: Exposure Summary - Santa Cruz County Slope Failure Risk

3.2.6.9.1 Population

Almost three-quarters of the county's total population is exposed to some degree of slope failure risk, as demonstrated in Figure 3-56 and Table 3-49. Of that, over 80,000 people are located in moderate to high risk areas, and another 15,000 are located in low risk areas.

Although the county's population is concentrated in urban centers like Santa Cruz and Watsonville, where slope failure susceptibility is lower, there are numerous smaller towns and rural communities situated in mountainous or coastal areas exposed to slope failure risk. Homes located near steep slopes or within wildfire burn scars, such as those from the CZU Lightening Complex Fire, face an increased risk of landslides and debris flows, and remote areas with limited evacuation routes may experience higher vulnerability, particularly in cases of sudden slope failures triggered by heavy rainfall or earthquake.

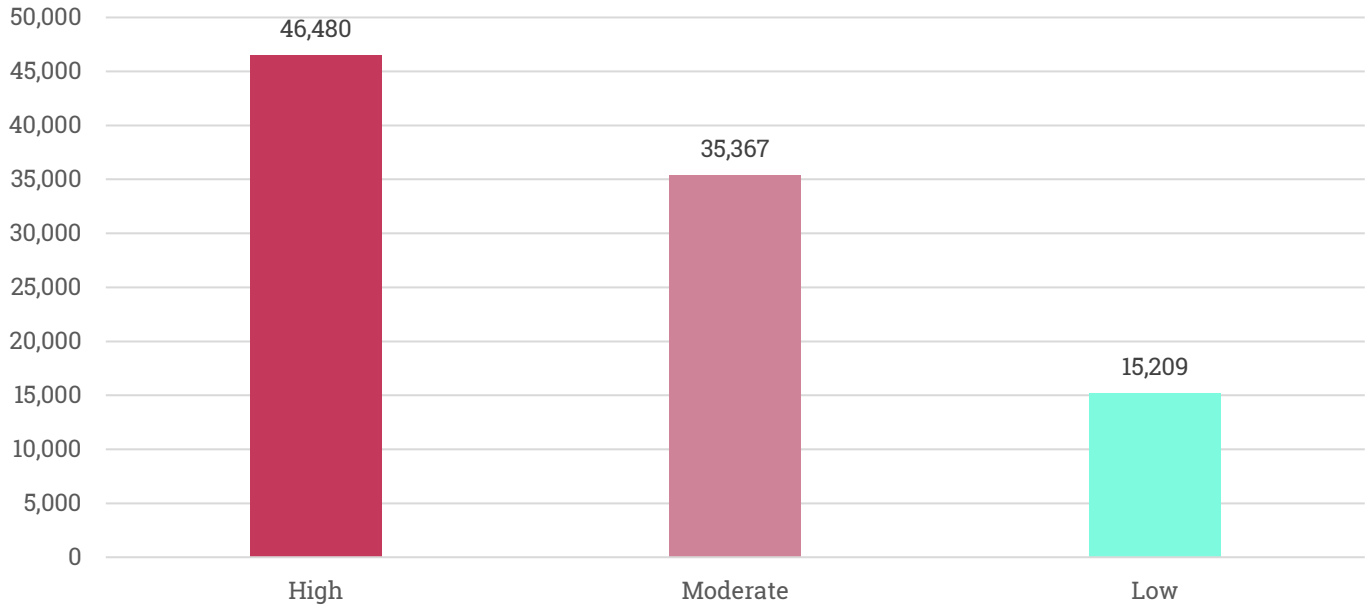


Figure 3-56 Santa Cruz County Population Exposed to Slope Failure Risk

Table 3-49: Santa Cruz County Population Exposed to Slope Failure Risk

	Total Population
Unincorporated County	131,149

Landslide Susceptibility	Population Count	% of Total
High	46,480	*35.44%*
Moderate	35,367	*26.97%*
Low	15,209	*11.60%*
Total	**97,056**	**74.00%**

3.2.6.9.2 Property

Property vulnerability to slope failure is influenced by factors such as location, construction materials, soil stability, and proximity to steep slopes or waterways. These hazards, including landslides and debris flows, can cause significant structural damage to homes and businesses, particularly in areas with high erosion or unstable terrain such as wildfire burn scars and coastal areas.

Buildings constructed on steep slopes or near fault lines are at high risk of structural failure due to ground movement. Landslides can undermine foundations, collapse retaining walls, and shift entire structures downslope, leading to costly repairs or total loss. Debris flows, especially in burn scar areas, pose a major threat to properties by burying structures under mud and rock or washing away roads and bridges.

Table 3-50 shows the number of parcels and value exposure in the slope failure risk areas of Santa Cruz County. Over 75% of parcels in the unincorporated county are exposed, totaling $41 billion in assessed building and content value. A wide range of land uses are located in landslide hazard areas, but 90% of the structures are residential. Homes built before 1989 (approx. 80% countywide) are particularly vulnerable to landslides, as some of these were constructed without the benefit of engineering or geologic investigations.

Table 3-50: Santa Cruz County Parcels Exposed to Slope Failure Risk

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Landslide Susceptibility	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
High	13,621	*28.6%*	$10,480,677,999	$5,339,785,600	$15,820,463,599	*29.1%*
Moderate	14,990	*31.5%*	$11,152,453,196	$5,966,777,598	$17,119,230,794	*31.5%*
Low	7,507	*15.8%*	$5,251,975,198	$2,745,185,399	$7,997,160,597	*14.7%*
Total	**36,118**	**75.8%**	**$26,885,106,393**	**$14,051,748,597**	**$40,936,854,991**	**75.4%**

3.2.6.9.3 Critical Facilities & Infrastructure

Numerous critical county facilities and many miles of county infrastructure are located in areas that are exposed to slope failure risk.

Critical infrastructure, including highways, bridges, water supply systems, and utility networks, is at the highest risk from slope failure hazards. Key transportation corridors such as Highways 9 and 17, which traverse the Santa Cruz Mountains, are particularly susceptible to landslides, leading to periodic closures and increased maintenance costs. Scenic Highway 1 that runs along the Pacific Coast is also prone to closures from landslides and bluff failures.

Most of the roadways in the county were constructed many years ago with little consideration to slope stability and, in high-risk areas, are likely be affected by slope failures at some point in the future. Because

utilities follow these roads, damage to roads often disrupts sanitary sewers and water systems, gas and electricity transmission, and cable and telephone utilities. Slope failures can sever transportation routes, limiting emergency response and isolating communities, and water and sewer lines built on unstable ground may rupture, leading to service interruptions and environmental contamination. Power lines and communication networks are also at risk, increasing the likelihood of prolonged outages following a major event. These hazards pose significant risks to public safety, economic stability, and emergency response capabilities, particularly in unstable coastal, mountainous, and wildfire-affected areas.

As provided in Table 3-51, a total of nearly 3,000 miles of critical infrastructure is exposed to slope failure risk across the county, including almost 2,000 miles of roadways alone. Other lifelines exposed include approximately 31 miles of natural gas pipelines, 75 miles of transmission lines, and 131 miles of sanitary sewer pipes. For all these types of critical infrastructure, the major of miles are located in moderate to high susceptibility areas.

Table 3-51: Santa Cruz County Critical Infrastructure Exposed to Slope Failure Risk

Lifelines (miles) - Landslide Susceptibility			
Infrastructure Type (Linear)	High	Moderate	Low
County Maintained Roads*	164.1	196.2	107.8
Levee	-	1.0	-
Maintained Channel	7.6	18.1	3.6
NG Pipeline	10.4	16.8	4.3
Railroad	6.3	12.7	4.8
Sanitation Pipe	25.8	76.7	28.4
All Roads	877.7	683.0	430.2
Alley	0.2	1.0	0.3
Drive	236.4	172.2	110.8
Major Road	105.8	112.8	60.1
Ramp	3.5	5.5	2.0
Street	431.9	305.9	197.4
State Highway	30.5	40.9	32.5
Unnamed	69.5	44.7	27.1
Transmission Line	33.2	29.3	13.3
Grand Total	**1,125.3**	**1,033.6**	**592.5**

With almost the entire county exposed to slope failure, a significant number of critical facilities are at risk of impacts from these hazards. More than 4,000 critical facilities were identified as being in areas susceptible to slope failure hazards to some degree, including 22 fire stations, 36 schools, six dams, and 148 hazardous materials facilities. The majority of these critical facilities are within moderate to high susceptibility areas, further demonstrating the extent of slope failure hazards in the county. Childcare

centers and mobile home parks also make up a large portion of the high-potential-loss facilities located in these hazardous areas.

Table 3-52: Santa Cruz County Critical Facilities Exposed to Slope Failure Risk

Critical Facilities - Landslide Susceptibility			
Facility Type	High	Moderate	Low
Essential Facilities	6	18	4
Fire Station	6	12	4
Hospital	-	-	-
Law Enforcement	-	5	-
EOC	-	-	-
American Medical Response	-	1	-
High-Potential-Loss	67	176	95
Adult Care Facility	-	15	3
Child Care Center	1	20	9
Cell Tower	37	32	18
County Real Property Asset	13	48	35
Dam	1	3	2
Healthcare Facility	1	4	1
Historic Building	1	2	3
Library	-	3	-
Mobile Home Park	5	21	8
Power Generation	1	1	-
Radio Sites	4	4	6
School	3	23	10
Transportation and Lifeline	1,670	1,201	630
Airport	-	1	-
Substation	1	8	2
NG Station	-	-	2
Church	5	32	4
Stormwater Culvert	1,601	1,083	578
Parks	16	31	13
Bridge NBI	47	46	31
Hazmat	29	97	39
HWTS Active Facility	25	88	35
Geotracker Cleanup Site	4	9	4
Grand Total	**1,772**	**1,492**	**768**

**Real Property Assets are digitized insurance rolls for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

3.2.6.10 Development Trends

The potential for loss of life and property from slope failure is much greater today due to the increase in population residing in areas of possible instability. County Code Title 16, in combination with the California

Building Standards Code, requires careful consideration of landslide factors by both engineering geologists, soils engineers, and civil engineers. However, even with proper care, there remains a higher-than-normal potential for damage from landsliding in many areas of the county.

Santa Cruz County has a number of compact urban communities as well as extensive rural areas. As dictated by the Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly in-fill or reuse development, and further development of existing rural residential properties.

Growth management policies prevent development from occurring where hazards are present and, in most cases, require substantial setbacks from potentially unstable slopes. Development on existing lots of record is required to avoid hazards and incorporate these setbacks and other requirements to mitigate potential impacts from slope failure hazards. No changes in these development regulation or patterns occurred that would affect the county's overall vulnerability since the previous plan in 2021.

Most of the critical structures within Santa Cruz County are located away from slope failure areas, but many homes and roadways are located on and around high-hazard slopes. Future infrastructure projects, including roads, bridges, and utility improvements, will need to incorporate geologic assessments. Engineering solutions such as slope stabilization, drainage improvements, and retaining structures will play a crucial role in reducing risks, especially to transportation infrastructure, and maintaining connectivity and public safety. Improvements in technology, including LiDAR mapping, remote sensing, and real-time monitoring systems, will also enhance the ability to predict and mitigate slope failure hazards.

3.2.6.11 Slope Failure Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing slope failure-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with slope failure hazards. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-53 presents the slope failure problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in in Table 4-1 and Table 4-2.

Table 3-53: Santa Cruz County Slope Failure Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Slope Failure	Victim	ps-SF-SCC-01	Residents in landslide-prone rural communities can become isolated if slope failures damage or block critical access routes, with elderly and dependent populations at heightened risk.	ma-SF-SCC-02
Slope Failure	Victim	ps-SF-SCC-02	Residents in known hazard areas have little warning of landslides or debris flows beyond weather alerts and may lack awareness of warning signs, mitigation options, or insurance coverage.	ma-SF-SVL-01
Slope Failure	Impact	ps-SF-SCC-03	Many mountain roadways ? both publicly- and privately-owned and maintained ? are built on or near unstable slopes where failures can cause culvert damage and roadbed collapse, leading to costly repairs, service interruptions, and prolonged loss of access.	ma-AH-SCC-06
Slope Failure	Impact	ps-SF-SCC-04	Aging, undocumented, or unmaintained drainage features can oversaturate adjacent slopes during storms, as clogged or undersized culverts and ditches can trigger localized slides.	ma-SF-SCC-01
Slope Failure	Threat	ps-SF-SCC-05	Homes on or near landslide-prone soils face chronic risk from both slow earth movement and sudden slope failure, including some mobile home parks, hillside subdivisions, and older homes with little to no riparian setback situated above stream banks.	ma-SF-CBC-02
Slope Failure	Threat	ps-SF-SCC-06	Lack of mapping, erosion control, stabilization measures, and coordination with private landowners increases the risk of post-fire debris flows during storms in burn-scarred areas.	ma-SF-CBC-01
Slope Failure	Impact	ps-SF-SCC-07	Water lines, especially those above ground, are vulnerable to damage from landslides and trees made unstable by slope failures, which can also eliminate access to the infrastructure (e.g., in Davenport). Additionally, landslide debris can increase turbidity in surface water sources, increasing treatment costs, reliance on reserves, and water purchases from the City of Santa Cruz.	ma-AH-SCC-06

3.2.6.12 Climate Change Impacts & Vulnerable Populations

Slope failures, including landslides and debris flows, are a persistent hazard in Santa Cruz County due to its steep terrain, unstable soils, and history of intense winter storms. Climate change is expected to worsen these risks by increasing the intensity of rainfall events, prolonging wet seasons, and compounding erosion in burn scar areas. These conditions increase the likelihood of both sudden slope failures and slow-moving ground deformation, threatening residents, infrastructure, and essential services. Vulnerable populations including seniors, people with disabilities, mobile home residents, and low-income households living in hillside subdivisions or rural areas are particularly at risk due to limited evacuation options, older housing stock, and reduced access to financial and technical resources for mitigation.

Direct Impacts: Landslides and debris flows can block or destroy mountain roads, both publicly and privately maintained, isolating communities and impeding emergency response. Failures often damage culverts, ditches, and other drainage features, while slope instability undermines roadbeds, homes, and mobile home parks located near stream banks. Water and wastewater infrastructure is also vulnerable, with landslides damaging exposed water lines and increasing turbidity in surface water supplies, driving up treatment costs and threatening system reliability.

Secondary Hazards: Post-fire debris flows in mountainous terrain present significant risks in burn scar areas, where slopes stripped of vegetation are more prone to failure during subsequent storms. Clogged, undersized, or unmaintained drainage features worsen these risks, allowing oversaturation that triggers localized slides. Landslide debris can also obstruct streams and culverts, worsening downstream flooding and erosion hazards.

Public Health and Social Impacts: Residents in landslide-prone rural communities often receive little warning beyond storm advisories, leaving those with limited mobility or transportation at risk of entrapment when access roads fail. Lower-income households and renters face additional challenges, as few have insurance coverage or financial capacity to recover from landslide damage or displacement. Communities with high social vulnerability such as those mapped in the San Lorenzo Valley and rural South County are disproportionately affected by slope failure events, compounding existing inequities in disaster recovery.

The mitigation strategy addresses slope failure by prioritizing drainage upgrades, slope stabilization, and improved mapping of unstable areas. It also emphasizes outreach and support for vulnerable populations, coordination with private road associations, and integration of slope stability measures into post-fire recovery and watershed management programs.



Dam Failure

FEMA DRAFT - 2/27/2026

3.2.7 Dam Failure Hazard Profile



Dam failure can be sudden and catastrophic to all life and property downstream. Hundreds of dam failures have occurred throughout U.S. history, mostly before safety legislation was passed in 1972, that caused immense property and environmental damages and took thousands of lives. As the nation's dams age and population increases, the potential for deadly dam failures grows. (Association of State Dam Safety Officials, 2024)

Timber, rock, concrete, earth, steel, or a combination of these materials may be used to build a dam. Dams must have spillway systems to safely convey normal stream and flood stage flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams also have a drain or other water-withdrawal facility to control the reservoir level and to lower or drain the reservoir for normal maintenance and emergency purposes.

Dam failures can result from earthquakes, structural instability, or intense rain in excess of design capacity, but typically occur in one of four ways:

- **Overtopping** of the primary dam structure, which accounts for 34% of all dam failures, can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- **Foundation defects** due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30% of all dam failures.
- Failure due to **piping**, or internal erosion caused by seepage, accounts for 20% of all failures. Piping occurs when seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes within it. Seepage often occurs around hydraulic structures, such as spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, or dam foundations. (*Id.*)
- Failure due to **problems with conduits and valves**, typically caused by the intrusion of embankment material into conduits through joints or cracks, constitutes 10% of all failures.

3.2.7.1 Secondary & Compounding Hazards

The main secondary hazard posed by dam failure is rapid and severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter and bank erosion downstream.

Many historical dam failures have been secondary hazards triggered by other disasters, such as earthquakes, landslides, extreme storms, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections; however, terrorism and vandalism are serious concerns that all operators of public facilities must plan for. These threats are under continuous review by public safety agencies. In Santa Cruz County, dam failure would most likely be a secondary hazard triggered by a major earthquake, excessive rainfall, or slope failure,

which are discussed in the Earthquake (3.2.3), Severe Weather (Section 3.2.4), and Slope Failure (Section 3.2.6) Hazard Profiles.

Climate Change

Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. As such, changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures. If the hygrograph changes, then dam operators may be forced to release increased volumes earlier in a storm cycle to maintain required margins of safety, increasing flood potential downstream. Throughout the western United States, communities downstream of dams are already experiencing increases in-stream flows from early releases.

3.2.7.2 Policies, Plans & Regulatory Environment

Federal Regulatory Environment

National Dam Safety Act & Dam Safety Program

The potential for catastrophic flooding due to dam failures led to passage of the 1972 National Dam Safety Act (Public Law 92-367). Then, following a series of deadly dam failures between 1972 and 1977, President Jimmy Carter directed the U.S. Army Corps of Engineers to inspect non-federal, high-hazard dams around the nation. The findings of these inspections helped establish dam safety programs in most states, and, ultimately, resulted in the creation of the National Dam Safety Program. (*Id.*)

The National Dam Safety Program requires a periodic engineering analysis of every major dam in the country. The goal of this program, monitored by FEMA, is to identify and mitigate the risk of dam failure to protect lives and property.

U.S. Army Corps of Engineers (USACE)

Under the National Dam Safety Program, the U.S. Army Corps of Engineers (USACE) is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried such dams and surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE also develops guidelines for inspection and evaluation of dam safety.

USACE is also responsible for maintaining the National Inventory of Dams (NID) and works in close collaboration with dam regulating agencies, including FEMA and state agencies, to obtain accurate and complete information about dams in the database.

Federal Energy Regulatory Commission (FERC) Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. The FERC cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. There are over 3,000 dams that are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC staff inspects hydroelectric projects on an unscheduled basis to investigate:

- Potential dam safety problems;
- Complaints about constructing and operating a project;
- Safety concerns related to natural disasters; and
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent consulting engineer, approved by the FERC, must inspect and evaluate projects with dams higher than 10 meters (32.8 feet), or with a total storage capacity of more than 2,000 acre-feet.

FERC staff monitors and evaluates seismic research in geographic areas where there are concerns about seismic activity. This information is applied in investigating and performing structural analyses of hydroelectric projects in these areas. FERC staff also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC staff visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication *Engineering Guidelines for the Evaluation of Hydropower Projects* guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

The FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

The only hydroelectric dam that poses an inundation risk in Santa Cruz County is the Leroy Anderson Dam owned and operated by the Santa Clara Valley Water District (SCVWD). This earthen-rock dam was constructed in 1950, has a total capacity of over 89,000 acre-feet, and supplies drinking water to Santa Clara County. It is jointly regulated by FERC and the California DWR, Division of Safety of Dams. As of winter 2024, the dam was still undergoing seismic retrofits to rebuild it in compliance with present-day safety standards. SCVWD initiated the project in 2012 following a seismic stability evaluation, then additional studies in 2016 revealed previously unidentified fault lines, requiring additional retrofits. In February 2020, FERC directed SCVWD to reduce water levels in Anderson Reservoir with the goal to speed up work to replace the dam, and the reservoir remains limited to about 3% of its capacity.

State Regulatory Environment

California Department of Water Resources (DWR), Division of Safety of Dams (DSOD)

The California Department of Water Resources (DWR) Division of Safety of Dams (DSOD) monitors the dam safety program at the state level. When a new dam is proposed, division staff inspects the site. DSOD reviews dam applications and building plans to ensure that the dam is designed to meet minimum requirements and that the design is appropriate for known geologic conditions. It also inspects construction to ensure that the work is done in accordance with the approved plans. Division staff inspects constructed dams on an annual basis to ensure they are performing as intended and are not developing problems. Roughly a third of these inspections include in-depth instrumentation reviews. DSOD periodically reviews the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California. (DWR, 2025)

California Senate Bill 92

Senate Bill 92 was signed into law in 2017 and provides new state requirements focused on dam safety. Specifically, it requires owners of significant and high hazard potential dams to submit inundation maps to the California DWR. After the map is approved, the dam owner must then submit an emergency action plan (EAP) to the California Office of Emergency Services (Cal OES). An EAP identifies the emergency notification protocols, response process, and responsibilities of the dam operator and other agencies should an incident occur. The plans also outline preparedness activities. EAPs must approved by Cal OES Dam Safety Planning Unit, and updated and resubmitted every 10 years and, in some cases, sooner. (CalOES, 2025)

California Senate Bill 854

Passed in 2018, Senate Bill 854 amended California Water Code Section 6161, clarifying requirements for dams with existing EAPs as of March 1, 2017. It stipulates that if the EAP lacked inundation maps for all critical appurtenant structures, dam owners must submit a schedule to the DSOD to complete these maps.

Local Regulatory Environment

Santa Cruz County General Plan Public Safety Element

Although dam safety is primarily regulated at the state and federal levels, the Santa Cruz County General Plan Public Safety Element sets forth policies relevant to dam failure under seismic hazards, including:

- **Policy 6.1.6 Siting of New Reservoirs:** Requires a full engineering geologic investigation prior to the construction of new reservoirs, and if an unmitigable hazard exists, relocation of the reservoir.
- **Policy 6.1.7 Dam Safety Act:** New dams must be constructed according to high seismic design standards of the Dam Safety Act and as specified by structural engineering studies.

3.2.7.3 Location

According to the California Division of Dam Safety, there are five dams in Santa Cruz County and six dams in adjacent counties, San Benito and Santa Clara, that have the potential to inundate portions of Santa Cruz County. The reservoirs range in capacity from 20 acre-feet to over 89,000 acre-feet, with the oldest dams being constructed in the late 1800s. These dams are summarized in Table 3-54, and Figure 3-57 shows inundation zones for the dams in Santa Cruz County and nearby counties that could impact the planning area.

Dam hazard classes, or hazard potential classifications, are used to categorize dams based on the potential consequences of a dam failure, not the risk of failure itself. The main categories are typically High-Hazard, where failure would likely cause loss of human life; Significant Hazard, where failure could cause economic loss or environmental damage but no probable loss of life; and Low Hazard, where failure would result in no loss of life and minor impacts.

Given its location, a major dam failure at the Newell Dam could result in extensive property damage and loss of life in the San Lorenzo Valley and City of Santa Cruz. A failure at the Mill Creek, Oak Site, or Sempervirens Dams could affect people and property in northern Santa Cruz County, to the east of the community of Boulder Creek. Soda Lake is a storage facility for fine-grained material or "fines" from the Wilson Quarry in San Benito County. Failure of the Soda Lake levees could potentially release this material and impact one or more nearby residences and encroach upon Highway 129.

Although located in neighboring counties, a failure of the Elmer J Chesbro, Uvas, or San Justo Dams could potentially impact people and properties along the Pajaro River in Santa Cruz County. In addition, the Leroy Anderson, Coyote, and Upper Howell Dams, located in Santa Clara County, have the potential to impact very limited areas and assets in the county.

Table 3-54: Dams in or Adjacent to Santa Cruz County

Name	Owner	County	Waterway	Year Built	Capacity (acre-feet)	Hazard Class
Mill Creek	Lockheed Missiles and Space Co.	Santa Cruz	Mill Creek	1889	223	**High**
Soda Lake	Granite Rock Co.	Santa Cruz	Tr. Pajaro River	1978	1,983	**High**
Newell	City of Santa Cruz	Santa Cruz	Newell Creek	1960	8,991	**High**
Elmer J. Chesbro	Santa Clara Valley Water District	Santa Clara	Llagas Creek	1955	8,086	**High**
Uvas	Santa Clara Valley Water District	Santa Clara	Uvas Creek	1957	10,000	**High**
Leroy Anderson	Santa Clara Valley Water District	Santa Clara	Coyote Creek	1950	89,073	**High**
Coyote	Santa Clara Valley Water District	Santa Clara	Coyote Creek	1936	22,541	**High**

Name	Owner	County	Waterway	Year Built	Capacity (acre-feet)	Hazard Class
San Justo	U.S. Bureau of Reclamation	San Benito	Offstream	1985	10,300	**High**
Sempervirens	California Department of Parks and Recreation	Santa Cruz	Sempervirens Creek	1951	78	**Significant**
Upper Howell	San Jose Water Company	Santa Clara	Rundell Creek	1878	243	**Significant**
Oak Site	California Department of Forestry and Fire Protection	Santa Cruz	Tr. Big Green	1969	20	**Low**

Source: National Inventory of Dams

In addition to the eight dams under the purview of DSOD, there are also a total of eight mining operations in Santa Cruz County that utilize ponds to hold processing plant wash water and storm water. These ponds are constructed using both artificial and natural barriers depending on whether the pond is created by a levee or dam, or excavation below grade. Because of their limited height and storage capacity, none of these ponds is within the jurisdiction of DSOD. In some cases, quarry ponds are non-jurisdictional because they are created by excavation, which means there is no artificial barrier that would qualify as a "dam" under state law.

There are also an unknown number of other dams in the county associated with agriculture, small water systems, and private ponds. These facilities are likely non-jurisdictional, and many are undocumented. Given their location, failure of one of these agricultural dams or levees at a quarry pond could affect a limited amount of people or property in downstream areas, but the extent of the hazard is unknown at this time.

3.2.7.4 Past Events

There have been no reported failures of dams located within Santa Cruz County to date, and previous occurrences of dam failure affecting the county are not known for any dams in adjacent counties. However, after the 1989 Loma Prieta Earthquake, an extensive set of cracks was observed at the crest of Soda Lake's west embankment and adjacent areas on the levee's interior face. The west levee was excavated to bedrock and reconstructed in 1997 with the approval of the California Division of Safety of Dams (DOSD). Additional stability issues involving the north levee tie-in to the hillside were addressed by the DOSD in a letter to the dam owner, Granite Rock Company, in 2000.

Based on available records, there have been no dam failures at any of the mines in Santa Cruz County. There have been rare events involving uncontrolled releases of water due to natural and human causes, but none of these events involved dam failure. Currently available information gives no indication that any of the dams within or adjacent to Santa Cruz County would fail or otherwise sustain damage, except by an act of terrorism.

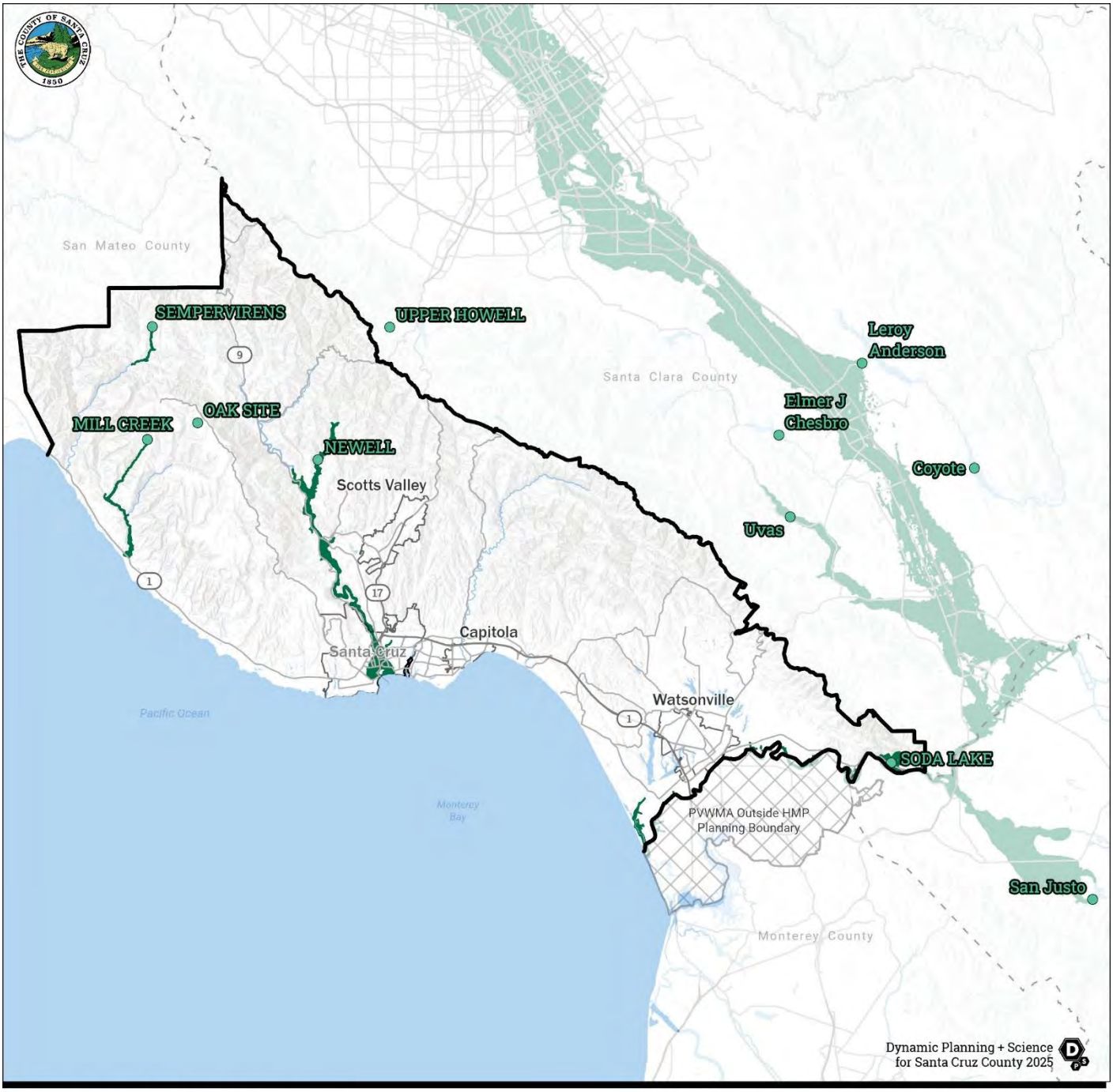


Figure 3-57: Dam Inundation Zone Location Map

3.2.7.5 Frequency & Probability of Future Occurrences

Dams are constructed with safety features known as "spillways" that allow water to overtop the dam if the reservoir fills too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. The residual risk associated with dams is the risk beyond that for which safeguards have been implemented. However, the probability of any type of dam failure is low in today's regulatory and dam safety oversight environment. Dam failure events usually coincide with events such as earthquakes, landslides, or excessive rainfall.

Given the monitoring protocol at all the dams within and adjacent to the county with significant or high-hazard potential, the probability of dam failure is very low.

3.2.7.6 Severity

Even though the probability of dam failure is low in Santa Cruz County, a failure could be catastrophic to all life and property downstream. The highest-capacity dams that are located upstream from population centers, such as Newell Dam above the San Lorenzo Valley and City of Santa Cruz (Figure 3-58), pose the greatest risk.

FEMA developed a classification system for potential dam failures, as shown in Table 3-55. This classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests. Improbable loss of life exists where persons are only



Figure 3-58: Newell Dam and Loch Lomond Reservoir

Source: City of Santa Cruz

temporarily in the potential inundation area. For instance, this hazard potential classification system does not contemplate the improbable loss of life of the occasional recreational users of the river and downstream lands or passers-by.

In any classification system, all possibilities cannot be defined. High usage areas of any type should be considered appropriately, and judgment and common sense must ultimately be a part of any decision on classification. Further, no allowances for evacuation or other emergency actions by the population should be considered because emergency procedures should not be a substitute for appropriate design, construction, and maintenance of dam structures.

Table 3-55: FEMA Dam Hazard Potential Classifications

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable; one or more expected	Yes (but not necessary for this classification)

Source: Federal Guidelines for Dam Safety, Hazard Potential Classification Systems for Dams, 2004

No dams have failed in Santa Cruz County to date and, as the risk assessment for Santa Cruz County illustrates, the chances of a dam failure area low, but the consequences of such an event are quite severe.

The most recent concerning dam failure in California was the 2017 collapse of a spillway on the Oroville Dam in Butte County, California. Oroville Dam is the largest facility within the State Water Project in California; the dam stores 3.5 million acre-feet of water, and serves as important flood control for the Feather River. In 2017, after substantial runoff from the Sierra Nevadas, Lake Oroville was full and the spillway was opened to release extra water downstream.

The force of the release gouged a large crater in the concrete spillway and required a halt to water releases via that conduit. The high lake level then created fear that erosion would compromise the integrity of the auxiliary spillway and flood the City of Oroville and surrounding communities. Thousands were evacuated, and eventually runoff receded without further issue. Ultimately, an independent analysis concluded that poor design and construction and inadequate state oversight contributed to the collapse of the concrete spillway. (Water Education Foundation, 2020)

The Oroville Dam spillway failure triggered the inspection of 93 dam spillways across California through the new Spillway Re-evaluation Program, including one in Santa Cruz County: Newell Dam. (DWR, 2025)

In the event of a dam or levee failure of an agricultural or quarry pond, significant environmental impacts and property damage could occur. Environmental impacts would likely be limited to temporary impacts on water quality and erosion. Property damage would likely be limited to impacts on downstream drains, culverts, roads, and bridges.

3.2.7.7 Warning Time

Warning time for dam failure depends on the cause of failure. In an event of extreme precipitation, such as during an atmospheric river event, evacuations can be planned with sufficient time, but in the event of a structural failure due to earthquake, there may be no warning time. A dam's structural type also affects warning time.

Earthen dams do not tend to fail instantaneously. Once a breach is initiated, discharging water erodes the breach until the reservoir water is depleted, or the breach resists further erosion. Concrete gravity dams also tend to have an initial partial breach. The time of breach formation ranges from a few minutes to a few hours. Several participating jurisdictions have established protocols in their emergency operations plans for warning and response to imminent dam failure. These protocols are tied to emergency action plans (EPA) created by the dam owner.

EAPs identify areas downstream from dams requiring warning and evacuation in the event of a failure. Documented cases have demonstrated that warning and evacuation time for EAPs can dramatically influence the loss of life, varying from 0.02% of the threatened population when the warning time is 90 minutes or more, to 50% when there is less than 15 minutes of warning. (Graham, 1988)

Dam failure inundation mapping studies usually assume one of two scenarios:

- Flows from a dam failure during "fair weather" or "sunny day" conditions with the reservoir at the normal pool level and receiving normal inflow (usually insignificant). A fair weather failure is generally considered to have the most potential for loss of human life, primarily due to the element of surprise.
- Flows from a dam failure during flood conditions or the inflow design flood. Failure during flood conditions is considered to show the upper limit of inundation and to have less potential for loss of human life because the operators and downstream population are on alert. However, the flood conditions scenario is used less frequently because of the expense in additional watershed and spillway analysis.

Inundation mapping shows a continuous line of inundation identifying the area potentially at risk. It starts at the dam and continues downstream to a point where the breach flood no longer poses a risk to life or property, such as a large river or reservoir with the capacity of storing the flood waters. The domino effect of a dam failure causing failures of any downstream dams is studied on a case-by-case basis.

EAPs are not publicly available but are on file with local emergency management agencies. Information provided on flooding conditions at downstream locations includes: distance downstream; arrival time of the leading edge of the breach flood wave; peak flow depth, incremental rise, or water surface elevation (as appropriate); and peak velocity.

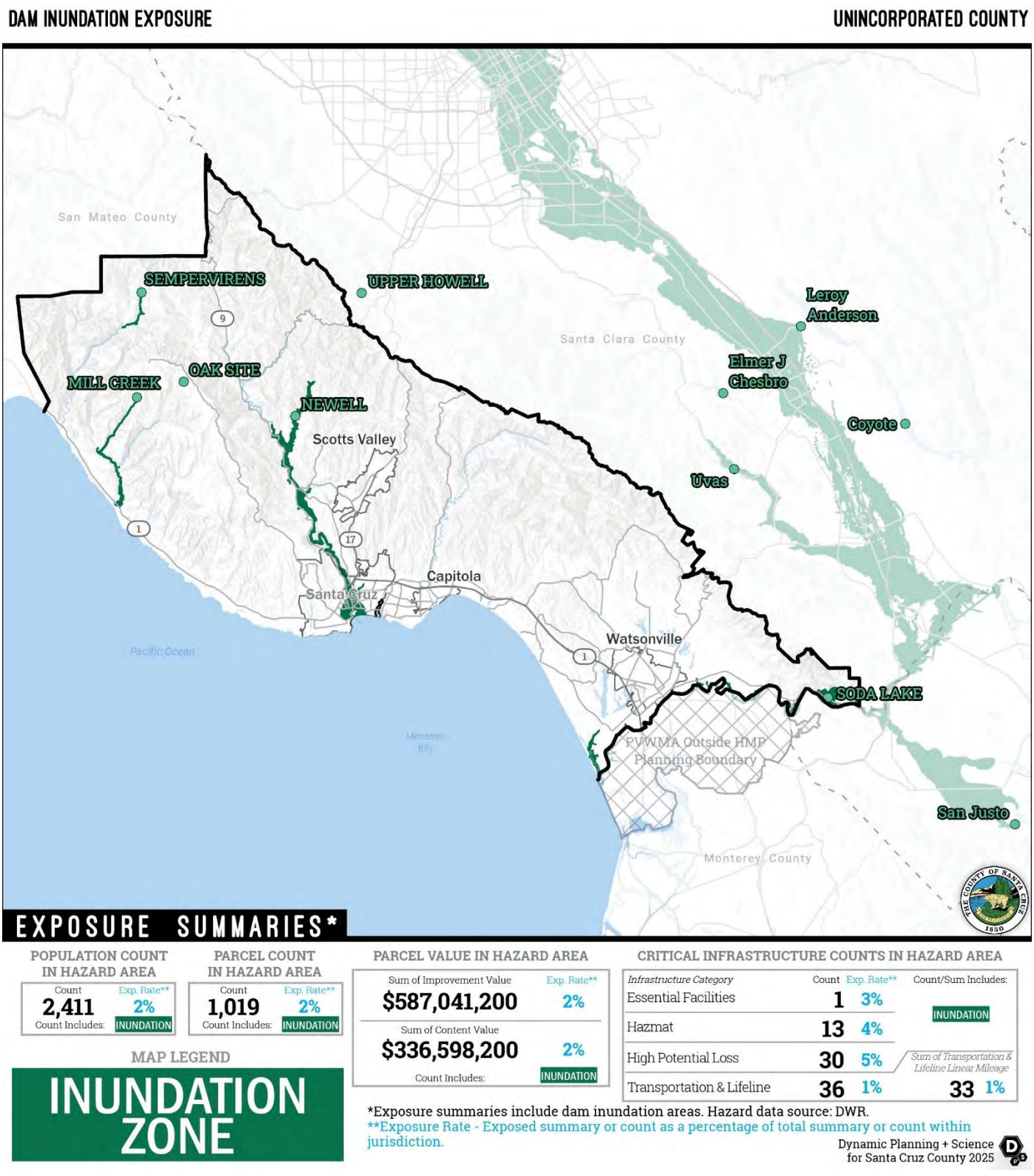


Figure 3-59: Exposure Summary – Santa Cruz County Dam Failure Risk

3.2.7.8 Dam Failure Vulnerability Assessment

The primary danger associated with dam failure is high-velocity flooding downstream of the dam and limited warning times for evacuation. Vulnerability varies by community and depends on the particular dam and stream profiles, and the nature and extent of the failure. A summary of dam failure risk exposure in Santa Cruz County to people, property, and critical facilities and infrastructure is provided in Figure 3-59.

3.2.7.8.1 Population

The potential for loss of life from a dam failure is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation, but the entire population in a dam failure inundation zone is exposed to the risk. The estimated population exposed to dam failure risk is summarized in Table 3-56 and Figure 3-60.

Several dams pose risks to downstream populations, including Elmer J. Chesbro, Leroy Anderson, Mill Creek, Newell, Soda Lake, and Uvas, exposing about 2% of the total county population to dam failure risk. However, most of the populations exposed are very small. The dam that poses the highest risk in the unlikely event of a failure is Newell, which could impact about 2,300 people in the unincorporated county and thousands more within the City of Santa Cruz.

Vulnerable populations that are present directly below a dam may include those incapable of escaping the area within the allowable time frame. These populations include the elderly, young children, and other who may be unable to self-evacuate from the inundation area, as well as those who do not receive adequate warning due to cultural, language, or technological barriers.

Table 3-56: Santa Cruz County Population Exposed to Dam Failure Risk

	Total Population
Unincorporated County	131,149

Dam Inundation Zone	Population Count	% of Total
Elmer J Chesbro	6	*0.00%*
Leroy Anderson	48	*0.04%*
Mill Creek	6	*0.00%*
Newell	2,331	*1.78%*
Soda Lake	27	*0.02%*
Uvas	6	*0.00%*
Total*	**2,411**	**1.84%**

**Total population is not equal to sum of all dam inundation zones due to dissolved overlapping inundation areas.*

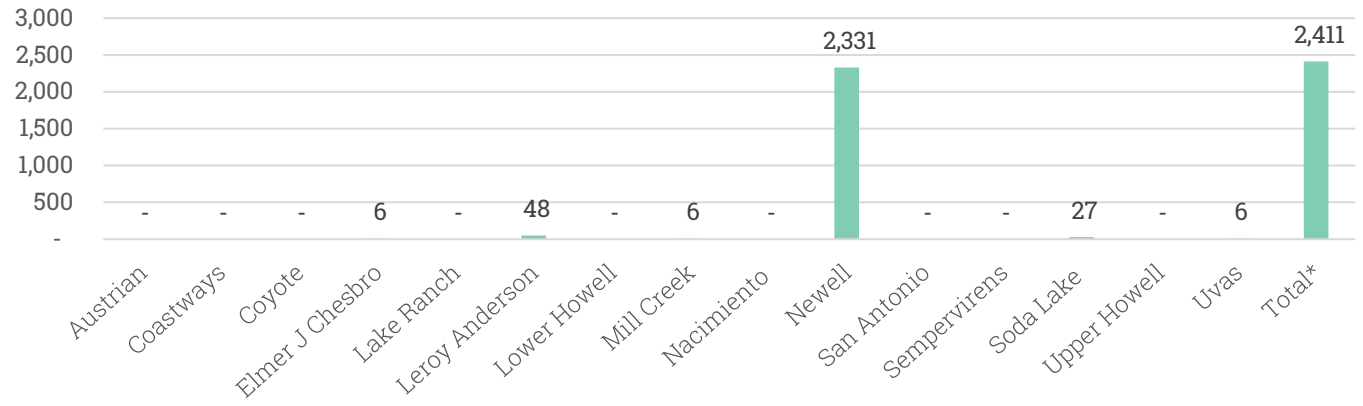


Figure 3-60: Santa Cruz County Population Exposed to Dam Failure Risk Chart

3.2.7.8.2 Property

Vulnerable properties are those within and adjacent to the dam inundation area. These properties would experience the largest, most destructive surge of water. Structures in low-lying areas where water would collect are also vulnerable.

Only about 2% of county parcels are exposed to dam failure risk, but the total value of exposed property is still almost $924 million. As with population exposure, Newell Dam poses the greatest risk to downstream property and makes up over $911 million of the total property value at risk. Table 3-57 displays parcel values at risk from dam inundation.

Table 3-57: Santa Cruz County Parcels Exposed to Dam Failure Risk

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Dam Inundation Zone	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
Mill Creek	1	0.0%	$477,200	$238,600	$715,800	0.0%
Newell	1,009	2.1%	$580,496,000	$330,861,000	$911,357,000	1.7%
Soda Lake	9	0.0%	$6,068,000	$5,498,600	$11,566,600	0.0%
Uvas	1	0.0%	$896,000	$896,000	$1,792,000	0.0%
Dam Inundation Area*	**1,019**	**2.1%**	**$587,041,200**	**$336,598,200**	**$923,639,400**	**1.7%**

**Totals are not equal to sum of all dam inundation zones due to dissolved overlapping inundation areas.*

3.2.7.8.3 Critical Facilities & Lifelines

Critical facilities and infrastructure located downstream from a dam within its inundation zone are vulnerable to catastrophic damage. Assets in adjacent low-lying areas are also vulnerable to dam inundation. The most vulnerable critical facilities are those in poor condition that would have difficulty withstanding a large surge of water. There are few critical facilities located within dam inundation zones in the county; included are a fire station, 12 hazardous materials facilities, two childcare centers, and a mobile home park. Almost all of the exposed assets (76 out of 80) are within the Newell Dam inundation area; the remainder are located in the Leroy Anderson, Mill Creek, or Upper Howell zones.

Transportation infrastructure is especially vulnerable to impacts from dam failure, including roads, railroads, and bridges in the flow path of water. Utilities such as overhead power lines and communication lines could also be vulnerable. Loss of these utilities could create additional compounding issues for emergency management officials attempting to conduct evacuation and response actions. A total of 33 miles of critical infrastructure is located within dam failure inundation zones, including 21 miles of roads. Again, the majority of these lifelines—approximately 75%—are exposed to failure risk from the Newell Dam. Of the remaining mileage exposed, most is located within the inundation areas of the Soda Lake, Mill Creek, or Leroy Anderson Dams.

Table 3-58 through Table 3-59 summarize the county's critical facilities and infrastructure that are located in a mapped dam failure inundation area.

Table 3-58: Santa Cruz County Critical Infrastructure Exposed to Dam Failure Risk

Critical Infrastructure - Dam Inundation	
Infrastructure Type (linear)	Total Dam Exposure
County Maintained Roads*	7.1
Levee	1.1
Maintained Channel	3.6
NG Pipeline	0.0
Railroad	0.2
Sanitation Pipe	-
All Roads	21.0
Alley	0.1
Drive	2.3
Major Road	1.3
Ramp	-
Street	14.2
State Highway	2.6
Unnamed	0.5

Transmission Line	0.1
Grand Total	**33.1**

**Partially Overlaps "All Roads"*

Table 3-59: Santa Cruz County Critical Infrastructure Exposed to Dam Failure Risk by Dam

Infrastructure Type (linear)	TOTAL DAM EXPOSURE	Coyote	Elmer J Chesbro	Leroy Anderson	Mill Creek	Newell	Sempervirens	Soda Lake	Uvas
County Maintained Roads*	7.1	-	-	0.03	0.09	6.52	-	0.47	0.01
Levee	1.1	-	-	0.98	-	-	-	0.12	-
Maintained Channel	3.6	0.01	-	3.10	-	0.52	-	0.65	-
NG Pipeline	0.0	-	-	0.00	-	-	-	-	-
Railroad	0.2	-	-	-	-	0.19	-	-	-
Sanitation Pipe	-	-	-	-	-	-	-	-	-
All Roads	21.0	-	0.03	0.06	1.09	17.60	0.30	1.98	0.07
Alley	0.1	-	-	-	-	-	-	-	-
Drive	2.3	-	-	-	-	-	-	-	-
Major Road	1.3	-	-	-	-	-	-	-	-
Ramp	-	-	-	-	-	-	-	-	-
Street	14.2	-	-	-	-	-	-	-	-
State Highway	2.6	-	-	-	-	-	-	-	-
Unnamed	0.5	-	-	-	-	-	-	-	-
Transmission Line	0.1	-	0.03	0.11	-	-	-	0.04	0.03
Grand Total	**33.1**	**0.0**	**0.1**	**4.3**	**1.2**	**24.8**	**0.3**	**3.3**	**0.1**

Table 3-60: Santa Cruz County Critical Facilities Exposed to Dam Failure Risk

Critical Infrastructure - Dam Inundation	
Infrastructure Type	Total Feature Count
Essential Facilities	1
Fire Station	1
Hospital	-
Law Enforcement	-
EOC	-
American Medical Response	-
High-Potential-Loss	30
Adult Care Facility	-
Child Care Center	2
Cell Tower	-
County Real Property Asset	25
Dam	2
Healthcare Facility	-
Historic Building	-
Library	-
Mobile Home Park	1
Power Generation	-
Radio Sites	-
School	-
Transportation and Lifeline	36
Airport	-
Substation	-
NG Station	-
Church	4
Stormwater Culvert	17
Parks	3
Bridge NBI	12
Hazmat	13
HWTS Active Facility	12
Geotracker Cleanup Site	1
Grand Total	**80**

**Real Property Assets are digitized asset lists for demonstrating value and ownership and may have overlapping points with other categories such as fire stations and law enforcement.*

Table 3-61: Santa Cruz County Critical Facilities Exposed to Dam Failure Risk by Dam

Infrastructure Type	TOTAL FEATURE COUNT	Leroy Anderson	Mill Creek	Newell	Upper Howell
Essential Facilities	1	-	-	1	-
Fire Station	1	-	-	1	-
Hospital	-	-	-	-	-
Law Enforcement	-	-	-	-	-
EOC	-	-	-	-	-
American Medical Response	-	-	-	-	-
High-Potential-Loss	30	-	-	28	2
Adult Care Facility	-	-	-	-	-
Child Care Center	2	-	-	2	-
Cell Tower	-	-	-	-	-
County Real Property Asset	25	-	-	25	-
Dam	2	-	-	-	2
Healthcare Facility	-	-	-	-	-
Historic Building	-	-	-	-	-
Library	-	-	-	-	-
Mobile Home Park	1	-	-	1	-
Power Generation	-	-	-	-	-
Radio Sites	-	-	-	-	-
School	-	-	-	-	-
Transportation and Lifeline	36	1	1	34	-
Airport	-	-	-	-	-
Substation	-	-	-	-	-
NG Station	-	-	-	-	-
Church	4	-	-	4	-
Stormwater Culvert	17	1	1	15	-

Parks	3	-	-	3	-
Bridge NBI	12	-	-	12	-
Hazmat	13	-	-	13	-
HWTS Active Facility	12	-	-	12	-
Geotracker Cleanup Site	1	-	-	1	-
Grand Total	**80**	**1**	**1**	**76**	**2**

3.2.7.9 Development Trends

Very little new development within the county could be impacted by a dam failure since most of the inundation areas are rural and sparsely populated, with the exception of the communities downstream from Newell Dam. Land use within the planning area is guided by the county's Growth Management Ordinance, which directs most development into urban service areas where water and sewer are available, especially high-density development.

Most areas susceptible to impacts from dam failure overlap with mapped flood hazard zones. Consequently, flood-related policies and regulations contribute to mitigating risks associated with dam failure for future development in the planning area. Development on existing lots of record is required to avoid flood hazards and incorporate appropriate setbacks, structural elevation, floodproofing, and other requirements to mitigate potential impacts from flood hazards. However, flooding due to a dam failure event is likely to exceed a 100-year event, which is the minimum standard that development in a designated flood hazard area must be protected. Increased consideration of dam failure risk when permitting development in inundation zones and downstream of high-hazard and significant hazard dams could be incorporated to mitigate this hazard. Low hazard dams could become significant or high-hazard dams if development occurs below them.

In addition, there is limited potential for significant expansion of mining activities in Santa Cruz County. As quarry resources are depleted, the sites are reclaimed. Reclamation will include elimination of unnecessary water impoundments and eliminating any danger to public health and safety from failure of any remaining dams or levees.

3.2.7.10 Dam Failure Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing dam failure-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with dam failure hazards. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-62 presents the dam failure problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-2.

