Humboldt County Operational Area

Hazard Mitigation Plan

VOLUME 1

Area-Wide Elements

July 2025 Draft

Cover photo courtesy of Lindsey Esh

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1. Executive Summary

Hazard mitigation is the use of long-term and short-term policies, programs, projects and other activities to reduce the risk of death, injury and property damage that can result from a disaster. Humboldt County, in collaboration with local governments in the operational area, has developed an updated Local Hazard Mitigation Plan (LHMP) to mitigate risks from natural disasters in the Humboldt County Operational Area (OA). The plan complies with federal and state hazard mitigation planning requirements, establishing eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs for all planning partners.

1.1. Planning Partners

This plan is a comprehensive update of the 2020 Humboldt Operational Area Hazard Mitigation Plan, which covered the unincorporated county, the cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Rio Dell and Trinidad, as well as 18 special-purpose districts in the county. FEMA approved the 2020 plan on March 11, 2020, and it expired on March 10, 2025. This update reestablishes FEMA hazard mitigation grant assistance eligibility for participating planning partners. The planning partners for the 2025 update were listed on the Humboldt County Government website and are displayed in Table 1.

Currently, only the County of Humboldt, the City of Rio Dell, and McKinleyville Community Services District are seeking FEMA approval. This plan is intended to be reviewed as a standalone local hazard mitigation plan document. All participating jurisdictions will be incorporated into the Humboldt County plan through amendments at a later date.

Table 1: Planning Partners

Jurisdiction	Participant
Humboldt County	Ryan Derby and Patric Esh
Arcata Fire District	Chris Emmons
Big Lagoon Community Services District (new)	Richard Maier
City of Arcata	Danielle Allred
City of Blue Lake	Amanda Mager
City of Eureka	Kelly Allen
City of Ferndale	Jay Parrish
City of Fortuna	Shari Meads
City of Rio Dell	Kyle Knopp

Jurisdiction	Participant
City of Trinidad	Angela Cather
Fieldbrook Glendale Community Services District	Richard Hanger
Fortuna Fire Protection District	Rus Brown
Humboldt Bay Fire	William Reynolds
Humboldt Bar Harbor, Recreation and Conservation District	Chris Mikkelsen
Humbolt Bay Municipal Water District	Michiko Mares
Humboldt Community Service District	Terrence Williams
Manila Community Services District	Christopher Drop
McKinleyville Community Services District	Pat Kaspari
Peninsula Community Services District	Dale Unea
Redway Community Services District	Cody Cox
Rio Dell Volunteer Fire District (new)	Shane Wilson
Resort Improvement District No. 1, Shelter Cove	Chris Christianson
Southern Humboldt Community Healthcare District	Chris Valk
Westhaven Community Services District	Paul Rosenblatt
Willow Creek Community Services District	Susan O'Gorman
Willow Creek Fire Protection District (new)	Samantha Smith

1.2. Plan Organization

A core planning team, consisting of a contracted consultant and Humboldt County staff, was assembled to develop this plan update. A planning partnership was formed by engaging eligible local governments in the operational area and ensuring they understood their compliance expectations under the updated plan.

A steering committee was assembled to oversee the plan update, consisting of governmental and non-governmental stakeholders in the operational area. Coordination with other county, state and federal agencies involved in hazard mitigation occurred throughout the plan update process.

Organization efforts included a review of the 2020 Humboldt Operational Area Hazard Mitigation Plan, the California State Hazard Mitigation Plan (SHMP) and existing programs that may support hazard mitigation actions. The updated plan continues to have two volumes. Volume 1 includes components that apply to all partners and the broader operational area.

Volume 2 consists of all jurisdiction-specific components, with each planning partner having a dedicated annex.

1.2.1. Planning Process

The update process was initiated by a series of meetings to ensure input from planning partners and stakeholders across the planning area. The planning team implemented a multimedia public involvement strategy utilizing the outreach capabilities of the planning partnership, which was approved by the Steering Committee. The strategy included public meetings, a hazard mitigation survey, a project website, the use of social media and multiple media releases to ensure the public could contribute to the planning process.

1.2.2. Risk Assessment

Risk assessment is the process of measuring the potential loss of life resulting from natural hazards, as well as personal injury, economic injury and property damage, to determine the vulnerability of people, buildings and infrastructure to natural hazards. For this update, risk assessment models were enhanced with new data and technologies that have become available since 2010. The Steering Committee used the risk assessment to rank risk and gauge the potential impacts of each hazard of concern in the operational area. The risk assessment included an assessment of the impact of hazards on physical, social and economic assets, identification of areas of vulnerability and estimates of the cost of potential damage.

1.2.3. Mitigation Strategy

The Steering Committee reviewed and updated the goals from the 2020 plan, while the objectives from the 2020 Humboldt Operational Area Hazard Mitigation Plan remained unchanged. The full list of goals can be found in the Mitigation Strategy Section. Planning partners reviewed their previous mitigation actions, shared status updates and evaluated whether each action should be completed, deferred, deleted, or ongoing. In addition to the prior mitigation actions, the jurisdictions reviewed the countywide initiatives.

1.2.4. Plan Maintenance

The Steering Committee developed a plan implementation and maintenance strategy that includes grant monitoring and coordination, a strategy for continued public involvement, a commitment to plan integration with other relevant plans and programs, and a recommitment from the planning partnership to actively monitor and evaluate the plan over the five-year performance period.

1.2.5. Plan Adoption

Once pre-adoption approval has been granted by the California Governor's Office of Emergency Services (Cal OES) and FEMA Region 9, the final adoption phase will begin. Each planning partner will adopt the updated plan individually.

2. Planning Process

FEMA defines hazard mitigation as any sustained action taken to reduce or eliminate long-term risks from hazards to people or property. Hazard mitigation activities include planning efforts, policy changes, programs, studies, capital improvement projects, nature-based solutions and other steps to reduce the impacts of hazards.

Prior to 2000, federal disaster funding focused on relief and recovery after disasters occurred, with limited funding for hazard mitigation planning. The Disaster Mitigation Act (DMA), passed in 2000, shifted the federal emphasis toward planning for disasters before they occur. The DMA requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Regulations developed to fulfill the DMA's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR). Hazard mitigation plans prepare communities through a comprehensive risk assessment and mitigation action development process to break the cycle of disaster damage, reconstruction and repeated damage. Plan approval expires every five years, prompting this plan update.

2.1. Plan Update – What Has Changed

Since the previous 2019 plan, plan priorities have changed. During this plan update, plan participants emphasized community lifelines and developing clear, effective mitigation actions. Plan participant involvement and public outreach were also noted as important priorities. The size of the previous plan was noted as a challenge for plan implementation. This plan update is intended to streamline the hazard mitigation plan to make it more user-friendly.

In addition, the plan was revised to reflect the federal changes to the hazard mitigation planning program as outlined in FEMA's Local Mitigation Planning Policy Guide, which became effective April 19, 2023. During the plan update process, this guidance changed. Changes are acknowledged where applicable, but the plan was almost completely drafted at the time; therefore, the plan participants elected to retain some information, particularly regarding federal programs, which may or may not be applicable anymore. As federal programs change over the five-year life cycle of the plan, readers are encouraged to explore what resources may be available at the time.

Additional changes to this plan update include the following:

- Expanded public outreach, including an emphasis on engaging socially vulnerable populations, such as by translating the public survey into multiple languages and utilizing a multimodal public survey methodology
- Broader outreach to stakeholders across the operational area, including multiple touchpoints throughout the plan development process

- New Hazus loss estimates utilizing updates to the Hazus software and building stock data, as well as local input to create a Level 2 advanced analysis
- A revised list of hazards of concern, including separating out severe weather into more specific hazard categories instead of a single hazard profile to meet new FEMA requirements
- Incorporation of climate change into each hazard profile as applicable instead of as a separate hazard profile, in accordance with Cal OES best practices
- Hazard profiles that directly reference the community lifelines concepts and profile specific hazard risks to community lifelines
- Additional capabilities assessment information, including required evaluations of opportunities to expand current capabilities and National Flood Insurance Program (NFIP) implementation efforts
- Revised countywide goals that emphasize new priorities for the plan participants and better reflect the participation of special districts in the hazard mitigation planning process
- A new plan maintenance approach that incorporates new capabilities and countywide efforts to monitor and implement hazard mitigation measures moving forward

2.2. Plan Format

The base plan is intended to be reviewed by Cal OES and FEMA on behalf of all plan participants. More specific details and selected mitigation actions are included in each plan participant’s respective annexes. The plan is outlined as follows:

- Executive Summary
- Planning Process
- Community Profile
- Programs and Regulations
- Risk Assessment
    - Dam Failure
    - Drought
    - Earthquake
    - Extreme Temperatures (Hot and Cold)
    - Flooding
    - Landslide
    - Tsunami

  - Wind
  - Winter Weather
  - Wildfire
- Mitigation Strategy
- Plan Maintenance and Implementation
- Appendix A: Public Involvement Materials and Planning Process
- Appendix B: Plan Adoption Resolutions from Planning Partners
- Annexes (one per plan participant)

2.3. Plan Development Schedule and Milestones

The plan was developed on an expedited schedule to minimize the amount of time the plan remained expired in order to enable plan participant eligibility for federal hazard mitigation grants. Table 2 outlines key milestones achieved during this plan update process.

Table 2: Plan Development Schedule and Milestones

Task	Date	Description
Planning Process	December 2024-June 2025	Document the planning process, including identifying plan participants, stakeholders and public outreach opportunities. Conduct public outreach and incorporate input into draft plan. Conduct Kickoff Meeting. Complete Capability Assessment survey.
Public Outreach, Meetings and Public Hearings	December 2024-June 2025	Implement public engagement plan and solicit input on public review draft.
Hazard Identification	January 2025-April 2025	Update draft community profile and hazard profiles, including climate change and community lifelines.
Risk Assessment	January 2025-April 2025	Review and update current risk assessment, including geographic information system (GIS) mapping and Hazus Level 2 analysis. Conduct risk assessment meeting. Complete Risk Assessment forms.
Planning Partner Workshops	March 2025	Host workshops on the mitigation strategy for municipal partners and special districts.

Task	Date	Description
Mitigation Strategy	March 2025-April 2025	Identify mitigation goals and actions. Consider a comprehensive range of mitigation actions and develop plan participant-specific mitigation actions. Complete Mitigation Strategy forms.
Plan Preparation	March 2025-April 2025	Develop plan maintenance, including continued public outreach procedures.
Plan Drafting	April 2025-June 2025	Compile draft plan. Complete plan participant, stakeholder and public draft plan review and incorporate edits.
Plan Adoption	June 2025-TBD	Complete state and FEMA draft plan review. Incorporate any required edits until plan reaches “Approvable-Pending-Adoption” status. Formally adopt the plan.

2.4. Grant Funding

This planning effort was funded by a FEMA Hazard Mitigation Assistance grant (Hazard Mitigation Grant Program for DR-4683 in fiscal year 2023). The Humboldt County Office of Emergency Services (Humboldt County Office of Emergency Services) was the applicant agent for the grant. It covered 75% of the cost for the development of this plan; the planning partners covered the balance through in-kind match funding.

2.5. Defining the Planning Area

The planning area, or operational area, was defined to consist of the unincorporated county, incorporated cities and special purpose districts within the geographical boundary of Humboldt County. All partners to this plan have jurisdictional authority in this planning area.

2.6. Review of Existing Resources

Hazard mitigation planning includes review and incorporation, if appropriate, of existing plans, studies, reports and technical information (44 CFR, Section 201.6(b)(3)). This is an opportunity to incorporate the best available data at the time of the plan update to complement the 2025 draft plan. Incorporating existing resources into the plan also ensures alignment with ongoing state and local initiatives. References are included throughout the plan in AP style in accordance with Humboldt County branding guidelines.

In addition, the following key resources helped inform the plan update:

- 2023 California State Hazard Mitigation Plan (SHMP)
- FEMA National Risk Index (NRI)
- FEMA Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS)
- National Centers for Environmental Information (NCEI) Storm Events Database
- National Weather Service (NWS) extent and hazard definitions
- National Inventory of Dams (NID)
- California Department of Water Resources Division of Safety of Dams Dam Condition Assessment
- Scotia Log Pond Emergency Action Plan (EAP)
- California Building Code
- Cal-Adapt
- California's Fourth Climate Change Assessment
- State of California Sea Level Rise Guidance 2024 Science & Policy Update
- California Department of Forestry and Fire Protection (CAL FIRE) Fire Hazard Severity Zones
- Humboldt County Emergency Operations Center (EOC) activation data
- Humboldt County Community Wildfire Protection Plan
- Humboldt County Farm Bureau reports
- Humboldt County General Plan
- Humboldt County Capital Improvement Plan
- Local general plans, floodplain management ordinances and other local planning and regulatory resources

2.7. Plan Participant Involvement

FEMA defines plan participants as any local government or entity developing or updating a local hazard mitigation plan (LHMP). Each plan participant must be actively involved in the plan, including providing input into the draft plan. Plan participants met this requirement by attending meetings, completing plan participant surveys and input forms on each major section of the plan, and reviewing the draft plan, including their respective annexes.

Table 3 provides a list of plan participants seeking approval for this plan and details how they were involved.

Table 3: Planning Partners

Name	Attended Meeting(s)	Conducted Public Outreach	Completed Risk Assessment, Mitigation Strategy Form	Completed Capability Assessment Survey	Completed Mitigation Strategy Forms	Reviewed Draft Plan
Humboldt County	X	X	X	X	X	X
City of Arcata	X	X	X	X	X	X
City of Blue Lake	X	X	X	X	X	X
City of Eureka	X	X	X	X	X	X
City of Ferndale	X	X	X	X	X	X
City of Fortuna	X	X	X	X	X	X
City of Rio Dell	X	X	X	X	X	X
City of Trinidad	X	X	X	X	X	X
Arcata Fire District	X	X	X	X	X	X
Big Lagoon Community Services District (CSD)	X	X	X	X	X	X
Fieldbrook Glendale CSD	X	X	X	X	X	X
Fortuna Fire Protection District	X	X	X	X	X	X
Humboldt Bay Fire	X	X	X	X	X	X
Humboldt Bay Harbor Recreation and Conservation District	X	X	X	X	X	X

Name	Attended Meeting(s)	Conducted Public Outreach	Completed Risk Assessment, Mitigation Strategy Form	Completed Capability Assessment Survey	Completed Mitigation Strategy Forms	Reviewed Draft Plan
Humboldt Bay Municipal Water District	X	X	X	X	X	X
Humboldt Bay CSD	X	X	X	X	X	X
Manila CSD	X	X	X	X	X	X
McKinleyville CSD	X	X	X	X	X	X
Samoa Peninsula Fire District/Peninsula CSD	X	X	X	X	X	X
Redway CSD	X	X	X	X	X	X
Rio Dell Fire Protection District	X	X	X	X	X	X
Shelter Cove Resort Improvement District No. 1	X	X	X	X	X	X
Southern Humboldt Community Healthcare District	X	X	X	X	X	X
Westhaven Community Services District	X	X	X	X	X	X
Willow Creek CSD	X	X	X	X	X	X
Willow Creek Fire Protection District	X	X	X	X	X	X

2.7.1. The Hazard Mitigation Plan Steering Committee

Hazard mitigation planning enhances collaboration among diverse parties who can be affected by hazard losses. A key element of this plan update process was the formation of a Steering Committee to oversee all phases of the plan update. Members were nominated and confirmed by the plan participants at the Kickoff Meeting. Both special districts and jurisdictions from across the county were invited to participate. Further, the Steering Committee meetings were open to the public, enabling all interested stakeholders and members of the public to participate. Table 4 lists the Steering Committee members for this plan update.

Table 4: Steering Committee Members

Name	Title	Agency/Jurisdiction
Patric Esh	Hazard Mitigation Program Coordinator	Humboldt County OES
Ryan Derby	Emergency Services Program Manager	Humboldt County OES
Cybelle Immitt	Natural Resources Manager	Humboldt County Public Works
Hank Seemann	Deputy Public Works Director	Humboldt County Public Works
Danielle Allred	Contracts & Special Projects Manager	City of Arcata
Patrick Kaspari	General Manager	McKinleyville CSD
Christopher Christianson	General Manager	Shelter Cove Resort Improvement District No. 1
Cody Cox	General Manager	Redway CSD

The Steering Committee met monthly throughout the plan update. Meetings were held virtually to enable all members and the public to attend regardless of geographic location. Table 5 provides the timeline for meetings and includes meeting descriptions.

Table 5: Steering Committee Meetings

Meeting Name	Date	Description
January Monthly Meeting	Jan. 16, 2025	The Steering Committee met to review and approve the hazards to be profiled in the draft plan, the draft goals and the draft capabilities survey. Attendees also discussed expectations for public outreach.

Meeting Name	Date	Description
February Monthly Meeting	Feb. 13, 2025	The Steering Committee met to discuss and approve the draft public survey, as well as review the plan participant involvement so far. Attendees discussed opportunities to engage plan participants who were not yet involved.
March Monthly Meeting	March 13, 2025	The Steering Committee met to discuss the ongoing public outreach efforts, review and approve the draft approach to plan maintenance, and discuss the current status of plan participants, including status of jurisdictional annex input. Attendees offered support in conducting outreach.
April Monthly Meeting	April 10, 2025	The Steering Committee met to discuss the status of the base plan and annexes as well as review the plan review process, including the public plan review period. Attendees also discussed changes to federal programs and how these could be reflected in the plan while still staying on track schedule-wise.

2.7.2. Stakeholder Engagement

Stakeholders — including local and regional agencies, neighboring communities, representatives of businesses and academia, private organizations, nonprofit organizations and community-based organizations that work directly with and/or provide support to underserved communities and vulnerable populations — were invited to be involved in the planning process and are recognized in Table 6. Stakeholders were invited to the stakeholder meetings through emails, calendar invites and phone calls. In addition, they were encouraged to complete and share a public survey to gather more information. Lastly, all stakeholders were provided the opportunity to review the draft plan and provide feedback.

Table 6: Stakeholders Invited to Participate

Name (First, Last)	Job Title	Agency or Organization	Associated Community Lifeline	Preferred Contact Info (Email and/or Phone)
Amanda Gonzales	Office of Emergency Services Manager	Bear River Band of the Rohnerville Rancheria Tribal Government	All Lifelines	amandagonzales@brb-nsn.gov
Heidi Aldoroty	Director – Board President	Patrick Creek Community Services District	Safety and Security, Transportation	HeidiAldoroty@gmail.com
Kelsey Younker	Administrative Secretary	Humboldt OES	All Lifelines	kyounker@co.humboldt.ca.us
Terrence Williams	General manager	Humboldt Community Services District	Water Systems	Twilliams@humboldtcsd.org
Amos Pole	Director – Senior Emergency Manager	Yurok Tribe	Safety and Security	apole@yuroktribe.nsn.us
Justin Legge	Stewardship Director	Friends of the Dunes	All Lifelines	justin@friendsofthedunes.org
Chris Gilda	Fire Chief	Petrolia Fire	Safety and Security	chief@petroliafire.org
Cybelle Immitt	Natural Resources Manager, Public Works	County of Humboldt	All Lifelines	cimmitt@co.humboldt.ca.us
Andrew Bogar	Emergency Manager	Blue Lake Rancheria OES	Safety and Security	Abogar@bluelakerancheria-nsn.gov
Chestine Anderson	Board President	Briceland Community Services District	Water Systems	bandon48@gmail.com
James White	Meteorologist	National Oceanic and Atmospheric	All Lifelines	james.h.white@noaa.gov

Name (First, Last)	Job Title	Agency or Organization	Associated Community Lifeline	Preferred Contact Info (Email and/or Phone)
		Administration (NOAA)		
Ryan Aylward	Warning Coordination Meteorologist/ Public Information Officer (PIO)	NOAA	All Lifelines	ryan.aylward@noaa.gov
Keith Ingersoll	Chief Building Official	County of Humboldt	Water Systems	kingersoll@co.humboldt.ca.us
Hank Seemann	Public Works Deputy-Director	County of Humboldt	All Lifelines	hseemann@co.humboldt.ca.us
Kurt McCray	Humboldt – Del Norte Unit Chief	CAL FIRE	All Lifelines	Kurt.mccray@fire.ca.gov

2.7.3. Planning Team Meetings

Plan participants and stakeholders (the Planning Team) were actively engaged in meetings and workshops over the course of four months to garner local input on the plan and update the plan in a short timeframe (see Figure 1). The planning consultant, IEM, was responsible for facilitating each meeting. Two meetings (Kickoff, Risk Assessment & Community Lifelines) were held in a hybrid format. Plan participants were invited to attend in person, while stakeholders attended virtually. One webinar (Eligible Mitigation Actions) was held virtually, and two workshops (Mitigation Actions Workshop – Special Districts, Mitigation Actions Workshops – Municipality Specific) were held only in-person. In-person meeting locations rotated to reduce drive time and increase participation. Table 7 provides the schedule and description of each group meeting. Appendix A includes additional meeting documentation.

Figure 1: Participants Attend the Kickoff Meeting

Table 7: Meetings and Workshops

Meeting Name	Date	Description
Kickoff	Dec. 17, 2024	The Kickoff Meeting introduced plan participants and stakeholders to hazard mitigation and hazard mitigation planning. The planning consultants from IEM facilitated a review of each section of the plan, including the anticipated public outreach. Plan participants discussed their goals and expectations for the plan update process.
Risk Assessment and Community Lifelines	Feb. 5, 2025	Attendees reviewed the status of the plan, including the required upcoming Capabilities Assessment survey. Community lifelines were evaluated, and each hazard profile was described before plan participants completed their Risk Assessment Worksheet in a workshop format.
Eligible Mitigation Actions Webinar	Feb. 27, 2025	Attendees reviewed the ongoing planning efforts, including the status of plan participants' forms and public outreach. The planning consultant presented the components of the mitigation strategy and potential funding sources. Attendees brainstormed a comprehensive range of actions to include in the plan.

Meeting Name	Date	Description
Mitigation Actions Workshop – Special Districts	March 20, 2025	Attendees reviewed and approved the countywide mitigation actions before discussing the required forms for the mitigation strategy section. Then, attendees reviewed example mitigation action ideas and completed their forms in a workshop format.
Mitigation Actions Workshop – Municipality Specific	March 21, 2025	Attendees reviewed and approved the countywide mitigation actions before discussing the required forms for the mitigation strategy section. Then, attendees reviewed example mitigation action ideas and completed their forms in a workshop format.
1:1 Meeting with Big Lagoon Community Service District	April 22, 2025	IEM hosted a 1:1 meeting with the planning partner due to the limited bandwidth of the CSD to complete all required forms and to walk through the major items discussed during previous meetings.
1:1 Meeting with Manila Community Service District	April 23, 2025	IEM hosted a 1:1 meeting with the planning partner due to the limited bandwidth of the CSD to complete all required forms and to walk through the major items discussed during previous meetings.
1:1 Meeting with Southern Humboldt Community Healthcare District	April 23, 2025	IEM hosted a 1:1 meeting with the planning partner due to the limited bandwidth of the CSD to complete all required forms and to walk through the major items discussed during previous meetings.

Plan participants who were unable to attend or had further questions following the group meetings were invited to engage in one-on-one calls or meetings with the planning consultant.

2.7.4. Plan Participation

Table 8 lists the individuals who represented plan participants in updating the LHMP. Their invaluable contributions helped develop a comprehensive, locally informed hazard mitigation plan update.

Table 8: Representatives of Plan Participants

Name	Agency/Organization	Title
Chris Emmons	Arcata Fire District	Fire Chief
Ross McDonald	Arcata Fire District	Assistant Chief
Wayne Peabody	Arcata Fire District	Assistant Chief
Richard Maier	Big Lagoon CSD	Staff Accountant
Emily Wood	City of Blue Lake	Parks and Recreation Director
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Morguine Sefcik	City of Arcata	Environmental Programs Manager
David Caisse	City of Arcata	Assistant City Engineer
Steven Luu	City of Arcata	Senior Project Manager
Garry Rees	City of Blue Lake	City Planner
Amanda Mager	City of Blue Lake	City Manager
Mike Foget	City of Blue Lake	City Engineer
Christopher Firor	City of Blue Lake	Community Resource Coordinator
Kelly Allen	City of Eureka	Public Works Director
Michael Hansen	City of Eureka	Deputy Public Works Director
Kristin Galt	City of Eureka	Administrative Analyst
Amanda Kruschke	City of Eureka/Eureka Main Street	Economic Development Coordinator
Larry Henderson	Eureka Police Department	Emergency Manager
Jay Parrish	City of Ferndale	City Manager
Michelle Nielson	City of Ferndale	Contract City Planner
Shari Meads	City of Fortuna	Community Development Director
Brendan Byrd	City of Fortuna	Public Works Director
Kyle Kertscher	Fortuna Fire Protection District	Division Chief
Kyle Knopp	City of Rio Dell	City Manager
Kevin Caldwell	City of Rio Dell	Community Development Director
Cheryl Kelly	City of Trinidad	Mayor

Name	Agency/Organization	Title
Joe Tagliaboschi	City of Trinidad	City Manager
Larry Henderson	Eureka Police Department	Emergency Manager
Rebecca Crow	Fieldbrook Glendale CSD	District Engineer
Richard Hanger	Fieldbrook Glendale CSD	District General Manager
Tim Citro	Humboldt Bay Fire Joint Powers Authority	Fire Chief
William Reynolds	Humboldt Bay Fire	Deputy Fire Chief
Chris Mikkelson	Humboldt Bay Harbor, Recreation and Conservation District	Executive Director
Bryan Robinson	Humboldt Bay Harbor, Recreation and Conservation District	Facilities Manager
John Friedenbach	Humboldt Bay Municipal Water District	General Manager
Contessa Dickson	Humboldt Bay Municipal Water District	Executive Assistant/Board Secretary
Michiko Mares	Humboldt Bay Municipal Water District	General Manager
Kelsey Younker	Humboldt County OES	Administrative Secretary
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Patric Esh	Humboldt County OES	Program Coordinator – Hazard Mitigation Program
Cybelle Immitt	Humboldt County	Natural Resources Manager, Public Works
Terrence Williams	Humboldt CSD	General Manager
Robert Christensen	Humboldt CSD	Board Secretary/Administrative Services
Brian McNeill	Humboldt CSD	Utility Services Planner
Michael Montag	Humboldt CSD	Finance Manager
Kush Rawal	Humboldt CSD	Assistant Engineer
Christopher Drop	Manila CSD	General Manager

Name	Agency/Organization	Title
James Henry	McKinleyville CSD	Operations Director
Patrick Kaspari	McKinleyville CSD	General Manager
Joseph Blaine	McKinleyville CSD	Board Secretary
Samantha Howard	McKinleyville CSD	Finance Director
Dale Unea	Peninsula CSD/Samoa Fire	Fire Chief/Operations Manager
Troy Nicolini	Peninsula CSD/Samoa Fire	Board of Directors President
Cody Cox	Redway CSD	General Manager
Shane Wilson	Rio Dell Fire Protection District (FPD)	Fire Chief
Linda Barsanti	Rio Dell FPD	Secretary
Joe Timmerman	Rio Dell FPD	Commissioner
Marc Barsanti	Rio Dell Volunteer Fire Department (VFD)	Battalion Chief
Nickolas Pape	Shelter Cove Resort Improvement District No. 1	Fire Chief
Christopher Christianson	Shelter Cover Resort Improvement District No. 1	General Manager
Frank Wilson	Shelter Cove Resort Improvement District No. 1	Water/Wastewater Superintendent
Jon Aronson	Shelter Cover Resort Improvement District No. 1	Power Distribution Superintendent
Chris Valk	Southern Humboldt Community Healthcare District	Special Projects Coordinator
Paul Rosenblatt	Westhaven CSD	General Manager
Susan O'Gorman	Willow Creek CSD	General Manager
Samantha Smith	Willow Creek VFD	Fire Chief
Olivia Lopes	Willow Creek FPD	Clerk

2.7.5. Annex Development and Plan Review

Each plan participant contributed input to their respective annexes, including completing forms and surveys for each part of the planning process as well as documenting public outreach (see Figure 2). Each annex includes additional plan participant-specific details on their public outreach, previous and future plan integration, local vulnerabilities, changes in development, mitigation capabilities and mitigation actions. Those who participated in the past plan have additional information on the status of mitigation actions. Jurisdictions that, unlike special districts, are eligible to participate in the NFIP have a more extensive NFIP capabilities assessment. Participants reviewed their draft annexes and recommended additional changes to reflect their own unique local considerations. The base plan was also shared for plan participant feedback prior to public plan review.

Figure 2: Participants Work on Mitigation Strategy Forms at a Mitigation Strategy Workshop

2.8. Stakeholder Engagement

Involving stakeholders is a key component of the hazard mitigation planning process because it ensures that a diverse range of perspectives and local knowledge are incorporated into the draft plan. Further, they may be directly impacted by hazard events. By incorporating them early in the action development process, stakeholders can help refine and establish hazard risk reduction objectives for the planning area. Stakeholders provide useful data and hazard mitigation actions, including identifying opportunities to support local mitigation actions themselves.

According to FEMA’s 2025 Local Mitigation Policy Planning Guide, the following types of stakeholders must be involved in the planning process:

1. Local and regional agencies involved in hazard mitigation activities
2. Agencies that have the authority to regulate development
3. Neighboring communities, including special districts
4. Representatives of businesses, academia and other private organizations
5. Representatives of nonprofit organizations, including community-based organizations

To meet the optional High Hazard Potential Dam (HHPD) element of the mitigation plan, the plan participants also invited:

6. Dam owners and state dam safety agency

Table 9 lists stakeholders invited to participate in the plan. Stakeholders were invited to participate in the plan update by attending a meeting, sharing information with the Planning Team or reviewing and providing input on the draft plan. Stakeholder type is identified by number, as described in the previous list.

Table 9: Humboldt County Stakeholders Invited to Participate in the Plan Update

Name	Stakeholder Type
American Red Cross – Northern CA Coastal Region	5
Arcata Main Street	4
Bear River Band of the Rohnerville Rancheria	3
Blue Lake Rancheria	3
Briceland Community Services District	3
Briceland Fire Protection District	3
CAL FIRE	2
California Department of Transportation	2
California Department of Water Resources	6
California Department of Water Resources – Dam Safety	6
Cal OES	1
Cal OES – Mitigation Planning	1
Cal Poly Humboldt Emergency Management	4
Cher-Ae Heights Indian Community of the Trinidad Rancheria	3
Del Norte County	3
Environmental Protection Information Center	5
Eureka Main Street	4
Friends of the Dunes	5
Hoopa Valley Tribe	3
Humboldt Area Foundation	5
Karuk Tribe	3

Name	Stakeholder Type
Loleta CSD	3
Loleta Fire Protection District	3
Mendocino County	3
North Coast Emergency Medical Services (EMS)	1
Northcoast Environmental Center	5
Orick Community Services District	3
Orick VFD	3
Patrick Creek CSD	3
Redwood Acquisition Company	6
Scotia Community Services District	6
Siskiyou County	3
Table Bluff Rancheria	3
Trinity County	3
U.S. Geological Survey	1
Weott Community Services District	3
Wiyot Tribe	3
Yurok Tribe	3

Table 10 lists the stakeholders who participated in the plan update.

Table 10: Humboldt County Stakeholders Involved in the Plan Update

Name	Agency/Organization	Title
Amanda Gonzales	Bear River Band of the Rohnerville Rancheria	OES Manager
Amanda Kruschke	City of Eureka/Eureka Main Street	Economic Development Coordinator
Amos Pole	Yurok Tribe	Director – Senior Emergency Manager
Andrew Bogar	Blue Lake Rancheria OES	Emergency Manager
Andrew Gonzales	CAL FIRE	Battalion Chief – Emergency Command Center

Name	Agency/Organization	Title
Chestine Anderson	Briceland Community Services District	Board President
Chris Gilda	Petrolia Fire	Fire Chief
Heidi Aldoroty	Patrick Creek Community Services District	Director-President
Justin Legge	Friends of the Dunes	Stewardship Director
Kyle Ebert	DWR Flood Operations Center	Staff Engineer
Nicholas Anderson	Bear River Band of Rohnerville Rancheria/Office of Emergency Services	Coordinator
Patrick Lynch	North Coast EMS	Disaster Liaison for Humboldt County
Samantha Karges	Cal OES	Emergency Services Coordinator
Sherry Constancio	California Department of Water Resources	Senior Water Resources Engineer
Simon Knopf	American Red Cross	Disaster Program Manager
Tyler Felt	Trinidad Rancheria	Emergency Operations Center Technician

2.9. Public Outreach

Broad public participation in the planning process helps ensure that diverse points of view about local needs are considered and addressed. The public must have the opportunity to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The public was invited to participate in the hazard mitigation planning through the Steering Committee meetings and a digital public survey. In addition, the public was invited to review and comment on the draft plan.

2.9.1. Meetings

The Steering Committee meetings were open to the public. Meeting agendas and information were advertised through the Humboldt County website. No general members of the public attended. Stakeholders did attend and were documented in Section 2.8.

2.9.2. County Website

Humboldt County manages a dedicated website for this project. Updates on the local hazard mitigation planning process were advertised online (see Figure 3), including the Steering Committee meetings and public survey. Meeting minutes for each Planning Team and Steering Committee were also publicized. Additional meeting documentation can be found in Appendix A.

About the Plan

The Humboldt County Multi-Jurisdiction Local Hazard Mitigation Plan (HMP) 2025 serves as an update to the county's ongoing efforts in hazard mitigation planning. The initial plan, developed in 2007, identified resources, information, and strategies to reduce risks from natural hazards and called for regular updates. The plan was last updated in 2019, and the 2025 HMP fulfills this ongoing update requirement.

The 2025 update continues to comply with the federal Disaster Mitigation Act (DMA), ensuring that Humboldt County and its partners remain eligible for Federal Emergency Management Agency (FEMA) funding. The plan encompasses the entire Humboldt County Operational Area, including twenty-five cities and special-purpose districts, and aims to guide policies, programs, and projects that reduce the impacts of natural disasters on life, property, and infrastructure.

The planning process for the 2025 HMP involves a collaborative effort among local governments, stakeholders, and the public. It included a comprehensive risk assessment, the development of mitigation strategies, and the formulation of implementation plans. Public outreach was conducted through various channels, including social media, surveys, meetings, and a dedicated website, to ensure community involvement and input.

Figure 3: Humboldt County Website Advertising the Hazard Mitigation Plan

2.9.3. Public Survey

Humboldt County OES developed a hazard mitigation plan with support and recommendations from the Steering Committee. The survey was used to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. This survey was designed to help identify areas vulnerable to one or more natural hazards. The survey was available between February and May 2025.

The survey was translated into Spanish and Hmong to provide access to non-English-speaking members of the community (see Figure 4). Then, the survey was shared via social media, plan participants' websites, in-person flyers and on buses. The goal of the public outreach was to meet people where they are, engaging the public through platforms and opportunities, such as social media, with which they are already familiar. This multimodal approach to outreach was intended to ensure a broad reach across the operational area.

Figure 4: Public Survey Graphic with Multiple Language Options

Public outreach was discussed at subsequent Planning Team meetings and incorporated into the mitigation action ideas presented during the workshops and the mitigation strategy section of the plan. Plan participants were encouraged to incorporate public input into their mitigation strategies. In addition, public survey results were incorporated into the plan in this section. Further details on each plan participant's contributions can be found in the relevant sections.

2.9.3.1.PUBLIC SURVEY RESULTS

The public survey collected 613 responses, with 612 in English and one in Spanish, but none in Hmong. Participants resided in or near most census-designated places in the county. The areas with the highest rate of responses include Arcata (79), Bayside (12), Blue Lake (20), Cutten (18), Eureka (180), Ferndale (12), Fieldbrook (20), Fortuna (44), Manila (10), McKinleyville (71), Petrolia (16) and Willow Creek (13).

Respondents had the option to provide additional demographic data as well. This information helps the Planning Team assess the survey's effectiveness in reaching the whole community, including vulnerable members of the general population who might be disproportionately impacted by disaster events. As shown in Table 11, the survey reached a wide audience.

Table 11: Public Survey Demographics

Category	# of Responses
Age 65 or older	150
Age 18 or younger	21
Veteran	30
Possess a physical or mental disability	65
Use an electricity-dependent medical device(s)	53
Primarily speak a language other than English at home	13
Single parent	72
Married and living together	275
Married and have children	143
Household income is less than the poverty level	52
Man	195
Woman	371
Transgender	10
Member of a tribe	17
Identify as LGBTQIA+ (lesbian, gay, bisexual, transgender, queer or questioning, intersex, asexual, and more)	71
Do not have stable housing	11
Own my own home	358

Race/ethnicity was also recorded (see Figure 5).

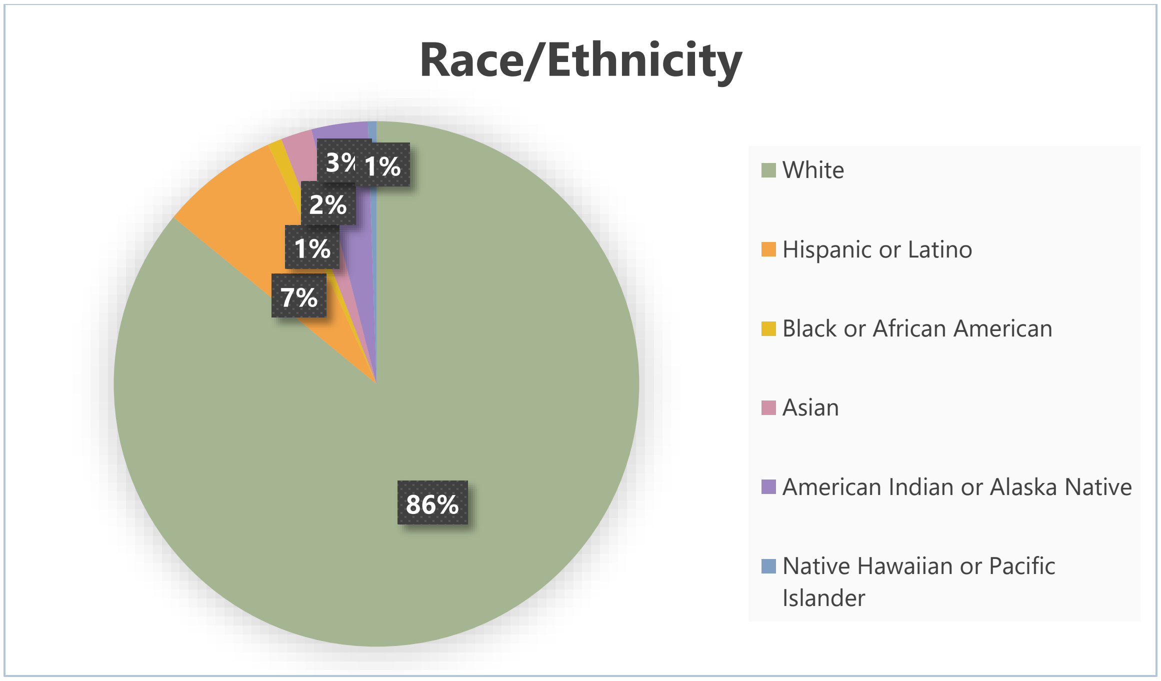

Figure 5: Race/Ethnicity of Survey Respondents

Employment status was also considered (see Figure 6).

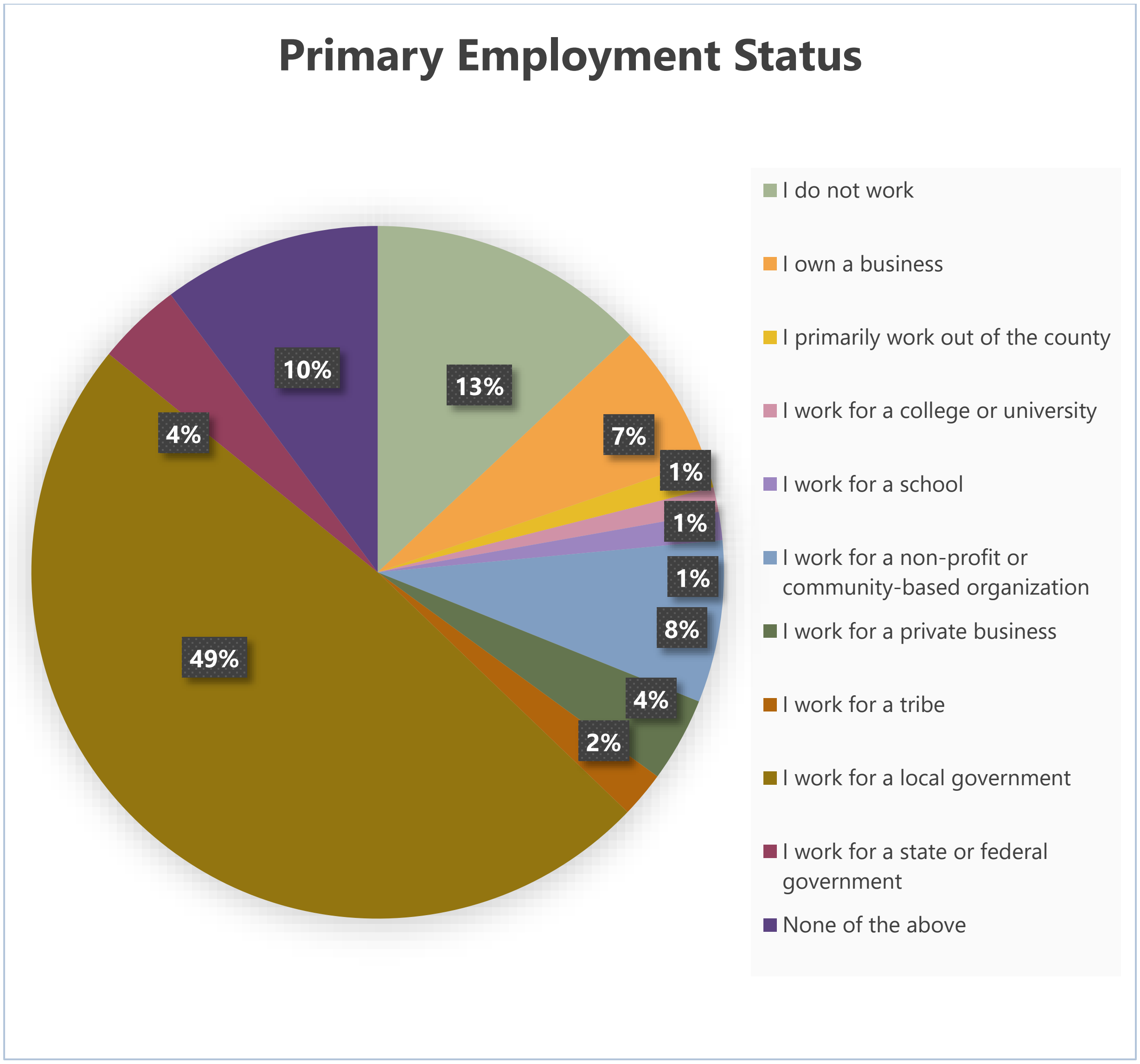

Figure 6: Primary Employment Status of Survey Respondents

Respondents ranked what assets they valued most in their community (see Table 12). Identifying these priorities can guide the selection of mitigation actions.

Table 12: Community Priorities for Assets

Rank	Asset Type
1	Infrastructure (Power, Water, Roads, etc.)
2	Emergency Services (Law Enforcement, Fire Service, Hospitals)
3	Natural Lands (Parks, Beaches, Open Spaces, etc.)
4	Housing

Rank	Asset Type
5	Cultural and Historical Landmarks
6	Economic and Financial Institutions (Banks, Credit Unions, etc.)

Participants were asked about their familiarity with hazard mitigation, current mitigation efforts and their thoughts on the hazards of concern to the operational area (see Figure 7). Most participants reported that they were at least somewhat familiar with hazard mitigation (51%) or very familiar (21%).