Table 3-62: Santa Cruz County Dam Failure Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Dam Failure	Victim	ps-DF-SCC-01	Approximately 4.5% of the County?s population (~12,000) lives within a dam inundation zone. Few residents are aware of dam failure risk or know their proximity to inundation zones, which are not clearly communicated to the public and lack consistent signage and educational outreach.	ma-DF-SCC-01
Dam Failure	Impact	ps-DF-SCC-02	Failure of a major dam in the Santa Cruz Mountains (e.g., Loch Lomond, Newell Creek) could rapidly and catastrophically inundate populated drainages downstream, potentially causing fatalities and extensive infrastructure damage.	ma-DF-SCC-01, ma-DF-RCD-01
Dam Failure	Threat	ps-DF-SCC-03	Numerous small, privately owned legacy dams and sediment basins in the County are unmanaged and lack regular inspection or maintenance, increasing the risk of structural failure and downstream impacts during extreme storm or seismic events.	ma-AH-WTS-01
Dam Failure	Threat	ps-DF-SCC-04	Multiple schools and other critical facilities are located within mapped inundation zones for multiple dams and could be cut off or damaged without adequate pre-event mitigation or response planning.	ma-DF-SCC-02

3.2.7.11 Climate Change Impacts & Vulnerable Populations

Dam failure is a low-probability but high-consequence hazard in Santa Cruz County. Approximately 12,000 residents, or 4.5 percent of the population, live within mapped dam inundation zones, yet public awareness of this risk remains limited. Climate change increases the stress on these systems by driving more extreme storm events that can accelerate erosion, increase sediment loads, and test the capacity of aging structures. Prolonged droughts followed by intense rainfall also create rapid shifts in reservoir levels that place additional strain on dams and spillways.

Direct Impacts: Failure of a major dam in the Santa Cruz Mountains, such as Loch Lomond or Newell Creek, could cause catastrophic flooding that damages infrastructure, disrupts essential services, and threatens downstream communities. Critical facilities, including schools and emergency operations sites, lie within inundation zones and face service disruption or isolation in the event of failure.

Secondary Hazards: Many small privately-owned dams and sediment basins lack regular inspection or maintenance, increasing their vulnerability to storm events and seismic activity. Climate change-driven storm intensity heightens the risk of structural failure and downstream flooding, while sediment release could reduce water quality and affect habitat.

Public Health and Social Impacts: Vulnerable populations within inundation zones, including low-income households, renters, and non-English speaking residents, face greater barriers to recovery due to financial constraints, lack of insurance, and limited evacuation awareness. Limited education and outreach further reduce preparedness for these communities, which are also more likely to experience disproportionate impacts from long-term displacement after an event.

The mitigation strategy addresses dam failure by improving risk communication, expanding outreach to vulnerable communities, and coordinating with dam operators to strengthen emergency planning for facilities and residents located in inundation zones.

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Drought

FEMA DRAFT - 2/27/2026

3.2.8 Drought Hazard Profile



California's water resources have been stressed by periodic drought cycles, but climate change is expected to increase the frequency, severity, and duration of droughts across the state. While the length of drought periods is always in question, it is certain that California and Santa Cruz County will continue to be impacted by drought. (California Drought Contingency Plan, 2021)

Santa Cruz County surface and groundwater resources provide drinking water for residents and visitors, critical habitat to numerous plant and animal species, and opportunities for recreational and commercial activities. Like many other areas of California, the county faces water resource challenges, including inadequate water supply particularly during droughts, impaired water quality, over-drafted groundwater basins, depleted streams, and degraded riparian habitat. The overwhelming majority of Santa Cruz's water supply is locally derived—a unique situation in a state supported by large federal and state water projects. Domestic supply within the region is provided by five large public agencies, four medium water systems, 115 small water systems, and some 8,000 individual wells. Water use in 2024 is summarized in Table 3-63.

Table 3-63: Santa Cruz County Water Supplier Summary

Supplier	Connections	Service Area Population	Use (acre-feet/ year)	Source			
				Groundwater	Surface	Recycled	Imported
Santa Cruz City Water Department	24,957	95,017	7,612	1.2%	98.8%	0%	
Watsonville City Water Department*	14,602	65,231	6,389	99.6%	0.4%		
Soquel Creek Water District*	14,548	40,644	2,930	100%			
San Lorenzo Valley Water District	7,900	23,700	1,827	30.1%	69.9%		
Scotts Valley Water District*	3,945	11,147	1,110	85.8%		14.2%	
Central Water District	829	2,706	364	100%			
Big Basin Water Company[1]	540	1,120	160	100%	63%		
Mount Hermon Association	491	2,850	152	100%			
Forest Lakes Mutual Water Company	326	1,067	36	100%			
Smaller Water Systems	2,540	7,958	1,258	85%	6%		9%
Individual Users[1]	8,000	21,000	2,350	95%	5%		
Mid- & North County Agriculture[1]			2,400	90%	10%		
Pajaro Agriculture[2] (Unincorporated County Only)			19,960	95.3%	0.3%	4.4%	
Total	**78,589**	**273,132**	**44,845**	**78%**	**19%**	**3%**	**3.6%**
Summary by Water Source (acre-feet/year)				**34,057**	**9,111**	**1,624**	**62**
Summary of Non-Agricultural Use (percentage)			**53.6%**	**43.6%**	**97%**	**18.4%**	**100%**

*Notes: *Jurisdictions participating in the 2025 MJHMP. [1]Values are estimated. [2]Includes a small number of systems.*

Source: Santa Cruz County Water Resources Annual Report, 2024

Nearly all of Santa Cruz County's domestic water supply is derived from local surface water (streams and reservoirs, accounting for 20% of supply) and groundwater (80% of supply), which are fed entirely by precipitation and the county does not receive any imported water. A small amount of recycled water is produced for irrigation (4%). Partially because Santa Cruz County obtains all its own water, it is somewhat insulated from drought that has a greater impact on portions of the state that rely on state or federal water projects. However, the county continues to face major water supply challenges in that most groundwater basins have more water removed on an annual basis than is replaced and the major water supply agencies do not have sufficient sustainable supplies to meet current and future demand, even with very effective water conservation programs already in place.

The San Lorenzo Valley Water District (SLVWD), Scotts Valley Water District (SVWD), City of Santa Cruz Water Department (CSCWD), Soquel Creek Water District (SqCWD), Central Water District (CWD), City of Watsonville Department of Public Works and Utilities, and the Pajaro Valley Water Management Agency (PVWMA) are the major water agencies in the county. Except for their recycled water project, the PVWMA does not provide residential drinking water but rather is a management agency tasked with developing supplemental supplies and bringing the aquifers within its boundary into sustainable yield. Of these water agencies, four are participating jurisdictions in this plan: SVWD, SqCWD, City of Watsonville, and PVWMA.



Figure 3-61: Watsonville Slough

Source: Pajaro Valley Water Management Agency

While there are numerous small water diversions on many of the county streams, most of the stream water used is diverted from the San Lorenzo River Watershed, North Coast streams, and Corralitos Creek. Most groundwater is contained in permeable geologic basins, typically referred to as aquifers. There are three major groundwater basins in the county: the Santa Margarita, Santa Cruz Mid-County, and Pajaro.

The major water purveyors share the water resources in the county and most obtain water from multiple sources. While most depend solely on groundwater for potable supply, the CSCWD, CWWD and SLVWD get a large portion of their water supply from local streams. The CSCWD is the largest user of surface water in the county, deriving approximately 90% of their supply from the San Lorenzo River Watershed and North Coast

streams. The water purveyors actively work together to make the county's limited water resources sustainable for current and future generations of Santa Cruz residents.

Outside of the municipal service areas, individual parcels and communities rely on private wells and stream diversions for their water supply. Santa Cruz County, acting as a Local Primacy Agency for the State Water Resources Control Board, oversees small water systems serving between five and 199 water connections. The Small Water System Regulatory Program is designed to ensure that small public water supply systems deliver a reliable and adequate supply of groundwater or surface water to their customers. There are approximately 130 small water systems in the county serving roughly 2,500 households. Additionally, there are at least 8,000 private wells in Santa Cruz County that serve between one and four households.

Table 3-62 depicts the service areas of the major water suppliers in Santa Cruz County.

3.2.8.1 Secondary & Compounding Hazards

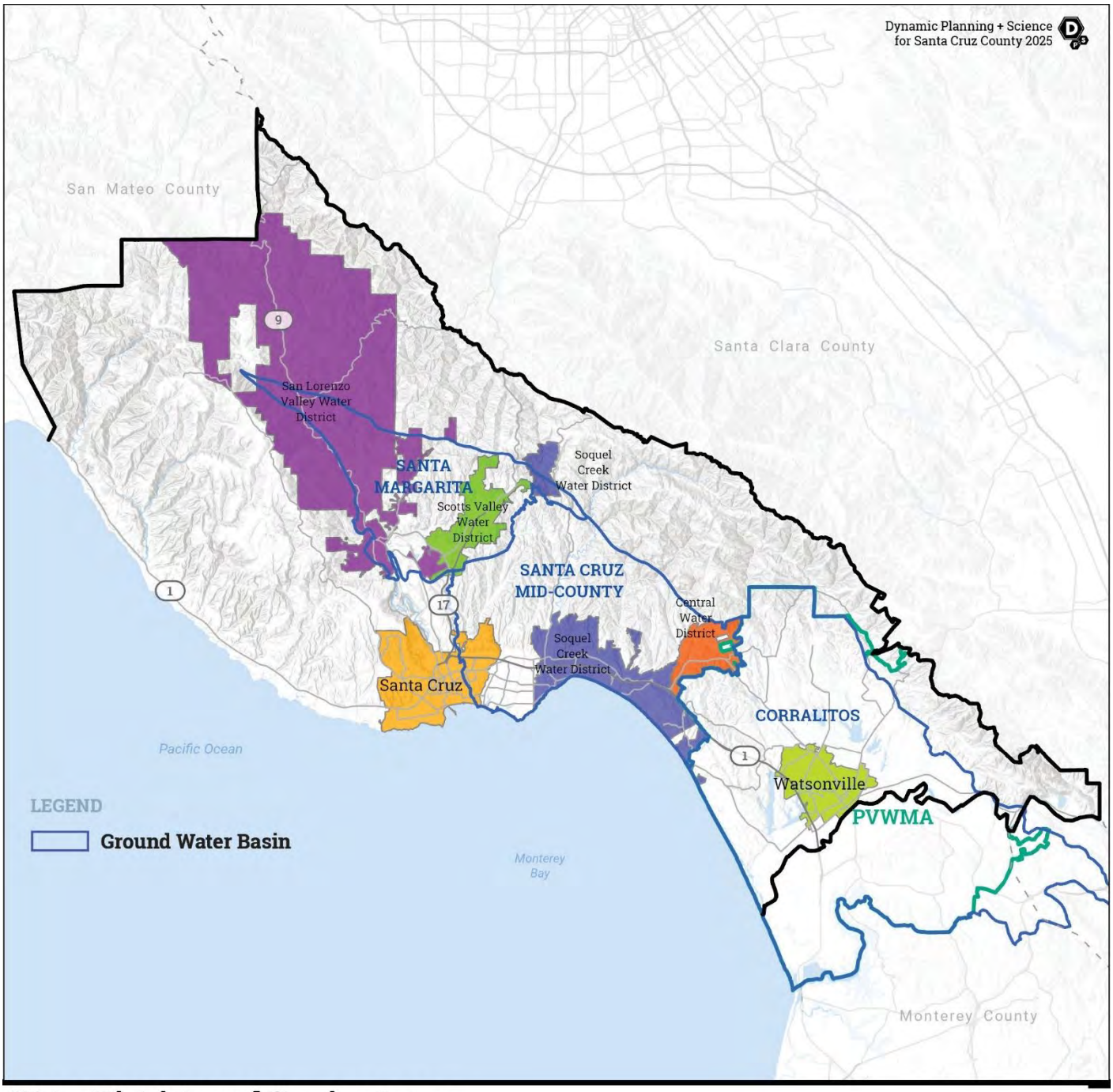
Drought is compounded by climate change and contributes to secondary hazards like wildfire. These hazards are briefly discussed in this section in relation to drought; detailed assessments of wildfire and climate change are found in their respective profiles, in Sections 3.2.1 and 3.2.10.

Climate Change

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing stresses without climate change, including growing populations, increased competition for available water, poor water quality, groundwater overdraft, and aging urban water infrastructure. With a warmer climate, droughts could increase in severity, frequency, and duration, contributing to declining streamflow in surface waterbodies, which in turn, reduces groundwater recharge as well as water availability for humans, wildlife, and vegetation. It can also contribute to sea level rise-driven seawater intrusion into aquifers. Refer to 3.2.10 Climate Change Hazard Profile for more information.

Wildfire

The secondary hazard most associated with drought is wildfire. A prolonged lack of precipitation stresses and dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Increased temperatures from climate change during drought conditions further intensify wildfire danger by warming and accelerating the desiccation of vegetative fuels. As climate conditions shift toward longer fire seasons and drier fuels, secondary wildfire effects from drought are expected to increase in both frequency and severity across Santa Cruz County. A changing climate is expected to subject forests to increased stress due to drought, disease, invasive species, and insect pests (e.g., shothole borer and sudden oak death). These stressors are likely to make forests more vulnerable to catastrophic fire.



Water Districts and Service Areas

Source: Santa Cruz County

Figure 3-62: Water Districts and Service Areas

3.2.8.2 Policies, Plans & Regulatory Environment

State Regulatory Environment

State Water Resources Control Board

Through a ballot initiative in the early 20th century, state law-makers passed a Constitutional amendment declaring that California's water resources "shall put water to the highest beneficial use possible and shall not waste water or use it unreasonably." In 1967, the State Legislature recognized that California would not have enough clean water for agricultural, municipal, industrial, environmental, and other uses unless water quality and quantity decision-making were coordinated. It was at that time that the State Water Resources Control Board (State Water Board) was created and given the broad authority and responsibility to protect water quality, balance competing demands on water resources, and attempt to resolve decades-long water disputes.

This new regulatory board merged the functions of two previous state boards: the State Water Quality Control Board and the State Water Rights Board. The former had its roots in the late 1940s, when legislators created a streamlined regulatory agency to address rising water quality problems with the state's explosive industrial and population growth. A water rights commission, which preceded the water rights board, was created in the early 1900s to arbitrate and resolve the state's water battles, which began during the 1849 Gold Rush. Back then, prospectors from throughout the world raced to the Sierra Nevada Mountains to stake their claims, using the cold mountain streams as a tool to unearth gold.

Today the five-member State Water Board allocates water rights, adjudicates water right disputes, develops statewide water protection plans, establishes water quality standards, and guides the nine Regional Water Quality Control Boards located in California's major watersheds. The Regional Boards, each comprised of seven members, serve as the front-line for state and federal water pollution control efforts. In Santa Cruz County, the Central Coast Regional Board has jurisdiction.

Today's challenges are California's rapid population growth, and the continuing struggle over water flows. The State Water Board faces tough demands: to fix ailing sewer systems; build new wastewater treatment plants; and tackle the cleanup of underground water sources harmed by the technology and industry that has catapulted the state into global prominence. (State Water Board, 2018)

California Sustainable Groundwater Management Act (SGMA)

In 2014, Governor Brown signed into law a package of senate bills (SB) and assembly bills (AV), including SB 1168, AB 1739, and SB 1319, collectively called the Sustainable Groundwater Management Act (SGMA). SGMA requires governments and water agencies of high and medium priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. Under SGMA, these basins should reach sustainability within 20 years of implementing their sustainability plans. For critically overdrafted basins, that will be 2040. For the remaining high and medium priority basins, 2042 is the deadline.

Executive Order B-37-16

Governor Brown issued Executive Order B-37-16, Making Water Conservation a California Way of Life, in 2016 that included, among other directives, drought hazard and planning related actions. The order established long-term, permanent water conservation measures in response to the ongoing drought and changing climate, and mandated the California State Water Resources Control Board permanently prohibit practices like using hoses to clean driveways and sidewalks, overwatering lawns, and serving water by default in restaurants, with a focus on urban water use. In addition, directive number 10 in the order specified that, "for areas not covered by a Water Shortage Contingency Plan, the [board] shall work with counties to facilitate improved drought planning for small water suppliers and rural communities."

In 2016, the State Water Board adjusted emergency water conservation regulations indefinitely in recognition of the differing water supply conditions and ongoing drought across the state. Executive Order B-37-16 updates temporary emergency water restrictions and transitions to permanent, long-term improvements in water use by using water more wisely; eliminating water waste; strengthening local drought resilience; and improving agricultural water use efficiency and drought planning.

California Water Plan

The California Water Plan, which dates back to the late 1800s, is the state's strategic plan for sustainably managing and developing water resources for current and future generations. As required by State Water Code Section 10005(a), the California Department of Water Resources (DWR) presents in the plan the status and trends of California's water-dependent natural resources; water supplies; and agricultural, urban, and environmental water demands for a range of plausible future scenarios. The plan is updated every five years and provides a framework for collaboration among local government officials, tribes, water suppliers and resource managers, businesses, academia, and the general public. Although the plan does not mandate actions, authorize spending,



Figure 3-63: Zayante Creek

Source: Resource Conservation District of Santa Cruz County

or make project-specific recommendations, it does require policy-makers to take definitive steps to authorize specific actions proposed in the plan and appropriate the funding needed for their implementation.

The plan was last updated in 2023. This update promotes a vision where "all Californians benefit from water resources that are sustainable, resilient to climate change, and managed to achieve shared values and connections to our communities and the environment." To tackle this ambitious vision, the 2023 update focuses on three intersecting themes: addressing climate urgency, strengthening watershed resilience, and achieving equity in water management. (DWR, 2025)

Local Regulatory Environment

Santa Cruz County Authority & Role

Santa Cruz County has no direct authority over the entities that provide water supply to county residents. The two largest suppliers are governed by the city councils elected by those city residents. Independently elected agency boards govern the other public entities, and the California Public Utilities Commission oversees privately-owned water systems to some extent. All water systems are governed by state and federal safe drinking water regulations. The larger systems, with more than 200 connections, are regulated directly by the California Department of Public Health.

The county serves as an agent of the state, ensuring compliance with the state regulations for small water systems with between five and 199 connections. The county also permits individual water systems to serve new homes in rural areas, typically on wells. Although well yield standards for new development are conservative, it is possible that individual wells and older wells serving small water systems may experience diminished yield or go dry during an extended drought. The county has no ongoing oversight of water use for individual water systems after the initial development permit is approved.

Santa Cruz County Code Chapter 7.69

Water conservation requirements for new development are established in Santa Cruz County Code Chapter 7.69 to prevent waste of water and reduce long-term demand for water supply. The chapter prohibits certain uses of water, such as for washing sidewalks or running ornamental fountains, unless measures are taken to reduce waste. It also requires high-efficiency plumbing fixtures in all new structures, and for older fixtures to be upgraded upon redevelopment or change of property ownership.

Groundwater Sustainability Plans

The Sustainable Groundwater Management Act (SGMA) requires local groundwater basin agencies in the state's high and medium priority basins to develop and implement Groundwater Sustainability Plans (GSPs) or alternative plans, which provide roadmaps for how groundwater basins will reach long-term sustainability. Basin agencies are required to submit annual reports to the California Department of Water

Resources (DWR) following adoption of their GSP, and periodic evaluations are also due to DWR every five years. Priority basins in Santa Cruz County that have a GSP or alternative plan include:

- **Santa Margarita Groundwater Basin:** A roughly triangular basin between Felton, Ben Lomond, and Scotts Valley, providing drinking water for the Scotts Valley and San Lorenzo Valley Water Districts, over a dozen small water systems, and roughly 1100 parcels served by private wells. The groundwater table also influences surface water in the San Lorenzo River, a primary drinking water source for the City of Santa Cruz and a home for endangered species. The GSP for this basin was approved by DWR in 2023.
- **Mid-County Groundwater Basin:** This basin is located at the northern end of the Central Coast hydrologic region, extending from the Santa Cruz Mountains to the Pacific Ocean and from Live Oak to La Selva Beach along the Pacific coast, including a portion of the City of Santa Cruz, all of the City of Capitola, and unincorporated areas of Santa Cruz County. The land uses served by the basin are predominantly residential (50%) and open space/parks (34%), with limited commercial (8%) and agriculture (2%). The basin has been classified as in critical overdraft due to seawater intrusion. The GSP for the basin was approved by DWR in 2021.
- **Pajaro Valley Groundwater Basin:** The basin encompasses approximately 75,000 acres in portions of Santa Cruz, Monterey, and San Benito Counties adjacent to the Monterey Bay. Total water use in the Pajaro Valley tends to range between about 47,000 and 55,000 acre-feet/year, with the Aromas Red Sands as the principal aquifer and providing the majority of pumped groundwater. Long-term groundwater overdraft in the 20th century lowered water levels throughout the basin and led to seawater intrusion. The GSP-Alternative Plan for this basin was approved by DWR in 2019.

Integrated Regional Water Management Plan

The water purveyors within Santa Cruz County work together to make the county's limited water resources sustainable for current and future generations through an Integrated Regional Water Management Plan (IRWM). This plan covers the entire county and has provided for ongoing collaboration among agencies, as well as facilitated grant funding for project implementation. Some of the most progressive water conservation programs in the country have been implemented by local Santa Cruz agencies, resulting in the county's per-capita water use being far below state or national averages. Water purveyors also work cooperatively and individually to develop additional sources of water, such as desalted sea water and recycled wastewater.

Urban Water Management Plans (UWMP)

Jurisdictions either supplying over 3,000 acre-feet of water annually or serving more than 3,000 urban connections are required to submit an Urban Water Management Plan (UWMP) for review and approval by the California Department of Water Resources (DWR), pursuant to California Water Code, § 10610-10656 and § 10608. The plans must be updated every five years and support the suppliers' long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs. The information collected for UWMPs is useful for local, regional, and statewide water and drought planning.

UWMPs also explore stormwater capacity and assist in planning and funding future stormwater needs. (DWR, 2025)

All jurisdictions participating in this MJHMP which are also water suppliers have an UWMP, including the City of Watsonville and the Soquel Creek and Scotts Valley Water Districts. These jurisdiction-specific plans are explored in more detail in the annexes in Volume 2.

Sana Cruz County General Plan Agriculture, Natural Resources & Conservation Element

The Santa Cruz County General Plan Agriculture, Natural Resources, and Conservation Element sets forth Goal ARC-4, several objectives, and many policies relevant to mitigation of and resiliency to drought. Goal ARC-4 directs the county to protect and manage water resources in order to preserve the quality and quantity of water supplies and protect natural habitats for current and future generations. The following objectives and policies support this goal:

- **Objective ARC-4.2 Watershed Protection:** To protect and manage watersheds, including least disturbed watersheds and those that provide surface water supplies, to preserve the quality and quantity of water as well as habitat [and recreational] values, and meet the needs of county residents, local industry, agriculture, and the natural environment while taking into account the projected effects of climate change. Policies under this objective designate critical watersheds; limit new development, including subdivision and allowed density, within some of these watersheds and additional areas crucial for maintaining water quality; and require proper stormwater management.
- **Objective ARC-4.3 Adequate Streamflows:** To protect and restore in-stream flows to ensure a full range of beneficial uses including recreation, fish and wildlife habitat, and visual amenities, as part of an ecosystem-based approach to watershed management and groundwater management that also takes into account the projected effects of climate change. Policies under this objective designate critical water supply streams; prohibit new diversions and seek to restore in-stream flows to support beneficial uses; and require mitigation measures for new water supply projects.
- **Objective ARC-4.4 Surface Water Quality:** To protect and enhance surface water quality in the county's streams, coastal lagoons, and marshes by establishing best management practices on adjacent land uses. Policies under this objective limit development near and alterations to these water resource areas; establish setbacks for septic systems; and require stormwater management and erosion control measures.
- **Objective ARC-4.5 Groundwater Protection and Overdraft:** To protect the quantity and quality of the county's groundwater resources through an integrated program of land use regulation and runoff management in groundwater recharge areas and karst areas, careful water quality monitoring and management of extractions consistent with long-term sustainable water supply yields and projected effects of climate change. The objective also directs the county to coordinate and work with water agencies to eliminate long-term overdraft in all basins where it has been documented. Policies under this objective designate primary recharge areas and protection zones; limit new land uses and development within recharge areas, including subdivision and allowed density; direct the study and protection of highly permeable karst areas; and require new wells to meet certain standards.

Santa Cruz County Climate Action & Adaption Plan (CAAP)

The Santa Cruz County Climate Action and Adaption Plan (CAAP) provides a comprehensive roadmap to address the challenges of climate change in unincorporated Santa Cruz County. The CAAP identifies drought as one of the three most concerning hazards for the county that will be compounded by climate change and establishes strategies and objectives to address this hazard. These include protecting and managing local county aquifers and increasing the use of recycled wastewater and stormwater for both irrigation and general use.

3.2.8.3 Past Events

A drought is a period of dry weather that persists long enough to cause serious problems such as crop damage and water supply shortages. In recent history, Santa Cruz County has experienced three main drought periods: 1976 to 1977, 1987 to 1992, 2007 to 2009, and 2012 to 2016. It is expected that the effects of climate change will result in more severe droughts of longer duration.

Figure 3-64 shows a time series of the level of drought in Santa Cruz County between 2002 and 2024 according to the National Drought Monitor. The National Drought Monitor provides drought data and maps nationally and on a localized, watershed-scale. The National Drought Monitor is the product of 11 agencies, including the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln, National Oceanic and Atmospheric Administration (NOAA), and U.S. Department of Agriculture (USDA). The National Drought Monitor categorizes the level of drought from D0 through D4, with D4 being the highest "exceptional drought." Table 3-64 depicts drought classifications and impacts from the level of drought occurrence in California.

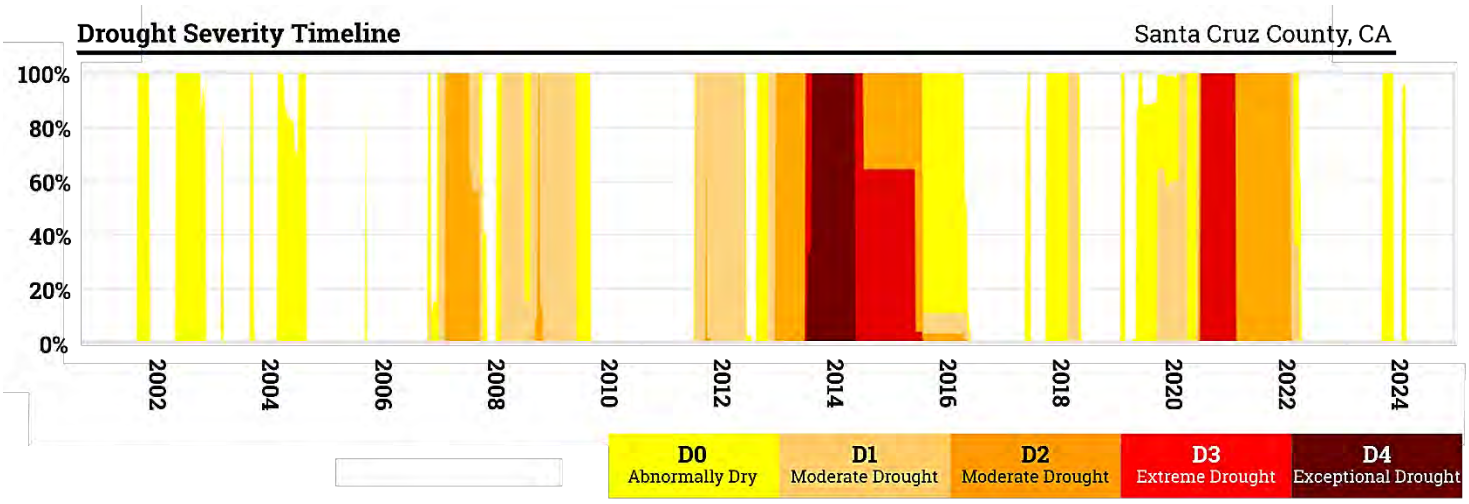


Figure 3-64: County-Wide Drought History and Severity Chart

Table 3-64: Drought Classifications and Impacts for California

Category	Description	Possible Impacts
D0	Abnormally Dry	▪ Soil is dry; irrigation delivery begins early ▪ Dryland crop germination is stunted ▪ Active fire season begins ▪ Winter resort visitation is low; snowpack is minimal
D1	Moderate Drought	▪ Dryland pasture growth is stunted; producers give supplemental feed to cattle ▪ Landscaping and gardens need irrigation earlier; wildlife patterns begin to change ▪ Stock ponds and creeks are lower than usual
D2	Severe Drought	▪ Producers increase water efficiency methods and drought-resistant crops ▪ Grazing land inadequate ▪ Fire season is longer, with high burn intensity, dry fuels, and large fire spatial extent; more fire crews on staff ▪ Lake- and river-based tourism declines; boat ramps close ▪ Trees are stressed; plants increase reproductive mechanisms; wildlife diseases increase ▪ Water temperatures increase; programs to divert water to protect fish begin ▪ River flows decrease; reservoir levels are low and banks are exposed
D3	Extreme Drought	▪ Federal water not adequate to meet irrigation contracts; extracting supplemental groundwater is expensive ▪ Fire season lasts year-round; fires occur in typically wet parts of the state; burn bans are implemented ▪ Ski and rafting business is low; mountain communities suffer ▪ Low water levels impede fish migration and cause lower survival rates ▪ Wildlife encroach on developed areas; little native food and water is available for bears, which hibernate less ▪ Water sanitation is a concern; reservoir levels drop significantly; surface water is nearly dry, flows are very low; water theft occurs ▪ Livestock need supplemental feed, cattle and horses are sold; little pasture remains ▪ Well and aquifer levels decrease; homeowners drill new wells
D4	Exceptional Drought	▪ Fire season is very costly; number of fires and areas burned are extensive ▪ Many recreational activities are affected ▪ Fields are left fallow; orchards are removed; vegetable yields are low; honey harvest is small; agricultural unemployment is high, food aid is needed ▪ Fish rescue and relocation begins; pine beetle infestation occurs; forest mortality is high; wetlands dry up; wildlife death is widespread; algae blooms appear ▪ Poor air quality affects health; greenhouse gas emissions increase as hydropower production decreases; West Nile outbreaks rise ▪ Water shortages are widespread; surface water is depleted; federal irrigation water deliveries are curtailed; water prices are extremely high; wells are dry, more and deeper wells are drilled; water quality is poor

Source: Adapted from U.S. Drought Monitor Drought Classifications and Impacts

3.2.8.4 Location

Drought is one of the few hazards with the potential to directly or indirectly impact the entire population of Santa Cruz County, be it from water restrictions, higher water and food prices, reduced air or water quality, restricted access to recreational areas, or secondary impacts like wildfire. No portion of the county is immune from drought conditions.

3.2.8.5 Frequency & Probability of Future Occurrences

Droughts may not be predictable, but they should be expected. They occur with some regularity and varying levels of severity. The magnitude and duration of a drought, as shown in Figure 3-64, is something that can be predicted based on historical records and should be taken into account in water resources planning. According to the results of the hazard risk ranking exercises conducted by the participating jurisdictions, the probability of drought occurring in Santa Cruz County is likely (between 10% and 100% annual probability).

Currently there is no data on the probability of drought akin to data for predicting earthquakes or flood probability. Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

The expected effects of climate change will also increase the risk of drought. Numerous climate models have been run with various predictions for the Santa Cruz County area. Although it is unclear whether the average amount of rainfall will increase, it is apparent that the timing and intensity of rainfall will change, which will lead to more severe and extended droughts. More intense rainfall (as opposed to longer, less intense events) will not contribute as much to groundwater recharge or dry season stream baseflows and will ultimately have adverse impacts on water supply quality through flooding and erosion.

3.2.8.6 Severity

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, local economies, and natural resources, impacting people indirectly.

Drought eventually affects groundwater sources but generally not as quickly as surface water supplies, but groundwater supplies take longer to recover. Reduced precipitation during a drought means that groundwater is not replenished at a normal rate, leading to problems such as reduced pumping capacity, wells going dry, seawater intrusion, and land subsidence. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater also affects streams and other surface water supplies. Much

of the flow in streams comes from groundwater, especially during the summer when there is less precipitation. Reduced groundwater levels mean that even less water will enter streams when steam flows are lowest.

On average, the nationwide annual impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be between $6 billion and $8 billion annually in the United States and occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in layoffs. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. Droughts that occur in populated areas may not have direct effects to the residents but may increase the threat of wildfire.

Impacts on Agriculture

The agricultural sector demonstrates the potential site-specific impacts of drought. Droughts of just a few weeks during critical periods of plant development can have disastrous effects on agriculture production. A drought can result in farmers not being able to plant crops or the failure of planted crops, leading to loss of work for agricultural workers and those in food industries.

Agricultural drought impacts are normally felt earliest by those relying on unmanaged water supplies: entities carrying out dryland grazing and non-irrigated crop production, usually grain crops. Impacts to irrigated agriculture depend on the source and nature of the irrigation water supply, whether it be local groundwater, local surface water, or imported surface water, and any water rights or contractual provisions that may be associated with the source. The extent to which producers may mitigate water shortage impacts depends on multiple factors but is heavily influenced by economic considerations. Factors involved in making decisions about mitigating irrigation water shortages include availability and costs of pumping groundwater, price of alternative surface water sources, capital investments associated with maintaining permanent plantings, and status of international crop markets. (California Drought Contingency Plan, 2021)

The 2023 Economic Contributions of Santa Cruz County Agriculture Report indicates that agriculture contributed $1.558 billion to the county economy. This includes approximately $655 million in crop value and economic activity associated with agriculture. The report indicated agriculture directly employed nearly 9,000 people in Santa Cruz County. It should be emphasized that 2023 was above-average water year for Santa Cruz County and, thus, a single-year drought or a multi-year drought has the potential to deleteriously affect the county's agricultural economy.

Reduced reservoir storage from decreased runoff in the mountains can lead to water shortages. Stream flow is inadequate to meet demands during a drought and all the major groundwater basins in Santa Cruz County are in some level of overdraft (i.e., more water is being extracted from the aquifers than is naturally recharged through the soils and stream valleys). In the Pajaro Valley, agricultural use far exceeds sustainable yield. In other parts of the county, historical development contributes to the overdraft both through demand but also because development covers the ground surface with impervious layers that

greatly reduce groundwater recharge. Drought conditions sometimes encourage agricultural producers who historically used surface water to switch to groundwater, which can further deplete the resource. Negative consequences of overdraft include declining groundwater levels, a decrease in groundwater quality, reduced streamflow, and seawater intrusion along the coast that destroys wells.

The projected increase in temperatures from climate change will also lead to an increase in water demand for irrigation, particularly in the inland parts of the county that are less influenced by coastal fog. Further, elevated temperatures will lead to greater rates of evapotranspiration, exacerbating reduced stream flow. The water agencies in the county provide detailed assessments of water supplies, which help to better quantify the expected impacts of climate change.

3.2.8.7 Warning Time

Unlike most disasters, droughts normally occur slowly but last a long time. Droughts are climatic patterns that occur over extended periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions.

Scientists at this time do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

3.2.8.8 Drought Vulnerability Analysis

Vulnerability to drought varies with the different water agencies and their water sources. Agencies with a greater reliance on surface water are more vulnerable than those that rely entirely on groundwater. For this reason, many county water agencies have installed interties among jurisdictions to be able to exchange water in the event of an emergency or shortage.

The county-wide decline in groundwater levels and streamflow is indicative of the continuing need to reduce any non-essential water use throughout the planning area by small and large water systems, private wells, and stream diversions. Conservation programs, curtailment programs, and plans to increase water supply are all components that will decrease the vulnerability of the community to drought.

3.2.8.8.1 Population

The entire population of Santa Cruz County is either directly or indirectly susceptible to drought hazards. Direct susceptibility includes reduced water availability and health impacts. Indirect susceptibility includes higher water rates, less food supply, fewer water recreational opportunities, and local economic impacts. With agriculture being a major piece of Santa Cruz County's economy, reduced employment in this sector is one of the primary indirect impacts to the population.

According to the Center for Disease Control and Prevention, a number of adverse public health effects and conditions can be attributed either directly or indirectly to drought. For example, people exposed to dust clouds are at increased risk for acquiring "dust pneumonia," an often fatal type of pneumonia caused when dust fills the lungs and inflames them. During droughts, dry soils and secondary wildfires increase the amount of airborne particles such as dust and smoke. These particles can irritate the airways and worsen chronic respiratory illnesses such as asthma.

Drought can affect vulnerable populations as well as economic productivity throughout Santa Cruz County and is likely to exacerbate water affordability concerns, through the context of availability, for low-income populations. During drought years, property owners with shallow wells can be impacted by drought with increased demand on groundwater resources. Surface water supplies are often lower, which can reduce availability and increase costs. If groundwater levels drop too far during extended periods of drought, then wells may run dry. Many rural residents are on single well or small water systems that do not have water supply resiliency components built into their maintenance and operations plans; these populations are highly vulnerable to direct drought impacts.

Drought can also have significant impacts on landscapes from reduced water availability and imposed conservation restrictions. While this could cause a financial burden to property owners, especially low-income populations who may not be able to afford to maintain their properties during water shortages, the main impact from drought on landscaping is the emergent wildfire threat induced by dried vegetation. Further, the impacts to surrounding natural plant communities (and wildlife) that occur as the result of severe drought conditions also increase the risk of wildfire and subsequent impacts on people and damage to structures as a result.

3.2.8.8.2 Property

No structures will be directly affected by drought conditions, though some structures may become more vulnerable to indirect effects such as those from wildfires, which are highly likely to follow years of drought. Physical property losses are mostly limited to public and private landscaping.

While structures are not at risk, significant economic losses may occur as a result of severe rationing during a water shortage. One of the county's major industries is tourism. The vulnerability to drought (or more specifically water shortages as a result of drought) reaches its peak during the summer tourism season. Restaurants, hotels, amusement parks, and other tourist serving businesses would all be at risk of closing from severe restrictions during a critical drought. This, in turn, impacts the funding of county services because of the county's reliance on the Transient Occupancy Tax (TOT).

Other industries such as agriculture, food processing, contractors, landscapers, nurseries, golf courses, public landscaping and school grounds would all experience losses, and other water-dependent businesses would suffer economic damages. The agricultural sector is particularly susceptible to drought impacts, as discussed in Section 3.2.8.6.

3.2.8.8.3 Critical Facilities & Infrastructure

Although critical facilities and infrastructure, as defined for this plan, will continue to be operational during a drought, some of these systems and the essential services they support are vulnerable to and can be impacted by severe drought. According to the U.S. Department of Homeland Security, Office of Cyber and Infrastructure Analysis (OCIA), these include water, wastewater, energy, and communications systems and emergency services. In addition, the facilities and lifelines themselves may be impacted by secondary hazards caused by drought, such a damage from wildfire.

Besides physical scarcity of water for the operation of water and wastewater systems, contamination of water sources can occur during drought conditions. Water reservoirs may experience increased pollutant levels and lower levels of oxygen, contributing to higher concentrations of illness-causing bacteria and protozoa, as well as toxic blue-green algae blooms. Reduced flow levels in rivers and aquifers can allow saltwater to move inland and also contaminate the water supply. Most water treatment plants are not equipped to remove salts, which can cause problems not only for potable water but also for industrial uses. (OCIA, 2015)

In Santa Cruz County, which has relatively shallow underground karst aquifers, droughts may also increase the likelihood of land subsidence or sinkhole formation, as aquifers are depleted and unsupported ground collapses. When these collapses occur, they may result in water or wastewater pipe breaks buried nearby, leading to unfiltered water entering from lakes and streams and, eventually, aquifers used as drinking water sources, sullying the drinking water supply.

In today's economies, water systems are tightly linked to energy and communications systems, and recent droughts have focused national attention on these infrastructure connections. For example, when severe drought affected more than a third of the United States in 2012, limited water availability constrained the operation of some power plants and other energy production activities. All sources of energy (including electricity) require water in their production processes for things such as cooling, cleaning, and powering turbines. Because of the interdependency between the energy sector and availability of water, drought greatly affects the resilience of these systems. (*Id.*)

Communications equipment and information technology data centers use water for cooling. Data centers, for example, often use high-tonnage heating, ventilating, and air conditioning systems that require drinkable water to operate. A sustained loss of water to a communications facility during a drought can cause equipment shutdown or failure, resulting in a degradation of communication capabilities and the disruption of some services for minutes to hours.

During extraordinary dry conditions, fire services especially are met with challenging restraints. Reduced water availability can complicate firefighting efforts in urban and suburban areas where standard wildfire-fighting tactics, such as chemical retardants and controlled burns, are less suitable. Some fire suppression equipment, including hydrants, requires a minimum level of water pressure to activate and work properly, which may not always be available during severe drought periods. (*Id.*)

3.2.8.9 Development Trends

The greater Santa Cruz area is a compact urban area surrounded by mountains, greenbelt, and the Pacific Ocean. The sizes of the water service areas are generally fixed by the county's urban services line via its Growth Management Ordinance. Water service areas for all jurisdictions have generally remained constant over time due to policies limiting water main extensions to unserved areas. The only extensions of service or agency boundaries have involved incorporating an existing developed area into a larger district, which has better capabilities for providing reliable water service. Accordingly, any growth and redevelopment that does happen going forward is expected to be concentrated within the confines of the existing service area boundaries.

Only a relatively small amount of land remains undeveloped in the county; consequently, the majority of future growth is likely to be achieved through redevelopment, remodeling, in-fill, and increased density on underutilized land, along with new construction on the little amount of vacant land remaining. In other words, the service areas are relatively fixed and not growing outward. There has not been a residential subdivision in rural areas of the county since the adoption of Measure J, the county's growth management plan, in the late 1970s. A few other municipalities have also established urban growth boundaries.

The general plan housing elements of the county and incorporated cities set forth goals and objectives for housing production, rehabilitation, and conservation, and must address water needs to support their allocation of units. The plans identify generally where sites are available for housing to be built and describe programs to facilitate new housing opportunities; however, this does not necessarily mean such housing will be constructed. Regardless, all new development is required to incorporate water conservation measures to mitigate potential impacts from drought.

3.2.8.10 Drought Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing drought-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with drought hazards. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-65 presents the drought problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2..

Table 3-65: Santa Cruz County Drought Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Drought	Victim	ps-DR-SCC-01	Prolonged drought can reduce surface water supplies and force greater reliance on groundwater for irrigation, leading to lower crop yields, higher production costs, and economic losses that ripple through the broader regional economy.	ma-DR-CBC-03
Drought	Victim	ps-DR-SCC-02	Many residents?particularly renters, low-income households, and non-English speakers?face barriers to implementing drought-related water conservation measures due to limited control over property infrastructure, financial constraints, and lack of accessible information in multiple languages.	ma-DR-RCD-01
Drought	Impact	ps-DR-SCC-03	Prolonged droughts reduce aquifer recharge, particularly in the Mid-County and Pajaro Valley basins, leading to increased groundwater pumping and risk of seawater intrusion and land subsidence.	ma-DR-SVW-01, ma-DR-RCD-02
Drought	Impact	ps-DR-SCC-04	Reduced streamflow and reservoir levels during drought lead to higher water temperatures, lower dissolved oxygen, and contaminant concentration, threatening watershed health, coastal water quality, ecological and public health, while increasing treatment costs.	ma-AH-SCC-06
Drought	Impact	ps-DR-SCC-05	Drought can severely reduce the reliability of small and private water systems, especially shallow residential wells that often lack contingency plans or interties to larger water systems, leaving residents without water for extended periods and facing costly emergency hauling.	ma-DR-SCC-01
Drought	Threat	ps-DR-SCC-06	Drought compounds wildfire hazards by intensifying fuel drying and increasing ignition potential and fire spread, heightening risk in WUI areas and across the State Responsibility Areas within the County.	ma-DR-SCC-01
Drought	Threat	ps-DR-SCC-07	In Davenport, where the County supplies water through a County Service Area (CSA), there is no groundwater supply option. If creek source water dries up, the community must rely on limited storage tanks and purchased water from the City of Santa Cruz.	ma-DR-SCC-04

3.2.8.11 Climate Change Impacts & Vulnerable Populations

Drought is a recurring hazard in Santa Cruz County and is projected to worsen with climate change. Rising temperatures, reduced snowpack, and shifting precipitation patterns are leading to more frequent and severe multi-year droughts that strain groundwater basins, stress ecosystems, and reduce the reliability of surface water supplies. These pressures increase dependence on groundwater pumping, heighten the risk of seawater intrusion, and accelerate long-term challenges to agricultural production and drinking water availability.

Direct Impacts: Drought reduces water available for crops, irrigation, and household use, with cascading impacts on the regional economy and food security. Reduced streamflow and reservoir levels threaten

watershed health, increase contaminant concentrations, and raise the costs of treatment and delivery. Small and private water systems, especially shallow residential wells, face high risks of running dry, leaving households without reliable access to water.

Secondary Hazards: Drought intensifies wildfire hazards by drying vegetation, extending the fire season, and increasing ignition potential across the county. In addition, drought reduces the capacity of streams and aquifers to recharge, compounding risks of land subsidence and saltwater intrusion in the Mid-County and Pajaro Valley groundwater basins.

Public Health and Social Impacts: Vulnerable populations including renters, low-income households, non-English speakers, and farmworker communities face disproportionate drought impacts. Many lack control over property infrastructure, have limited financial resources, or do not have access to conservation information in multiple languages. These barriers reduce the ability of households to comply with conservation mandates or prepare for water shortages. In communities such as Davenport, where the County supplies water through a County Service Area (CSA), drought threatens local supply reliability because there is no backup groundwater option.

The mitigation strategy addresses drought by improving conservation outreach in multiple languages, strengthening coordination with small and private water systems, enhancing drought contingency planning, and expanding water supply resilience projects that reduce reliance on over-drafted aquifers and support equitable access to safe, reliable water.



Extreme Heat

FEMA DRAFT - 2/27/2026

3.2.9 Extreme Heat Profile



Extreme heat is defined as temperatures that are much hotter and/or more humid than average for a particular location and the time of year. In Santa Cruz County, an extreme heat day that exceeds the 98th percentile of daily maximum temperatures is one at or above 90°F, and a warm night (also exceeding the 98th percentile) is one at or above about 55°F. A heat wave is an extended period of extreme heat days or warm nights, lasting days to weeks.

As a climate change-driven hazard, unusually hot and humid summer days and warm nights have become more common since the 1960s. (Bole, et al., 2018) The effects of extreme heat are amplified in urban centers such as in an around the Cities of Watsonville and Santa Cruz, with consequences for health, air quality, and utilities.

Studies show that by the end of this century, the number of days with temperatures reaching 100°F or more is projected to increase dramatically across the United States as a result of climate change. What the public now considers to be an exceptional event could become routine across much of the country. As temperatures rise and extreme heat events become longer, more severe, and more frequent, experts expect to see more health problems and deaths caused by heat.

Heat has a greater toll on human health—as measured by deaths (mortality) and negative health outcomes (morbidity)—than all other natural disasters combined. (NIHHIS, 2021) In California, a high number of heat-related deaths occurred in 2006, when a record-breaking heat wave between July 15 and August 1 in Northern California was linked to 650 deaths and 16,000 excess emergency room visits. (California Office of Environmental Health Hazard Assessment, 2019) Although Santa Cruz County has rarely experienced extreme heat in the past, heat waves and events are anticipated to increase in frequency, severity, and duration as climate change progresses in the coming decades, even in the areas like the City of Capitola where marine influences generally provide moderate temperatures.

Heat-related death and illness are widely regarded as preventable within the public health community; despite this, extreme heat kills over 600 people in the U.S. annually. (CDC, 2021) The following populations face specific vulnerability to heat-related illness:

- Seniors aged 65+, especially those who live alone;
- Infants and children;
- Low-income households;
- Unhoused people;
- Individuals with chronic underlying medical conditions;
- Athletes; and
- Agricultural and other outdoor workers.

The cumulative impacts of extreme heat events, along with smaller, longer-term differences in seasonal average temperatures, exacerbate inequities in health outcomes among already at-risk groups. (NIHHIS,

2021) Heat impacts are distributed inequitably among low-income communities of color in the United States. On average, Black and Latino households are more cost-burdened, occupy denser housing stock, and have lower access to heat-coping strategies, such as air conditioning and access to green space.

Within Santa Cruz County, geographic patterns in extreme heat are mostly influenced by topography. The coastal areas of the county are heavily influenced by marine temperature gradients. While extreme heat days are defined by localized variation from norms, the inland valley areas tend to experience higher temperatures than the coastal or mountain areas. That being said, air conditioning systems are less prevalent in the county and the population may be less adapted to higher temperatures compared to regions which regularly experience high heat events.

According to the Santa Cruz County Climate Action and Adaption Plan (CAAP), the average maximum and minimum temperatures in the county are expected to increase 3.2°F to 4°F by mid-century and 4.3°F to 7°F by end of the century.

Although Santa Cruz County is predominantly rural, there are clusters of highly urbanized areas. Urbanized areas experience higher temperatures than natural landscapes, creating localized pockets of higher temperatures known as heat islands. Roads and conventional building materials reflect less solar energy and absorb and re-emit more heat compared to trees and other vegetation. Heat islands can build throughout the day and worsen immediately after sunset as heat is slowly released from pavement and building material. The graph in Figure 3-65 demonstrates the impact of increased urbanization in relation to diurnal fluctuation of temperature extremes, with urban areas sometimes experiencing daytime highs 7°F greater than surrounding non-urban environments. (EPA, 2024)

Urban heat islands disproportionately affect low-income urban populations and people of color, communities who are more likely to occupy older (see section Figure 1-7: Age of Countywide Building Stock), higher density housing stock with lower urban forest cover and less access to air conditioning. A 2020 study of 108 urban areas across the U.S. found that neighborhoods subjected to federal redlining policies in the first half of the 20th century, which discouraged investment in neighborhoods with high minority populations, currently experience surface temperatures approximately 5°F higher than their non-redlined counterparts. (Hoffman, Shandas, & Pendleton, 2020)

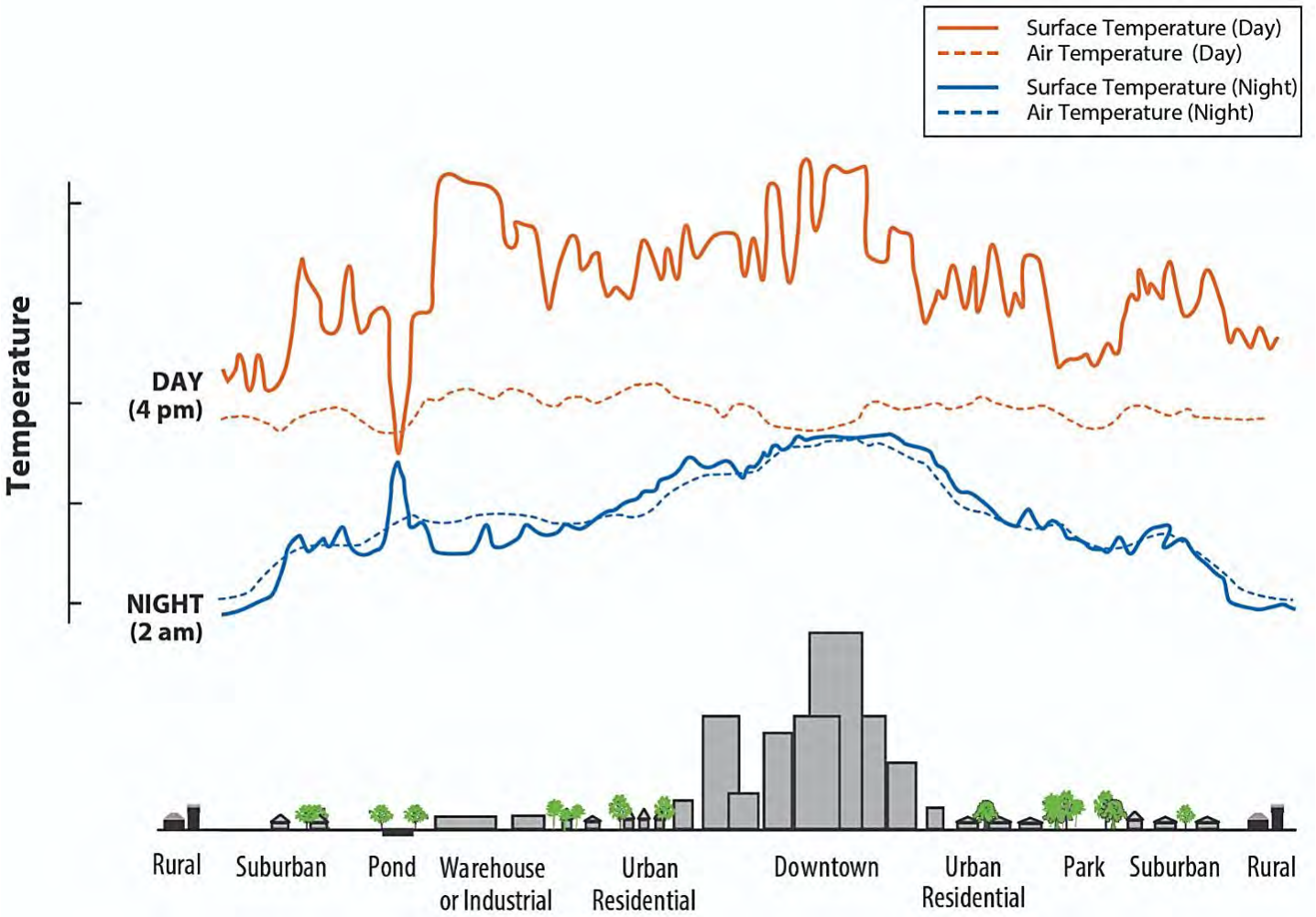


Figure 3-65: Day and Night Urban Heat Island Effect Across Natural and Built Landscapes

Source: U.S. Environmental Protection Agency

3.2.9.1 Secondary & Compounding Hazards

The most significant secondary hazards associated with extreme heat events are increased public health risks from heat-related and vector-borne illness (discussed in Section 3.2.9.6), wildfires fueled by heat-related vegetation die-off and stress, and power outages. Climate change is the main driving force behind the increase in extreme heat events and is further discussed in Section 3.2.10.

Wildfire & Air Quality

Extreme heat often coincides with conditions favorable to wildfires and contributes to vegetation stress and mortality, fueling these hazards. Wildfires during extreme heat events can place excess health burdens on wildland firefights, impeding fire containment. Extreme heat further increases the negative effects of poor air quality from particulates like smoke as well as ozone-related sensitivities. While wildfires do not always present during extreme heat events, extreme heat always increases the risk of human health impacts to

poor air quality. Climate change has a long-term negative effect on air quality metrics, including ozone. (State of California, 2018)

Power Outages

High temperatures may increase peak electricity demand beyond system capacity as residents switch on air conditioning units. Loss of power during a high heat poses a risk to human health by limiting access to air conditioning and disrupting continuous power supply for medical equipment. In California, high heat days may also coincide with conditions that trigger Public Safety Power Shutoff (PSPS) events by utility providers to curb wildfire ignition risk from faulty powerline equipment, which could disrupt residential power supply for air conditioning and at-home medical equipment.

Climate Change

The state and county have seen increased average temperatures, more extremely hot days, fewer cold nights, and shifts in the water cycle from climate change. Increased greenhouse gases in the atmosphere raises temperatures and alters seasonal temperature patterns. Effects can include changes in average temperature, the timing of seasons, and the degree of cooling that occurs in the evening. In addition to new seasonal temperature patterns, extreme events such as heat waves are projected to occur more frequently and last for longer periods of time. Though extreme heat may be moderated in the county's coastal location, inland areas can experience much higher temperatures, and even under reduced emissions scenarios, climate change is expected to increase the frequency, intensity, and duration of extreme heat events in the Santa Cruz County region.

3.2.9.2 Policies, Plans & Regulatory Environment

Very few formal regulations exist which pertain to extreme heat, except for workplace safety standards for outdoor workers. There are no state or local regulations pertaining to cooling technology standards for general residential buildings, but places of work, senior residential facilities, schools, and childcare centers are subject to state regulations for indoor air temperature standards. However, there is an extensive regulatory environment concerning climate change in that profile under Section 3.2.10.

State Regulatory Environment

California Outdoor Heat Illness Prevention Standard

Title 8, Section 3395 of the California Code of Regulations establishes an Outdoor Heat Illness Prevention Standard for employers of outdoor workers. Established in 2006, it requires employers to provide water and shade access; to develop a heat illness prevention plan; and provide heat illness prevention and response training to employees. Specific procedures must be followed for temperatures exceeding 80°F and 95°F. Employers must provide shade, water, and monitor for signs of heat illness. Workers also have a right to request breaks to cool off.

Local Regulatory Environment

Santa Cruz County General Plan Built Environment Element

The Santa Cruz County General Plan Built Environment Element contains objectives, policies, and implementation strategies related to extreme heat events, including designing new development with the environment (Objective BE-4.2) and fostering safe public spaces (Objective BE-4.3). A few key policies and strategies related to extreme heat include:

- **Policy BE-3.5.9:** Plan for evolving visitor accommodation needs related to climate change, including an influx of visitors to the county from hotter inland regions during extended and more frequent heat waves.
- **Strategy BE-4.2f:** Strengthen the county's design criteria regarding urban heat islands, such as establishing maximum impervious area limits and greening requirements.
- **Strategy BE-4.3.9:** Incorporate more street trees to provide shade at regular intervals and for parking areas, buildings, and the public realm to improve the pedestrian experience and reduce the urban heat island effect.

3.2.9.3 Past Events

The rarity of extreme heat events in the past is largely a result of the county's coastal climate; however, climate change is expected to increase the number of events experienced in the county, and more recent data shows a trend toward increasing temperatures, especially in the Santa Cruz Mountains. Figure 3-66 identifies the maximum annual temperatures and number of days exceeding 89°F at the Ben Lomond and Watsonville Weather Stations between 2000 and 2024.

Some populations are already exposed, namely, agricultural and outdoor workers, and most residents in Santa Cruz County are not equipped with air conditioning to address these events. The 2022 Santa Cruz County CAAP indicates that the county has historically experienced 11 warm nights a year and is projected to experience a mid-century total of 46 warm nights and an end-century total of 50 to 90 warm nights.

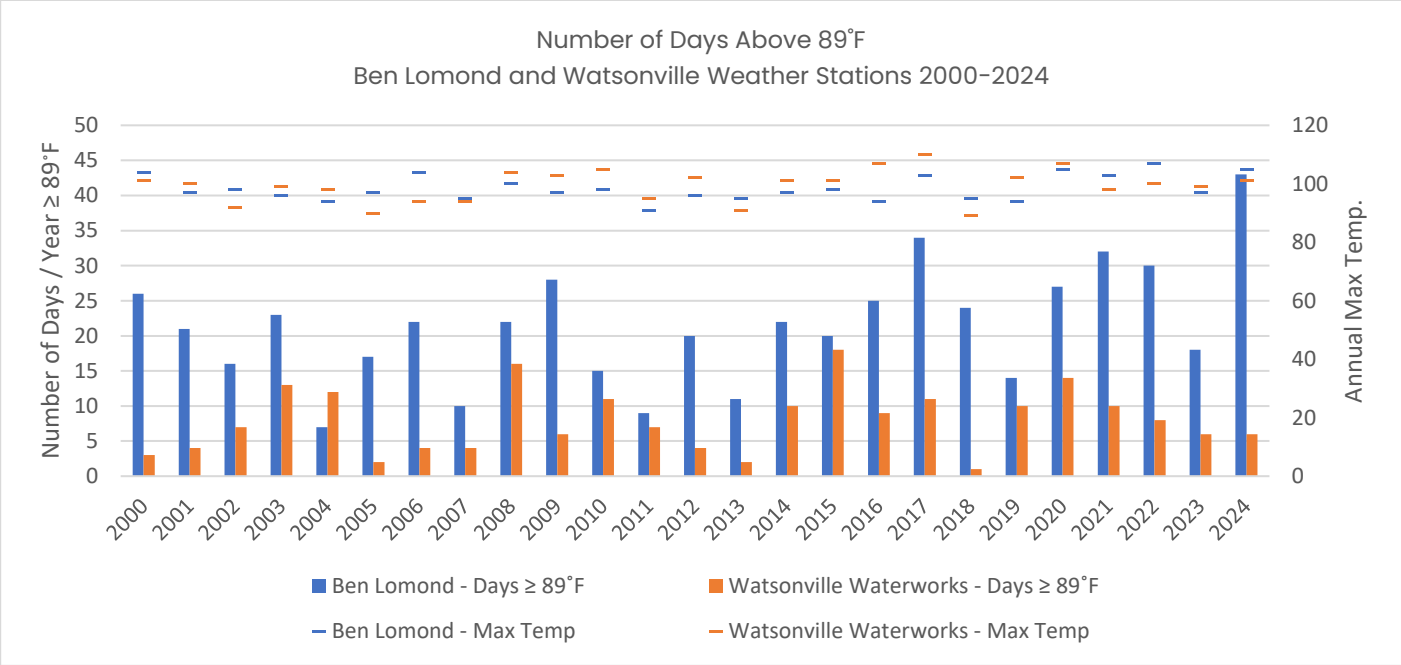


Figure 3-66: Number of Days Above 89°F at Ben Lomond and Watsonville Weather Stations, 2000-2024

Source: NOAA National Centers for Environmental Information

3.2.9.4 Location

Extreme heat events have the potential to happen anywhere in Santa Cruz County but are likely to be most pronounced in and around dense urban centers and upper elevation inland valleys above the marine layer. Observed ground temperatures and impacts during extreme heat events may vary widely based on surface materials and due to differences in housing density, building type, year of construction, access to air conditioning, and presence of tree canopy.

3.2.9.5 Frequency & Probability of Future Occurrences

Santa Cruz County is expected to experience an increase in the frequency and probability of extreme heat events as the climate warms. Rather than only tracking changes in average annual temperatures, current best practice focuses on the number of days exceeding defined thresholds, such as daily maximums above 95°F and nights that remain above 65°F. These indicators provide a more practical measure of community exposure to harmful heat conditions. Projections indicate that both hot days and warm nights will occur with greater regularity throughout the century, creating heightened risks for public health, energy systems, and vulnerable populations.

The Santa Cruz County Climate Action and Adaption Plan (CAAP) indicates the county has an average maximum temperature of 67.4°F and an average minimum temperature of 43.1°F. However, the average maximum and minimum temperatures in the county are expected to increase with mid-century projections showing a 3.2°F to 4°F increase in temperature maximum and minimums, and end-century projections show a 4.3°F to 7°F increase.

The CAAP uses Cal-Adapt data based on the localized constructed analogs (LOCA) downscaled climate model ensemble, consistent with state guidance. Expressed in terms of extreme heat thresholds, these projections translate into a substantial increase in the number of days above 95°F and warm nights above 65°F, indicating not only hotter summers but also reduced nighttime cooling. This shift will amplify risks to public health, energy demand, and sensitive populations.

3.2.9.6 Severity

Extreme heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of heat during the summertime. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died. (Disasters Are Us, n.d.) Although these events preceded the boom in residential use of air conditioning nationwide, they demonstrate the severity of extreme heat events when people are left without such protections.

Because the human body is capable of acclimating to local climate conditions, there is no single temperature that serves as a definition of extreme heat. This MJHMP uses the definitions set forth by Cal-Adapt (a data download interface provided by the CEC) for extreme heat events, warm nights, and heat waves, with descriptions and threshold values for Santa Cruz County outlined in Table 3-66.

Table 3-66: Cal-Adapt Extreme Heat Terms

Term	Cal-Adapt Definition	Thresholds for Santa Cruz County
Extreme Heat Day	Defined as a day in a year when the daily maximum/minimum temperature exceeds the 98th percentile of daily maximum/minimum temperatures based on observed historical data from 1961-1990 between April and October.	**90°F**
Warm Night	Defined as a day in April through October when daily minimum temperature exceeds the 98th historical percentile of daily minimum temperatures, based on observed data from 1961-1990 between April and October.	**55.2°F**
Heat Wave	Defined as four consecutive days or nights above the extreme heat / warm night threshold.	**3 days ≥ 90°F** or **4 nights ≥ 55.2°F**

Source: Cal-Adapt Extreme Heat Days and Warm Nights Tool

Heat Stress Indicators

Humidity plays a large role in determining how hot conditions actually feel. As the air becomes saturated with moisture, the body loses its ability to shed excess heat through sweating. Warm and humid nights contributed to the fatal nature of the July 2006 heatwave in California. (Hulley, Dousset, & Kahn, 2020)

A heat index describes what temperatures feel like to the human body, accounting for both air temperature and humidity. Figure 3-67 shows the Nation Weather Service's (NWS) heat index classifications and calculation chart based on temperatures at different relative humidities, which are used to forecast the heat watches, warnings, and advisories for local areas described in Table 3-69. The heat index was developed for shaded, light wind conditions; it does not capture hazards from exposure to direct sunlight and hot, dry winds, which may be relevant to populations who exercise or perform physical work in direct sun.

The wet bulb global temperature (WBGT) is an indicator of heat stress for active populations that incorporates temperature, humidity, wind, solar radiation, and other weather parameters. (National Weather Service, 2022) Different heat stress indicators are useful for different applications; the WBGT may be more useful for workplace safety or athletic programs, but the heat index can help reveal community-wide vulnerabilities for inactive populations who are able to seek shade during an extreme heat event.

HEAT INDEX CLASSIFICATION

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

National Weather Service Heat Index Classifications. National Oceanic and Atmospheric Administration. Values are for shaded areas, sunny locations can increase value by up to 15°F. The **heat index** is what temperature the human body feels in relation to both humidity and temperature.

HEAT INDEX CALCULATION CHART

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

Source: National Weather Service.

Figure 3-67: Head Index Classification and Calculation

Health Impacts

The human body possesses a variety of adaptations to regulate internal temperature under warm conditions, including sweat glands, exposed skin, and walking on two legs. Above-average temperatures, even outside summer months, compromise the body's ability to internally regulate, leading to excess illness and death. Heat-related health impacts include exacerbating existing medical conditions and acute illness related to direct exposure to high temperatures, such as heat cramps, heat exhaustion, and heat stroke, as described in Table 3-67.

Table 3-67: Heat-Related Illnesses

Heat-Related Illness	Symptoms
Heat Cramps	▪ Symptoms include muscular pains and spasms, usually in the stomach, arms, and leg muscles. ▪ Usually results from heavy exertion, such as exercising during extreme heat. ▪ Although heat cramps are the least severe of all heat-related problems, they are usually the first signal that the body is having trouble coping with hot temperatures.
Heat Exhaustion	▪ Heavy sweating ▪ Pale, clammy, moist skin ▪ Extreme weakness or fatigue ▪ Muscle cramps ▪ Headaches ▪ Dizziness or confusion ▪ Nausea or vomiting ▪ Fast and shallow breathing ▪ Fainting
Heat Stroke	▪ Flushed, hot, dry skin (no sweating) ▪ Body temperature above 103˚F ▪ Confusion or dizziness ▪ Throbbing headache ▪ Rapid or strong pulse ▪ Unconsciousness Heat stroke is the most severe heat-related illness and occurs when a person's temperature control system, which produces sweat, stops working. Heat stroke may lead to brain damage and death.

Many chronic medical conditions are exacerbated by high temperatures, including cardiovascular and respiratory diseases. Extreme heat days are associated with increases in hospital visits and emergency medical service (EMS) calls for heat-related illnesses along with cardiovascular and respiratory complications, renal failure, electrolyte imbalance, kidney stones, preterm birth, and negative fetal health outcomes. (Ebi, et al., 2018) Warm nighttime temperatures may also reduce the body's ability to recover from extreme heat during the day, especially for people with underlying chronic ischemic conditions such as coronary heart disease. (Sarofim, et al., 2016) The annual number of extreme heat days and warm nights the Santa Cruz County region is expected to increase over the next century, driven by climate change, which is discussed further in its hazard profile (Section 3.2.10).

3.2.9.7 Warning Time

Meteorologists can often predict the likelihood of an extreme heat event up to 10 days in advance. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the event and some may come on more quickly or severely than expected.

Since 2014, the National Weather Service (NWS) has issued heat-related alerts for local areas based on its HeatRisk index that are then propagated in California by Cal OES. The NWS's HeatRisk index assigns a numerical value ranging from 0 to 4 based on average historical conditions for a given local area and time of year and also accounts for the vulnerability of specific groups such as outdoor workers, children, and the

elderly (Table 3-68). This tool accounts for differences in local adaptations to climate identifies unusual heat (defined as the warmest 5% of temperatures) specifically for a particular date and location, resulting in daily thresholds that are unique for each location and date. For example, the index recognizes that residents of Florida are better prepared for 90°F weather than residents of Alaska.

Each HeatRisk level is accompanied by recommendations for heat protections and serves as a useful tool for planning for upcoming heat events. Based on the index and other forecasting tools, NWS issues watches, advisories, and warnings for heat events, depending on confidence and imminence factors (Table 3-69).

Table 3-68: NWS HeatRisk Categories and Related Impacts

Category	Risk	Heat-Related Impacts
0 Green	**Little / None**	Little to no risk from expected heat.
1 Yellow	**Minor**	Primarily affects those who are extremely sensitive to heat and without cooling/hydration.
2 Orange	**Moderate**	Affects those who are sensitive to heat, especially those without cooling/hydration, and some health systems and industries.
3 Red	**Major**	Affects anyone without cooling/hydration as well as health systems and industries.
4 Magenta	**Extreme**	Rare and/or long-duration extreme heat with no overnight relief affecting anyone without cooling/hydration as well as health systems, industries, and infrastructure.

Source: National Weather Service

Table 3-69: NWS Heat Forecast Terms and Definition

Alert Type	Criteria	HeatRisk Category
Heat Advisory	Issued for dangerous heat conditions not expected to reach warning criteria. Consider postponing or rescheduling outdoor activities. Stay hydrated and find a cool indoor place during the heat of the day.	**2-3** (Orange to Red)
Excessive Heat Watch	Issued when an extreme heat event is possible but its occurrence and timing are still uncertain. Reschedule outdoor activities in the coming days. Make sure that children, elderly, and pets have a place to cool off during the heat.	**3-4** (Red to Magenta)
Excessive Heat Warning	Issued when extremely dangerous heat conditions are expected or occurring. Avoid heavy activity and direct sunlight. Stay hydrated, find a cool indoor place, and check on children, elderly, and pets.	**3-4** (Red to Magenta)

Source: National Weather Service

3.2.9.8 Extreme Heat Vulnerability Analysis

3.2.9.8.1 Population

Santa Cruz County has historically been buffered by the impacts of extreme heat due to the colder marine and fog influence cooling down evening temperatures and tempering early to mid-morning temperatures. However, the average maximum and minimum temperatures in the county are expected to increase with mid-century projections showing a 3.2°F to 4°F increase in temperature maximum and minimums, and end-century projections show a 4.3°F to 7°F increase. The planning area has historically experienced 11 warm nights a year, but is projected to experience a mid-century total of 46 warm nights and an end-century total of 50 to 90 nights, which will further exacerbate the risk of heat illness because they affect the body's ability to cool after a day of heightened temperatures.

Health impacts of extreme heat are not distributed equally, with certain groups facing compounding vulnerability to extreme heat, particularly populations such as older adults, young children, individuals experiencing homelessness, and individuals with underlying chronic diseases. Areas with higher populations of seniors and low-income households, and low cover of trees and green surfaces, face the highest exposure to extreme heat hazards. Most residents in Santa Cruz County are not equipped with air conditioning to address these events. The most sensitive populations in the county reside in the areas surrounding the City of Watsonville, north of Soquel Village between Soquel San Jose Road and North Rodeo Gulch Road, and in some parts of the Live Oak region.

3.2.9.8.2 Property

Although extreme heat days in Santa Cruz County are not expected to reach temperatures that would affect most buildings, older structures (see Figure 1-7: Age of Countywide Building Stock) are generally more vulnerable to the impacts of extreme heat. High temperatures can cause roofs and other structural components to expand and warp, weakening the structural integrity of buildings. Aging pipes are vulnerable to leaks or breakage during periods of increased water demand, as residents seek relief from heat by turning on sprinklers, filling pools, or using hoses.

In addition, agricultural crops may suffer during extreme heat events. This can result in reduced crop yields and cause a reduction in the nutritious value of the crops for the consumer. Heat events also negatively affect livestock, causing reductions in fertility, less resilience to disease, and lower production of goods such as eggs and milk. (NOAA, 2023) In Santa Cruz County, these impacts on the agricultural sector would have rippling effects from farm and food industry workers to the other sectors that support them.

3.2.9.8.3 Critical Facilities & Infrastructure

Many types of infrastructure are impacted by prolonged exposure to extreme heat including rails, roads, and aviation. High temperatures can lead to deterioration of pavement and expansion or buckling of sidewalks and roads. (Federal Highway Administration, 2013) Railroad tracks are at risk of buckling at temperatures

exceeding 100°F. (Union of Concerned Scientists, 2018) However, in Santa Cruz County, it is unlikely that temperatures will get high enough to cause direct damage to most types of critical facilities or infrastructure, but there may still be impacts to structural integrity, system operations, and public services.

The most common problems associated with extreme heat are loss of utilities. Public safety power shutoffs during high heat conditions combined with fire weather or increased demand on the grid from cooling systems can cause brownouts or blackouts that leave vulnerable populations without electricity and expose them heat-related illness. While those in poverty, children, and the elderly are the most at risk, no one is completely safe without the ability to stay cool. And without power, other utility systems that lack backup generation may not function. Energy demand and grid vulnerability is expected to increase across the nation and in California. (California Energy Comission, 2018) Increased energy usage and higher demand peaks can stress electricity grid system, while extreme temperatures can decrease the safe operating capacity of hardware. (US Department of Energy, 2019, p. 12)

Extreme heat events are also increasingly disruptive to educational opportunities for children. Research has shown that up to 41% of schools in the country may not have proper cooling or ventilation systems, which have already caused early school dismissals and cancellations. (NOAA, 2023) Early class dismissals or cancellations due to heat put more strain on worker attendance and productivity for some parents as they scramble to find childcare, and these conditions expose children to heat-related health risks as well as lower test scores in some instances.

3.2.9.9 Development Trends

Although population growth and new development continues to occur across the county, energy efficiency and worker safety regulations help address heat-related hazards by limiting exposure, and local services include providing community cooling centers. The county's General Plan also establishes objectives and policies aimed at protecting its communities from the impacts of extreme heat, especially in the few urbanized areas. In particular, the General Plan calls for several strategies to mitigate extreme heat hazards through activities such as urban forestry and greening to reduce urban heat islands. Additionally, the City of Watsonville has an adopted Urban Greening Plan that sets specific goals for increasing tree cover.

California residential and building codes require residential units to have heating, but this requirement does not exist for air conditioning. The California Building Standards Code, which has been adopted by the county and other participating municipalities, includes provisions for energy efficiency that may help increase power grid resilience to peak demand during heat events.

3.2.9.10 Extreme Heat Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing extreme heat-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and

experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with extreme heat. Instead, they highlight the most urgent concerns that can be addressed within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3-70 presents the extreme heat problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in in Table 4-1 and Table 4-2.

Table 3-70: Santa Cruz County Extreme Heat Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Extreme Heat	Victim	ps-EH-SCC-01	Farmworkers and other outdoor workers are routinely exposed to extreme heat, often compounded by drought and wildfire smoke, which can cause illness and exacerbate underlying respiratory and other health conditions, with disproportionate impacts on already vulnerable populations.	ma-EH-SCC-01
Extreme Heat	Threat	ps-EH-SCC-02	While the County has planning and coordination in place for severe weather response (low temperature and heavy rain), it lacks a formal strategy with partners for a network of cooling centers during extreme heat events, particularly for unsheltered and medically vulnerable populations. The few public facilities that could serve as resilience centers often require upgrades, backup power, air filtration, and ADA-accessible services.	ma-AH-SCC-05, ma-AH-WTS-01
Extreme Heat	Threat	ps-EH-SCC-03	Cal-Adapt climate models project an increase in extreme heat days and warm nights County-wide but especially in inland mountain areas, including for areas with historically mild microclimates which are less prepared with cooling strategies and infrastructure investment.	ma-EH-SCC-01
Extreme Heat	Impact	ps-EH-SCC-04	Heat emergencies increase demand for EMS and hospital services, particularly during extended events, and the county has limited surge capacity and real-time monitoring of heat-related illness.	ma-EH-SCC-01
Extreme Heat	Victim	ps-EH-SCC-05	Seniors, those with underlying health conditions, people experiencing homelessness, and households without HVAC systems face heightened, and sometimes life-threatening, risks during extreme heat events, particularly when compounded by underlying health conditions or limited access to medical care.	ma-EH-SCC-01

3.2.9.11 Climate Change Impacts & Vulnerable Populations

Extreme heat is an emerging hazard in Santa Cruz County and is projected to become more frequent and severe as climate change accelerates. Rising temperatures, longer heatwaves, and warmer nights will increase health and safety risks, particularly in inland and mountain areas that have historically had mild microclimates and are less prepared with cooling strategies or resilient infrastructure. Extreme heat often compounds other hazards such as drought and wildfire smoke, amplifying risks for both human health and critical infrastructure.

Direct Impacts: Extreme heat threatens public health, energy reliability, and continuity of essential services. Increased electricity demand for cooling raises the risk of brownouts or blackouts, which can disrupt public safety operations and limit access to indoor cooling. Heat also stresses critical systems such as water supply, stormwater infrastructure, and transportation networks, with prolonged events creating additional maintenance and operational challenges.

Secondary Hazards: Extreme heat often coincides with drought, wildfire, and poor air quality, creating cascading risks. Farmworkers and outdoor laborers face simultaneous exposure to heat and wildfire smoke, heightening risks of illness, dehydration, and long-term respiratory damage. Extended periods of high temperatures also reduce nighttime cooling, placing chronic stress on vulnerable populations and increasing the likelihood of medical emergencies.

Public Health and Social Impacts: Vulnerable populations including seniors, individuals with underlying health conditions, people experiencing homelessness, low-income households, renters, and non-English speakers face the greatest risks during extreme heat events. Many households lack air conditioning, financial means to absorb higher energy costs, or reliable access to cooling centers. The County does not yet have a fully developed strategy for cooling centers or resilience hubs, and existing facilities often lack backup power, air filtration, or accessibility upgrades. As a result, those most at risk may be unable to access safe, reliable shelter during extended heat events.

The mitigation strategy addresses extreme heat by expanding access to cooling centers, improving outreach to vulnerable populations in multiple languages, strengthening monitoring of heat-related illness, and investing in resilience upgrades for public facilities. These actions aim to reduce inequities and enhance the County's overall preparedness for a warming climate.



Climate Change

FEMA DRAFT - 2/27/2026

3.2.10 Climate Change Hazard Profile



Santa Cruz County has experienced seven federally declared disasters since 2017 tied to climate-driven hazards such as coastal storms, wildfires, flooding, and extreme wind events. Climate change is increasing the frequency, severity, and unpredictability of these disasters, intensifying long standing risks and expanding their reach into areas and populations that have not been as exposed in the past.

Throughout this plan, each hazard section includes an assessment of how climate change is expected to alter frequency, severity, and cascading impacts. This integrated approach ensures that mitigation strategies are informed by the best available climate science and address the ways climate change is making existing hazards more damaging and harder to manage.

This stand-alone section on climate change focuses specifically on sea level rise, a subhazard that requires unique attention due to its long-term and irreversible impacts. Unlike other hazards that can ebb and flow with weather cycles, sea level rise will steadily increase exposure for coastal communities, infrastructure, and ecosystems. Rising seas compound flood risk, accelerate coastal erosion, and threaten the stability of underground utilities, transportation corridors, and low-lying neighborhoods. Vulnerable populations, including low-income residents and those living near the shoreline, will face disproportionate impacts from displacement, loss of access, and reduced public safety.

It is important to emphasize that this Multi Jurisdiction Hazard Mitigation Plan is not a climate change plan. Broader strategies to reduce greenhouse gas emissions and plan for long-term climate adaptation are addressed in the County's 2022 Climate Action and Adaptation Plan (CAAP). Instead, this plan highlights how climate change drives hazard risk, while treating sea level rise as a stand-alone hazard due to its unique and compounding challenges.

Climate Projections: Representative Concentration Pathways (RCP)

Climate change projections must account for many different variables besides greenhouse gas emissions (GHG), including changes in energy generation and land use, global and regional economic circumstances and population growth. So that research among different groups is complementary and comparable, a standard set of scenarios was developed to ensure that starting conditions, historical data, and projections are employed consistently.

These scenarios are referred to as Representative Concentration Pathways (RCP), which show the time-dependent trajectories of GHG concentrations in the atmosphere and corresponding global temperature outcomes. A range of RCPs has been developed that reflect the potential timing of global action or inaction in decreasing GHGs, resulting in a lower or higher global average temperature.

Location is a key factor in determining the range of impacts from climate change. In California, the University of California Berkeley Geospatial Innovation Facility developed a platform called Cal-Adapt funded by the California Energy Commission (CEC). This platform provides tools and data on climate change

across the state, including for Santa Cruz County, from global scale models that have been localized (downscaled) to 3.7-mile by 3.7-mile grids.

Cal-Adapt data combined with information from the California Fourth Climate Change Assessment was used to model future changes in specific types of hazards in the 2022 CAAP consistent with the information presented in this section; projections are outlined by two separate RCPs:

- **RCP 4.5** is a medium emissions scenario where global emissions peak by the year 2040 and then decline.
- **RCP 8.5** is a high emissions scenario in which global emissions continue to rise through the end of the twenty-first century.

Sea Level Rise

While the sea level rose a little less than a foot over the past century, most scientists are concerned that due to the increase in greenhouse gases from human activity, warming will accelerate. As a result, glaciers will continue to retreat and the rate of sea level rise will increase, with the best estimate being about three feet higher by 2100.

As stated in other hazard profiles projected impacts from rising sea level will accelerate coastal erosion, increase the extent of coastal inundation, increase localized elevated groundwater levels, and magnify the impacts of severe storm and wave events including El Niño and atmospheric river events. The State of California Sea Level Rise Guidance: 2024 Science and Policy Update projects a statewide average of 0.8 feet of rise by 2050. By 2100, statewide sea levels are expected to rise between 1.6 feet and 3.1 feet.

The State of California Sea Level Rise Guidance: 2024 Science and Policy Update is considered the best available science and provides sea level rise projections that have been refined for 12 tide gauges throughout California. The report provides projections for planning purposes based on probability of occurrence and the level of risk aversion. Low risk aversion means a high risk of occurrence, and extreme risk aversion means an extremely low risk of occurrence.

3.2.10.1 Policies, Plans & Regulatory Environment

Successful efforts to address the challenges of climate change begin at the local level and include the implementation of environmentally sustainable practices designed to meet present and future energy needs.

State Regulatory Environment

California Green Building Standards

The County has adopted the California Green Building Standards, also known as CALGreen Code. CALGreen Code establishes regulations for green building, nonresidential and residential buildings. Topics covered in the regulations include planning and design, energy efficiency, water efficiency and conservation, material

conservation and resource efficiency and environmental quality. The code also includes voluntary measures for residential, nonresidential and health facilities.

California Sustainable Communities and Climate Protection Act

The Sustainable Communities and Climate Protection Act of 2008 (Sustainable Communities Act, SB 375, Chapter 728, Statutes of 2008) looks to reduce GHG emissions through coordinated transportation and land use planning with the goal of more sustainable communities. Regional targets are established for GHG emissions reductions from passenger vehicle use by the sustainable communities strategy (SCS) established by each metropolitan planning organization (MPO). The SCS is an integral part of regional transportation plans (RTP) and contains land use, housing, and transportation strategies to meet GHG reductions targets.

SB 375 also supports state requirements that a city or county General Plan contains a Safety Element in addition to a Hazard Mitigation Plan. AB 2140 also requires a vulnerability assessment, adaptation goals, policies and objectives, and a set of feasible implementation measures.

California Adaptation Planning Guide (APG)

California has been taking action to address climate change for over 20 years, focusing on both greenhouse gas emissions reduction and adaptation. The California APG provides guidance and support for communities addressing the unavoidable consequences of climate change.

California Coastal Commission Sea Level Rise Guidance

The California Coastal Commission Sea Level Rise Guidance provides guidance for addressing sea level rise in coastal programs and development permits. The guidance includes interpretive guidelines for LCPs and is based on updated scientific knowledge of statewide sea level rise and coastal hazards. It offers practical approaches for state agencies, local governments, and communities to enhance coastal resilience and protect vital ecosystems. The guidance emphasizes the importance of sustainable adaptation strategies to manage the impacts of rising sea levels.

Local Regulatory Environment

Santa Cruz County 2022 Climate Action & Adaption Plan (CAAP)

The Climate Action and Adaption Plan (CAAP) provides a comprehensive roadmap to address the challenges of climate change in unincorporated Santa Cruz County. The 2022 CAAP includes the most current data on climate impacts for unincorporated Santa Cruz County. The 2022 CAAP is comprised of actionable steps towards reducing the causes of global warming, adapting our communities to climate hazards, and ensuring the safety and well-being of those most vulnerable to climate change.

The CAAP indicated that the Santa Cruz mass emissions budget for 2019 was 691,262 metric tons of carbon dioxide equivalents (CO_2e). The CAAP identified the top three Santa Cruz County greenhouse gas emissions sources as 1) passenger vehicles (51%); 2) residential natural gas (15%); and 3) commercial vehicles (13%).

The CAAP sets forth a greenhouse gas emissions target of 448,762 metric tons of CO_2e by 2045 for unincorporated Santa Cruz County. To reach this target, the CAAP sets for a target of reducing mass emissions from 1990 levels by 191,111 metric tons of CO_2e by 2030 and an additional 257,651 metric tons of CO_2e by 2045. The CAAP indicated that the Santa Cruz Mass Emissions for 2019 was 691,262 metric tons of CO_2e by 2045.

The CAAP proposes to meet this 2045 target through the following goals: 1) affordable housing; 2) healthy ecosystems; 3) healthy communities; 4) decarbonization; 5) resilience; 6) staff engagement; and 7) programmatic approach. The CAAP sets forth 29 strategies that pertain to energy, transportation, water, waste, wildfire prevention & mitigation strategies, and government operations to implement the goals.

Santa Cruz County General Plan

The 2024 Santa Cruz County General Plan Update sets forth the following goal and objectives relevant to climate change. Goal ARC-3 is to Protect and restore biological resources, including unique, rare, threatened, and endangered plant and animal species and their habitats, that warrant preservation because of their biological and scientific values, contributions to open space, and importance in maintaining a healthy environment and mitigating the effects of climate change. Climate change-related objectives include:

- **Objective ARC-4.2:** To protect and manage watersheds, including least disturbed watersheds and those that provide surface water supplies, to preserve the quality and quantity of water as well as habitat values, and to meet the needs of county residents, local industry, agriculture, and the natural environment while taking into account the projected effects of climate change.
- **Objective ARC-4.3:** To protect and restore in-stream flows to ensure a full range of beneficial uses including recreation, fish and wildlife habitat and visual amenities, as part of an ecosystem-based approach to watershed management and groundwater management that also takes into account the projected effects of climate change.
- **Objective ARC-4.5:** To protect the quantity and quality of the County's groundwater resources through an integrated program of land use regulation and runoff management in groundwater recharge areas and karst areas, careful water quality monitoring and management of extractions consistent with long-term sustainable water supply yields and projected effects of climate change. To act directly and coordinate and work with relevant water purveyors and agencies to eliminate long-term groundwater overdraft in all water basins where overdraft has been documented.

3.2.10.2 Past Events

Climate change is currently affecting California and Santa Cruz County, where global mean sea level has risen by as much as seven inches along the coast over the last century, increasing pressure on the state's

and county's infrastructure, water supplies, and natural resources. The state and county have seen increased average temperatures, more extreme hot days, fewer cold nights, shifts in the water cycle with less winter precipitation falling as snow, and snowmelt running off sooner in the year (California Natural Resources Agency, 20189).

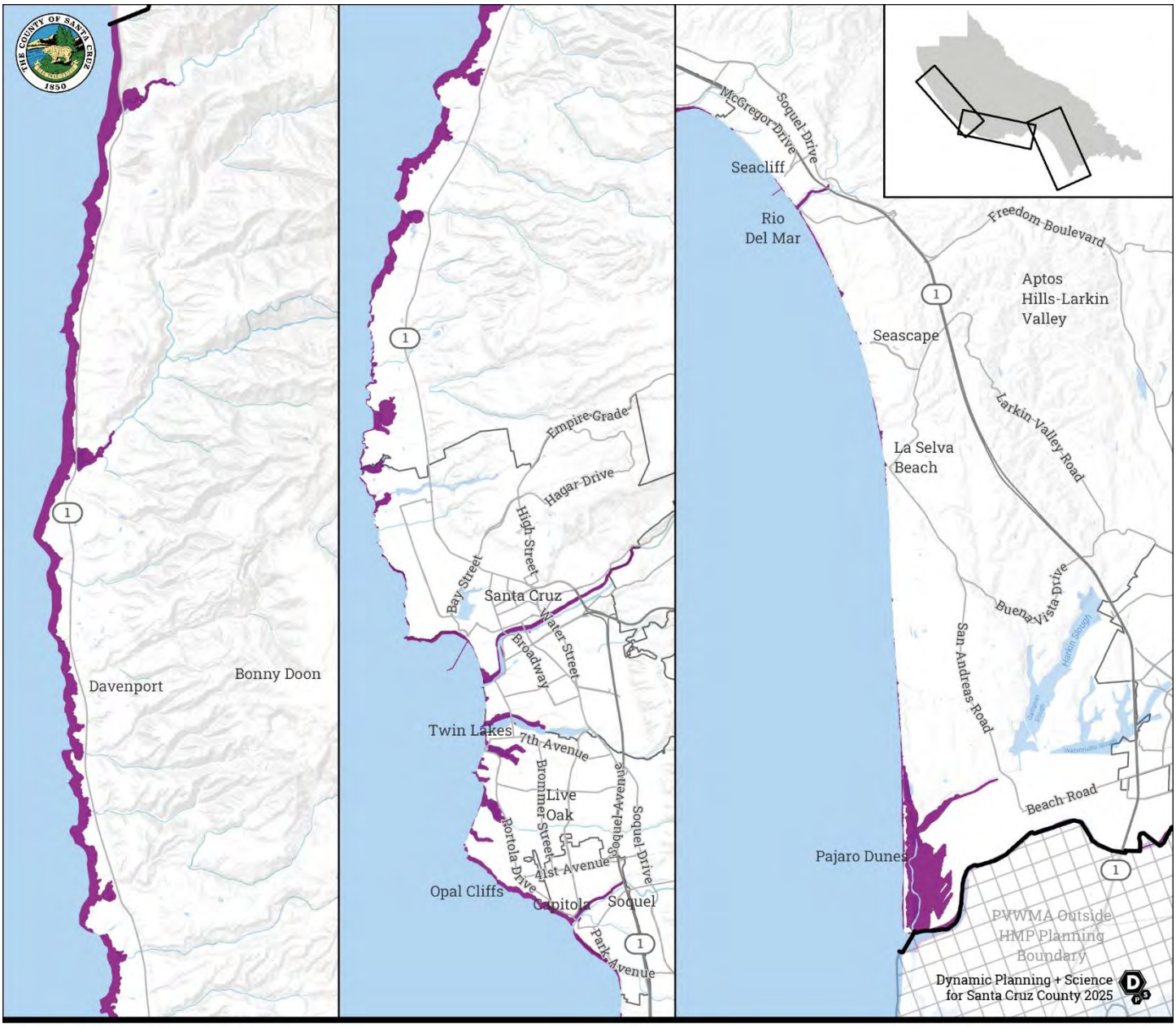
There is consensus among the world's leading climate change scientists that human-generated emissions of heat-trapping greenhouse gases (GHGs) are the primary cause of the warming trend. Projections indicate that atmospheric concentrations of GHGs will continue to increase throughout this century. Data describing atmospheric GHG concentrations over the past 800,000 years demonstrates that concentrations of carbon dioxide (CO2), the primary anthropogenic GHG, have increased substantially since pre-industrial times, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century. (IPCC,2014).

The Intergovernmental Panel on Climate Change (IPCC) described potential global emission scenarios for the coming century. The scenarios vary from a best-case, characterized by low population growth, clean technologies, and low GHG emissions; to a worst-case, wherein high population and fossil-fuel dependence result in extreme levels of GHG emissions. Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases (IPCC 2014) Our natural, economic, and cultural systems are closely tied to the climate. Significant changes in the climate will impact the way people live: the food we grow, our health and safety, the availability of water, our economy, wildlife and vegetation, and many other aspects of our lives.

3.2.10.3 Location

The effects of climate change are not limited by geographical borders. Santa Cruz County, the State of California, the United States, and the rest of the world are all at risk of climate change. As such, the entire county is at risk to the effects of climate change. Sea level rise will directly impact areas along the county's coastline; however, it is also likely to impact other areas of the county secondarily, such as saltwater intrusion into aquifers affecting drinking water. See a summary of exposure to sea level rise in Figure 3-68.



Sea Level Rise Exposure

Unincorporated County

*Data sources: COSMOS v3.1.

Sea Level Rise

Figure 3-68 Unincorporated County - Standard Layout - Sea Level Rise Exposure

3.2.10.4 Frequency & Probability of Future Occurrences

In terms of how likely and quickly impacts will occur, temperature related impacts are the most likely near-term climate change exposure facing the county and should be addressed and prioritized in future adaptation planning efforts. While sea level rise has a high certainty rating and is already occurring, its onset is not expected to occur until closer to the end of the century in terms of changes in areas already vulnerable to flooding or causing permanent inundation in tidally-influenced areas of the County. Addressing increases in flooding and wildfire risk have mid-term onsets and should be prioritized accordingly.

Climate change is one of the few natural hazards where the probability of occurrence is influenced by human action. In addition, unlike earthquake and floods that occur over a finite time period, climate change is an ongoing hazard. The California Climate Adaptation Strategy delineated how climate change may impact and exacerbate natural hazards in the future, including wildfires, extreme heat, floods, drought, and levee failure:

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Santa Cruz County and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors.
- Droughts are likely to become more frequent and persistent in the 21st century.
- Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and/or more extensive flooding.
- Winter storms may produce higher runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms.

Droughts and warmer and more severe weather can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, vegetation conversions, and habitat fragmentation.

Sea Level Rise

In 2017, the Central Coast Wetlands Group conducted a study of future sea level rise impacts along the Santa Cruz County coast. The report, titled Coastal Climate Change Vulnerability Report, was funded through a grant from the Ocean Protection Council through the Local Coastal Program (LCP) Sea Level Rise Adaptation Grant Program. This grant program is focused on updating LCPs and other plans authorized under the Coastal Act, such as Port Master Plans, Long-Range Development Plans and Public Works Plans (other

Coastal Act authorized plans) to address sea-level rise and climate change impacts, recognizing them as fundamental planning documents for the California coast.

An update to the original study was initiated in 2025, called the Sea Level Rise Vulnerability Assessment Project, and aims to achieve the same objectives and more from the 2017 project to further regional planning for the inevitable impacts associated with sea-level rise (SLR):

- Identify what critical coastal infrastructure will be compromised due to SLR and estimate when those risks may occur; and
- Define appropriate response strategies for these risks and discuss with regional partners the programmatic and policy options that can be adopted for LCP updates.

The 2017 project incorporated the most complete inventory of coastline revetment and seawalls for the Monterey Bay with coastal hazard GIS layers to account for existing protections from current and future coastal hazards. The project evaluated the impacts of sea level rise, coastal flooding, and coastal erosion on municipal infrastructure, private properties, and natural resources, and also evaluated relevant state policies and adaptation response alternatives ranging from "grey to green" for integration into municipal planning. The results of the study identified Pajaro Dunes and East Cliff and Opal Cliffs Drives as particularly vulnerable locations.

Both the 2017 and 2025 projects have fostered regional discussions about the integration of appropriate adaptation strategies.

Santa Cruz County Sea Level Rise Vulnerability Assessment & LCP Amendment

The 2025 Santa Cruz County Sea Level Rise Vulnerability Assessment (SLRVA) Project is a comprehensive planning effort to identify potential risks and adaptation strategies along the county's roughly 32-mile shoreline which will be used to inform future decisions to enhance long-term resilience to climate change. The project aims to address challenges like sea-level rise and erosion while safeguarding property values, natural resources, and equitable access to recreation.

The SLRVA will provide technical analyses related to coastal hazard vulnerabilities, economics, and adaptation planning at the county-wide and neighborhood scales, culminating in an amendment to the county LCP. The evaluation of adaptation options will be heavily based on community outreach, including with marginalized populations, and will be incorporated into the LCP Land Use and Implementation Plans

3.2.10.5 Severity

The State of California has been addressing climate change impacts projected severity of impacts for more than two decades through policies that reduce greenhouse gas emissions and promote climate adaptation. To support local governments, the California APG provides a framework for assessing climate risks and developing adaptation strategies across 11 climate impact regions defined by geographic and environmental factors. Santa Cruz County is part of the Central Coast region, characterized by its Pacific Ocean coastline

and the Santa Cruz Mountains, with most urban development concentrated on the coastal plain. At the county level, the Santa Cruz Climate Action and Adaptation Plan (CAAP) provides projections for climate-related changes including temperature, precipitation, coastal fog, sea level rise, riverine and stormwater flooding, extreme heat, drought, wildfire, and air quality.

Sea Level Rise

Sea level rise can negatively impact the coastal area of Santa Cruz County through related hazards including tidal inundation, coastal storm flooding, coastal erosion, and dune erosion. Tidal inundation occurs when sea level rises (due to storm events or climate change) and high tide events become co-occurrent, allowing water levels to reach higher points on beaches, and occasionally cause localized coastal flooding or our low-lying areas.

Coastal storm flooding, also known as storm surge, refers to the phenomena of water rising to abnormal and unpredicted elevations during a storm. When coupled with high tide, storm surge can cause extreme flooding and coastal erosion. The Santa Cruz County coastline is dominated by sandstone cliffs which are susceptible to cliff erosion. When sea level rise causes waves to break against the base of the cliffs, it can cause the cliff face to become unstable and to erode.

In Santa Cruz County, dunes provide protection to agricultural fields, residences, and commercial areas from sea level rise related hazards in the southern part of the county. When sea levels rise, dunes are not able to function naturally and can more easily be eroded, leading to more tidal inundation, slope stability for coastal bluff top development and coastal flooding.

The State of California Sea Level Rise Guidance: 2024 Science and Policy Update projects a statewide average of 0.8 feet of rise by 2050. By 2100, statewide sea levels are expected to rise between 1.6 feet and 3.1 feet. Sea level rise will have impacts to coastal critical facilities and many residential properties will be at high risk. Sea level rise in the county has the potential to negatively impact both private and public infrastructure including the wastewater treatment plant, sewer infrastructure, coastal transport infrastructure, critical facilities including fire stations and schools, the County Jail, oceanfront residences, and commercial properties.

Other Projected Impacts

Beyond the stand-alone discussion of sea level rise, climate change is expected to intensify multiple hazards that are already present in Santa Cruz County. This section introduces projected impacts to precipitation and coastal fog, riverine and stormwater flooding, extreme heat, drought, wildfire, and air quality. These impacts are not entirely new hazards but rather shifts in the frequency, severity, and extent of events that communities already experience. Each hazard profile in this plan contains its own discussion of climate change impacts and vulnerable populations. The following material highlights the broader

scientific projections that tie these hazards together, showing how climate change will increasingly challenge public health, infrastructure, ecosystems, and the resilience of vulnerable communities across the county.

Precipitation & Coastal Fog

In the Central Coast of California, precipitation variability is expected to increase substantially. Santa Cruz County can expect longer and more frequent dry spells as well as an increase in the number of years with below average rainfall totals. Santa Cruz County has already experienced damaging extreme precipitation events in 2017 and again in 2021. It is projected that the wettest day every year will increase by up to 35 percent for some Coastal California locations by the end of the century. Maximum 1-day precipitation values are projected to increase between 0.2 inch and 0.3 inch by mid-century and between 0.3 inch and 0.6 inch by the end of the century.

On average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. The Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling during winter from North Pacific storms. However, even modest changes would have a significant impact because California ecosystems are conditioned to historical precipitation levels and water resources are nearly fully utilized. (Cal-Adapt, 2018)

In Santa Cruz County, summertime coastal fog reduces temperatures, increases water availability, and reduces evapotranspiration and respiration by plants. Fog moisture is transported from the ocean and can provide up to 33 percent of the water received by the neighboring ecosystems. In the county many native species, including coastal redwood trees and the ecosystems beneath their canopy, rely on high summertime fog frequency to maintain their habitat. Agriculture depends on coastal fog to reduce summer temperature extremes and to reduce crop demand for water and irrigation. Changes in air patterns, urban heat, and air quality all can cause changes in fog prevalence. Additionally, vectors, including Shothole bore and mosquitos are expected to be more prevalent.

Riverine & Stormwater Flooding

Low-lying areas throughout Santa Cruz County are expected to experience more frequent flooding as a result of climate change. Riverine flooding is projected to increase as precipitation extremes increase. Stormwater systems may be overwhelmed more frequently as more extreme rain events occur, causing localized flooding which could impact properties and close streets. Data from the Santa Cruz County MJHMP identifies over 2,000 1 to 4-unit residential structures, over 200 other habitable structures, and approximately 16,000 permanent Santa Cruz County residents living in flood hazard areas. Several schools, fire stations, hospitals, and police stations are located within the flood plains, as shown in Figure 11. Flooding impacts create physical damage directly through inundation. Flooding can also trigger cascading impacts to power, water, and wastewater services and stormwater drainage infrastructure which may exacerbate public health concerns for vulnerable populations.

Extreme Heat

Santa Cruz County has an average maximum temperature of 67.4°F and an average minimum temperature of 43.1°F. The average maximum and minimum temperatures are expected to increase in the county with mid-century projections showing a 3.2°F to 4.0°F increase in temperature maximum and minimums.

For Santa Cruz County, the threshold temperature is 90°F. Increased frequency of extreme heat days can result in increased public health risks through an increase in heat-related and vector-borne illnesses. Particularly vulnerable populations include older adults, young children, and individuals with underlying chronic diseases. Santa Cruz County has historically been buffered by the impacts of extreme heat due to the colder marine and fog influence cooling down evening temperatures and tempering early to mid-morning temperatures. Warm nights will further exacerbate the risk of heat illness because they affect the body's ability to cool after a day of heightened temperatures.

Figure 3-69 depicts California historical and projected temperature between 1961 and 2099. Overall temperatures are projected to rise substantially throughout this century. These projections differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the county's ecosystem health, agricultural production, water use and availability, and energy demand.