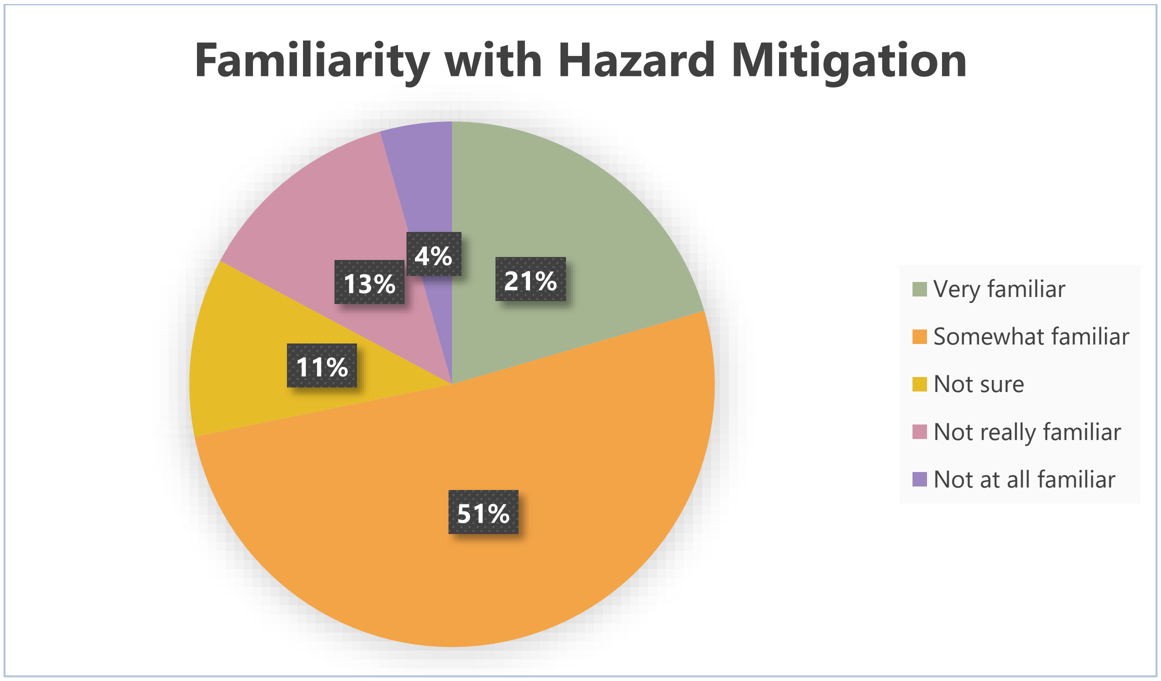

Figure 7: Respondents' Familiarity with Hazard Mitigation

Overall, participants were mixed in their impression of how well the community's infrastructure is equipped to handle the impacts of climate change (see Figure 8). Most participants felt that the community's infrastructure was either somewhat well prepared (238) or not very well prepared (265). In addition, more participants felt that the community's infrastructure was extremely poorly prepared (62) compared to those who felt it was extremely well prepared (13). This indicates there may be a need to further incorporate changing conditions into hazard mitigation and public infrastructure projects.

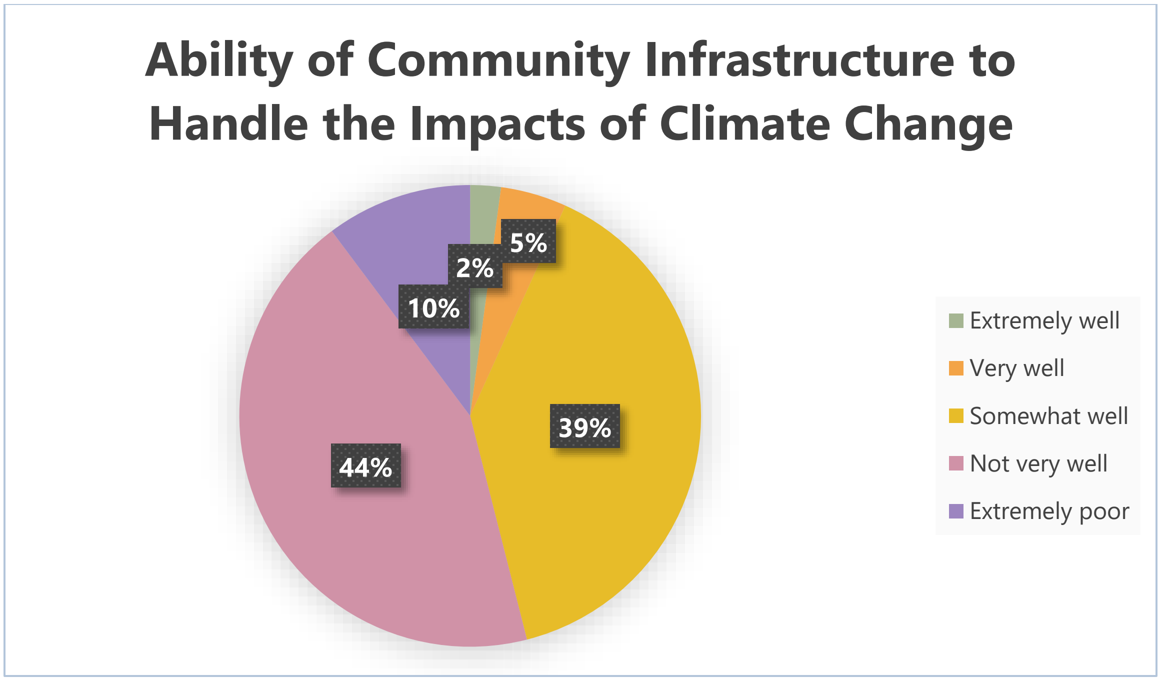

Figure 8: Ability of Community Infrastructure to Handle the Impacts of Climate Change

Most participants felt that they were personally familiar with how to reduce their risks. They shared that they do receive enough information on their hazard risks and what to do about them (316) (see Figure 9). This reported public understanding of hazard risks and mitigation opportunities speaks to the ongoing efforts of the plan participants and stakeholders to inform and engage the public. However, many still wanted additional information (193). Many additional comments were received recommending specific types of outreach and engagement initiatives. In addition, not everyone reported understanding how to reduce their risk (96). This indicates that additional public education and awareness activities would be good mitigation activities for the operational area.

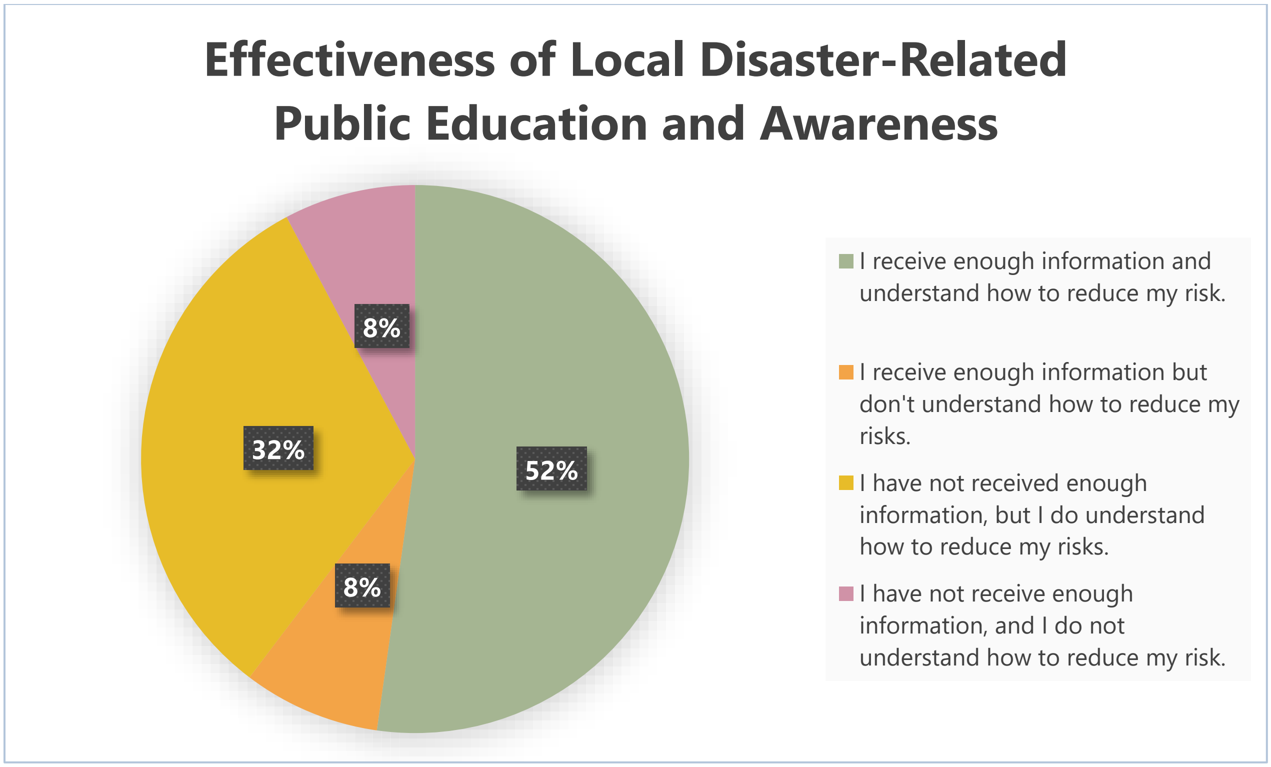

Figure 9: Effectiveness of Local Disaster-Related Public Education and Awareness

Respondents reviewed the hazards of concern identified for this plan update and ranked how concerned they were with each hazard impacting their community (see Figure 10). Overall, earthquakes were the hazard of most concern, with most respondents reporting they were very concerned with the impacts of earthquakes. Given the location of Humboldt County and the potential risks associated with earthquakes to the operational area, this seems consistent with the risk assessment. The second-highest ranked hazard of concern was wildfire. Nearly half (45.8%) of respondents were concerned about the impacts of wildfire. From there, hazard concern was more evenly distributed among flooding, landslides and tsunami. Dam failure was the hazard of least concern.

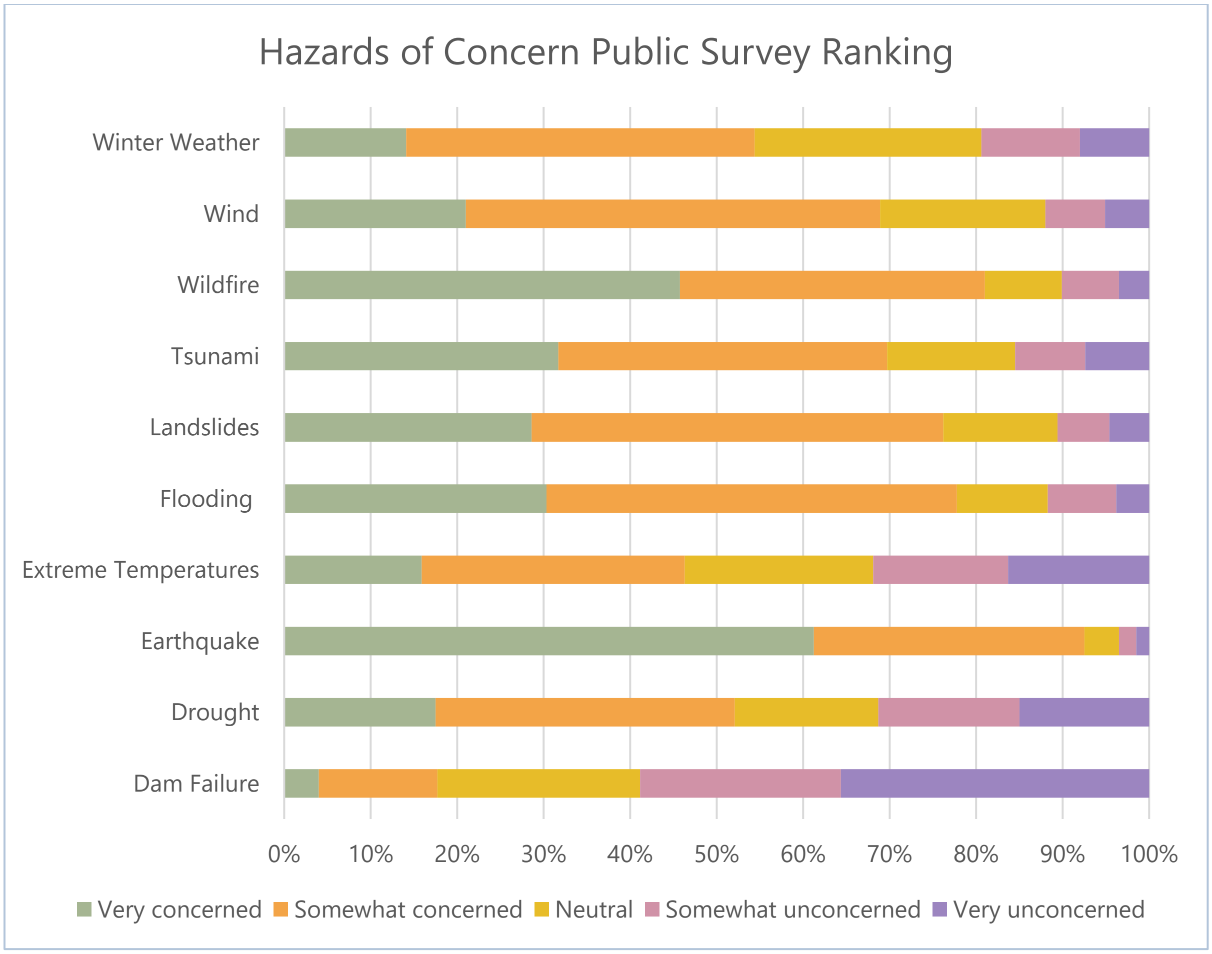

Figure 10: Hazards of Concern Public Survey Ranking

Respondents supported a broad range of mitigation activities to address the hazards identified. The highest-ranked activity of the options provided was to upgrade/update bridges, power, roads, water supply, wastewater, etc. (481) (see Figure 11). Supporting the transportation, power, and water system community lifelines appears to be a high priority for the public. Additional information on the risks to these assets is included in the Risk Assessment portion of the plan, and mitigation actions are included in the Mitigation Strategy section.

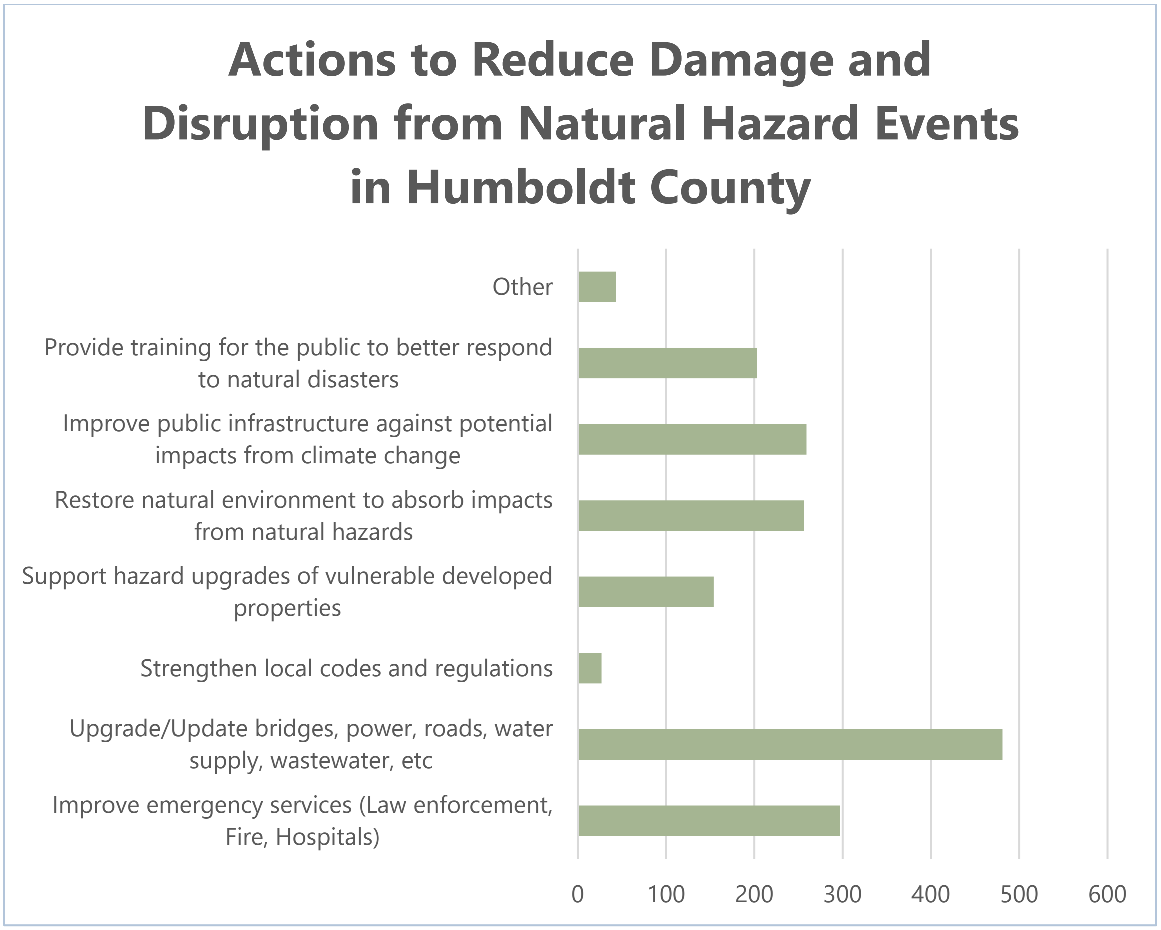

Figure 11: Actions to Reduce Damage and Disruption from Natural Hazard Events in Humboldt County

In addition, more specific hazard concerns and mitigation action ideas were mentioned throughout the survey. Many respondents shared common concerns, such as the impact of flooding on the unhoused population and the effects of multiple hazards on roads and bridges. Roads were mentioned multiple times in the context of evacuation routes and the potential isolation of communities, which could hamper economic activities and the ability of emergency services to respond effectively. Emergency services were noted as a concern that could increase vulnerability to multiple hazards. Elderly individuals were also mentioned frequently.

Additional concerns included the following:

- Populations at risk include the unhoused, those who don't speak English as a primary language, those with low income, the elderly, people living with disabilities, people who use an electricity-dependent medical device, rural community members, people without family in the community and the underinsured.
- Locations at risk in the planning area include the entire peninsula, low-lying areas prone to flooding or a tsunami, roadways leading to Elk River, highways, and communities with only one access route.

- Community lifelines at risk in the planning area include hospitals, water and sewer systems, drinking water infrastructure, bridges, highways including Highway 101 and Highway 299, phone and internet services, power stations, fuel stations and fuel resupply routes, and the nuclear power plants.
- Structures at risk include those that are not seismically retrofitted, such as buildings in old town and manufactured homes. Schools and hospitals are also a concern.
- Economic activities at risk include local commerce and the regional supply chain if there are transportation disruptions. Earthquakes and wildfires were noted as significant concerns to local businesses.
- Community and natural assets at risk include fairgrounds, historical sites, crops and livestock, wetlands and marshes, and forests and rivers.
- General concerns include isolation of the area, including the inability to access outside resources, transportation issues and availability of emergency services, cancellation of fire insurance and power outages. Evacuation routes are also a concern.

Respondents acknowledged that Humboldt County is a “wild and rural place,” which comes with some inherent risk, such as from earthquakes. However, there are measures that can be taken to reduce this risk. Some comments that were received relate more to response or preparedness. These comments are acknowledged but not incorporated directly into this section. Additional hazard mitigation action recommendations included the following:

- Additional public outreach, including on infrastructure and structural weaknesses and how to address them, including for residential properties.
- Develop simple educational materials that are easy to learn and repeat.
- Conduct targeted public outreach programs, including engaging students and parents. Specifically, educate students who are new to Humboldt County as well.
- Older adults are less likely to rely on the internet for information or their cell phones. Provide information in local newspapers and on radio in addition to targeted mailings and outreach through community service partners.
- Host public workshops and record trainings that can be shared via social media.
- Support efforts to engage the public in hazard mitigation and emergency management, including increasing community partnerships and local networks. Bolster local Community Emergency Response Teams (CERTs) and grassroots disaster prep organizations.
- Engage the local Fire Safety Councils and support their efforts to reduce wildfire risk.
- Map areas of concern, including the locations of the elderly and people living with disabilities who will need additional attention during disaster response and recovery.
- Map evacuation routes and provide additional evacuation route training, including for earthquake and tsunami hazards.

- Reduce rapid fire growth potential, including by implementing fuels reduction programs.
- Support individual homeowners in hardening their homes from wildfire. Provide education on how to prepare structures for wildfire events. Host more chipper days.
- Build partnerships for hazard mitigation, including with U.S. Forest Service (USFS) and nonprofits.
- Implement requirements to clear overgrown areas, including on vacant properties.
- Determine base flood elevations in FEMA Flood Hazard Zone A.
- Develop and implement sea level rise analysis requirements.
- Address repeated flooding around Berta Road in Elk River.
- Improve storm drainage along Broderick and Chartin Lake.
- Enhance the road system and power grid to prepare for earthquakes, tsunamis, flooding and wildfire.
- Increase the energy resilience of the community by investing in alternative power sources.
- Support communication infrastructure improvements to enable the reception of emergency alerts.
- Build tsunami towers.
- Reduce new development in areas at high risk of tsunamis.
- Support local homeowners in obtaining fire insurance.
- Assist renters and residents moving to the community in understanding their risk and what they can do about it.
- Work with health care providers and emergency medical services to expand their services.
- Work with businesses to ensure they plan for disasters and understand how to reduce their own risks.
- Pursue hazard mitigation grant funding and allocate local funds to support hazard mitigation activities.

2.9.4. Draft Plan Review

The public was invited to review the draft plan over the course of 30 days between May 9, 2025, and May 30, 2025. This meeting was advertised via the county's website and social media pages. The plan received two comments, which were reviewed by the Humboldt County Office of Emergency Services to make sure all concerns were addressed.

3. Humboldt County Community Profile

3.1. Geographic Overview

Humboldt County, on California's northern coast, borders Del Norte, Siskiyou, Trinity and Mendocino counties. Its major cities include Eureka (the county seat), Arcata and Fortuna. Roughly 80% of the county's 2.3 million acres is forestland and protected areas, contributing to tourism, timber and recreation. Key public lands include Redwood National and State Parks and Six Rivers National Forest. Humboldt Bay supports a port and oyster production, while other key industries include timber, agriculture and dairy. The county is approximately 225 miles north of San Francisco and accessible via Highway 101, Highway 36 and Highway 299, with air service available through the California Redwood Coast-Humboldt County Airport.

Figure 12 provides a geographic overview of Humboldt County, California, highlighting key transportation routes, jurisdictional boundaries and populated areas in the county. The map illustrates principal and minor arterials, major and minor collectors and significant water bodies, including the Eel, Mad and Klamath rivers. It delineates Humboldt County's borders with neighboring counties.

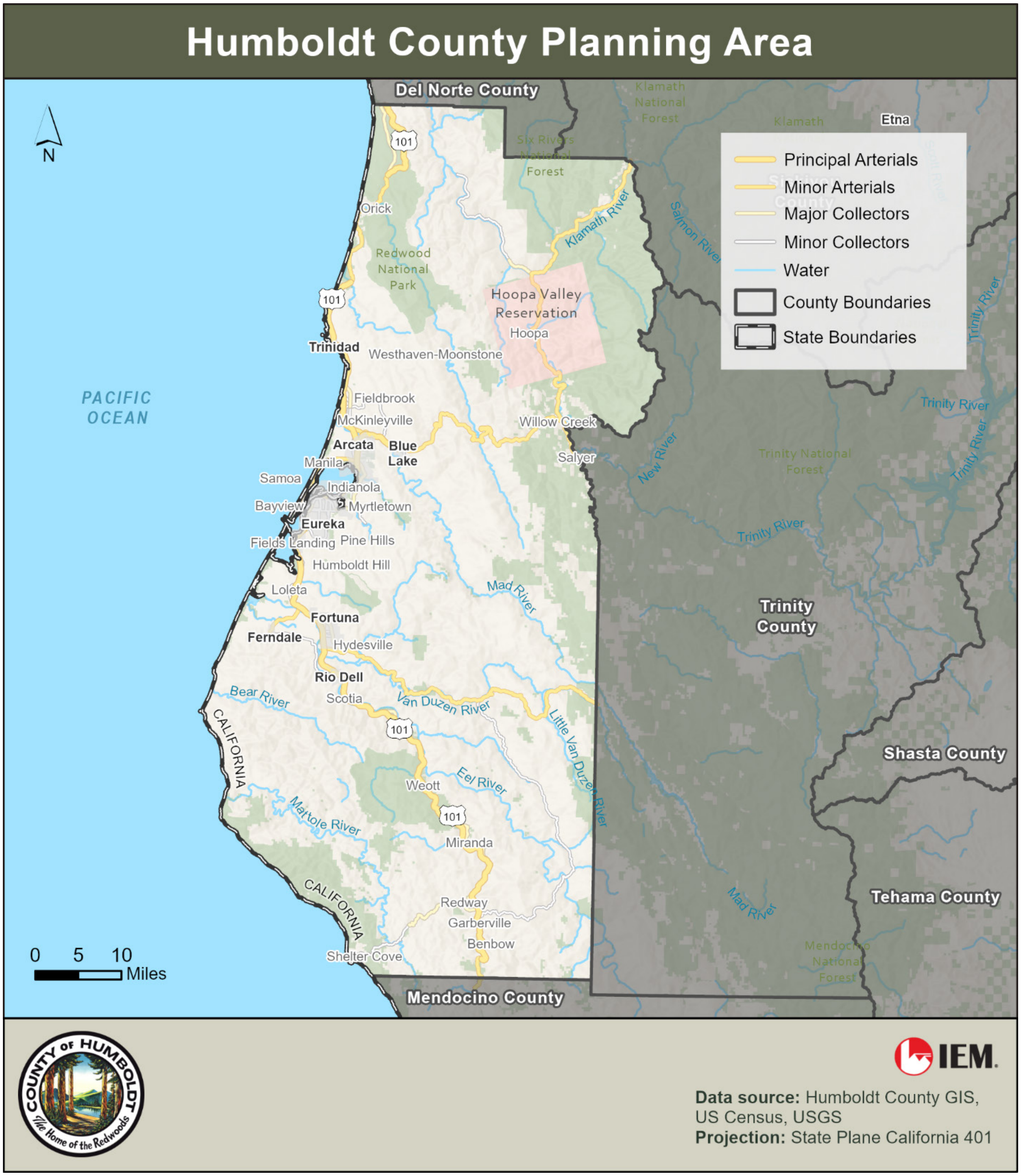

Figure 12: Humboldt County Planning Area

3.1.1. Municipalities

The incorporated municipalities in Humboldt County play a critical role in delivering essential public services, supporting economic development and maintaining local infrastructure. These cities manage services such as water and wastewater utilities, public safety, transportation systems, land use planning and community development initiatives. Municipal governments operate independently in their jurisdictions, yet they often coordinate with special-purpose districts and county agencies to ensure comprehensive service delivery across Humboldt County.

- **City of Arcata:** Known for its environmental stewardship and home to Cal Poly Humboldt, the city operates its own wastewater treatment facility, maintains urban infrastructure and prioritizes sustainable land use and transit options. Arcata's municipal services support a mix of residential, commercial and academic land uses.
- **City of Blue Lake:** A smaller inland municipality, Blue Lake manages local water and sewer systems, road maintenance and recreational programming. Its municipal services are designed to meet the needs of a tight-knit community while preserving the surrounding rural character.
- **City of Eureka:** As the county seat and largest city, Eureka provides extensive municipal services, including law enforcement, fire protection, road and bridge maintenance and stormwater management. The city is also a regional economic and health care hub and maintains one of the county's most complex infrastructure systems.
- **City of Ferndale:** This historic Victorian-era town offers full municipal services, including planning, zoning and utility management, tailored to support tourism, local agriculture and heritage preservation. Its compact footprint allows for efficient service delivery across its community.
- **City of Fortuna:** Serving the growing southern Humboldt region, Fortuna manages its own public works, police, water treatment and planning departments. The city's services support a mix of residential neighborhoods and light industry.
- **City of Rio Dell:** Rio Dell provides essential municipal services such as water, sewer, public works and police protection. As a gateway to the Lost Coast region, the city supports local infrastructure development while promoting access to nearby natural resources.
- **City of Trinidad:** The smallest incorporated city in the county, Trinidad manages basic municipal services including water, land use planning and coastal resource protection. The city also collaborates with environmental groups to steward its unique coastal setting.

Together, these cities form the core of Humboldt County's municipal governance framework, each responding to local priorities while contributing to regional planning and resilience.

3.1.2. Fire District Boundaries

Humboldt County is protected by a network of 39 fire departments, each serving specific areas based on population and geography to ensure effective emergency response. The Arcata Fire District covers Arcata and nearby wildland-urban areas, while Humboldt Bay Fire specializes in urban firefighting and hazardous materials. Smaller districts focus on fire prevention and community outreach in rural areas while more remote areas of the county have their own fire departments mainly staffed and led by volunteers. CAL FIRE also plays a key role in wildfire response across the county's unincorporated areas.

Figure 13 illustrates the fire districts and their associated response areas throughout Humboldt County. Shaded in orange, these districts are distributed across urban, suburban and rural landscapes, highlighting the regional variability in fire service coverage. The map also identifies principal and minor arterials, major and minor collectors and jurisdictional boundaries, providing context for accessibility and service delivery. Notably, the figure underscores how fire districts are strategically positioned along population centers such as Eureka, Arcata, Fortuna and Rio Dell, while also extending into inland and remote regions where wildfire risk is elevated. This spatial distribution reflects the county's commitment to comprehensive emergency response across diverse topographies and settlement patterns.

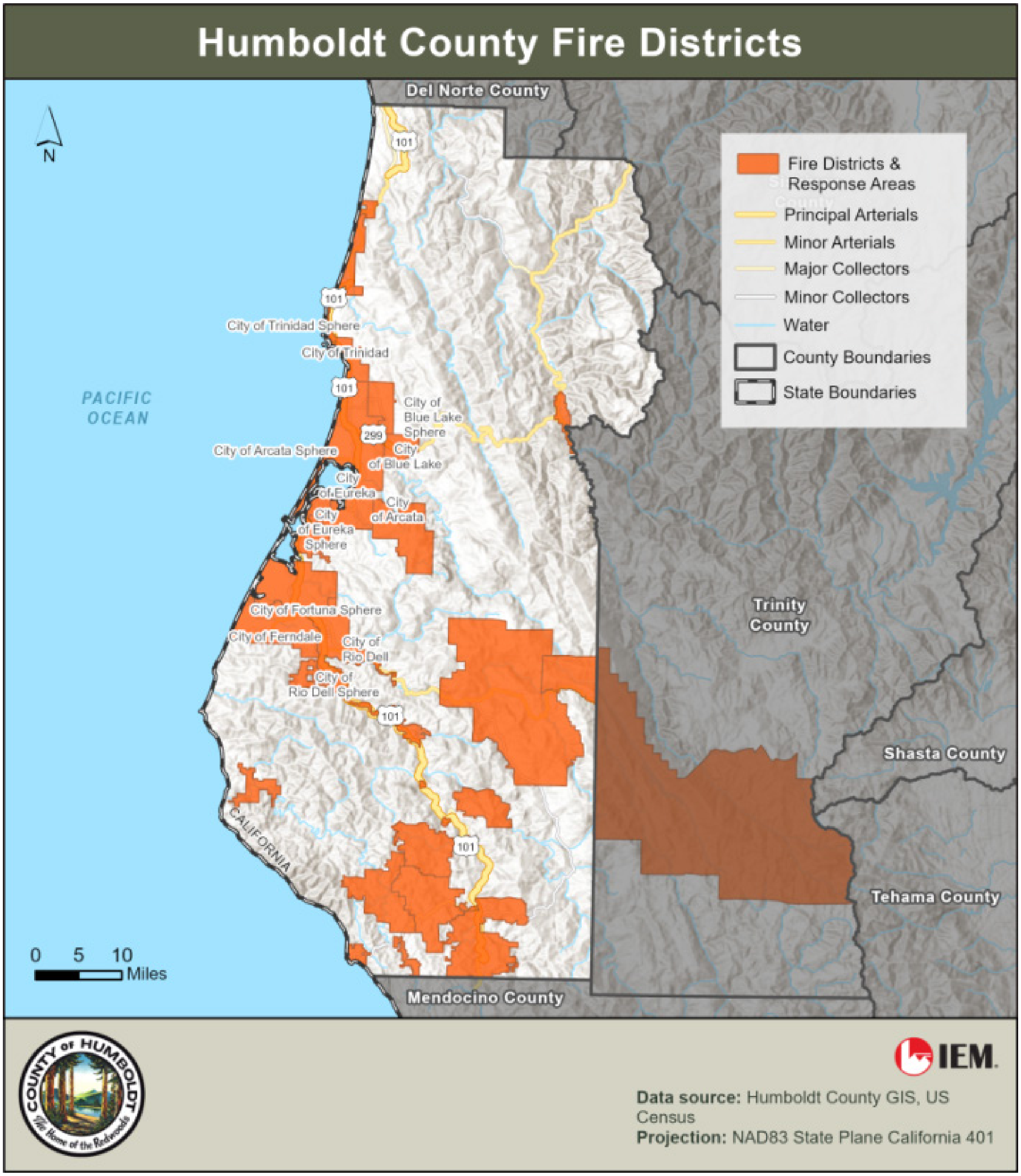

Figure 13: Humboldt County Fire Districts

3.1.3. Special Purpose Districts

The special-purpose districts in Humboldt County serve vital roles in meeting community needs and providing essential services. These services include water supply, wastewater management, fire protection, infrastructure maintenance, environmental stewardship and community engagement. Figure 14 displays the spatial distribution of special-purpose districts in Humboldt County, California. These districts, such as community services districts (CSDs), municipal water districts and improvement districts, are designated to provide specific public services, including water supply, sanitation, parks and street maintenance. The map also highlights key transportation routes and county boundaries, offering insight into how these districts are geographically organized to serve both urban centers and remote communities. Their presence reflects the county's approach to addressing diverse local infrastructure and service delivery needs.

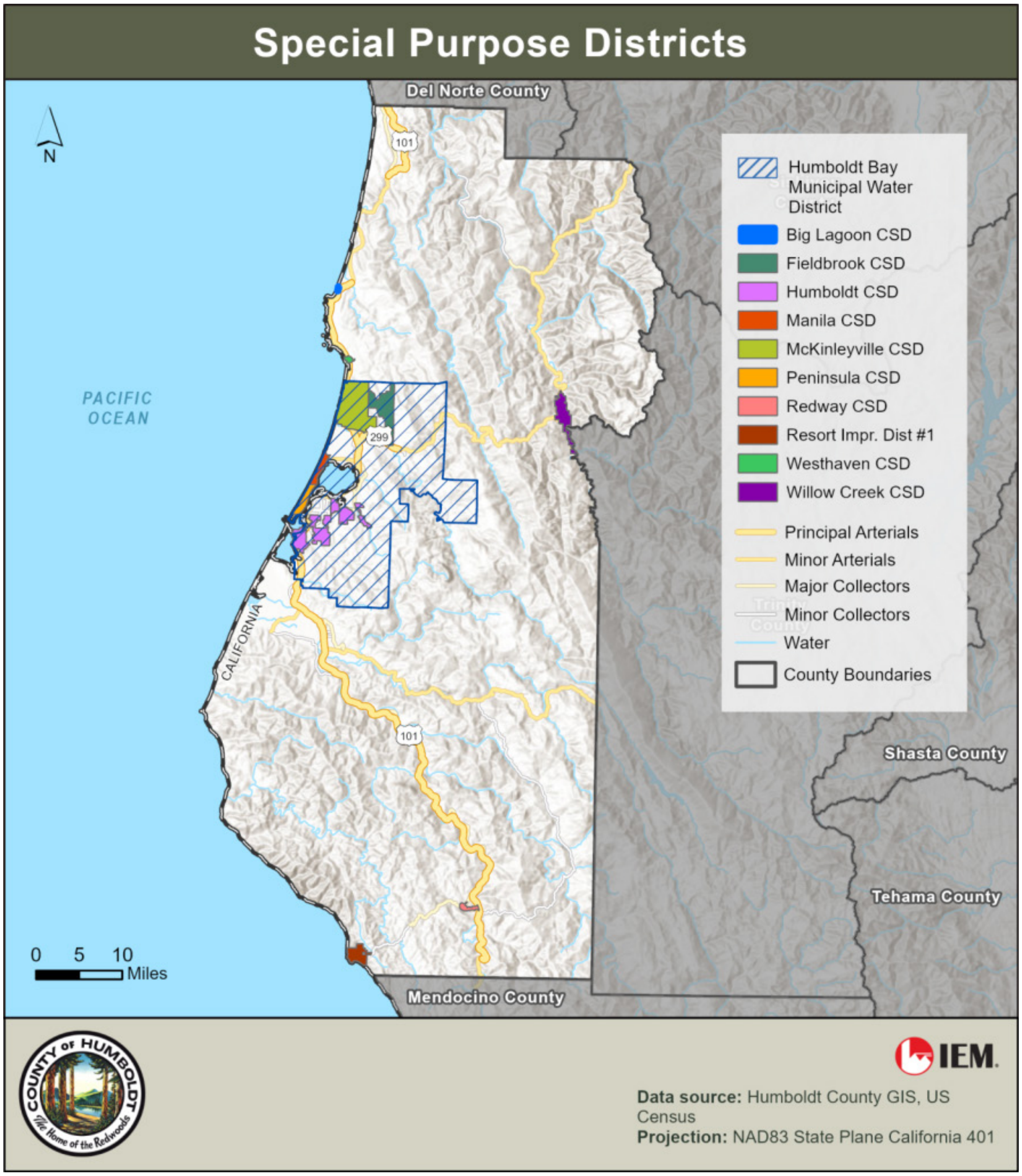

Figure 14: Humboldt County Special-Purpose Districts

3.2. Historical Overview

Humboldt County's history is shaped by the lasting presence of Indigenous peoples, periods of exploration and settlement, resource-based industries, and a range of cultural influences. The area was originally home to numerous Native American tribes, including the Wiyot, Yurok, Hupa and Karuk, whose sovereign nations remain vital to the region's cultural identity and hazard planning today. European exploration began with the Spanish in 1775, followed by American settlers arriving in the mid-1800s during the gold rush, which led to the establishment of towns such as Eureka and Arcata.

As gold mining waned, the economy shifted toward logging, fishing and agriculture, drawing immigrants from China, Italy, Canada, France and Eastern Europe. These groups contributed to the development of industry, railroads and communities across the county. Timber remained the dominant economic driver through the mid-20th century, employing workers from across the U.S., particularly in booming mill towns like Arcata and Manila.

By the 1970s, demographic shifts and growing environmental awareness began reshaping the economy. While natural resource extraction declined, new sectors such as education, health care and environmental conservation emerged, marking Humboldt County's transition to a more diversified economic base.

3.3. Major Previous Hazard Events

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government. A presidential disaster declaration makes federal recovery programs available to help public entities, businesses and individuals. State programs partially match some disaster assistance programs. A review of presidential disaster declarations helps establish the probability of reoccurrence for each hazard and identifies targets for risk reduction. Table 13 displays the declared disasters that have impacted Humboldt County through Feb. 14, 2025. FEMA's Disaster Declarations for States and Counties date back to May 2, 1953.

Table 13: Previous Hazard Events

Event	Disaster Declaration #	Date
Severe Storm	4699	04/03/2023
Flood	3592	03/10/2023
Flood	4683	01/14/2023
Flood	3591	01/09/2023
Biological	4482	03/22/2020
Biological	3428	03/13/2020
Severe Storm	4434	05/17/2019
Flood	4308	04/01/2017
Severe Storm	4301	02/14/2017
Severe Storm	1628	02/03/2006
Hurricane	3248	09/13/2005
Fire	3140	09/01/1999

Event	Disaster Declaration #	Date
Severe Storm	1203	02/09/1998
Severe Storm	1155	01/04/1997
Severe Storm	1046	03/12/1995
Severe Storm	1044	01/10/1995
Fishing Losses	1038	09/13/1994
Flood	979	02/19/1993
Earthquake	943	05/04/1992
Flood	758	02/21/1983
Coastal Storm	677	02/09/1983
Flood	651	01/07/1982
Flood	412	01/25/1974
Flood	329	04/05/1972
Flood	253	01/26/1969
Flood	212	01/22/1966
Flood	183	12/24/1963

3.4. Physical Setting

3.4.1. Geology

Humboldt County’s bedrock geology is primarily divided into two provinces: the Coast Ranges in the central and southwestern areas, and the Klamath Mountains in the northeast, separated by South Fork Mountain Ridge. Due to limited detailed mapping, especially inland, site-specific stability assessments typically require investigation, though general risk assessments can be based on broader geological patterns.

The Coast Ranges, the dominant geologic province, include the Franciscan and Yager complexes and are drained by rivers like the Mad, Eel and Mattole. The Franciscan sandstone unit is relatively stable but prone to debris slides on steep slopes, while the Franciscan mélange is unstable, with hummocky terrain susceptible to mass movement. The Yager Formation, mainly sandstone and shale, is more stable but can slide on steep riverbanks. Coastal areas and lower river basins consist of alluvial sediments that are generally stable when gently sloped and vegetated.

In contrast, the Klamath Mountains province contains older rocks and high-elevation terrain drained by the Klamath and Trinity rivers. This area features a mix of sedimentary rocks, sandstone, slate, chert and schist, alongside occasional granite intrusions, contributing to a complex and rugged geological landscape.

3.4.2. Soils

Humboldt County's soils vary widely by land use and geographic setting. Agricultural soils include the productive Ferndale, Bayside, Loleta, Rohnerville, Carlotta and Hookton series, typically found on floodplains and marine terraces. Most have high productivity ratings (Storie Index 80-100), though drainage issues can limit yields, particularly in Bayside soils.

Forest soils are generally medium-textured, acidic and well-drained, found on alluvial floodplains and terraces. These soils support some of the county's most notable old-growth redwood groves. Grassland soils range from shallow loams to deep clays, often more nutrient-rich than forest soils. Many form on unstable Franciscan mélange, contributing to landslide-prone areas.

Woodland soils, found inland beyond the fog belt, are shallow, typically well-drained and slightly richer in nutrients than adjacent forest soils. However, their Franciscan mélange parent material also makes them susceptible to instability and slow drainage in some areas.

3.4.3. Climate

Humboldt County's climate is shaped by both its coastal location and inland topography, resulting in a cool, marine-influenced climate along the coast and more variable continental conditions inland. Coastal areas experience mild, stable temperatures with minimal seasonal variation, while inland regions see greater temperature extremes. The coastal mountains and semipermanent pressure systems over the Pacific Ocean significantly influence weather patterns. During summer and fall, high pressure over the North Pacific brings dry, stable air, resulting in a dry season. In winter and spring, shifting pressure systems bring moist air and sustained rainfall, marking the wet season from October through April.

Most precipitation occurs as light to moderate rain over extended periods, with the coast averaging 38 inches annually and mountainous areas receiving up to 100 inches. Fog is frequent along the coast, and humidity remains high year-round. Snow is rare at low elevations but common in higher terrain. Temperatures along the coast are relatively stable, with highs seldom surpassing 80 degrees Fahrenheit (F). However, inland valleys can experience much hotter conditions, often exceeding 100 F during the summer. Freezing temperatures occur nearly every winter across the region.

Wind patterns are predominantly from the southwest or west, with the strongest winds occurring in winter and spring. Coastal areas occasionally experience gusts up to 80 mph, while interior valleys may see winds of 40-50 mph annually. The highest recorded wind gust in the county, 94 mph, occurred in the King Range on Jan. 4, 2023.

3.5. Development Profile

3.5.1. Current Land Ownership and Use

The Humboldt County General Plan dictates land use in the planning area. Figure 15 provides an updated visual representation of the county's surface cover types based on data from the National Land Cover Database. This map helps support local land use planning, hazard mitigation, natural resource management and climate resilience efforts by illustrating the diversity and distribution of vegetation, development and water features across the region.

Figure 15 shows that the majority of Humboldt County is dominated by evergreen forest, particularly across inland and mountainous regions, with mixed forest and shrub/scrub lands interspersed throughout. Developed land is concentrated in coastal and lowland areas, especially near Eureka, Arcata, Fortuna and Rio Dell. These areas exhibit varying intensities of urban development, including medium- and high-density zones shown in red on the figure. Pasture/hay and cultivated crops appear in limited patches, mostly in valleys and along river corridors. The Eel River delta region near Ferndale shows a mix of grassland and agricultural land uses. Along the coast and low-lying areas, emergent herbaceous wetlands and woody wetlands are present, while open water is found in Humboldt Bay and various inland lakes and rivers. This detailed classification offers insight into current land use patterns and helps inform environmental planning across Humboldt County.

Figure 15: Humboldt County Land Cover Classifications

3.5.2. Critical Facilities and Infrastructure

Critical facilities and infrastructure are vital to the health and welfare of the population, particularly following hazardous events. This category also includes Tier II facilities and railroads, which hold or transport significant amounts of hazardous materials that could impact public health and safety during such events. For the update of this hazard mitigation plan, the Steering Committee defined critical facilities and infrastructure as those essential components necessary for the health and well-being of the community. These become especially important after a hazardous or natural disaster.

The following categories of critical facilities and infrastructure were established for this hazard mitigation plan:

- **Essential Facilities:**
  - **Medical and Shelter Facilities and Vulnerable Populations:** Facilities likely to be used as a sheltering or community assembly location, and structures likely to contain occupants who may not be sufficiently mobile to avoid death or injury during and after a natural disaster event, including but not limited to hospitals, schools, skilled nursing facilities, board and care homes, pharmacies, clinics, fairgrounds, community centers, ambulance services and veterinary hospitals.
  - **Emergency Response:** Facilities and EOCs needed for response and recovery activities before, during and after a natural disaster, including but not limited to police stations, fire stations, local, state and federal vehicle and equipment storage facilities, and emergency response staging sites.
  - **Utility Services:** Public and private utility facilities that are vital to maintaining or restoring standard services to impacted areas before, during and after a natural disaster, including but not limited to primary and secondary transportation infrastructure, municipal water pumps and wells, water treatment plants, water storage, sewage treatment facilities, lift stations, water and sewer mainlines, substations, electric power generating infrastructure, gas transmission infrastructure, telecommunications, repeater stations, radio stations and towers, fuel storage facilities, aviation control towers, standby power-generating equipment and grocery stores.
  - **Levees:** Soil embankments along the bank or shoreline of a river, creek, slough, or bay to prevent or limit the impact of flooding on the adjacent floodplain. Levees may be engineered structures or un-engineered fills. The level of flood protection varies with capacity, quality of design and construction, age and deterioration, history of flood damage, and level of maintenance. A levee failure can cause sudden, unpredictable distribution of water or debris to the land and structures behind the levee.
- **Hazardous Facilities:**
  - **Major Dams:** Failure of upriver dams in other counties could significantly impact Humboldt County.
  - **Risk Management Plan for Hazardous Material Sites:** These sites include but are not limited to facilities that use or store acutely hazardous materials as defined by the California Code of Regulations, Title 19, Division 2, Chapter 4.5, Section 2770.5.

- **Additional Hazardous Material Sites:** Additional hazardous material sites may include nuclear material storage facilities, retail and wholesale fuel facilities, hazardous materials yards and pulp mills.

These categories were used to identify critical facilities and infrastructure in the planning area. The identified facilities and infrastructure were reassigned to categories defined in the risk assessment software, specifically FEMA's Hazus software, to perform a risk assessment of critical facilities. The identified facilities, grouped by Hazus category, are mapped in Figure 16. This information is based on the best data available on critical facilities and infrastructure during this plan update. The county and its planning partners consider this information subject to change as new information about critical facilities and infrastructure becomes available during the performance period for this plan.

The maps in Figure 16 provide a detailed spatial representation of critical infrastructure across Humboldt County, California. These infrastructure datasets are essential for emergency preparedness, response planning and hazard mitigation activities. The maps highlight the location and distribution of key assets such as airports, electric power facilities, EOCs, communication nodes and wastewater systems, along with essential public services, including police stations, medical care facilities, fire stations, schools and ports. An inset focused on Humboldt Bay offers additional clarity on the concentration of infrastructure in the county's most urbanized area. These visuals support efforts to identify potential vulnerabilities, improve resilience and prioritize resources during both routine planning and emergency situations.

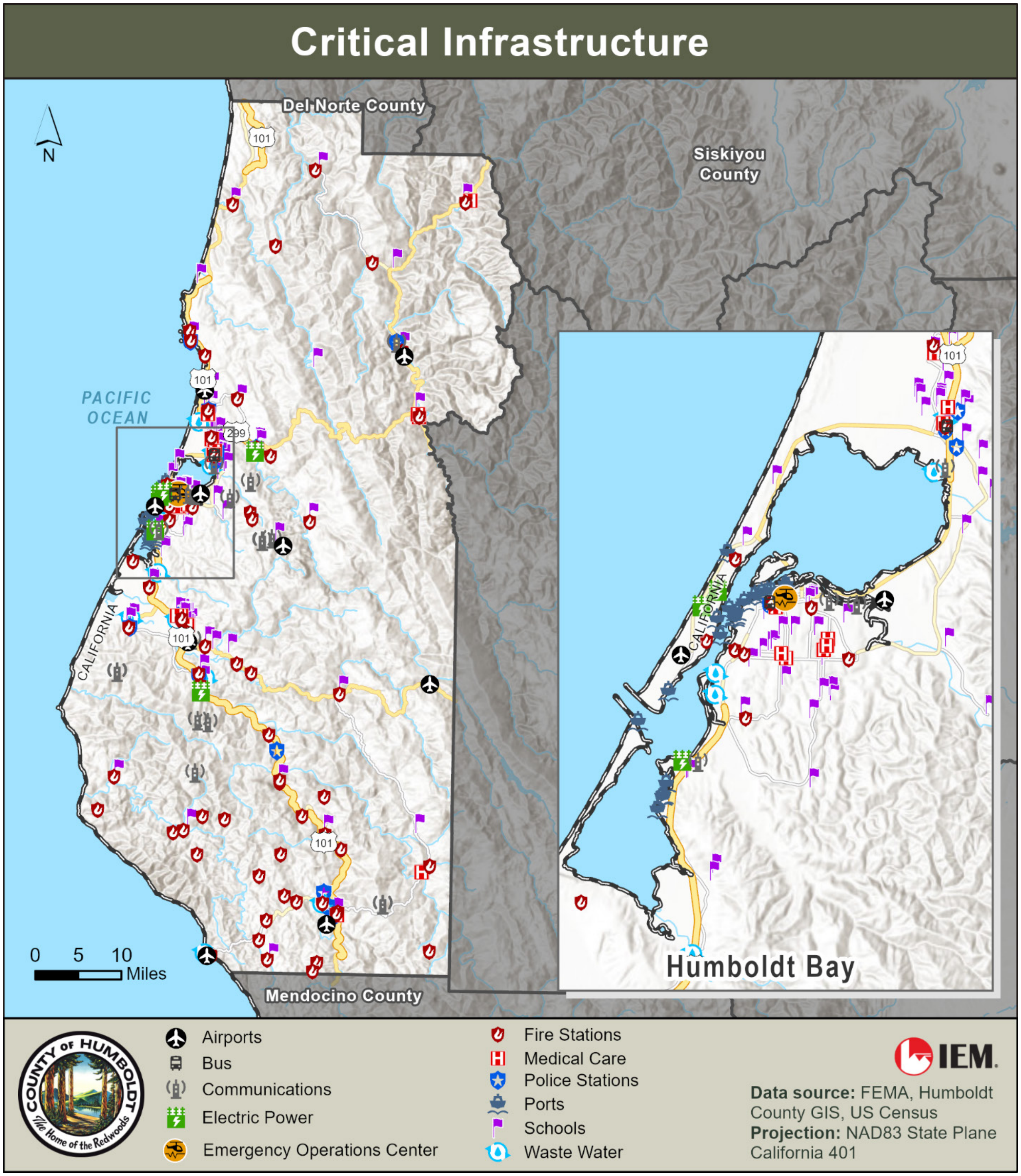

Figure 16 Humboldt County Critical Infrastructure

3.5.3. Future Trends in Development

The county's 2017 General Plan designates Community Planning Areas in various parts of the county to allow for more precise mapping and application of General Plan policies. These areas include most of the county's population and urban infrastructure, so they will continue to be the focus of development activity. Defining these areas also allows for more direct citizen involvement in their communities' planning and increased opportunities for infrastructure planning.

The 2017 General Plan promotes existing focused community development patterns known as "phased urban development." Land use designations outlined in the Land Use Element and Land Use Map promote the efficient use of public infrastructure and offer higher development potential in urban areas with access to public sewer and water services. The General Plan also establishes a framework for the phased expansion of the urban regions. This is intended to create housing opportunities, ensure the continued fiscal viability of infrastructure and urban services and safeguard the continued profitability of resource production in rural lands.

The development timing measures for phased urban development primarily consist of designating areas where near-term service availability is feasible and designating outlying areas as the next logical areas for development. The outlying areas are reserved until the primary areas are nearing capacity. These measures require coordination between the county, the Local Agency Formation Commission, cities, special districts and community members. Issues to be addressed by this partnership include the following:

- Timing growth to be consistent with public service capacity
- Arranging urban land uses to benefit the community while considering individual property rights
- Estimating the amount of development that can be absorbed and its relationship to the environment

The development timing measures focus on and facilitate growth in urban development areas. This system sets the framework for designating regions for urban development and expansion based on the availability and capacity of urban services.

The municipal planning partners have adopted general plans that govern land use decisions and policymaking for their jurisdictions. These programs will govern decisions on land use. This plan will collaborate with these programs to support informed land use decisions in the future by providing vital information on the risks associated with natural hazards in the planning area. All municipal planning partners will reference this hazard mitigation plan update in their general plans. This will ensure that future development trends can be established with the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

3.5.4. Changes in Development with Land Use and Population

Humboldt County has seen notable changes in development and land use, driven by economic shifts and environmental concerns. Once primarily focused on agriculture and timber, the area has increasingly adopted sustainable practices, including organic farming. Urban development, particularly in cities like Eureka and Arcata, has surged due to population growth, leading to a need for new residential and commercial spaces while highlighting challenges such as affordable housing.

Population dynamics reflect a mix of trends, with younger residents moving to urban areas for job opportunities and older individuals returning for a quieter lifestyle. The diversification of the economy, marked by growth in tourism, health care and education, has also impacted demographics, particularly around Cal Poly Humboldt, which draws in a vibrant student population.

Looking forward, balancing development with sustainability is crucial for the county. Effective planning must prioritize environmentally responsible growth to maintain the region's unique character and natural beauty. The relationship between land use, population and environmental preservation will shape Humboldt County's future and requires collaborative efforts from the community to ensure a resilient and thriving area.

3.6. Demographics

Certain populations are at greater risk from hazardous events due to limited resources or physical abilities. For instance, elderly individuals may require additional assistance during such events. Research indicates that people living near or below the poverty line, the elderly, women, children, ethnic minorities, renters, individuals with disabilities and others with specific access and functional needs tend to experience more severe impacts from disasters compared to the general population.

These vulnerable groups may differ from the general population in several ways, including risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability — such as disability, age, poverty and minority race and ethnicity — often overlap spatially and are frequently located in the most geographically vulnerable areas. Conducting detailed spatial analyses to identify regions with higher concentrations of vulnerable community members could enhance targeted public outreach and education efforts for those most in need.

3.6.1. Population Estimates

3.6.1.1. CURRENT POPULATION

Knowledge of the population's composition, its past changes and potential future shifts is necessary for making informed decisions about the future. Information about the population is a critical part of planning because it directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Humboldt County is 35th in population among California's 58 counties. The California Department of Finance estimated the county's population at 133,100 as of Jan. 1, 2024.

3.6.1.2.HISTORICAL POPULATION TRENDS

Population changes are useful socioeconomic indicators: A growing population can indicate a growing economy, and a decreasing population may signify economic decline. Figure 17 illustrates the population change in Humboldt County from 2010 to 2023, while Figure 18 provides information on population estimates during the same period. The state and county experienced 10-year growth rates of about 50% in the 1940s and 1950s. According to USAFacts, Humboldt County has experienced population growth in seven of the 12 years, from 2010 to 2022. The largest increase occurred between 2015 and 2016, while the largest decline was noted between 2020 and 2021. The state's growth rate has also gradually increased by 5.8% over the 10 years from 2010 to 2020, according to the Public Policy Institute of California.

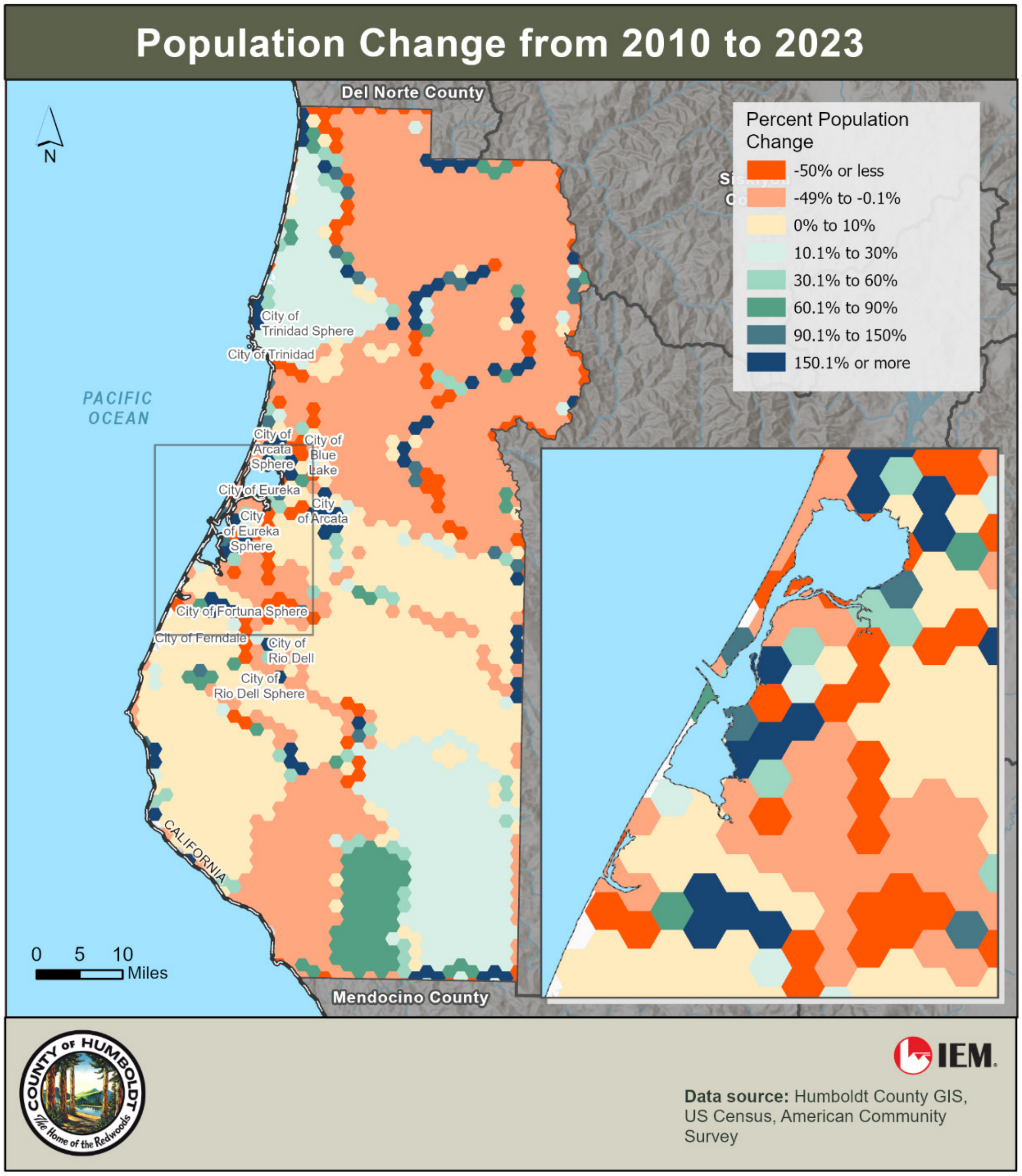

Figure 17: Humboldt County Population Change, 2010–2023

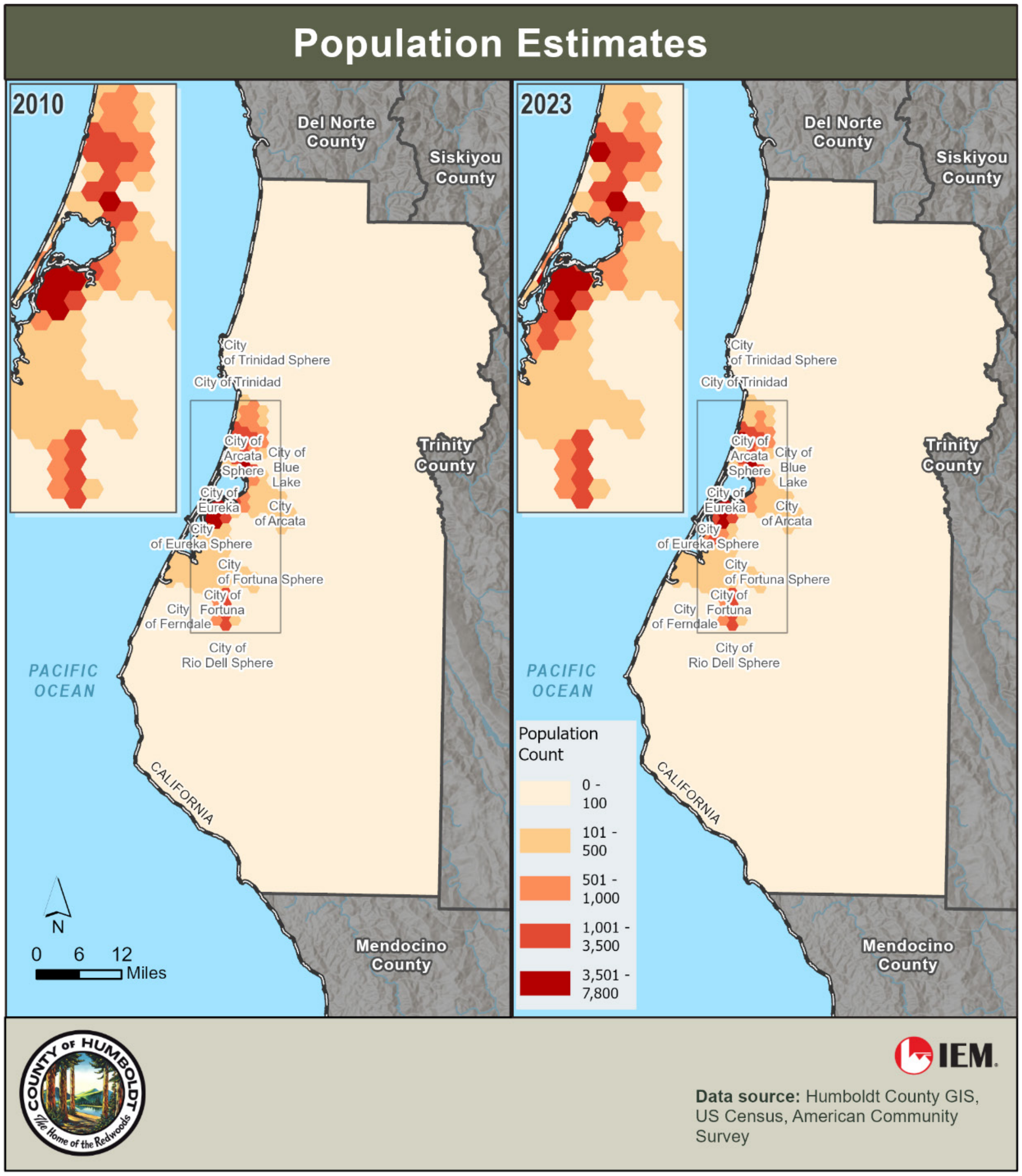

Figure 18: Humboldt County Population Estimates, 2010–2023

Table 14 presents the population of incorporated municipalities from 2020 to 2025. The overall population in incorporated areas decreased approximately 2.37% during that time, according to the World Population Review.

Table 14: Population Growth Data Estimates

Jurisdiction	2020	2021	2022	2023	2024	2025
Arcata	18,790	17,699	18,578	19,012	19,086	19,160
Blue Lake	1,211	1,207	1,192	1,172	1,159	1,146
Eureka	26,496	26,367	26,109	25,734	25,480	25,226
Ferndale	1,399	1,399	1,395	1,389	1,385	1,382
Fortuna	12,496	12,469	12,390	12,285	12,214	12,144
Rio Dell	3,386	3,399	3,360	3,308	3,282	3,256
Trinidad	336	334	330	325	321	317

3.6.1.3.PROJECTED FUTURE POPULATION

Per the California Department of Finance, Humboldt County's population is expected to increase to 140,243 by 2040. This represents a 3.63% increase from the 2018 population. Per the County of Humboldt's 2017 General Plan, a 0.23% average annual growth rate is projected for Humboldt County through 2025, compared to the 0.94% growth rate in the 1990s. Humboldt County's population is projected to decline after 2028 per the County of Humboldt's 2017 General Plan, from 141,441 in 2028 to 138,307 in 2040. There are expected to be 6,325 more persons in 2028 than in 2016 and only 3,134 more in 2040 than in 2016. The General Plan includes a policy to review these trends every five years and adjust as necessary.

3.6.2. Age Distribution

As a group, people who are elderly are more apt to lack the physical and economic resources necessary for responding to hazardous events and are more likely to suffer health-related consequences, making recovery slower. In addition, populations who are elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. Emergency Managers typically identify these facilities as "critical facilities" because they require extra notice to implement evacuation. Elderly residents living in their homes may face greater difficulty evacuating and could be left stranded in hazardous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to the isolation caused by the event.

Children under 14 are particularly vulnerable to disaster events due to their young age and dependence on others for essential necessities. Very young children may also be susceptible to injury or illness; this vulnerability can be exacerbated during a natural disaster because they may not understand the necessary measures to protect themselves from hazards.

The current overall age distribution for the planning area is illustrated in Figure 19. According to U.S. Census data, 20.4% of the planning area's population is 65 years or older, and 18.5% is under 18. Twelve percent of the population aged 65 and older has incomes below the poverty level, and 14% of children under 18 live below the poverty level.

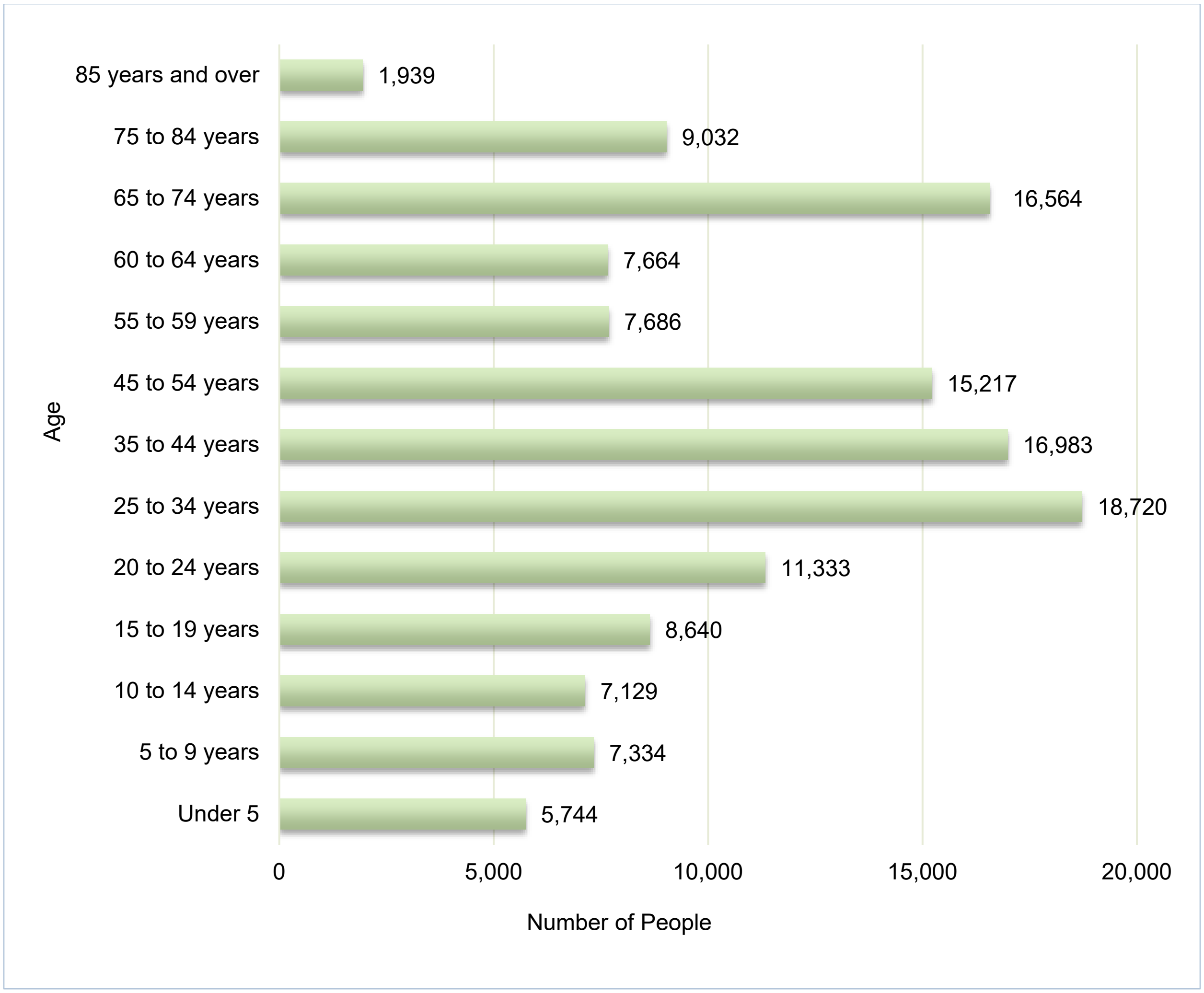

Figure 19: Humboldt County Planning Area Age Distribution

3.6.3. Race, Ethnicity and Language

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. According to the U.S. Census, the racial composition of the planning area is predominantly white, at about 82%. The largest minority populations are multiracial at 6% and American Indian and Alaskan Native at 6.4%. Although not considered a separate race, the planning area has a Hispanic or Latino population of 14.4%. Figure 20 presents the racial distribution in the planning area. Numbers are rounded.

The planning area has a 6.4% foreign-born population. Spanish and English are the most spoken languages in the area. The census estimates that 10.1% of the residents speak English “less than very well.”

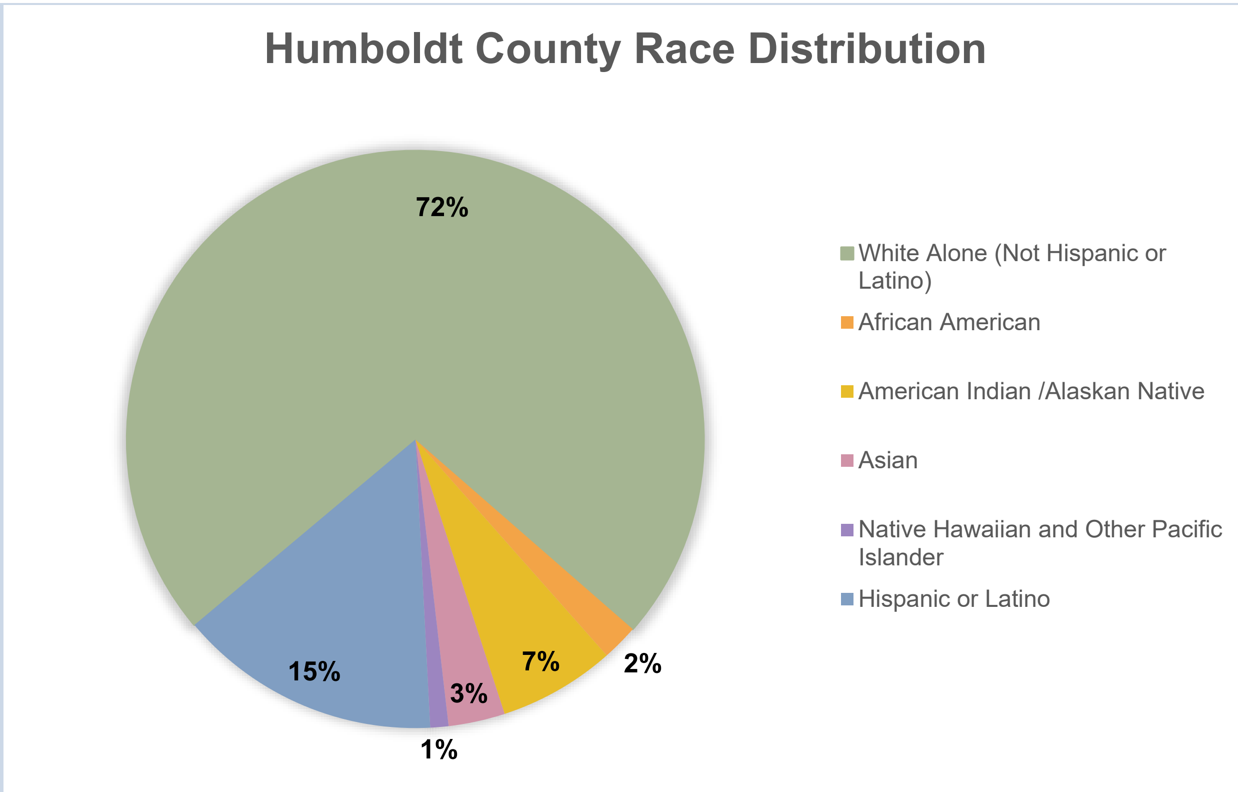

Figure 20: Humboldt County Planning Area by Race Distribution

3.6.4. Individuals with Disabilities or with Access and Functional Needs

The 2022 U.S. Census anniversary report on the Americans with Disabilities Act estimates that 44.1 million non-institutionalized Americans with disabilities live in the U.S. This equates to about one in five persons. The 2023 U.S. Census data shows that 14.3% of individuals under 65 years old in Humboldt County have some form of disability.

Individuals with disabilities are more likely to have difficulty responding to a hazardous event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs to plan for incidents that require evacuation and sheltering. Knowing the percentage of the population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs.

4. Programs and Regulations

Existing regulations, agencies and programs at the federal, state and local levels can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Information presented in this section can be used to review local capabilities to implement the action plan outlined in this hazard mitigation plan.

4.1. Relevant Federal and State Agencies, Programs and Regulations

Federal and state regulations and programs that must be considered in hazard mitigation are constantly evolving. For this plan, a review was conducted to determine which regulations and programs are most relevant to hazard mitigation planning. Table 15 summarizes relevant federal agencies, programs and regulations, and Table 16 summarizes relevant state agencies, programs and regulations.

Table 15: Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
A Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment	Wildfire Hazard	This implementation plan, developed by federal and Western state agencies, outlines strategies to restore fire-adapted ecosystems and mitigate hazardous fuels.
Americans with Disabilities Acts	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Bureau of Indian Affairs	Wildfire Hazard	The Bureau's Fire and Aviation Management National Interagency Fire Center provides wildfire protection, fire use, hazardous fuels management and emergency rehabilitation on Indian forest and rangelands.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Bureau of Land Management (BLM)	Wildfire Hazard	The Bureau provides funding and oversees programs for wildfire management, as well as structural fire management and prevention on BLM lands.
Civil Rights Act of 1964	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Clean Water Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Community Development Block Grant Disaster Resilience Program	Action Plan Funding	This is a potential alternative source of funding for actions identified in this plan.
Community Rating System	Flood Hazard	This voluntary program encourages floodplain management activities that exceed the minimum NFIP requirements.
Disaster Mitigation Act	Hazard Mitigation Planning	This is the current federal legislation addressing hazard mitigation planning.
Emergency Relief for Federally Owned Roads Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Emergency Watershed Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Endangered Species Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Federal Energy Regulatory Commission Dam Safety Program	Dam Failure Hazard	This program cooperates with a large number of federal and state agencies to ensure and promote dam safety.
National Environmental Policy Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Federal Wildfire Management Policy and Healthy Forests Restoration Act	Wildfire Hazard	These documents mandate community-based collaboration to reduce risks from wildfire.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
National Dam Safety Act	Dam Failure Hazard	This act requires a periodic engineering analysis of most dams in the country.
National Fire Plan (2001)	Wildfire Hazard	This plan calls for joint risk reduction planning and implementation by federal, state and local agencies.
National Flood Insurance Program	Flood Hazard	This program makes federally backed flood insurance available to homeowners, renters and business owners in exchange for communities enacting floodplain regulations.
National Incident Management System	Action Plan Development	Adoption of this system for government, nongovernmental organizations and the private sector to work together to manage incidents involving hazards is a prerequisite for federal preparedness grants and awards.
National Park Service, Redwood National Park	Wildfire Hazard	Park staff provide wildland and structure fire protection, and they conduct wildfire management in the park.
Presidential Executive Order 11988 (Floodplain Management)	Flood Hazard	This order requires federal agencies to avoid long- and short-term adverse impacts associated with modification of floodplains.
Presidential Executive Order 11990 (Protection of Wetlands)	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable presidential executive orders.
U.S. Army Corps of Engineers Dam Safety Program	Dam Failure Hazard	This program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act.
U.S. Army Corps of Engineers Flood Hazard Management	Flood Hazard, Action Plan Implementation, Action Plan Funding	The Corps of Engineers offers multiple funding and technical assistance programs available for flood hazard mitigation actions.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
U.S. Fire Administration	Wildfire Hazard	This agency provides leadership, advocacy, coordination and support for fire agencies and organizations.
U.S. Fish and Wildlife Service	Wildfire Hazard	This service's fire management strategy employs prescribed fire throughout the National Wildlife Refuge System to maintain ecological communities.
U.S. Forest Service Six Rivers National Forest	Wildfire Hazard	Staff provide wildfire management primarily on national forest lands.

Table 16: Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 32: The California Global Warming Solutions Act	Action Plan Development	This act establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020.
AB 70: Flood Liability	Flood Hazard	A city or county may be required to partially compensate for property damage caused by a flood if it unreasonably approves new development in areas protected by a state flood control project.
AB 162: Flood Planning	Flood Hazard	Cities and counties must address flood-related matters in the land use, conservation and safety and housing elements of their general plans.
AB 747: General Plans — Safety Element	Hazard Mitigation Planning	The safety elements of cities' and counties' general plans must address evacuation routes and include any new information on flood and fire hazards and climate adaptation and resilience strategies.
AB 2140: General Plans — Safety Element	Hazard Mitigation Planning	This bill enables state and federal disaster assistance and mitigation funding to communities with compliant hazard mitigation plans.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 2800: Climate Change — Infrastructure Planning	Action Plan Development	This act requires state agencies to take into account the impacts of climate change when developing state infrastructure.
Alquist-Priolo Earthquake Fault Zoning Act	Earthquake Hazard	This act restricts construction of buildings used for human occupancy on the surface trace of active faults.
California Coastal Management Program	Flood, Landslide, Tsunami and Wildfire Hazards	This program requires coastal communities to prepare coastal plans and ensures that new development minimize risks to life and property in areas of high geologic, flood and fire hazard.
California Department of Forestry and Fire Protection	Wildfire Hazard	CAL FIRE has responsibility for wildfires in areas that are not under the jurisdiction of the Forest Service or a local fire organization.
California Department of Parks and Recreation	Wildfire Hazard	The State Parks Resources Management Division has wildfire protection resources available to suppress fires on State Park lands.
California Department of Water Resources	Flood Hazard	This state department is the state coordinating agency for floodplain management.
California Division of Safety of Dams	Dam Failure Hazard	This division monitors the dam safety program at the state level and maintains a working list of dams in the state.
California Environmental Quality Act	Action Plan Implementation	This act establishes a protocol of analysis and public disclosure of the potential environmental impacts of development projects. Any project action identified in this plan will seek full California Environmental Quality Act compliance upon implementation.
California Fire Alliance	Wildfire Hazard	The alliance works with communities at risk from wildfires to facilitate the development of community fire loss mitigation plans.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
California Fire Plan	Wildfire Hazard	This plan's goal is to reduce costs and losses from wildfire through pre-fire management and through successful initial response.
California Fire Safe Council	Wildfire Hazard	This council facilitates the distribution of National Fire Plan grants for wildfire risk reduction and education.
California Fire Service and Rescue Emergency Mutual Aid Plan	Wildfire Hazard	This plan provides guidance and procedures for agencies developing emergency operations plans, as well as training and technical support.
California General Planning Law	Hazard Mitigation Planning	This law requires every county and city to adopt a comprehensive long-range plan for community development, and related laws call for integration of hazard mitigation plans with general plans.
California Multi-Hazard Mitigation Plan	Hazard Mitigation Planning	Local hazard mitigation plans must be consistent with their state's hazard mitigation plan.
California Residential Mitigation Program	Earthquake Hazard	This program helps homeowners with seismic retrofits to lessen the potential for damage to their houses during an earthquake.
California State Building Code	Action Plan Implementation	Local communities must adopt and enforce building codes, which include measures to improve buildings' ability to withstand hazard events.
Disadvantaged and Low-Income Communities Investments	Action Plan Funding	This is a potential source of funding for actions located in disadvantaged or low-income communities.
Division of the State Architect's AB 300 List of Seismically At-Risk Schools	Earthquake Hazard, Action Plan Development	The Division of the State Architect recommends that local school districts conduct detailed seismic evaluations of seismically at-risk schools identified in the inventory that was required by AB 300.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Governor's Executive Order S-13-08 (Climate Impacts)	Action Plan Implementation	This order includes guidance on planning for sea level rise in designated coastal and floodplain areas for new projects.
Office of the State Fire Marshal	Wildfire Hazard	This office has a wide variety of fire safety and training responsibilities.
Senate Bill 97: Guidelines for Greenhouse Gas Emissions	Action Plan Implementation	This bill establishes that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for California Environmental Quality Act analysis.
Senate Bill 379: General Plans: Safety Element — Climate Adaptation	Action Plan Implementation	This bill requires cities and counties to include climate adaptation and resilience strategies in the safety element of their general plans.
Senate Bill 1000: General Plan Amendments — Safety and Environmental Justice Elements	Action Plan Implementation	Under this bill, review and revision of general plan safety elements are required to address only flooding and fires (not climate adaptation and resilience), and environmental justice is required to be included in general plans.
Senate Bill 1241: General Plans: Safety Element — Fire Hazard Impacts	Wildfire Hazard	This bill requires cities and counties to evaluate and document available fire protection and suppression services before approving a tentative map or parcel map.
Standardized Emergency Management System	Action Plan Implementation	Local governments must use this system to be eligible for state funding of response-related personnel costs.

4.2. Local Plans, Reports and Codes

Plans, reports and other technical information were either provided directly by participating jurisdictions and stakeholders or identified through independent research by the planning consultant. These documents were reviewed to determine the following:

- Existing jurisdictional capabilities
- Needs and opportunities to develop or enhance capabilities

- Mitigation-related goals or objectives considered during the development of the overall goals and objectives
- Proposed, in-progress or potential mitigation projects, actions and initiatives to be incorporated into the updated jurisdictional mitigation strategies

The following local regulations, codes, ordinances and plans were reviewed to develop complementary and mutually supportive goals, objectives and mitigation strategies that align with local and regional planning and regulatory mechanisms:

- General plans (land use, housing safety and open space elements)
- Building codes
- Zoning and subdivision ordinances
- NFIP flood damage prevention ordinances
- Stormwater management plans
- Emergency management and response plans
- Land use and open space plans
- Climate action plans
- Community wildfire protection plans
- Tribal hazard mitigation plans

4.3. Local Capability Assessment

All participating jurisdictions compiled an inventory and analysis of existing authorities and capabilities, referred to as a "capability assessment." This assessment documents a jurisdiction's mission, programs and policies, and evaluates its capacity to implement them. It also identifies potential gaps in the jurisdiction's capabilities.

The planning partnership considers all core jurisdictional capabilities fully adaptable to address a jurisdiction's needs. Every code can be revised, and every plan can be updated. This adaptability is recognized as an overarching capability. If the capability assessment revealed an opportunity to address a missing core capability or enhance an existing one, it has been included as an action in the jurisdiction's action plan, which is outlined in the individual annexes.

The following sections outline the specific capabilities assessed during this process.

4.3.1. Legal and Regulatory Capabilities

Jurisdictions are able to develop policies and programs and to implement rules and regulations to protect and serve residents. Local policies are typically identified in various community plans, implemented through a local ordinance and enforced by a governmental body.

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain and stormwater management ordinances. When effectively prepared and administered, these regulations can contribute to hazard mitigation.

4.3.2. Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of its ability to meet the financial requirements for hazard mitigation projects. This assessment identifies both external resources, such as grant-funding eligibility, and local jurisdictional authority to create internal financial capability, such as impact fees.

4.3.3. Administrative and Technical Capabilities

Legal, regulatory and fiscal capabilities provide the foundation for successfully developing a mitigation strategy; however, without adequate personnel, the strategy may not be implemented. Administrative and technical capabilities emphasize the availability of personnel resources responsible for carrying out all aspects of hazard mitigation. These resources include technical experts such as engineers and scientists, as well as personnel with skills that may span multiple departments, such as grant writers.

4.3.4. National Flood Insurance Program Compliance

Flooding is the most expensive natural hazard in the United States, and recent federal regulations have led to rising flood insurance premiums for homeowners nationwide. Participation in the NFIP offers access to grant funding specifically aimed at addressing flooding challenges. Reviewing a jurisdiction's NFIP status and compliance helps planners gain insight into the local flood management program, identify areas for enhancement and explore available funding opportunities.

4.3.5. Public Outreach Capability

Engaging with the public on hazard mitigation issues allows for direct interaction with community members. Evaluating this outreach and education capability highlights the relationship between the government and the community, fostering a two-way dialogue that promotes resilience through education and active public involvement.

4.3.6. Participation in Other Programs

Programs like the Community Rating System, Storm/Tsunami Ready and Firewise USA strengthen a jurisdiction's capacity to address, prepare for and respond to natural hazards. These initiatives reflect a commitment to exceed the basic requirements established by local, state and federal regulations, fostering greater resilience in the community. By emphasizing communication, mitigation and community readiness, these programs work together to protect lives and reduce the effects of natural hazards on communities.

4.3.7. Development and Permitting Capability

Understanding past and future development trends involves thoroughly reviewing permits issued since the previous plan's completion and considering anticipated future development. Monitoring growth in areas prone to hazards offers insight into a community's increasing exposure to potential risks.

4.3.8. Adaptive Capacity

An adaptive capacity assessment examines a jurisdiction's ability to foresee and address potential impacts from future conditions. By considering factors such as public support and technical adaptive capacity, jurisdictions can evaluate their fundamental resilience to challenges like sea level rise. This assessment allows jurisdictions to pinpoint areas needing improvement.

4.3.9. Integration Opportunity

The assessment sought ways to align this mitigation plan with the identified legal and regulatory capabilities. Opportunities for integration were recognized if they could either support or strengthen the actions outlined in this plan or benefit from components of the plan. Planning partners evaluated and included actions for implementing this integration in their jurisdictional annexes.

5. Risk Assessment and Hazard Identification

Risk assessment involves evaluating the potential consequences of hazardous events, including threats to human life, personal safety, economic stability and property integrity. This process includes several key components:

- **Hazard Identification:** Utilizing available data to determine the types of hazards that could impact a specific area, their frequency and their likely severity.
- **Exposure Analysis:** Estimating the number of people, structures and assets that may be affected if a hazardous event occurs.
- **Vulnerability Assessment and Impact Estimation:** Analyzing how hazards may affect residents, infrastructure, the environment and the local economy, including potential financial losses and the benefits of mitigation efforts.

The risk evaluation conducted for this hazard mitigation plan assesses the region's susceptibility to natural disasters and complies with the requirements outlined in the Disaster Mitigation Act (44 CFR, Section 201.6(c)(2)). To safeguard privacy and protect sensitive infrastructure details, property data is presented in a summarized format without specific references to individual residences or public facilities.

5.1. Identified Hazards of Concern

The Steering Committee conducted a comprehensive evaluation of natural hazards that could impact the planning area, identifying those that pose the most significant risks. This assessment involved reviewing state and local hazard planning documents, analyzing past hazard events and considering their frequency, intensity and financial impact. In addition, firsthand accounts and local insights regarding hazard exposure and vulnerabilities were taken into account. Based on this analysis, the plan focuses on the following hazards of concern (listed alphabetically, with no ranking of severity implied):

- Dam Failure
- Drought
- Earthquake
- Extreme Temperatures (Hot and Cold)
- Flooding (including Sea Level Rise)
- Landslide
- Wind
- Winter Weather

- Tsunami
- Wildfire

5.2. Risk Assessment Tools

5.2.1. Mapping

To support this planning effort, national, state and county databases were examined to identify relevant spatial data. When applicable datasets were available, Geographic Information System (GIS) software was used to create maps illustrating the areas affected by various hazards.

5.2.2. Modeling

In 1997, FEMA introduced the Hazus computer simulation model to assess earthquake-related losses and identify areas most at risk. Over time, Hazus evolved into a multi-hazard tool, expanding its capabilities to estimate potential damages from hurricanes and floods.