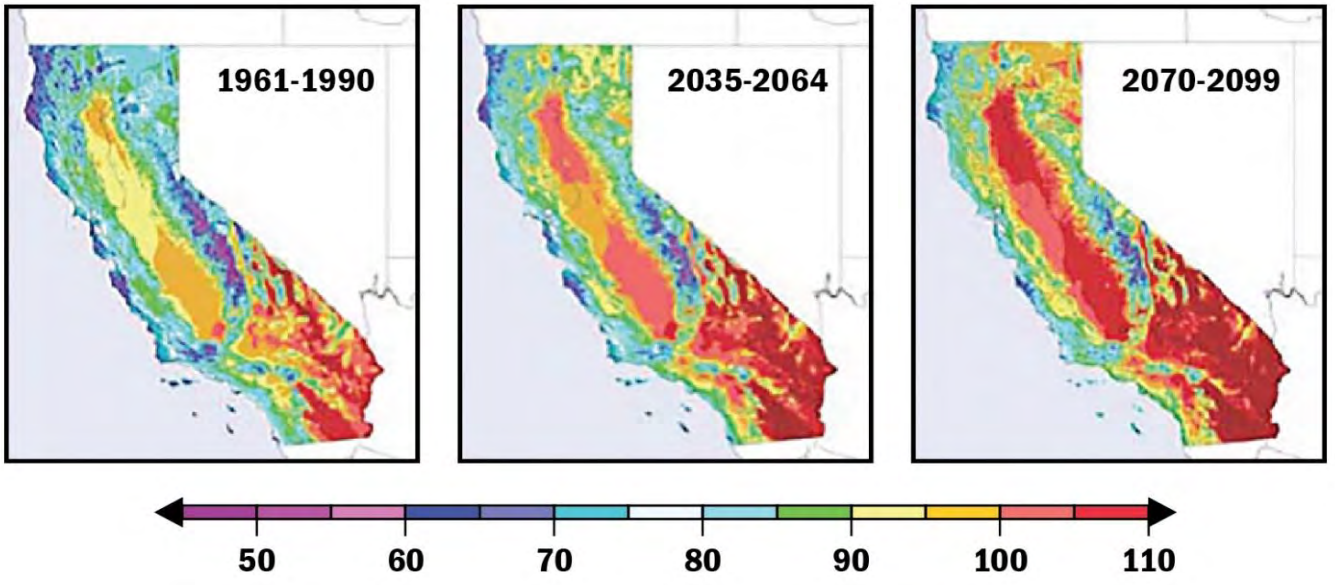


Figure 3-69: California Historical and Projected Temperature Increases, 1961 to 2099

Source: Dan Cayan, California Climate Adaptation Strategy

Drought

Climate change will increase the likelihood that low-precipitation years will coincide with above-average temperature years. Warming temperatures increase seasonal dryness and the likelihood of drought due to

decreased supply of moisture and increased atmospheric demand for moisture as evaporation from bare soils and evapotranspiration from plants increases. The increased moisture loss from soils and vegetation amplifies dryness during periods without precipitation. In California's highly variable climate setting, climate models project less frequent but more extreme daily precipitation, with year-to-year precipitation becoming more volatile and the number of dry years increasing. The duration of dry spells is projected to vary depending on which emissions scenario is used. Like precipitation patterns, some of the annual variability is obscured within 30-year averages. Despite this, the clear trend is for maximum lengths of dry spells to increase through the end of century.

Wildfire

The occurrences of wildfires have increased significantly within California in frequency and intensity over the past two decades. Santa Cruz County is projected to experience increasing wildfire risk through the end of the century. An increase in temperatures and prevalence of drought conditions are projected to result in increased wildfire risk through decreases in ground and ladder fuel moisture levels. Wildfires in the Central Coast region are influenced by wind events, utility infrastructure, topography, humidity, fuel availability, and lightening or other severe weather (Langridge 2018). From 1948 to 2019, 15 wildfires were responsible for burning 61,455 acres in the county. The 2020 CZU Lightening Complex Fire burned a total of 85,509 acres and 1431 structures.

There are many areas in the county categorized by CAL FIRE as Moderate, High, and Very High Fire Hazard Severity Zones (FHSZs). Some areas in the county that border fire hazard zones are considered WUI areas, which are zones of transition between open space and residential or commercial development. These areas are particularly at risk to damage because they often have significant quantities of vegetative fuels for fire near buildings and facilities that are vulnerable to fire. The county is projected to experience an increase in the decadal probability of wildfire by 20 percent by the end of the century.

Air Quality

In Santa Cruz County, good ambient air quality is typically maintained by the mountains and breezy coastal environment. However, the San Lorenzo Valley and other inland areas can experience poor air quality more frequently due to a lessening coastal wind influence and local topography. Worsening air quality due to climate change can create respiratory issues for vulnerable populations and impact indoor areas without adequate air filtration systems. There are several types of air quality decline sources found below:

- **Dust:** Dry, dusty conditions also associated with drought and increased evaporation.
- **Smog:** Increases in ambient temperature can lead to higher rates of smog also referred to as ozone. Ground-level ozone specifically will be experienced at higher rates leading to raised cardiovascular and respiratory morbidity and mortality rates. Ground-level ozone has also been shown to have particularly disproportionate adverse impacts on populations experiencing homelessness and lower median income. Santa Cruz County is expected to experience increases in ozone concentrations in tandem with temperature increases.

- **Wildfire Smoke:** Temperature, severe wildfire conditions, and the area burned by wildfires throughout the state has increased and will continue to increase. Higher temperatures accompanied by an increase in the incidence and extent of large wildfires will lead to increased wildfire smoke and associated toxins and air pollution. Poor air quality can force school and business closures and limit healthy outdoor activity.

3.2.10.6 Warning Time

As this section as described, many existing hazards could be intensified as a result of climate change, decreasing warning times and exacerbating impacts. Warning times are discussed under the various other hazards. Other climate change impacts are more long-term; scientists have a high confidence in predicting the rise in global temperatures and have reached a consensus on the future impacts of climate change and the time frame in which they will occur.

3.2.10.7 Vulnerability Assessment

This section outlines vulnerabilities of Santa Cruz County to impacts from climate change and focuses on sea level rise in particular, as many of the other impacts are secondary and outlined in other hazard profiles.

3.2.10.7.1 Population

The predicted health effects of climate change include increased incidence of emerging diseases and vector-borne disease if ecological changes lead to migration of insect and animal disease vectors, and physical and mental health impacts associated with severe weather events, such as flooding, when they cause population dislocation and infrastructure loss. Though extreme heat may be moderated in our coastal location, inland areas of the county can experience much higher temperatures. An increase in temperature can exacerbate existing respiratory disease, cardiovascular disease, and stroke. Wildfires are also expected to increase in frequency and severity as drought takes hold, which may cause respiratory distress, exacerbation of existing disease, physical and mental dislocation, as well as some number of direct fatalities.

While all Santa Cruz County residents will experience climate change, some may be disproportionately more affected than others. For example, older adults and young children may be more at-risk to heat illness during an extreme heat event. Many factors can influence sensitivity to climate hazards including an individual's health, age and ability, societal disadvantages, access to health care, economic opportunity, education and other resources, access to basic needs, and exposure to environmental stressors

The Santa Cruz County CAAP conducted a social sensitivity index scoring and found the most sensitive populations in the county are in the areas surrounding the City of Watsonville, north of the Soquel between Soquel San Jose Road and North Rodeo Gulch Road, and in some parts of the Live Oak region. Most moderate

risk populations are in south Santa Cruz County, north of the City of Watsonville, with others located in the Ben Lomond and Scotts Valley areas. Table 3-71 summarizes the population susceptible to sea level rise.

Table 3-71: Population Susceptible to Sea Level Rise

	Total Population
Unincorporated County	131,149

Sea Level Rise (Feet Above Mean High Water)	Population Count	% of Total
50cm 100yr COSMOs	875	*0.67%*

3.2.10.7.2 Property

The structures and buildings that occupy wildfire hazard zones are at risk of structural damage from wildfires. There are several areas of the county that are classified as moderate and high severity wildfire zones. Cal-Adapt projections indicate that wildfire risk will increase most in Northeastern portion of the county in the Castle Rock State Park area and South towards State Route 17, which will put many buildings and facilities in these areas at high future risk. There are several residential structures and critical facilities situated within moderate and high fire hazard zones in the county including schools, fire stations, sheriff stations, and healthcare facilities. There are at least two schools located in very high severity wildfire zones.

The location of floodplains along the San Lorenzo River, Bear Creek, Zayante Creek, Soquel Creek, Corralitos Creek, the Pajaro River, and along the coastline that will impact critical buildings and facilities. The following features are located in FEMA flood hazard zones: 6,646 parcels, 4,061 structures, 2 schools, and 3 fire stations. Additionally, some government buildings and the County Jail are in the flood zone along the San Lorenzo River and will likely be damaged in the case of a 100-year flood event. Flooding can cause structure damage due to flowing debris, saturation of building materials, and collapse of water-logged structures. High-velocity and high-pressure flooding may also cause structures to wash away.

Climate change could significantly impact the county's agricultural industry, which is a significant driver of the county's economy. A 2025 report issued by the Santa Cruz County Agricultural Commissioner indicated that agriculture contributed approximately $1.5 billion to the county's economy in 2023. The same report indicated that agriculture directly employed 8,744 persons. Santa Cruz County is one of the leading counties for berry production, with strawberry, raspberries, and blackberries accounting for approximately $384 million in production value in 2023.

Increases in temperature and changes in precipitation and soil moisture could impact the growing of berries by causing late or irregular blooming and affecting yields. The increased likelihood of extreme floods could lead to the destruction of crops, erosion of topsoil, and deposits of debris and sediment on crop lands. Conversely, as average temperatures increase with climate change, agricultural demand for water could intensify under extreme heat conditions, under which water evaporates faster and plants need more water to move through their circulatory systems to stay cool. More specifically, attempts to maintain berry

productivity and quality in the face of warming may be associated with increased water use for irrigation. As noted earlier, increased average temperatures and changes in timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies in the future, which could in turn affect water supplies for agricultural uses. Table 3-72 summarizes the property susceptible to sea level rise.

Table 3-72: Population Susceptible to Sea Level Rise

	Total Parcels	Total Market Value ($)	Total Content Value ($)	Total Value ($)
Unincorporated County	47,630	$35,189,614,790	$19,116,504,796	$54,306,119,586

Sea Level Rise	Parcel Count	% of Total	Market Value Exposure ($)	Content Value Exposure ($)	Total Exposure ($)	% of Total
50cm 100yr COSMOS	41	*0.1%*	$31,615,200	$15,999,600	$47,614,800	*0.1%*

3.2.10.7.3 Critical Facilities

Within Santa Cruz County, there is a complex network of infrastructure and services that are vulnerable to climate change. Assets within this category include water services, wastewater, airports, emergency services, utilities, roadways, public transit lines, public transportation, and communication services. Natural gas and electricity services are provided by Pacific Gas and Electric (PG&E) and distributed to Santa Cruz County residents through two major transmission lines. In addition, utility companies provide electricity, natural gas, water, and sewer services to residents, though residents not utilizing a community or municipal water provider depend on wells and/or surface water to meet their water needs. Wastewater infrastructure is provided by Santa Cruz County Sanitation District, and the Davenport Sanitation District provides water supply infrastructure in addition to wastewater. Numerous pump stations and associated sanitary sewer infrastructure are in locations vulnerable to severe weather damage, as well as sea level rise. Table 3-73 and Table 3-74 summarize critical facilities susceptible to sea level rise. Sea level rise has the potential to adversely impact the following types of public and private infrastructure:

- **City of Santa Cruz Neary Lagoon Wastewater Treatment Plant:** The Santa Cruz County Service District provides wastewater collection to the City of Capitola and unincorporated communities of Aptos, Live Oak, and Soquel, and conveys effluent to the City of Santa Cruz Neary Lagoon Wastewater Treatment Plant. Groundwater level at the Neary Lagoon Wastewater Treatment Facility is very high. The anticipated rise in groundwater due to sea level rise may adversely impact the facility by impacting storage tanks and associated infrastructure (City of Santa Cruz, 2018). A large underground pump gallery is also susceptible to groundwater impacts through infiltration of groundwater through electrical conduits and cracking walls (City of Santa Cruz 2018).
- **Santa Cruz County Sanitation District Sewer Infrastructure:** Numerous pump stations and associated sanitary sewer infrastructure operated by the Santa Cruz County Sanitation District are situated in locations vulnerable to winter storm damage. The primary sewer force main transports three to five million gallons of raw sewage per day under dry weather conditions and up to 23 million gallons during

wet weather. The force main crosses the face of Schwan Lake to the Neary Lagoon Wastewater Treatment facility and is susceptible to sea level rise. It is expected that several of these facilities may be increasingly impacted as sea level rises and storms increase.

- **Coastal Transportation Infrastructure:** Roads at the top edge of coastal bluffs are vulnerable to damage because the rate of retreat of unprotected coastal bluffs is expected to increase in response to increased exposure to storm waves and intense rain events. Roads at low elevations at the back beach and the subsurface infrastructure within the roads are also particularly vulnerable to coastal erosion.
- **Oceanfront Residential and Commercial Properties:** The projected rise in sea level would put most Santa Cruz County oceanfront properties at greater risk from either inundation and/or coastal flooding, or from increased bluff erosion. Unincorporated Santa Cruz County has approximately 29 miles of coastline. Approximately 3 miles of the most intensively developed coastline with primarily residential uses is located in the mid-county community of Live Oak. An additional 3 miles of vulnerable beaches with extensive coastal residential and commercial development occurs from Seacliff to Rio Del Mar.

Table 3-73: Critical Facilities Susceptible to Sea Level Rise

Lifelines (miles) - Sea Level Rise	
Infrastructure Type (Linear)	50cm 100 YR COSMOS
County Maintained Roads*	0.4
Levee	1.2
Maintained Channel	2.4
NG Pipeline	0.2
Railroad	0.0
Sanitation Pipe	0.4
All Roads	3.6
Alley	-
Drive	0.4
Major Road	0.2
Ramp	-
Street	1.9
State Highway	0.1
Unnamed	1.0
Transmission Line	0.0
Grand Total	**8.2**

Table 3-74: Detailed Inventory of Critical Facilities Susceptible to Sea Level Rise

Critical Infrastructure - Sea Level Rise	
Infrastructure Type	50cm 100yr COSMOs
Essential Facilities	-
Fire Station	-
Hospital	-
Law Enforcement	-
EOC	-
American Medical Response	-
High-Potential-Loss	1
Adult Care Facility	-
Child Care Center	-
Cell Tower	-
County Real Property Asset	1
Dam	-
Healthcare Facility	-
Historic Building	-

Critical Infrastructure - Sea Level Rise	
Infrastructure Type	50cm 100yr COSMOs
Library	-
Mobile Home Park	-
Power Generation	-
Radio Sites	-
School	-
Transportation and Lifeline	10
Airport	-
Substation	-
NG Station	-
Church	-
Stormwater Culvert	3
Parks	5
Bridge NBI	2
Hazmat	-
HWTS Active Facility	-
Geotracker Cleanup Site	-
Grand Total	**11**

3.2.10.8 Future Trends in Development

The County is committed to continuing efforts to address and reduce existing climate-related risks and future impacts on a holistic and programmatic level. Two examples are the LCP and Climate Action and Adaption Plan. With several ordinances and programs that cover a range of climate exposures and related impacts, the County is well equipped to handle current issues of extreme heat events and water supply issues, but could still likely face increasing challenges as projected changes occur.

3.2.10.9 Climate Change Hazard Problem Statements

As part of the mitigation action identification process, the Santa Cruz County Planning Team developed areas of concern (i.e., problem statements) that summarize the county's most pressing climate change-related vulnerabilities and challenges. The problem statements were developed based on the updated risk assessment and vulnerability analysis contained herein, as well as the team's local knowledge and experience and community input. The problem statements address a broad spectrum of concerns, from direct impacts on residents and vulnerable populations to threats to critical infrastructure and long-term recovery.

These problem statements are not intended to be all-encompassing or to describe each and every issue associated with climate change. Instead, they highlight the most urgent concerns that can be addressed

within the scope of this MJHMP. Each statement will be linked to at least one mitigation action, ensuring that identified needs are met with specific, measurable, and equitable solutions. Table 3 75 presents the climate change problem statements for Santa Cruz County, along with their associated areas of concern and reference numbers for cross-linking to the mitigation actions in Table 4-1 and Table 4-2.

Table 3-75: Santa Cruz County Climate Change Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
Climate Change	Victim	ps-CC-SCC-01	Climate change is expected to intensify a range of hazards in Santa Cruz County?including extreme heat, wildfire, flooding, and drought?which may disproportionately affect lower-income residents living in high-risk areas, where adaptive capacity, home retrofitting options, and relocation opportunities are limited.	ma-CC-RCD-01
Climate Change	Impact	ps-CC-SCC-02	Climate-driven hazards place overlapping stress on emergency response systems, infrastructure, and communities, yet planning and coordination efforts remain fragmented across multiple County and regional initiatives, limiting efficiency and unified action.	ma-CC-SCC-01
Climate Change	Impact	ps-CC-SCC-03	Climate change is degrading ecosystems that offer flood protection, carbon sequestration, and biodiversity. Shifts in coastal, estuarine and inland habitats can reduce natural resilience to wildfire, flood, drought, and erosion.	ma-CC-CPT-01
Climate Change	Threat	ps-CC-SCC-04	Fragmented land ownership / governance and short grant cycles hinder implementation of long-term climate resilience programs which demand cross-jurisdictional coordination and sustained investment.	ma-CC-SCC-01
Climate Change	Threat	ps-CC-SCC-05	County facilities and infrastructure were not designed for the frequency and severity of severe weather, drought, wildfire, and coastal hazard events now expected under current climate trajectories.	ma-AH-WTS-01
Climate Change	Impact	ps-CC-SCC-06	Climate change is expected to worsen water quality impacts, including harmful algal blooms, due to higher temperatures, increased evapotranspiration, altered precipitation patterns, and more frequent drought conditions.	ma-CC-SCC-03
Climate Change	Threat	ps-CC-SCC-07	Climate change is expanding the range and prevalence of vectors, including plant pathogens, invasive pests such as shothole borer, and disease-carrying mosquitos, increasing risks to ecosystems, agriculture, and public health.	ma-AH-SCC-04, ma-CC-SCC-02

3.3 All Hazard Problems

Santa Cruz County faces several systemic vulnerabilities that increase risk across all hazard types (Table 3-76). Threats stem from gaps in emergency warning systems, constrained capacity for infrastructure hardening, and an underdeveloped sheltering network.

The county's communication systems, including cellular networks, radio towers, and public alert infrastructure, are susceptible to disruption during hazard events. Limited cellular coverage in remote areas of the Santa Cruz Mountains impedes timely dissemination of emergency alerts, while the county's public safety radio system is aging and experiencing coverage gaps that compromise first responder coordination and response capabilities. At the same time, there are numerous vulnerable evacuation routes, particularly in mountains, that pose risks during fast-moving events like wildfires and flash floods.

Small utility providers, including water and wastewater agencies, also face significant challenges due to constrained financial and staffing resources, limiting their ability to recover from and adapt to repeated hazard events. Damage to these systems during hazard events can lead to a catastrophic loss of water, given the county's isolated supplies, and sewage spills that threaten public health and environmental quality.

Populations such as older adults, individuals with medical or mobility limitations, and people who are homeless, are disproportionately exposed to hazard impacts due to economic, health, and accessibility barriers, as well as challenges in outreach and communication. Even so, the county's network of emergency shelters and resilience hubs remains underdeveloped, with deficiencies in backup power, air filtration, and ADA accessibility, limiting protection for vulnerable and unhoused populations during disaster events.

Table 3-76: Santa Cruz County All Hazard Problem Statements

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
All Hazard	Impact	ps-AH-SCC-01	Communications systems, including wireless telecommunications facilities, radio towers, and other emergency communications infrastructure, are vulnerable to damage during hazard events, and public alerts may not reach community members due to limited cellular service in geographically isolated areas of the county.	ma-AH-SCC-07
All Hazard	Victim	ps-AH-SCC-02	Small utility providers, including water and wastewater agencies, are disproportionally impacted by natural hazard events due to limited resources, straining recovery efforts and adaptive capacity to mitigate against future events.	ma-AH-CPT-01
All Hazard	Victim	ps-AH-SCC-03	The population of unincorporated Santa Cruz County is predominantly older, with a significant number of seniors at risk to disproportionate impacts from hazards due to often being on fixed incomes, having medical conditions or mobility limitations, and restricted transportation access.	ma-AH-SCC-06

Hazard	Area of Concern	Problem ID	Description	Related Mitigation Actions
All Hazard	Victim	ps-AH-SCC-04	People living in homeless encampments along riparian corridors are at higher risk of impacts from hazard events, including due to limitations in communication and outreach and resistance to mitigation efforts.	ma-AH-SCC-03
All Hazard	Threat	ps-AH-SCC-05	Santa Cruz County?s VHF public safety radio system is aging, with components at or near end-of-life and limited manufacturer support, and it has significant coverage gaps that affect first responder communications.	ma-AH-SCC-07
All Hazard	Threat	ps-AH-SCC-06	Spilled sewage due to wastewater infrastructure damage from hazard events endangers public health, waterways/water supplies, and ecosystems.	ma-AH-SCC-07
All Hazard	Threat	ps-AH-SCC-07	Gaps in emergency warning systems and limited evacuation routes, especially in mountainous areas, threaten communities with delayed response to rapid-onset hazard events such as wildfire and inundation from flash flooding or dam failure.	ma-AH-SCC-08
All Hazard	Threat	ps-AH-SCC-08	The County lacks a fully developed network of emergency shelters, including cooling and warming centers, and many public facilities lack backup power, air filtration, and ADA?accessible services to protect medically vulnerable, unhoused, and other populations during hazard events.	ma-AH-SCC-05, ma-AH-WTS-01, ma-AH-SCC-03

3.4 Planning for Hazards & Growth

Santa Cruz County and its incorporated cities each maintain general plans that serve as the foundation for guiding land use, development, and long-term community priorities. Santa Cruz County is a general law county, which means it establishes and enforces its own development regulations in compliance with the State of California's stringent planning, zoning, subdivision, building, and environmental standards. This framework ensures that future development in the unincorporated areas is carefully managed, with a strong emphasis on recognizing and mitigating the impacts of natural hazards.

The county's General Plan, alongside the general plans of participating jurisdictions such as Capitola, Santa Cruz, Scotts Valley, and Watsonville, provide comprehensive planning frameworks that integrate hazard mitigation strategies into land use decisions, community safety, and infrastructure investments. These plans address long-term issues such as sustainable growth, climate change resilience, and protection of vulnerable populations.

Incorporating hazard analysis into general plans and development regulations enables both the County and its cities to meet state requirements while reducing risks from natural hazards such as wildfire, flooding, drought, and extreme heat. Climate change is increasing the frequency and severity of these hazards, underscoring the importance of proactive planning and durable mitigation strategies.

Through coordinated planning, adherence to strict environmental regulations, and investment in resilience measures, the County and its jurisdictions are working to foster sustainable, safe, and adaptable communities. Together, these efforts provide a consistent and comprehensive approach to balancing growth with hazard risk reduction and climate adaptation across the region.

3.4.1 Long-Range Planning & Growth Management

Anticipating future growth in Santa Cruz County requires a proactive approach that balances state housing mandates with local hazard mitigation priorities. Growth management has long been a defining feature of the county's planning framework. Since 1978, voter-approved Measure J has directed new development inside the USL and RSL, concentrating growth within incorporated cities and established unincorporated communities while limiting sprawl into rural and hazard-prone areas. This framework, combined with California's stringent planning, zoning, subdivision, building, and environmental standards, helps ensure that future development occurs in areas with appropriate infrastructure and lower hazard exposure.

At the same time, all jurisdictions in Santa Cruz County are subject to the State's Regional Housing Needs Allocation (RHNA), which requires each to plan for a fair share of new housing across all income levels. Accommodating RHNA targets in a county constrained by coastal regulations, agricultural preservation, steep topography, and hazard-prone landscapes creates both opportunities and challenges. Most new housing will need to be located within existing urban centers such as Santa Cruz, Capitola, Scotts Valley, Watsonville, and nearby unincorporated communities, where infrastructure is already in place. Concentrating growth in these areas helps to preserve rural lands and environmentally sensitive habitats,

but also underscores the importance of investing in resilient infrastructure and retrofitting older housing stock that remains vulnerable to natural hazards.

The Santa Cruz County General Plan, updated in 2024, serves as the overarching blueprint for managing this growth while addressing hazard resilience. Its Public Safety Element establishes policies for natural hazards including flood, wildfire, earthquake, and coastal hazards, and is being further updated to integrate this MJHMP. Other General Plan elements, such as the Built Environment and Housing Elements, direct land use and housing decisions in a way that complements hazard mitigation goals. Together, these planning frameworks ensure that decisions about future development are informed by the most current hazard data and mitigation strategies.

By aligning growth management tools such as Measure J, the General Plan, and RHNA compliance with hazard mitigation priorities, Santa Cruz County and its jurisdictions are working to achieve two critical goals: meeting the region's pressing housing needs and reducing long-term risk to people, property, and natural systems. As one more step toward reducing hazard risk, the County and participating jurisdictions will adopt this MJHMP by reference into their general plans pursuant to AB 2140, ensuring stronger integration between hazard mitigation and long-range land use planning.

3.4.2 Building Codes & Development Standards

Santa Cruz County's development strategies integrate comprehensive planning frameworks and regulatory measures to guide growth while minimizing risks from natural hazards. Nationally, building codes have continually improved disaster resilience and, since 1990, those great improvements have added approximately one percent to construction costs. (National Institute of Building Sciences, 2019) In addition, California's building codes are considered some of the world's most robust and set minimum standards to safeguard against many of the natural hazards that affect communities within the state. These codes form a strong foundation for safe construction practices which the county enforces.

The county is required to regularly update its building and development codes to meet the minimum standards required by California, including the CBC which was last updated in 2022. California's minimum code requirements provide some of the safest construction standards in the world and are meant to reduce risk to occupants from high wind, seismic activity, landslides, flood, wildfire, and other natural hazards. Further, climate change impacts are also required to be addressed through the adoption and regular updating of California's Green Building Standards and Energy Codes.

For flood hazards, specifically, Santa Cruz County participates in the National Flood Insurance Program (NFIP) and Community Rating System (CRS), in addition to adhering to other California minimum floodplain development standards. All development within designated flood hazard areas must meet minimum flood protection standards as set forth by FEMA; however, the county has adopted higher standards than the NFIP minimums, including a requirement to elevate the lowest flood of structures multiple feet above the base flood elevation, known as a "freeboard." A freeboard is a factor of safety for purposes of floodplain management to compensate for the many unknown factors that could contribute to flood heights or

elevations greater than what is anticipated on regulatory flood maps, such as wave action, bridge openings, climate change, sea level rise, and the hydrological effect of watershed urbanization. The freeboard in the county is two feet.

The Santa Cruz County Code (SCCC) incorporates stringent building and development regulations to mitigate hazards for both new and existing structures, and many chapters of the SCCC recognize the diverse terrain found throughout the county by differentiating between coastal, inland, and other areas where hazard risks and impacts may vary greatly. These code sections include:

- 2022 California Building, Mechanical, Plumbing, Electrical, Existing Building, Residential, Green Building Standards, Energy, and Historical Building Codes (SCCC Chapter 12.10)
- Fire Code (SCCC Chapter 7.92), including construction and design, defensible space, vegetation management, and emergency access requirements in compliance with the 2022 California Fire Code
- Planning and Zoning Regulations (SCCC Title 13), including coastal and geologic hazards zone designations and development standards, tree preservation and water-efficient landscaping requirements, and specific plan criteria related to General Plan conformity and public safety
- Subdivision Regulations (SCCC Title 14), including General Plan conformity requirements and design standards that prohibit subdivision in flood, geological, or other hazard areas without adequate mitigation
- Floodplain Management Regulations (SCCC Chapter 16.13), in compliance with NFIP requirements and including higher standards such as a two- to three-foot freeboard
- Water Conservation (SCCC Chapter 7.69), which prohibits wasteful water uses and establishes requirements for water-efficient plumbing fixtures
- Geologic Hazards (SCCC Chapter 16.10), which implements the California Alquist-Priolo Earthquake Fault Zoning Act by setting development standards to minimize injury, loss of life, and damage to public and private property caused by earthquakes, floods, slope failures, and coastal hazards
- Grading Regulations (SCCC Chapter 16.20), which sets forth regulations controlling all grading and earthwork activities, including road construction, to minimize unnecessary disturbance and erosion
- Erosion Control (SCCC Chapter 16.22), which requires control of all existing and potential conditions of human-induced erosion to prevent increased danger from flooding, slope failure, or water quality degradation

These regulations are designed to protect public health, safety, and welfare, and to limit the impacts of natural disasters on development. In the county's hazard-prone areas, new development is very limited and, where development is feasible and permitted, these codes emphasize minimizing exposure and vulnerability to hazard risks through appropriate siting, advanced construction techniques, maintaining adequate access for emergency services, and other mitigation methods.

3.4.3 Environmental Regulations

Santa Cruz County anticipates and plans for its future growth while maintaining a robust regulatory framework to mitigate exposure and vulnerability to hazards. Further, the State of California has some of

the most rigorous environmental regulations in the nation to which the county and all new development within it are bound.

California Environmental Quality Act (CEQA)

Under the California Environmental Quality Act (CEQA), the county's General Plan and any specific plans that propose land use changes or significant development projects must include extensive evaluations of hazards and potential impacts. CEQA analysis requires consideration of factors such as proximity to floodplains, wildfire-prone areas, or seismic zones. Additionally, mitigation measures proposed in CEQA documents aim to reduce environmental and hazard-related risks, including updates to infrastructure, evacuation planning, or restrictions on development in high-risk areas.

For example, if a specific plan proposes rezoning to allow residential development in a previously undeveloped area near the wildland-urban interface (WUI), CEQA would necessitate an assessment of wildfire risk to the development. The resulting analysis might recommend increased setbacks, advanced fire-resistant construction materials, and enhanced emergency access to mitigate identified hazards.

CEQA also requires analysis and mitigation of environmental impacts related to climate change. As part of the review process, for example, the proposed development's contributions to greenhouse gas (GHG) emissions must be evaluated and mitigation techniques or other alterations to the project may be required to reduce future emissions that could result from the project.

California Climate Change Legislation

In California, counties like Santa Cruz are required to address climate change through various state laws and policies designed to promote sustainability, reduce GHG emissions, and increase resilience to climate-related hazards. In addition to applicable CEQA requirements and the county's adopted sustainability standards outlined in Section 3.4.2, key senate bills (SB), assembly bills (AB), executive orders (EO), and other state environmental legislation includes:

- **SB 375 – Sustainable Communities and Climate Protection Act:** Requires cities to integrate regional transportation planning and land use to reduce GHG emissions, particularly by fostering development near transit hubs and reducing vehicle miles traveled.
- **AB 32 and SB 32 – Global Warming Solutions Act and Amendments:** Mandates that cities contribute to California's broader goals of reducing GHG emissions to 40% below 1990 levels by 2030 and achieving carbon neutrality by 2045.
- **SB 379 – General Plan Safety Element:** Requires jurisdictions to incorporate climate adaptation and resilience strategies into the safety element of their general plan to address risks such as wildfires, extreme heat, drought, and sea-level rise.
- **SB 1000 – General Plan Environmental Justice Element:** Mandates the inclusion of an environmental justice element in general plans for communities which have been (or are anticipated to be) disproportionately impacted by environmental hazards, often compounded by climate change.

- **Title 24 – California Building Code (CBC):** Establishes energy efficiency and renewable energy requirements to reduce GHG emissions from the built environment, which jurisdictions enforce through local permitting processes.
- **EO B-30-15 and EO N-79-20:** Establish statewide targets for climate resilience and decarbonization of transportation and energy sectors, influencing local and regional planning efforts.

Santa Cruz County incorporates these state mandates into its local planning, leveraging the General Plan and hazard mitigation strategies to prepare for the increasing risks of wildfires, drought, flooding, coastal hazards, severe weather, and extreme heat caused and compounded by climate change. By aligning with state goals, the county ensures its development contributes to a sustainable and resilient future for its communities.

3.4.4 County-Wide Resilience Planning

An overview of current resilience planning initiatives is essential for identifying effective strategies, coordinating efforts, and ensuring the efficient utilization of resources to protect communities from natural hazards and impacts associated with environmental shifts. This section covers strategies from current and previous planning efforts of several participating jurisdictions as well as the City of Santa Cruz (not participating), including the 2021 Santa Cruz County HMP, 2022 Santa Cruz County Climate Action and Adaptation Plan (CAAP) and Vulnerability Technical Compendium, HMPs for the Cities of Capitola (2020), Watsonville (2020), and Santa Cruz (2018), and the 2018 and 2022 City of Santa Cruz Climate Adaptation Plans (CAP).

As described throughout this 2025 MJHMP, this first effort to plan for hazards across multiple jurisdictions in Santa Cruz County will enhance regional collaboration and resilience. Table 3-77 summarizes the key resilience strategies outlined in these current and previous planning documents, as further detailed in the 2025 AT&T Hazard Scenarios report which is incorporated into this MJHMP by reference.

Table 3-77: Resilience Planning Initiatives in Santa Cruz County

Resilience Strategy	Current & Previous Plans Mentioning Strategy	Hazards Addressed
Seismic Retrofitting of Critical Facilities and Infrastructure	County, Capitola, Watsonville, and City of Santa Cruz HMPs	Earthquake and Liquefaction
Wildfire Defensible Space and Vegetation Management	County, Capitola, Watsonville, and City of Santa Cruz HMPs	Wildfire
Stormwater Infrastructure Upgrades and Flood Management Improvements	County CAAP, City of Santa Cruz CAP, and County, Capitola, Watsonville, and City of Santa Cruz HMPs	Flood, Coastal Storm, and Sea-Level Rise
Water Conservation Programs and Groundwater Management Plans	County CAAP, City of Santa Cruz CAP, and County, Capitola, Watsonville, and City of Santa Cruz HMPs	Drought
Tsunami Inundation Mapping and Early Warning Systems	County, Capitola, and City of Santa Cruz HMPs	Tsunami

Resilience Strategy	Current & Previous Plans Mentioning Strategy	Hazards Addressed
Coastal Erosion Management and Shoreline Protection Measures	County CAAP, City of Santa Cruz CAP, and County, Capitola, and City of Santa Cruz HMPs	Coastal Erosion and Sea-Level Rise
Dam Infrastructure Inspections and Maintenance Programs	County, Capitola, and City of Santa Cruz HMPs	Dam Failure
Landslide and Debris Flod Stabilization and Drainage Infrastructure Improvements	County, Capitola, Watsonville, and City of Santa Cruz HMPs	Slope Failure
Community Education and Outreach for Hazard Preparedness and Resilience	County CAAP, City of Santa Cruz CAP, and County, Capitola, Watsonville, and City of Santa Cruz HMPs	All Hazards
Climate Adaption Strategies Integration into Local Plans	County CAAP, City of Santa Cruz CAP, and County, Capitola, Watsonville, and City of Santa Cruz HMPs	Flood, Drought, Wildfire, Extreme Heat, Sea-Level Rise, and Climate Change
Energy Resilience Initiatives (Renewable Energy and Microgrid Development)	County CAAP, City of Santa Cruz CAP, and County, Capitola, Watsonville, and City of Santa Cruz HMPs	Wildfire, Extreme Heat, High Wind, and Climate Change
Infrastructure Backup Systems (Power, Communications, Redundancy)	County, Capitola, Watsonville, and City of Santa Cruz HMPs	High Wind, Wildfire, Earthquake, and Flood
Community Gardens and Local Food Security Initiatives	County and Watsonville HMPs	Drought, Flood, Extreme Heat, and Climate Change
Green Infrastructure Projects (Bioswales, Urban Tree Canopy)	City of Santa Cruz CAP and County, Capitola, Watsonville, and City of Santa Cruz HMPs	Flood, Coastal Storm, and Climate Change

Source: 2025 AT&T Hazard Scenarios: A Roadmap to Resilience for Santa Cruz County (Project Report 2025-006)

3.5 Capabilities & Opportunities

This section provides a detailed assessment of the current capabilities of Santa Cruz County to support hazard mitigation, as well as future opportunities and funding options. This consists of describing how the county is planning for hazards and growth (Section 3.3) and a summary of its existing capabilities and the potential for enhancement (Section 3.5.1).

A summary of funding opportunities to advance the goals of this MJHMP is also provided in this section (Section 3.5.2), including local, state, and federal mechanisms and ways the participating jurisdictions can leverage their shared resources to fund coordinated mitigation efforts.

Volume 2 of this MJHMP describes the planning efforts, existing capabilities, and future opportunities for each of the other participating jurisdictions as part of their annexes. Additional details about the regulatory environment surrounding each hazard are found in the hazard profiles in Section 3.2.

3.5.1 Capabilities & Opportunities Assessment

To develop a realistic and actionable mitigation strategy, it must account for existing jurisdictional capabilities and what future opportunities there are to enhance those capabilities for purposes of hazard mitigation. This section provides an assessment of Santa Cruz County's existing capabilities and future opportunities, including planning and regulatory, administrative and technical, fiscal, and public outreach and education capabilities. This assessment also identifies opportunities to integrate this MJHMP into future planning, policies, or programs to weave mitigation efforts into daily operations and address hazard problems wholistically. Capabilities are categorized into four groups and include various mechanisms.

- **Planning and Regulatory Capabilities:** Existing long-range plans, emergency response plans, hazard-specific plans, land use policies, and building and development standards.
- **Administrative and Technical Capabilities:** Available expertise in emergency services, engineering, grant management, and community planning.
- **Fiscal Capabilities:** Budgetary capacity, taxing authority, grants, and other funding mechanisms that can support mitigation projects.
- **Outreach and Education Capabilities:** Existing programs for providing technical assistance, community education, public warnings, and stakeholder engagement.

A full description of the process used to develop the capabilities assessments is provided in Section 2.3.3. The capabilities and opportunities assessments for other participating jurisdictions are found in the annexes in Volume 2 of this plan.

Expanding & Improving Existing Capabilities

The capabilities assessment exercise presents an opportunity for Santa Cruz County and the other participating jurisdictions to examine what capabilities they do and do not currently have and where it makes the most sense to expand and improve upon those capabilities in the future. These assessments shaped mitigation actions for all-hazards as well as for specific hazards that focus on expanding and improving existing policies and programs. The expansions and improvements were based upon identified vulnerabilities and areas of concern specific to each jurisdiction, as profiled in Volume 1, Section 3.2, and each jurisdiction's annex in Volume 2.

3.5.1.1 Santa Cruz County Capabilities & Opportunities Assessment

This Capabilities and Opportunities Assessment for Santa Cruz County summarizes the various types of capabilities it has for hazard mitigation currently. The assessment also identifies opportunities to integrate, expand, and improve the county's capabilities for future hazard mitigation. Table 3-78 provides a comprehensive list of capabilities and identifies the current status, current mitigation use, and future opportunities.

The three "HMP Integration" columns that identify the capability's status and usage are color-coded with green, yellow, or orange shading to communicate the following:

- **Status:** If the capability is present at all and what level of use it has generally.
- **Current Mitigation Use:** If the capability is currently being used in mitigation efforts, specifically, and at what level.
- **Future Opportunity:** If there is a future opportunity to integrate the capability into mitigation efforts and at what level.

Summary of Capabilities & Opportunities

Planning & Regulatory

Santa Cruz County demonstrates strong planning and regulatory capacity for hazard mitigation, anchored by robust land use controls, hazard-specific ordinances, and consistent adoption of state building codes, including WUI provisions. Hazard considerations are currently well integrated into the General Plan Public Safety Element, zoning overlays, floodplain regulations, and growth management policies that intentionally limit development in high-risk areas. Capital improvement planning, erosion and sediment control, stormwater management, and wildfire planning (via the CWPP) are actively used to reduce risk.

A key opportunity for future HMP integration is to more explicitly link mitigation actions to implementation mechanisms already embedded in the Capital Improvement Program, the Climate Action Plan, and future updates to the CWPP, ensuring that mitigation priorities directly inform capital investments and long-range planning decisions. This HMP prescribes multiple mitigation actions that further integrate hazard mitigation, including results of the updated vulnerability assessment, into these existing mechanisms.

Administrative & Technical

Santa Cruz County benefits from a strong interdisciplinary staff structure that includes planners, engineers, natural resource specialists, GIS professionals, emergency managers, and building and floodplain management officials. These resources support effective development review, hazard mapping, post-disaster recovery, and grant implementation. County-wide warning and notification capabilities are well established through CruzAware, a major improvement since the previous county HMP; however, actions in this plan direct further improvement in interagency coordination and communication systems.

An opportunity for enhanced integration lies in formalizing the use of hazard mitigation data—such as risk assessments, damage histories, and equity considerations—across departments, particularly by adopting prioritization frameworks for resource allocation and increasing interagency coordination. The integration of updated hazard mapping informed by climate change, and especially sea-level rise, is also a priority in this plan.

Fiscal

Santa Cruz County has access to a limited set of fiscal tools that support hazard mitigation, including parcel taxes, system development fees, benefit assessments, Community Development Block Grants, stormwater fees, and a multi-year Capital Improvement Program. While some financing mechanisms (such as general obligation bonds or special tax bonds) have been used sparingly, they represent a future opportunity to support large-scale resilience projects or serve as match funding for federal and state mitigation grants. Strong alignment already exists between growth management policies and fiscal decision-making, discouraging investment in high-hazard areas. An opportunity for further HMP integration is to more clearly

tie mitigation actions to funding strategies—such as voter-approved Measure Q, resilience-focused CIP prioritization, grant pipelines, and potential future bond measures—within the HMP implementation framework.

Education & Outreach

Santa Cruz County maintains extensive public education and outreach capacity through dedicated web-based resources, social media, printed materials, CERT programs, and partnerships with Fire Safe Councils, Firewise communities, and other community-based organizations. These efforts support broad public awareness of wildfire, flood, earthquake, and climate-related risks, with increasing attention on equity and vulnerable populations in educational programs.

While outreach is active, there is an opportunity to expand and formalize recurring public safety events and to more directly connect HMP goals with ongoing community engagement initiatives, such as Firewise expansion, climate resilience education, and recovery-focused partnerships. A major county-wide priority in this plan is to collaborate with the other participating jurisdictions to create a coordinated public outreach and education strategy through consistent, aligned messaging. This effort will leverage partnerships with trusted voices and existing social networks to reach diverse communities with out-of-the-box resources and tools that are highly inclusive and accessible.

ASSESSMENT LEGEND

HMP Integration

Status	Current Mitigation Use	Future Opportunity
Currently in use or present.	Used widely for mitigation.	Opportunity to expand and integrate.
(Sort of) Seldomly used or limited presence.	Limited use in mitigation planning.	Limited opportunity to expand and integrate.
(No) Not present or available.	Not used in mitigation planning.	No opportunity to expand or integrate.

Table 3-78: Santa Cruz County Capabilities and Opportunities Assessment

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Construction and Future Development Regulations				
Building Codes				Santa Cruz County Code (SCCC) Ch 12.10, Building Regulations, adopts the latest version (2022) of the California Building Code (California Code of Regulation, Title 24), including Chapter 7A for WUI

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Building Code Effectiveness Grading Schedule (BCEGS) Rating				2019: Class 4 for 1 & 2 family residential, Class 4 for commercial / industrial. Will prepare submittal in 2025.
Hazard-Related Development Standards				The County General Plan and SCCC Titles 12, 13, and 16 contain land use and development standards for areas with wildfire, earthquake, coastal, geologic, and flood hazards.
Zoning Ordinance				SCCC Title 13, Planning and Zoning Regulations, includes overlay districts for geological, coastal, and flood hazard areas
Hazard-Specific Ordinance				SCCC Titles 12, 13, and 16 contain chapters and sections specific to wildfire, earthquake, coastal, geological, and flood hazards.
Growth Management Ordinance				The County General Plan and Measure J, implemented by SCCC Ch 17.01, Growth Management), Ch 17.04 (Annual Population Growth Goal for Santa Cruz County), and Ch 12.02 (Residential Permit Allocation System) limit growth across the county, but especially in rural and hazard-prone areas, via residential building permit allocations
Hazard Reduction Programs (Annually Conducted)				
Capital Improvements Program (CIP) or Plan				2025-2030 CIP includes improvements and repairs to roads, bridges, stormwater systems, and county facilities
Erosion/Sediment Control Program				SCCC Ch 16.20 and 16.22 establish standards for grading and erosion control, including requiring BMPs and construction inspections for compliance
Hazard-Related Public Outreach Program				County Office of Response, Recovery & Resilience (OR3) runs engagement programs and campaigns, including general disaster preparedness, hazard-specific resources, and educational partnerships.
Urban Water Management Plan				Not a water provider, but coordinates with water agencies in management planning
Stormwater Management Program (Annual Inspections)				Community Development and Infrastructure Department (CDI) oversees Storm Drain Master Plan (updated 2023), including enforcing design criteria and NPDES requirements, and performing annual MS4 inspections
Seismic Safety Program (Non-structural)				CD/OR3 includes seismic information as a part of regular public outreach efforts; CDI enforces and inspects for seismic safety during permit review and post-earthquake recovery
Earthquake Modernization Plan (Building Safety)				No formal URM program, but CDI enforces and inspects for seismic safety during permit review and post-earthquake recovery
Hazard Plans				
General Plan Safety Element				2020 Public Safety Element profiles wildfire, earthquake, flood, slope, and coastal hazards

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Site Plan Review Requirements				SCCC Ch 13.10 establishes site plan review requirements enforced by CDI-PLN, including hazard constraints review
General Plan Environmental Justice Element				2024 General Plan Appendix E addresses Environmental Justice (EJ) policies and implementation measures
Community Wildfire Protection Plan (CWPP)				2022 CWPP is maintained by Cal Fire CZU Unit and will be updated in 2026
Economic Development Plan				No stand-alone plan, but economic development is addressed in the 2024 General Plan, 2018 Strategic Plan (being updated in 2025), and 2022 CAAP
Floodplain Management Plan				No formal plan, but addressed in 2024 General Plan Public Safety Element, 2021 LHMP, 2022 CAAP, and SCCC Ch 16.13 (Floodplain Management Regulations)
Stormwater Management Plan				2023 Zone 5 Storm Drain Master Plan maintained by CDI (only applicable within Zone 5 – mid-County & Capitola)
Emergency Operations Plan				2023 EOP as well as 2019 Winter Storm Response Plan and Emergency Shelter Management and Operations Plan managed by OR3/OES support multi-hazard response, evacuation planning, sheltering, and alerts
Climate Action Plan				2022 CAAP includes climate impact data, mitigation and adaptation strategies, equity guardrails, and GHG targets
Climate Vulnerability Assessment				2022 CAAP includes a Climate Vulnerability Technical Compendium; also embedded in 2021 LHMP
Urban Greening Plan				No formal plan, but addressed in 2022 CAAP and 2024 General Plan
Ground Water Management Planning / Plans				Not a water provider, but coordinates with water agencies in management planning
National Flood Protection Program (NFIP)				
Floodplain Management Regulations				SCCC Ch 16.13, Floodplain Development Regulations, establishes requirements for development in flood hazard areas in compliance with FEMA and NFIP standards
Flood Insurance Education and Technical Assist.				OR3 and CDI provide flood education, outreach, and technical assistance
Flood Insurance Study				2017 FEMA FIS and best available data, per Ch 16.13
Elevation Certificates				CDI maintains elevation certificates; required during permitting
Flood Hazard Mapping / Re-Mapping				2012 and 2017 FEMA FIRM panels and best available data, per Ch 16.13 (including new mapping for post-CZU flood and debris flow hazards)
Community Rating System (CRS)				Active CRS participant; Class 8 rating

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Administrative and Technical				
Community Planning and Development Services				
Community Planner				CDI Planning Division includes development review and long-range community planners
Planner/Engineer (Land Development)				CDI Planning and Public Works Divisions include land development planning and engineering staff
Engineer/Professional (Construction)				CDI Public Works Division includes licensed civil and construction engineers
Planner/Engineer/Scientist (Natural Hazards)				CDI Planning Division includes development and environmental review staff (geologists, biologists, and planners with direct hazard mitigation roles)
Transportation Planner				CDI Public Works Division includes transportation planners; Regional Transportation Commission (RTC) manages public transportation planning
Resiliency Planner				OR3 includes 2 analyst roles focused on long-term planning for climate change / hazard mitigation and resiliency
Building Official (Full-time or Augmented)				CDI Planning Division houses County Building Official
Floodplain Administrator				Planning Director housed in CDI is designated Floodplain Administrator, per SCCC Sec 16.13.190
Fire Marshal				Fire Marshall housed in County Fire Department (operating under CAL FIRE contract)
Dedicated Public Outreach Personnel				CDI Public Works Division houses a Communications Officer; CDI Planning Division and OR3 include public outreach and equity engagement staff, but no dedicated role. Health Services Agency (HSA) has dedicated Emergency Preparedness staff.
GIS Specialist and Capability				Geographic Information Services team supports all-hazards planning and response efforts
Emergency Manager				OR3 houses Emergency Services Administrator
Dedicated Grant Manager, Writer, or Specialist				OR3 includes grant management staff, but no dedicated role
Other	N/A	N/A	N/A	
Warning Systems and Services				
General				In coordination with Santa Cruz Regional 9-1-1, SCC provides a county-wide alert system, CruzAware, which sends emergency and non-emergency alerts and warnings. Weather radios encouraged rural areas with limited cell reception due to local terrain + households reliant on landlines encouraged.
Flood				CruzAware alerts
Tornado				CruzAware alerts
Wildfire				CruzAware alerts
Geological Hazards				CruzAware alerts

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Fiscal Capabilities				
Financial Resources (for Hazard Mitigation)				
Levy Taxes for Specific Purposes				Used historically to fund mitigation efforts (e.g., Measure Q parcel tax for water quality, wildfire prevention, and habitat restoration)
Utilities Fees	N/A	N/A	N/A	The County is not a utility provider except for limited CSAs
Benefit Assessments				Used in limited zones (e.g., flood zones, CSA districts)
Community Development Block Grants (CDBG)				Receives CDBG funds for infrastructure and resilience improvements
System Development Fee				Imposed on new development for capital needs (e.g., drainage, roads)
General Obligation Bonds to Incur Debt				Not recently used for hazard mitigation; potential exists for future resilience bonds or match for federal mitigation grants
Special Tax Bonds to Incur Debt				Rarely used directly; future opportunity in partnership with special districts for mitigation projects
Withheld Spending in Hazard-Prone Areas				Measure J growth policies discourage capital investment in high-hazard zones
Stormwater Service Fees				Imposed on new development for drainage, grading, and erosion control plan reviews
Capital Improvement Project Funding				2025-2030 CIP includes improvements and repairs to roads, bridges, stormwater systems, and county facilities
Education / Outreach Capabilities				
Education/Outreach Resources				
Website Dedicated to Hazard Topics				OR3 and CDI Planning Division websites host hazard-specific pages on wildfire, flooding, earthquake, extreme temps, CZU recovery, evacuation, alerts, etc.
Dedicated Social Media				OR3, Fire Dept, Sheriff's Office, and other departments use Facebook, Twitter/X, and Instagram for emergency alerts and preparedness campaigns
Local Citizen Groups That Communicate Hazard Risks				Santa Cruz County Long-Term Recovery Group (LTRG), Fire Safe Councils, neighborhood associations, and recovery networks support education on wildfire, erosion, evacuation, and CZU rebuilding
Hazard Info. Avail. at Library/ Planning Desk				Hazard brochures available from CDI planning desk and at libraries, including flood and wildfire flyers
Annual Public Safety Events				Current OR3 outreach involves partnering with established events such as farmworker outreach fairs, Trunk or Treat, National Night Out (NNO); opportunity for expansion

Resource	HMP Integration: Status	HMP Integration: Current Mitigation Use	HMP Integration: Future Opportunity	Notes / Additional Detail
Planning and Regulatory Capabilities				
Ability to Field Public Tech. Assistance Requests				Assistance provided through OR3 and CDI
Public Safety Newsletters or Printed Outreach				Regular newsletters from OR3 and Fire Safe Council on preparedness and hazard topics
Community Emergency Response Team (CERT)				Active CERT program in partnership with OR3 and local fire districts
Fire Safe Councils				County-wide Fire Safe Council plus local chapters (e.g., Bonny Doon, South Skyline, Boulder Creek)
Firewise				70+ Firewise communities across the county
StormReady				Use both StormReady and TsunamiReady
Resource Conservation Districts				RCD of Santa Cruz County supports groundwater recharge, fire fuel management, and climate education
Other	N/A	N/A	N/A	

3.5.2 Funding Opportunities

The federal, state, and local funding opportunities listed in Table 3-79 are provided as potential options to leverage and increase the capabilities and adaptive capacities of Santa Cruz County and the other participating jurisdictions. This includes the FEMA Hazard Mitigation Assistance (HMA) grant program as well as other national, state, and local programs and grants. Note that this list serves as a resource and is not exclusive or exhaustive.