- **Standardized Risk Assessment:** Ensures a uniform approach to evaluating hazards across different regions and jurisdictions.
- **Data Storage and Updates:** Allows for continuous updates as population, infrastructure and mitigation strategies evolve.
- **Supports Mitigation Planning:** Helps align risk assessments with FEMA methodologies, streamlining the review process for hazard mitigation plans.
- **Enhances Grant Applications:** Provides FEMA-compliant loss estimates that can support funding requests.
- **Stakeholder Communication:** Generates hazard data and impact estimates to improve decision-making and community awareness.
- **Local Administration and Management:** Enables local governments to oversee and update hazard mitigation plans as conditions change.

By integrating GIS technology with hazard modeling, Hazus serves as a valuable tool for communities seeking to enhance their resilience and preparedness efforts.

Hazus includes preloaded data sets for inventory, vulnerability and hazards, which can be enhanced with locally sourced data to improve the accuracy of the analysis. The model offers three levels of assessment, based on the level of detail available for the planning area:

- **Level 1:** All of the information needed to produce an estimate of losses is included in the software’s default data. The data is derived from national databases and describes in general terms the characteristic parameters of the planning area.

- **Level 2:** More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format. Level 2 was utilized by the planning team.
- **Level 3:** This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

5.3. Risk Assessment Approach

The risk assessments in this plan examine the potential impacts of each identified hazard of concern. The following approach was used to evaluate the risk associated with each hazard:

- **Hazard Identification and Profiling:** Each hazard was analyzed based on the following:
  - A historical overview of past events affecting the area
  - Geographic regions most susceptible to the hazard
  - Estimates of how often the event may occur
  - Expected severity levels
  - The amount of warning time available before impact
- **Exposure Analysis:** The NCEI data was analyzed to determine exposure to a hazard.
- **Vulnerability Assessment:** The susceptibility of exposed structures and infrastructure was assessed by evaluating the probability of hazard occurrence and the potential impact on at-risk facilities.

5.3.1. Mapping

Mapping was an essential component of the hazard mitigation planning process, allowing planners to identify hazard prone areas and assess exposure to threats. GIS was used to overlay hazard data with population centers, infrastructure, and critical facilities to determine potential impacts and guide decision-making. These maps supported the development of targeted mitigation actions to reduce risk. Visualizations also helped communicate risk to stakeholders.

5.3.2. Exposure and Vulnerability

Hazard profiles were created by conducting online research and reviewing existing reports and plans, such as community general plans and state and local hazard mitigation strategies. Assessments of frequency and severity were based on historical events as well as insights from geologists, emergency management professionals and other subject matter experts.

5.3.2.1. FLOODING AND EARTHQUAKES

The assessment of community exposure and vulnerability to floods and earthquakes was conducted using available hazard mapping, historical data and local risk evaluations.

- **Flooding:** Flood-prone areas were identified using current floodplain mapping. An analysis of general building stock, critical facilities and infrastructure in flood zones helped estimate potential losses. Damage projections were based on flood depth, property values and past flood impacts.
- **Earthquake:** Earthquake vulnerability was assessed based on known fault lines, past seismic activity and potential ground-shaking scenarios. Infrastructure, residential structures and lifelines at risk were identified to estimate possible damages and disruptions.

5.3.2.2. OTHER ASSESSED HAZARDS

Hazards, such as dam failure, extreme temperatures, wind, tsunami, wildfire, landslides, severe storms, and drought, historical records and expert assessments were used to evaluate risk. Due to limited historical datasets for some hazards, a qualitative approach was applied, incorporating available hazard maps, environmental conditions and professional judgment.

- **Dam Failure:** Risk was assessed based on the presence of high-hazard potential dams, available inundation mapping, and downstream population and infrastructure exposure.
- **Extreme Temperatures:** Hazard impacts were analyzed by examining historical temperature extremes, frequency of heatwaves and cold spells, and potential effects on vulnerable populations, infrastructure, and energy demand.
- **Wind:** The assessment considered historical windstorm events along with damage reports, building exposure, and regional wind vulnerability data.
- **Tsunami:** Vulnerability was evaluated using coastal topography and proximity to subduction zones or offshore seismic sources.
- **Wildfires:** Areas at risk were identified based on vegetation patterns, climate conditions and past fire occurrences.
- **Landslides:** Susceptibility was evaluated using slope stability maps and historical slide data.
- **Winter Weather:** Impacts from high winds, heavy rainfall, and coastal erosion were assessed based on past events and regional climate patterns.
- **Drought:** Since drought does not directly affect structures, its assessment focused on water supply, agricultural impacts and long-term economic consequences.

This analysis provides a comprehensive understanding of how various hazards impact Humboldt County, guiding mitigation planning and preparedness efforts.

5.4. Limitations

Loss estimates, exposure assessments and hazard vulnerability evaluations are based on the most reliable data and methodologies available. However, inherent uncertainties exist in any loss estimation process due to limitations in scientific understanding of natural hazards and their impacts on the built environment. Several factors contribute to these uncertainties, including the following:

- The need for approximations and simplifications in conducting assessments
- Gaps or outdated information in inventory, demographic, or economic data
- The unique characteristics of each hazard, including its extent, severity and unpredictability
- The effectiveness of existing mitigation measures that may reduce potential losses
- The amount of warning time available for residents to prepare for and respond to a hazard

5.5. Risk Ranking

FEMA mandates that all hazard mitigation planning partners develop mitigation actions tailored to their jurisdiction's specific risk, vulnerability and community priorities. This plan incorporates a risk ranking protocol for each planning partner, where "risk" was determined by multiplying the likelihood of an event by its impact on people, property and the economy. Risk estimates were calculated using FEMA-endorsed methodologies. The Steering Committee examined, deliberated on and approved both the approach and its outcomes. All planning partners applied the same methodology to assess risk in their own jurisdictions.

Results from risk rankings are utilized to guide the setting of mitigation priorities. Each partner relied on its risk ranking to shape its action plan. Planning partners were instructed to identify mitigation actions to address, at minimum, hazards assigned a "high" or "medium" risk ranking. Addressing hazards with a low risk or no ranking is optional.

5.5.1. Probability of Occurrence

The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence:

- **High:** The hazard event is likely to occur within 5 years (probability factor = 3).
- **Medium:** The hazard event is likely to occur within 25 years (probability factor = 2).
- **Low:** The hazard event is not likely to occur within 100 years (probability factor = 1).
- **No Exposure:** There is no probability of occurrence (probability factor = 0).

These variables can lead to significant variations in loss projections, sometimes by a factor of two or more. As a result, exposure and loss estimates should be considered approximate indicators of relative risk, rather than precise predictions. Over time, the County of Humboldt will work to improve data collection efforts to enhance the accuracy of future risk assessments.

5.5.2. Impact

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People:** Values were assigned based on the percentage of the total population exposed to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. It should be noted that planners can use an element of subjectivity when assigning values for impacts on people. Impact factors were assigned as follows:
  - High – Twenty-five percent or more of the population is exposed to a hazard (impact factor = 3).
  - Medium – Ten percent to 25% of the population is exposed to a hazard (impact factor = 2).
  - Low – Ten percent or less of the population is exposed to the hazard (impact factor = 1).
  - No Impact – None of the population is exposed to a hazard (impact factor = 0).
- **Property:** Values were assigned based on the percentage of the total property value exposed to the hazard event.
  - High – Twenty-five percent or more of the total assessed property value is exposed to a hazard (impact factor =3).
  - Medium – Ten percent to 25% of the total assessed property value is exposed to a hazard (impact factor = 2).
  - Low – Ten percent or less of the total assessed property value is exposed to the hazard (impact factor = 1).
  - No Impact – None of the total assessed property value is exposed to a hazard (impact factor = 0).
- **Economy:** Values were assigned based on the percentage of the total property value vulnerable to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total replacement value of the property exposed to the hazard.
  - High – Estimated loss from the hazard is 10% or more of the total exposed property value (impact factor = 3).
  - Medium – Estimated loss from the hazard is 5%-10% of the total exposed property value (impact factor = 2).

- Low – Estimated loss from the hazard is 5% or less of the total exposed property value (impact factor = 1).
- No Impact – No loss is estimated from the hazard (impact factor = 0).

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: Impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the economy was given a weighting factor of 1. The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors. Based on these ratings, a priority of high, medium, or low was assigned to each hazard.

5.6. Dam Failure

5.6.1. Hazard Description

Dams are vital components of modern infrastructure, offering a range of benefits, including water storage, flood prevention, hydroelectric power generation, irrigation and recreational opportunities. Reservoirs assist in managing water supply and fostering economic growth. However, despite their advantages, dams also have substantial risks, particularly in cases of structural failure. When the integrity of a dam or its foundation is compromised, it may no longer be able to contain the water it holds. This can result in an uncontrolled release of water, leading to flash floods downstream. Such events can cause severe destruction, including loss of life, widespread property damage and the displacement of entire communities.

There are multiple reasons why a dam might fail, often stemming from a combination of natural and human-induced factors. One major cause is excessive rainfall and flooding, which can push a dam beyond its storage capacity, resulting in overtopping. If the spillway is blocked or insufficient, water may overflow, gradually eroding the embankment and leading to collapse. Another significant risk is internal erosion, where water seeps through the dam's foundation or embankment, weakening its structure over time. In some cases, this process leads to a phenomenon known as piping, in which water flow erodes the dam from within, increasing the likelihood of failure.

Structural issues also play a role in dam instability. Poor design or substandard construction materials can compromise a dam's strength, making it more susceptible to collapse. Lack of proper maintenance and oversight further heightens the risk, as neglected gates, valves and essential components can deteriorate over time. In addition, natural disasters, such as earthquakes, high winds and landslides, pose serious threats to dam stability. A landslide into a reservoir can rapidly raise water levels beyond manageable limits, while seismic activity can cause cracks or weaken the foundation, increasing the potential for failure.

The aftermath of a dam failure extends beyond immediate physical destruction. In cases where large reservoirs are breached, the resulting floods can spread rapidly, leaving little time for residents to evacuate. Such disasters can also lead to severe water shortages if the affected dam plays a key role in a region's water supply network. In addition, the economic repercussions can be devastating, particularly in areas where dams are critical for power generation, agriculture and infrastructure. Given the potentially catastrophic consequences, ensuring the structural integrity of dams through proper design, regular inspections and timely maintenance is essential for safeguarding communities and minimizing risks.

5.6.1.1.CASCADING HAZARDS

When a dam fails, it can set off a series of cascading hazards on surrounding communities. One of the most immediate and severe hazards is catastrophic flooding in downstream areas. The sudden surge of water can cause widespread destruction, resulting in extensive property damage, environmental devastation and loss of life. In addition to flooding, critical infrastructure, such as roads, bridges and utility systems, can suffer severe damage. This disruption can lead to prolonged outages in essential services, including electricity, water supply and communication networks, making recovery efforts even more challenging. In addition, the immense force of escaping water can destabilize surrounding slopes, triggering landslides that further threaten homes, infrastructure and roadways. Another major concern is contamination, as floodwaters can carry hazardous materials, including sewage, industrial chemicals and debris, which can pollute water sources and agricultural land, posing significant health risks. Each of these hazards compounds the destruction caused by the initial dam failure, making preparedness and mitigation strategies essential for reducing the overall impact.

5.6.2. Location

The three dams in and near Humboldt County serve critical roles, including local infrastructure support, environmental management and water supply. Table 17 lists key information on dams in the county as well as dams in Mendocino and Trinity counties, including their regulatory status, purpose, hazard classification and inspection history. Although these structures are maintained under regulatory oversight, their failure could have significant consequences for downstream communities, natural habitats and essential infrastructure. In addition, dams in Mendocino and Trinity counties are outside of the operational area, but failure of these dams would adversely impact Humboldt County.

5.6.2.1.BIG LAGOON DAM

Big Lagoon Dam is classified as having low hazard potential. If the dam were to fail, the flooding impact would likely be contained with minimal threat to human life or significant infrastructure. However, a failure could still lead to localized flooding affecting nearby wetland ecosystems and adjacent properties. The increased water release could temporarily alter the lagoon's balance, potentially disrupting local fisheries and wildlife habitats. Although major infrastructure is unlikely to be impacted, prolonged flooding could erode nearby roadways and temporarily displace recreational users and local residences.

5.6.2.2.SCOTIA LOG POND DAM

The Scotia Log Pond Dam is classified as a high hazard potential dam, meaning its failure could have severe consequences. Located near the town of Scotia, a historic mill town, with structures built close to the Eel River floodplain, a dam breach would likely result in a sudden release of water that could flood parts of Scotia and the local low-lying area. A significant dam failure could also lead to extensive property damage and the potential displacement of residents.

Floodwaters could impact Scotia's road network, utilities and water supply systems, causing prolonged service disruptions. In addition, sediment and debris from the Log Pond could be carried downstream, contributing to water contamination and harming aquatic ecosystems in the Eel River. Due to these risks, an EAP is in place to ensure swift response efforts in case of structural failure.

5.6.2.3.R. W. MATTHEWS DAM

R. W. Matthews Dam is located on the Mad River approximately 80 miles upstream of the mouth of the river. The dam is located in southern Trinity County. R.W. Matthews is a zoned, earth-fill dam. It has an ungated spillway, and a maximum height above the streambed of approximately 150 feet. The spillway is classified as a critical appurtenant structure by the Division of Safety of Dams (DSOD). Ruth Lake Reservoir has a capacity of approximately 48,000 acre-feet at spillway crest elevation 2,654 feet. According to the “Recommended Guidelines for Safety Inspection of Dams” R.W. Matthews Dam is a large, high-hazard dam due to the dam’s height, reservoir capacity and potential to cause downstream damage. DSOD also rates the dam as high hazard because of the expectation that a failure would cause the loss of at least one human life. The dam is rated high hazard not because it is at risk of failing, but because of the number of people who could be impacted downstream in the event of failure.

Failure of R. W. Matthews Dam is highly unlikely; however, if it were to fail, it would most likely be due to one of the following events: flooding, earthquake, foundation, or embankment failure, landslide, log boom failure (resulting in spillway blockage), penstock rupture, or criminal or terrorist acts. The Humboldt Bay Municipal Water District has performed a comprehensive dam-break engineering analysis, in accordance with Federal Energy Regulatory Commission (FERC) guidelines, to estimate the areas and magnitude of downstream inundation resulting from a sudden failure of R. W. Matthews Dam. The analysis assumed starting conditions such as the amount of water in Ruth Reservoir and the flow conditions in the Mad River at the time of failure. Two hypothetical failure scenarios were developed and analyzed to determine the extent of inundation resulting from failure of the dam. The first scenario represents a “worst-case” scenario by assuming similar starting conditions as the maximum recorded winter flood event that occurred on the Mad River in 1964. The second scenario, called the “sunny day” failure, assumes that failure occurs when the reservoir is full, but when the Mad River has much lower summertime flows. Figure 21 shows the locations of all dams that would affect the planning area.

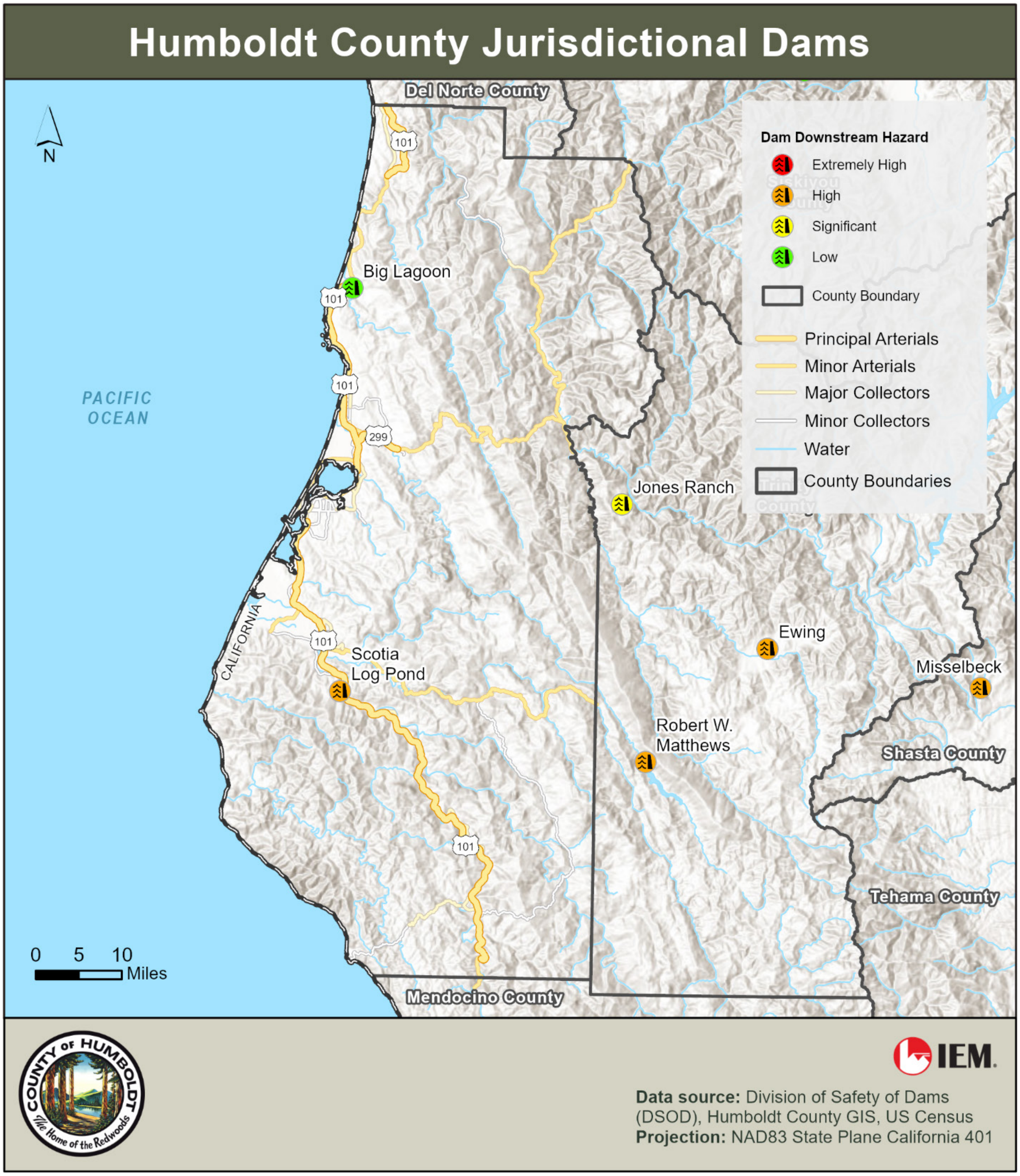

Figure 21: Humboldt County Dams

Table 17: Humboldt County Dams[1]

Name	NID	State Regulated	Federal Regulated	Purpose	Hazard Potential	EAP Prepared	Owner	Capacity (Acre-Ft)	Inspection Date
Big Lagoon	CA00503	Yes	No	Water Supply	Low	Not Required	California Redwood Acquisition Company	780	4/23/2024
Scotia Log Pond	CA00504	Yes	No	Water Supply	High	Yes	Scotia Community Services District	210	4/24/2024
R.W. Matthews*	CA00833	Yes	Yes	Water Supply	High	Yes	Humboldt Bay Municipal Water District	60,200	8/16/2023
Jones Ranch*	CA01258	Yes	No	Water Supply	Significant	No	Blue Planet, LLC	58	4/23/2024
Schwindt*	CA01323	Yes	No	Water Supply	Low	No	David P. Schwindt	23	3/14/2018
Mast*	CA00972	Yes	No	Water Supply	Significant	No	Stacy Holland	380	6/12/2024

* Denotes a dam located outside of Humboldt County.

[1] NID = National Inventory of Dams

5.6.3. Extent

Federal regulations establish a three-tier classification system to assess the risks associated with dam failure (Table 18). This system categorizes dams as low, significant, or high hazard, based on the expected consequences, including potential loss of life, economic impact and environmental damage.

Table 18: Dam Classification System

Classification	Description
High	Likely to cause loss of life.
Significant	Could cause economic loss, environmental damage, or disruption of services.
Low	Unlikely to cause loss of life or significant economic or environmental damage.

Humboldt County currently has one low hazard dam and one high hazard dam in the planning area.

5.6.4. History of Previous Hazard Events

Humboldt County has not experienced any dam failures to date. However, periods of heavy rainfall and extreme weather events have placed increased pressure on local dam infrastructure. For example, during particularly intense storm seasons, Ruth Lake and the Eel River dams have faced heightened water levels, requiring careful management to prevent overflow. In response to such challenges, water management agencies have implemented measures to regulate water flow and ensure structural stability.

According to Humboldt County's Emergency Operations Plan, several dams, including those along the Mad River, Eel River and Big Lagoon, could pose risks to nearby communities, recreational areas, and campgrounds in the event of failure. Flooding from a dam breach could impact residents, anglers and visitors to popular outdoor sites, necessitating ongoing monitoring and preparedness planning. Despite these risks, current assessments indicate that Humboldt County's dams are generally stable and not classified as major threats, provided that regular inspections and maintenance continue to be prioritized.

5.6.5. Probability of Future Hazard Events

The lack of recorded dam failures in Humboldt County makes it challenging to predict the likelihood of future incidents. Although regular, systematic evaluations are done, a forensic investigation into the 2017 Oroville Dam crisis in Butte County revealed significant weaknesses in dam safety regulations and industry standards. This raised concerns about potential overconfidence in safety evaluations by dam operators. However, historical data suggest dam failures in California are rare, with only two out of the state's 1,500 dams experiencing failure over the past 90 years. Notably, no major failures have occurred since 1963, indicating that while risks exist, the probability of future failures remains relatively low.

5.6.5.1.CLIMATE CHANGE CONSIDERATIONS

The risk of dam failure is becoming an increasing concern due to the potential impacts of climate change. As weather patterns shift, more frequent and intense precipitation, along with accelerated snowmelt, could place additional strain on dam infrastructure. This added pressure may worsen existing structural weaknesses, especially in older dams that were not engineered to withstand such extreme conditions. Although records indicate that dam failures are uncommon, changing climate conditions highlight the need to reassess safety measures and reinforce infrastructure to better withstand these emerging challenges. Strengthening dam resilience and adapting safety protocols will be essential in addressing the growing risks associated with climate change.

5.6.6. Vulnerability

The California Department of Water Resources DSOD oversees a comprehensive database of dams throughout the state. This database includes essential information related to dam safety, such as certification status, downstream hazard classification and overall condition assessment. A dam's condition is evaluated using criteria established by the NID, along with additional standards set by DSOD. Based on these guidelines, dams are assigned one of five possible condition ratings, as outlined in Table 19.

Table 19: Ratings for Dam Safety Conditions

Rating	National Inventory of Dams Definitions	Additional Criteria from California Division of Safety of Dams
Satisfactory	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with applicable regulatory criteria or tolerable risk guidelines.	None
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events	Dam has a long-standing deficiency that is not being addressed in a timely manner. Dam is not certified, and its safety is under evaluation.

Rating	National Inventory of Dams Definitions	Additional Criteria from California Division of Safety of Dams
	may result in dam safety deficiency. Risk may be in the range to take further action.	Dam is restricted and the operation of the reservoir at the lower level does not mitigate the deficiency.
Poor	A dam safety deficiency is recognized for loading conditions that may realistically occur. Remedial action is needed. This rating may also be used when there are uncertainties about critical analysis parameters that identify a potential dam safety deficiency. Further investigations and studies are needed.	Dam has multiple deficiencies or a significant deficiency that requires extensive remedial work.
Unsatisfactory	A dam safety deficiency requires immediate or emergency remedial action for problem resolution.	None

Table 20 shows the structural integrity and safety status of three dams that could impact Humboldt County: Big Lagoon, Scotia Log Pond and R. W. Matthews.

Table 20: Dam Condition Assessment

Name	Condition Assessment
Big Lagoon	Satisfactory
Scotia Log Pond	Poor
R. W. Matthews	Satisfactory

5.6.6.1. ESTIMATED IMPACTS AND LOSSES

Assessing the potential consequences of a dam failure requires examining multiple factors, including the likelihood of flooding, infrastructure damage and risks to human life. If a dam were to fail, the most immediate effect would be widespread flooding in downstream areas, resulting in severe property damage, displacement of residents and possible loss of life. Essential infrastructure, such as roads, bridges and utilities, could suffer major damage, disrupting transportation networks and critical public services.

The financial impact would be significant, covering emergency response efforts, repair costs and long-term rebuilding projects. In addition, the environmental consequences could be far-reaching, with damage to natural habitats and a decline in water quality. Beyond the physical and economic toll, affected communities may also experience lasting social and psychological challenges, as residents grapple with the loss of their homes, livelihoods and overall sense of security.

5.6.6.2.VULNERABLE POPULATIONS

In Humboldt County, certain populations could be particularly vulnerable to a dam failure. Residents in downstream areas, especially those in developed communities near dams, would face the highest risk of flooding and displacement. Areas near major water bodies, such as the Eel River, Mad River and Big Lagoon, could be significantly impacted.

In addition, tourists and outdoor enthusiasts who visit campgrounds, hiking trails and fishing locations near these waterways also may be at risk, particularly during peak recreational seasons. Individuals facing economic hardships, those with limited English proficiency, and people with disabilities or other access and functional needs may encounter additional obstacles during evacuation and recovery efforts. Ensuring that emergency preparedness plans address these at-risk groups is essential for minimizing harm and supporting an effective response in the event of a dam failure.

5.6.7. Impacts

Dam failures in Humboldt County can have widespread consequences, affecting public safety, the local economy, infrastructure and the environment. The immediate risks include potential injuries and fatalities due to severe flooding, which can displace residents and create long-term stress and anxiety, impacting overall well-being. Economically, such disasters could severely impact local agriculture by destroying farmland and crops, while the region’s tourism industry — an essential economic driver — may suffer if flooding damages natural attractions or deters visitors.

Infrastructure, including homes and historic landmarks, may experience significant damage, requiring expensive repairs and restoration efforts. In addition, the disruption of ecosystems could lead to biodiversity loss, affecting local wildlife and the region’s natural balance. Cultural traditions that rely on Humboldt County’s natural resources also may be at risk, further altering the way of life for many residents. Outdoor recreation opportunities, such as hiking and fishing, may be limited by environmental changes, while resources required for disaster response and recovery could divert attention from other community projects, impacting overall social and economic stability.

5.6.8. Changes in Development

In Humboldt County, recent development initiatives have placed strong emphasis on infrastructure resilience and adherence to updated building regulations, particularly concerning dam safety. The 2022 California Building Codes and Humboldt County Development Standards have been adopted to ensure that new construction projects meet rigorous safety criteria. These regulations include specific guidelines for the design, construction and maintenance of dams, aiming to reduce risks associated with potential failures.

In addition, Humboldt County's Capital Improvement Plan outlines key strategies for enhancing critical infrastructure, including efforts to strengthen dam safety. This plan prioritizes projects that improve the structural integrity of existing dams and related facilities, ensuring that they can withstand extreme weather conditions and other environmental stressors. By incorporating these updated codes and long-term planning efforts, Humboldt County is taking proactive measures to address potential vulnerabilities, enhance public safety and improve the overall resilience of the region.

5.6.9. Community Lifelines

Table 21 lists the impacts on community lifelines and their vulnerability to dam failure.

Table 21: FEMA Community Lifelines Impacted by Dam Failure

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems **Water Systems**	Humboldt County is fortunate to report that no Community Lifelines have been directly impacted by dam failure.	• Infrastructure damage: Water treatment facilities, pumping stations and storage tanks can be destroyed by floodwaters. • Contamination of water supply: Excessive sediment, debris and chemicals can infiltrate drinking water sources. • Loss of potable water: Damage to pipelines and treatment plants can leave communities without drinking water for extended periods. • Disruption of wastewater treatment: Overflows and damage to wastewater plants can allow raw sewage to enter water bodies, posing public health risks. • Increased erosion and sedimentation: Massive water surges can alter riverbeds, reducing water quality.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	None	• Infrastructure destruction: Roads, bridges and railways can be washed away by floodwaters, severing critical transportation routes. • Traffic gridlock and evacuation challenges: Sudden dam failure can overwhelm escape routes, delaying emergency evacuations. • Loss of access to emergency services: Emergency response efforts may be hindered by impassable roads. • Long-term transportation disruption: Rebuilding roads and bridges may take months or years, limiting access to resources and economic activity.
Energy	None	• Power outages: Floodwaters can damage power plants, substations and transmission lines, leading to widespread blackouts. • Disruption of fuel supply: Gas and oil storage tanks may be damaged, causing fuel shortages. • Hydroelectric plant failure: If a dam is used for hydroelectric power, its destruction can eliminate a critical energy source for the region. • Worker safety risks: Flooded power plants and substations create electrocution and explosion hazards.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	None	• Food supply disruption: Washed-out roads and railways delay food transportation, leading to shortages. • Loss of agricultural land: Farmland can be inundated, killing crops and reducing food production. • Damage to shelters and homes: Flooded shelters may become uninhabitable, worsening displacement issues. • Emergency response challenges: Flooded roads delay aid distribution, leaving affected populations without basic necessities. • Economic impact: The destruction of businesses and agricultural land reduces long-term food security.
Safety and Security	None	• Loss of life: Sudden flooding can lead to mass casualties, particularly in downstream areas. • Displacement crisis: Thousands may be forced to evacuate, straining shelters and emergency services. • Increased crime risks: Disruptions to law enforcement and emergency response can lead to looting and civil unrest. • Mental health trauma: Survivors may experience long-term psychological distress due to sudden displacement and loss of property. • Challenges for first responders: Emergency response personnel may struggle to access affected areas due to impassable roads.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	None	• Damage to hospitals and clinics: Flooding can incapacitate healthcare facilities, reducing the ability to treat injuries. • Injuries and fatalities: Floodwaters can cause drowning, crush injuries and electrocutions. • Waterborne diseases: Stagnant floodwaters can lead to outbreaks of cholera, dysentery and other illnesses. • Disruptions in medical supply chains: Flooded roads can prevent medical supplies from reaching affected areas. • Long-term health effects: Exposure to mold, contaminated water and hazardous debris can cause chronic illnesses.
Communications	None	• Damage to communication infrastructure: Cell towers, radio stations and internet infrastructure may be damaged or destroyed. • Loss of emergency communication: Emergency services may struggle to coordinate rescue operations without reliable communication. • Power loss to communications infrastructure: Without electricity, phones, radios and the internet may be inaccessible. • Increased demand on communication networks: Network congestion can slow down or block critical calls and emergency alerts. • Long-term outages: Repairing communications networks can take weeks or months, delaying information sharing.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	None	• Chemical spills: Industrial sites, wastewater treatment plants and hazardous material storage facilities may be flooded, releasing toxic chemicals into the environment. • Water contamination: Flooding can introduce oil, pesticides and sewage into rivers and drinking water supplies. • Fire and explosion risks: Damage to industrial storage tanks can cause fires and explosions. • Soil and ecosystem contamination: Pollutants from floodwaters can seep into the ground, causing long-term environmental damage. • Health risks to communities: Exposure to hazardous materials can lead to acute and chronic health effects, including respiratory illnesses and poisoning.

5.7. Drought

5.7.1. Hazard Description

Drought is characterized by a substantial reduction in water availability compared with the levels typical for a given region. It represents a natural phase in the climate cycle across most areas, stemming from an extended period of insufficient precipitation, generally lasting a season or longer. This scarcity of water impacts various activities, groups and environmental sectors.

Droughts are climatic phenomena that develop over prolonged durations due to multiple contributing factors. Persistent global weather patterns, such as upper-level high-pressure systems along the West Coast, lead to warm, dry air and decreased precipitation. These anomalies in precipitation and temperature can persist from several months to multiple decades. Their duration is influenced by interactions between the atmosphere and oceans, soil moisture, land surface processes, topography, internal dynamics and the cumulative effect of global weather systems.

5.7.1.1.CASCADING HAZARDS

A cascading hazard frequently linked to drought conditions is wildfire. Prolonged periods of insufficient precipitation led to the desiccation of vegetation, rendering it increasingly prone to ignition as the drought persists. In addition, the scarcity of water can place stress on trees and other vegetation, making them more susceptible to pest infestations, which further heighten their vulnerability to ignition. This has resulted in the loss of millions of board feet of timber and in many instances has led to erosion that adversely affects aquatic ecosystems, irrigation systems and power production due to the heavy silting of streams, reservoirs and rivers.

Drought can also significantly degrade water quality. The concentration of pollutants often increases due to reduced dilution capacity as water levels in lakes and rivers drop. Warmer water temperatures and stagnant conditions can foster the development of harmful algae blooms which release toxins that pose serious risks to human and ecological health. These blooms can contaminate drinking water sources, endanger aquatic species and complicate water treatment processes.

Figure 22 maps water shortage vulnerability for Humboldt County. The legend provides a scale from low vulnerability in yellow (0.00 to 15.8) to high vulnerability in brown (36.4 to 100).

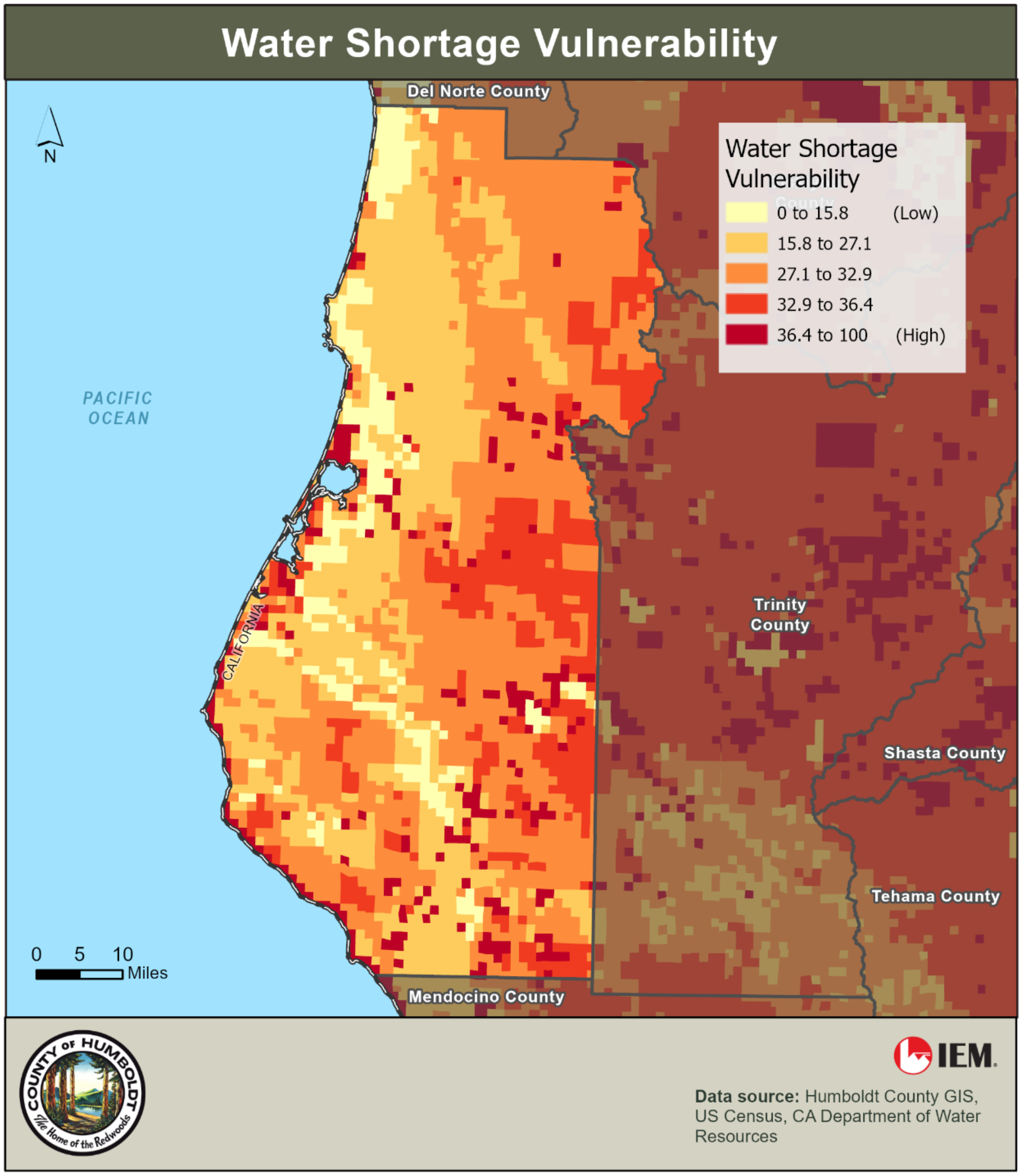

Figure 22: Water Shortage Vulnerability for Humboldt County

5.7.2. Location

Drought is a localized occurrence that can influence the entire planning region. It simultaneously affects the environment and the community, potentially reaching every individual in the area. Drought conditions can also have significant negative consequences for the local economy, either directly or indirectly.

Humboldt County, despite having abundant water resources from both groundwater and surface water due to its high levels of rainfall and multiple major rivers, faces several water-related challenges. These challenges impact water supply and demand, as well as cultural, economic, social and environmental conditions. The North Coast region of California contributes approximately 26% of the state's water supply. Two of California's largest rivers, the Klamath and Eel rivers, flow through Humboldt County, though both are subject to major water diversion projects that have economic, cultural, social and ecological consequences extending beyond the county's borders.

The county's diverse economic and environmental landscape relies heavily on this water supply, including rural communities, agriculture, timber, fisheries and industries such as sand and gravel extraction. Urban areas are primarily concentrated around Humboldt Bay, where a sufficient water supply is crucial for residents and businesses and for maintaining the natural environment. Water is essential for replenishing rivers, creeks and groundwater, which support forestry, livestock and fish populations that are vital to the local economy and culture.

According to the county's General Plan, the primary supplier of domestic and industrial water in Humboldt County is the Humboldt Bay Municipal Water District. This district serves the cities of Eureka, Arcata and Blue Lake, along with the Fairhaven community and various special districts around Humboldt Bay. Most inland and southern special districts have adequate water supplies to meet current demands, including those in Willow Creek, Jacoby Creek, Hydesville, Miranda, Redway, Orick, Alderpoint and Orleans. However, water availability is uncertain in areas such as Weott and Shelter Cove.

The county's surface water supply fluctuates, depending on seasonal rainfall patterns, and many areas experience insufficient summer flows due to hot, dry conditions. Inland regions beyond the coastal fog belt often face water scarcity, as rainfall is unevenly distributed during the year. Despite large hydraulic basins that provide significant surface water volumes — an estimated 23 million acre-feet of annual runoff — the county's total groundwater yield is relatively low, at approximately 100,000 acre-feet. The Eel River and its tributaries account for the largest drainage area, covering more than one-third of the county's total surface area.

The rivers running through Humboldt County contribute nearly 30% of California's total annual runoff, yet river flow levels vary drastically. For instance, the Mattole River's maximum recorded winter discharge exceeds 90,000 cubic feet per second, while its summer flow can drop below 20 cubic feet per second. These seasonal extremes highlight the importance of drought preparedness, as the highest demand for water occurs when river flows are at their lowest. Most rivers in the county, except for the Trinity and Klamath rivers, are directly dependent on local rainfall, with over 80% of their annual flow occurring between November and March.

Water diversions also significantly affect the county's water availability. More than 70% of the Trinity River's water is dammed and redirected for agricultural projects in the Central Valley, while flows from the Klamath River are similarly diverted for agricultural use. The Eel River also supplies water to three southern counties — Mendocino, Sonoma and Marin — which have growing populations and face moderate drought conditions, collectively serving more than 350,000 people along with agricultural needs.

Drinking water for the Humboldt Bay area primarily comes from Ranney Collectors in the Mad River, while other coastal streams supply additional communities. The Mad River benefits from water releases from the Ruth Reservoir, which has a storage capacity of 48,030 acre-feet, but its long-term reliability depends on seasonal precipitation levels.

Humboldt County has four main groundwater basins in the North Coast Hydrologic Area: Hoopa Valley, Mad River Valley, Eureka Plain and Eel River Valley. The last three are part of the Coastal Basins. Groundwater development has mainly supported individual domestic use and irrigation for farming in the Eel River and Mad River delta regions. The largest groundwater reserves are found in the Eel River and Van Duzen delta, where storage capacity is estimated at 136,000 acre-feet, with usable yields of 40,000 to 60,000 acre-feet annually. The current groundwater extraction for agricultural use is around 10,000 acre-feet per year. Meanwhile, the Mad River basin has an estimated annual yield of approximately 45,000 acre-feet.

Other groundwater basin areas include Hoopa Valley, Prairie Creek, Big Lagoon, Mattole River Valley, Honeydew, Pepperwood, Weott, Garberville, Larabee Valley and Dinsmore. As development increases, more wells are drilled each year, yet there is limited information about the exact locations and capacities of these groundwater aquifers. More precise estimates of groundwater availability are needed to ensure sustainable development and to improve planning and modeling for potential drought conditions.

5.7.3. Extent

The Palmer Drought Severity Index (PDSI), also referred to as the Palmer Drought Index, is a widely used metric for assessing drought conditions. Developed by Wayne Palmer in 1965, the PDSI evaluates drought severity by analyzing recent precipitation and temperature data in a soil moisture supply and demand framework. This index is particularly effective for long-term drought assessments. Additional indices for measuring drought include the Palmer Hydrologic Drought Index (PHDI), the Crop Moisture Index (CMI) and the Keetch-Byram Drought Index (KBDI). The KBDI is primarily used to estimate the wildfire risk associated with drought conditions. The PDSI is commonly applied to drought analysis, providing standardized measurements of moisture conditions that facilitate comparisons across different locations and time periods.

Table 22 and Table 23 present the classification ranges of the PDSI index and the intensity scale used by the United States Drought Monitor.

Table 22: Palmer Drought Severity Index Classification and Range

Range	Palmer Classification
4.0 or more	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

Table 23: United States Drought Monitor Drought Intensity Scale

Range	Palmer Classification	PDSI Equivalent
D0	Abnormally Dry	-1.0 to -1.99
D1	Moderate Drought	-2.0 to -2.99
D2	Severe Drought	-3.0 to -3.99
D3	Extreme Drought	-4.0 to -4.99
D4	Exceptional Drought	-5.0 or less

Based on historical data, Humboldt County and its jurisdictions can expect to experience Exceptional Drought (D4) as a worst-case scenario. Figure 23, Figure 24 and Figure 25 show the drought conditions for the State of California for Feb. 25 and March 2–8, 2025. Currently, Humboldt County is experiencing normal conditions.