Table 3-79: Federal, State, and Local Funding Opportunities

Agency / Program Name	Potential Programs / Grants
Federal Funding Opportunities	
FEMA HMA and Other Programs	FEMA HMA grant programs include: ▪ Hazard Mitigation Grant Program (HMGP): fema.gov/hazard-mitigation-grant-program ▪ Building Resilient Infrastructure and Communities (BRIC)* Program: fema.gov/grants/mitigation/building-resilient-infrastructure-communities ▪ Flood Mitigation Assistance (FMA) Program: fema.gov/flood-mitigation-assistance-grant-program For more information on current HMA grants visit fema.gov/hazard-mitigation-assistance

Agency / Program Name	Potential Programs / Grants
	Assistance to Firefighters Grant (AFG) Program: Grants for firefighting resources, fire prevention and safety, and staffing for adequate response. fema.gov/welcome-assistance-firefighters-grant-program
	Fire Prevention and Safety (FP&S) Program: Grants to enhance the safety of the public and firefighters and administered as part of the AFG Program. FP&S Grants are offered to support projects that cover fire prevention and safety activities and research and development activities. fema.gov/fire-prevention-safety-grants
	Emergency Management Performance Grants (EMPG): Grants for equipment such as backup generators. fema.gov/emergency-management-performance-grant-program
	Regional Catastrophic Preparedness Grant Program (RCPGP): Grants for housing, logistics, and supply chain management encouraging innovative regional solutions to issues related to catastrophic incidents. fema.gov/regional-catastrophic-preparedness-grant-program
	The Flood Mitigation Assistance Swift Current (Swift Current) effort provides funding to mitigate buildings insured through the NFIP after a major disaster declaration following a flood-related disaster event to reduce risk against future flood damage. fema.gov/grants/mitigation/learn/flood-mitigation-assistance/swift-current
Office of State and Community Energy Programs (SCEP)	The Office of State and Community Energy Programs (SCEP) is part of a concerted effort at the DOE to extend the capacity and capability of states, tribes, local governments, schools, and community-serving organizations to implement high-impact, self-sustaining clean energy projects that center the needs of low-income and disadvantaged communities. SCEP does this through the management and oversight of over $16 billion in formula grants, competitive grant awards, consumer rebate grants, and technical assistance. energy.gov/scep/office-state-and-community-energy-programs
U.S. Department of Agriculture (USDA) Programs	USDA offers a variety of programs to help farmers, ranchers, communities, and businesses that have been hard hit by natural disaster events. Available FSA programs; are available at farmers.gov. For additional USDA programs visit: fsa.usda.gov/programs-and-services/disaster-assistance-program
U.S. Bureau of Reclamation (BOR) Programs	BOR has annual funding available through the WaterSMART grant program, including for Water Reclamation and Reuse, Drought Resiliency Project, and Water and Energy Efficiency Grant. usbr.gov/watersmart/
State Funding Opportunities	

Agency / Program Name	Potential Programs / Grants
California Department of Housing and Community Development (HCD) Programs	Community Development Block Grants (CDBG) include: ▪ Community Development (CD) ▪ Economic Development (ED) ▪ Neighborhood Stabilization Program (NSP) ▪ Disaster Recovery Initiative (DRI) ▪ Emergency Solutions Grant (ESG) Program: Funds projects that serve homeless individuals and families with emergency housing and supportive services or that provide homelessness prevention assistance. The Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2009 places new emphasis on assisting people to quickly regain stability in permanent housing after experiencing a housing crisis or homelessness. For more information on current grants visit hcd.ca.gov/grants-and-funding
California Governor's Office of Emergency Services (Cal OES) Programs	Get notified via email when a new Competitive Funding Opportunity (CFO) or Public Meeting Notice is released: Join the Cal OES Grants Management Mailing List Search for active Cal OES grant programs here: caloes.ca.gov/office-of-the-director/policy-administration/finance-administration/grants-management/search-for-grants/
California Department of Forestry and Fire Protection (CAL FIRE)	Wildfire Prevention and Forest Health Grants: Supports CWPPs and collaborative wildfire risk reduction. fire.ca.gov/what-we-do/grants
California Water Resources Control Board Programs	The Division of Financial Assistance (DFA) has the lead in administering the State Water Resources Control Board's financial assistance programs. These programs include loan and grant funding for construction of drinking water treatment and distribution systems, municipal sewage conveyance and treatment systems; water recycling facilities; remediation for underground storage tank releases and groundwater contamination; technical assistance for small communities; nonpoint source pollution control projects; interim water, and operation and maintenance/Administrator support for small, disadvantaged community water systems; and drought support for individual households. DFA coordinates closely with the Division of Administrative Services, Office of Chief Counsel, Division of Drinking Water, Division of Water Quality, and the Regional Water Quality Control Board, as well as other State, federal, local, and non-governmental organizational partners. DFA administers the Operator Certification Program, which oversees the certification of all wastewater treatment plant and drinking water treatment plant and distribution system operators in California. For more information visit: waterboards.ca.gov/water_issues/programs/grants_loans/

Agency / Program Name	Potential Programs / Grants
California Department of Transportation (CalTrans) Programs	Caltrans' Local Assistance Program oversees more than one billion dollars annually available to over 600 cities, counties and regional agencies for the purpose of improving their transportation infrastructure or providing transportation services. This funding comes from various Federal and State programs specifically designed to assist the transportation needs of local agencies. Annually, over 1,200 new projects are authorized through the Local Assistance Program of which approximately 700 are construction projects. dot.ca.gov/programs/local-assistance
California Community Emergency Response Team (CERT) Program Manager Course	There are over 450 CERT programs in California. The State CERT Administrator provides technical support and CERT updates to programs in California. caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/community-emergency-response-team/
California Residential Mitigation Program	The California Residential Mitigation Program (CRMP): Established to carry out mitigation programs to assist California homeowners who wish to seismically retrofit their houses. californiaresidentialmitigationprogram.com/ ▪ Earthquake Brace + Bolt (EBB) Program: Developed as part of the CRMP to help homeowners lessen the potential for damage to their houses during an earthquake by offering eligible homeowners up to a $3,000 incentive to seismically retrofit their homes. earthquakebracebolt.com/
California Air Resources Board (CARB) Incentives, Grants, and Credit Programs	These programs have hundreds of millions of dollars in grants available over the next several years to reduce emissions from on- and off-road vehicles and equipment. arb.ca.gov/ba/fininfo.htm
California Department of Water Resources (DWR) Grants and Loans	Agency offers a variety of grants and loans related to integrated regional water management, flood mitigation, water conservation and efficiency, environmental restoration, groundwater, water quality, and water supply. water.ca.gov/Work-With-Us/Grants-And-Loans
California Department of Conservation (DOC)	Funds projects that improve soil, water, and habitat conservation at the local level. conservation.ca.gov/information-for/funding-grants-easements
California State Coastal Conservancy	Provides support for nature-based solutions, shoreline protection, and community resilience. scc.ca.gov/grants/
2024 Climate Bond (Proposition 4)	Voters passed the 2024 Climate Bond (Proposition 4) in November 2024, a general obligation bond that will yield $10 billion for a variety of climate resilience efforts, including flood, wildfire, coastal, watershed, water supply, and natural resource management programs. resources.ca.gov/Bonds-Oversight/Proposition-4-Climate-Bond
Local Funding Opportunities	

Agency / Program Name	Potential Programs / Grants
Santa Cruz County Safe Drinking Water, Clean Beaches, Wildfire Risk Reduction, and Wildlife Protection Initiative (Measure Q)	Approved by Santa Cruz County voters in November 2024, the Santa Cruz County Safe Drinking Water, Clean Beaches, Wildfire Risk Reduction, and Wildlife Protection Initiative (Measure Q) aims at protecting and enhancing the county's precious natural resources. The initiative prioritizes water quality, wildfire prevention, habitat restoration, and the creation of resilient ecosystems to ensure the health and well-being of Santa Cruz County's environment and residents. Measure Q funds support projects such as: ▪ Water Conservation and Quality ▪ Wildfire Risk Reduction ▪ Wildlife and Habitat Protection ▪ Clean Beaches and Coastal Protection ▪ Community Resilience

*Notes: *If reinstated; BRIC funds were not allocated for 2025*

Section 4. Mitigation Strategy

This section describes the mitigation strategies developed for the 2025 MJHMP to reduce or eliminate the long-term risks of high-priority hazards impacting Santa Cruz County. Building upon the findings of the risk assessment detailed in Section 3, the strategies in this plan outline prioritized mitigation actions, projects, and policies aimed at safeguarding vulnerable populations, protecting property and critical infrastructure, and enhancing overall community resilience.

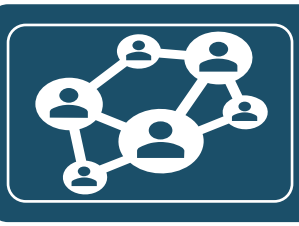
4.1 Mitigation Goals

Hazard mitigation plans must define clear goals for reducing long-term vulnerabilities to natural hazards. For this plan, the county-wide Hazard Mitigation Planning Team (HMPT) established goals using findings from the risk assessment, input from the planning team, and feedback from the public gathered through surveys, stakeholder interviews, and document review. The four goals, developed by the Planning Team and confirmed by jurisdictional teams, outline broad priorities for protecting people, property, services, infrastructure, and the environment. These goals provide the framework for the 2025 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Mitigation Strategy. The mitigation actions that follow are specific and measurable steps designed to achieve these goals through both jurisdiction-specific initiatives and a coordinated county-wide approach.



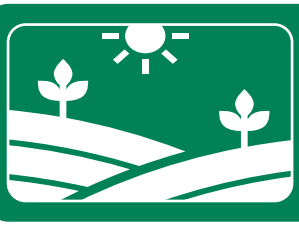
Goal 1: People & Community

Avoid or reduce the potential for life loss, injury, and economic damage to community members from hazard events.



Goal 2: Continuity of Services

Increase the ability of local government, agencies, special districts, and partner organizations to serve the community during and after hazard events.



Goal 3: Natural & Built Environment

Protect the County's unique character, scenic beauty, and values in the natural and built environment from being compromised by hazard events.



Goal 4: Lifeline Resilience

Identify and encourage mitigation activities that increase the disaster resilience of the community, institutions, private companies, and systems essential to a functioning County.

4.2 Translating Strategy to Action

As detailed in Section 2.3.4.3, the mitigation actions in this 2025 MJHMP are organized into FEMA's six broad categories, which provide a consistent framework for identifying, evaluating, and prioritizing hazard reduction efforts. These categories include Prevention (PRV), Property Protection (PPRO), Public Education and Awareness (PEA), Natural Resource Protection (NRP), Emergency Services (ES), and Structural Projects (SP). Together, they capture the full range of strategies available to reduce hazard risks in Santa Cruz County.

Proposed mitigation actions align with these categories, highlighting both the diversity of approaches and the emphasis on solutions that provide multiple community benefits. This framework ensures that limited resources are directed toward the actions with the greatest potential to reduce risk and strengthen long-term resilience.



Figure 4-1: Mitigation Concepts by Jurisdiction

Integrating Public Input

Public participation played a central role in shaping the Mitigation Action Plan by ensuring that the strategies and actions reflect the needs, concerns, and priorities of residents across Santa Cruz County. Through surveys, workshops, and stakeholder outreach, community members identified both the types of mitigation projects they value most and the barriers they face in taking action themselves.

Survey results show strong public demand for investments that improve safety, infrastructure resilience, and long-term community preparedness. The most frequently requested actions included upgrading bridges and roadways, creating safer evacuation corridors, expanding water storage and connectivity, and ensuring reliable backup power for emergency operations. Additional high priorities were improving stormwater and sewer systems, retrofitting critical facilities, and increasing access to public hazard and risk information. These findings directly informed the development of county-wide and jurisdiction-specific mitigation actions, ensuring that the final plan addresses the most urgent community needs.

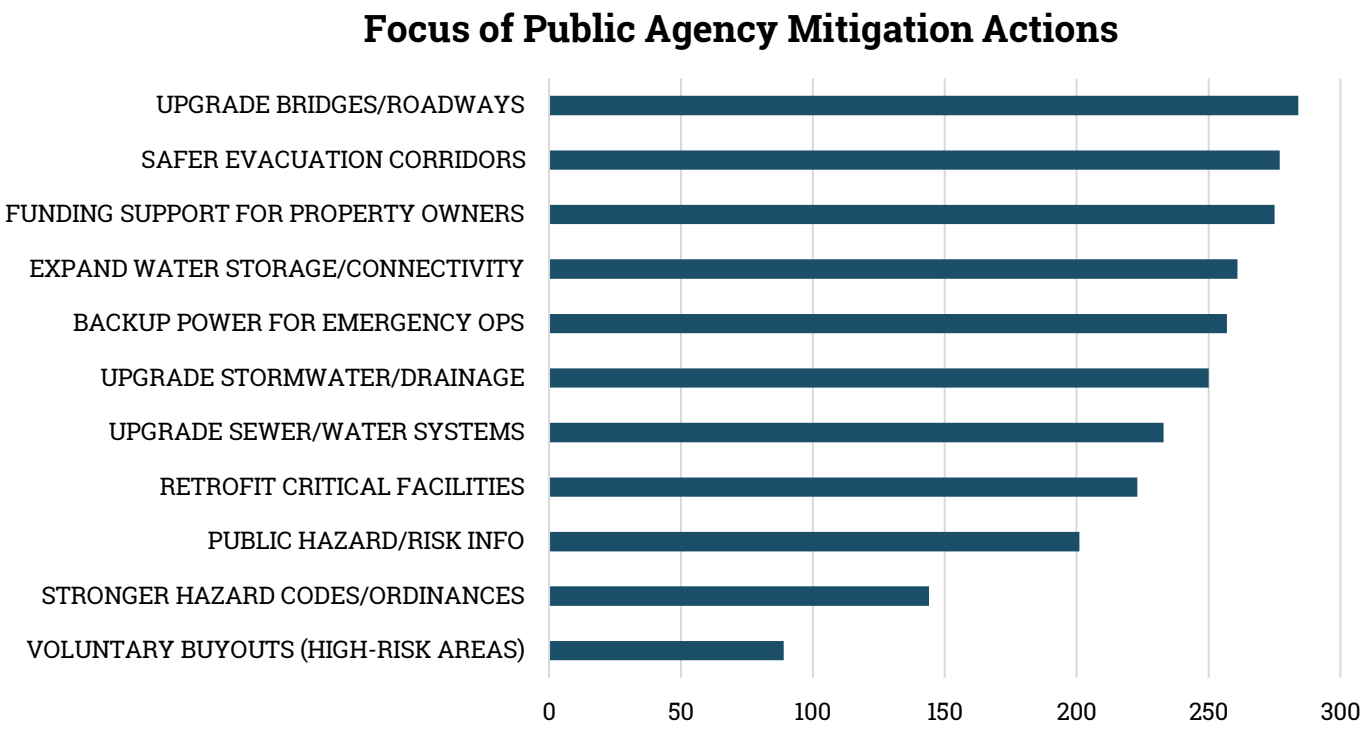


Figure 4-2: Survey Results; Focus of Public Agency Mitigation Actions

At the same time, the survey highlighted key barriers that prevent residents from advancing mitigation on their own. The most significant challenge was a lack of funding, followed by a need for technical assistance, risks perceived as beyond individual control, and limited access to information about where to start. Recognizing these constraints, the Mitigation Action Plan emphasizes solutions that provide shared benefits at the community-scale, leverage outside funding sources, and include robust public education and outreach.

By integrating community input with technical risk assessment and planning team expertise, the Mitigation Action Plan prioritizes actions that not only reduce hazard exposure but also respond directly to the challenges residents experience. This approach ensures that mitigation is both technically sound and socially responsive, aligning limited resources with the areas of highest public concern and need.

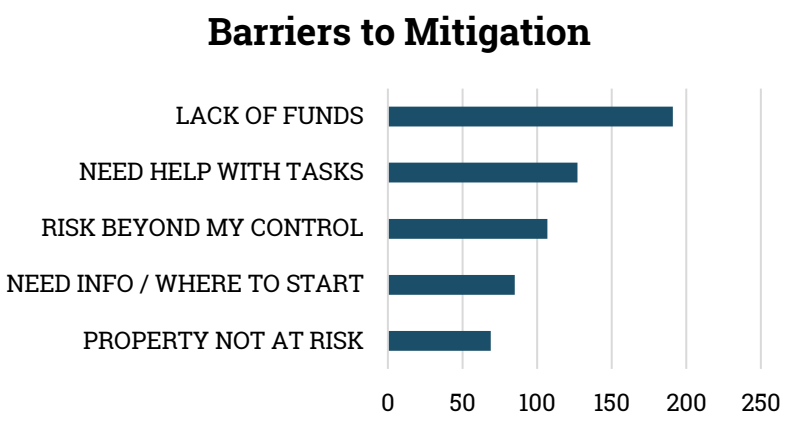


Figure 4-3: Survey Results; Barriers to Reducing Property Risk

Action Prioritization

Mitigation actions in the 2025 MJHMP were prioritized using a scoring system that emphasizes risk reduction, equity, and collaboration. Each action was evaluated against four criteria. Hazard Risk (+0–2) assigns higher scores to actions that address hazards ranked as extreme, high, or medium in the jurisdiction's Risk Matrix, ensuring focus on the most pressing threats. Multi-Benefit Outcomes (+1) prioritize actions that provide ecological, social, and economic co-benefits while incorporating community and stakeholder perspectives. Equity Impact (+1) highlights actions that reduce disparities, improve conditions in disadvantaged neighborhoods, address the needs of vulnerable populations, and lower barriers to mitigation. Finally, Strategic Alignment (+1) gives preference to actions that are consistent with regional, local, and state plans and that foster collaboration among jurisdictions, non-profits, land trusts, and tribal partners. This framework ensures that selected actions not only reduce hazard risk but also advance equitable, multi-benefit, and regionally aligned resilience strategies.

1. **Hazard Risk (+0-2):** Actions that address high-priority hazards based on the jurisdiction's completed Risk Matrix (extreme, high, or medium).
2. **Multi-Benefit Outcomes (+1):** Actions that achieve multiple beneficial ecological, social, and economic outcomes, including public benefits.
3. **Equity Impact (+1):** Actions that help reduce disparities in access to opportunities, improve environmental health conditions for vulnerable populations, or reducing barriers of mitigation.
4. **Strategic Alignment (+1): :** Actions that are in alignment with regional, local, and state plans and programs, and demonstrate collaboration among planning partners.

Figure 4-4: Prioritization Criteria

4.3 County-Wide Mitigation Strategy

In recognizing that hazards do not distinguish jurisdictional boundaries and resource limitations, the Steering Group and HMPT determined that a coordinated, county-wide mitigation strategy was needed to address cross-cutting challenges. The County-Wide Mitigation Action Plan establishes a unified strategy for reducing risk across all participating jurisdictions. While each jurisdiction faces its own hazards and sets local priorities, many risks overlap and require county-wide coordination to address effectively. The mitigation strategy emphasizes actions that strengthen resilience across the entire county, build on local capabilities, and leverage regional collaboration for greater impact. This shared framework ensures that county-wide challenges are met with consistent, equitable, and coordinated solutions.

Figure 4-1 illustrates the county-wide mitigation concept, showing how the plan builds on the individual efforts and strengths of each participating jurisdiction to address shared hazard risks. The action plan was developed collaboratively by the county-wide Planning Team through the comprehensive planning process described in Section 2. The County-Wide Mitigation Action Plan is presented in Table 4-1.

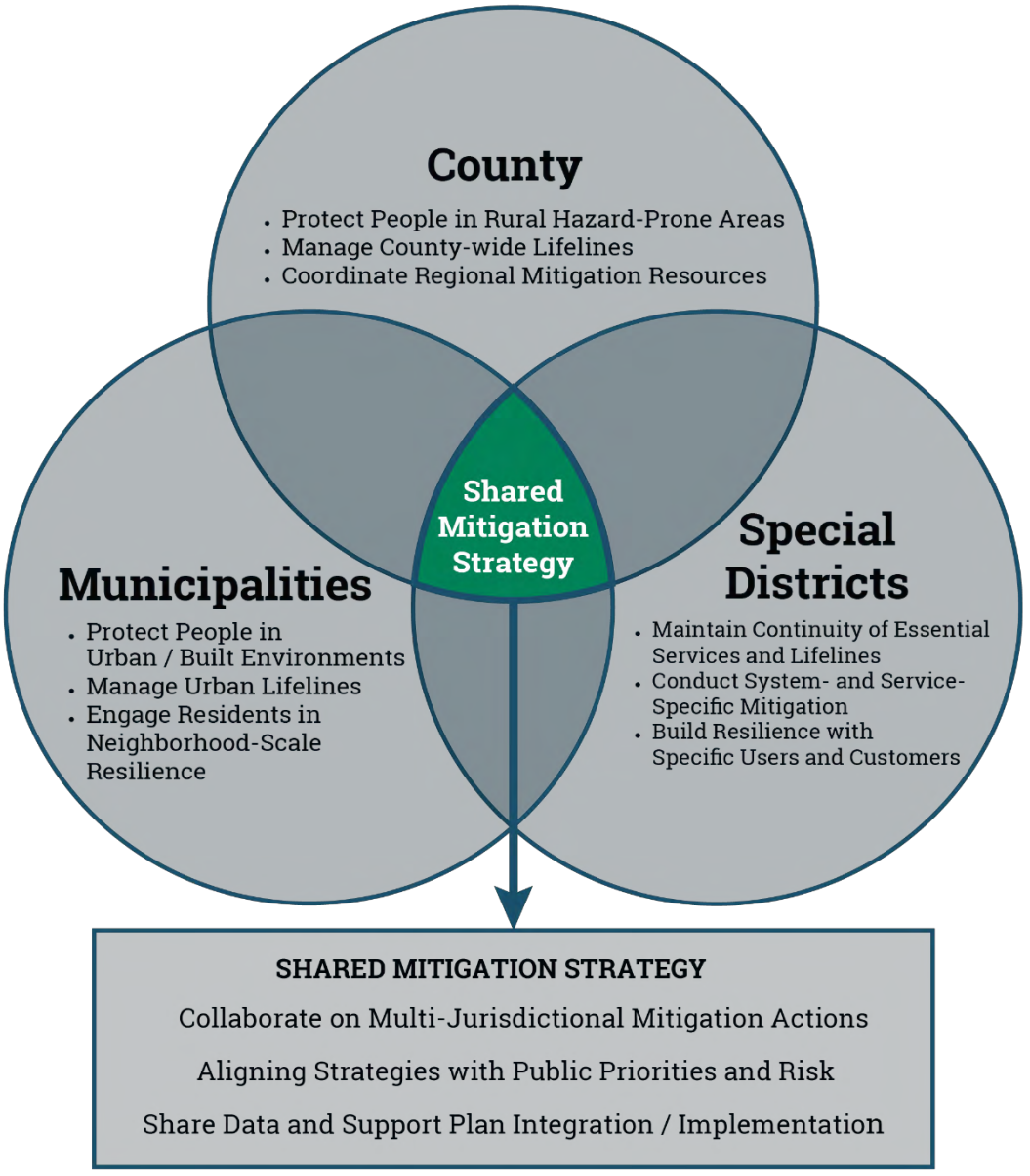


Figure 4-5: County-Wide Mitigation Strategy Diagram

4.4 Mitigation Action Plan

The Mitigation Action Plan is the roadmap for reducing hazard risk and strengthening resilience across Santa Cruz County and all participating jurisdictions. It translates the county-wide goals, range of mitigation alternatives, and prioritization framework into a set of actionable steps designed to safeguard people, property, infrastructure, and natural systems.

The actions in the county-wide plan (Table 4-1), Santa Cruz County plan (Table 4-2), and those in Volume 2 annexes are the product of a structured process that combined data from the risk assessment, input from planning partners and stakeholders, and a prioritization framework designed to ensure accountability and transparency. Each action was evaluated against prioritization factors presented previously and accompanied by key details to guide implementation and accountability:

- **Timeline:** Short-term, medium-term, or long-term implementation schedule.
- **Responsibility:** The lead agency or department and supporting partners.
- **Cost/Benefit Review:** A qualitative review of relative costs and benefits:
    - Cost: Low (fundable under existing budget), Medium (requires budget adjustment or multi-year allocation), or High (requires new funding source such as grants or bonds).
    - Benefit: Low (difficult to quantify in short-term), Medium (provides long-term benefits or immediate property risk reduction), or High (provides immediate life-safety and property protection).

      Note: Actions with benefits equal to or greater than their costs are considered cost-beneficial.
- **Level of Readiness:** Actions were further categorized to reflect their stage of development:
    - Conceptual: The action addresses a known hazard but requires scoping or feasibility analysis.
    - Planning: The action has been defined and is undergoing design, permitting, or resource identification.
    - Implementation: The action is ready to proceed with identified resources, partnerships, and timeline.
- **Internal Funding Sources:** Local resources such as general funds, enterprise funds, or dedicated fees.
- **External Funding Sources:** State, federal, and private funding, including FEMA Hazard Mitigation Assistance programs and Cal OES grants.

Together, these elements ensure that the Mitigation Action Plan is not just a list of projects but a carefully prioritized and actionable strategy. By balancing readiness, cost-effectiveness, equity, and strategic alignment, the plan provides a clear pathway for jurisdictions to reduce risk while maximizing co-benefits and shared investment

Mitigation Action Identification

Each mitigation action in this MJHMP is assigned a unique identification number using alphanumeric characters that denote specific attributes, as illustrated in Figure 4-6. These attributes include the type of hazard being mitigated (e.g., WF for wildfire), an abbreviation for the responsible jurisdiction, and a number to facilitate easy reference and management.

In addition, the mitigation actions encompass both newly developed actions for this plan update and existing actions carried over from previous hazard mitigation plans that were yet to be completed or needed refinement. This is reflected in the identification information for each action as "new" or "existing."

Problem statements are similarly assigned a unique identification number, except that instead of beginning with "ma" for mitigation action, they begin with "ps" for problem statement. Problem statements for Santa Cruz County are found in the hazard profiles of the risk assessment in Volume 1 (Section 3.2), and statements for other participating jurisdictions are found in Volume 2.

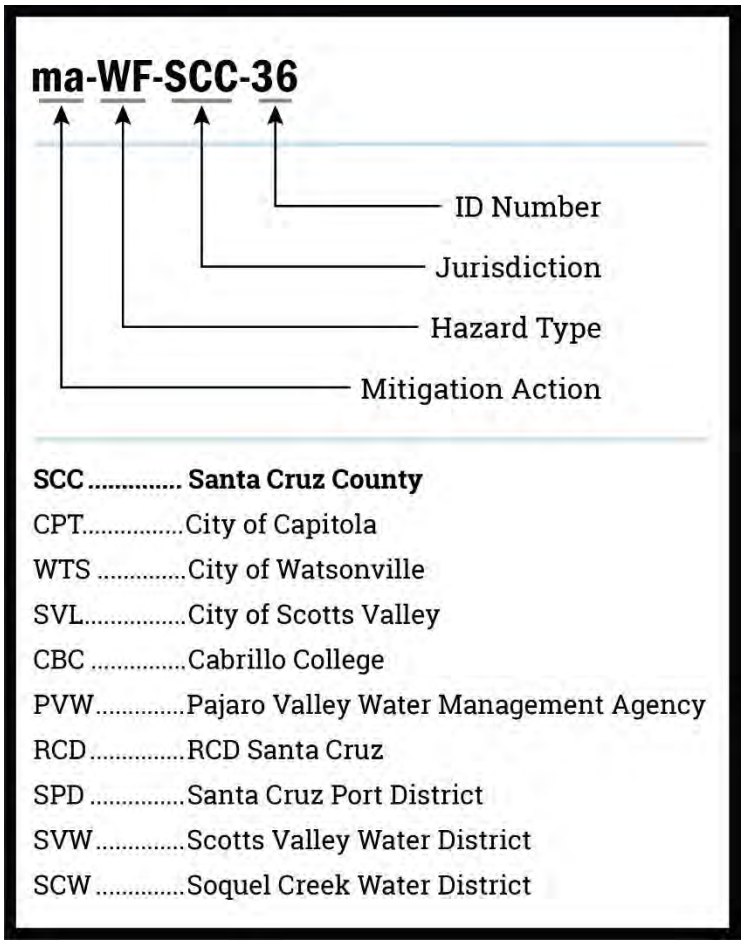


Figure 4-6: Mitigation Action Number Key

Important Note: Recognizing that new needs and priorities may arise as a result of a disaster or other circumstances, the MJHMP partners reserve the right to support new and edit existing actions as necessary, so long as the actions conform to the overall goals of this plan.

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Table 4-1: County-Wide Hazard Mitigation Action Plan

Hazard	Key Partners	Action ID	Action Title	Description	Selected FEMA Mitigation Alternative(s)	Priority
All Hazard	All Jurisdictions	**ma-AH-SCC-01**	County-Wide Hazard Mitigation Working Group	Develop an inter-jurisdictional and County inter-departmental hazard mitigation task force between OR3, CDI, GSD, Parks, AG to support collaboration for hazard mitigation planning, funding, and implementation through Measure Q, Prop 4, FEMA grants, and other state and federal grant sources.	PRV	Very High
All Hazard	Santa Cruz County, RCD, City of Scotts Valley, City of Watsonville, City of Capitola	**ma-AH-SCC-02**	Residential Hazard Mitigation Incentives	In collaboration with planning partners, explore cost-share models such as rebates, grants, CSA formation, and low-interest loans repaid through property tax bills (PACE-style financing) to reduce upfront costs and increase participation in hazard mitigation projects on private property / roads.	PPRO	Very High
All Hazard	All Jurisdictions	**ma-AH-SCC-04**	County-Wide Coordinated Outreach Strategy	In collaboration with MJHMP planning partners, coordinate a countywide outreach strategy to enhance public education and awareness of hazard risks and mitigation actions through consistent, aligned messaging. Efforts should leverage trusted voices and existing networks to reach diverse communities, using inclusive, multilingual, and accessible materials delivered across a variety of platforms. Develop a suite of ready-to-use outreach resources and tools that can be tailored to specific audiences and jurisdictions to promote sustained engagement and shared understanding of local hazards and mitigation opportunities.	PE&A	Very High
All Hazard	Santa Cruz County, City of Scotts Valley, City of Watsonville, City of Capitola	**ma-AH-SCC-05**	Establish Resilience Center Network	Identify and retrofit public agency and community-based organization (CBO)–owned facilities—such as libraries, Veterans Halls in Watsonville and Santa Cruz, the Davenport Resource Center, and other community centers—to serve as accessible, low-barrier resilience hubs. Upgrades may include backup power, HVAC and air filtration systems, ADA compliance improvements, and capacity to operate during heat, cold, smoke, wildfire, and other severe weather or hazard events, while supporting community outreach and emergency response operations.	ES, PE&A	High
All Hazard	Santa Cruz County, PV Water, Cabrillo College, Soquel Creek Water District, Scotts Valley Water District, City of Watsonville	**ma-AH-SCC-06**	Coordinated Catastrophic Water Supply Disruption Training & Exercise Program	Develop and implement a training and exercise program with county water districts to prepare for catastrophic loss of major water treatment facilities (e.g., due to fire/earthquake), with a focus on establishing Community Points of Distribution (CPODs) for safe drinking water, coordinating logistics, staffing, and communications during extended outages.	ES	Very High
All Hazard	All Jurisdictions	**ma-AH-SCC-07**	Communications System Improvements	Modernize and expand the County's public safety radio and communications system to improve interagency coordination, coverage in rural areas, and public notification capabilities.	ES, PRV	Very High
Drought	RCD, Santa Cruz County, Soquel Creek Water District, PV Water, Scotts Valley Water District	**ma-DR-RCD-04**	Multi-Benefit Water Resilience Projects	Plan, design, and implement multi-benefit land repurposing and water resilience projects.	SP, NRP	High
Drought	Santa Cruz County, PV Water, Soquel Creek Water District, Scotts Valley Water District	**ma-DR-SCC-04**	Enhanced County Water Resources Portfolio	In partnership with local water agencies, GSAs, and IRWM partners, support projects that expand and diversify the County's water resources portfolio including potable and non-potable recycled water projects, groundwater recharge and storage, conjunctive use and water transfer programs, stormwater infiltration and reuse.	NRP, PRV	High
Flood	RCD, Santa Cruz County, Cabrillo College, City of Capitola, City of Watsonville, Port District	**ma-FL-RCD-02**	Multi-Benefit Habitat Restoration	Expand multi-benefit floodplain, stream, and wetland restoration projects that reduce flood risk while restoring ecosystem function, particularly where prior land use changes have damaged natural infrastructure.	NRP, NSP	High

Hazard	Key Partners	Action ID	Action Title	Description	Selected FEMA Mitigation Alternative(s)	Priority
Flood	Santa Cruz County, City of Capitola, Cabrillo College, PV Water, Soquel Creek Water District, Port District, City of Scotts Valley, City of Watsonville	**ma-FL-SCC-02**	Expand Flood Hazard Forecasting, Data & Mapping	Develop, update, and refine flood models for key flashy / frequently flooding watersheds and tributaries, such as Corralitos Creek, to incorporate climate change scenarios and planned infrastructure projects, and with consideration of RLA mapping completed in this HMP update. Use updated models to inform mitigation investments, land use planning, and emergency preparedness.	ES, PE&A	High
Sea Level Rise	Santa Cruz County, City of Capitola, PV Water, Soquel Creek Water District, Port District, RCD	**ma-SLR-SCC-01**	Develop Community-Scale Coastal Adaptation Strategies	Develop community-scale adaptation strategies for Seacliff/Rio del Mar, Pleasure Point/East Cliff Drive, and other coastal neighborhoods vulnerable to sea level rise. Integrate findings from the County's Local Coastal Program (LCP) Update and Sea Level Rise Vulnerability Assessment to evaluate options such as managed retreat, nature-based solutions, shoreline restoration, and elevation of vulnerable infrastructure. Coordinate with local jurisdictions, community groups, and regional partners to guide future project design and investment priorities.	SP, PRV, NRP	High
Wildfire	Santa Cruz County, RCD, City of Capitola, City of Scotts Valley, Soquel Creek Water District, PV Water, City of Watsonville, Scotts Valley Water District, Cabrillo College	**ma-WF-SCC-05**	Collaborative Forest Health & Fuel Reduction Projects	Implement priority forest health, fuel reduction, and shaded fuel break projects on private lands and public-agency–owned parcels and watersheds through collaborative partnerships among local, regional, and state entities. These projects will advance shared forest health and wildfire risk reduction priorities identified in the Santa Cruz Mountains Regional Prioritization Plan (RPP) and will leverage cross-jurisdictional coordination, shared resources, and community engagement to achieve landscape-scale resilience outcomes.	PRV, PE&A, NRP	Very High

Table 4-2: Santa Cruz County Hazard Mitigation Action Plan

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
All Hazard	**ma-AH-SCC-01**	County-Wide Hazard Mitigation Working Group	Develop an inter-jurisdictional and County inter-departmental hazard mitigation task force between OR3, CDI, GSD, Parks, AG to support collaboration for hazard mitigation planning, funding, and implementation through Measure Q, Prop 4, FEMA grants, and other state and federal grant sources.	PRV	Ongoing	County OR3 (lead) + CDI (multiple divisions), GSD, Parks, and Agricultural Commissioner	Low	High	Staff time (limited)	N/A	Very High	ps-FL-SCC-05, ps-CC-SCC-01
All Hazard	**ma-AH-SCC-02**	Residential Hazard Mitigation Incentives	In collaboration with planning partners, explore cost-share models such as rebates, grants, CSA formation, and low-interest loans repaid through property tax bills (PACE-style financing) to reduce upfront costs and increase participation in hazard mitigation projects on private property / roads.	PPRO	Medium 3-5 Years	County OR3 (lead) + GSD, Environmental Planning, CDI - Planning, RCD, local jurisdictions, and CBOs	High	High	Staff time (limited)	FMA HMGP USDA CalOES / CAL FIRE programs bolstered by Prop 4, 3CE	Very High	ps-CS-SCC-02, ps-CC-SCC-01, ps-WF-SCC-02
All Hazard	**ma-AH-SCC-04**	County-Wide Coordinated Outreach Strategy	In collaboration with MJHMP planning partners, coordinate a countywide outreach strategy to enhance public education and awareness of hazard risks and mitigation actions through consistent, aligned messaging. Efforts should leverage trusted voices and existing networks to reach diverse communities, using inclusive, multilingual, and accessible materials delivered across a variety of platforms. Develop a suite of ready-to-use outreach resources and tools that can be tailored to specific audiences and jurisdictions to promote sustained engagement and shared understanding of local hazards and mitigation opportunities.	PE&A	Ongoing	County OR3 (lead) + Department PIO's, HSA - Public Health, Cities, water districts, Port, RCD, Cabrillo College, fire protection districts, libraries, COE/School Districts, CBO's (esp. Fire Safe Council, SCC LTRG)	Medium	High	Staff time (limited) General Fund via CIP (limited)	Measure Q California Fire Safe Council CalOES / Listos CAL FIRE HMGP	Very High	ps-CC-SCC-07, ps-CH-SCC-02,ps-CC-SCC-01, ps-WF-SCC-02, ps-WF-SCC-10, ps-WW-SCC-02
All Hazard	**ma-AH-SCC-05**	Establish Resilience Center Network	Identify and retrofit public agency and community-based organization (CBO)–owned facilities—such as libraries, Veterans Halls in Watsonville and Santa Cruz, the Davenport Resource Center, and other community centers—to serve as accessible, low-barrier resilience hubs. Upgrades may include backup power, HVAC and air filtration systems, ADA compliance improvements, and capacity to operate during heat, cold, smoke, wildfire, and other severe weather or hazard events, while supporting community outreach and emergency response operations.	ES, PE&A	Long 5-10 Years	County OR3 (planning) and GSD (implementation) + Facility owners/operators: Cities, Fairgrounds, libraries, schools, CBOs	High	High	Staff time (limited) General Fund via CIP (limited)	MOUs Measure Q HMGP Other State Grants (Prop 4), CDBG-DR	Very High	ps-AH-SCC-08, ps-EH-SCC-02, ps-AH-SCC-03, ps-AH-SCC-04, ps-CC-SCC-01, ps-EH-SCC-03, ps-EH-SCC-05, ps-SW-SCC-01, ps-WF-SCC-09, ps-WW-SCC-01
All Hazard	**ma-AH-SCC-08**	Road Network Mapping & System Integration	In coordination with RCD, CAL FIRE/County Fire, local FPD's, and local law enforcement identify and comprehensively map road systems across the county, including road type, capacity, ownership (public / private), and condition (e.g., surfacing, culverts), for integration into response data systems and into evacuation planning.	ES, PRV	Short 1-3 Years	County OR3 (lead) + ISD - GIS, CDI - Public Works / Roads, Sheriff, County Fire / CAL FIRE, local FPD's, RCD, CBO's (esp. Fire Safe Council, CERT)	Medium	High	Staff Time (limited)	Measure Q California Fire Safe Council CAL FIRE CalTrans	Very High	ps-EQ-SCC-07, ps-AH-SCC-07, ps-FL-SCC-02, ps-FL-SCC-06, ps-SF-RCD-02, ps-WF-SCC-06, ps-CC-SCC-01, ps-WF-SCC-04, ps-WW-SCC-02

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
All Hazard	**ma-AH-SCC-03**	Climate Action & Hazard Mitigation Outreach	Expand and diversify existing public outreach channels to broaden awareness of the County's Climate Action and Adaptation Plan (CAAP) and its links to hazard mitigation, including accessible web and social media content, dashboard tracking of objectives / performance metrics, and attendance at community events with partners.	PE&A	Short 1-3 Years	County OR3 (lead) + Department PIO's, ISD, Cities, regional climate collaboratives (RCPWG, MBCAAN), COE, UCSC, CSUBM, Cabrillo, CBO's	Medium	Medium	Staff time (limited)	Private organization grants UC / CSU resilience partnerships	High	ps-AH-SCC-08, ps-AH-SCC-04, ps-EH-SVL-04, ps-CC-SCC-01, ps-CC-SCC-06, ps-EH-SCC-03, ps-WF-SCC-02, ps-WF-SCC-10
All Hazard	**ma-AH-SCC-06**	Coordinated Catastrophic Water Supply Disruption Training & Exercise Program	Develop and implement a training and exercise program with county water districts to prepare for catastrophic loss of major water treatment facilities (e.g., due to fire/earthquake).	ES	Ongoing	County OR3 & HSA - Environmental Health (co-lead) + Water districts, small water system operators, fire protection districts, Cities, CalOES, HSA, CBO partners (esp. CERT, LTRG)	Low	Medium	Staff time	BAUASI EMPG SHSGP	High	ps-EQ-SCC-06, ps-EQ-SCC-07, ps-LQ-SCC-01, ps-AH-SCC-02, ps-DR-SCC-04, ps-SF-SCC-03, ps-SF-SCC-07, ps-TS-SCC-01, ps-WF-RCD-01, ps-CC-SCC-01
All Hazard	**ma-AH-SCC-07**	Communications System Improvements	Modernize and expand the County's public safety radio and communications system to improve interagency coordination, coverage in rural areas, and public notification capabilities.	ES, PRV	Short 1-3 Years	County CEO (lead) + ISD, Cities, Sheriff, local LE, Fire Protection Districts, EMS, Netcomm	High	High	Staff Time General Fund, via CIP	MOUs with partner agencies	High	ps-AH-SCC-01, ps-AH-SCC-05, ps-AH-SCC-06, ps-CS-SCC-01, ps-AH-SCC-07
All Hazard	**ma-AH-SCC-09**	Support VOAD & CBO Disaster Coordination	In partnership with the Long-Term Recovery Group (LTRG) and community-based organizations (CBOs), develop and implement procedures for coordinating Volunteer Organizations Active in Disaster (VOAD) within the County's emergency management framework. This includes establishing standard operating procedures (SOPs) for VOAD activation and integration into Emergency Operations Center (EOC) functions, offering regular trainings and exercises for VOAD and CBO partners, and development of recovery and donation management frameworks.		Short 1-3 Years	County OR3 (lead) + Long Term Recovery Group (LTRG) and RWG	Low	Medium	Staff Time	EMPG, SHSGP, Private Grants	High	ps-EQ-SCC-01, ps-CC-SCC-01, ps-SW-SCC-01, ps-WF-SCC-10, ps-WW-SCC-01, ps-WW-SCC-02
Climate Change	**ma-CC-SCC-01**	Regional Climate Project Working Group (RCPWG) Alignment	Support the Regional Climate Project Working Group in finalizing a long-term governance model and advancing priority regional climate adaptation and hazard mitigation projects.	NRP	Short 1-3 Years	County OR3 (participant / partner agency) + RCPWG stakeholders including Cities, water+ other special districts, regional/state agencies, and CBO's	Low	Medium	Staff Time General Fund (limited)	EPA DOT CalTrans Establishment of future JPA's / sustainable funding mechanisms	High	ps-CC-SCC-04, ps-CC-SCC-02, ps-CC-SCC-01
Climate Change	**ma-CC-SCC-02**	Shothole Borer Rapid Response & Management	In partnership with UCNAR, develop and implement a rapid response program for shothole borer infestations to expedite contracting to remove and safely process infested trees, particularly box elder along Zayante Creek and other riparian areas where dead or dying trees increase fire risk, contribute to downstream flood hazards, and threaten creek ecosystem health.	NRP, PRV	Short 1-3 Years	County AGC (lead) + OR3, HSA - Environmental Health, CDI-Planning, RCD, State Parks, UCNAR, USDA-NRCS, Santa Cruz Mountain Stewardship Network partners	Medium	Medium	Staff Time	USDA-NRCS UCNAR	High	ps-CC-SCC-07, ps-CC-SCC-06

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Climate Change	**ma-CC-SCC-03**	Harmful Algal Bloom (HAB) Monitoring & Response	Expand monitoring and response for harmful algal blooms in reservoirs, lagoons, and lakes such as Pinto Lake. Activities include temperature and nutrient monitoring (e.g., shading, upstream nutrient management, point source control), in-lake treatments where feasible, and posting public advisories during HAB events.	NRP	Short 1-3 Years	County HSA - Environmental Health (lead) + County Parks, RCD, water districts, City of Watsonville, DWR	Medium	High	Staff time (limited if expanded) General Fund (limited, if expanded) Measure Q	DWR Coastal Conservancy	High	ps-CC-SCC-06, ps-CC-SCC-07
Coastal Hazards (Coastal Erosion)	**ma-CE-SCC-01**	Coastal Bluff & Access Adaptation	Develop and implement a phased adaptation program for transportation corridors and coastal access points in high-risk bluff areas. Use a mix of nature-based and, where necessary, structural measures—such as revegetation, drainage improvements, and living shorelines—to reduce bluff collapse risk and maintain safe, sustainable public access. Coordinate with Caltrans, State Parks, and coastal property owners to align with regional shoreline management priorities.	SP	Long 5-10 Years	County CDI - Planning (lead) + CDI - Sanitation, Stormwater Management + Flood Control; OR3, cities, CA State Parks, Coastal Commission	High	High	Staff time (limited)	Measure Q BRIC (if reinstated) Coastal Conservancy DOC Long-term finance strategies	High	ps-CE-SCC-01, ps-CH-SCC-02, ps-CS-SCC-01, ps-CS-SCC-02
Coastal Hazards (All)	**ma-CH-SCC-01**	Enhanced Shoreline & Coastal Asset Protections	Conduct a feasibility study and phased implementation program to relocate, retrofit, elevate, or otherwise protect coastal assets and critical infrastructure—including stormwater and sewer systems, pump stations, and bluff-top facilities—to withstand projected storm surge, erosion, and sea level rise impacts. Integrate natural and engineered shoreline measures to enhance protection and maintain natural storm-buffering functions, consistent with the County's 2026 SLR Vulnerability Assessment.	NRP, SP	Long 5-10 Years	County CDI - Planning (lead) + CDI - Sanitation, Stormwater Management + Flood Control; OR3, cities, CA State Parks, Coastal Commission	High	High	Special Services Funding Sources (i.e., service fees, CSA, Measure D)	Measure Q Coastal Conservancy HMGP CDBG BRIC EPA DOC	High	ps-CH-CPT-01, ps-CH-SPD-01, ps-AH-SCC-06, ps-CC-SCC-01, ps-CC-SCC-02, ps-CC-SCC-03, ps-CC-SCC-05, ps-CE-SCC-01, ps-CH-SCC-02, ps-CS-SCC-01, ps-CS-SCC-02
Dam Failure	**ma-DF-SCC-01**	High-Risk Dam Training & Exercise	Coordinate with partners and participate in a multi-agency training and exercise focused on Newell Creek Dam to test the dam's Emergency Action Plan, communication protocols, and community preparedness.	ES, PE&A	Short 1-3 Years	County OR3 (coordination lead) + City of Santa Cruz (Water Department, Fire), DSOD, OR3, SLVWD, local FPD's, Sherriff, school and care facilities within inundation zone, CERT	Low	Medium	Staff Time (limited)	BAUASI EMPG / SHSGP	Medium	ps-DF-SCC-01, ps-DF-SCC-02, ps-DF-SCC-04
Dam Failure	**ma-DF-SCC-02**	Dam Failure Outreach & Evacuation Drills	Develop and share online inundation mapping and outreach/communications tools for residents and businesses in high-risk downstream zones (e.g., Felton, Lompico). Conduct periodic community-scale evacuation drills in partnership with schools, care facilities, CBOs, and local agencies, and integrate outcomes into response planning and warning systems.	PE&A, ES, PRV	Medium 3-5 Years	County OR3 (coordination lead) + City of Santa Cruz Water, local FPD's, schools, care facilities, CERT	Medium	Medium	Staff Time (limited)	BAUASI EMPG / SHSGP	Medium	ps-DF-SCC-04, ps-DF-SCC-03
Drought	**ma-DR-SCC-02**	Water Conservation Education & Outreach	In partnership with the RCD and local water agencies, provide education and outreach on water conservation practices for both residential/commercial and agricultural users.	PE&A	Ongoing	County HSA - Environmental Health and AGC + RCD, water districts, Cities, Farm Bureau, UCSC, Cabrillo, COE	Low	Medium	Staff time (limited if expanded)	UCNAR USDA - NRCS DOC	Medium	ps-DR-CPT-03, ps-DR-RCD-04, ps-DR-SCC-01, ps-DR-SCC-02

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Drought	**ma-DR-SCC-01**	Drought Resilience for Small Water Systems	Support development of drought contingency plans, interconnection options, and capacity expansions for small and private water systems, especially in communities where wells increasingly go dry and in WUI zones where water supply deficits (e.g., tank shortfalls, dry hydrants) compound wildfire risk.	PRV, ES, SP	Medium 3-5 Years	County HSA - Environmental Health (lead) + OR3, County Parks, RCD, water districts, Cities, DWR	Low	Medium	Staff time General Fund (limited if expanded)	DWR DOC HMGP BRIC Prop 4 Measure Q	High	ps-DR-SCC-05, ps-DR-SCC-06, ps-AH-SCC-02, ps-CC-SCC-01, ps-CC-SCC-02, ps-DR-SCC-01, ps-DR-SCC-02
Drought	**ma-DR-SCC-03**	Watershed Monitoring & Drought Adaptation	Monitor and protect low-flow streams, temperature-sensitive ecosystems, fish habitat, and key aquifer recharge areas during extended droughts.	NRP, SP	Short 1-3 Years	County HSA - Environmental Health (lead) + GIS, County Parks, RCD, water districts, Cities, NOAA, DWR, CBO's	Medium	Medium	Staff Time General Fund (both limited if activities expanded beyond existing monitoring)	DWR DOC HMGP BRIC Prop 4 Measure Q	High	ps-DR-RCD-01, ps-CC-SCC-01, ps-CC-SCC-03, ps-CC-SCC-06, ps-DR-SCC-01, ps-DR-SCC-03, ps-DR-SCC-04
Drought	**ma-DR-SCC-04**	Enhanced County Water Resources Portfolio	In partnership with local water agencies, GSAs, and IRWM partners, support projects that expand and diversify the County's water resources portfolio including potable and non-potable recycled water projects, groundwater recharge and storage, conjunctive use and water transfer programs, stormwater infiltration and reuse.	NRP, PRV	Long 5-10 Years	County HSA- Environmental Health (lead collaboration through GSA's / IRWM) + Cities, water districts, RCD, OR3	High	High	Staff time (limited)	DWR DOC HMGP BRIC Prop 4 Measure Q	High	ps-DR-SCC-07, ps-CC-SCC-01, ps-CC-SCC-06, ps-DR-SCC-01, ps-DR-SCC-06
Earthquake	**ma-EQ-SCC-01**	Critical Facilities & Infrastructure Assessment & Hardening	Conduct structural assessments and phased hardening of vulnerable critical facilities (e.g., fire stations, shelters, 500 Westridge, Juvenile Hall) and aboveground water and wastewater infrastructure in liquefaction and fault rupture zones.	SP, PRV	Long 5-10 Years	County GSD, CDI - Building Official, CDI - Sanitation, SCCSD, ISD, County Fire, OR3	High	High	General Fund via CIP (limited)	HMGP BRIC	High	ps-EQ-SVL-05, ps-AH-SCC-06, ps-EQ-SCC-03, ps-EQ-SCC-04, ps-EQ-SCC-06, ps-EQ-SCC-07, ps-LQ-SCC-01
Earthquake	**ma-EQ-SCC-02**	Earthquake Outreach & Education	Launch an ongoing outreach and education campaign for homeowners, renters, and small businesses on earthquake preparedness and mitigation including both structural and non-structural retrofit options, as well as promotion of the Earthquake Brace + Bolt program.	PE&A	Short 1-3 Years	County OR3 (lead) + Department PIO's, Cities, CBO's	Low	Medium	Staff time (limited)	CalOES Listos, CARESTAR	High	ps-EQ-SVL-01, ps-EQ-WTS-02, ps-EQ-SCC-01, ps-EQ-SCC-02, ps-EQ-SCC-05, ps-LQ-SCC-01
Extreme Heat	**ma-EH-SCC-01**	Outdoor Worker Extreme Heat Protections	Coordinate with agricultural agencies and employers of outdoor workers to ensure extreme heat requirements are adhered to (e.g., shaded rest areas, hydration stations), provide support for enhanced heat mitigation, and educate workers on their rights and resources.	PE&A, PRV	Short 1-3 Years	County AGC (lead) + OR3, HSA - Public Health Emergency Preparedness, RCD, CBO's	Low	Medium	Staff time (limited)	CalOES Listos, CARESTAR	Medium	ps-EH-SCC-01, ps-EH-WTS-01, ps-EH-CPT-01, ps-EH-CPT-03, ps-EH-SCC-03, ps-EH-SCC-04, ps-EH-SCC-05, ps-EH-SVL-03, ps-CC-SCC-01