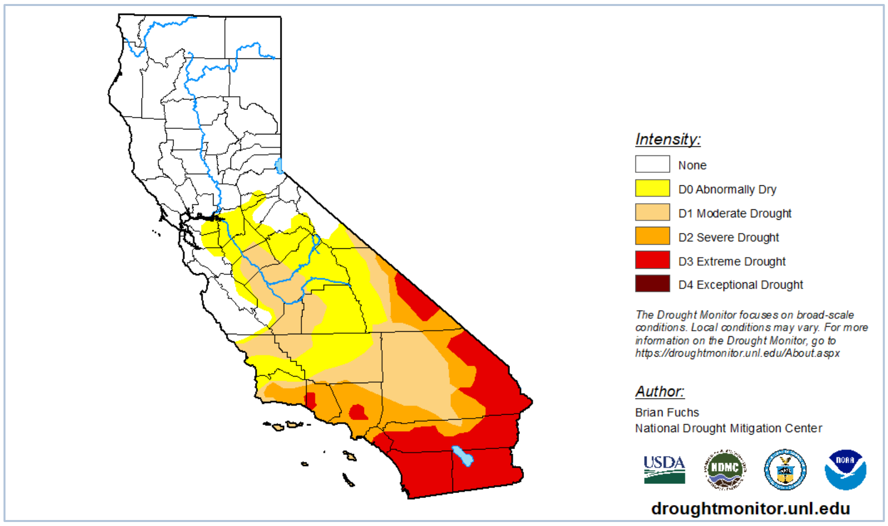

Figure 23: Drought Severity Across the State of California, February 25, 2025

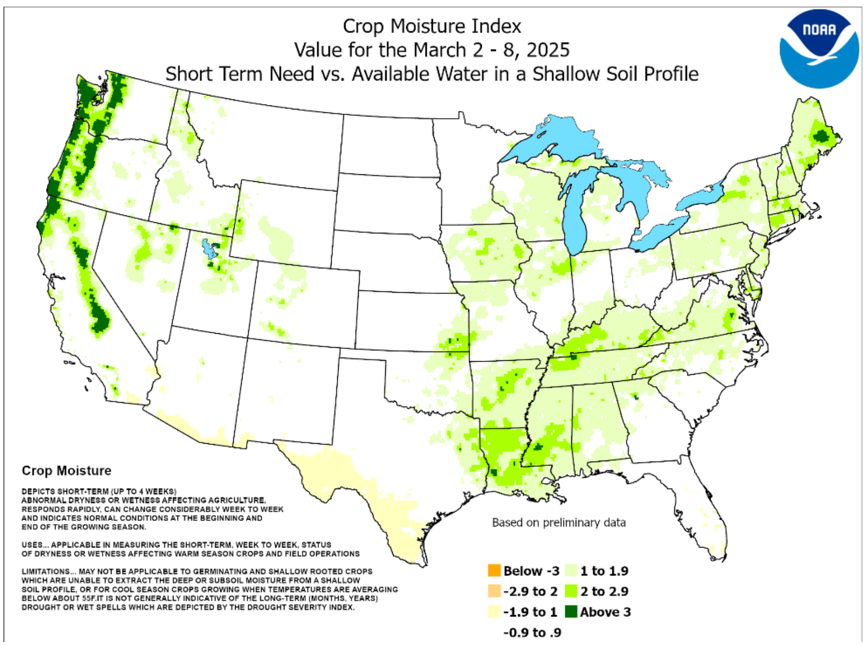

Figure 24: Crop Moisture Index for the Week of March 2, 2025

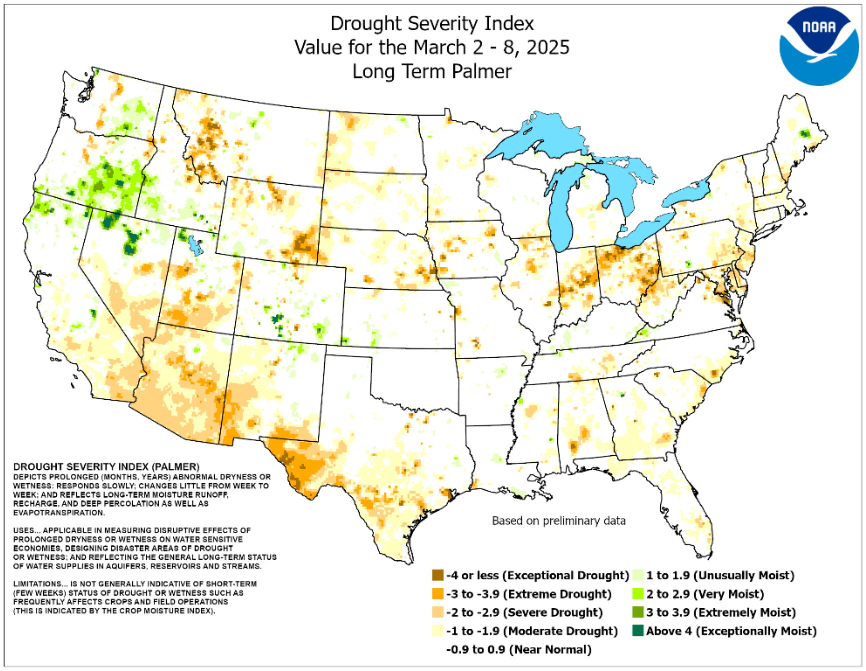

Figure 25: Drought Severity Index for the Week of March 2, 2025

In periods of extreme drought, the California State Water Resources Control Board has the authority to enforce water conservation measures for both water users and agencies to manage statewide water shortages. Water rights holders are required to follow specific stages outlined in the State Drought Management Program.

5.7.4. History of Previous Hazard Events

California's history is marked by recurring droughts that have significantly impacted its environment, economy and communities. Notable drought periods that occurred after the last plan include the following:

From 2000 to 2022, California faced another significant drought, leading to water shortages, increased wildfire risks and renewed discussions on sustainable water management practices.

Drought such as the above have shaped California's approach to water management, leading to the development of extensive infrastructure and policies aimed at mitigating the impacts of future dry periods.

In Humboldt County, agriculture-related drought disasters have been a recurring concern. The U.S. Department of Agriculture (USDA) Farm Service Agency provides assistance for agriculture-related losses from drought, flood, fire, freeze, tornadoes, pest infestation and other natural disasters. The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to them. Humboldt County was included in drought-related USDA declarations in 2012 (USDA S3268), 2013 (S3565), 2015 (S3784, S3810, S3943), 2016 (S3952, S3964), 2019 (S4467), 2020 (S4675, S4691), 2021 (S4675, S4691), 2022 (S5146) and 2023 (S5371). These declarations have provided critical support to local farmers and ranchers, helping them navigate the challenges posed by water scarcity and maintain agricultural productivity during difficult times.

5.7.5. Probability of Future Hazard Events

Given California's history of recurring droughts, the probability of future drought events remains high due to the state's reliance on seasonal precipitation and the increasing impacts of climate change. Past droughts, ranging from short-term severe events to prolonged multi-year dry periods, have demonstrated the state's vulnerability to water shortages, reduced agricultural productivity and heightened wildfire risks. The frequency and intensity of droughts appear to be increasing, as seen in the record-setting droughts of 2011-2017 and 2020-2022. In Humboldt County, the agricultural sector has faced significant challenges during past droughts, necessitating federal disaster declarations and financial assistance. With ongoing climate variability, declining snowpack levels and increasing water demand, future droughts are likely to occur with greater frequency and severity, underscoring the need for continued investment in water conservation, infrastructure resilience and adaptive management strategies.

5.7.5.1. CLIMATE CHANGE CONSIDERATIONS

Climate change is expected to significantly impact Humboldt County and the broader California region, particularly in terms of temperature increases and changing precipitation patterns, both of which contribute to drought conditions. Projections indicate that overall temperatures will rise throughout the 21st century, with extreme heat days becoming more frequent under both medium- and high-emissions scenarios. These rising temperatures will intensify evapotranspiration, leading to drier soils and increased water demand for agriculture, ecosystems and human consumption.

Besides temperature changes, precipitation patterns are expected to become more erratic, with wet years becoming wetter and dry years becoming drier. This variability increases the likelihood of prolonged droughts, as dry years are more likely to be followed by additional dry years. Although total annual precipitation is not projected to change significantly in the next 50-75 years, rainfall is expected to occur in more intense bursts over shorter wet seasons. This shift reduces the effectiveness of natural water storage and groundwater recharge, making the water supply less predictable.

As Humboldt County and the rest of California face these climate-driven changes, the risk of future droughts will continue to rise. The combination of higher temperatures, more extreme weather fluctuations, and an increasingly unreliable water supply underscores the need for proactive water management strategies, improved conservation efforts and infrastructure investments to build resilience against future drought conditions. Figure 26 through Figure 30 show weather-related data and projections for Humboldt County.

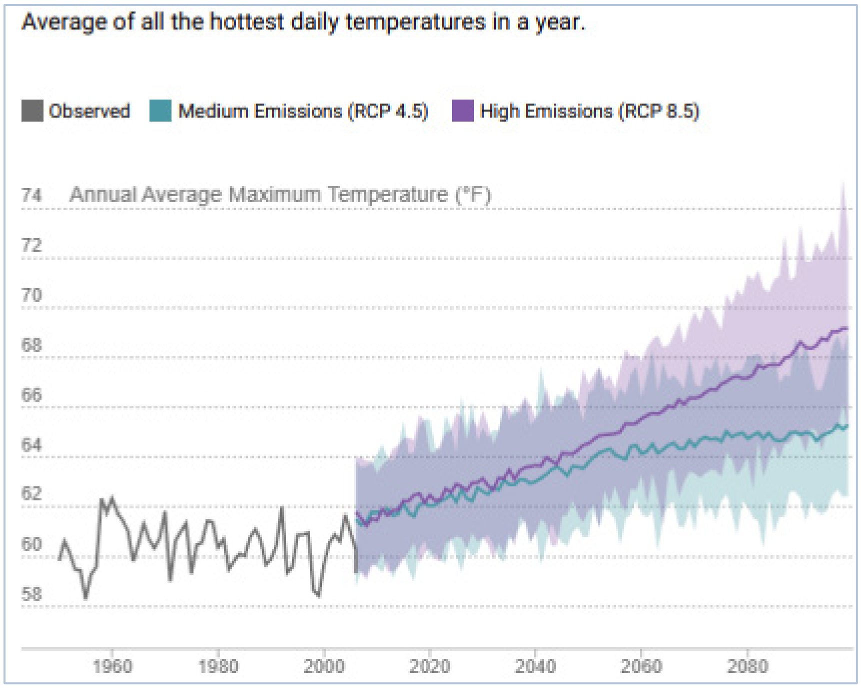

Figure 26: Annual Average Maximum Temperature for Humboldt County, 1950-2100

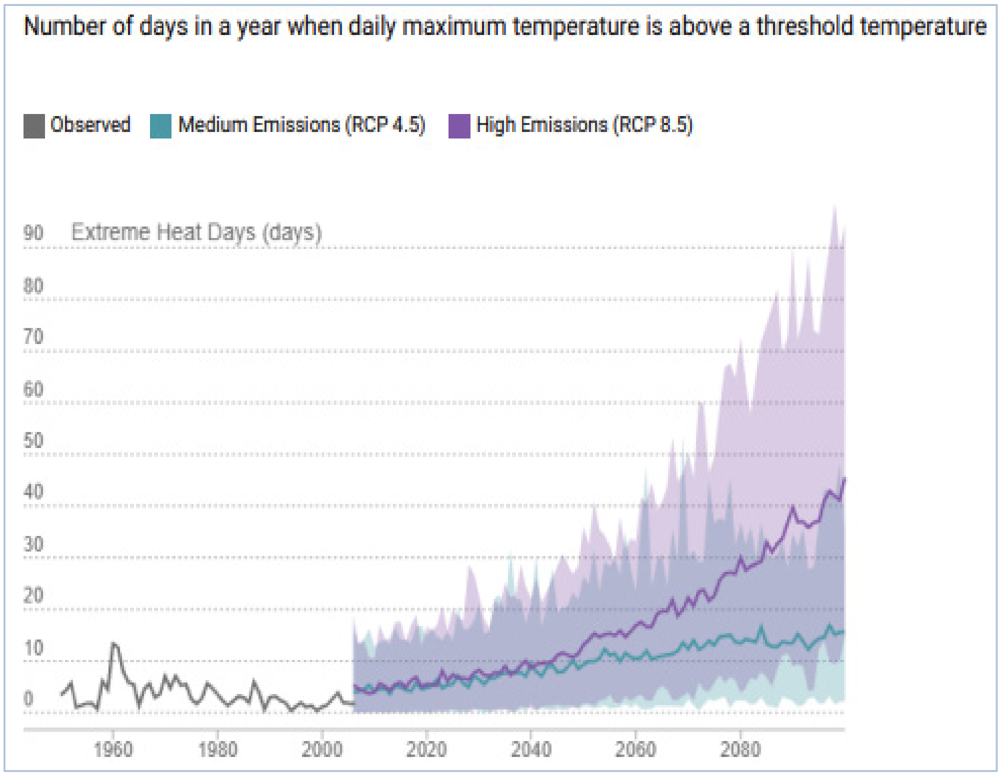

Figure 27: Extreme Heat Days for Humboldt County, 1950-2100

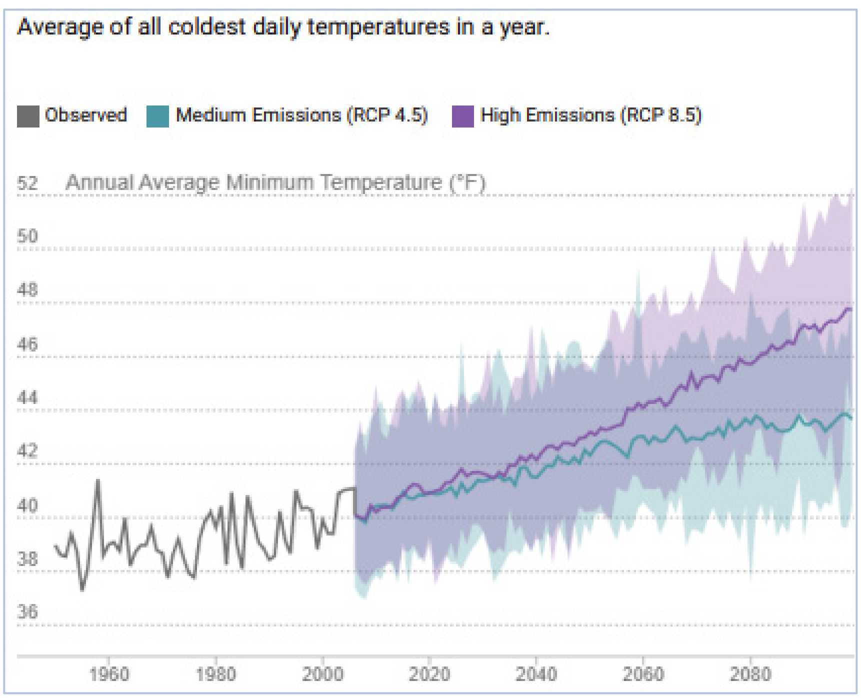

Figure 28: Annual Average Minimum Temperature for Humboldt County, 1950-2100

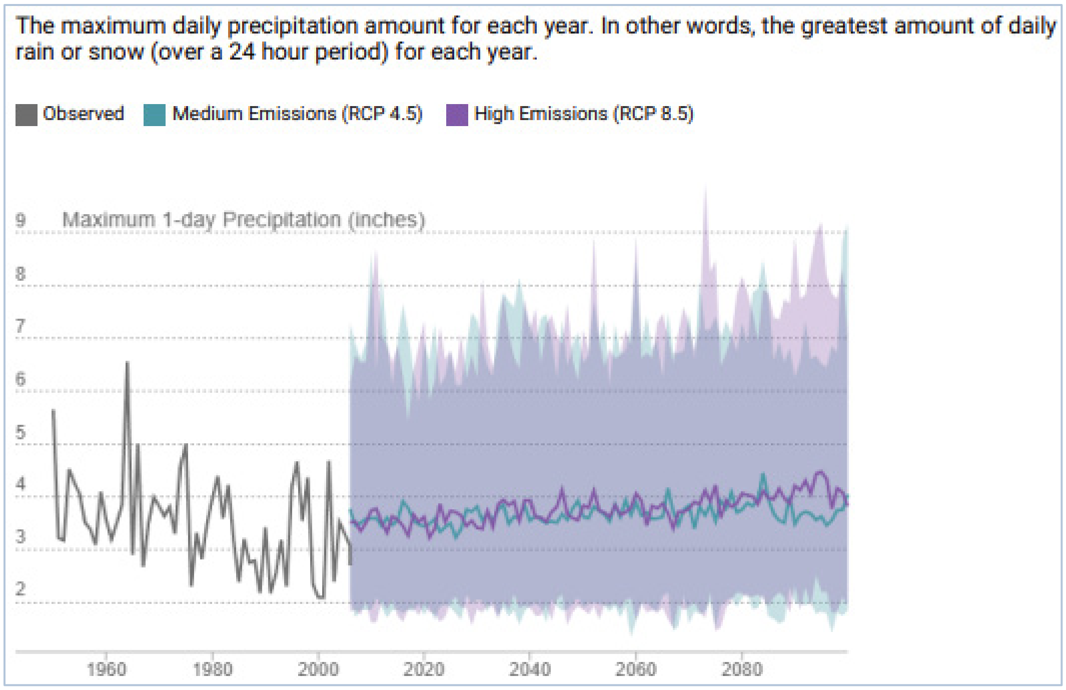

Figure 29: Maximum 1-Day Precipitation for Humboldt County, 1950-2100

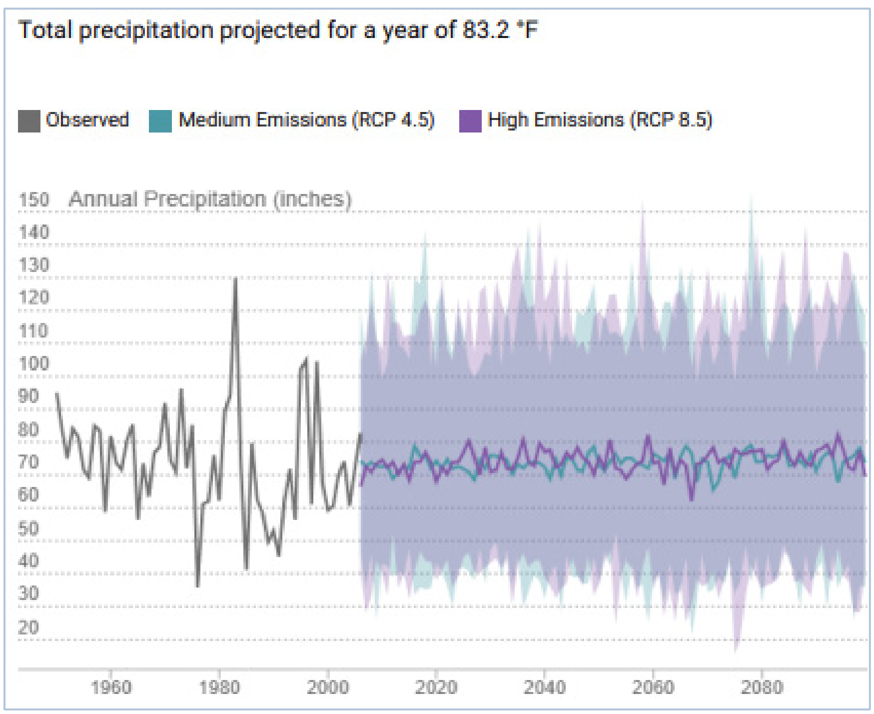

Figure 30: Annual Precipitation for Humboldt County, 1950-2100

5.7.6. Vulnerability

Drought is a recurring hazard in Humboldt County, affecting water availability, ecosystems, agriculture and communities. The severity and duration of droughts vary, with climate change expected to increase their frequency and intensity. The California Department of Water Resources (DWR) monitors drought conditions through hydrologic data, precipitation records and groundwater assessments. Drought severity is classified based on various hydrologic indicators, including precipitation deficits, reservoir storage, soil moisture levels and streamflow reductions.

Several vulnerabilities impact the county’s risk during drought conditions according to the California Drought Contingency Plan and the Humboldt County Drought Resilience Plan. Rural communities reliant on groundwater or single-source surface water supplies are particularly at risk due to limited access to alternative water sources and storage infrastructure. Agricultural operations are vulnerable due to their dependency on consistent water availability for crop and livestock production. Ecosystems also face stress from diminished stream flows which can degrade water quality, disrupt fish migration and reduce biodiversity.

5.7.6.1. ESTIMATED IMPACTS AND LOSSES

Drought in Humboldt County can have widespread economic, environmental and social consequences. Reduced surface water availability and groundwater depletion strain both municipal and rural water systems, increasing the need for water conservation efforts and alternative supply sources. Agriculture, a key component of the local economy, is particularly vulnerable, as drought leads to lower crop yields and diminished livestock forage, resulting in financial losses for farmers and food producers. Ecosystems and fisheries also suffer, with reduced river and stream flows endangering the populations of fish such as salmon and steelhead, which impacts both the environment and the fishing industry. In addition, drier vegetation heightens wildfire risks, posing threats to communities and forested areas. Beyond these physical impacts, prolonged drought affects public health and quality of life by driving up utility costs, causing economic hardship and increasing mental stress for residents who rely on agriculture and water-based industries.

5.7.6.2. VULNERABLE POPULATIONS

Certain populations in Humboldt County are particularly vulnerable to drought conditions due to their reliance on natural resources and limited access to emergency support. Rural and agricultural communities, which depend on groundwater and surface water for farming and livestock, are among the hardest hit by drought-related shortages. Low-income residents may struggle with rising water costs and food price inflation as agricultural production declines. Indigenous communities, whose cultural and subsistence practices are deeply tied to fish and river ecosystems, face significant disruptions as water flows decrease. In addition, the tourism and recreation sectors suffer when drought leads to waterway closures, diminished fishing opportunities, heightening wildfire risks and impacting local businesses and economies. Elderly and disabled individuals, particularly those with limited mobility or access to emergency resources, also may face greater challenges during periods of water rationing and increased fire hazards. These factors highlight the need for targeted drought response strategies to support the most at-risk populations in Humboldt County.

5.7.7. Impacts

Prolonged drought in Humboldt County can have far-reaching consequences, affecting public safety, the local economy, infrastructure and the environment. Immediate risks include water shortages that can strain households, businesses and emergency services, leading to increased stress and anxiety for residents. Drought conditions also may heighten fire danger, putting communities at greater risk of wildfires that can displace residents and damage property.

Economically, drought can severely impact local agriculture by depleting the water supplies needed for crops and livestock, reducing yields, and driving up costs for farmers. The region's tourism industry — an essential economic driver — also may suffer, as lower river and lake levels, dry landscapes, and fire risks can deter visitors and limit outdoor recreation activities.

Infrastructure, including homes, businesses and historic landmarks, may face increased wear and degradation, as drought intensifies soil instability, causing land subsidence and structural damage. In addition, ecosystems that depend on stable water levels may be disrupted, leading to loss of biodiversity and long-term environmental changes that affect local wildlife. Cultural traditions tied to Humboldt County's natural resources, such as fishing and Indigenous practices, also may be at risk. Limited water availability could reduce outdoor recreation opportunities, such as fishing, kayaking and hiking, while resources allocated for drought mitigation and emergency response could divert funding from other vital community projects, impacting overall social and economic stability.

5.7.8. Changes in Development

In Humboldt County, recent development initiatives have focused on strengthening infrastructure resilience and adapting to prolonged drought conditions. The 2022 California Building Codes and Humboldt County Development Standards have been adopted to ensure that new construction projects incorporate water conservation measures and sustainable design practices. These regulations include specific guidelines for water-efficient landscaping, rainwater harvesting and drought-resistant building materials to mitigate the impacts of water scarcity aligning with priorities outlined in the Humboldt County Drought Resilience Plan.

In addition, Humboldt County's Capital Improvement Plan outlines key strategies for enhancing water infrastructure, prioritizing projects that improve water storage capacity, groundwater recharge and distribution efficiency. Investments in modernizing water treatment facilities and upgrading pipelines aim to reduce water loss and ensure a reliable supply during extended dry periods. By integrating updated building codes and forward-thinking infrastructure planning, Humboldt County is proactively addressing drought-related vulnerabilities, safeguarding water resources and enhancing the region's long-term resilience.

5.7.9. Community Lifelines

Table 24 lists the impacts on community lifelines and their vulnerability to drought.

Table 24: FEMA Community Lifelines Impacted by Drought

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems	Agricultural sectors in Humboldt County are vulnerable during droughts, facing reduced water availability for crops and livestock. This can lead to decreased agricultural yields, impacting the local food supply and economic stability. In addition, water shortages can affect both urban and rural communities, leading to water conservation measures and potential restrictions.	• Strain on water infrastructure: Reduced reservoir levels and groundwater depletion can limit water availability for treatment facilities. • Water contamination risks: Lower water levels may concentrate pollutants, leading to poor water quality. • Limited potable water supply: Decreased surface and groundwater reserves may cause water shortages for households and businesses. • Wastewater treatment complications: Reduced water flow can impact wastewater treatment efficiency, increasing the risk of pollution in local waterways. • Ecosystem disruptions: Lower water levels in rivers and lakes can harm aquatic life and increase sedimentation.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	Drought-related wildfires pose significant threats to transportation infrastructure. Increased fire potential due to lower-than-average river levels and strained water resources has been noted in the North Coast region, including Humboldt County. These conditions can lead to road closures and hazardous travel conditions, disrupting daily commutes and supply chains.	• Roadway damage: Extreme heat can cause pavement to crack or buckle, making roads hazardous. • Increased wildfire risk: Dry conditions elevate wildfire threats, leading to road closures and detours. • Limitations on cargo transport: Waterway transport may be disrupted due to lower river levels. • Dust storms and visibility issues: Dry, loose soil can lead to dust storms, reducing visibility for drivers. • Long-term infrastructure stress: Drought-related ground shifting can damage roads, bridges and railways.
Energy	Droughts can affect energy production, particularly hydroelectric power, due to reduced water availability. This reduction can lead to increased reliance on other energy sources, potentially raising energy costs for consumers.	• Reduced hydroelectric power generation: Decreasing reservoir levels can impact hydroelectric facilities, leading to energy shortages. • Increased energy demand: Higher temperatures drive up electricity use for cooling, straining the grid. • Disruptions in fuel transport: Lower water levels in rivers may impede the transport of oil and gas supplies. • Increased fire risk to power infrastructure: Drought conditions heighten the chance of wildfires damaging power lines and substations. • Worker safety concerns: Extreme heat exposure can endanger utility and energy sector employees.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	Agricultural sectors in Humboldt County are vulnerable during droughts, facing reduced water availability for crops and livestock. This can lead to decreased agricultural yields, impacting the local food supply and economic stability. In addition, water shortages can affect both urban and rural communities, leading to water conservation measures and potential restrictions.	• Crop failure and food shortages: Reduced water availability leads to lower crop yields, impacting food production and prices. • Livestock impacts: Drought limits access to grazing land and water for animals, affecting meat and dairy production. • Water restrictions on households: Mandatory water conservation efforts may impact daily living conditions. • Increased displacement risk: Economic hardships from drought may force residents to relocate in search of work or resources. • Food supply disruption: Washed-out roads and railways delay food transportation, leading to shortages. • Higher costs of essential goods: Rising food and water costs create financial strain on local communities.
Safety and Security	Drought conditions elevate wildfire risks, threatening both property and human life. The increased potential for devastating fire seasons in Humboldt County has been acknowledged by local emergency services, emphasizing the need for preparedness and resource allocation to manage these hazards.	• Increased wildfire threats: Dry vegetation creates conditions for fast-spreading wildfires, endangering homes and communities. • Population displacement: Prolonged drought can drive residents to leave rural areas for places with more stable resources. • Potential for civil unrest: Water scarcity and economic hardship may contribute to social tensions. • Mental health strain: Financial and lifestyle stress due to drought conditions can lead to increased cases of anxiety and depression. • First responder challenges: Fire and emergency personnel may face increased demands with limited resources during wildfire seasons.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	Although direct impacts of drought on communications infrastructure are limited, associated factors like increased wildfire risks can damage communications lines, leading to service disruptions.	• Limited access to clean water: Water scarcity can lead to hygiene and sanitation concerns, increasing the risk of illness. • Respiratory issues: Dry conditions and increased wildfire smoke contribute to respiratory diseases and other health complications. • Heat-related illnesses: Prolonged periods of high temperatures can lead to dehydration, heat exhaustion and heatstroke. • Medical supply chain disruptions: Transportation and production challenges may impact the availability of medical goods and pharmaceuticals. • Mental health concerns: Economic and environmental uncertainty can contribute to stress, anxiety and depression.
Communications	Although direct impacts of drought on communications infrastructure are limited, associated factors like increased wildfire risks can damage communications lines, leading to service disruptions.	• Increased wildfire-related damage: Fires fueled by drought may destroy cell towers and internet infrastructure. • Power grid strain affects communications systems: Blackouts caused by excessive energy demand can limit access to communications channels. • Network congestion: Emergency situations, such as wildfires, may overload communications networks. • Challenges in emergency alerts: Limited water resources may impact firefighting capabilities, making timely alerts more crucial. • Long-term recovery of communications systems: Infrastructure damaged by fires or heat waves can take extended periods to repair.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	Dry conditions can increase the risk of wildfires, which may lead to the release of hazardous materials from industrial sites or residential areas, posing environmental and public health risks.	• Higher concentration of pollutants: Reduced water flow can cause contaminants to accumulate in local water bodies. • Wildfire-related toxic exposure: Burning structures and industrial sites may release hazardous chemicals into the air and soil. • Soil degradation and contamination: Dry conditions can lead to increased dust, which may carry toxins. • Increased risk of industrial accidents: Water shortages may limit cooling capabilities in factories and power plants, raising the potential for accidents. • Health hazards from poor air and water quality: Drought-related environmental changes can lead to long-term public health issues.

5.8. Earthquake

5.8.1. Hazard Description

The U.S. Geological Survey (USGS) describes an earthquake as what occurs when two segments of the Earth suddenly slip past one another along a fault plane. Faults are zones of weakness where segments of the Earth's crust, known as plates, move relative to each other. As plates move, friction can build until the stress exceeds the strength of the rocks and they suddenly slip in a process called fault rupture. The sudden movement along a fault releases energy in all directions in the form of seismic waves. These waves can cause strong ground shaking that can damage buildings and infrastructure.

Northern California is a seismically active region due to the proximity of the Mendocino Triple Junction, where the Gorda Plate, the North American Plate, and the Pacific Plate meet in the Pacific Ocean near Cape Mendocino. This triple junction is the location of a change in the broad plate motions that dominate the west coast of North America, linking the convergence of the northern Cascadia Subduction Zone (CSZ) and the translation of the southern San Andreas Fault system. According to Oppenheimer's 2013 article, the Gorda Plate is subducting under the North American Plate at 2.5 to 3 centimeters per year and is simultaneously converging obliquely against the Pacific Plate at a rate of 5 centimeters per year.

Subduction-zone earthquakes occur at the interface between tectonic plates at a convergence zone where one plate dives beneath another. A subduction zone earthquake affecting the Humboldt County Operational Area could be centered in the CSZ off the coast of Washington or Oregon. Such earthquakes could have a minute or more of strong ground shaking and be quickly followed by damaging tsunamis and many large aftershocks. The potential exists for large earthquakes along the CSZ, with a magnitude of 9 or more. This could produce a tsunami all along the fault line from British Columbia to Mendocino, California. Such an earthquake would produce catastrophic damage in the region.

Faults are more likely to have future earthquakes if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years).

Determining whether a fault is "active" or "potentially active" depends on geologic evidence, which might not be available for every fault. Nearly all the movement between the two plates, and therefore the majority of the seismic hazards, is on well-known active faults. However, inactive faults, where no displacements have been recorded, can also reactivate or experience displacement along a branch sometime in the future. The California Geological Survey indicates that increased earthquake activity throughout California may cause tectonic movement along currently inactive fault systems.

5.8.1.1.CASCADING HAZARDS

Earthquakes can cause disastrous landslides. Slopes along river valleys are vulnerable to failure, often as a result of the loss of cohesion in clay-rich soils. Earthen dams and levees are highly susceptible to damage from seismic events, and the impacts of their eventual failures can be considered secondary risk exposure to earthquakes. Depending on the location and magnitude, earthquakes can also trigger tsunamis. In addition, fires can result from broken gas lines or downed power lines, and water lines could be impacted from the ground movement. Additional damage could be caused by liquefaction, which is when saturated soil loses its strength and can flow like a liquid in response to ground shaking.

5.8.2. Location

Humboldt County is located in the two highest of five seismic risk zones specified by the Uniform Building Code, and offshore Cape Mendocino has the highest concentration of earthquake events anywhere in the continental United States. The area near Cape Mendocino is a complex, seismically active region, where three crustal plates, the Pacific Plate, the Gorda Plate and the North American Plate intersect to form the Mendocino triple junction.

The USGS maintains information on faults and seismic activity from the past 1.6 million years, known as the Quaternary period. Figure 31 shows the location of many of these faults. A searchable USGS database shows two Class A faults in the planning area: Big Lagoon-Bald Mountain and Lost Man. Class A faults are those where “Geologic evidence demonstrates the existence of a Quaternary fault of tectonic origin, whether the fault is exposed for mapping or inferred from liquefaction or other deformational features.”

Faults outside Humboldt County also can impact its people, property and economy. A rupture in the CSZ, for example, would have a considerable impact on the planning area. This is the 700-mile-long offshore zone from northern Vancouver Island to Cape Mendocino where the Juan de Fuca plate is being subducted below the North American Plate. The CSZ is at its closest distance to the west coast of the United States in the proximity of Humboldt County.

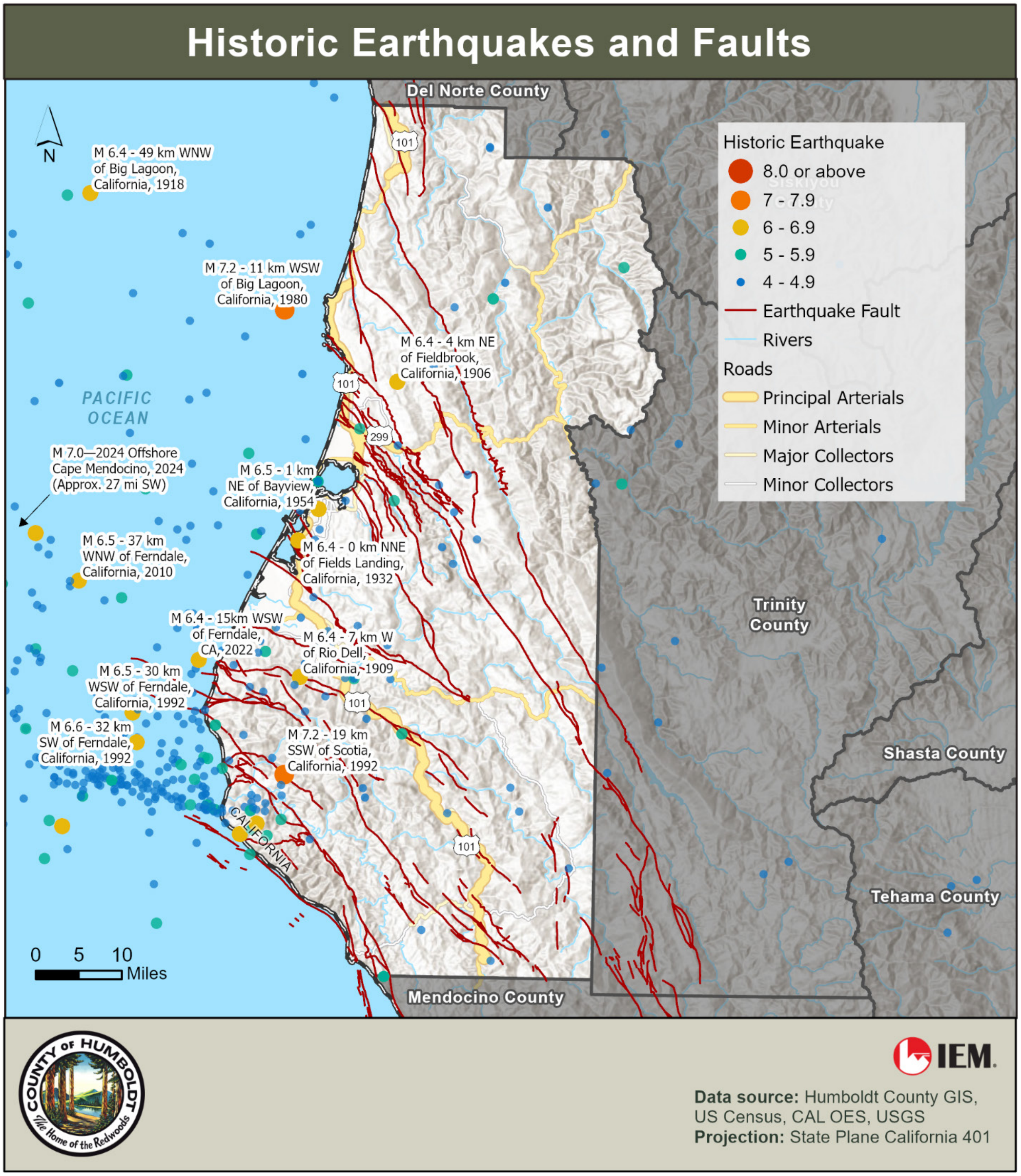

Figure 31: Historic Earthquakes and Faults in Humboldt County

5.8.2.1.SOIL TYPES

Soil types defined under the National Earthquake Hazards Reduction Program (NEHRP) indicate locations that will be significantly impacted by an earthquake. NEHRP Soils B and C can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F. Figure 32 shows the NEHRP soil classifications in the planning area. Liquefaction mapping with levels of susceptibility suitable for modeling in the Hazus risk assessment platform is not available for the planning area.

Figure 32: Soil Types Under the National Earthquake Hazards Reduction Program

5.8.3. Extent

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.

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. According to USGS, magnitude is commonly expressed by ratings on the moment magnitude scale (M_W), the most common scale used today. This scale is based on the total moment release of the earthquake (the product of the distance a fault moved and the force required to move it). The scale is as follows:

- Great — $M_w > 8$
- Major — $M_w = 7.0\text{-}7.9$
- Strong — $M_w = 6.0\text{-}6.9$
- Moderate — $M_w = 5.0\text{-}5.9$
- Light — $M_w = 4.0\text{-}4.9$
- Minor — $M_w = 3.0\text{-}3.9$
- Micro — $M_w < 3$

The most commonly used intensity scale is the Modified Mercalli Intensity Scale. Ratings of the scale and the perceived shaking and damage potential for structures are shown in Table 25. This scale is represented visually using shake maps, which show the expected ground shaking from an earthquake at a given location with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the variation of ground shaking in a region immediately following significant earthquakes .

The ground experiences acceleration as it shakes during an earthquake. Peak ground acceleration (PGA) is the largest acceleration recorded by a monitoring station during an earthquake. PGA is a measure of how hard the earth shakes in a given geographic area. It is expressed as a percentage of the acceleration due to gravity (% g). Horizontal and vertical PGA vary with soil or rock type. Earthquake hazard assessment involves estimating the annual probability that certain ground accelerations will be exceeded and then summing the annual probabilities over a specified time period.

Table 25: Modified Mercalli Intensity 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. Delicately suspended objects may swing.
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. Vibration 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. Rail bent.
XI		Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII		Damage total. Lines of sight and level are distorted. Objects thrown into the air.

5.8.4. History of Previous Hazard Events

California experiences hundreds of earthquakes each year, most of which have a magnitude below 3.0, which are not generally felt and do not cause damage. The locations of past earthquake epicenters greater than a magnitude of 4.0 are shown in Figure 31, along with faults.

Generally, only two or three events large enough to cause minor to moderate damage (magnitude of 5.5 or higher) occur each year. Humboldt County is susceptible to regular earthquake activity, as evidenced by 22 seismic events with a magnitude of 5.0 or higher from 2000 through 2024 (Table 26). Figure 34 shows the locations of the events listed in Table 26.

Table 26: Earthquakes Greater than 5.0 Near Humboldt County, 2000-2024

Date	Magnitude	Depth	Description
Dec. 15, 2024	5.3	10.0 km	77 km WNW of Petrolia, CA
Dec. 5, 2024	7.0	10 km	70 km SW of Ferndale, CA Cape Mendocino, near the Mendocino triple junction
Jan. 1, 2023	5.4	30.6 km	15 km SE of Rio Dell, CA
Dec. 20, 2022	6.4	17.9 km	15 km WSW of Ferndale, CA
Dec. 20, 2021	6.2	27.0 km	7 km N of Petrolia, CA
Dec. 20, 2021	5.7	16.5 km	29 km W of Petrolia, CA
July 18, 2021	5.1	30.9 km	12 km W of Petrolia, CA
March 18, 2020	5.2	28.6 km	15 km W of Petrolia, CA
March 9, 2020	5.8	3.2 km	69 km SSW of Petrolia, CA
June 23, 2019	5.6	9.4 km	6 km SSW of Petrolia, CA
July 29, 2017	5.1	80 km	26.5 km W of Indianola, CA
Jan. 28, 2015	5.7	16.9 km	40 km SW of Ferndale, CA
March 10, 2014	6.8	16.4 km	77 km WNW of Indianola, CA
Feb. 4, 2010	5.9	23.0 km	61 km WSW of Ferndale, CA
Jan. 10, 2010	6.5	28.7 km	35 km WNW of Ferndale, CA
April 30, 2008	5.4	27.8 km	3 km NNW of Burnt Ranch, CA
May 9, 2007	5.2	-0.4 km	67 km WSW of Ferndale, CA
Feb. 26, 2007	5.4	-0.5 km	51 km W of Ferndale, CA

Date	Magnitude	Depth	Description
July 19, 2005	5.0	20.1 km	35 km SSW of Ferndale, CA
June 17, 2002	5.2	17.2 km	29 km WNW of Fields Landing, CA
Jan. 13, 2001	5.4	2.2 km	Off the coast of Northern California
March 15, 2000	5.7	4.8 km	85 km WSW of Ferndale, CA

Humboldt County has activated its Emergency Operations Center five times since 2004 in relation to earthquakes.

- **June 15-16, 2005:** A magnitude 7.0 earthquake off the Humboldt/Del Norte County coastline triggered an automatic Emergency Alert System broadcast to area residents warning of a possible tsunami. Though rescinded, the effects of that broadcast were widespread and long lasting. No damage was reported.
- **Jan. 10, 2010:** A magnitude 6.5 earthquake centered 30 miles offshore of Eureka. The earthquake caused about $20 million in damage to structures in Eureka and was felt from Eugene, Oregon to south of the San Francisco Bay Area.
- **March 9, 2014:** A magnitude 6.8 earthquake occurred offshore about 50 miles west of Eureka, followed by a series of aftershocks. No damage or injuries were reported, and no tsunami advisories were issued.
- **Dec. 21, 2021:** A magnitude 6.2 earthquake damaged storefront windows, knocked items off shelves, and caused minor damage to homes, see Figure 33.

Figure 33: Earthquake Damage in Rio Dell, 2021

- **Dec. 20, 2022:** A magnitude 6.5 earthquake occurred offshore near Ferndale, resulting in two deaths and 17 injuries. A water main burst in Rio Dell left approximately 1,450 residents without water. Historic Fernbridge on State Route 211 was closed due to damage. Gas leaks were reported in Rio Dell. Homes and businesses were damaged. Power was interrupted for tens of thousands of customers, and two Humboldt County hospitals were running on generators.
- **Dec. 5, 2024:** A magnitude 7.0 earthquake struck offshore in the morning. A tsunami warning was issued but later canceled. Power was out for 1,000 customers. Minor damage included damage to roofs in Ferndale, items falling from shelves in grocery stores, cracks in the road in Rio Dell and a gas leak at a middle school.

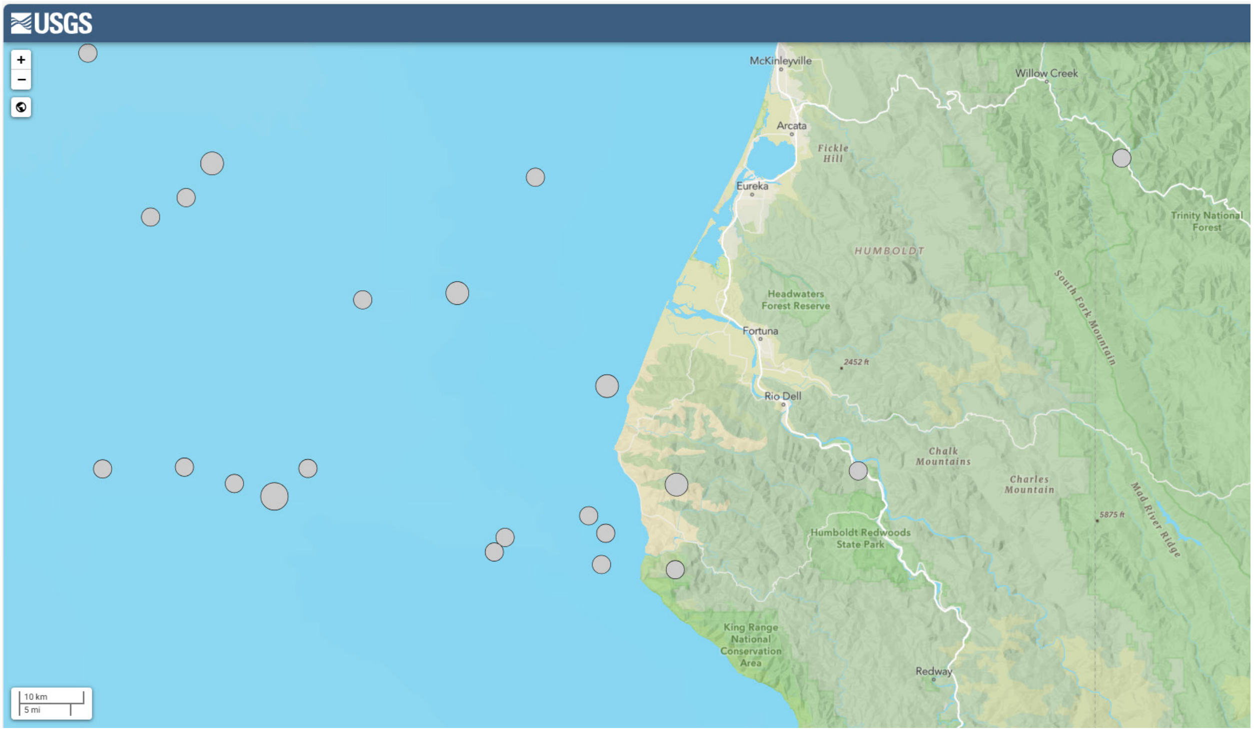

Figure 34: Earthquakes of 5.0 Magnitude or Greater Near Humboldt County from the USGS Earthquake Catalog, 2000-2024

5.8.5. Probability of Future Hazard Events

The National Seismic Hazard Model (Figure 35) from the USGS provides a large-scale view of earthquake probability. Earthquake shaking hazards are calculated by projecting earthquake rates based on earthquake history and fault slip rates. The map shows peak ground accelerations having a 2% probability of being exceeded in 50 years. These models are based on seismicity and fault slip rates and take into account the frequency and magnitude of earthquakes that have occurred. The Northern California coast falls in the highest hazard category in this model.

The probabilistic seismic hazard model in Figure 36 is an excerpt of Map Sheet 48, “Earthquake Shaking Potential for California,” from the California Geological Survey (2016). It shows the level of earthquake hazard for California based on the relative intensity of ground shaking from anticipated future earthquakes. It takes into consideration uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. The seismic shaking is based on historic earthquakes, slip rates on major faults and deformation through the region, and potential amplification of shaking due to the near-surface soils.

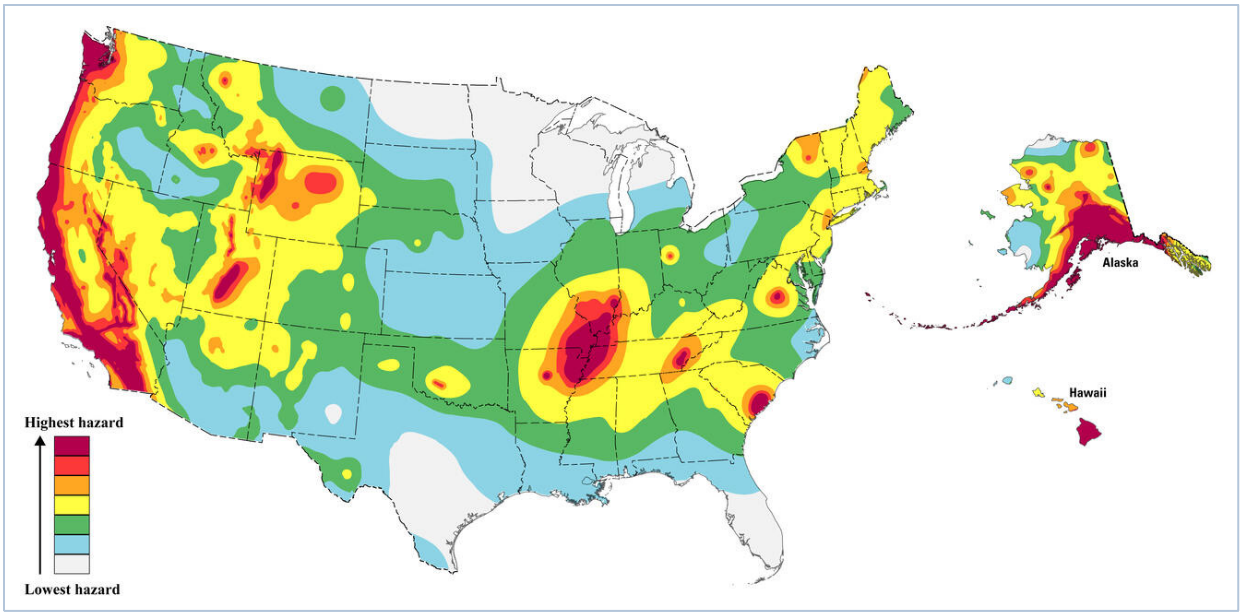

Figure 35: 2023 National Seismic Hazard Model

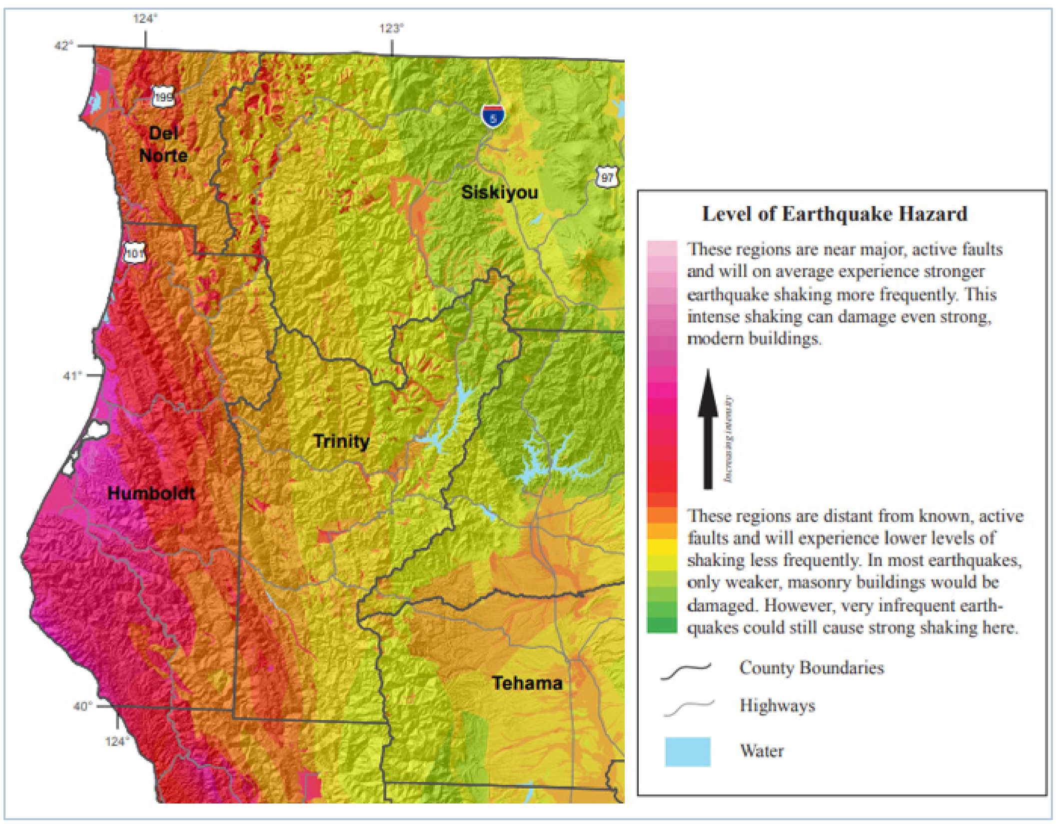

Figure 36: Earthquake Shaking Potential for California[2]

[2] California Geological Survey Map Sheet 48.

Scientists have developed earthquake forecast models that estimate the magnitude, location and likelihood of earthquake fault ruptures throughout the state. The Uniform California Earthquake Rupture Forecast (UCERF) estimates events and repeat times for regions in California. Table 27 shows the estimates for the Northern California region. The USGS estimates that there is up to a 5.5% probability that an earthquake with a magnitude of 7.5 or greater could occur within 50 kilometers of the planning area in the next five years. Locally, the probability of a magnitude 7.5 or greater event over a 30-year time is 0.11% for Subsection 3 of the Trinidad fault zone and 0.69% for Subsection 8 of the Big Lagoon-Bald Mountain fault zone.

Table 27: Earthquake Forecast for Northern California

Magnitude (greater than or equal to)	Average Repeat Time (years)	30-Year Likelihood of One or More Events	Readiness*
5	0.24	100%	1.0
6	2.4	100%	1.0
6.7	12	95%	1.0
7	25	76%	1.1
7.5	92	28%	1.0
8	645	5%	1.1

*Readiness is that factor by which likelihoods are currently elevated or lowered because of the length of time since the most recent large earthquake.

The UCERF estimates do not account for an earthquake in the CSZ that would impact the planning area. The recurrence interval for a megathrust event in the CSZ is between 200 and 800 years, although recurrences appear to be irregular. The probability of a magnitude 8.0 to 9.0 earthquake in the subduction zone over the next 30 years is estimated to be about 10%. Based on UCERF forecasts and the historical frequency of earthquakes in and near Humboldt County, the probability of future earthquake events is highly likely.

5.8.5.1. CLIMATE CHANGE CONSIDERATIONS

The 2023 California State Hazard Mitigation Plan states that the potential direct impacts of climate change on earthquake probability are unknown. Climate change can increase the risk of cascading hazards related to earthquakes. For example, an increase in temperatures can facilitate soil breakdown, allowing more water to penetrate soils and affecting erosion rates and the likelihood of landslides. Climate change may also increase the probability of more frequent, intense rainstorms. This can lead to more significant erosion, higher sediment transport in rivers and streams, and a higher probability of landslides, primarily from higher water content. Because earthquakes can trigger landslides, the changes in landslide likelihood from climate change may exacerbate the effect of ground shaking in landslide-susceptible areas.

5.8.6. Vulnerability

Earthquakes can cause extensive damage to structures, such as homes, businesses and other public and private buildings, like the one shown in Figure 37. Infrastructure, such as roads, bridges and other transportation networks, also can experience widespread damage following a strong earthquake. Earthquakes can damage power and energy lifeline facilities and transmission lines, and the interruption of power systems can delay emergency response. Damage to communications facilities can further limit emergency response. Water and wastewater facilities and pipe networks can be damaged and may leave residents without these services while costly and time-consuming repairs are made. Damaged buildings and interruption of various community lifelines can contribute to business closures and lead to severe economic losses.

Figure 37: Earthquake Damage to a Brick Building in Humboldt County, 2021

5.8.7. Impacts

To determine possible impacts of an earthquake in or near Humboldt County, the Hazus 6.1 loss estimation models were performed for five different scenarios. Hazus 6.1 is a nationally standardized risk assessment tool developed by FEMA to estimate potential losses. Hazus models serve as a resource for identifying general patterns of risk and supporting mitigation planning efforts by providing baseline data. However, HAZUS relies on default datasets and generalized assumptions, which may not accurately reflect local conditions or recent developments. As a result, while it is useful for broad planning purposes, its outputs should be interpreted with caution and especially with benefit-cost analysis that would support ongoing mitigation grant opportunities. This section describes the methodology used in these Hazus models and the potential impacts on critical facilities, structures, people and community lifelines.

5.8.7.1.SCENARIO DESCRIPTIONS

The data in the countywide analysis included general building stock data, population data and default data for transportation and utility networks. Based on the Hazus data, there are over 56,000 households, with a total population of 136,463. There are an estimated 54,000 buildings in the region, with a replacement value of $28 billion. The replacement values of transportation and utility lifeline systems are estimated to be $4.58 billion and $3.36 billion, respectively. There are seven transportation systems: highways, railways, light rail, buses, ports, ferries and airports. There are six utility systems: potable water, wastewater, natural gas, crude and refined oil, electric power and communications.

Hazus evaluates the probability of damage to buildings and infrastructure and impacts on the population, based on models of earthquake ground-shaking intensity and the effects on different building construction types. The scenarios were drawn from the USGS Earthquake Hazard Program ShakeMap scenario catalog. The scenario fault ruptures represent a potential earthquake assuming a particular magnitude, location, fault-rupture geometry and estimated shaking. These provide realistic earthquake conditions that can be used to model the potential impacts on the structures, lifelines, utilities and transportation assets that are exposed to the potential earthquake and are derived from the 2014 National Seismic Hazard Model for the U.S. The five scenarios modeled are as follows:

- Magnitude-7.5 Big Lagoon-Bald Mountain Scenario
- Magnitude-9.3 CSZ Fault Scenario
- Magnitude-7.1 Little Salmon Fault (Onshore) Scenario
- Magnitude-7.5 Mad River-Trinidad Fault Zone Scenario
- Magnitude-7.4 Russ Fault Scenario

The PGAs for the scenarios are displayed in Figure 38 through Figure 42. PGA is a measure of the force of ground shaking experienced across an area due to an earthquake. According to the USGS Earthquake Hazards 201, this measure is a good indicator of potential building damage for buildings up to about seven stories, while peak ground velocity (PGV) is suitable for taller buildings.

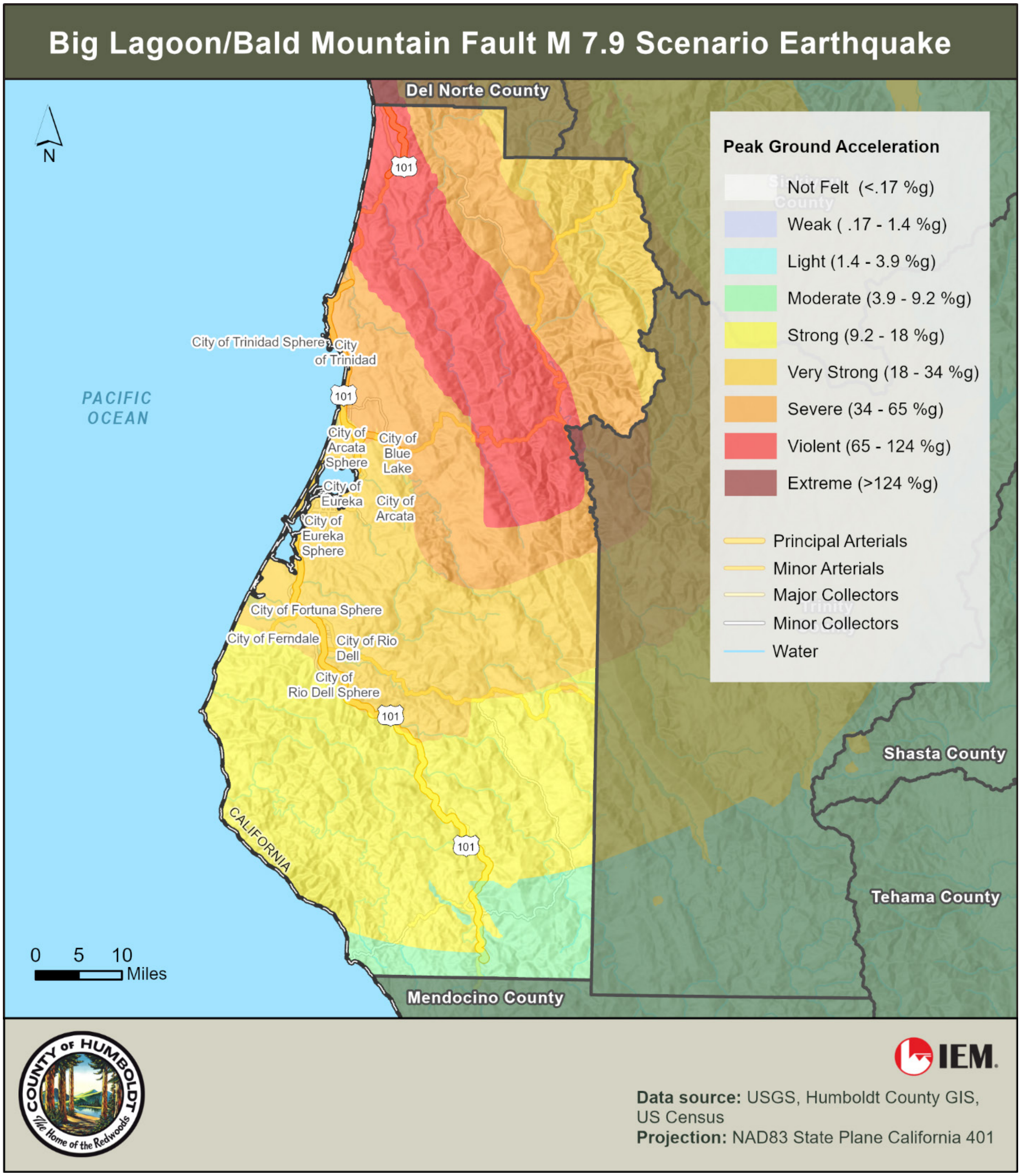

Figure 38: Peak Ground Acceleration for the Big Lagoon-Bald Mountain Scenario

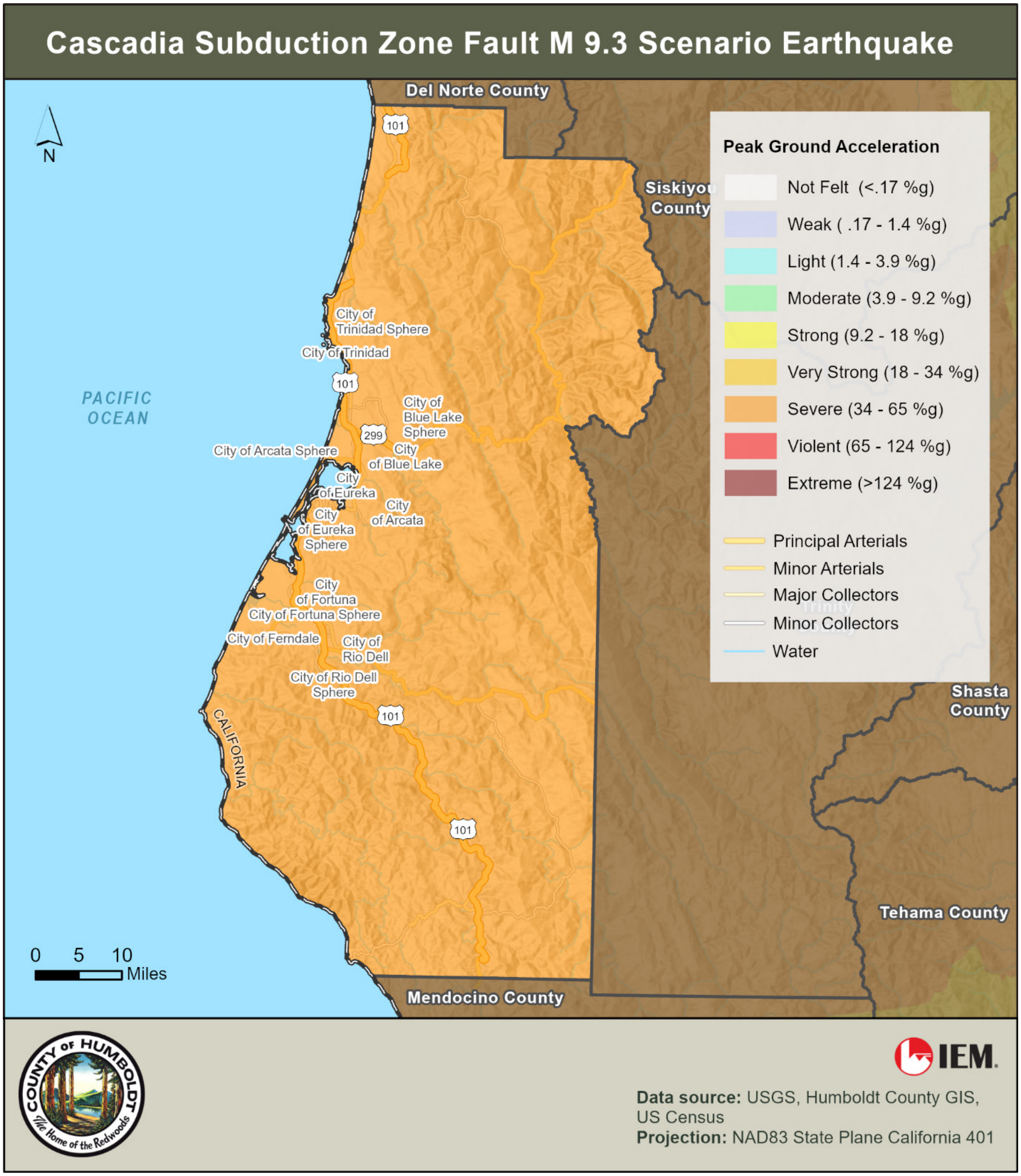

Figure 39: Peak Ground Acceleration for the Cascadia Subduction Zone Scenario

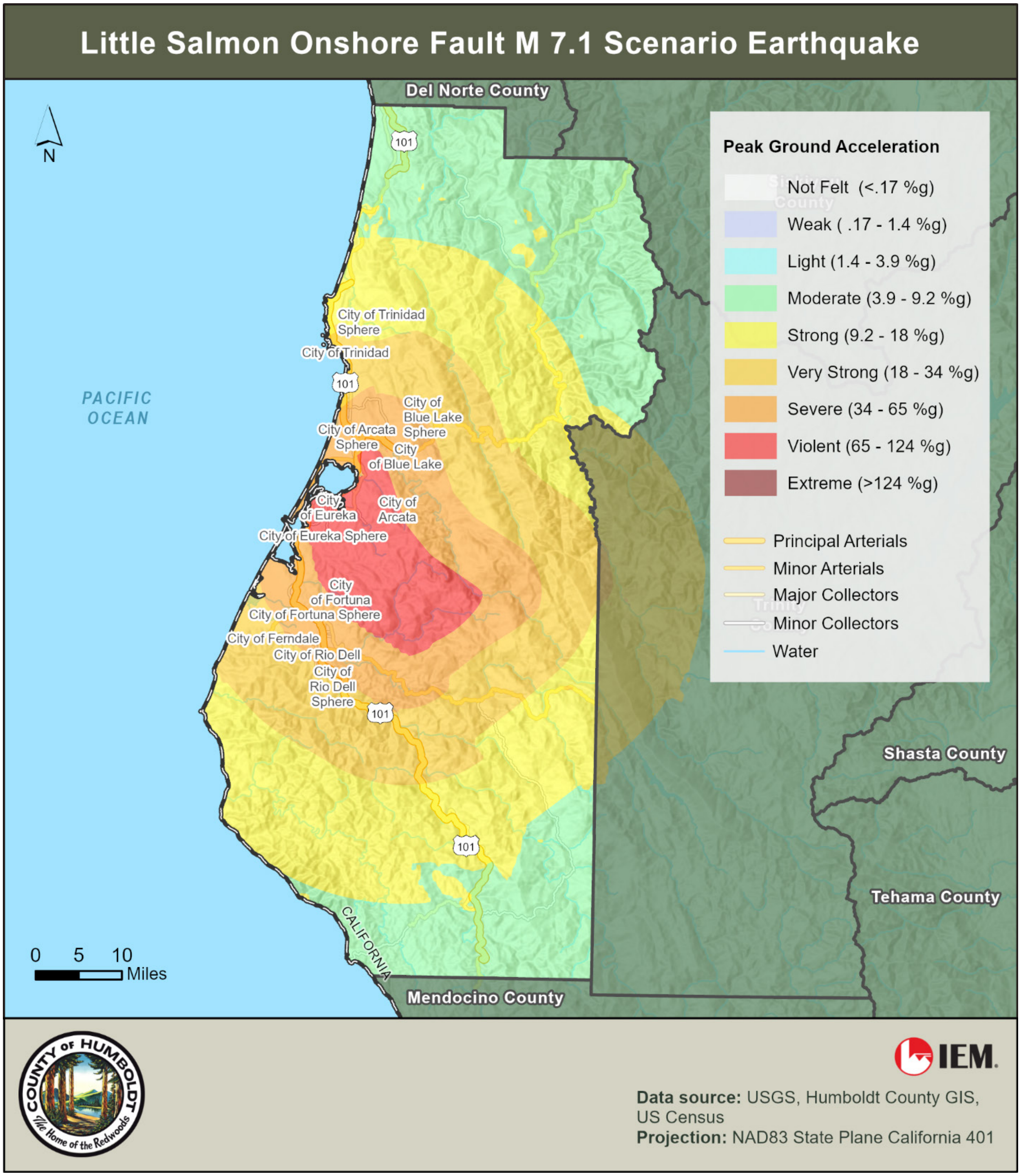

Figure 40: Peak Ground Acceleration for the Little Salmon Fault Scenario

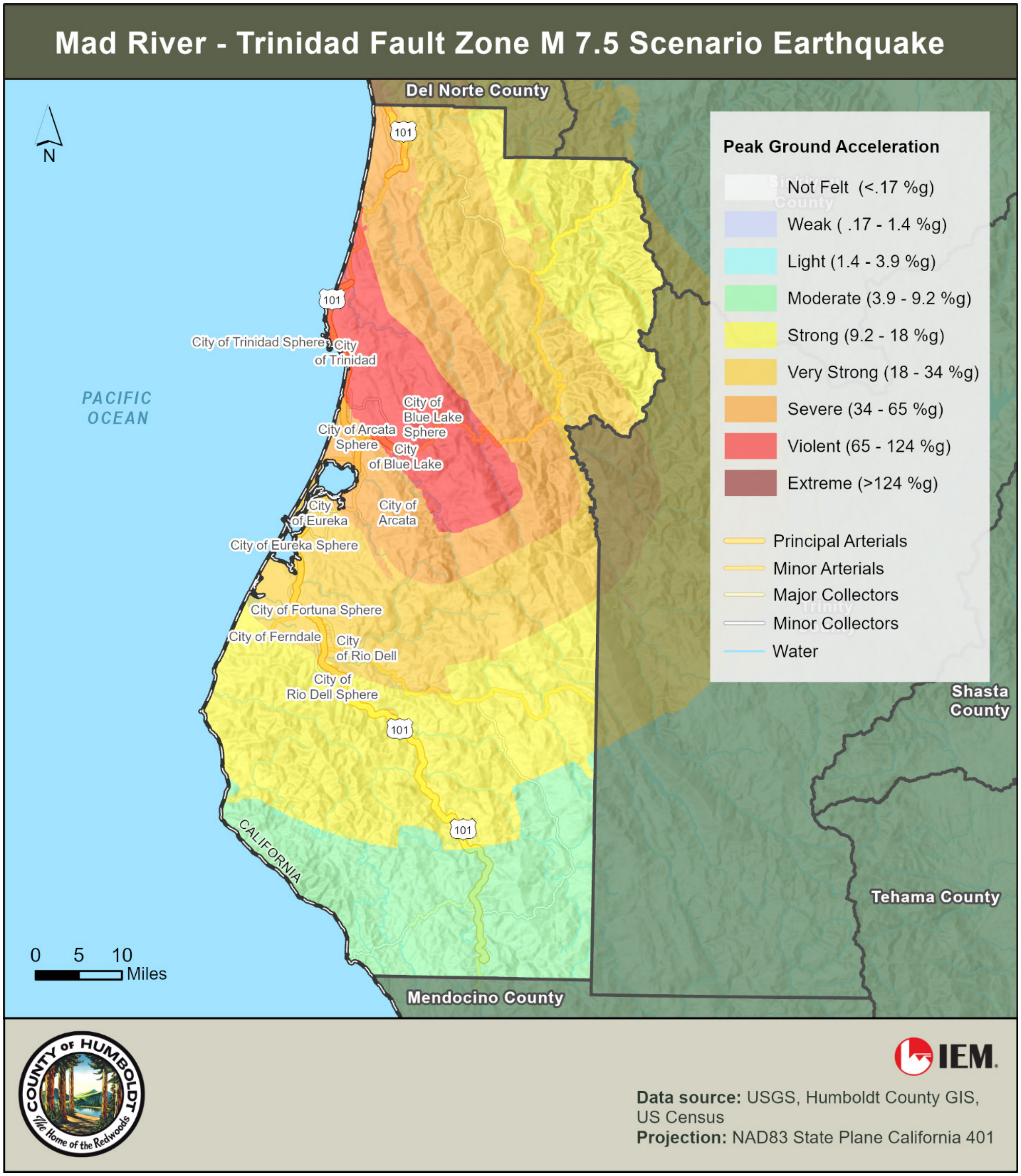

Figure 41: Peak Ground Acceleration for the Mad River-Trinidad Fault Scenario

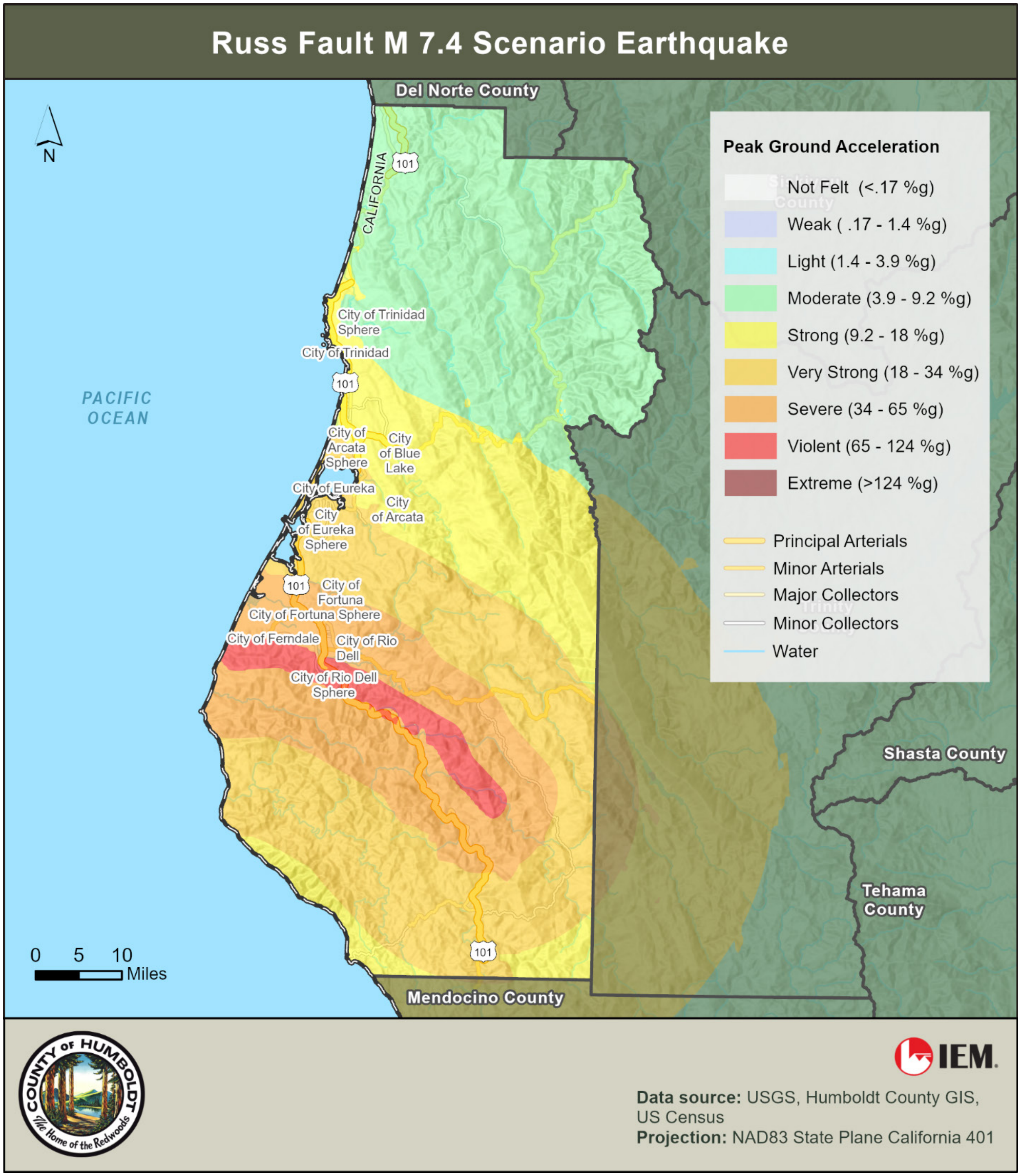

Figure 42: Peak Ground Acceleration for the Russ Fault Scenario

5.8.7.2. CRITICAL INFRASTRUCTURE

The Hazus model estimates the amount of structural damage anticipated to affect critical facilities in the county and provides an estimate of the impacts on their functionality. These impacts are summarized for the five earthquake scenarios in Table 28 through Table 32. A total of 215 facilities — including hospitals, schools, EOCs, police stations and fire stations — were included in the model. All scenarios indicate disruptions to the functionality of many of these facilities immediately following an earthquake. The most severe impacts are for the Cascadia scenario, in which only two of the 215 facilities, or 1%, are expected to be over 50% functional on Day 1.

Table 28: Critical Facility Impacts for the Big Lagoon-Bald Mountain Scenario

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
Hospitals and Medical Clinics	21	8	0	4
Schools	105	29	1	24
EOCs	1	0	0	1
Police Stations	17	2	0	11
Fire Stations	71	5	0	54

Table 29: Critical Facility Impacts for the Cascadia Scenario

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
Hospitals and Medical Clinics	21	21	0	0
Schools	105	97	0	0
EOCs	1	0	0	0
Police Stations	17	8	0	0
Fire Stations	71	30	0	2

Table 30: Critical Facility Impacts for the Little Salmon Fault Scenario

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
Hospitals and Medical Clinics	21	16	0	5
Schools	105	70	0	24

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
EOCs	1	1	0	0
Police Stations	17	4	0	7
Fire Stations	71	10	0	41

Table 31: Critical Facility Impacts for the Mad River-Trinidad Fault Scenario

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
Hospitals and Medical Clinics	21	9	0	8
Schools	105	47	0	38
EOCs	1	0	0	0
Police Stations	17	2	0	9
Fire Stations	71	8	0	51

Table 32: Critical Facility Impacts for the Russ Fault Scenario

Classification	Total Facilities	Moderate Damage >50%	Complete Damage >50%	Functionality >50% on Day 1
Hospitals and Medical Clinics	21	5	0	10
Schools	105	19	0	44
EOCs	1	0	0	1
Police Stations	17	3	0	13
Fire Stations	71	7	0	51

5.8.7.3. STRUCTURAL LOSSES

Hazus estimates that there are 54,000 buildings in the region, which have an aggregate total replacement value of over $24 billion. Hazus models the effects of ground shaking in each earthquake scenario on different building construction and occupancy types to estimate the potential costs of structural and content damage and indirect economic costs due to business interruptions. The results show that the areas of higher building losses correspond with the areas of higher ground shaking shown in the PGA maps.

Inventory loss, wage loss and income loss will be zero for all single-family residential occupancies in all of the scenarios. Although some households may maintain small businesses with the values associated with them, these are not reflected in the general building stock data available. Similarly, the multifamily residential category has no inventory value associated with it, but it does have estimated losses for wages and income associated with running a multifamily housing facility.

BIG LAGOON-BALD MOUNTAIN SCENARIO

The total economic loss for this scenario is $1,702,810,000. This includes building damage and transportation and utility lifeline losses. Hazus estimates that 5,385 buildings will be at least moderately damaged, which is over 10% of buildings in the county, and 185 buildings are anticipated to be damaged beyond repair.

Hazus provides loss estimates for direct building damage, the cost of repairing or replacing the damage caused to a building, and its contents and business interruption losses associated with the inability to operate a business because of damage caused by an earthquake. The total building losses for this scenario are $1,363,410,700. Of those losses, 14% are related to business interruption, and the remainder is related to direct building losses. Damage to residences accounts for over 44% of the loss. The locations where losses are concentrated for this scenario, grouped by census tract, are shown in Figure 43.

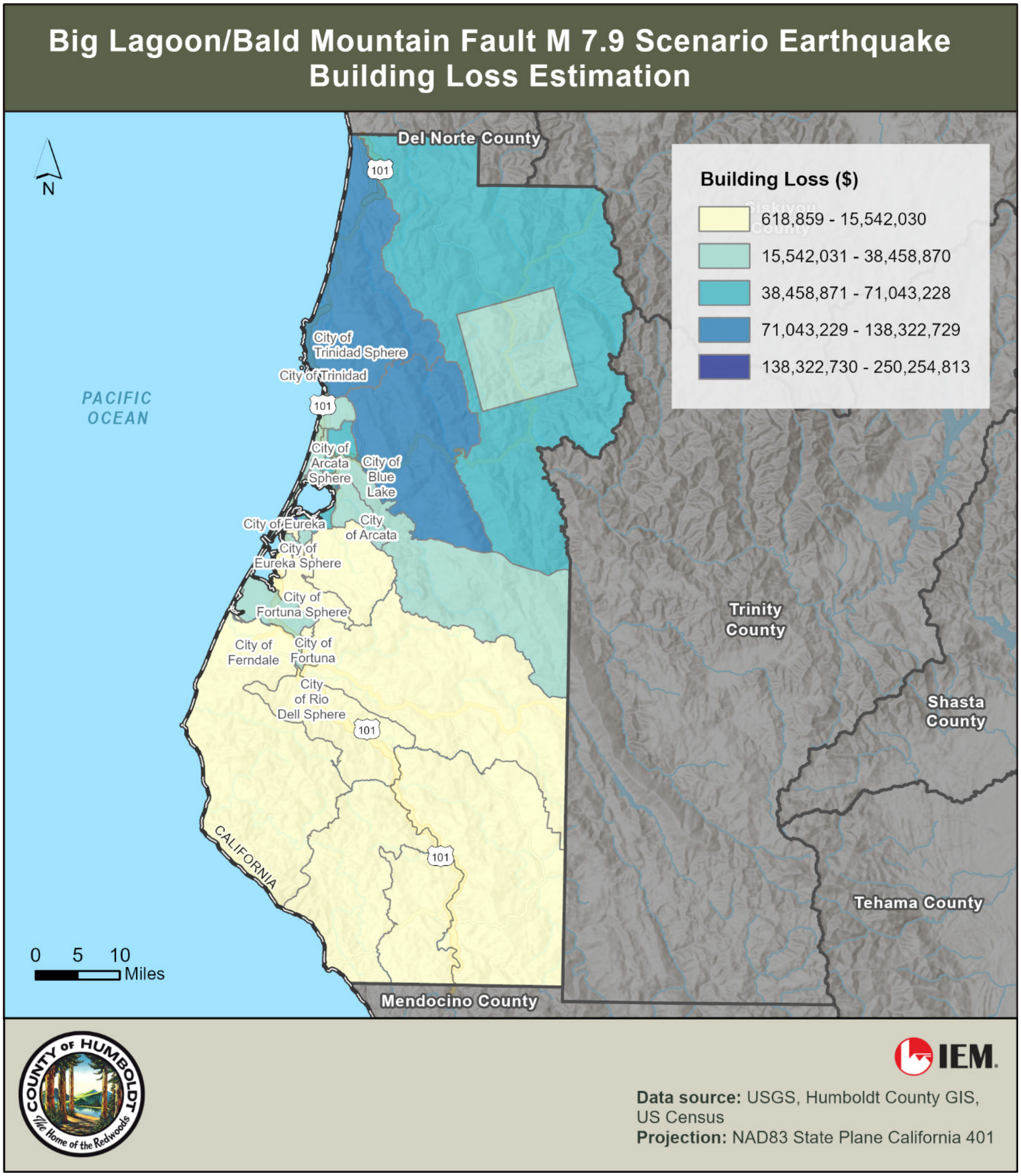

Figure 43: Building Loss Estimates for the Big Lagoon-Bald Mountain Scenario

Figure 44 shows the direct and indirect loss categories, and Figure 45 displays the losses by building occupancy type. A summary of direct and business interruption losses by different building occupancy categories is in Table 33. The “Other” occupancy category includes agricultural, educational, government and religion/nonprofit structures.

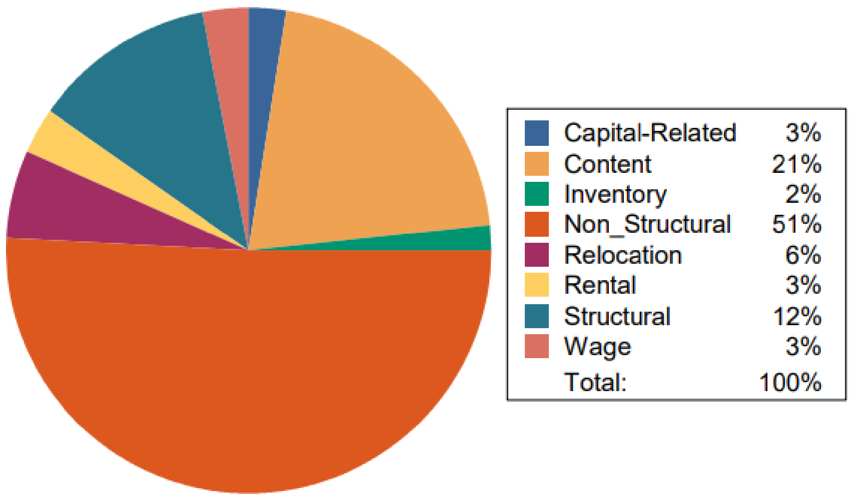

Figure 44: Direct and Indirect Economic Losses for the Big Lagoon-Bald Mountain Scenario

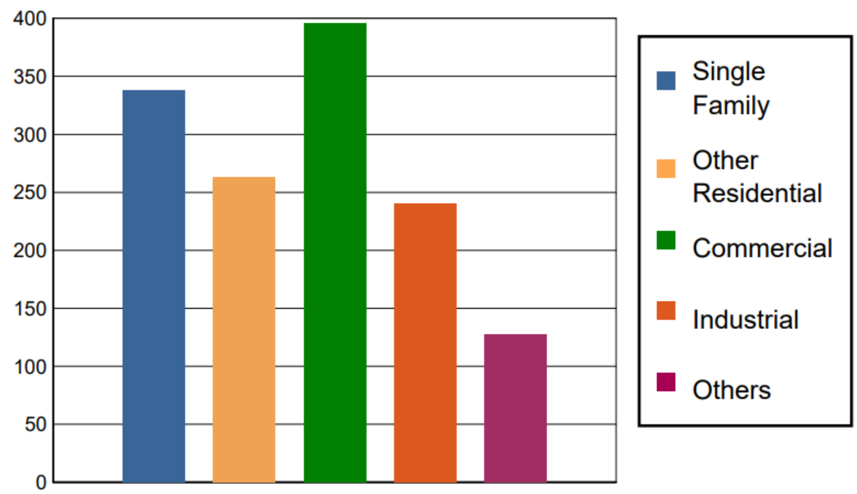

Figure 45: Earthquake Losses by Occupancy Type for the Big Lagoon-Bald Mountain Scenario ($ millions)

Table 33: Building-Related Economic Loss Estimates for the Big Lagoon-Bald Mountain Scenario

Building Type	Structural Loss	Non-Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Single Family Residential	$34,076,300	$207,898,800	$78,742,300	$0	$0	$0	$3,990,100	$12,919,200	$337,626,700
Other Residential	$29,835,700	$160,855,900	$36,870,500	$0	$5,665,100	$2,406,100	$13,893,600	$13,116,200	$262,693,100
Commercial	$53,792,100	$153,459,400	$74,420,600	$12,831,600	$26,500,700	$28,110,400	$19,686,200	$26,565,000	$395,366,000
Industrial	$36,768,800	$104,897,200	$70,041,900	$10,021,300	$4,900,500	$3,026,500	$1,940,100	$8,945,300	$240,541,600
Other	$12,085,700	$66,401,300	$22,771,100	$1,316,100	$4,377,200	$1,201,300	$2,120,100	$16,913,500	$127,186,300
Total	**$166,558,600**	**$693,512,600**	**$282,846,400**	**$24,169,000**	**$41,443,500**	**$34,744,300**	**$41,630,100**	**$78,459,200**	**$1,363,413,700**

CASCADIA SCENARIO

The total economic loss estimated for this scenario is $7,551,870,000, which includes buildings and transportation and utility lifelines. Hazus estimates that 20,776 buildings will be at least moderately damaged, which is over 38% of buildings in the county, and 1,833 buildings are anticipated to be damaged beyond repair.

Hazus provides loss estimates for direct building damage, the cost of repairing or replacing the damage caused to a building and its contents, and business interruption losses associated with the inability to operate a business because of damage caused by an earthquake. The total building losses for this scenario are $6,300,700,000. Of those losses, 16% are related to business interruption, and the remainder is related to direct building losses. Damage to residences accounts for over 39% of the total loss.

Figure 46 shows the direct and indirect loss categories, and Figure 47 shows the losses by building type and occupancy type. The locations where losses are concentrated, grouped by census tract, are shown in Figure 48. A summary of direct and business interruption losses by different building occupancy categories is in Table 34. The “Other” occupancy category includes agricultural, educational, government and religion/nonprofit structures.