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Flood	**ma-FL-SCC-01**	Flood Mitigation Assistance Program	Provide technical and financial assistance to homeowners, mobile home parks, small businesses, and farmers to relocate, elevate, or floodproof vulnerable structures in repetitive loss and other flood-prone areas. Explore cost-sharing mechanisms, incentives, and partnerships to maximize use of FEMA's Flood Mitigation Assistance (FMA) program and related state/federal funding sources.	PPRO	Medium 3-5 Years	County CDI - Floodplain Manager (lead) + OR3, CDI - Environmental Planning, CBO's (esp. SCC LTRG)	High	High	Staff time (limited)	FMA HMGP USDA-NRCS	High	ps-FL-SCC-09, ps-FL-SCC-01, ps-FL-SCC-02, ps-FL-SCC-03, ps-FL-SCC-09
Flood	**ma-FL-SCC-02**	Expand Flood Hazard Forecasting, Data & Mapping	Develop, update, and refine flood models for key flashy / frequently flooding watersheds and tributaries, such as Corralitos Creek, to incorporate climate change scenarios and planned infrastructure projects, and with consideration of RLA mapping completed in this HMP update. Use updated models to inform mitigation investments, land use planning, and emergency preparedness.	ES, PE&A	Short 1-3 Years	County CDI - Stormwater Management and Flood Control (lead) + OR3, ISD - GIS, PRFMA, USACE, NWS, PVWMA, DWR	Medium	High	General Fund (limited)	Measure Q DWR USACE	High	ps-FL-SCC-05, ps-FL-SCC-07, ps-FL-SCC-09, ps-LV-SCC-01
Flood	**ma-FL-SCC-03**	Improve Flood Warning Systems	Identify opportunities to improve storm monitoring tools and expand real-time river gage and flood detection and warning systems and develop MOU's with partner agencies for installation and maintenance costs.	ES, PE&A	Medium 3-5 Years	County CDI - Stormwater Management and Flood Control (lead) + OR3, ISD - GIS, NWS, Cities, PRFMA	Medium	Medium	General fund (limited if expanded)	Measure Q DWR MOUs UCSC partnerships	High	ps-FL-PVW-02, ps-AH-SCC-07, ps-FL-SCC-01
Flood	**ma-FL-SCC-04**	Paulsen Road Flood Resilience Project Implementation	Advance phased implementation of the Paulsen Road Multi-Benefit Flood Resilience and Connectivity Project, following assessment and design studies, to improve emergency access, restore watershed health, enhance floodplain resilience along the corridor.	SP, PPRO, NRP	Medium 3-5 Years	County CDI - Roads, CDI - Stormwater Management + Flood Control, County OR3, Parks, PRFMA, PVWMA, RCD, SC Fairgrounds, CBOs (i.e., Land Trust)	High	High	General Fund (limited) Staff Time (limited)	Measure Q BRIC DOC DWR Prop 4 HMGP CDBG-DR	High	ps-FL-RCD-02, ps-CC-SCC-05, ps-FL-SCC-01, ps-FL-SCC-04, ps-FL-SCC-06
Flood	**ma-FL-SCC-05**	Flood Risk & Mitigation Outreach	Deliver bi-annual outreach in flood-prone and vulnerable communities—through workshops, indigenous language accessible video, and partnership with trusted voices (e.g., CBO's, schools)—to build awareness of flood risks, mapping updates, mitigation options, and insurance, with emphasis on equitable access for Spanish- and Indigenous-language speakers.	PE&A	Short 1-3 Years	County OR3 (lead) + CDI (PIO), PRFMA, CBO's (esp. organizations serving South County), RCD, cities, school districts, UCSC, Cabrillo	Low	Medium	Staff time (limited)	Private organization grants (i.e, AT&T, PG&E) BAUASI EMPG/SHSGP	High	ps-FL-WTS-02, ps-FL-SCC-01, ps-FL-SCC-07, ps-FL-SCC-09
Flood	**ma-FL-SCC-06**	Sewer Infrastructure Flood Mitigation	Assess sewer pump stations and other wastewater infrastructure located in flood-prone areas for susceptibility and identify drainage improvements and other mitigation measures to improve resilience to floodwater inflow and infiltration. Implement highest-priority improvements identified.	PRV, SP	Medium 3-5 Years	County CDI (Sanitation / Stormwater Management + Flood Control / Roads / Planning), OR3, CA State Parks, Sanitation Districts	High	High	Service rate fees (limited)	BRIC HMGP Measure Q DWR	High	ps-FL-SCC-08, ps-FL-SVL-03, ps-AH-SCC-06, ps-CC-SCC-05
Flood	**ma-FL-SCC-07**	Enhanced Streamwood Management	Complete analyses and development of tools that inform siting of streamwood installation projects that would have the dual benefit of enhancing wildlife habitat and reducing flood-related risks to infrastructure and property.	PRV, NRP, SP	Medium 3-5 Years	County Environmental Health (lead) + CDI (Stormwater Management + Flood Control), RCD, CDFW, RWQCB, watershed groups	Medium	High	Staff time (limited)	Measure Q DWR DOC Prop 4	High	ps-FL-RCD-02, ps-CC-SCC-03

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Flood	**ma-FL-SCC-08**	Channel Maintenance Program	Develop a channel maintenance program, including metrics to develop maintenance specification sheets for each County - maintained channel and complete a CEQA analysis.	PRV, NRP	Short 1-3 Years	County CDI - Roads / Stormwater Management + Flood Control, OR3, and Parks	Medium	Medium	Staff time (limited)	DWR DOC CalTrans Prop 4 Measure Q	High	ps-FL-RCD-01, ps-LV-SCC-01
Severe Weather (Heavy Rain)	**ma-HR-SCC-01**	Implement Stormwater BMPs	Identify low-lying areas on County-owned lands suitable for development of stormwater BMPs and implement measures to retain stormwater and reduce the risk of flooding in adjacent or downstream areas.	NRP, SP	Short 1-3 Years	County Parks, Environmental Health, OR3, CDI - Roads / Stormwater Management + Flood Control, RCD, Cities	Medium	Medium	Staff time (limited)	DWR DOC Prop 4 Measure Q	High	ps-HR-CPT-01, ps-HR-WTS-01, ps-HR-SCC-01
Sea Level Rise	**ma-SLR-SCC-01**	Develop Community-Scale Coastal Adaptation Strategies	Develop community-scale adaptation strategies for Seacliff/Rio del Mar, Pleasure Point/East Cliff Drive, and other coastal neighborhoods vulnerable to sea level rise. Integrate findings from the County's Local Coastal Program (LCP) Update and Sea Level Rise Vulnerability Assessment to evaluate options such as managed retreat, nature-based solutions, shoreline restoration, and elevation of vulnerable infrastructure. Coordinate with local jurisdictions, community groups, and regional partners to guide future project design and investment priorities.	SP, PRV, NRP	Long 5-10 Years	County CDI - Planning (lead) + CDI - Sanitation, Stormwater Management + Flood Control; OR3, cities, CA State Parks, Coastal Commission	High	High	Special Services Funding Sources (i.e., service fees, CSA, Measure D)	Measure Q Coastal Conservancy HMGP CDBG BRIC EPA DOC	High	ps-SLR-SCC-01, ps-CC-SCC-01, ps-CC-SCC-02, ps-CC-SCC-03, ps-CC-SCC-05, ps-CE-SCC-01, ps-CH-SCC-01, ps-CH-SCC-02, ps-CS-SCC-01
Sea Level Rise	**ma-SLR-SCC-02**	Lower Watsonville Slough SLR Resiliency	Support ongoing efforts to assess and address flood and sea level rise risks in the Lower Watsonville Slough and adjacent areas (including Reach 1 of the Pajaro River, Hwy 1 corridor, and Beach Road). The County's role will focus on technical studies, data sharing, and coordination to integrate with partner-led projects and ensure consistency across planning efforts.	ES	Medium 3-5 Years	County CDI (Stormwater / Roads) + PVWMA, City of Watsonville, PRFMA, State Parks, Pajaro Dunes Association, and local CSAs	High	High	Staff time (limited)	Measure Q, Coastal Conservancy USACE HMGP BRIC NOAA	High	ps-SLR-PVW-03, ps-CC-SCC-01, ps-CE-SCC-01
Sea Level Rise	**ma-SLR-SCC-03**	Coastal Sanitation Infrastructure Mitigation Alternatives Study	In coordination with State Parks / local agency partners, evaluate alternatives for armoring, relocation, or other protections for vulnerable coastal sanitation infrastructure at sites such as Rio del Mar, Las Olas / Seacliff, Hidden Beach, and the East Cliff Drive force main. Initial study will build on priorities identified in the County's 2026 SLR Vulnerability Assessment / LCP	SP, PRV	Medium 3-5 Years	County CDI - Sanitation (lead) + CDI - Planning, Stormwater + Flood Control, SCCSD, CA State Parks, cities, Coastal Commission	Medium	High	Special Services Funding Sources (i.e., service fees, CSA, Measure D)	Coastal Conservancy, Measure Q, Prop 4, HMGP, BRIC	High	ps-SLR-SCC-01, ps-CC-SCC-01, ps-CC-SCC-02, ps-CC-SCC-05, ps-CE-SCC-01, ps-CS-SCC-02
Severe Weather (All)	**ma-SW-SCC-01**	Critical Facility Weatherproofing	Identify and implement priority safety, backup generation, and weatherization upgrades for critical County facilities and data storage centers.	SP	Medium 3-5 Years	County GSD, ISD, OR3	Low	Medium	Staff time (limited) General Fund via CIP (limited)	CDBG Prop 4 HMGP	Medium	ps-SW-SCC-02, ps-CC-SCC-05, ps-HW-SCC-01, ps-WW-SCC-02

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Severe Weather (All)	**ma-SW-SCC-02**	Expand Alert & Warning Systems	Expand public access to NOAA weather radios to ensure timely alerts in areas with limited cell coverage or high frequency of power outages. Partner with CBOs to distribute radios, provide training, and integrate their use into household and community preparedness. Ensure maintenance of the X-band radar is secured.	PRV, ES, PE&A	Long 5-10 Years	County OR3 (lead) + Cities, NWS, CBOs, schools, and local emergency partners	Medium	High	Staff time (limited)	BAUASI EMPG SHSGP HMGP	High	ps-SW-CBC-03, ps-SW-SCC-01, ps-SW-SVL-01, ps-HW-SCC-01, ps-SW-SCC-03, ps-WW-SCC-02
Slope Failure	**ma-SF-SCC-01**	Develop Drainage Structure Inventory & Prioritization Framework	Develop prioritization framework and upgrade aging stormwater conveyance systems / culverts using both nature-based and structural solutions where appropriate, to reduce slope failure potential.	NRP, PRV, ES	Short 1-3 Years	County CDI - Public Works (lead) + OR3, CDI - Roads, Planning, RTC, RCD	High	High	Staff time (limited)	HMGP Cal Trans Measure Q	High	ps-SF-SVL-04, ps-SF-SCC-04, ps-SF-SVL-02, ps-FL-SCC-06, ps-HR-SCC-01, ps-SF-SCC-01, ps-SF-SCC-02, ps-SF-SCC-03, ps-SF-SCC-07
Slope Failure	**ma-SF-SCC-02**	Landslide Risk & Mitigation Education Campaign	Partner with the RCD, FPD's, and trusted CBOs to educate residents in landslide-prone rural areas served by private roads or informal road associations on slope failure risks and mitigation options. Provide information on stabilization strategies, benefits/costs, and how forming a Community Service Area (CSAs) could support long-term slope and road maintenance. Prioritize outreach to one-way-in/one-way-out communities with vulnerable populations at higher evacuation risk.	PE&A	Short 1-3 Years	County OR3, CDI - Public Works, LAFCO, RCD, CBOs, HOAs / private road associations	Low	Medium	Staff time (limited)	NA - dependent on community interest in CSA formation	High	ps-SF-SCC-01,ps-CE-SCC-01, ps-SF-SCC-02, ps-SF-SCC-03, ps-SF-SCC-04, ps-SF-SCC-05, ps-SF-SCC-06, ps-SF-SCC-07
Coastal Hazards (Tsunami)	**ma-TS-SCC-01**	Tsunami Signage & Evacuation Drills	Install updated tsunami warning signage in maximum inundation zones, and regularly conduct outreach and community drills, especially in harbor and beachfront areas.	ES, PRV, PE&A	Short 1-3 Years	County OR3, CDI - Roads, ISD-GIS, Sheriff + FPDs, Port District, State Parks, cities, CERT, UCSC	Medium	Medium	Staff time	EMPG SHSGP BAUASI	Medium	ps-TS-SCC-01, ps-TS-SCC-02, ps-TS-SPD-04
Wildfire	**ma-WF-SCC-01**	Evacuation Route Fuel Management	Expand roadside shaded fuel breaks and maintain vertical/horizontal clearances along key County-maintained evacuation routes in high-risk WUI areas (high fire hazard / limited egress) with consideration for combined wildfire and high wind hazards that can block roads through downed trees, debris, or powerlines.	NRP, PPRO, PRV	Short 1-3 Years	County OR3, CDI - Roads, CDI - Environmental Planning, Fire Safe Council, Fire Districts	Medium	High	Staff time (limited)	HMGP BRIC CAL FIRE Prop 4 Measure Q	Very High	ps-WF-SCC-01, ps-WF-RCD-03, ps-WF-SCC-02, ps-CC-SCC-01, ps-DR-SCC-06, ps-WF-SCC-04, ps-WF-SCC-06, ps-WF-SCC-08
Wildfire	**ma-WF-SCC-02**	Mitigation Education, Inspection & Incentives Program	Through partnerships with fire districts, RCD, and the Fire Safe Council, expand free, no-obligation property inspections and offer incentives such as cost shares and low-interest loans to incentivize home hardening, improving access and address signage, and establishing defensible space in high-risk WUI zones.	PPRO, PE&A	Short 1-3 Years	County OR3, Fire Districts, RCD, Fire Safe Council	Medium	High	Staff time (limited)	HMGP BRIC CAL FIRE CalOES Prop 4 Measure Q	Very High	ps-WF-CBC-02, ps-CC-SCC-01, ps-WF-SCC-01, ps-WF-SCC-02, ps-WF-SCC-04, ps-WF-SCC-08
Wildfire	**ma-WF-SCC-03**	Community Chipping & Biomass Disposal Programs	Expand neighborhood chipping programs to increase coverage across at-risk neighborhoods and promote free or low-cost slash disposal opportunities.	NRP, PPRO, PE&A	Short 1-3 Years	County OR3, RCD, CDI - Solid Waste, Fire Districts, Fire Safe Council	Medium	High	General Fund (limited)	HMGP BRIC CAL FIRE CalOES Prop 4 Measure Q	Very High	ps-WF-SCC-07, ps-CC-SCC-01, ps-DR-SCC-06, ps-WF-SCC-01, ps-WF-SCC-02, ps-WF-SCC-04, ps-WF-SCC-08

Hazard	Action ID	Action Title	Description	FEMA Mitigation Alternative	Timeline	Responsibility	Cost	Benefit	Internal Funding Source	External Funding Source	Priority (Based on Criteria)	Problems Addressed
Wildfire	**ma-WF-SCC-05**	Collaborative Forest Health & Fuel Reduction Projects	Implement priority forest health, fuel reduction, and shaded fuel break projects on private lands and public-agency–owned parcels and watersheds through collaborative partnerships among local, regional, and state entities. These projects will advance shared forest health and wildfire risk reduction priorities identified in the Santa Cruz Mountains Regional Prioritization Plan (RPP) and will leverage cross-jurisdictional coordination, shared resources, and community engagement to achieve landscape-scale resilience outcomes.	NRP, PRV, PE&A	Short 1-3 Years	County OR3 + RCD, water districts, CAL FIRE, FPDs, Fire Safe Council, Santa Cruz Mountain Stewardship Network	High	High	General Fund (limited) Staff time (limited)	HMGP BRIC DOC CAL FIRE CalOES Prop 4 Measure Q	Very High	ps-WF-RCD-02, ps-WF-SCC-09, ps-CC-SCC-01, ps-CC-SCC-03, ps-CC-SCC-04, ps-DR-SCC-06, ps-WF-SCC-01, ps-WF-SCC-03, ps-WF-SCC-04, ps-WF-SCC-08, ps-WF-SCC-10
Wildfire	**ma-WF-SCC-04**	Critical Facilities & Infrastructure Protections	Complete shaded fuel breaks, defensible space treatments, and hardening measures at critical facilities and infrastructure sites (including County as well as outside agency-owned properties for communications towers, corrections, power, sewer, water, stormwater, and solid waste.)	SP, NRP, ES	Short 1-3 Years	County GSD, OR3, Fire, Parks, and CDI (Sanitation) + CAL FIRE, utility providers	Medium	High	General Fund via CIP (limited)	HMGP BRIC CAL FIRE CalOES Prop 4 Measure Q	High	ps-WF-SCC-03, ps-CC-SCC-01, ps-CC-SCC-02, ps-CC-SCC-05, ps-DR-SCC-06
Wildfire	**ma-WF-SCC-06**	Post-Fire Watershed Health & Erosion Control Plan	In partnership with the RCD and NRCS, formalize a Countywide recovery plan for post-fire watershed protection including erosion control measures for private residences along steep slopes. Incorporate lessons learned and documentation from the CZU Fire recovery and establish protocols for long-term watershed health and resilience.	NRP, ES, PRV	Short 1-3 Years	County OR3, CDI (Environmental Planning), and Environmental Health + RCD, NRCS, Santa Cruz Mountain Stewardship Network	Medium	High	General Fund (limited) Staff time (limited)	CAL FIRE DOC Prop 4 Measure Q	High	ps-WF-SVL-02, ps-WF-SCC-05, ps-CC-SCC-01, ps-CC-SCC-03, ps-SF-SCC-06, ps-WF-SCC-01, ps-WF-SCC-08
Wildfire	**ma-WF-SCC-07**	Biomass Utilization & Air Curtain Burner Program	In coordination with the Santa Cruz Mountains Stewardship Network's regional biomass strategy, pursue permitting and acquisition of a Carbonator system to centralize processing of hazardous fuels and standing dead trees into biochar.	NRP	Short 1-3 Years	County OR3 and CDI (Environmental Planning / Solid Waste) + RCD, SCMSN, CAL FIRE, Fire Safe Councils	High	High	General Fund (limited)	CAL FIRE DOC Prop 4 Measure Q	High	ps-WF-SCC-08, ps-CC-SCC-01, ps-DR-SCC-06, ps-WF-SCC-01, ps-WF-SCC-09
Wildfire	**ma-WF-SCC-08**	Streamlining Sensitive Habitat Permitting	Develop streamlined permitting pathways and habitat-specific BMPs to support wildfire risk reduction projects in environmentally sensitive areas while maintaining ecological safeguards and watershed health.	NRP	Short 1-3 Years	County CDI - Environmental Planning (lead) + OR3, Parks, HSA - Environmental Health, County Fire / CAL FIRE, RCD, CDFW, RWQCB	Medium	Medium	Staff time (limited)	BRIC HMGP CAL FIRE DOC Prop 4 Measure Q	High	ps-WF-RCD-02, ps-WF-SCC-04, ps-WF-SCC-10, ps-CC-SCC-01, ps-CC-SCC-03, ps-WF-SCC-01
Wildfire	**ma-WF-SCC-09**	Strengthening WUI & Fire Safety Ordinances	Evaluate opportunities to strengthen local policies and ordinances in alignment with the state fire code to reduce wildfire risk in the wildland–urban interface (WUI). This may include assessing options for enhanced defensible space, vegetation management, and wildfire-resistant construction standards, developed through stakeholder engagement and coordination with local fire agencies.	NRP, PRV	Short 1-3 Years	County CDI - Planning (lead) + County Fire / CAL FIRE; FPD's, OR3, Fire Safe Councils	Medium	High	Staff time (limited)	CAL FIRE	High	ps-WF-SCC-07, ps-WF-SVL-03, ps-CC-SCC-01, ps-WF-SCC-01, ps-WF-SCC-04

4.5 Status of Previous Mitigation Actions

In 2021, Santa Cruz County adopted its previous FEMA-approved HMP. This 2025 MJHMP represents a comprehensive update from that previous plan, as discussed in Section 1.5. Table 4-3 provides status updates for all of the previous mitigation actions from the 2021 Santa Cruz County HMP, from which many of the mitigation actions in Table 4-2 were sourced and revised. Status updates for the old action plans of other jurisdictions with previous HMPs are provided in the annexes of Volume 2.

Table 4-3: Status of 2021 Santa Cruz County Mitigation Actions

Action ID	Description	Status
A-1	Coordinate preparedness efforts with other agencies and cities within the county	Combined and revised into ma-AH-SCC-08, ma-CC-SCC-01, ma-DF-SCC-01, ma-EQ-SCC-01, ma-FL-SCC-02, ma-FL-SCC-03, ma-SF-SCC-02, ma-WF-SCC-01, ma-WF-SCC-03, ma-WF-SCC-04, ma-WF-SCC-05
A-2	Continue to enforce floodplain management regulations on all permit applications	Combined and revised into ma-FL-SCC-01
A-3	Continue to participate in the Community Rating System to improve floodplain management	Combined and revised into ma-FL-SCC-01
A-4	Reduce fire risk in urban/wildland interface (WUI) by advocating use of improved building materials and appropriate code enforcement, including defensible space and fuel reduction programs	Combined and revised into ma-WF-SCC-02, ma-WF-SCC-03, ma-WF-SCC-04, ma-WF-SCC-05
A-5	Promote land use planning which will reduce incidence of human caused wildfires especially in very high hazard areas	Combined and revised into ma-WF-SCC-02, ma-WF-SCC-05
A-6	Advocate for creation of secondary road access improvement	Combined and revised into ma-AH-SCC-08
A-7	Implement water conservation efforts to maximize the use of existing water resources	Revised into ma-DR-SCC-02
A-8	Support the development of additional water supplies	Combined and revised into ma-DR-SCC-04
A-9	Promote more effective use of groundwater storage through increased groundwater recharge and conjunctive use among agencies	Combined and revised into ma-DR-SCC-03, ma-DR-SCC-04
A-10	Continue to coordinate communication system upgrades with other agencies and cities, including evacuation management and operations, for homes and businesses within specific areas	Combined and revised into ma-FL-SCC-03
A-11	Promotion of built-in fire extinguishing systems and fire alarm systems	Combined and revised into ma-WF-SCC-02

Action ID	Description	Status
A-12	Continue to maintain cooperative fire protection and prevention agreements with other agencies	Combined and revised into ma-AH-SCC-08, ma-WF-SCC-01, ma-WF-SCC-04
A-13	Improve road signs and address marking to increase visibility and reduce response times	Combined and revised into ma-WF-SCC-02
A-14	Enhance support for interoperability communications system with local, state, and federal emergency services	Combined and revised into ma-FL-SCC-03
A-15	Continue to require that the County Geologist review development in areas of suspected landsliding and require engineering geology reports when landsliding is identified or suspected	Combined and revised into ma-SF-SCC-01, ma-SF-SCC-02
A-16	Continue to require that an engineering geologist and/or geotechnical engineer investigate the site of any proposed construction near landsliding and require mitigation of landslide hazards before issuing any building or grading permit	Combined and revised into ma-SF-SCC-02
A-17	Continue to require that an engineering geologist and a geotechnical engineer investigate any landslide damage to homes or roadways before repair of the landslide and reuse of the homes or roadways	Combined and revised into ma-SF-SCC-01
A-18	Continue to refine and improve our evacuation management plans and tools using Zonehaven	Combined and revised into ma-AH-SCC-08, ma-DF-SCC-01, ma-DF-SCC-02
A-19	Re-establish and support Community Organizations Assisting in Disaster (COAD)	Revised into ma-AH-SCC-09
A-20	Reduction of fire risk in the urban/wildland interface (WUI) through hazardous fuel reduction projects including but not limited to indigenous land use practices of controlled burns, hazardous fuel removal, other shaded fuel break burn strategies	Combined and revised into ma-WF-SCC-01, ma-WF-SCC-03, ma-WF-SCC-04, ma-WF-SCC-05
A-21	Support CZU Fire Recovery for survivors utilizing best practices for improving overall safety of rebuild	Combined and revised into ma-WF-SCC-01, ma-WF-SCC-02
A-22	Enhance our early warning, and rainfall monitoring capacity in the high debris flow risk areas of the County following the CZU fires of 2020	Combined and revised into ma-SF-SCC-01
A-23	Identify, monitor, and mitigate where feasible the hazards and risks associated with post fire debris flows	Combined and revised into ma-SF-SCC-01, ma-WF-SCC-06
A-24	Expand use and functionality of targeted shelters County Wide to serve as “All Hazard Resiliency Centers” which can serve as an all-hazard resource for community members in events including but not limited to: earthquakes, fires, floods, Public Safety Power Shut-off events, extreme weather events, poor air quality days. Building resiliency centers may include but is not limited to back-up power generation capacity, air filtration, air conditioning, kitchen facilities, shelter capacity	Combined and revised into ma-SW-SCC-01
B-1	Upgrade roadways, sewer, water, and other infrastructure to withstand seismic shaking	Combined and revised into ma-EQ-SCC-01

Action ID	Description	Status
B-2	Review and revise California Environmental quality Act (CEQA) Initial Study checklist to ensure storm water runoff is fully mitigated	Completed
B-3	Implement additional fire prevention programs through inspections and education	Combined and revised into ma-WF-SCC-02
B-4	Maintain adequate Fire Suppression and Prevention staffing levels to meet the needs of the county residents and development trends	Cancelled, operational focus; addressed through other planning efforts, replaced with actions that focus on mitigation
B-5	Update and revise the Geologic Hazards Ordinance	Completed
B-6	Pursue elevation of structures to raise them above the 100-year flood level	Combined and revised into ma-FL-SCC-01
B-7	Continue to enforce requirements for on-site retention of storm water runoff from impervious surfaces where feasible for all new development in the Groundwater Recharge Zone and the Water Supply Watershed Zone and throughout Santa Cruz County	Combined and revised into ma-SF-SCC-01, ma-SW-SCC-01
B-8	Evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and recommend revisions to improve the effectiveness of these policies	Combined and revised into ma-SF-SCC-01, ma-SW-SCC-01
B-9	Evaluate the effectiveness of current drainage plan requirements	Combined and revised into ma-SF-SCC-01, ma-SW-SCC-01
B-10	Implement the "Stormwater Facilities Master Plan" for Flood control Districts 5 & 6	Combined and revised into ma-SF-SCC-01
B-11	Continue to inspect and maintain drainage system infrastructure	Combined and revised into ma-SF-SCC-01
B-12	Develop public education materials on flood protection and mitigation by working collaboratively with community groups, non- governmental organizations, and the local media	Combined and revised into ma-FL-SCC-01, ma-FL-SCC-02, ma-FL-SCC-03
B-13	Regulate development in flood zones to optimize preservation of open space through the application of the Geologic Hazards Ordinance and Open Space Preservation policies	Combined and revised into ma-FL-SCC-02
B-14	Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation	Combined and revised into ma-SF-SCC-01, ma-SF-SCC-02
B-15	Promote drought planning by the 150 small water systems under county jurisdiction	Revised into ma-DR-SCC-01
B-16	Promote seismic safety upgrade of all emergency use and critical structures	Combined and revised into ma-EQ-SCC-01
B-17	Require all new and replacement critical structures be designed to standards of the California building Code and County Geologic Hazard Code	Combined and revised into ma-EQ-SCC-01

Action ID	Description	Status
B-18	Train appropriate plan check staff on seismic requirements for structures	Cancelled, ongoing baseline mitigation requirement
B-19	Encourage zoning in geologically constrained areas that reflect the nature and extent of the seismic hazard	Cancelled, mitigation achieved through Ch. 16 implementation
B-20	Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands	Cancelled, ongoing responsibility of PRFMA
C-1	Management of early warning system	Combined and revised into ma-TS-SCC-01
C-2	Update tsunami maps	Combined and revised into ma-TS-SCC-01
C-3	Protect and preserve the coastline through permit review and continue to review coastal development for conformance with the County's Geologic Hazards ordinance	Cancelled, ongoing baseline mitigation requirement
C-4	Encourage the replacement of existing seawalls with shoreline protection structures which meet current engineering practice, integrate coastal access elements, and reduce their footprint impact on coastal resources	Combined and revised into ma-CE-SCC-01, ma-CH-SCC-01
C-5	Develop an event protocol with the State Division of Safety of Dams	Combined and revised into ma-DF-SCC-01, ma-DF-SCC-02
C-6	Continue to require soils reports as part of the building permit process	Cancelled, ongoing baseline mitigation requirement
C-7	Encourage investigation of tsunami threat to the county and update development regulations based upon the best available information	Combined and revised into ma-TS-SCC-01
C-8	Protect and preserve the coastline and infrastructure through restoration efforts	Combined and revised into ma-CE-SCC-01, ma-CH-SCC-01, ma-SLR-SCC-01
C-9	Update dam inundation maps	Combined and revised into ma-DF-SCC-01
C-10	Review dam evaluation files to determine the extent of potential dam failures	Combined and revised into ma-DF-SCC-01
C-11	Continue to enforce design criteria for areas of known expansive soils	Cancelled, ongoing baseline mitigation requirement
C-12	Adopt General Plan and County Code amendments to implement the Sustainable Santa Cruz County Plan to support higher density development along major transit corridors.	Completed
C-13	Plan for climate change	Combined and revised into ma-CC-SCC-01, ma-CH-SCC-01, ma-DR-SCC-03, ma-FL-SCC-02, ma-SLR-SCC-01

Action ID	Description	Status
C-14	Develop a forum for ongoing engagement with coastal private property owners and the California Coastal Commission to discuss frameworks for land use policies that respond to expected future losses	Combined and revised into ma-CC-SCC-01
C-15	Consider relocating coastal development away from areas that will be inundated to eliminate the risk of damage and the need for coastal protection	Combined and revised into ma-CH-SCC-01, ma-SLR-SCC-01
C-16	Consider limiting new engineered protection structures to infill in locations where the back beach is currently fixed	Combined and revised into ma-SLR-SCC-01
C-17	Consider a program to identify those areas where managed retreat should replace engineered protection structures, based on public benefit	Combined and revised into ma-CH-SCC-01, ma-SLR-SCC-01
C-18	Work with the engineering community to define a standard increment of additional height that should be added to the FEMA 100-year wave run up, storm surge, and flood levels when analyzing hazards in specific locations	Combined and revised into ma-SLR-SCC-01
C-19	In consultation with the California Coastal Commission, consider revising regulations that address rebuilding structures that are repeatedly damaged by SLR and coastal storms	Combined and revised into ma-CC-SCC-01, ma-SLR-SCC-01
C-20	Amend the Public Safety Element of the General Plan and revise implementing regulations to increase the efficacy of the damage prevention and flood protection aspects of the National Flood Insurance Program	Completed, pending Coastal Commission certification
C-21	Work with the County Office of Response, Recovery, and Resilience to refine FEMA flood hazard mapping to account for climate change, as maps are the basis for evacuation notification in the event of anticipated flooding and/or a tsunami	Combined and revised into ma-FL-SCC-02
C-22	Consider evaluating unprotected developed coastal bluff areas subject to future erosion, and develop plans and timeline for either armor placement, or retreat and relocation of existing public structures and/or infrastructure	Combined and revised into ma-CE-SCC-01, ma-CH-SCC-01, ma-SLR-SCC-01
C-23	Consider designing and siting all future County projects and infrastructure to account for sea level rise projections, considering projected life span of project	Combined and revised into ma-CH-SCC-01, ma-SLR-SCC-01
C-24	Consider securing federal grant funding for the following drainage improvements within the Rio Del Mar Esplanade necessary to protect against a 10-year storm	Combined and revised into ma-SF-SCC-01
C-25	Continue to improve wastewater collection system to reduce infiltration by groundwater or surface water	Combined and revised into ma-CH-SCC-01
C-26	Consider coordinating with the City of Santa Cruz on programs to minimize vulnerabilities at the Neary Lagoon plant	Combined and revised into ma-CH-SCC-01

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Appendix A. Analysis Methodology

SANTA CRUZ COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN

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A vulnerability assessment was conducted using Geographic Information Systems (GIS) for each of the priority hazards identified by the county-wide Hazard Mitigation Planning Team (HMPT). Several sources of data are necessary to conduct a vulnerability analysis. This appendix presents an outline of the data inputs, processing steps, and outputs used to create the vulnerability analysis results presented in the 2025 Santa Cruz County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The analysis methodology is presented first, followed by an overview of the analysis data.

A.1. Natural Hazard Exposure

The natural hazard exposure analysis is an inventory of population, parcels, critical facilities, and other assets within each natural hazard area. As shown in Figure A- 1, the presence of a structure inside a natural hazard area (the flood zone in this example) qualifies that structure as exposed to the natural hazard.



Figure A- 1: Hazard Exposure

The total counts of parcels, people, facilities, and assets and the sum of values within the planning area which could be exposed to a hazard event are referred to as the "exposure" in this plan. A natural hazards overlay was developed to reflect the combination of many known natural hazard spatial footprints. The spatial overlay method enables summarization of building values, parcel counts, population exposure, and critical facility exposure within a hazard's geographic extents (see C. Natural Hazard Exposure in Figure A-4). The input data is used to evaluate exposure for wildfire, flood, areas protected by levee, dam inundation, earthquake, liquefaction, faults of required investigation, landslide, SLR, and tsunami run-up.

A.1.1. Damage Estimation with HAZUS

FEMA's HAZUS software was implemented to conduct a detailed loss estimation for flooding within the Special Flood Hazard Area (SFHA). HAZUS is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS uses GIS technology to estimate physical, economic, and social impacts of disasters. For purposes of this planning effort, HAZUS was used to generate damage estimations due to possible flooding. The estimated damage and losses provided by the HAZUS Software provide the ability to understand possible widescale damage to

buildings and facilities. Figure A- 2provides a visual simplification of the HAZUS Software flood modeling parameters.

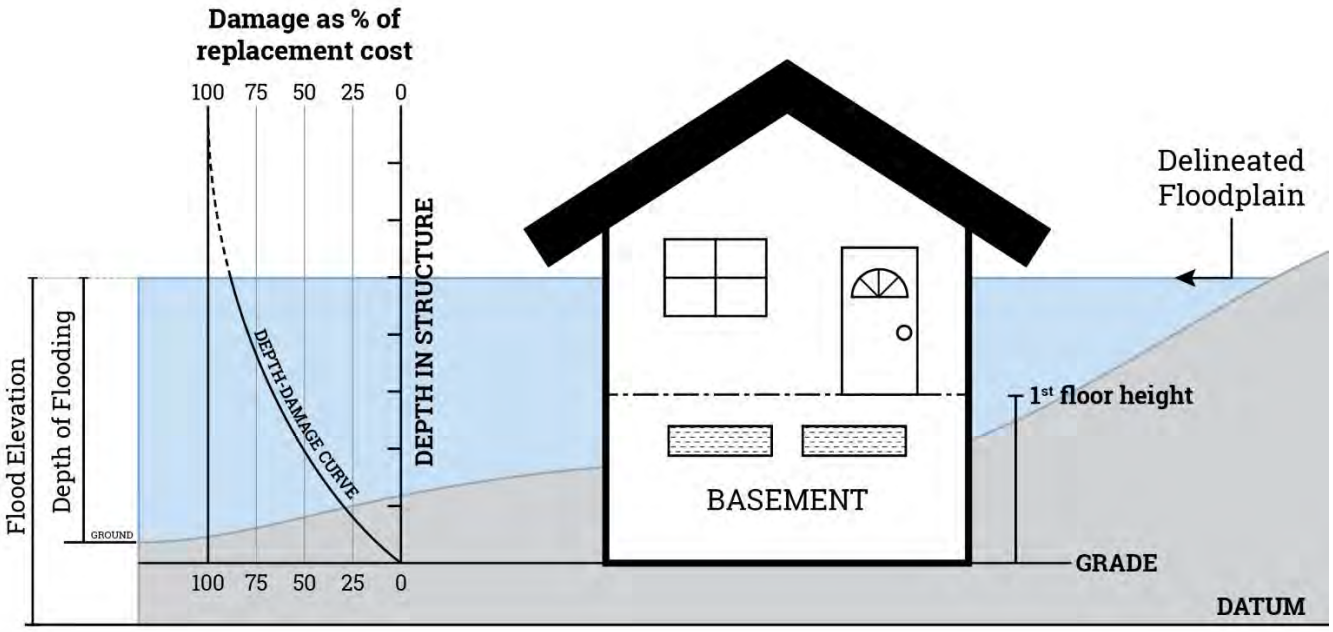


Figure A- 2: Flood Depth and Damage Curves

In the hypothetical geography shown in Figure A- 3, even though both structures are exposed to flooding, it is expected that the structure with a first-floor height below the depth-of-flooding will receive significantly more damage than the structure with a first-floor height above the expected water depth. Note that not all building data contains first-floor height, and first-floor height is an example of the type of field utilized by HAZUS in calculating damage estimates.

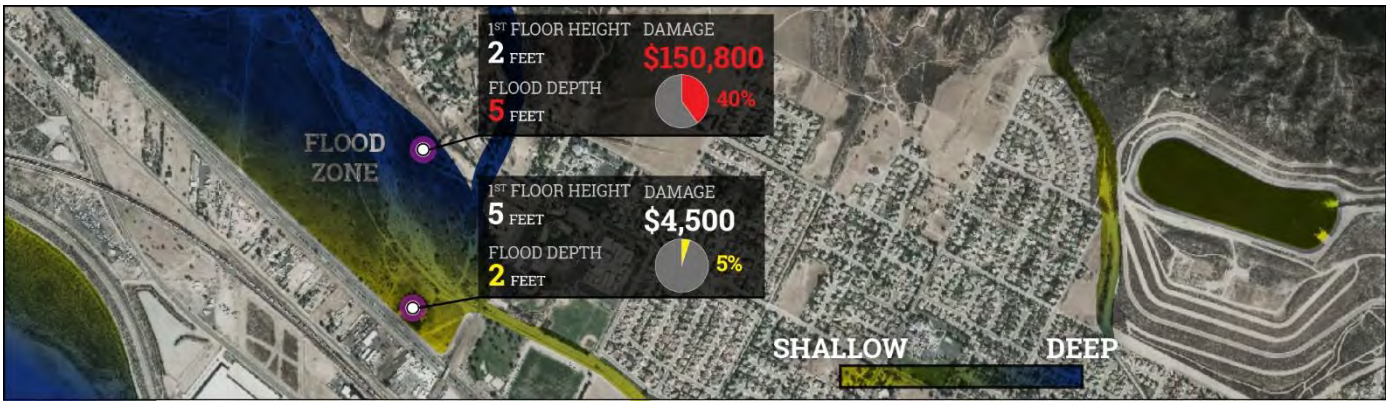


Figure A- 3: HAZUS Damage Estimations

Damage estimations are summarized by flood scenario and building occupancy type. Custom depth grids were modeled from county LiDAR data and the most up-to-date DFIRM at the time the analysis was run. HAZUS Inventory data were analyzed within HAZUS 7.0 against these depth grids at various return intervals.

HAZUS is a FEMA product with highly detailed documentation provided on the analysis steps and algorithms performed against the input data and associated scenarios in the process of obtaining loss estimates. The explanation in this appendix section is simplified. Refer to the full documentation and technical manuals from FEMA for greater explanation on HAZUS specifics.

A.1.2. Distinguishing Results: Natural Hazard Exposure Analysis vs HAZUS Results

Table and chart references throughout the hazard mitigation plan are explicitly called out for HAZUS results as "Damage Estimates". There are expected differences in the results between estimations of Natural Hazard overlays and HAZUS results. Snapshot tables and Natural Hazard Exposure sections do not contain HAZUS estimates.

A.2. Analysis Data: Population, Parcel Value & Assets

A.2.1. Population

Population input data for analyses consisted of 2023 ACS 5-Year Estimates for Census Block Groups. These were then processed through GIS modeling in order to break down the proportional population for smaller units of area in relation to natural hazards. Large bodies of water and parks were omitted from the weighted areas.

A.2.2. Parcels

County provided parcel geometry was joined with County Assessor data. Centroids were created to represent parcels at a single location. The centroid approach offered data integrity benefits over the use of address points due to multiple buildings occurring per parcel APN. Improved parcels were chosen for the parcels dataset by a query of building area and use-code descriptors. A replacement cost of $400 per square foot was used in place of assessed structure values. HAZUS occupany type categories and HAZUS based content multipliers were used to generally estimate content value based on a ration of replacement value.

Real Property Assets

For jurisdictions that supplied building specific tabular building data or insurance schedules, addresses were used to compile Real Property Asset data with valuations and structural data for analyses were possible. These assets were utilized in vulnerability exposure analysis. The tabular data were geocoded, and quality checked for building placement. This data, which is not exclusive to insurance or valuation rolls, is presented in the exposure analysis as "Real Property Assets". There may be some overlap with these infrastructure locations and other asset sources.

A.2.3. Critical Facilities & Infrastructure

Critical facilities and transportation/lifeline typically include hospitals, fire stations, police stations, storage of critical records, and similar facilities. These data came from a collection of sources, including but not limited to: county GIS, county and local jurisdiction insurance data, CDSS, CEC, FCC, HAZUS, USACE, NBI, FEMA, and National Park Service (NPS). All data sources have a level of accuracy acceptable for planning purposes.

Table A- 1 is a complete list of Critical Infrastructure data used in the analysis.

A.2.4. Natural Hazard Data

A.2.4.1. Earthquake Shaking

The CGS 2% chance/50-year probability map was used as a qualitative guide in selecting an earthquake epicenter-based ShakeMap scenario for analyses. The M7.1 N San Andreas; Santa Cruz Mountain earthquake scenario and ShakeMaps were used in this plan's analyses.

Intensity	Shaking	MMI	Description/Damage
I	Not Felt	0-1	Not felt except by a very few under especially favorable conditions.
II	Weak	1-2	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	2-3	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	3-4	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	4-5	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	5-6	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	6-7	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	7-8	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

Intensity	Shaking	MMI	Description/Damage
IX	Violent	8-9	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	9-10	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS Scenario MMI Grid

A.2.4.2. Liquefaction Potential

Hazard	Native Class	Description
Low	Low	Soil potential for liquefaction. Based on "Geology and Liquefaction Potential of Quaternary Deposits in Santa Cruz County" 1975 W.R. Dupre.
Moderate	Moderate	
High	High	
Very High	Very High	

Source: County. W.R. Dupre 1975

A.2.4.3. Fault Zones of Required Investigation

Hazard	Native Class	Description
County Fault Zone	CFZ	County defined fault zones.
State Fault Zone	SFZ	State Fault Zones of Required Investigation - Regulatory areas around active faults with the potential for surface rupture.

Source: CGS and County Data

A.2.4.4. Sea Level Rise Inundation

Hazard	Native Class	Description
Sea Level Rise	50_w100	COSMOS v3.1 - 50cm Sea Level Rise modeled 100-YR Coastal Flood Event inundation boundary

Source: COSMOS v3.1

A.2.4.5. Tsunami Run-Up

Hazard	Description
Tsunami Run-up Area	County provided tsunamic run-up inundation area boundary

Source: County

A.2.4.6. Dam Failure Inundation

Dam inundation zone GIS data were provided by Cal DWR. These represent the estimated flood extent in the event of dam failure for individual dams.

Hazard	Description
Inundation Zone	Dam Inundation maps for the State of California are required by California Government Code Section 8589.5(b). DWR Dam Breach Inundation studies are used for inundation sourcing for dams with published inundation areas.

Source: Cal DWR

A.2.4.7. Flood Hazard Zones

The input parameters for HAZUS analysis of Flood exposure included depth grids created with the FEMA Flood Zone data for the 100-YR Flood Riverine as well as 100-YR Coastal zones within the DFIRM. 100-YR, Coastal, and 500-YR were scenarios used to analyze the exposure to inputs. The Coastal VE Zone is within the SFHA.

Hazard	Flood Zone	Description
100-YR Flood [SFHA]	Subtype: Floodway	A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations.
	SFHA outside Floodway	The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.
100-YR Coastal Flood [SFHA]	VE	Coastal High-Hazard Area where wave action and fast-moving water have potential to cause high levels of damage during a base flood event. Part of the SFHA.
500-YR Flood [non-SFHA]	Subtype: 0.2% Annual Chance	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than one square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

Source: FEMA DFIRM

A.2.4.8. USACE Best Available Mapping (BAM) Flood Awareness Zones

Hazard	Description
Awareness Zone	Awareness floodplains identify the 100-year flood hazard areas using approximate assessment procedures. These floodplains will be shown simply as flood-prone areas without specific depths and other flood hazard data.

Source: BAM USACE

A.2.4.9. Landslide Susceptibility

GIS layer with geographic boundaries defining the likelihood of deep-seated landslides. Underlying geology and slope angle are used in the creation of this layer by the California Geological Society. Low, Medium, and High landslide classes were chosen as summary classes for this plan.

Susceptibility	Native Class	Description
Low	**1-5**	These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks.
Medium	**6-7**	Very high landslide susceptibility, classes VIII, IX, and X, includes moderate and steep slopes in hard rocks and weak rocks.
High	**8-10**	Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks.

Source: CGS Susceptibility to Deep-Seated Landslides in California

A.2.4.10. Wildfire Hazard Severity

A proprietary Dynamic Planning + Science composite GIS layer derived from wildland-urban interfaces, California Public Utilities Commission fire threat areas, and Fire Hazard Severity Zones (FHSZ).

Hazard	Native Class	Description
Moderate	**Moderate**	Classification of a zone as moderate, high or very high fire hazard is based on a combination of how a fire will behave and the probability of flames and embers threatening buildings. "This data represents Fire Hazard Severity Zones (FHSZ) in the State Responsibility Area (SRA), effective April 1st 2024, and recommended Fire Hazard Severity Zones in the Local Responsibility Area (LRA) from 2007-2011. It also represents Fire Hazard Severity Zones originally adopted in SRA that have since been reclassified as LRA." - California Department of Forestry and Fire Protection. Accessed June 2024. ***Additionally - The March 2025 unpublished LRA delineations were included in areas not covered by the April 2024 CAL FIRE data. Very little overlap occurs between these two datasets.**
High	**High**	
Very High	**Very High**	

Source: CAL FIRE April 2024 Authoritative layer and CAL FIRE unpublished March 2025 LRA layer.

A.2.4.11. Wind Classification

Wind Power Class	10 m (33 ft)		50 m (164 feet)[1]	
	Wind Power Density W/m²	Mean Speed[2] m/s (mph)	Wind Power Density W/m²	Mean Speed[2] m/s (mph)
1	≤ 100	4.4 (9.8)	≤ 200	5.6 (12.5)
2	100-150	5.1 (11.5)	200-300	6.4 (14.3)
3	150-200	5.6 (12.5)	300-400	7.0 (15.7)
4	200-250	6.0 (13.4)	400-500	7.5 (16.8)
5	250-300	6.4 (14.3)	500-600	8.0 (17.9)
6	300-400	7.0 (15.7)	600-800	8.8 (19.7)
7	>400	9.4 (21.1)	>800	11.9 (26.6)

Notes: [1]Vertical extrapolation of wind speed based on the 1/7 power law. [2]Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density and is for standard sea-level conditions.