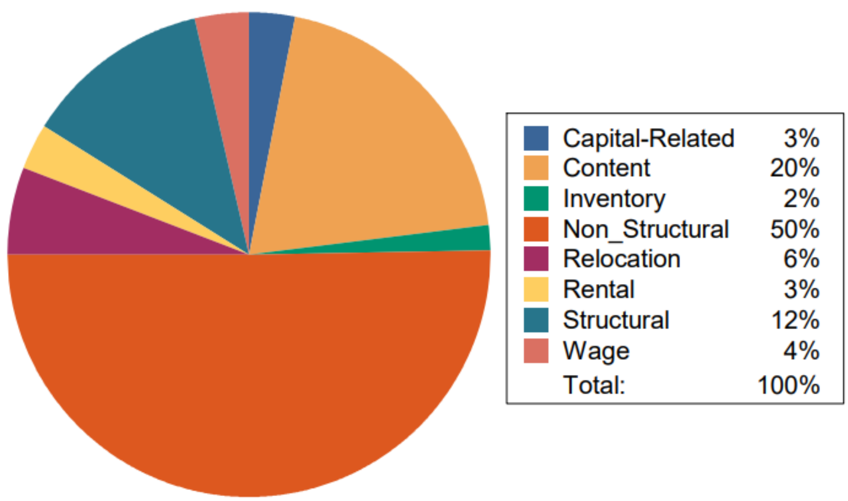

Figure 46: Direct and Indirect Economic Losses for the Cascadia Scenario

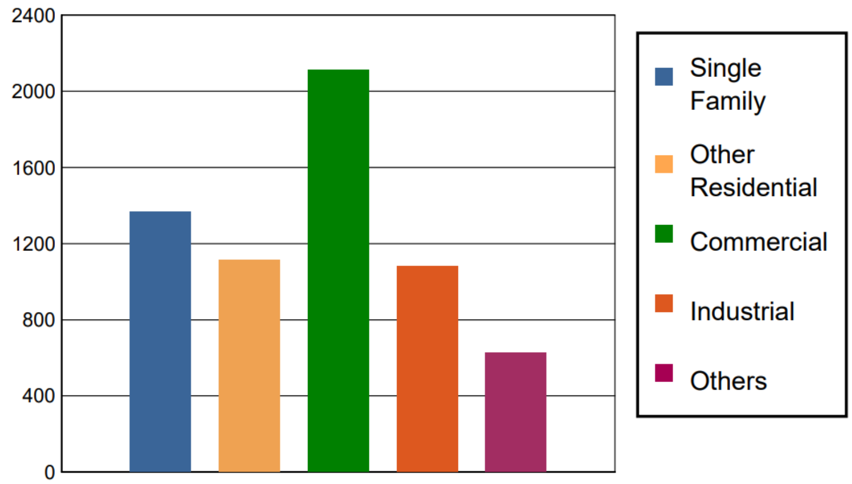

Figure 47: Earthquake Losses by Occupancy Type for the Cascadia Scenario ($ millions)

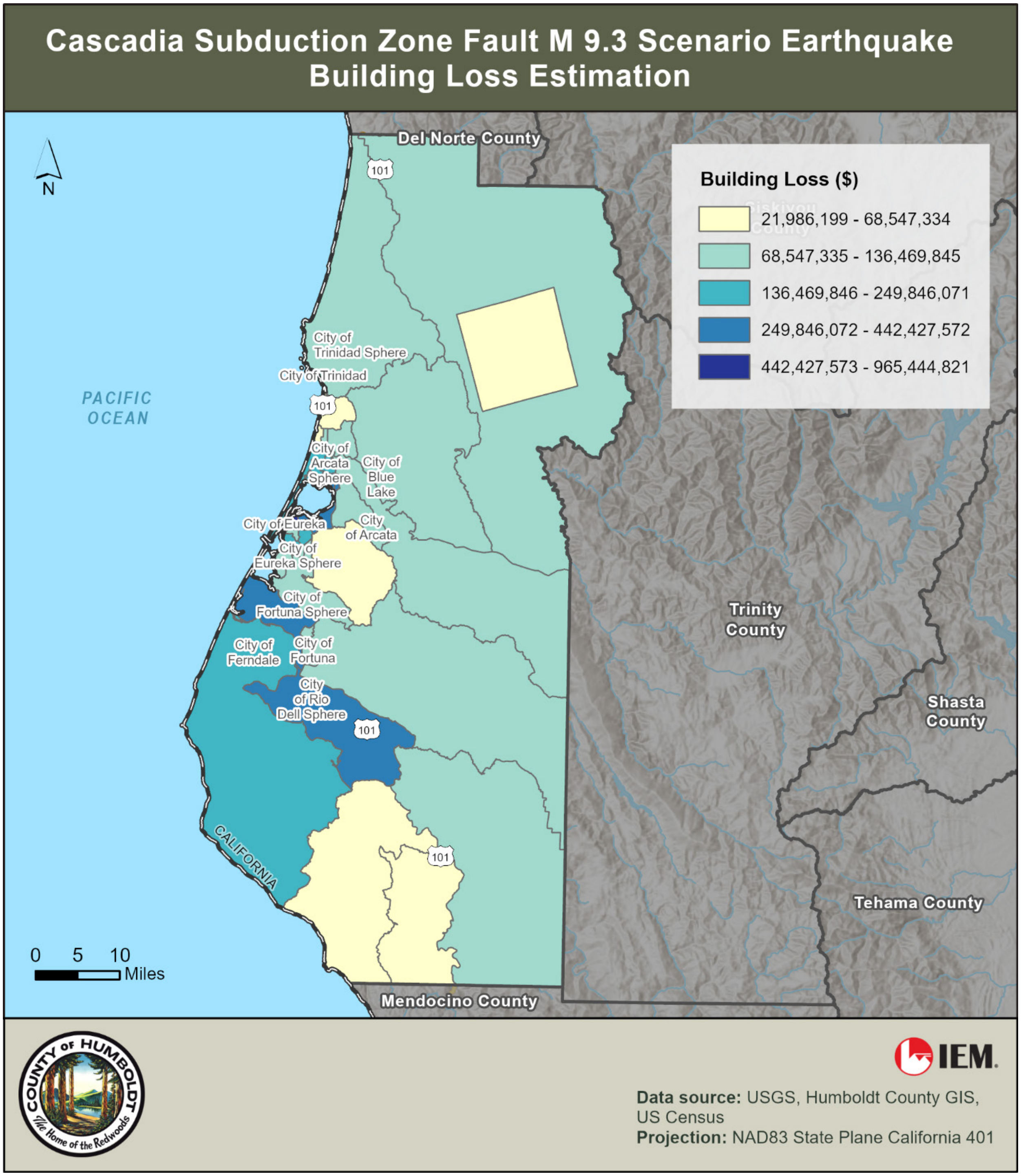

Figure 48: Building Loss Estimates for the Cascadia Scenario

Table 34: Building-Related Economic Loss Estimates for the Cascadia Scenario

Building Type	Structural Loss	Non-Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Single Family Residential	$149,833,800	$811,217,500	$283,278,800	$0	$0	$0	$25,359,300	$96,923,800	$1,366,613,200
Other Residential	$127,921,800	$664,854,100	$143,081,000	$0	$44,829,500	$19,061,500	$67,668,900	$48,333,800	$1,115,750,600
Commercial	$286,165,400	$867,432,600	$378,349,400	$61,485,400	$148,099,000	$158,132,000	$87,314,700	$125,054,500	$2,112,030,000
Industrial	$143,950,700	$500,086,500	$331,729,600	$49,406,600	$15,935,200	$9,875,200	$6,161,500	$25,567,500	$1,082,712,800
Other	$71,237,700	$316,485,700	$115,476,900	$6,981,000	$19,020,300	$6,538,300	$9,553,500	$81,301,400	$626,594,800
Total	**$779,109,400**	**$3,160,076,400**	**$1,251,915,700**	**$117,873,000**	**$227,884,000**	**$193,607,000**	**$196,057,900**	**$377,181,000**	**$6,303,704,400**

*Dollar amount totals rounded to the nearest whole number

LITTLE SALMON FAULT (ONSHORE) SCENARIO

Total economic loss estimated for this scenario is $5,261,900,000, which includes buildings and transportation and utility lifelines. Hazus estimates that 13,964 buildings will be at least moderately damaged, which is over 26% of the buildings in the county. A total of 833 buildings are anticipated to be damaged beyond repair.

Hazus provides loss estimates for direct building damage, the cost to repair or replace the damage caused to a building and its contents, and business interruption losses associated with the inability to operate a business because of damage caused by an earthquake. The total building losses for this scenario are $4,343,450,000, 16% of which is related to business interruption and the remainder is related to direct building losses. Damage to residences accounts for over 39% of the loss.

Figure 49 displays the direct and indirect loss categories, and Figure 50 shows the losses by building occupancy type. The locations of where losses are concentrated for this scenario, grouped by census tract, are shown in Figure 51. A summary of direct and business interruption losses by different building occupancy categories is presented in Table 35. The “Other” occupancy category includes agricultural, educational, government and religion/nonprofit structures.

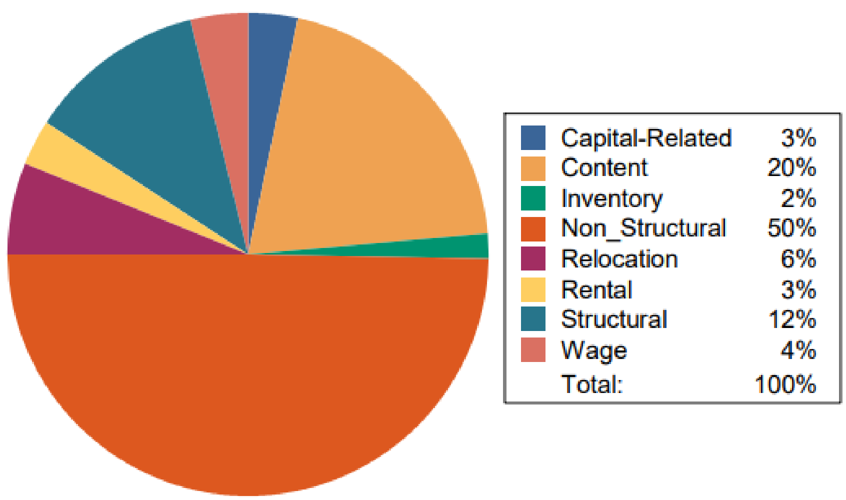

Figure 49: Direct and Indirect Economic Losses for Little Salmon Scenario

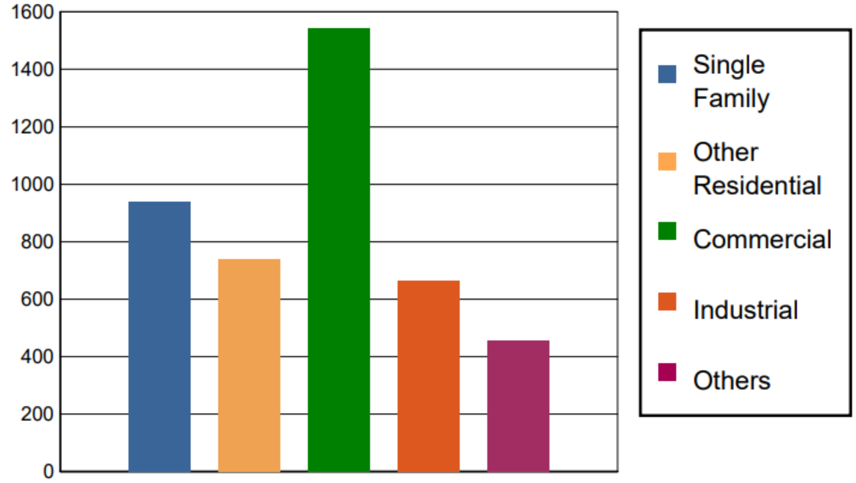

Figure 50: Earthquake Losses by Building Occupancy for the Little Salmon Fault Scenario

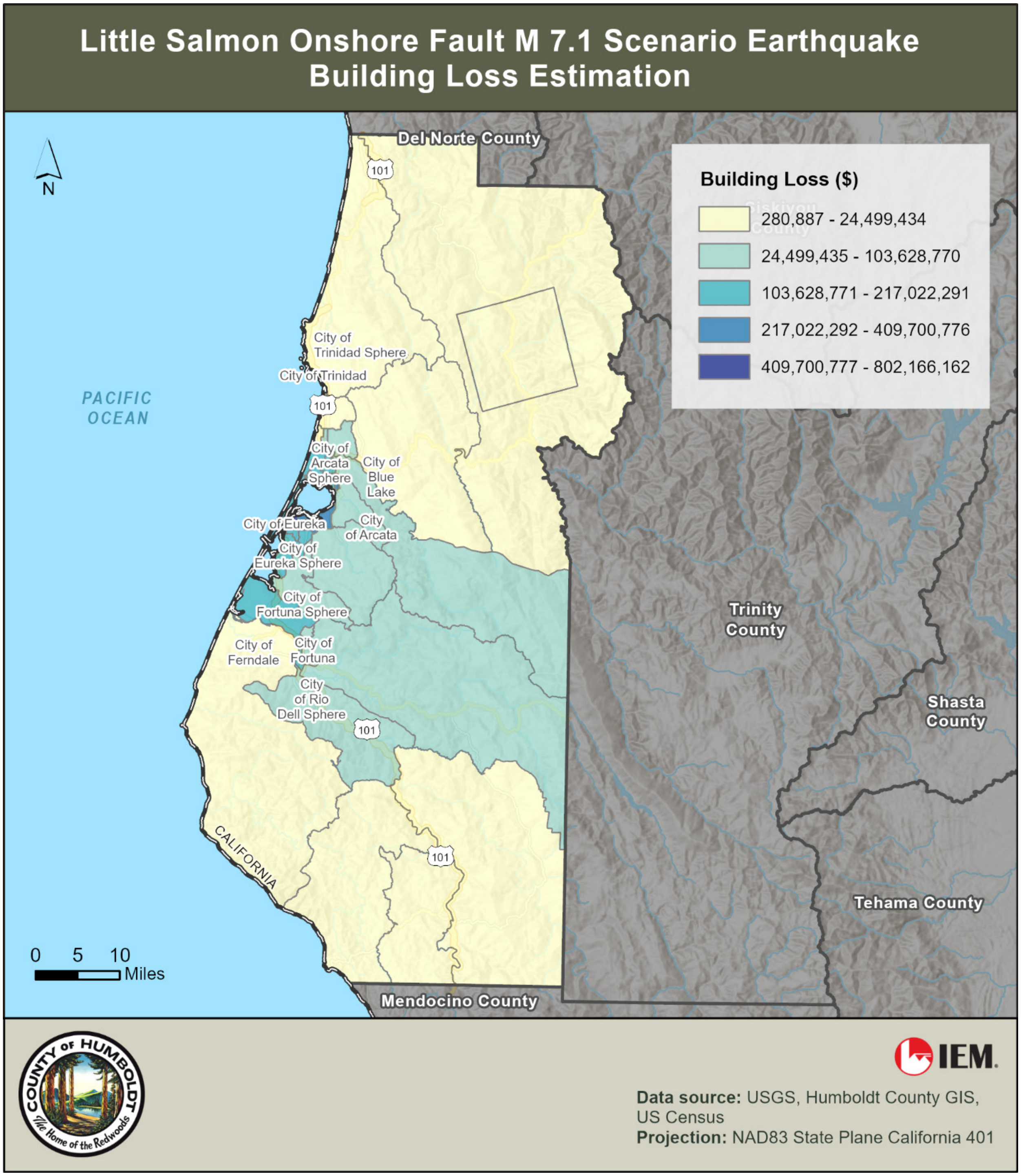

Figure 51: Building Loss Estimates for the Little Salmon Fault Scenario

Table 35: Building-Related Economic Loss Estimates for the Little Salmon Fault Scenario

Building Type	Structural Loss	Non-Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Single Family Residential	$100,390,000	$557,523,600	$203,504,500	$0	$0	$0	$16,230,100	$61,290,900	$938,939,100
Other Residential	$76,793,700	$438,800,100	$102,006,700	$0	$34,305,200	$14,591,000	$44,944,500	$29,155,900	$740,597,100
Commercial	$198,571,500	$629,001,900	$286,164,500	$46,574,900	$114,395,100	$116,809,600	$62,016,700	$89,735,800	$1,543,270,000
Industrial	$89,852,700	$303,869,800	$203,626,700	$28,301,700	$10,093,600	$6,328,500	$4,085,000	$17,735,800	$663,893,800
Other	$47,038,200	$233,237,300	$83,216,500	$2,633,900	$14,661,500	$5,004,500	$7,496,300	$63,460,500	$456,748,700
Total	**$512,646,100**	**$2,162,432,700**	**$878,518,900**	**$77,510,500**	**$173,455,400**	**$142,733,600**	**$134,772,600**	**$261,378,900**	**$4,343,448,700**

MAD RIVER-TRINIDAD FAULT SCENARIO

Total economic loss estimated for this scenario is $2,349,520,000, which includes buildings and transportation and utility lifelines. Hazus estimates that 6,626 buildings will be at least moderately damaged, which is over 12% of the buildings in the county. A total of 376 buildings are anticipated to be damaged beyond repair.

The total building losses for this scenario are $1,864,810,000, 14% of which is related to business interruption and the remainder is related to direct building losses. Damage to residences accounts for over 45% of the loss.

The graphic in Figure 52 displays the direct and indirect loss categories, and Figure 53 shows the losses by building occupancy type. The locations where these losses are concentrated, grouped by census tract, are shown in Figure 54. A summary of direct and business interruption losses by different building occupancy categories is shown in Table 36. The “Other” occupancy category includes agricultural, educational, government and religion/nonprofit structures.

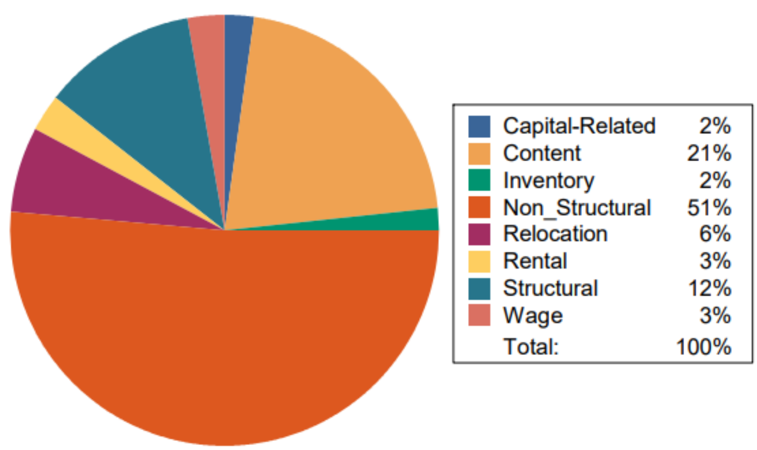

Figure 52: Direct and Indirect Economic Losses for the Mad River-Trinidad Scenario

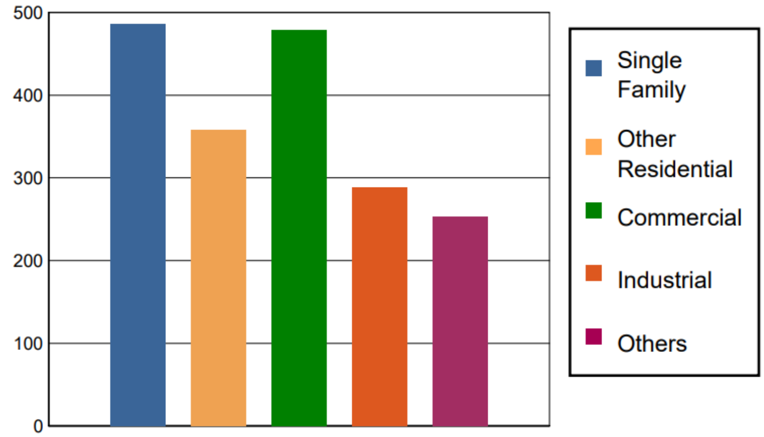

Figure 53: Earthquake Losses by Building Occupancy for the Mad River-Trinidad Scenario

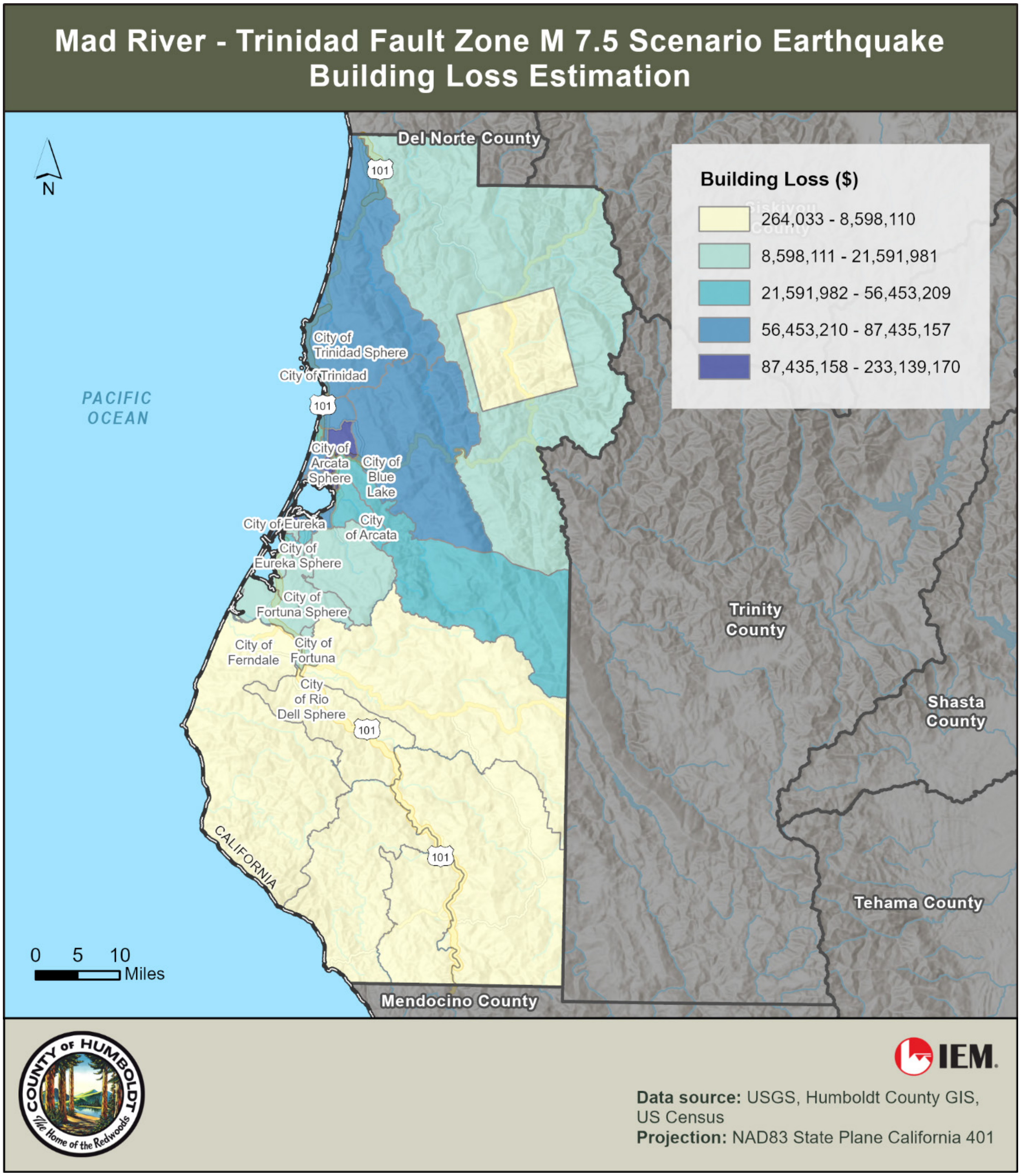

Figure 54: Building Loss Estimates for the Mad River-Trinidad Fault Scenario

Table 36: Building-Related Economic Loss Estimates for the Mad River-Trinidad Fault Scenario

Building Type	Structural Loss	Non-Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Single Family Residential	$47,383,200	$296,000,000	$114,724,600	$0	$0	$0	$6,329,700	$21,952,200	$486,389,700
Other Residential	$39,173,800	$222,395,600	$55,449,100	$0	$5,384,000	$2,288,200	$17,063,100	$15,923,900	$357,677,700
Commercial	$60,917,400	$185,755,700	$96,156,200	$16,313,400	$32,647,400	$32,961,500	$22,405,800	$31,172,700	$478,330,100
Industrial	$44,920,500	$125,703,100	$84,124,200	$11,810,300	$5,762,200	$3,551,100	$2,328,100	$10,613,000	$288,812,500
Other	$24,012,200	$129,197,600	$43,400,900	$2,353,900	$8,995,400	$3,118,200	$4,329,600	$38,190,300	$253,598,100
Total	**$216,407,100**	**$959,052,000**	**$393,855,000**	**$30,477,600**	**$52,789,000**	**$41,919,000**	**$52,456,300**	**$117,852,100**	**$1,864,808,100**

RUSS FAULT SCENARIO

Total economic loss estimated for this scenario is $1,577,740,000, which includes buildings and transportation and utility lifelines. Hazus estimates that 3,715 buildings will be at least moderately damaged, which is over 7% of the buildings in the county. A total of 82 buildings are anticipated to be damaged beyond repair.

The total building losses for this scenario are $1,007,450,000, 12% of which is related to business interruption and the remainder is related to direct building losses. Damage to residences accounts for over 50% of the loss.

Figure 55 displays the direct and indirect loss categories, and Figure 56 shows the losses by building occupancy type. The locations where these losses are concentrated, grouped by census tract, are shown in Figure 57. A summary of direct and business interruption losses by different building occupancy categories is in Table 37. The "Other" occupancy category includes agricultural, educational, government and religion/nonprofit structures.

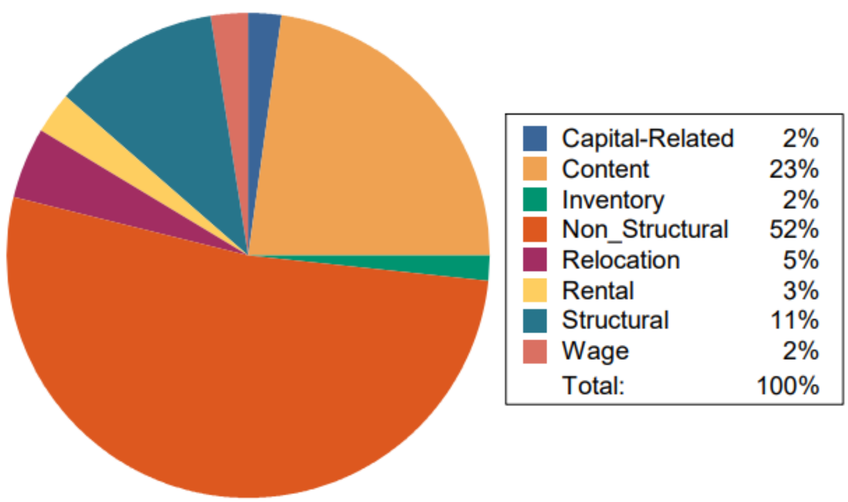

Figure 55: Direct and Indirect Building Losses for the Russ Fault Scenario

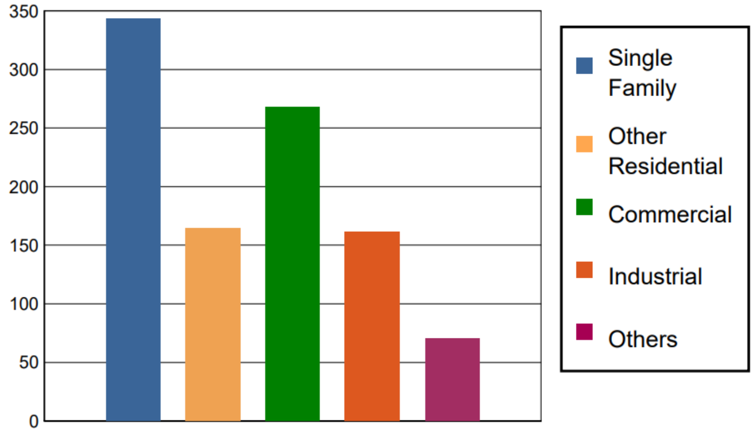

Figure 56: Earthquake Losses by Type and Occupancy for the Russ Fault Scenario

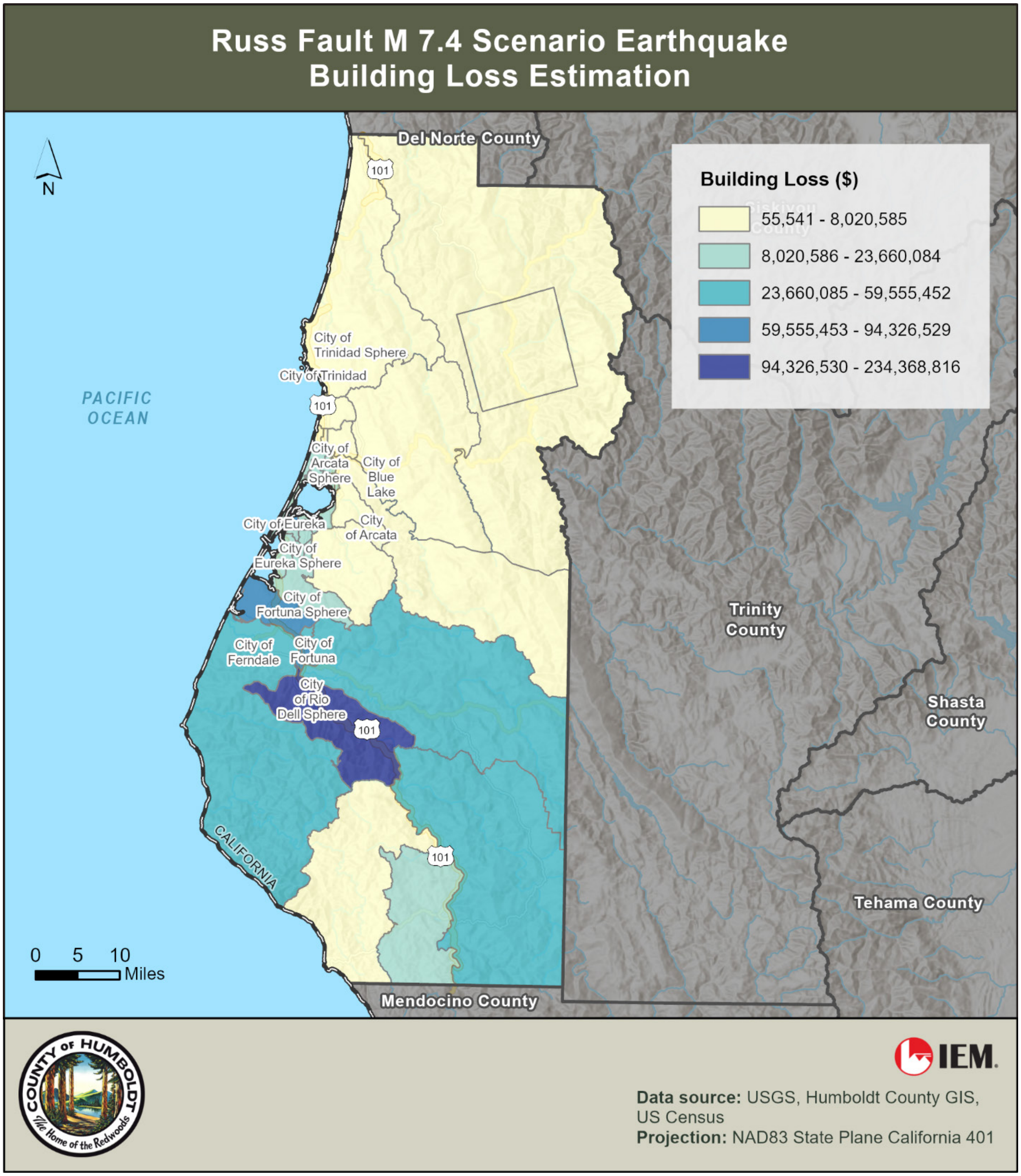

Figure 57: Building Loss Estimates for the Russ Fault Scenario

Table 37: Building-Related Economic Loss Estimates for the Russ Fault Scenario

Building Type	Structural Loss	Non-Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Single Family Residential	$34,351,600	$209,437,200	$80,330,500	$0	$0	$0	$4,377,500	$14,598,400	$343,095,200
Other Residential	$16,194,600	$102,948,900	$26,720,800	$0	$2,382,400	$1,011,900	$8,225,500	$7,331,400	$164,815,500
Commercial	$31,605,200	$106,426,300	$56,642,000	$7,574,200	$17,089,200	$18,553,300	$12,909,400	$17,097,500	$267,897,100
Industrial	$22,229,800	$72,141,000	$49,199,900	$6,676,800	$2,794,600	$1,718,200	$1,124,800	$5,062,200	$160,947,300
Other	$8,021,200	$36,482,700	$16,552,900	$1,942,400	$1,765,300	$398,400	$733,500	$4,794,000	$70,690,400
Total	**$112,402,400**	**$527,436,100**	**$229,446,100**	**$16,193,400**	**$24,031,500**	**$21,681,800**	**$27,370,700**	**$48,883,500**	**$1,007,445,500**

5.8.7.4.POPULATION IMPACTS

Damage to residences from an earthquake will displace people from their homes. Each earthquake scenario includes an estimate of the number of households that will be displaced and the number of people expected to seek public shelter. These values are summarized in Table 38.

Table 38: Sheltering Needs for the Earthquake Scenarios

Scenario	Displaced Households	Persons Seeking Temporary Public Shelter
Big Lagoon-Bald Mountain	418	238
Cascadia	2,693	1,571
Little Salmon	1,615	919
Mad River-Trinidad	508	299
Russ	258	155

5.8.7.5.TRANSPORTATION AND UTILITY LIFELINE LOSSES

Hazus estimates the cost of damage to transportation and utility lifelines, the severity of damage to these lifelines, and how long facilities may be out of service. These impacts are summarized for each of the five scenarios in Table 39 through Table 53.

Table 39: Transportation System and Loss Estimates and Facility Damage for the Big Lagoon-Bald Mountain Scenario

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Highway Segments	$2,671,034,700	$0	102	0	0	102	102
Highway Bridges	$1,452,527,300	$30,870,500	391	6	0	385	389
Railway Segments	$259,865,200	$0	59	0	0	59	59
Railway Bridges	$11,380,000	$125,700	2	0	0	2	2
Bus Facilities	$4,534,400	$824,000	2	0	0	2	2
Port Facilities	$83,860,500	$12,416,700	22	0	0	22	22
Airport Facilities	$50,750,200	$9,751,000	9	1	0	8	9
Airport Runways	$50,063,300	$0	10	0	0	10	10
Total	**$4,584,015,600**	**$53,987,900**	**597**	**7**	**0**	**590**	**595**

Table 40: Utility System Loss Estimates and Facility Damage for the Big Lagoon-Bald Mountain Scenario

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Potable Water Distribution Lines	$243,824,200	$4,000	N/A	N/A	N/A	N/A	N/A
Wastewater Facilities	$1,891,469,800	$133,293,600	11	0	0	6	11
Wastewater Distribution Lines	$146,294,500	$2,000	N/A	N/A	N/A	N/A	N/A
Natural Gas Pipelines	$337,919,800	$0	N/A	N/A	N/A	N/A	N/A
Natural Gas Distribution Lines	$97,529,700	$1,000	N/A	N/A	N/A	N/A	N/A
Electrical Power Facilities	$643,002,700	$151,448,800	5	3	0	4	5
Communications Facilities	$3,068,000	$664,500	26	11	0	25	26
Total	**$3,363,108,700**	**$285,413,900**	**42**	**14**	**0**	**35**	**42**

Table 41: Households Without Water and Electrical System Service for the Big Lagoon-Bald Mountain Scenario

System Type	Total Households	At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	56,422	0	0	0	0	0
Electric Power	56,422	6,989	4,781	2,255	311	9

Table 42: Transportation System Loss Estimates and Facility Damage for the Cascadia Scenario

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Highway Segments	$2,671,034,700	$0	102	0	0	102	102
Highway Bridges	$1,452,527,300	$135,059,800	391	26	1	363	383
Railway Segments	$259,865,200	$0	59	0	0	59	59
Railway Bridges	$11,380,000	$1,255,200	2	0	0	2	2
Bus Facilities	$4,534,400	$2,031,600	2	2	0	2	2
Port Facilities	$83,860,500	$36,947,900	22	22	0	22	22
Airport Facilities	$50,750,200	$21,123,300	9	7	0	9	9
Airport Runways	$50,063,300	$0	10	0	0	10	10
Total	**$4,584,015,600**	**$196,417,800**	**597**	**57**	**1**	**569**	**589**

Table 43: Utility System Loss Estimates and Facility Damage for the Cascadia Scenario

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1C	Functionality >50% after Day 7
Potable Water Distribution Lines	$243,824,200	$7,000	N/A	N/A	N/A	N/A	N/A
Wastewater Facilities	$1,891,469,800	$625,229,100	11	11	0	0	11
Wastewater Distribution Lines	$146,294,500	$1,000	N/A	N/A	N/A	N/A	N/A
Natural Gas Pipelines	$337,919,800	$0	N/A	N/A	N/A	N/A	N/A
Natural Gas Distribution Lines	$97,529,700	$1,000	N/A	N/A	N/A	N/A	N/A
Electrical Power Facilities	$643,002,700	$427,794,800	5	5	0	0	0
Communications Facilities	$3,068,000	$1,725,300	26	11	0	25	26
Total	**$3,363,108,700**	**$1,054,758,200**	**42**	**16**	**0**	**25**	**37**

Table 44: Households Without Water and Electrical System Service for the Cascadia Scenario

System Type	Total Households	At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	56,422	0	0	0	0	0
Electric Power	56,422	48,265	37,097	19,671	2,940	56

Table 45: Transportation System Loss Estimates and Facility Damage for the Little Salmon Fault Scenario

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Highway Segments	$2,671,034,700	$0	102	0	0	102	102
Highway Bridges	$1,452,527,300	$20,868,700	391	26	1	372	386
Railway Segments	$259,865,200	$0	59	0	0	59	59
Railway Bridges	$11,380,000	$1,252,100	2	0	0	2	2
Bus Facilities	$4,534,400	$2,245,300	2	2	0	0	2
Port Facilities	$83,860,500	$35,579,700	22	19	0	14	22
Airport Facilities	$50,750,200	$12,687,100	9	3	0	6	9
Airport Runways	$50,063,300	$0	10	0	0	10	10
Total	**$4,584,015,600**	**$72,632,900**	**597**	**50**	**1**	**565**	**592**

Table 46: Utility System Loss Estimates and Facility Damage for the Cascadia Scenario

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Potable Water Distribution Lines	$243,824,200	$0	N/A	N/A	N/A	N/A	N/A
Wastewater Facilities	$1,891,469,800	$7,000	11	7	0	2	11
Wastewater Distribution Lines	$146,294,500	$625,228,800	N/A	N/A	N/A	N/A	N/A
Natural Gas Pipelines	$337,919,800	$0	N/A	N/A	N/A	N/A	N/A
Natural Gas Distribution Lines	$97,529,700	$1,000	N/A	N/A	N/A	N/A	N/A
Electrical Power Facilities	$643,002,700	$427,794,800	5	5	0	0	1
Communications Facilities	$3,068,000	$1,725,300	26	17	0	9	26
Total	**$3,363,108,700**	**$1,054,756,900**	**42**	**29**	**0**	**11**	**38**

Table 47: Households Without Water and Electrical System Service for the Little Salmon Fault Scenario

System Type	Total Households	At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	56,422	0	0	0	0	0
Electric Power	56,422	36,014	27,224	14,553	2,457	43

Table 48: Transportation System Loss Estimates and Facility Damage for the Mad River-Trinidad Scenario

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Highway Segments	$2,671,034,700	$0	102	0	0	102	102
Highway Bridges	$1,452,527,300	$44,555,000	391	21	0	370	389
Railway Segments	$259,865,200	$0	59	0	0	59	59
Railway Bridges	$11,380,000	$642,800	2	0	0	2	2
Bus Facilities	$4,534,400	$1,327,000	2	1	0	2	2
Port Facilities	$83,860,500	$16,052,900	22	0	0	22	22
Airport Facilities	$50,750,200	$11,010,100	9	2	0	8	9
Airport Runways	$50,063,300	$0	10	0	0	10	10
Total	**$4,584,015,600**	**$73,587,800**	**597**	**24**	**0**	**575**	**595**

Table 49: Utility System Loss Estimates and Facility Damage for the Mad River-Trinidad Scenario

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Potable Water Distribution Lines	$243,824,200	$300	N/A	N/A	N/A	N/A	N/A
Wastewater Facilities	$1,891,469,800	$214,333,600	11	3	0	6	11
Wastewater Distribution Lines	$146,294,500	1,000	N/A	N/A	N/A	N/A	N/A
Natural Gas Pipelines	$337,919,800	$0	N/A	N/A	N/A	N/A	N/A

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Natural Gas Distribution Lines	$97,529,700	$0	N/A	N/A	N/A	N/A	N/A
Electrical Power Facilities	$643,002,700	$195,899,500	5	3	0	2	0
Communications Facilities	$3,068,000	$8,837,000	26	15	0	2	26
Total	**$3,363,108,700**	**$419,071,400**	**42**	**21**	**0**	**10**	**37**

Table 50: Households Without Water and Electrical System Service for the Mad River-Trinidad Scenario

System Type	Total Households	At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	56,422	0	0	0	0	0
Electric Power	56,422	16,663	12,124	6,142	938	20

Table 51: Transportation System Loss Estimates and Facility Damage for the Russ Fault Scenario

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Highway Segments	$2,671,034,700	$0	102	0	0	102	102
Highway Bridges	$1,452,527,300	$69,242,000	391	14	0	378	388
Railway Segments	$259,865,200	$0	59	0	0	59	59
Railway Bridges	$11,380,000	$317,400	2	0	0	2	2

Transportation System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Bus Facilities	$4,534,400	$543,000	2	0	0	2	2
Port Facilities	$83,860,500	$12,478,000	22	0	0	22	22
Airport Facilities	$50,750,200	$7,504,500	9	1	0	9	9
Airport Runways	$50,063,300	$0	10	0	0	10	10
Total	**$4,584,015,600**	**$90,084,900**	**597**	**15**	**0**	**584**	**594**

Table 52: Utility System Loss Estimates and Facility Damage for the Russ Fault Scenario

Utility System	Inventory Value	Economic Loss	Count	Moderate Damage	Complete Damage	Functionality >50% after Day 1	Functionality >50% after Day 7
Potable Water Distribution Lines	$243,824,200	$200	N/A	N/A	N/A	N/A	N/A
Wastewater Facilities	$1,891,469,800	$258,865,700	11	3	0	4	10
Wastewater Distribution Lines	$146,294,500	$1,000	N/A	N/A	N/A	N/A	N/A
Natural Gas Pipelines	$337,919,800	$0	N/A	N/A	N/A	N/A	N/A
Natural Gas Distribution Lines	$97,529,700	$0	N/A	N/A	N/A	N/A	N/A
Electrical Power Facilities	$643,002,700	$220,635,300	5	4	0	4	4
Communications Facilities	$3,068,000	$703,200	26	7	0	20	26
Total	**$3,363,108,700**	**$480,205,400**	**42**	**14**	**0**	**28**	**40**

Table 53: Households Without Water and Electrical System Service for the Russ Fault Scenario

System Type	Total Households	At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	56,422	0	0	0	0	0
Electric Power	56,422	9,274	5,966	2,540	275	12

5.8.7.6.DEBRIS

Hazus estimates the amount of debris generated by an earthquake. Table 54 shows the estimated amount of debris for each scenario in tons and the number of truckloads anticipated to remove it.

Table 54: Debris Generated by the Earthquake Scenarios

Scenario	Debris Generated (tons)	Truckloads
Big Lagoon-Bald Mountain	246,000	9,840
Cascadia	1,233,000	49,320
Little Salmon	784,000	31,360
Mad River-Trinidad	310,000	12,400
Russ	1,233,000	49,320

5.8.8. Changes in Development

Land use in the planning area will be directed by general plans adopted under California's General Planning Law. The safety elements of the general plans establish standards and plans for the protection of the community from hazards, including seismic hazards. The information in this plan provides a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the planning area are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

A large component associated with earthquakes is ensuring that residents know what to do in order to stay safe. Annually, Humboldt County does a Great ShakeOut Drill. The drills are based on scenario earthquakes that could affect the area if they were to actually take place. These drills are an annual opportunity for people in homes, schools and organizations to practice what to do during earthquakes, and to improve preparedness. Figure 58 shows a resident signing up to participate in the drill in 2024.