Source: NREL, 2007

A.2.5. Methodology Overview

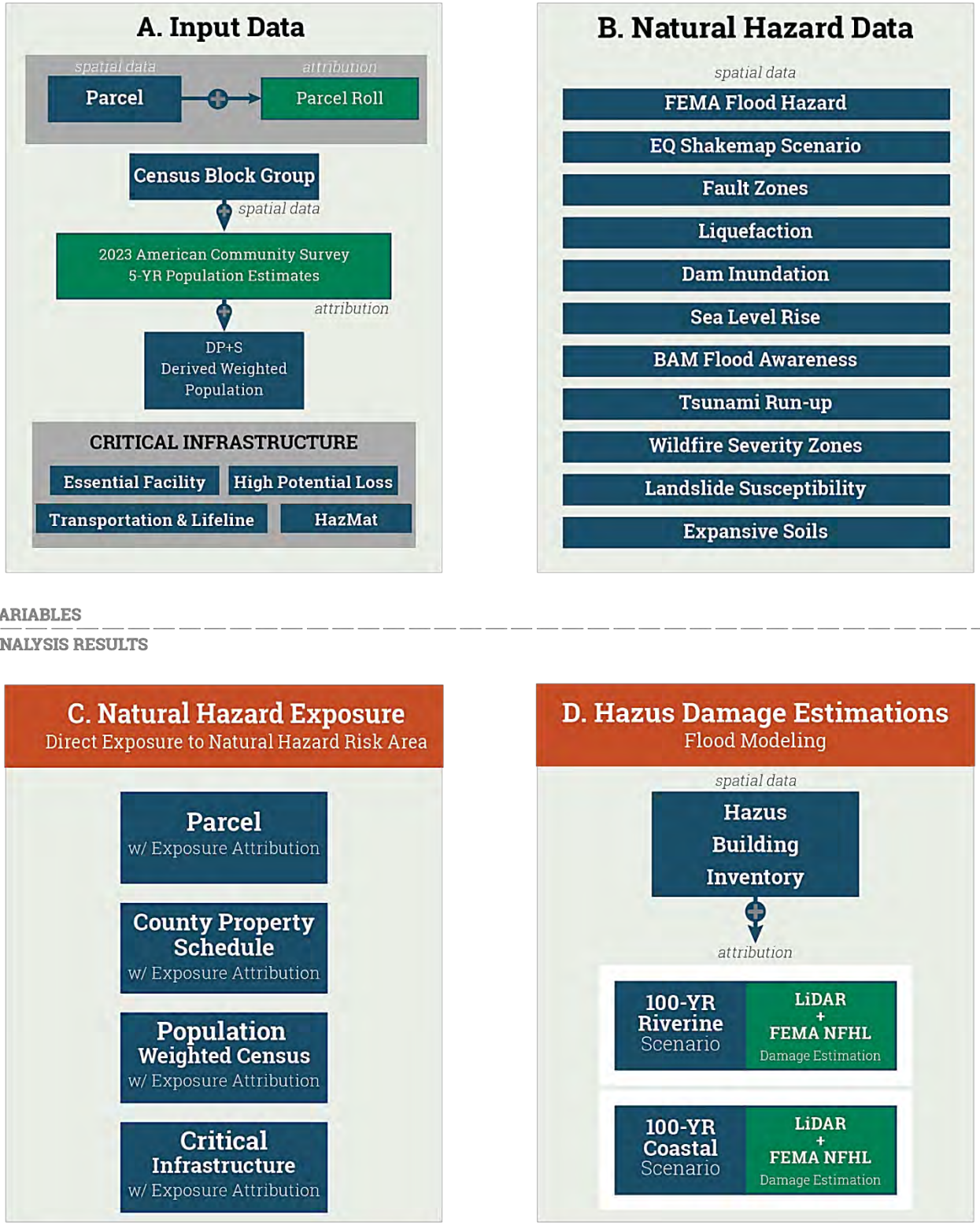


Figure A- 4: Data Analysis Methodology

A.2.6. Data Dictionary

Table A- 1: GIS Data Dictionary

Dataset	Data Steward	Notes
Jurisdictional/Municipal Boundaries	County	County GIS. Port District and Cabrillo College digitized based on parcel boundaries
County Boundary	County	County GIS
High-Resolution Elevation Model	County	LiDAR
GNIS	USGS	For Placenames
Stream	NHD+	Cartographic Purposes
Water	NHD+	Cartographic Purposes
Building Outlines	Microsoft, OSM	County Provided
Parcel Geometry	County	County GIS
Parcel Roll	County	County Assessor's Office
AMR	County	American Medical Response-separate from other medical (queried out facilities)
Emergency Operations Center	County	Queried from County 'Facilities' GIS layer. Only including County-wide EOC in this layer
Fire Station	County	Queried from County 'Facilities' GIS layer. Includes associated assets from participating Jurisdiction provided GIS Data
Hospital	County	Queried from County 'Facilities' GIS layer
Law Enforcement	County	Queried from County 'Facilities' GIS layer. Includes associated assets from participating Jurisdiction provided GIS Data
Adult Care Facility	County	Queried Nursing Homes from County 'Facilities' layer
Cabrillo Campus Buildings	DPS	Digitized from the available online campus map
Capitola City Additional Response Assets	City	Uncategorized geolocated city assets. Law enforcement, fire stations, library, city hall were all incorporated with appropriate datasets from the county
Cell Tower	County	County Provided via email
Child Care Center	CDSS	Queried from County 'Facilities' GIS layer
City Hall	County, City, DPS	Combination of County GIS, City data, and digitizing
County Real Property Asset	County	From the County GIS "County Facilities" layer. May be some overlap
Dam	USACE NID, DWR	USACE NID
Healthcare Facility	County	Queried 'clinics' from County 'Facilities' GIS layer
Historic Building	NPS	Historical data from NPS as registered
Historic Site	NPS	Historical data from NPS as registered

Dataset	Data Steward	Notes
Library	County	Queried from County 'Facilities' GIS layer
Power Generation	CEC	Updated CEC data from 2023; 3rd party source data can be supplemented by local data per availability. Includes non-traditional power plants
PVWMA Asset Location	DPS	Digitized office location
Radio Sites	County	County Provided
Resource Conservation District	DPS	Digitized office location
School	County	County GIS School's data
Scotts Valley City Water Treatment	City	This water treatment facility was not in the SVWD provided data but was in the City's data
SqCWD Water Treatment	District	SCWD GIS Files
SVWD Administration	District	From SVWD GIS File "Asset Locations"
SVWD Water Treatment	District	From SVWD GIS
Watsonville Emergency Shelters	City	From City GIS Files. Other Watsonville assets were integrated from city GIS into appropriate layers (Ie Fire Stations)
Watsonville Water Treatment	City	From City GIS Files. Other Watsonville assets were integrated from city GIS into appropriate layers (Ie Fire Stations)
Mobile Home Park	CAHCD	From CAHCD Mobile Home Park Search
Drainage Yard	DPS	Digitized based on prior plan assets
Airport	DPS	Manually Digitized
Bridge NBI	NBI	County GIS Hub
Capitola City Misc	City	Geolocated assets from city provided table. Integrated categorically with other major layers such as fire stations, law enforcement, etc. These are assets with no categorical integration
Church	County	Queried From County GIS Data Hub "Facilities" layer
County Maintained Roads	County	County Maintained Roads' Layer, has overlap with Streets layer
Levee	FEMA	FEMA DFIRM Sourced
Maintained Channel	County	County GIS Hub
NG Pipeline	CEC	From CEC Legacy
NG Station	CEC	From CEC Legacy
Capitola Pump Station	Capitola	Digitized from notes
SqCWD Hydrant	SqCWD	Appended to initial dataset by request. Data provided via email
Watsonville Surface Water Intake	Watsonville	Appended to initial dataset by request. Data provided via email

Dataset	Data Steward	Notes
Watsonville Water Control Valve	Watsonville	Appended to initial dataset by request. Data provided via email
Watsonville Hydrant	Watsonville	Appended to initial dataset by request. Data provided via email
Watsonville Water System Valve	Watsonville	Appended to initial dataset by request. Data provided via email
Watsonville Pump	Watsonville	Appended to initial dataset by request. Data provided via email
Watsonville Water Main	Watsonville	Appended to initial dataset by request. Data provided via email
PVWMA Harkins Slough Pump Recharge	PVWMA	Appended to initial dataset by request. Data provided via email
PVWMA Harkins Slough Recovery Well Line	PVWMA	Appended to initial dataset by request. Data provided via email
PVWMA Struve Slough Pipeline	PVWMA	Appended to initial dataset by request. Data provided via email
PVWMA Fiber Comms Line	PVWMA	Appended to initial dataset by request. Data provided via email
PVWMA Water Supply Facility	PVWMA	Appended to initial dataset by request. Data provided via email
Stormwater Culvert	County	Appended to initial dataset by request. Data provided via email
Sanitation Pipe	County	Appended to initial dataset by request. Data provided via email
SCWD Treated Water Mains	County	City of Santa Cruz Water Mains
Central Water Main Lines	County	Central Wawter District Water Mains
Parks	County	From County GIS Hub "Existing Parks" layer
Port District Infrastructure	DPS	Manually Digitized
PVWMA Coastal Distribution	District	District provided GIS Data
PVWMA College Lake Pipeline Water	District	District provided GIS Data
PVWMA College Lake Project Water	District	District provided GIS Data
Railroad	County	From County GIS Hub "Railroads" layer
Streets	County	Using County GIS Streets layer in addition to (and with overlap) the county maintained roads layer
Scotts Valley City Community Centers	City	Geolocated assets from city provided table. Integrated categorically with other major layers such as fire stations, law enforcement, etc. These are those assests with no categorical integration
SqCWD Emergency Intertie	District	District provided GIS Data
SqCWD Main	District	District provided GIS Data
SqCWD Pressure Regulating Valve	District	District provided GIS Data
SqCWD Production Well	District	District provided GIS Data

Dataset	Data Steward	Notes
SqCWD Pump Station	District	District provided GIS Data
SqCWD SWIP Well	District	District provided GIS Data
SqCWD Tank	District	District provided GIS Data
Substation	CEC	From CEC 2018
SVWD Backflow Device	District	District provided GIS Data
SVWD Backflow Facility	District	District provided GIS Data
SVWD ControlValve	District	District provided GIS Data
SVWD Hydrant	District	District provided GIS Data
SVWD Lateral	District	District provided GIS Data
SVWD Main	District	District provided GIS Data
SVWD PRV	District	District provided GIS Data
SVWD Pump	District	District provided GIS Data
SVWD Tank	District	District provided GIS Data
SVWD Well	District	District provided GIS Data
Transit Facilities	County	From County GIS Data Hub "Facilities" layer. May change to TL
Transmission Line	CEC	From CEC 2024
Watsonville Unreinforced Masonry	City	From City GIS Files. Other Watsonville assets were integrated from city GIS into appropriate layers (Ie Fire Stations)
Geotracker CleanupSite	Geotracker	Geotracker cleanup sites active
HWTS Active Facility	DTSC	HWTS Active Facilities
Census Block	US Census Bureau	2020 Census
Census Block Group	US Census Bureau	2023 5YR ACS
Dam Inundation	DWR	DWR 2025
EQ Scenario	USGS, CISN	M7.1 N San Andreas; Santa Cruz Mountain
Flood Awareness Zones	BAM USACE	Awareness floodplains identify the 100-year flood hazard areas using approximate assessment procedures. These floodplains will be shown simply as flood-prone areas without specific depths and other flood hazard data
Flood Hazard	FEMA, County	FEMA most recent DFIRM including SHFA areas and 0.2% Annual Chance of Flooding. Includes Coastal Flooding within 100 Yr
Sea Level Rise	Cal-Adapt, USGS	COSMOS v3.1 - 50cm Sea Level Rise modeled 100-YR Coastal Flood Event inundation boundary
Landslide Susceptibility	CGS	CGS

Dataset	Data Steward	Notes
Liquefaction	County	County GIS Liquefaction layer, Low, Moderate, High, Very High. Based on "Geology and Liquefaction Potential of Quaternary Deposits in Santa Cruz County" 1975 W.R. Dupre
Tsunami Run-up	County	County GIS Tsunamic Runup Area Boundary
Wildfire Hazard Severity Zone	County	Classification of a zone as moderate, high or very high fire hazard is based on a combination of how a fire will behave and the probability of flames and embers threatening buildings. "This data represents Fire Hazard Severity Zones (FHSZ) in the State Responsibility Area (SRA), effective April 1st 2024, and recommended Fire Hazard Severity Zones in the Local Responsibility Area (LRA) from 2007-2011. It also represents Fire Hazard Severity Zones originally adopted in SRA that have since been reclassified as LRA." - California Department of Forestry and Fire Protection. Accessed June 2024. *Additionally - The March 2025 unpublished LRA delineations were included in areas not covered by the April 2024 CAL FIRE data. Very little overlap occurs between these two datasets
Expansive Soil	County	County Data Portal
EQ Fault Zones	County	State and County mapped
Fire Perimeter Calfire	NIFC	Cartographic Purposes
Fire Regime MFRI	USGS	https://www.landfire.gov/NationalProductDescriptions13.php
Repetitive Loss Areas	FEMA	FEMA/County Supported
Shake Potential	USGS, CISN	Used for EQ Scenario Selection and Cartographic/Thematic mapping purposes

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Appendix B. Process Documentation

SANTA CRUZ COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN

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Planning Process Documentation Appendix

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Stakeholder Listening Sessions B.7-1

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Planning Committee Meeting Documentation

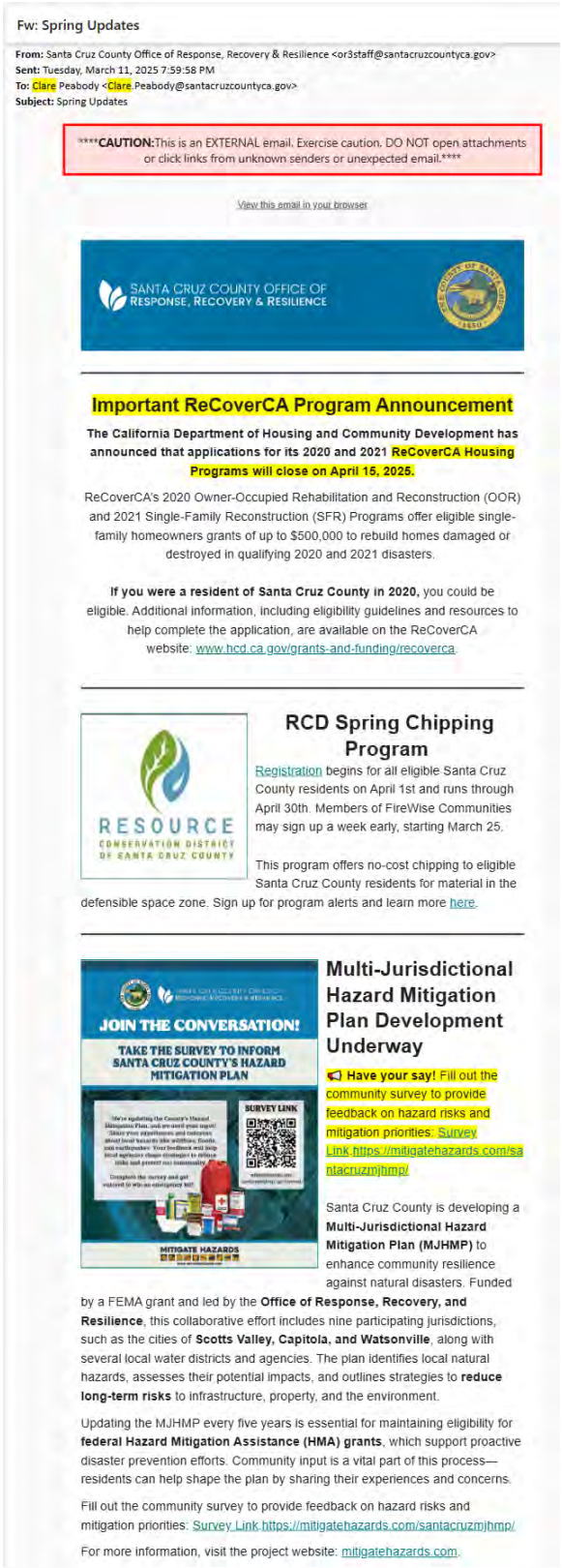
Appendix B.1

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Public Notice & Press Release Documentation

Appendix B.2

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Fw: Spring Updates

From: Santa Cruz County Office of Response, Recovery & Resilience <or3staff@santacruzcountyca.gov>
Sent: Tuesday, March 11, 2025 7:59:58 PM
To: Clare Peabody <Clare.Peabody@santacruzcountyca.gov>
Subject: Spring Updates

****CAUTION:**This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

View this email in your browser

SANTA CRUZ COUNTY OFFICE OF RESPONSE, RECOVERY & RESILIENCE

Important ReCoverCA Program Announcement

The California Department of Housing and Community Development has announced that applications for its 2020 and 2021 ReCoverCA Housing Programs will close on April 15, 2025.

ReCoverCA's 2020 Owner-Occupied Rehabilitation and Reconstruction (OOR) and 2021 Single-Family Reconstruction (SFR) Programs offer eligible single-family homeowners grants of up to $500,000 to rebuild homes damaged or destroyed in qualifying 2020 and 2021 disasters.

If you were a resident of Santa Cruz County in 2020, you could be eligible. Additional information, including eligibility guidelines and resources to help complete the application, are available on the ReCoverCA website: www.hcd.ca.gov/grants-and-funding/recoverca.

RESOURCE CONSERVATION DISTRICT OF SANTA CRUZ COUNTY

RCD Spring Chipping Program

Registration begins for all eligible Santa Cruz County residents on April 1st and runs through April 30th. Members of FireWise Communities may sign up a week early, starting March 25.

This program offers no-cost chipping to eligible Santa Cruz County residents for material in the defensible space zone. Sign up for program alerts and learn more here.

Multi-Jurisdictional Hazard Mitigation Plan Development Underway

📣 **Have your say!** Fill out the community survey to provide feedback on hazard risks and mitigation priorities: Survey Link https://mitigatehazards.com/santacruzmjhmp/

Santa Cruz County is developing a **Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)** to enhance community resilience against natural disasters. Funded by a FEMA grant and led by the **Office of Response, Recovery, and Resilience**, this collaborative effort includes nine participating jurisdictions, such as the cities of **Scotts Valley, Capitola, and Watsonville**, along with several local water districts and agencies. The plan identifies local natural hazards, assesses their potential impacts, and outlines strategies to **reduce long-term risks** to infrastructure, property, and the environment.

Updating the MJHMP every five years is essential for maintaining eligibility for **federal Hazard Mitigation Assistance (HMA) grants**, which support proactive disaster prevention efforts. Community input is a vital part of this process—residents can help shape the plan by sharing their experiences and concerns.

Fill out the community survey to provide feedback on hazard risks and mitigation priorities: Survey Link https://mitigatehazards.com/santacruzmjhmp/

For more information, visit the project website: mitigatehazards.com.

OR3 Spring Updates



Share your concerns about fires and other hazards!

Santa Cruz County is conducting a Hazard Mitigation Survey. Make your voice heard.
English.
Español.
***Hazard mitigation** is the use of sustained, long-term actions to reduce the loss of life, personal injury, and property damage that can result from a natural disaster.*

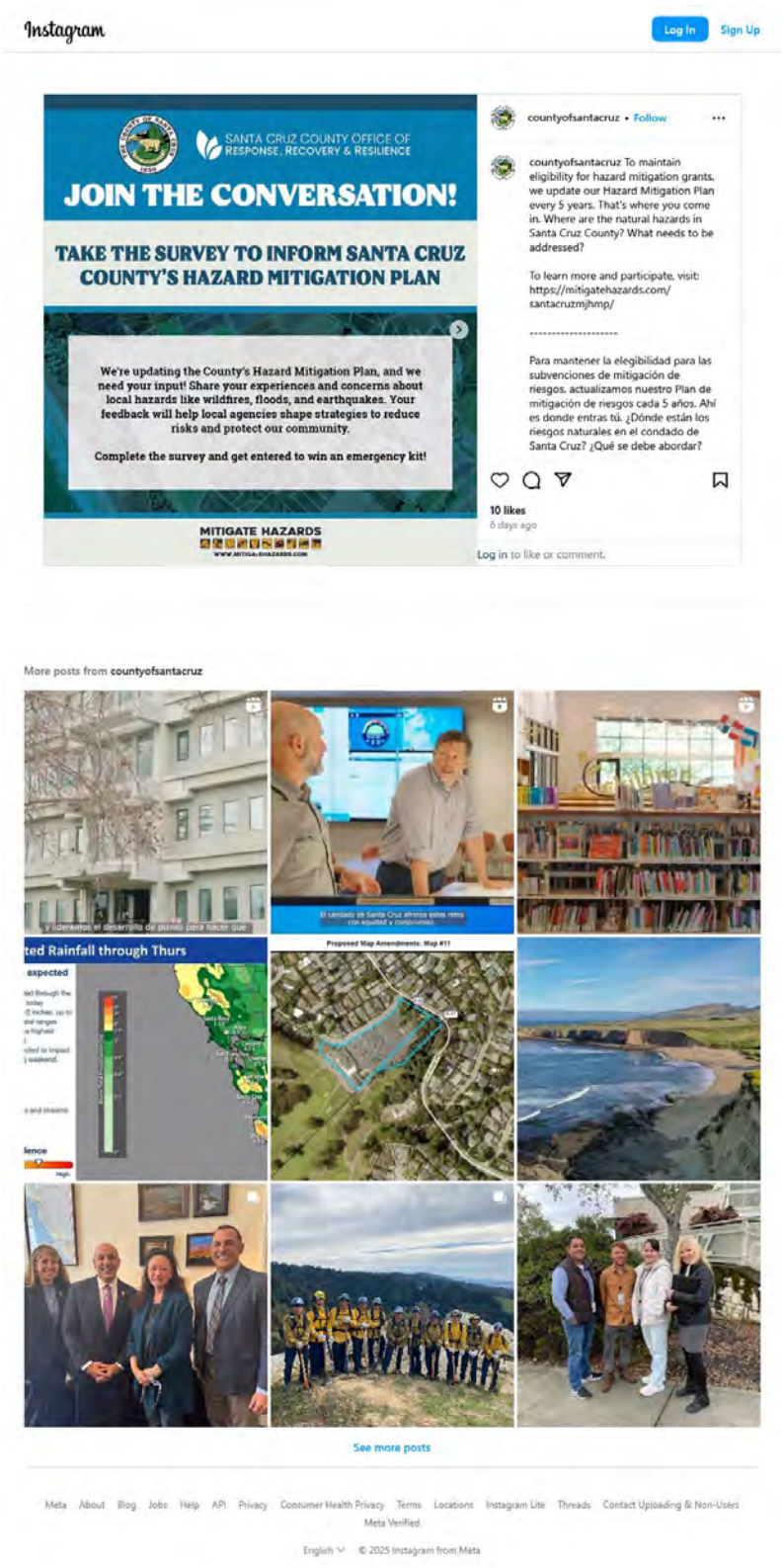
Survey Advertisement on Regeneración Partner Website-Newsletter 4-2-25



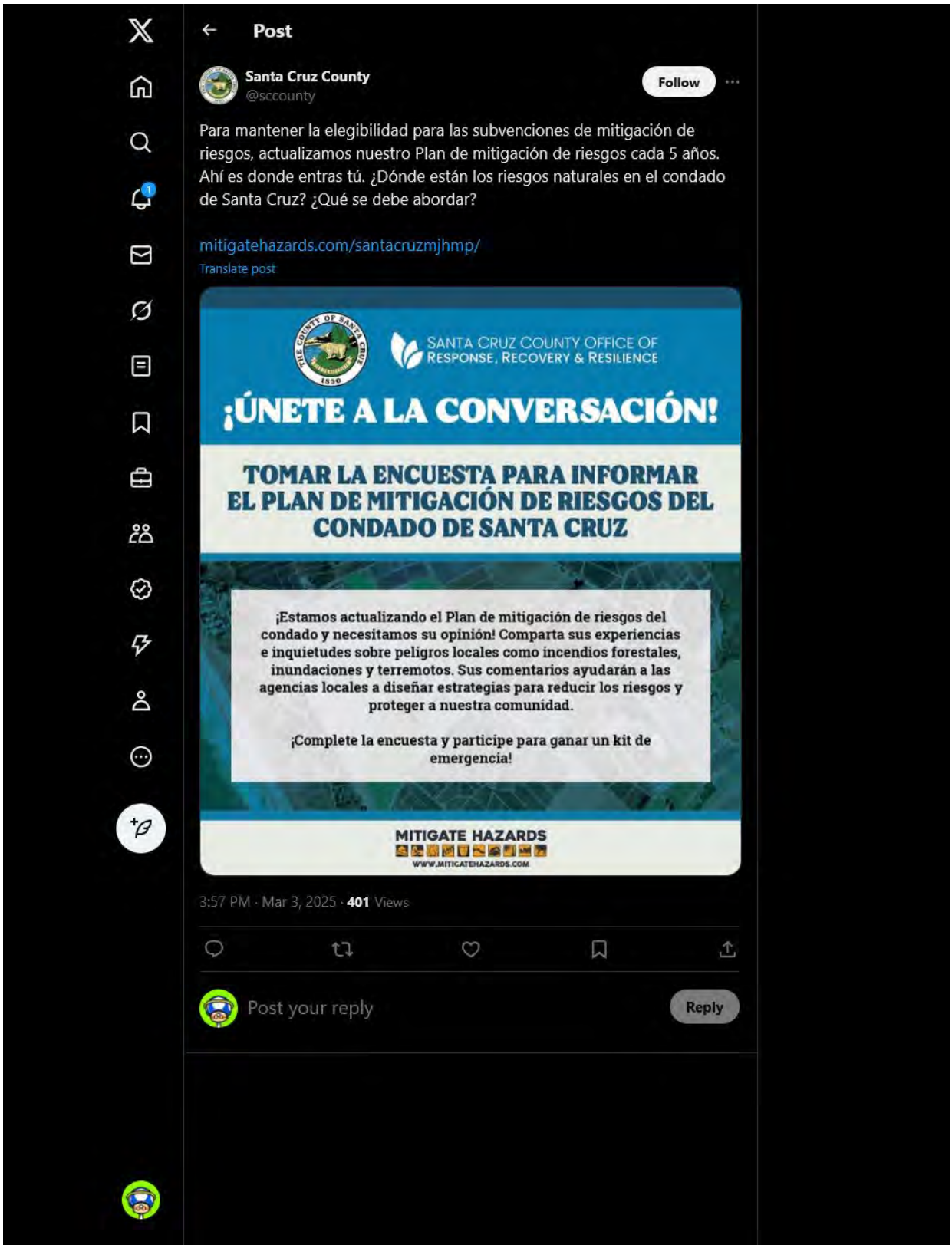
Nextdoor HMP Posting



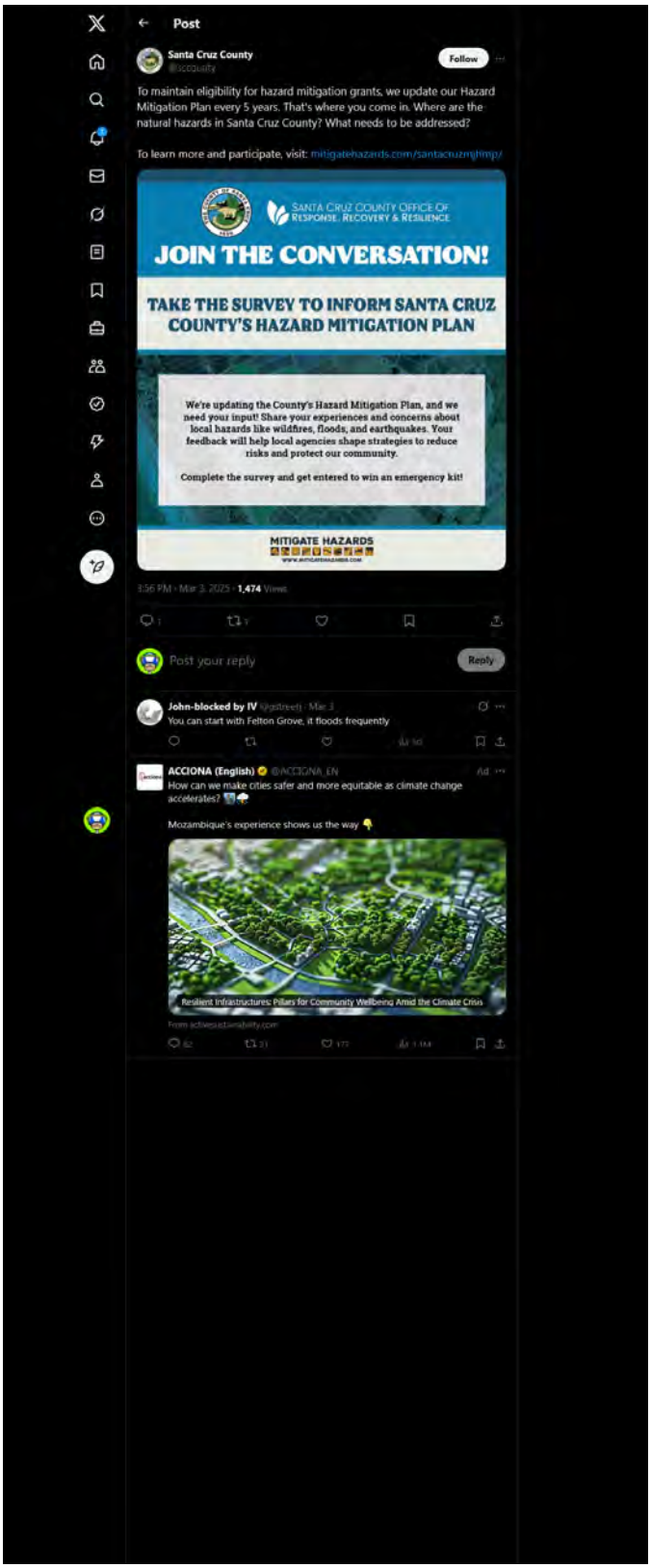
SCCo Facebook Posting



SCCo Instagram Posting



SCCo X Posting Spanish



SCCo X Posting



Survey Advertisement on Scotts Valley Facebook 4-10-25

Outlook

Santa Cruz County MJHMP - March Steering Committee Update and SURVEY LAUNCH!

From Clare Peabody <Clare.Peabody@santacruzcountyca.gov>

Date Mon 3/3/2025 9:41 AM

To David Reid <David.Reid@santacruzcountyca.gov>; Toto VuDuc <toto.vuduc@watsonville.gov>; Courtney Lindberg <courtney.lindberg@watsonville.gov>; Kahn, Jessica <jkahn@ci.capitola.ca.us>; Herlihy, Katie (kherlihy@ci.capitola.ca.us) <kherlihy@ci.capitola.ca.us>; Carly Blanchard <cblanchard@scottsvalley.gov>; Taylor Bateman <tbateman@scottsvalley.gov>; Skyler Murphy <skylerm@soquelcreekwater.org>; Soquel Water Shelley Flock <shelleyf@soquelcreekwater.org>; David McNair <DMcNair@svwd.org>; Nate Gillespie <ngillespie@svwd.org>; Lisa Lurie <llurie@rcdsantacruz.org>; Brian Lockwood <lockwood@pvwater.org>; maclaurie@santacruzharbor.org <maclaurie@santacruzharbor.org>; Luis Toledo <lutoledo@cabrillo.edu>; Julia Charles <jucharle@cabrillo.edu>

Cc Jason Hoppin <Jason.Hoppin@santacruzcountyca.gov>; Ethan E. Mobley <ethan@dynamicplanning.co>; Brian Greer <Brian@dynamicplanning.co>

Hello Santa Cruz County MJHMP Steering Committee,

I hope this finds you well! Thank you for your attendance at Planning Committee Meeting # 1 last month and for your engagement in the planning process so far. I want to provide a quick update on where we are in the MJHMP process and what's coming next. As **Steering Committee representatives**, you are the leads for your jurisdictions and the liaison to our consultant team. If you need a recap on Meeting # 1, you can find all materials on the project website:

Stakeholder Resources
Password: SantaCruz2025

Schedule Update

- **March 27:** Planning Committee Meeting #2 (In person @ EOC) / *TOPIC: Hazard Mapping & Community Vulnerabilities*
- **April – May** (following Meeting # 2): Round 1 of **jurisdiction-specific breakout sessions**
- **Early June** (tent. June 2): Planning Committee Meeting # 3 (Location TBD) - / *TOPIC: Mitigation Strategy Development*
- **June–July:** Second round of **breakout sessions** to refine strategies for each jurisdiction
- **Late July** (tent. July 31): Planning Committee Meeting # 4 - Final plan review
- **October 2025:** Final draft plan submission to CalOES/FEMA

Survey Launch & Media Kit

We are ready to launch the **public survey** to gather input on community hazard concerns. We have prepared press releases and social media materials to promote survey participation in both English and Spanish. Please help distribute these within your networks. Custom branded media graphics for each jurisdiction have been developed and can be downloaded here: **Santa Cruz Survey Media Kit Download** Also feel free to re-share the County's posts across social platforms (coming early this week!).

Next Steps: Breakout Sessions and Ongoing Outreach

- Here is the point at which I hand off to the DP+S team! Our consultant team will be reaching out to each of you next week directly to coordinate the **press release** for the public survey; as well as schedule a **breakout session** following PC2 specific to your jurisdiction.

Survey HMP Participant Blast_Part1

- Additionally, over the next few months we will be identifying **outreach opportunities** at public events such as Farmers' Markets, resource fairs, etc. to share more information about the plan, share preparedness/mitigation resources, and promote the survey to the wider community. Have an idea for a standalone public event / workshop? Have an event on the calendar and want to promote the HMP or get some OR3 representation? Reach out to me directly and let's coordinate!

Thank you all, and let me know if you have any questions. Looking forward to seeing you all at Planning Committee Meeting # 2 next month, March 27th at the EOC.

Sincerely,
Clare

Clare Peabody | Emergency Services Analyst (she/her)
SANTA CRUZ COUNTY OFFICE OF RESPONSE, RECOVERY & RESILIENCE
clare.peabody@santacruzcountyca.gov
831.588-9584 (cell)
Website

Survey HMP Participant Blast_Part2

Press Release

Santa Cruz County staff and key stakeholders are updating the current Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The goal of the planning effort is to revisit natural hazard information and update the 2021 plan to account for changes in population and occurrences of natural disasters in the planning area. This effort is two-fold; it assists in reduction of repetitive damages to community infrastructure and the county will maintain eligibility for grants under Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance program.

The county's hazard mitigation plan provides a formal explanation of prevalent hazards within the county and how hazards may affect communities differently. Most importantly, the mitigation strategy presented in the plan responds to the known vulnerabilities within each community and provides prescriptions or actions to achieve the greatest reduction of natural hazard risk. The result of this planning effort could save lives, reduce injury and property damage, and protect the environment in the event of a natural hazard within the county.

The planning effort includes analysis of natural hazards within unincorporated county areas and the incorporated City of Scotts Valley, City of Santa Cruz, City of Capitola, and City of Watsonville. Also assisting in the planning effort are the special districts Soquel Creek Water District, Scotts Valley Water District, Pajaro Valley Water Management Agency, Resource Conservation District of Santa Cruz County, Santa Cruz Port District, and Cabrillo College which are incremental in their knowledge and capacity of managing local water and other natural resources.

Over the coming months the county stakeholders will finalize newly developed mitigation action strategies based upon stakeholder and public consensus.

For more information on the planning effort or the survey please visit
https://mitigatehazards.com/santacruzmjhmp/

Press Release SCC HMP_Part1

Social Media Post

☀️ **Your Voice Matters, Santa Cruz County!** ☀️

We're updating the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) to better prepare our communities for natural disasters. This plan helps save lives, protect property, and reduce damage from future hazards.

📢 We need YOUR input! Share your thoughts to shape strategies that make a difference in your community. Whether you live in Santa Cruz, Scotts Valley, Capitola, Watsonville, or an unincorporated area, your feedback is essential.

🔗 **Take the survey now**: https://mitigatehazards.com/santacruzmjhmp/

Together, we can build a safer, more resilient Santa Cruz County! 💪 🌎

#SantaCruzCounty #HazardMitigation #CommunitySafety #PublicInput #FEMA #DisasterPreparedness

Sample Image, use provided PR_Survey_Information.jpg



Press Release SCC HMP_Part2



PR_Survey_Information_Social Image Spanish (1)



PR Survey Information Social Image Spanish

WHAT IS MITIGATION?

Hazard mitigation *means reducing risks from disasters—before they happen.* From home repairs to public infrastructure upgrades, mitigation means protecting people, property, and our way of life.

WHY IT MATTERS

Santa Cruz County is unique in its geography, history, and exposure to **many different types of hazards.** Our mitigation strategies must address:

Tsunami • Wildfire • Flooding
Coastal Erosion • Landslides
Earthquake • Drought
Extreme Heat • High Winds
Coastal Storms

WHO'S RESPONSIBLE?

- **Public agencies** handle large-scale projects—like road upgrades, drainage improvements, vegetation management, and slope stabilization.
- **Property owners & renters** can take steps to protect their homes and land—such as retrofitting, buying insurance, or clearing brush.

WHAT'S A HAZARD MITIGATION PLAN (HMP)?

The **HMP** is Santa Cruz County's roadmap for reducing disaster risk, which gets updated every 5 years. The County is currently updating the HMP in partnership with local cities / agencies, and we want to hear your concerns and priorities when it comes to mitigation.

➜ Take the survey to inform the plan!

HMP SURVEY LINK

SANTA CRUZ COUNTY OFFICE OF RESPONSE, RECOVERY & RESILIENCE

Participating Jurisdictions

City of Scotts Valley
City of Capitola
City of Watsonville
Scotts Valley Water District
Soquel Creek Water District
Pajaro Valley Water Management Agency (PVWMA)
Santa Cruz Port District
Resource Conservation District (RCD) of Santa Cruz County
Cabrillo College

What is Mitigation Handout 1



What is Mitigation Handout 2



We Need Your Input for Local Hazard Mitigation!

Santa Cruz County is unique in its geography, history, and exposure to many different types of hazards including **Tsunamis, Wildfires, Flooding, Coastal Erosion, Landslides Earthquake, Drought, Extreme Heat, High Winds and Coastal Storms.**

The **Hazard Mitigation Plan (HMP)** is Santa Cruz County's roadmap for reducing disaster risk, which gets updated every 5 years. The County is currently updating the HMP in partnership with local cities and agencies like the RCD, and we want to hear your concerns and priorities when it comes to mitigation.

The RCDs conservation work and hazard mitigation/preparedness assistance are intimately connected through our recognition that **healthy ecosystems can reduce the impact of natural disasters and enhance community resilience.** We are part of a multi-jurisdictional collaborative process across the County working to develop a comprehensive mitigation plan that serves all or our residents and the natural resources that support us. Your voice is an integral part of the process.

Please click HERE now **to take the survey** and help inform the plan. For more information about the planning process, go here.

RCD Newsletter

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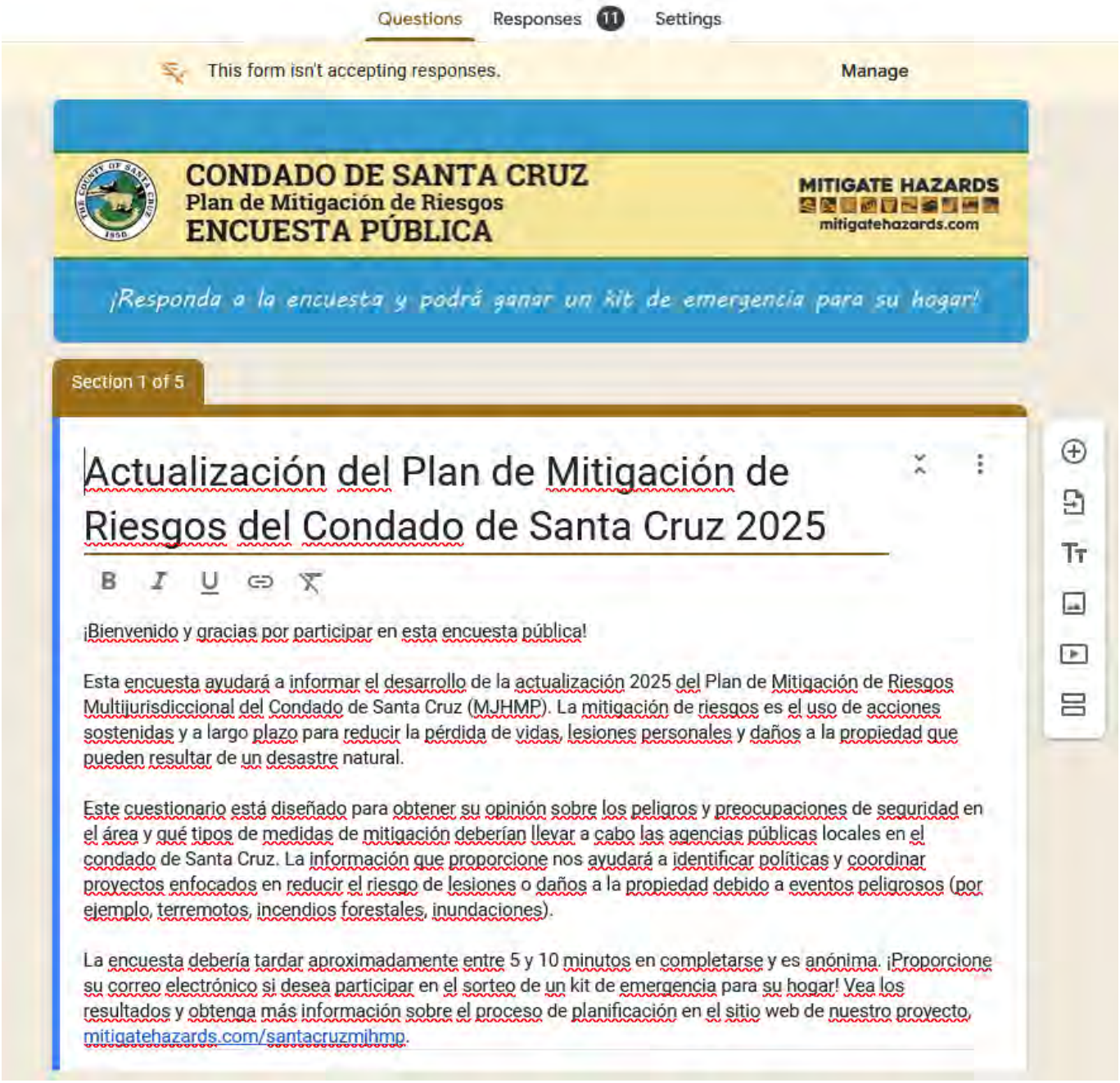
Survey & Results Documentation

Appendix B.3

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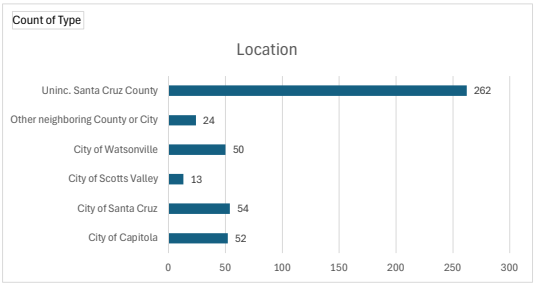


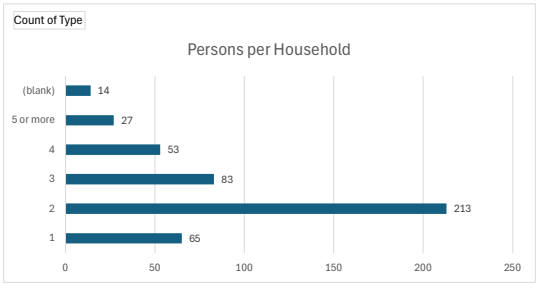
Survey Form English

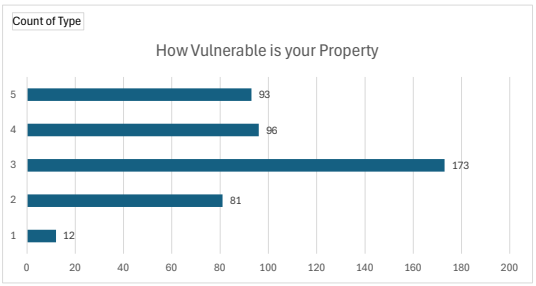


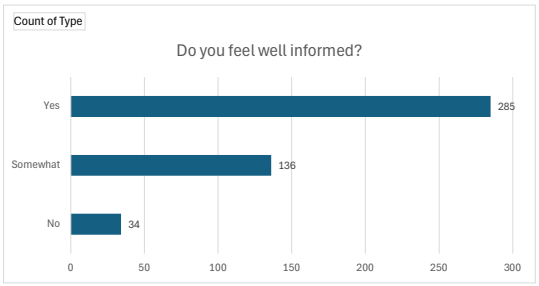
Survey Form Spanish

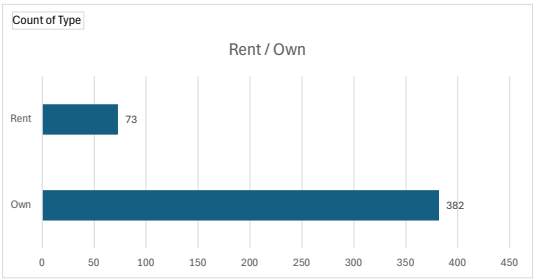
Total Surveys **455**

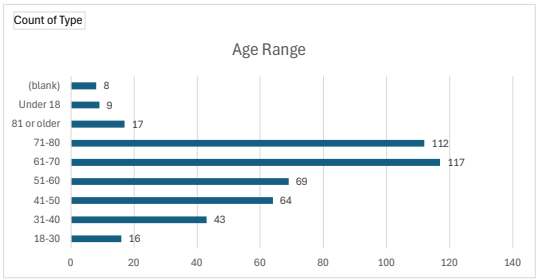


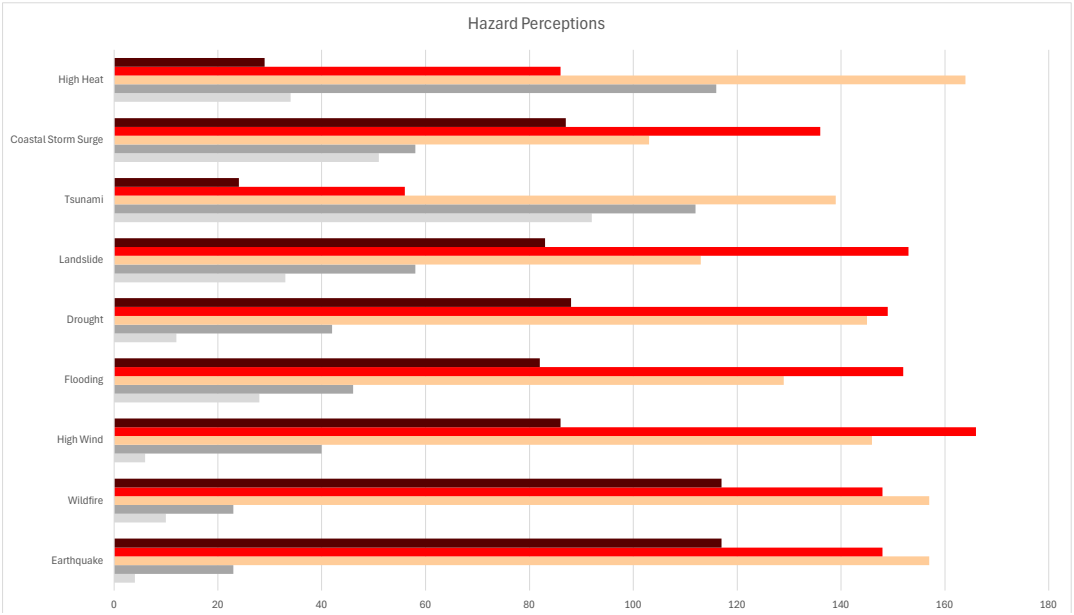




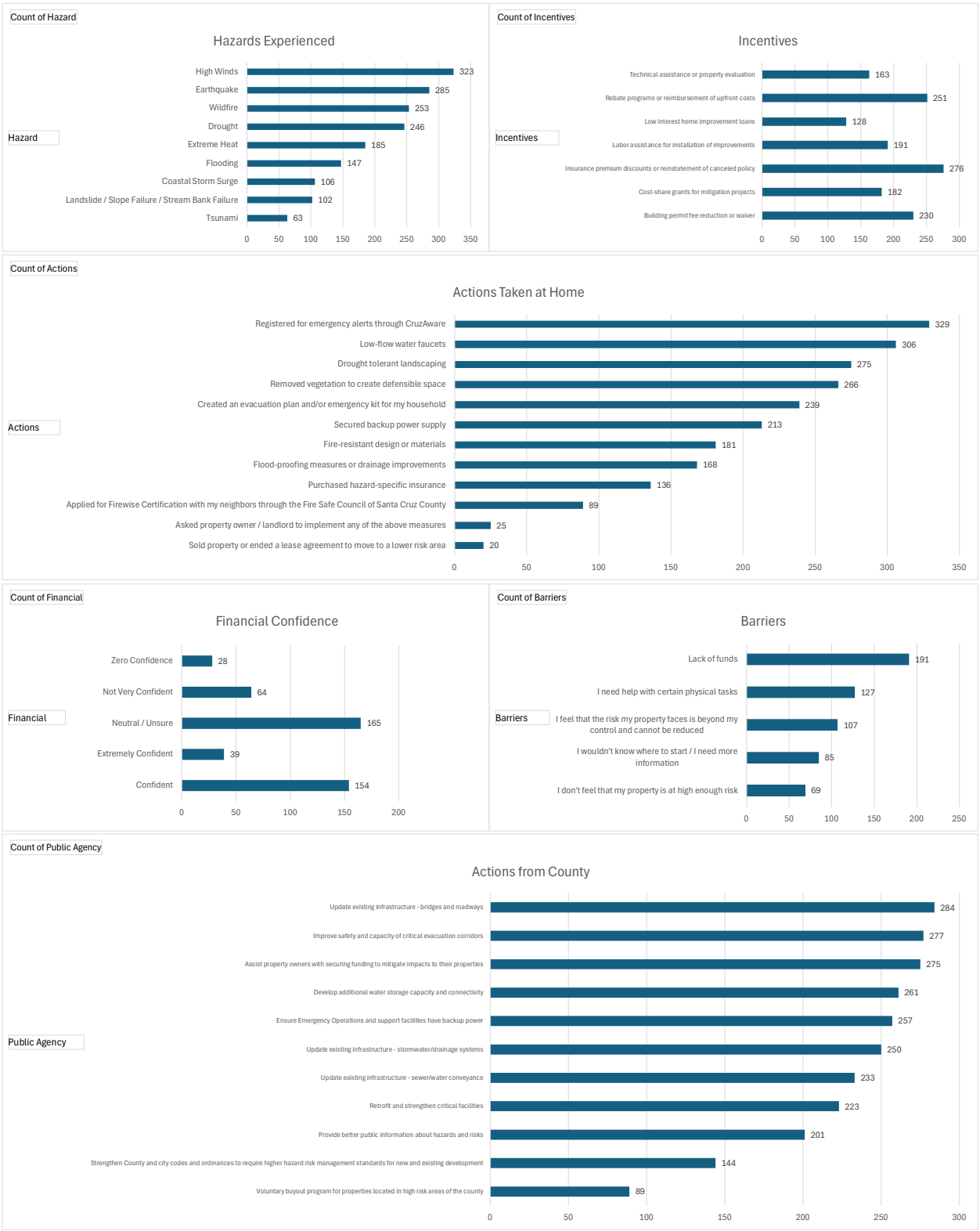








Survey Results A



Survey Results Long B

Mitigation Strategy Prioritization Process Documentation

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HMPT4-19


STATION ASSIGNMENTS
Extreme Temperatures, & Drought) – Clare
Hazards & Severe Weather Hazards) – Ethan
Lake & Slope Failure Hazards) – Chris
Flare and Flood) - Raini
WATSONVILLE
FIRE

HMPT4-21


Wildfire
How to Participate?
Write: One mitigation action per hexagon. Focus on actions where:
Multiple jurisdictions must act together
Shared resources are needed (e.g., funding, data, equipment)
One jurisdiction leads but needs support from others
Evacuation Route Fuel Management
Outreach Support
Website Support
Rural Wildfire Readiness Program
Outreach Program Development

HMPT4-5

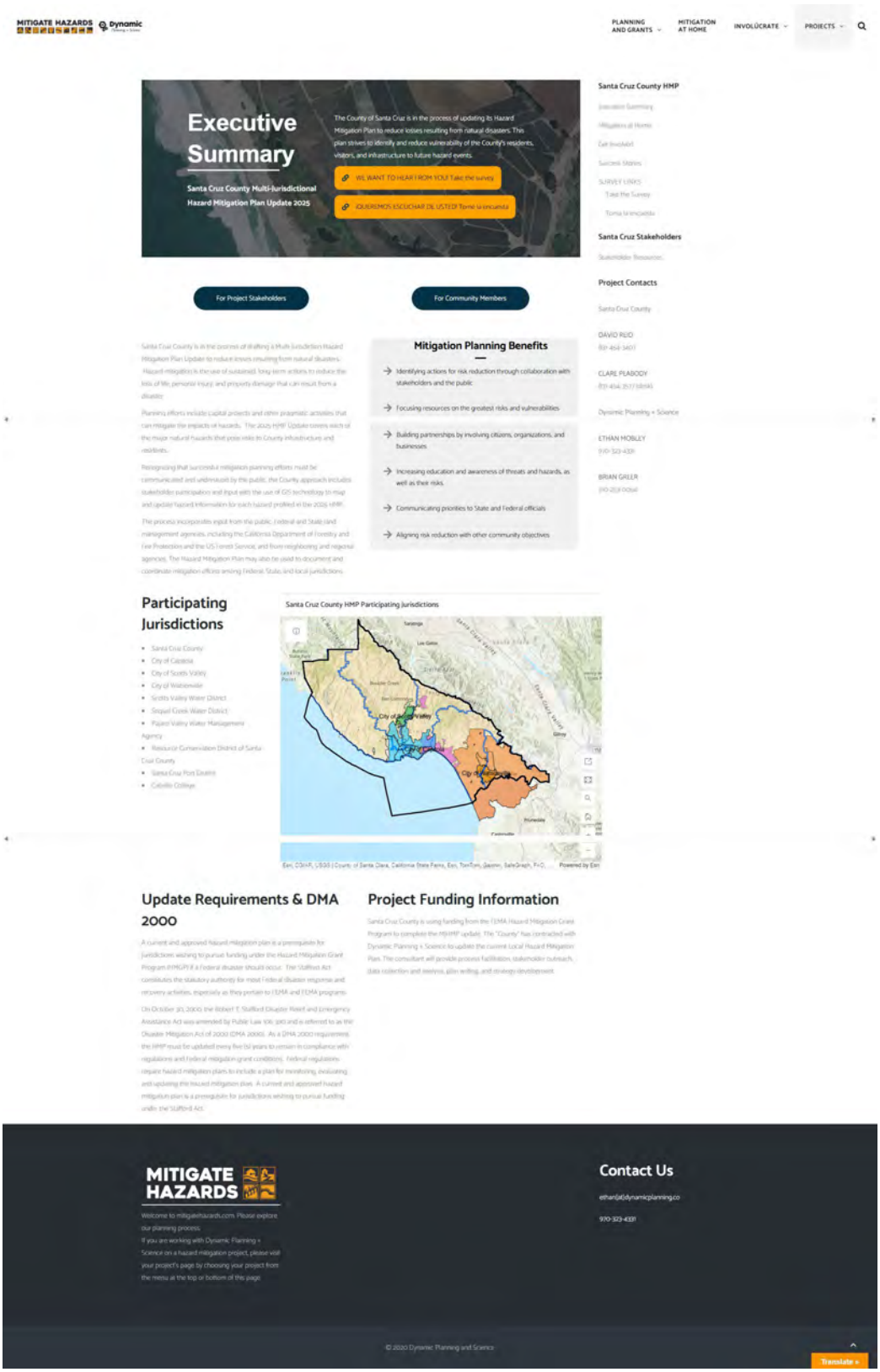


HMPT4-6

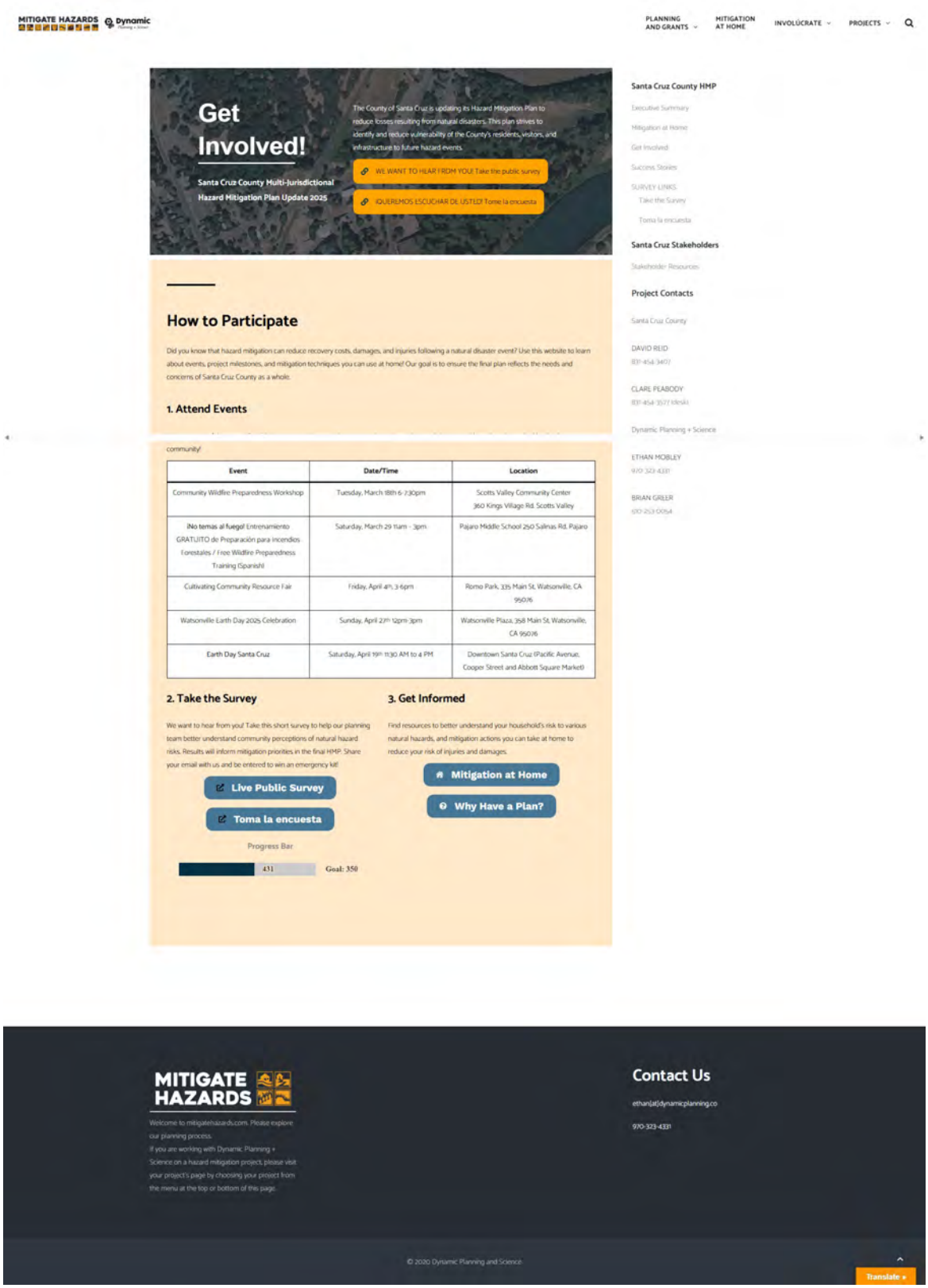
Website Documentation

Appendix B.5

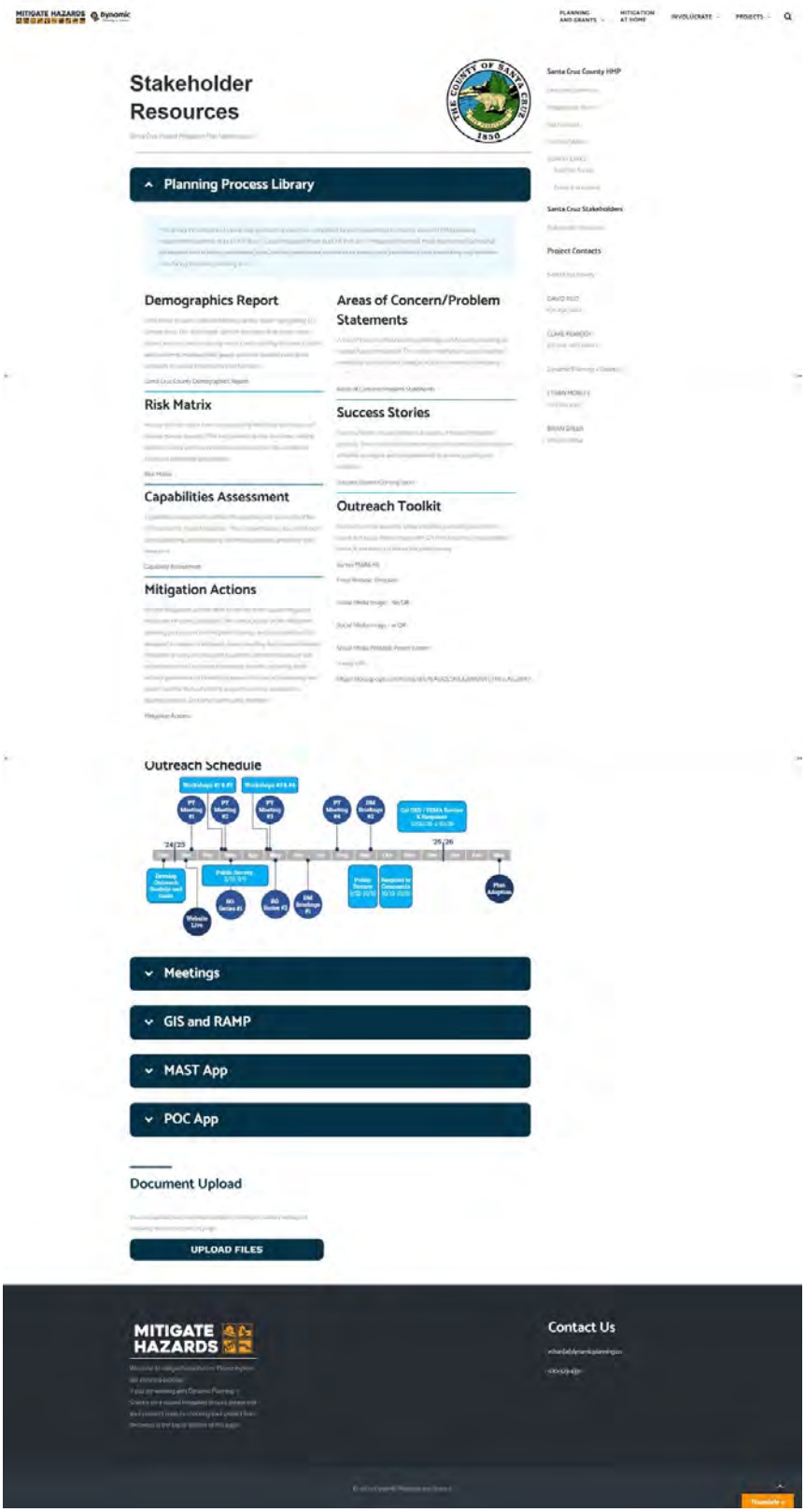
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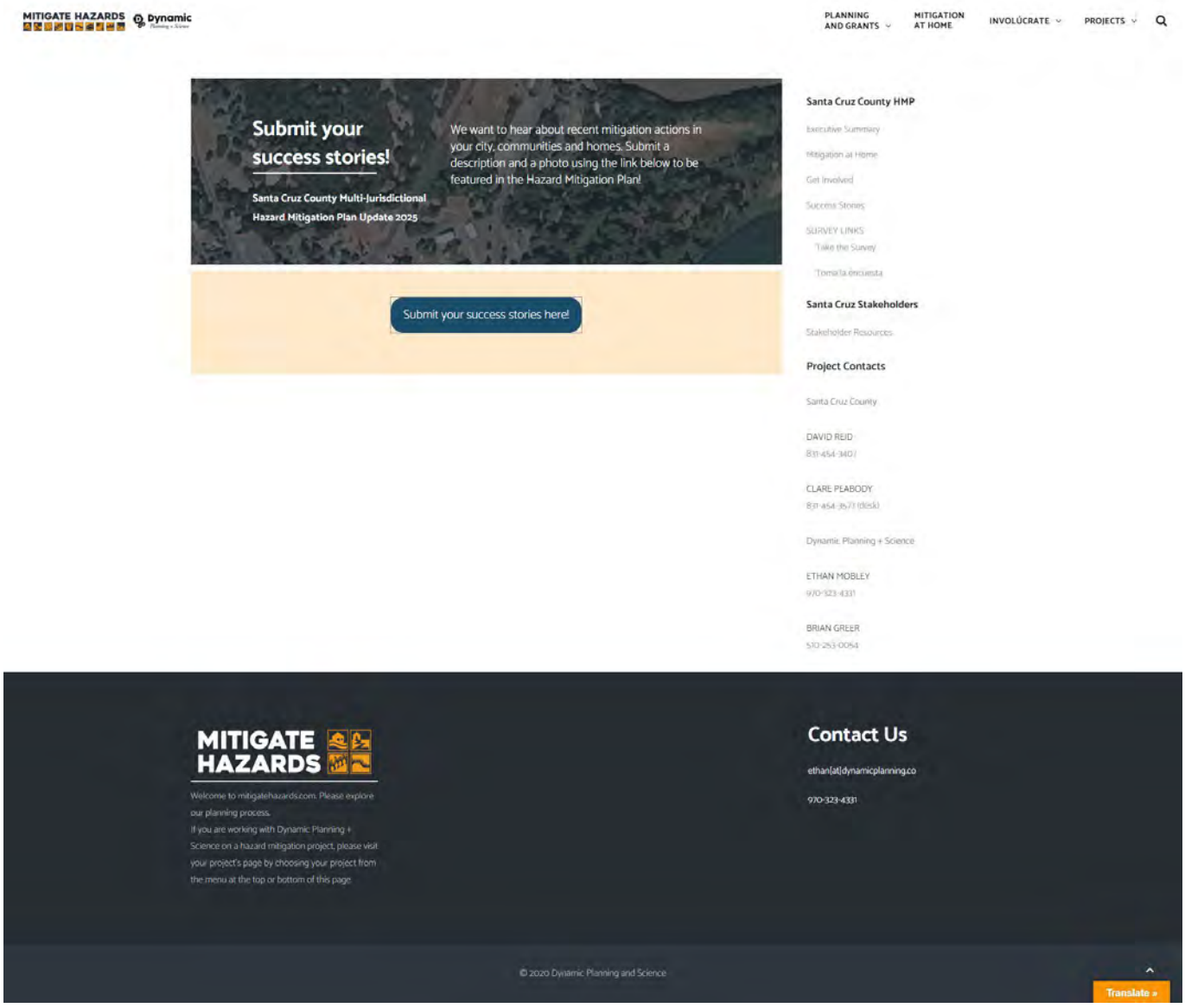
Executive Summary



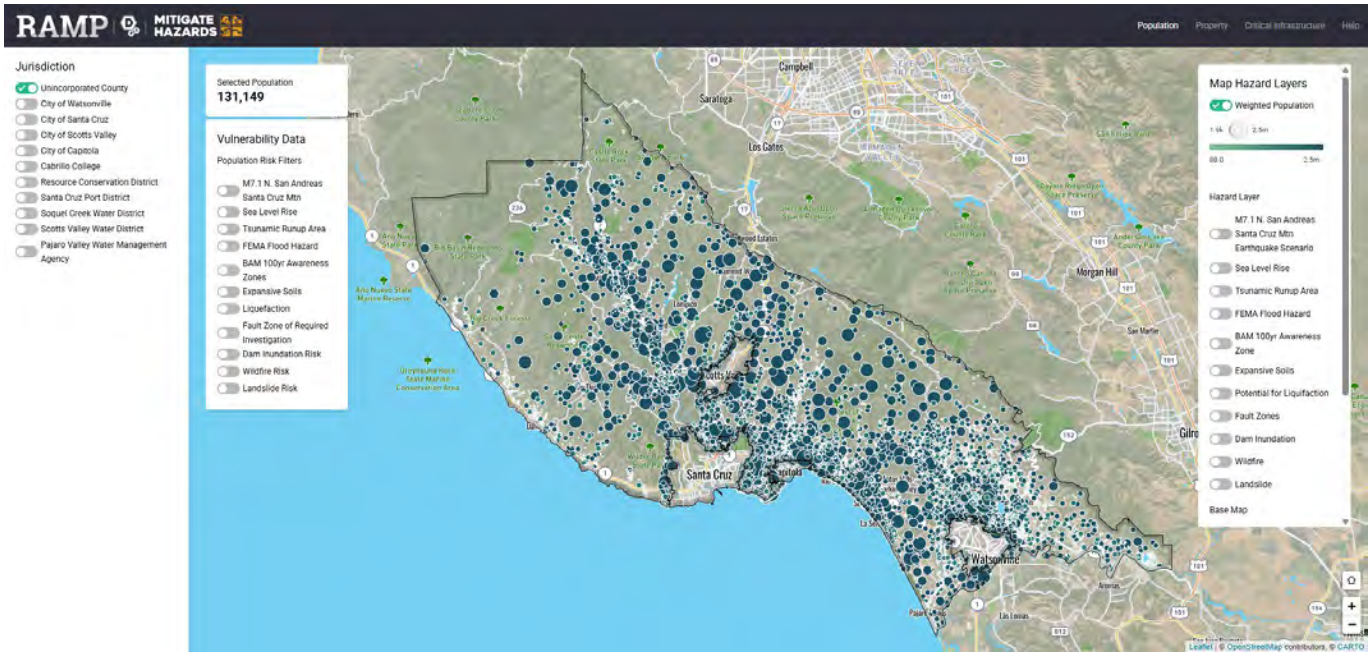
Get Involved



Stakeholder Resources



Success Stories


RAMP
MITIGATE HAZARDS
Population
Property
Critical Infrastructure
Help
Jurisdiction
Unincorporated County
City of Watsonville
City of Santa Cruz
City of Scotts Valley
City of Capitola
Cabrillo College
Resource Conservation District
Santa Cruz Port District
Soquel Creek Water District
Scotts Valley Water District
Pajaro Valley Water Management Agency
Selected Population
131,149
Vulnerability Data
Population Risk Filters
M7.1 N. San Andreas Santa Cruz Mtn
Sea Level Rise
Tsunamic Runup Area
FEMA Flood Hazard
BAM 100yr Awareness Zones
Expansive Soils
Liquefaction
Fault Zone of Required Investigation
Dam Inundation Risk
Wildfire Risk
Landslide Risk
Map Hazard Layers
Weighted Population
Hazard Layer
M7.1 N. San Andreas Santa Cruz Mtn Earthquake Scenario
Sea Level Rise
Tsunamic Runup Area
FEMA Flood Hazard
BAM 100yr Awareness Zone
Expansive Soils
Potential for Liquifaction
Fault Zones
Dam Inundation
Wildfire
Landslide
Base Map
Campbell
Saratoga
Los Gatos
Morgan Hill
Santa Cruz
Watsonville
Scotts Valley
Capitola
Aptos
Soquel
Live Oak
Leaflet | © OpenStreetMap contributors, © CARTO

RAMP

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Outreach Events

Appendix B.6

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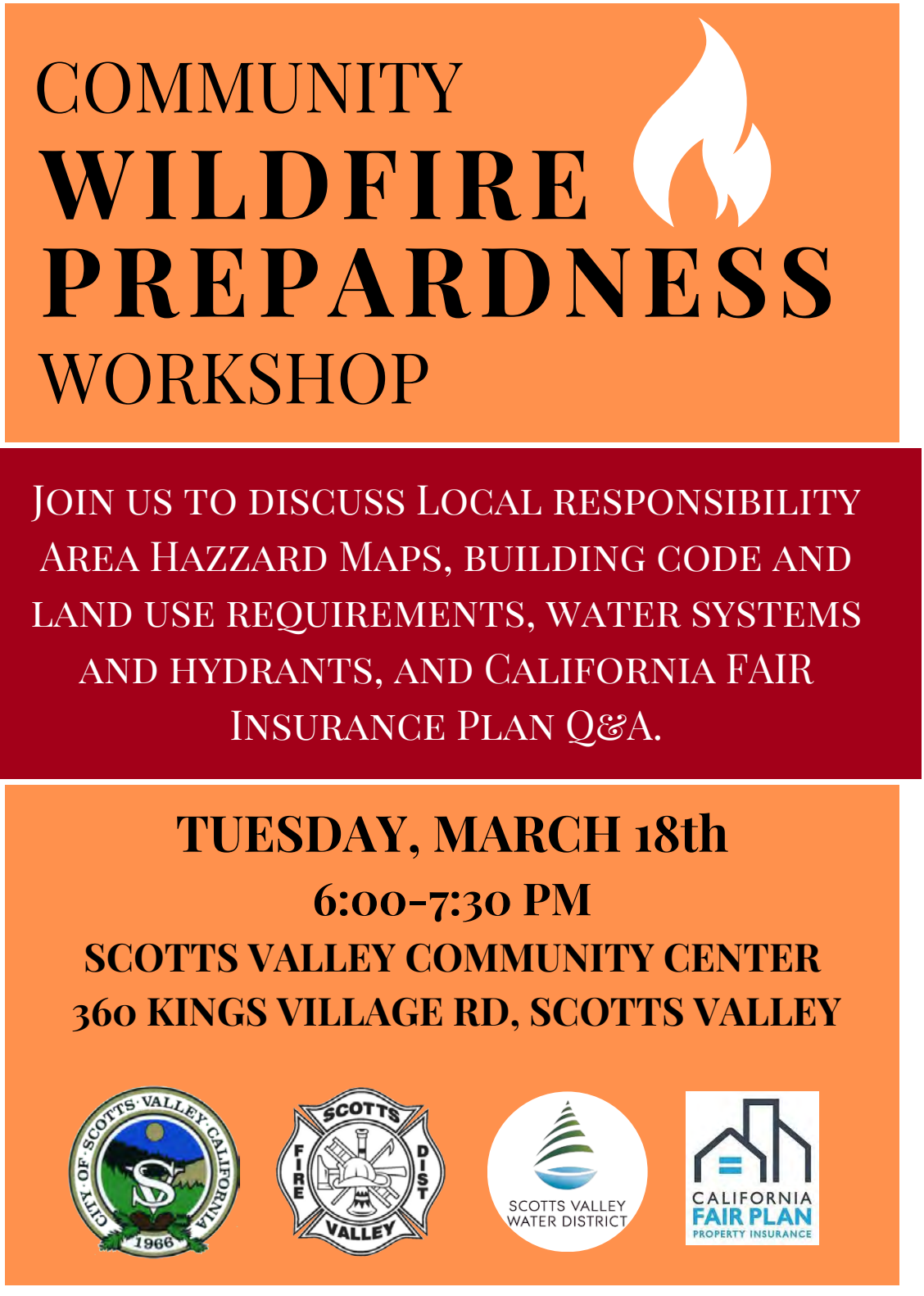
Corralitos Wildfire Resiliency Fair Flier



Watsonville Community Bike Rides



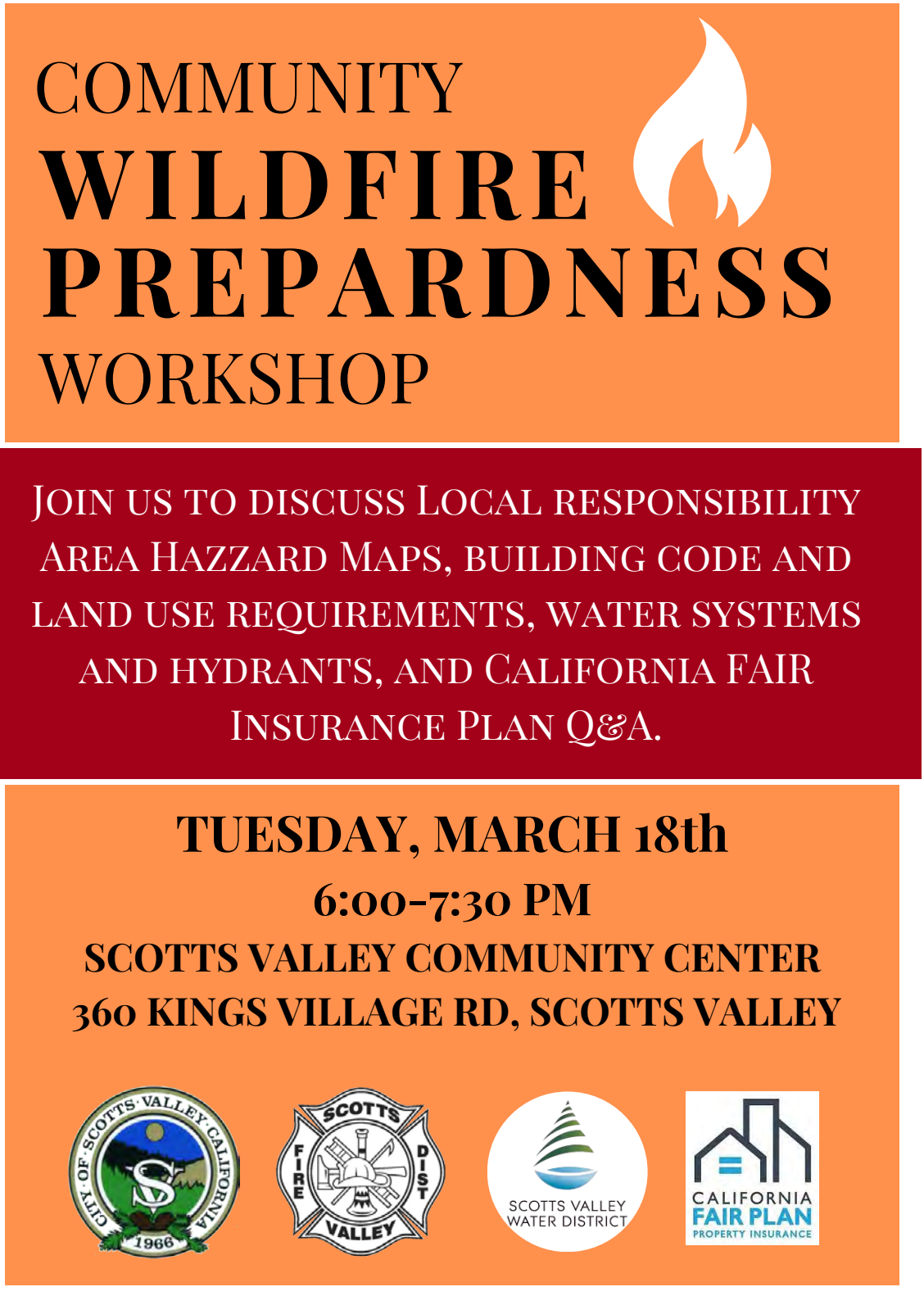
Paseo En Bicicleta Por Watsonville



Community Wildfire Event



Corralitos Wildfire Resiliency Fair



Community Wildfire Event



Cultivating Communities Fair (1)



Cultivating Communities Fair (2)



Capitola City Council Presentation



no temas al fuego

SANTA CRUZ
INTEGRATED REGIONAL WATER MANAGEMENT

REGIONAL WATER MANAGEMENT GROUP MEETING

March 24 (Monday), 2025 from 10 - noon
Hybrid Meeting
In person: Community Foundation Santa Cruz County
Attendance in person is encouraged
7807 Soquel Drive, Aptos, CA 95003

Remote participation: via Zoom
https://us06web.zoom.us/j/2746136931?pwd=CbcGmkYIU1P1bruW9eVQSX18wq9qPE.1&omn=84211095226
Meeting ID: 274 613 6931
Passcode: RWMG

Dial-in Option +1 669 444 9171 US
Meeting ID: 274 613 6931 Passcode: 851062

AGENDA

1. Welcome & Introductions

2. Update on Measure Q Water and Wildlife Protection
   - General Update: *Rebecca Hurley, Santa Cruz County Parks*
   - Updates from Cities, County, Partners that will receive funds: *Round robin/open forum*
     www.santacruzcountyca.gov/MeasureQ.aspx

3. Forest Health and Wildfire Resiliency Regional Collaboration – Regional Project Prioritization
   Matt Abernathy and Lisa Lurie, Resource Conservation District Santa Cruz County

4. Open Forum – Opportunities for updates from agencies and organizations

RWMG Meeting Agenda



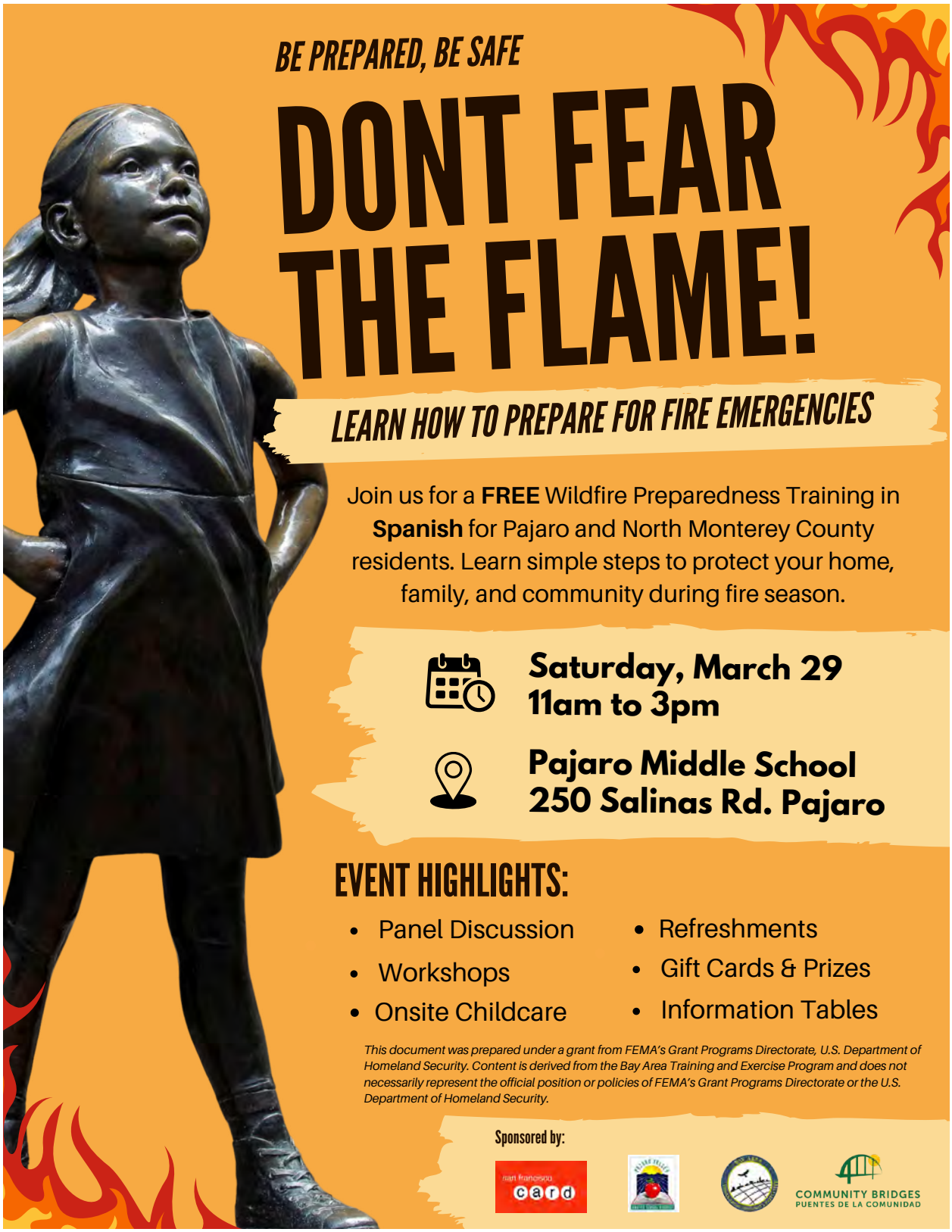
Scotts Valley Wildfire Event



Watsonville Earth Day 1



Watsonville Earth Day 2



Wildfire Preparedness Event Flyer 1



Wildfire Preparedness Event Flyer 2

Pajaro Valley Water Management Agency

English

PAY ONLINE CONSTRUCTION UPDATES

Director Agendas & Minutes

Board Agendas and Minutes

Meetings are held at the Watsonville City Council Chambers, 275 Main Street, 4th Floor, Watsonville, CA 95076. Meetings typically occur the third Wednesday of the month at a 7:00PM start time. For copies of previous agendas or minutes please contact our office. Ordinances can be found under Resources and References. The Rules of Order for all Board Meetings.

PV Water may be able to accomodate online attendance for members of the public during meetings this will be the link: https://www.gotomeet.me/PVWater/board-of-directors If GoToMeeting is being used you call also call in at 1-877-309-2073 Access Code: 347-473-301#

*Meeting dates and location are tentative and subject to change.

2025 DOCS 2024 DOCS 2023 DOCS 2022 DOCS 2021 DOCS

ORDINANCES

2025 Docs

Date	Agenda Packets	Minutes
January 15, 2025	Agenda; Agenda Packet Presentations: CLP Update; FY24 Audit Adopted Resolution: 2025-01, Amending Administration & Finance Committee Bylaws	Minutes

Date	Agenda Packets	Minutes
July 16, 2025	Agenda; Agenda Packet Presentations: SCC MJHMP Update	
August 20, 2025		
September 17, 2025		
October 15, 2025		
November 19, 2025		
December 17, 2025		

Last updated on September 12, 2023.

Contact PV Water

Pajaro Valley Water Management Agency

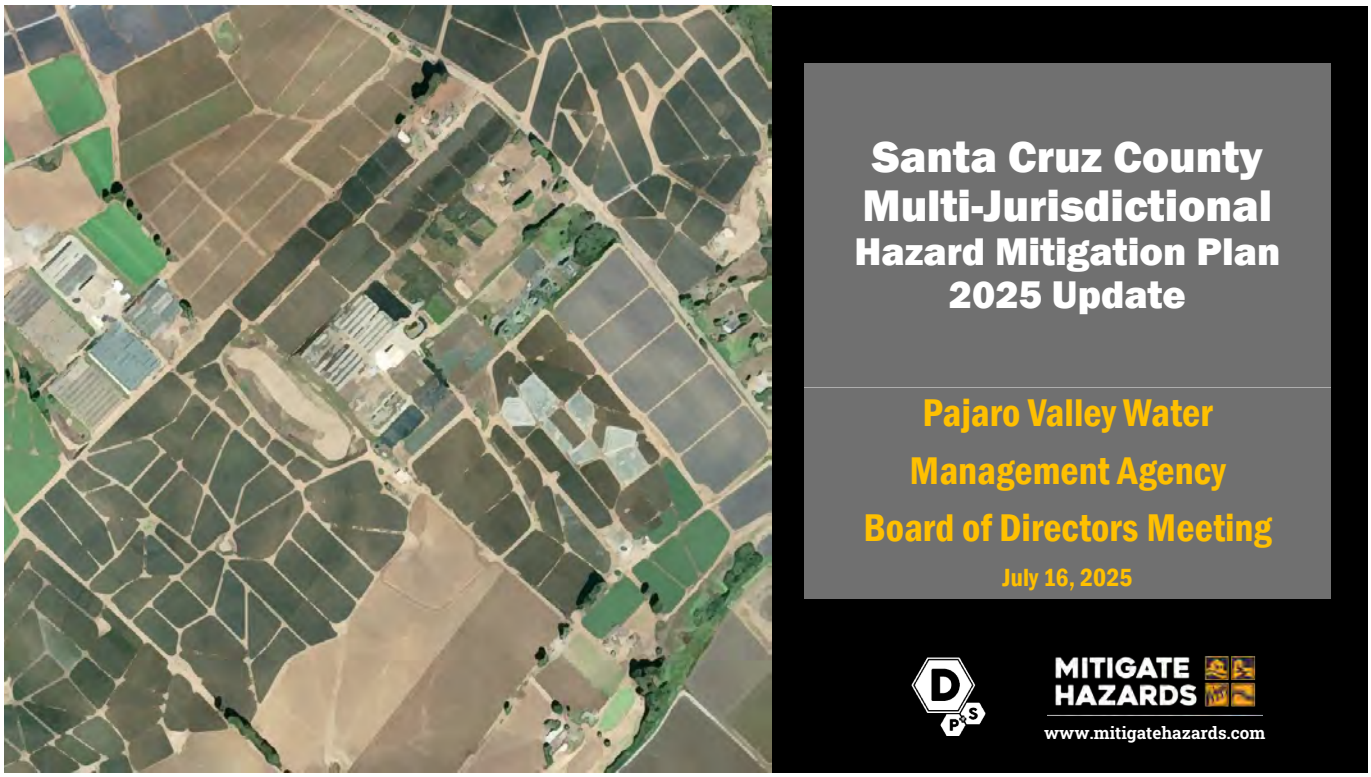
36 Brennan St.
Watsonville, CA 95076

1 (831) 722-9292

Info@PVWater.org

View Our Staff Directory

PVWMA Board Meeting Agenda 2



PVWMA Board Meeting Slide

SANTA CRUZ COUNTY OFFICE OF RESPONSE, RECOVERY & RESILIENCE

EMERGENCY MANAGEMENT COUNCIL
When: May 15, 2025, 1-3pm
Where: EOC, 5200 Soquel Ave., Santa Cruz

AGENDA

1. **Call to Order/Instructions for participation**
2. **Roll Call (*Emergency Management Council Appointed Members, Districts 1-5*)**
3. **Changes to the Agenda**
4. **Approval of Minutes** *(Attachment A)*
5. **Old Business –** Can EMC operate as a Hybrid Meeting?
6. **New Business**
7. **Informational Reports**
   - 7.1 Fire Safe Council – Lauren Moody
   - 7.2 OR3 – Multi-jurisdiction Hazard Mitigation Plan update, Federal Grants update
   - 7.3 City of Scotts Valley – Jason Rutherford
   - 7.4 City Of Santa Cruz – Robert Oatey/Meredith Albert
   - 7.5 City of Capitola – Leo Moreno
   - 7.6 City of Watsonville – Tom Avila
   - 7.7 County Office of Education – Rishi Lal
   - 7.8 Santa Cruz County Sheriff – Dan Freitas/Nicholas Baldrige
   - 7.9 County Fire – Jed Wilson
   - 7.10 Central Fire – Nigel Miller
8. **Non-Governmental Organizations**
   - 8.1 CERT Council – Amanda Gullings
   - 8.2 CERT Auxiliary – John Collins/Mary Edmond
   - 8.3 Medical Reserve Corp – Jessie Bola/ Greg Benson
   - 8.4 Amateur Radio Emergency Service (ARES) – John Gerhardt
   - 8.5 American Red Cross – Patsy Gasca

Emergency Management Council Agenda 1

SANTA CRUZ COUNTY OFFICE OF RESPONSE, RECOVERY & RESILIENCE

8.6 Watsonville Emergency Airlift Command Team (WEACT) – Tom Hail

8.7 UC Santa Cruz – Stephan Edgar/Vanessa Ackerman

9. **OR3 Grant Updates**

9.1 FY 2022 State Homeland Security Grant Program (SHSGP) – OPEN, closing 5/30/25

9.2 FY 2023 State Homeland Security Grant Program (SHSGP) – OPEN

9.3 FY 2024 State Homeland Security Grant Program (SHSGP) – Final Scope Pending Approval

9.4 FY 2025 State Homeland Security Grant Program (SHSGP) – Projects submitted for consideration

9.5 FY 23 Emergency Management Performance Grant (EMPG) – Closing 6/30/25

9.6 FY 24 Emergency Management Performance Grant (EMPG) – Approved

9.7 California Fire Safe Council – County Coordinator Grant ROUND 2 – Submitted

9.8 FEMA Building Resilient Infrastructure & Community Grant – Beginning Scope Development, Environmental permit scope development

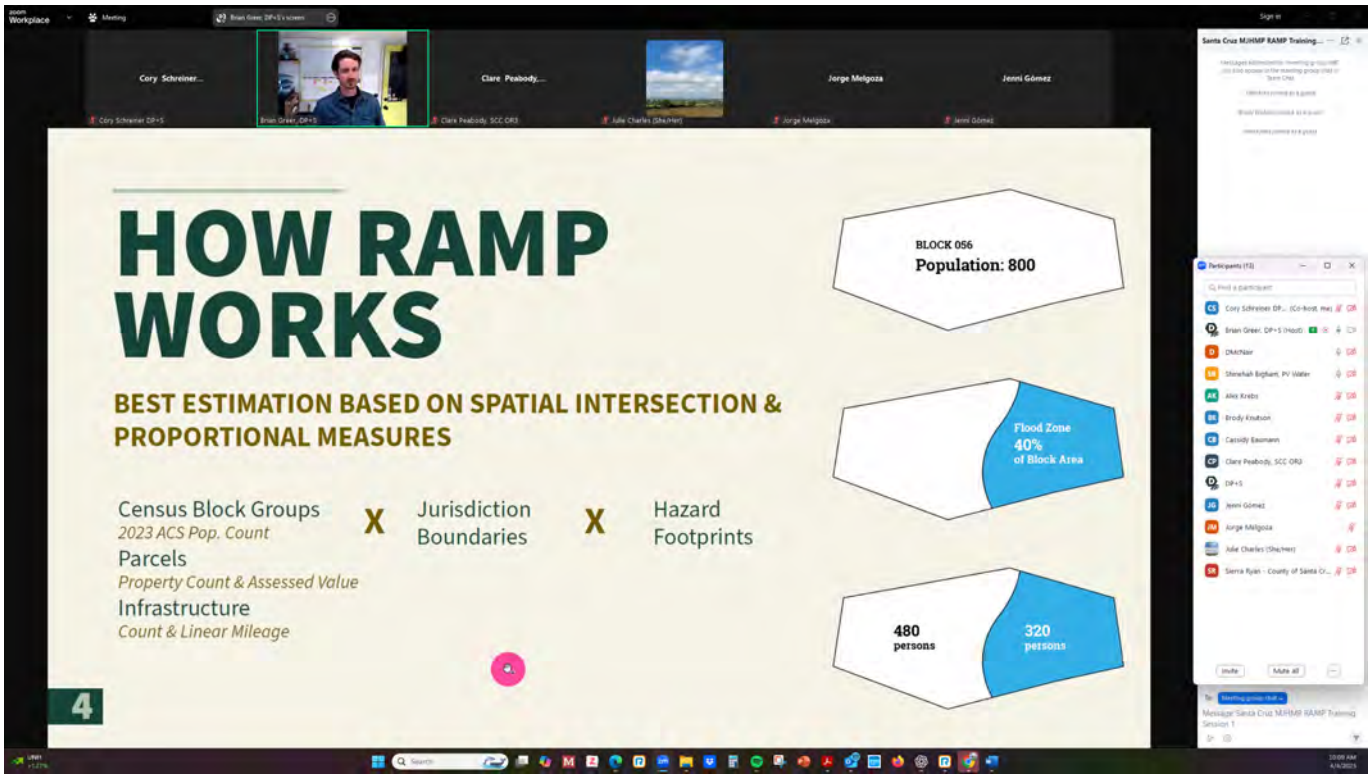
10. **Announcements**

11. **Adjourn**

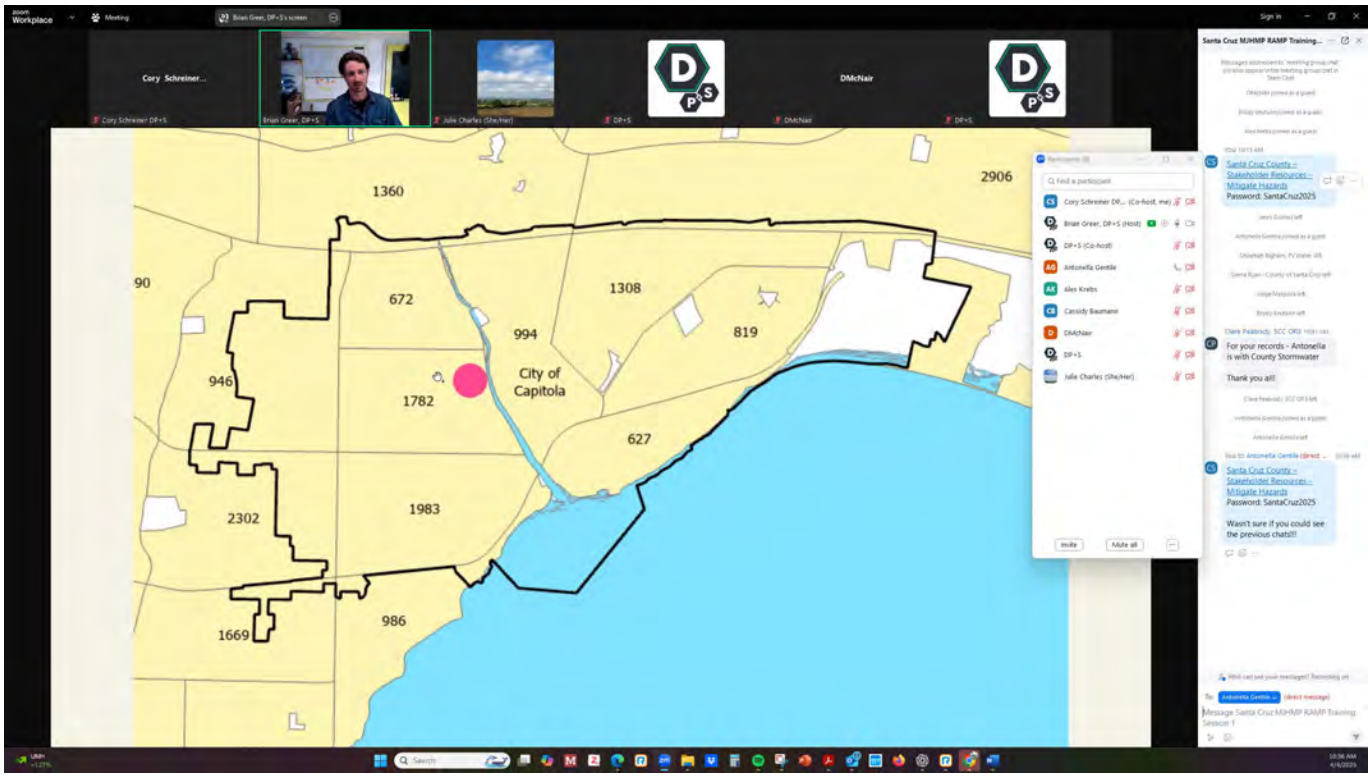
Emergency Management Council Agenda 2



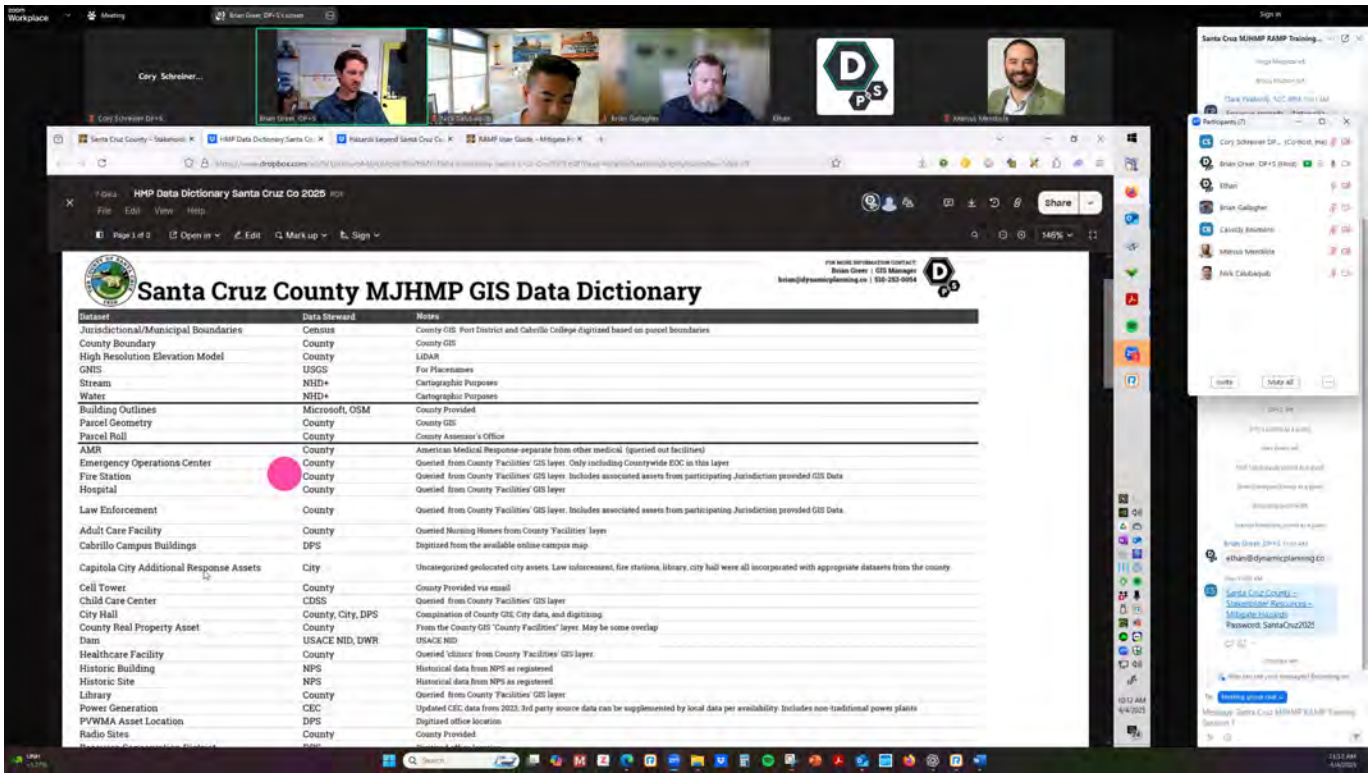
Emergency Management Council Slides



RAMP Training Session 1

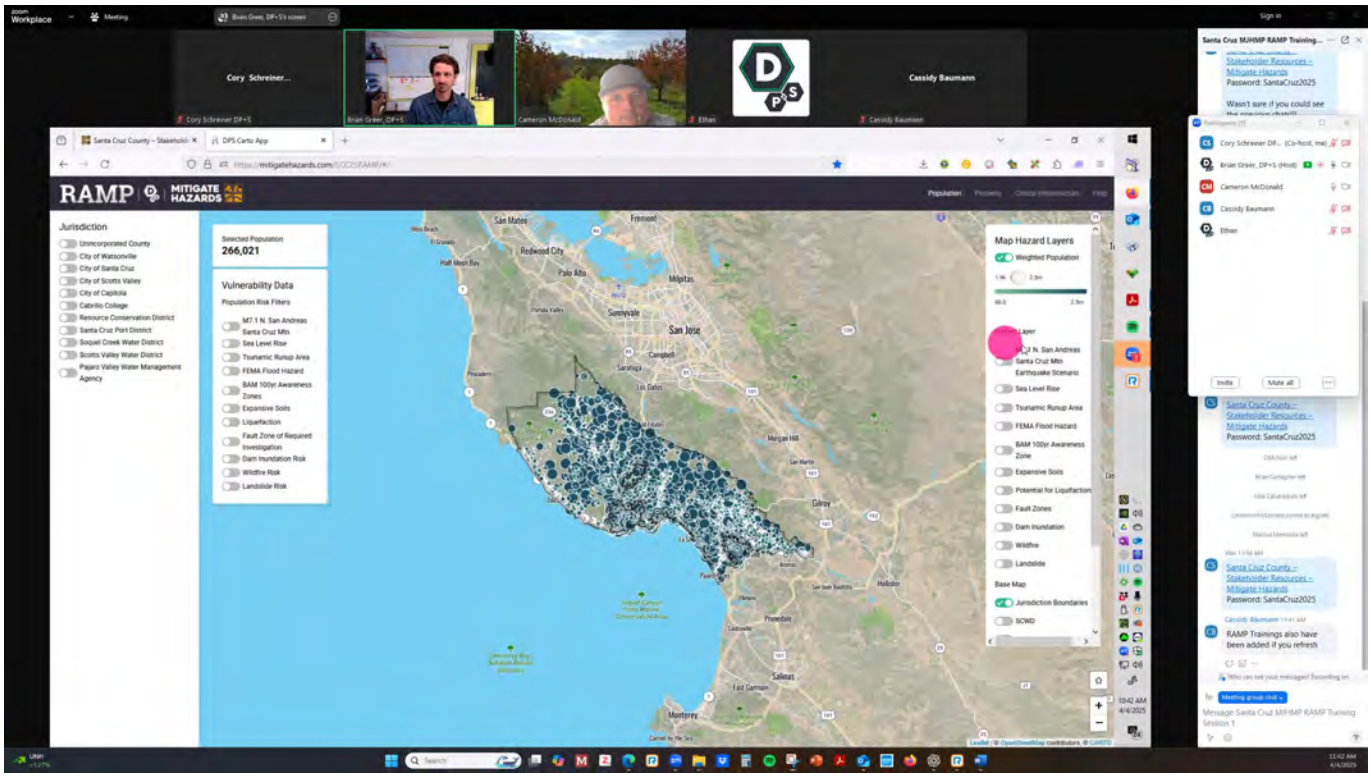


RAMP Training Session 2



Dataset	Data Steward	Notes
Jurisdictional/Municipal Boundaries	Census	County GIS. Port District and Cabrillo College digitized based on parcel boundaries
County Boundary	County	County GIS
High Resolution Elevation Model	County	LiDAR
GNIS	USGS	For Placenames
Stream	NHD+	Cartographic Purposes
Water	NHD+	Cartographic Purposes
Building Outlines	Microsoft, OSM	County Provided
Parcel Geometry	County	County GIS
Parcel Roll	County	County Assessor's Office
AMR	County	American Medical Response-separate from other medical. (queried out facilities)
Emergency Operations Center	County	Queried from County 'Facilities' GIS layer. Only including Countywide EOC in this layer
Fire Station	County	Queried from County 'Facilities' GIS layer. Includes associated assets from participating Jurisdiction provided GIS Data
Hospital	County	Queried from County 'Facilities' GIS layer
Law Enforcement	County	Queried from County 'Facilities' GIS layer. Includes associated assets from participating Jurisdiction provided GIS Data.
Adult Care Facility	County	Queried Nursing Homes from County 'Facilities' layer
Cabrillo Campus Buildings	DPS	Digitized from the available online campus map
Capitola City Additional Response Assets	City	Uncategorized geolocated city assets. Law enforcement, fire stations, library, city hall were all incorporated with appropriate datasets from the county
Cell Tower	County	County Provided via email
Child Care Center	CDSS	Queried from County 'Facilities' GIS layer
City Hall	County, City, DPS	Compination of County GIS, City data, and digitizing.
County Real Property Asset	County	From the County GIS "County Facilities" layer. May be some overlap
Dam	USACE NID, DWR	USACE NID
Healthcare Facility	County	Queried 'clinics' from County 'Facilities' GIS layer.
Historic Building	NPS	Historical data from NPS as registered
Historic Site	NPS	Historical data from NPS as registered
Library	County	Queried from County 'Facilities' GIS layer
Power Generation	CEC	Updated CEC data from 2023; 3rd party source data can be supplemented by local data per availability. Includes non-traditional power plants
PVWMA Asset Location	DPS	Digitized office location
Radio Sites	County	County Provided

RAMP Training Session 3



RAMP Training Session 4



Watsonville Strawberry Festival 1



Watsonville Strawberry Festival 2