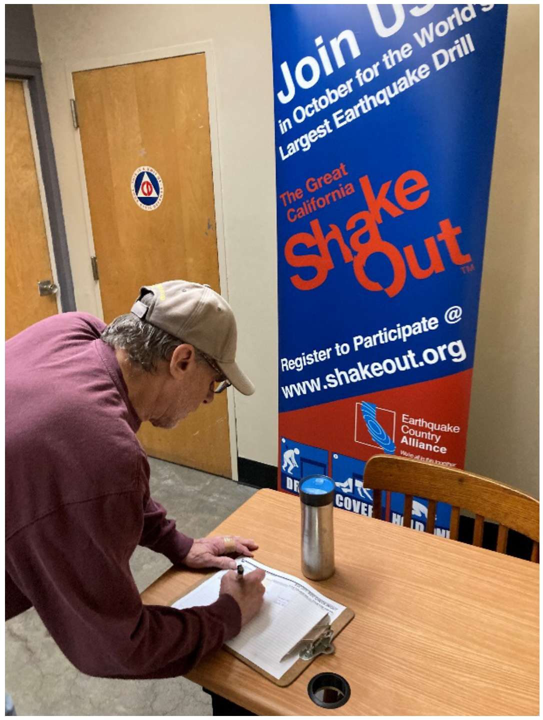

Figure 58: Resident Signing Up for the Great ShakeOut Earthquake Drill

5.8.9. Community Lifelines

Earthquakes have the potential to pose a significant risk to people and the services and systems that support a community's recovery and resilience during and after disaster. Disruption to these services can create dangerous and difficult situations for residents and safety officials. Table 55 lists the community lifelines and their vulnerability to earthquakes.

Table 55: FEMA Community Lifelines Impacted by Earthquakes

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems	Water lines were damaged in the 2022 magnitude 6.4 earthquake, and the City of Rio Dell was without running water.	• Infrastructure damage: Water treatment facilities, pumping stations, storage tanks, and wastewater facilities can be damaged or destroyed. • Loss of potable water: Damage to pipelines and treatment plants can leave communities without drinking water for extended periods. • Disruption of wastewater treatment: Overflows and damage to wastewater plants can lead to raw sewage entering water bodies, posing public health risks. • Earthquake-induced landslides can lead to increased sedimentation in waterways.
Transportation	Past earthquakes have damaged roads, and bridges were closed so officials could conduct safety inspections to look for seismic damage.	• Infrastructure destruction: Roads, bridges and railways can be damaged or destroyed by earthquakes, severing critical transportation routes. • Loss of access to emergency services: Emergency response efforts may be hindered due to impassable roads. • Long-term transportation disruption: Rebuilding roads and bridges may take months or years, limiting access to resources and economic activity.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Energy	Nearly 70,000 customers were left without electricity following the 2022 magnitude 6.4 earthquake. Access to fuel was also a concern due to extended power outages. Private facilities could provide fuel in this case. Damage to gas lines occurred in Rio Dell following the 2022 earthquake.	• Power outages: Earthquakes can damage power plants, substations and transmission lines, leading to widespread blackouts. • Disruption of fuel supply: Gas and oil storage tanks may be damaged, causing fuel shortages. • Hydroelectric plant failure: If a dam is used for hydroelectric power, its destruction can eliminate a critical energy source for the region. • Worker safety risks: Damaged power plants and substations create electrocution and explosion hazards.
Food, Hydration, Shelter	Fifteen homes were severely damaged and 18 moderately damaged in the 2022 magnitude 6.4 earthquake, requiring residents to seek alternate shelter. An estimated 100 Rio Dell residences were displaced. Redway Smart Shop had structural damage and water damage from broken sprinkler system pipes in the 2024 magnitude 7.0 earthquake, causing short-term disruption to basic supplies.	• Food supply disruption: Washed-out roads and railways delay food transportation, leading to shortages. • Damage to shelters and homes: Damaged shelters may become uninhabitable, worsening displacement issues. • Emergency response challenges: Damaged roads delay aid distribution, leaving affected populations without basic necessities. • Economic impact: The destruction of businesses reduces long-term food security.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Safety and Security	Two dead and 17 injured in the 2022 earthquake. Emergency response officials conducted damage assessment and response to damage and injuries.	• Loss of lives: A large magnitude earthquake can cause extensive structural damage and can lead to mass casualties. • Displacement crisis: Thousands may be forced to evacuate, straining shelters and emergency services. • Increased crime risks: Disruptions to law enforcement and emergency response can lead to civil unrest. • Mental health trauma: Survivors may experience long-term psychological distress due to sudden displacement and loss of property. • Challenges for first responders: Emergency response personnel may struggle to access affected areas due to impassable roads.
Health and Medical	Two hospitals lost power in the 2022 magnitude 6.4 earthquake but were operational via emergency generators.	• Damage to hospitals and clinics may reduce availability to treat patients. • Damage to water and power and other support systems can incapacitate healthcare facilities, reducing the ability to treat injuries. • Injuries and fatalities: Falling objects and collapsing structures can cause crush injuries or fatalities. A large earthquake could create a surge in medical needs. • Disruptions in medical supply chains: Damaged roads can prevent medical supplies from reaching affected areas. • Long-term health effects: Exposure to hazardous debris can cause chronic illnesses.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Communications	The 2022 earthquake caused significant damage to communications infrastructure, including cellular and radio.	• Damage to communication infrastructure: Cell towers, radio stations and internet infrastructure may be damaged or destroyed. • Loss of emergency communication: Emergency services may struggle to coordinate rescue operations without reliable communication. • Power loss impacts communication: Without electricity, phones, radios and the internet may be inaccessible. • Increased demand on communications networks: Network congestion can slow down or block critical calls and emergency alerts. • Long-term outages: Repairing communication networks can take weeks or months, delaying information sharing.
Hazardous Materials	Damage to gas lines and reports of gas leaks occurred in Rio Dell following the 2022 earthquake.	• Chemical spills: Industrial sites, wastewater treatment plants and hazardous material storage facilities may be damaged, releasing toxic chemicals into the environment. • Fire and explosion risks: Damage to industrial storage tanks can cause fires and explosions. • Health risks to communities: Exposure to hazardous materials can lead to acute and chronic health effects, including respiratory illnesses and poisoning.

5.9. Extreme Temperatures

5.9.1. Hazard Description

Extreme temperatures, whether hot or cold, can severely impact human health and infrastructure. Heat waves and cold snaps can cause primary and secondary effects, such as power outages and burst pipes, posing a significant threat to communities. The definition of "extreme cold" or "extreme heat" varies from region to region, depending on how well the local population is acclimatized and prepared for such events. Therefore, it is essential to understand the local conditions and prepare accordingly to mitigate the risks and impacts of extreme temperatures.

5.9.1.1. EXTREME HEAT

Although there is no universally agreed-upon definition for extreme heat, it generally refers to a period of time in which the high temperature significantly exceeds normal conditions. A commonly used definition in California declares that an extreme heat day is any day in which the maximum temperature is higher than all but 2% of historical high temperatures. Cal-Adapt defines an extreme heat day or warm night as a day in a year when the daily maximum/minimum temperature exceeds the 98th historical percentile of daily maximum/minimum temperatures based on observed historical data from 1961 to 1990 between April and October.

The 2023 California State Hazard Mitigation Plan defines extreme heat as temperatures that hover 10 F or more above the average high temperatures for a region for several days or weeks. Heat Ready California defines an extreme heat event as two or more days and nights of unusually high heat for the region. California is experiencing more frequent episodes of extreme heat, creating a greater danger to Californians from heat-related illness.

5.9.1.2. EXTREME COLD

Extreme cold occurrences happen when temperatures drop significantly below average in a particular area. In places not used to winter weather, temperatures nearing the freezing point also can be considered extreme cold. According to the National Weather Service (NWS) Instruction 10-1605, cold weather is defined as a period of low temperatures or wind chill temperatures that reach or exceed locally or regionally defined advisory conditions (usually -18 F or colder). On the other hand, extreme cold can be defined as a period of extremely low temperatures or wind chill temperatures that reach or exceed locally or regionally defined warning criteria (typically around -35 F or colder). There may be cases where advisory criteria are unmet, but the combination of seasonably low temperatures and low wind chill values (approximately 15 F below average) may harm human health.

The 2023 California State Hazard Mitigation Plan defines extreme cold events as when temperatures drop well below the temperatures that are normal in an area. Depending on what is normal, this may mean temperatures around the freezing point (32 F) or below 0 F. Freeze events are when temperatures remain below freezing for a sustained period.

5.9.1.3. CASCADING HAZARDS

EXTREME HEAT

Although extreme heat events generally do not damage property, they can damage or destroy agricultural crops and landscapes. Extreme heat events can lead to an increase in heat-related illnesses and deaths, and impact water supplies and other infrastructure such as transportation, agriculture, and energy. The most significant cascading hazards associated with excessive heat events are the failure of motorized systems such as ventilation systems used to control temperatures inside buildings. Heat can cause roads to buckle and may result in closures for emergency repairs. Extreme heat can also contribute to the risk of wildfires as vegetation dries out, which allows fires to ignite and spread more rapidly. Extreme heat can also exacerbate drought conditions.

Extreme heat poses substantial health risks, including heat cramps, heat exhaustion, and heatstroke. Elderly persons and individuals who work outside are often most vulnerable to extreme heat. Very high temperatures may also reduce the effectiveness of power infrastructure, leading to an increased risk of blackouts.

EXTREME COLD

Cascading hazards can include transportation disruption, infrastructure damage and failure, including power outages. Freezing temperatures and extreme cold can contribute to a variety of infrastructure disruptions and may cause insulators to fail and conductors to break. Extreme cold has the added effect of making people turn up their heaters, which causes circuit overload and the resulting power outage. People turning on their lights and heaters in anticipation of the power being restored may extend an outage. It creates a high-power demand on fusing that may not be able to handle the stress of the load. Extreme cold can also cause water in pipes to freeze and burst, causing water damage.

5.9.2. Location

All of Humboldt County is susceptible to both extreme heat and cold, though the intensity and frequency of these conditions vary significantly by region due to the county’s diverse topography and microclimates. According to the NWS Eureka Forecast Office, the most recent recorded maximum temperature was 87 F on September 28, 2020, while the coldest maximum temperature on record was 33 F on February 8, 1900. However, these figures largely reflect conditions in the coastal region, which is moderated by the cool marine influence of the Pacific Ocean.

In contrast, inland and eastern portions of Humboldt County, particularly areas beyond the coastal range such as Willow Creek, Orleans and Alderpoint, experience much more pronounced temperature extremes. These regions can regularly see summertime highs exceeding 100 F and winter lows well below freezing, conditions rarely experienced along the coast.

This stark thermal gradient across the county has important implications for hazard mitigation planning, public health advisories, agricultural practices, and energy infrastructure. Residents in inland areas often face higher wildfire risks exacerbated by extreme heat and prolonged drought, while coastal populations may contend with fog-related transportation hazards and the challenges of unseasonably cold, damp conditions. Recognizing and planning for these regional differences is essential to building countywide resilience to extreme temperature events.

Figure 59 shows annual weather trends for Humboldt County.

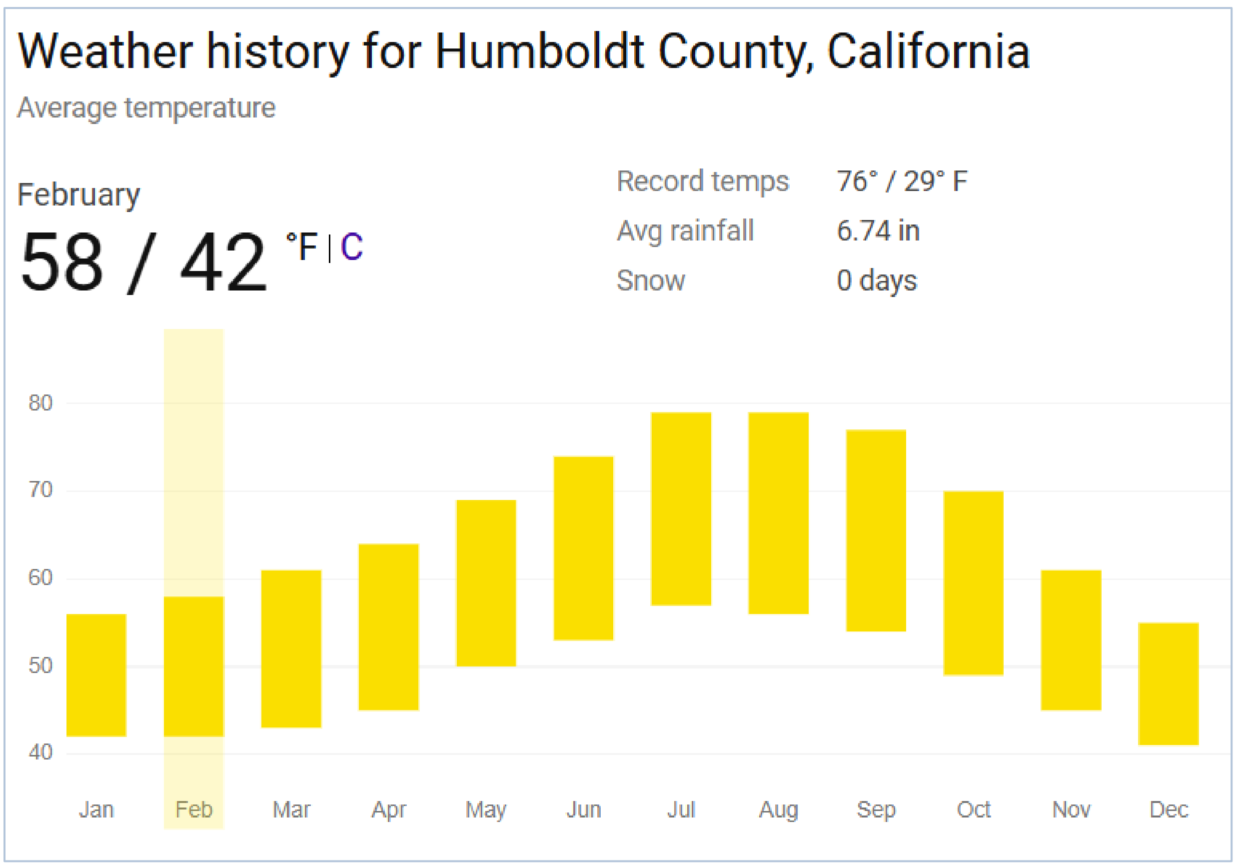

Figure 59: Humboldt County Historic Weather Trends

5.9.2.1. EXTREME HEAT

Cal-Adapt reports that in the North Coast region of the state, increases in annually averaged mean daily temperature have been limited to under 1 F over the last century, and annually averaged maximum temperatures for the region have ranged between 60 F and 64 F. However, there are substantial differences in temperature across the region. Coastal municipalities such as Eureka have annually averaged maximum temperatures around 60 F, with average maximum summer temperatures below 70 F.

5.9.2.2. EXTREME COLD

Extreme cold watches and warnings are issued mostly for the North Humboldt Coast, southern Humboldt interior and southwestern Humboldt County during the winter months from December to February.

Figure 60: National Weather Service Extreme Cold Warning Map – North Humboldt Coast, Southwestern Humboldt and Mendocino Coast

5.9.3. Extent

5.9.3.1. EXTREME HEAT

The NWS has developed a heat index — also known as the apparent temperature — which considers the chances of experiencing a heat disorder based on temperature and humidity levels. It measures how hot it feels to the human body when relative humidity is combined with air temperature. This index is particularly important in hot and humid climates, as high humidity levels can make the air feel much hotter than it is. In such conditions, the human body may be unable to cool itself efficiently through sweating, leading to heat-related illnesses, such as heat cramps, heat exhaustion, and heatstroke. Therefore, monitoring the heat index is crucial for ensuring the safety and well-being of individuals exposed to high temperatures and humidity, such as outdoor workers, athletes, and the elderly.

The heat index is used as a standard guide to issue excessive heat alerts. Such alerts are triggered when the maximum daytime heat index is expected to be 105 F or higher and the nighttime minimum heat index is 80 F or higher for at least two consecutive days. Figure 61 presents the likelihood of heat disorders based on the heat index.

NWS Heat Index Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Figure 61: National Weather Service Heat Index Chart

Each NWS forecast office issues some or all of the following heat-related products as conditions warrant. The local NWS offices often collaborate with local partners to determine when an alert should be issued for a local area (see Figure 62).

- **Extreme Heat Warning: Take Action!** An Extreme Heat Warning is issued when extremely dangerous heat conditions are expected or occurring. Avoid outdoor activities, especially during the heat of the day. If you must be outside, be sure to drink plenty of water and take frequent breaks in the shade. Stay indoors in an air-conditioned space as much as possible, including overnight. Check on family and neighbors.
  - **Extreme Heat Watch: Be Prepared!** An Extreme Heat Watch is issued when conditions are favorable for an extreme heat event, but its occurrence and timing is still uncertain. Plan to suspend all major outdoor activities if a warning is issued. If you do not have air conditioning, locate the nearest cooling shelter or discuss staying with nearby family or friends who have air conditioning.
  - **Heat Advisory: Take Action!** A Heat Advisory is issued for dangerous heat conditions that are not expected to reach warning criteria. Consider postponing or rescheduling

outdoor activities, especially during the heat of the day. If you must be outside, be sure to drink plenty of water and take frequent breaks in the shade. Stay in a cool place, especially during the heat of the day and evening.

Figure 62: National Oceanic and Atmospheric Administration Excessive Heat Watches and Warnings

5.9.3.2.EXTREME COLD

Each NWS forecast office issues some or all of the following cold-related products as conditions warrant. The local NWS offices often collaborate with local partners to determine when an alert should be issued for a local area (see Figure 63 and Figure 64).

EXTREME COLD WARNING VS. WATCH AND COLD WEATHER ADVISORY

- **Extreme Cold Warning: Take Action!** An Extreme Cold Warning is issued when dangerously cold air temperatures or wind chill values are expected or occurring. If you are in an area with an Extreme Cold Warning, avoid going outside. If you have to go outside, dress in layers, cover exposed skin, and make sure at least one other person knows your whereabouts. Update them when you arrive safely at your destination.
- **Extreme Cold Watch: Be Prepared.** An Extreme Cold Watch is issued when dangerously cold air temperatures or wind chill values are possible. As with a Warning, adjust your plans to avoid being outside during the coldest parts of the day. Make sure your car has at least half a tank of gas and update your winter survival kit.
- **Cold Weather Advisory: Be Aware.** A Cold Weather Advisory is issued when seasonably cold air temperatures or wind chill values, but not extremely cold values, are expected or occurring. Be sure you and your loved ones dress appropriately and cover exposed skin when venturing outdoors.

FREEZE WATCH VS. WARNING AND FROST ADVISORY

- **Freeze Warning: Take Action!** A Freeze Warning is issued when temperatures are forecasted to go below 32 F for a long period of time. This temperature threshold kills some types of commercial crops and residential plants, while temperatures below 28 F for an extended period of time can kill most types of commercial crops and residential plants.
- **Freeze Watch: Be Prepared.** A Freeze Watch is issued when there is a potential for significant, widespread freezing temperatures within the next 24–36 hours. A Freeze Watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.
- **Frost Advisory: Be Aware.** A Frost Advisory means areas of frost are expected or occurring, posing a threat to sensitive vegetation.

Figure 63: National Oceanic and Atmospheric Administration Extreme Cold Advisories, Watches and Warnings

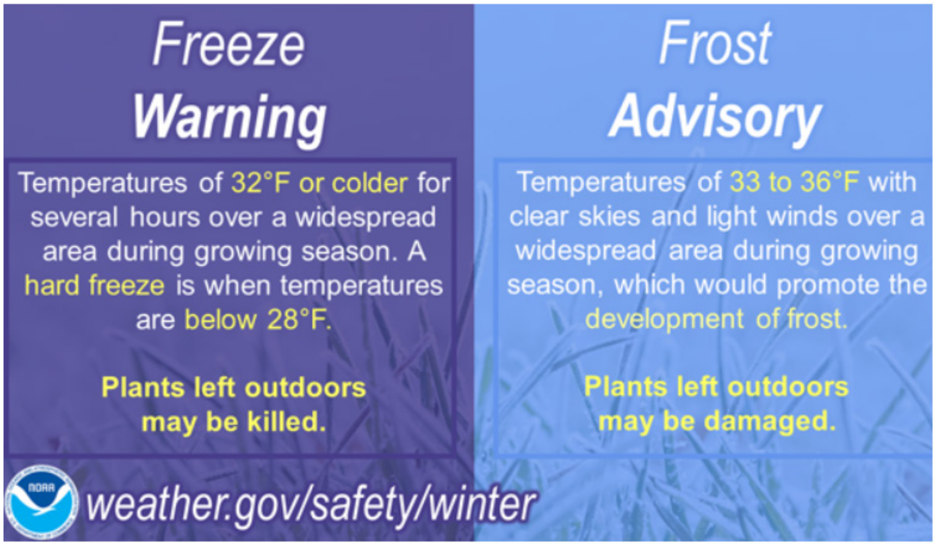

Figure 64: National Oceanic and Atmospheric Administration Extreme Cold Freeze Warning and Frost Advisory

The severity of extremely low temperatures, or cold waves, is usually measured using the Wind Chill Temperature Index. It uses a formula to calculate the dangers of winter winds and freezing temperatures. Essentially, it calculates the temperature felt when the effects of wind speed are added to the base air temperature. Figure 65 displays the NWS Wind Chill Chart.

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Figure 65: National Weather Service Wind Chill Chart

5.9.4. History of Previous Hazard Events

5.9.4.1. EXTREME HEAT

There were no FEMA major declarations for extreme heat since the last plan update. The NCEI has no reported incidents of extreme heat or extreme cold since the last plan update.

Cal OES posted the Aug. 31, 2022, press release of Governor Gavin Newsom's proclamation of a State of Emergency for an excessive heat event. A significant heat wave hit California, bringing temperatures in excess of 100 F throughout the state and record temperatures 10-20 degrees above normal, exceeding 110 F in some areas (the "extreme heat event").

On Aug. 30, 2022, the NWS issued excessive heat warnings and excessive heat watches in the state, in effect from Aug. 31, 2022, through Sept. 6, 2022. This excessive heat event put significant demand and strain on California's energy grid and was forecasted by the NWS to be a West-wide event, meaning that energy demand was high across the region and California had limited ability to import energy from out of state. The NWS issued extreme heat advisories, watches and warnings to impact 61 million people. The California Independent System Operator issued a heat bulletin forecasting high electric demand during the extreme heat event that stressed the energy grid, with peak load for electricity reaching its highest level of the year, exceeding 48,000 megawatts on Sept. 5, 2022.

5.9.4.2. EXTREME COLD

There have been no federal or state disaster declarations for extreme cold since the last plan update. Most extreme cold and freeze events in Humboldt County California take place in the winter, primarily between December and February.

The NWS in Eureka issued an updated extreme cold warning for the Northern Humboldt Coast and Southwestern Humboldt. The NWS warned that dangerously cold wind chills, from 15 to 20 degrees, were expected. The warning stated that there was potential for frostbite and hypothermia if unprotected skin is exposed to these temperatures, and threat of frozen water pipes.

5.9.5. Probability of Future Hazard Events

5.9.5.1. EXTREME HEAT

California's Fourth Climate Change Assessment: North Coast Region Report states that region-wide, average annual maximum temperatures are projected to increase by 5 F to 9 F by the end of the century under moderate and high emission scenarios, respectively, with the greatest temperature increases projected for the interior zones of the region. Climate projections in the Fourth Assessment estimated that summer temperatures in the North Coast region (Humboldt

County shown in Table 56) under a business-as-usual (Regional Climate Project 8.5) emissions scenario will increase 3-5 F by mid-century (2040-2069) and 6-9 F by the end of the century (2070-2099). Winter season temperatures are expected to increase by a greater magnitude: 5-7 F by mid-century and 8-11 F by the end of the century. The probability of future extreme heat events is likely.

Table 56: Humboldt County Historical and Future Modeled Annual Average Maximum Daily Temperatures

Period	Historical (1950 to 2005)	Early Century (2020 to 2039)	Mid-Century (2040 to 2069)	Late Century (2070 to 2099)
Degree (F)	60.4	63.2	65.1	68.2

The 2023 California State Hazard Mitigation Plan states that the NCEI reported California's 990 recorded extreme heat events between 1953 and 2022, which represents an average of almost 15 events per year. The state expects to continue experiencing a similar number of extreme heat events per year on average, or possibly more due to climate change.

5.9.5.2. EXTREME COLD

The 2023 California State Hazard Mitigation Plan states that the NCEI reported California's 1,373 recorded extreme cold/freeze events between 1953 and 2022, which represents an average of almost 20 events per year. The state expects to continue experiencing a similar number of extreme cold/freeze events each year. The probability of future extreme cold events is likely.

5.9.5.3. CLIMATE CHANGE CONSIDERATIONS

EXTREME HEAT

The 2023 California State Hazard Mitigation Plan states that California is already experiencing the impacts of climate change. When comparing average annual temperatures from 1901-1960 to those of 1986-2016, most of California has experienced increases exceeding 1 F, with some areas exceeding 2 F. The daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4 F to 5.8 F by 2050 and 5.6 F to 8.8 F by 2100.

Climate change is expected to significantly impact Humboldt County and the broader California region, particularly in terms of temperature increases and changing precipitation patterns, both of which contribute to drought conditions. Projections indicate that overall temperatures will rise throughout the 21st century, with extreme heat days becoming more frequent under both medium- and high-emissions scenarios. These rising temperatures will intensify evapotranspiration, leading to drier soils and increased water demand for agriculture, ecosystems and human consumption.

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

California's Fourth Climate Change Assessment: North Coast Region Report supports that rising temperature and extreme heat are direct indicators of climate change and are important factors affecting agriculture, forestry and water supplies as well as human and ecosystem health. Evidence of anthropogenic climate warming is already apparent in California, where minimum, average, and maximum temperatures have all been increasing over the past century. Statewide annual temperatures have increased by about 1.5 F in the last century, heat waves are becoming more common, and snow is melting earlier in the spring. The magnitude of temperature increases has been greatest in the warm summer months, increasing the frequency of extreme heat events that threaten human health, stress water and electric utility systems, and impact terrestrial and freshwater ecosystems.

EXTREME COLD

The 2023 California State Hazard Mitigation Plan states when comparing average annual temperatures from 1901-1960 to those of 1986-2016, most of California has experienced increases exceeding 1 F, with some areas exceeding 2 F. This general warming trend has the potential to reduce the occurrence and range of anticipated intensities of extreme cold or freeze events in the future.

California's Fourth Climate Change Assessment: North Coast Region Report states that minimum temperatures — which correspond to nighttime lows — have been increasing at a faster rate than both maximum daytime highs and average temperatures since the mid-1970s.

5.9.6. Vulnerability

Extreme temperatures can threaten the safety and well-being of the population in each area. Extreme temperatures pose a significant threat to livestock and agricultural crops and may occasionally threaten property and infrastructure, leading to disruptions in water and transportation systems. Furthermore, extreme temperatures can exacerbate the impact of other hazards, such as severe weather events that cause widespread power outages. In extreme temperatures, emergency responders may be called upon to work with public officials and nonprofit agencies to provide heating or cooling venues and transport vulnerable populations to such places.

5.9.6.1. EXTREME HEAT

Extreme heat events typically affect the elderly and other disadvantaged populations most heavily. The primary impacts of concern for extremely low temperatures include the life-threatening effects of overexposure to hypothermia, particularly in the elderly and disadvantaged populations. Heat-related casualties often result from inadequate air conditioning or heat exhaustion. The elderly, small children, and those with health issues or disabilities are the most vulnerable to heat-related illnesses, as they may live on low incomes and cannot run air-conditioning regularly. They may also be isolated, without friends or family to check on their well-being. In addition, air conditioning is not common in most of the County of Humboldt increasing the vulnerability of the populace during extreme heat events. Outdoor workers also are likely to be affected by extreme heat.

Common impacts associated with extreme heat in Humboldt County include individuals seeking medical treatment for heat-related illnesses, such as heat exhaustion, heatstroke, and heat stress. Power outages may also occur due to the associated strain on electrical networks, which can have cascading effects on public health and safety. For individuals who rely on electricity-dependent medical devices, such as oxygen concentrators, CPAP (continuous positive airway pressure) machines, or powered wheelchairs, power disruptions can pose serious risks, potentially requiring emergency services or temporary relocation. In response to extreme heat, cooling centers may be opened to provide relief for vulnerable populations, and schools may alter class schedules or limit outdoor activities to ensure student safety.

In extreme circumstances, extreme heat may impact critical lifelines such as energy. Large demand for power can strain the power infrastructure, potentially overloading the system. Critical facilities dependent on electricity without backup power sources could be impacted by an outage.

5.9.6.2. EXTREME COLD

Extreme cold also can be dangerous, resulting in casualties due to inadequate heating and carbon monoxide poisoning from unsafe heat sources. A significant drop in temperature combined with increased wind speed can cause the body’s core temperature to fall rapidly, leading to an increased risk of illnesses such as frostbite or hypothermia. Such illnesses can be life-threatening and can affect anyone, though people who are elderly, unhoused, or infants are the most vulnerable. In addition, extreme cold can negatively impact infrastructure and housing due to the possibility of pipes bursting in areas with no heat or poor insulation. Other significant impacts include strains on livestock and agriculture and the potential freezing of household water pipes and municipal water transmission systems. Water systems can break or be temporarily disrupted due to extreme cold.

5.9.7. Impacts

5.9.7.1. EXTREME HEAT

In Humboldt County, the impacts of extreme heat events are influenced by the region's typically mild coastal climate, which means infrastructure, populations, and ecosystems are not well-adapted to sustained high temperatures. When extreme heat does occur, especially inland and in eastern parts of the county, the consequences can be severe. Vulnerable populations — such as the elderly, children, individuals experiencing homelessness, and those with pre-existing health conditions — are at heightened risk of heat-related illnesses, including heat cramps, heat exhaustion, and potentially fatal heatstroke.

Rural and isolated communities may have limited access to air conditioning or cooling centers, exacerbating health risks. Power outages caused by increased strain on the electrical grid may further endanger residents who rely on electrically powered medical equipment or refrigeration for medications. Agricultural activities can be disrupted due to heat stress in crops and livestock, affecting both economic productivity and food security. In addition, high temperatures can increase the risk of wildfires, reduce air quality due to elevated ozone levels, and strain water resources in drought-prone areas of the county. Collectively, these impacts underscore the need for robust planning and outreach to mitigate health, economic, and infrastructure risks associated with extreme heat in Humboldt County.

5.9.7.2. EXTREME COLD

According to the NWS, cold weather can kill livestock and damage crops. In late spring or early fall, cold air outbreaks can harm or kill plants, flowers and farm crops. A freeze occurs when temperatures drop below 32 F. Freezes and their effects are significant during the growing season. Frost forms on clear, calm nights and can occur when the air temperature is in the mid-30s. Each plant species has a different tolerance for low temperatures. Freezing temperatures during winter and spring growing seasons can cause extensive crop damage.

5.9.8. Changes in Development

The Humboldt County Farm Bureau reports that agriculture has historically been one of the major resources of Humboldt County. Approximately 690,000 acres, or nearly a third of the total land area in the county, is directed to some type of agricultural use. About 67,000 acres of land are classified as being under intensive farming (e.g., harvested cropland and cropland used only for pasture), while an estimated 605,000 acres of land are used primarily for grazing-related purposes (e.g., pastureland and rangeland). The high rainfall, fertility of the soil, marine climate and soil depth make some of the county's agricultural land highly productive: the economic value of agricultural production topped $272 million in 2022.

The importance of agricultural land is unquestionable; yet, during the past several decades, nearly 100,000 acres of land have undergone land use changes due to subdivision activity. The county is currently attempting to slow down the agricultural land conversion process by supporting the Williamson Act Program. Nearly 200,000 acres of land in the county are presently under this program. Humboldt County will continue to support the Williamson Act, as well as other measures to discourage the loss of agricultural land.

Extreme temperature changes impacted by climate change will likely increase vulnerability to these hazards and directly impact the agricultural industry.

5.9.9. Community Lifelines

Table 57 lists the impacts on community lifelines and their vulnerability to extreme temperatures.

Table 57: FEMA Community Lifelines Impacted by Extreme Temperatures

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems **Water Systems**	Extreme cold temperatures can impact water infrastructure by causing pipe bursts and contamination due to freezing temperatures.	• Damage to water infrastructure: Freezing temperatures can cause pipes to burst, leading to service disruptions. • Wastewater system complications: Frozen sewage lines and blocked treatment facilities may lead to backups.
Transportation **Transportation**	None	• Roadway damage: Extreme heat can cause pavement to crack or buckle, making roads hazardous.
Energy (Power & Fuel) **Energy**	Increased energy demand for heating strains the power grid.	• Increased heating demand: Cold temperatures cause higher energy use, straining utility systems. • Risk of carbon monoxide poisoning: Improper use of backup heating sources can lead to toxic exposure. • Worker safety concerns: Extreme heat exposure can endanger utility and energy sector employees. • Increase use of gas fueled generators

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	Extreme temperatures can increase heating and cooling costs and force evacuations due to extreme heat or cold. Vulnerable populations, including low-income and elderly residents, may struggle to access necessities.	• Increased cost of heating and cooling: Extreme temperatures raise utility costs, burdening low-income households. • Shelter challenges: Homeless populations and those in inadequate housing face increased risk of exposure. • Water supply disruptions: Frozen pipes may prevent access to clean drinking water. • Emergency shelter strain: Sudden demand for cooling and warming centers may overwhelm resources.
Safety and Security	Extreme cold temperatures can increase the risk of hypothermia, frostbite and other cold-related illnesses.	• Increased cold-related health risks: Exposure to freezing temperatures can result in hypothermia and frostbite. • Increased fire hazards: Improper use of space heaters and fireplaces can cause house fires.
Health and Medical	Extreme temperature conditions can overwhelm health care systems due to weather-related injuries and illnesses. Power outages may disrupt medical facilities and the use of personal medical devices (ventilators and nebulizers, oxygen concentrators, etc.).	• Increased risk of illness: Extreme weather can worsen respiratory conditions and lead to flu outbreaks. • Heat-related illnesses: Prolonged periods of high temperatures can lead to dehydration, heat exhaustion and heatstroke. • Strained health care facilities: Patient intake can increase due to cold-related injuries and illnesses.
Communications	None	• Power grid strain on communication systems: Blackouts caused by excessive energy demand can limit access to communication channels. • Long-term recovery of communication systems: Infrastructure damaged by heatwaves can take extended periods to repair.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	None	• None

5.10. Flooding

5.10.1. Hazard Description

Flooding refers to the inundation of normally dry land. The causes of flooding profiled in this hazard mitigation plan includes coastal flooding and sea-level rise, tsunami flooding, riverine flooding, pluvial or urban flooding, and flooding due to dam or levee failure. Tsunami flooding is discussed in greater detail in the Tsunami profile, while dam failure is discussed further in the Dam Failure profile. This section focuses on the remaining flood sources.

Floodplains have many natural and beneficial functions, and disruption of natural systems can have long-term consequences for entire regions. Some well-known water-related functions of floodplains (noted by the FEMA) include the following:

- Providing natural flood and erosion control
- Providing flood storage and conveyance
- Reducing flood velocities
- Reducing flood peaks
- Reducing sedimentation
- Maintaining surface water quality
- Filtering nutrients and impurities from runoff
- Processing organic wastes
- Moderating temperatures of water
- Providing groundwater recharge
- Promoting infiltration and aquifer recharge
- Reducing frequency and duration of low surface flows

Areas in the floodplain that typically provide these natural functions are wetlands, riparian areas, sensitive areas and habitats for rare and endangered species.

5.10.1.1. RIVERINE FLOODING

The principal sources of riverine flooding in Humboldt County are as follows:

- **Eel River Basin:** This 3,260-square-mile basin drains a predominantly mountainous area in the southern part of the county. The Eel River flows through a narrow canyon from its junction with the Middle Fork downstream to its confluence with the Van Duzen River. Downstream of that confluence, the Eel River meanders through a wide coastal plain between the city of Fortuna and the Pacific Ocean. The second largest tributary in this basin is the South Fork Eel River. The South Fork joins the Eel River at Dryerville and flows through steep-walled canyons for most of its length. The Van Duzen River drains an area of approximately 430 square miles to its confluence with the Eel River. The Van Duzen floodplain is narrow for most of its length, widening only in its downstream portions near Cummings Creek Camp. The average annual precipitation in this basin ranges from 59 to 70 inches, depending on the location in the basin. The duration of floods in this basin is relatively short. Stages can rise from normal flow to extreme peaks in 16 to 44 hours. Flooding generally has a duration of 50 to 55 hours.

- **Mad River Basin:** The Mad River drains about 500 square miles at its outlet to the Pacific Ocean. The river flows through narrow canyons for most of its 100-mile length. It enters a wide coastal floodplain just north of Arcata, which continues to its confluence with the Pacific Ocean. The average annual precipitation for this basin is 64 inches upstream of the gauge located at the mouth of the Mad River.
- **Freshwater Creek Basin:** Freshwater Creek drains a small coastal basin of 34 square miles before it enters Ryan Slough. Ryan Slough flows into Eureka Slough, a brackish stream, which in turn empties into Arcata Bay north of Eureka. The floodplain in this basin is moderately wide and situated between a narrow stream in the mountains, widening as it enters the coastal plain. The average annual precipitation for this basin in 54 inches upstream of the gauge located at the confluence with Jacoby Creek.
- **Jacoby Creek Basin:** Jacoby Creek is a coastal stream just north of Freshwater Creek. Its headwaters are in the Coast range, and it flows west from there into Arcata Bay. The creek drains an area of 16 square miles at its mouth. The majority of this stream meanders through the Arcata Bay coastal plain. The average annual precipitation for this basin is 54 inches upstream of the gauge located at the confluence with Freshwater Creek.
- **Trinity River Basin:** As the largest tributary to the Klamath River, the Trinity River drains a total area of 2,969 square miles, most of which is in Trinity County. The river flows through a mountainous, heavily forested area in the eastern portion of Trinity County. Detailed flood insurance studies have been generated for the mountain valley downstream of the confluence with the South Fork Trinity River in the northeastern portion of Humboldt County. The average annual precipitation for this basin is 55 inches upstream of the gauge located at the mouth of the Trinity River.
- **Klamath River Basin:** The largest river in the region is the Klamath River, which originates in Oregon and drains 12,120 square miles. A 50-mile stretch runs through the mountainous, forested northern part of Humboldt County. It drains to the Pacific Ocean in Del Norte County to the north. Detailed flood insurance studies have not been undertaken for the Humboldt portion of the Klamath.
- **Elk River Basin:** The 52-square-mile Elk River watershed flows into Humboldt Bay just southwest of Eureka, California. It can conceptually be divided into a steep, forested upper watershed that makes up the majority of the basin (43 square miles) and a more developed lower watershed with a wide, low-gradient alluvial valley bottom and floodplain.

Designated beneficial uses of particular concern include municipal and agricultural water supply, endangered cold-water fisheries habitat and water contact recreation. Downstream flooding and high turbidity are critical concerns for the residents and are believed by many of the residents to have been greatly aggravated by upstream forest management activities.

5.10.1.2. URBAN FLOODING

Like many areas in Northern California, Humboldt County has experienced rapid change due to urban development in once-rural areas. The drainage facilities in these recently urbanized areas are often a patchwork of pipes, roadside ditches and channels rather than a coordinated system, as found in a mature utility. The two key factors that contribute to urban flooding are rainfall intensity and duration. Topography, soil conditions, urbanization and groundcover also play an important role. Urban flooding occurs when available conveyance systems lack the capacity to convey rainfall runoff to nearby creeks, streams and rivers. As drainage facilities are overwhelmed, roads and transportation corridors become conveyance systems.

Urban floods can greatly disturb daily life in urban areas. Roads can be blocked and people may be unable to go to work or school. Economic damage can be high, but the number of casualties is usually limited due to the nature of the flood. When the city is on flat terrain, the flow speed is low and people can still drive through it. The water rises relatively slowly and usually does not reach life endangering depths.

5.10.1.3. FLOODING DUE TO LEVEE FAILURE

The county maintains levees on the Mad River near the City of Blue Lake, the Eel River near the City of Fortuna, and on Redwood Creek near Orick. The Mad River levee was built by the U.S. Army Corps of Engineers in 1955, and the Eel River levee was built by the Corps of Engineers from 1958 to 1959. Congress authorized construction of the Redwood Creek flood control project with the Flood Control Act of 1962, and construction was completed in 1968. In addition, the county as a whole contains nearly 100 non-federal levees.

Flooding naturally occurs in the floodplain. A floodplain is an area adjacent to a river, creek, lake, or the ocean that becomes inundated during a flood. In general, there are two types of floodplains in Humboldt County: riverine and coastal.

5.10.1.4. RIVERINE FLOODPLAINS

Riverine floodplains may be broad, as when a river crosses an extensive, flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt and/or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. Such sediments often form important aquifers, with the water drawn from them being more filtered than the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered or significantly reduced.

5.10.1.5. COASTAL FLOODPLAINS

Coastal floodplains are adjacent to the ocean and other tidally influenced areas. Like riverine floodplains, coastal floodplains may be broad or narrow, depending on local topography and natural flood defenses such as dune systems or tidal wetlands. Coastal floods are usually caused by coastal storms that, when combined with normal tides, push water toward the shore. This is commonly referred to as storm surge. The result can be waves that extend further inland, causing damage to developed areas that would not normally be subject to wave action.

Flooding along the Pacific Coast near Humboldt Bay is often associated with the simultaneous occurrence of very high tides, large waves and storm swells during the winter. Storm centers from the southwest produce the type of storm pattern most commonly responsible for serious coastal flooding. The strong winds and high tides that accompany these storms can create storm surges in excess of 10 feet above mean high tide. Portions of Humboldt County are subject to flooding from storm surge.

The configuration of Humboldt Bay protects the coastal communities of Humboldt County from direct exposure to coastal storm flooding. The Samoa Peninsula and South Spit block the effects of normal storm waves and sea swells. A single channel, defined by jetties and seawalls, provides passage for water into and out of Humboldt Bay. The unincorporated community of King Salmon is located on an artificially constructed peninsula along the eastern margin of Humboldt Bay. Old channel dredgings were stockpiled on the site until 1948, when residential development in the area began. The elevation of the King Salmon vicinity is a few inches higher than the normal maximum high tide. Flooding can occur in this area during unusually high tides accompanied by storm surges.

According to FEMA, the coastal high hazard area (or “V zone,” where V stands for velocity wave action) is the most hazardous part of the coastal floodplain, due to its exposure to wave effects. The V zone has an increased degree of flood risk compared to coastal flood areas not in the coastal high hazard area (A zones) and is subject to more stringent regulatory requirements.

5.10.1.6. CASCADING HAZARDS

Flooding can result in multiple other types of hazards. One problematic secondary hazard for flooding is bank erosion. In many cases the threat and effects of bank erosion are worse than the actual flooding. This is especially true on the upper courses of the rivers in the county, where steep gradients allow floodwaters to pass quickly with minimal damage but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides, which occur when high flows oversaturate soils on steep slopes, causing them to fail. Hazardous materials spills can also occur if storage tanks rupture and spill into streams, rivers or drainage sewers. Dams may fail when overwhelmed by floodwaters, either in a breach or non-breach situation when they are overtopped by water.

5.10.2. Location

FEMA defines flood hazard areas as areas expected to be inundated by a flood of a given magnitude. These areas are determined via statistical analyses of records of river flow, storm tides and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on Digital Flood Insurance Rate Maps (DFIRMs), which provide the following information:

- Locations of specific properties in relation to special flood hazard areas
- Base flood elevations (1% annual chance) at specific sites
- Magnitudes of flood in specific areas
- Undeveloped coastal barriers where flood insurance is not available
- Regulatory floodways and floodplain boundaries (1% and 0.2% annual chance floodplains)

Land covered by floodwaters of the base flood is the special flood hazard area on a DFIRM — an area where NFIP floodplain management regulations must be enforced and where mandatory purchase of flood insurance applies. This regulatory boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities because many communities have maps showing the extent of the base flood and likely depths that will occur.

The base flood elevation (the water elevation of a flood that has a 1% chance of occurring in any given year) is one of the most important factors in estimating potential damage from flooding. A structure with a 1% annual chance floodplain has a 26% chance of undergoing flood damage during the term of a 30-year mortgage. The 1% annual chance flood is used by the NFIP as the basis for insurance requirements nationwide. DFIRMs also depict 0.2% annual chance flood designations.

Figure 66 shows the extent of the flood hazard in Humboldt County based on the current FIRMs generated by FEMA under the NFIP. The FIRMs are the principal tool used to identify the extent and location of flood hazards. FEMA and the floodplain management community acknowledge that FIRMs are not a total depiction of an area's flood risk. The FIRMs represent the best data source available, but the level of risk they indicate may be understated or overstated compared to current conditions. The following limitations to the accuracy of these maps need to be recognized:

- FIRMs are based on hydrologic conditions at the time they are prepared and do not account for changes in hydrology over time. The age of the FIRMs used for this assessment ranges from 10 years to 25 years. Therefore, these maps do not reflect current watershed conditions.
- FIRMs do not account for the flood protection benefits of levees unless the levees are certified as providing 100-year flood protection (according to criteria specified in Section 65.10 of 44 CFR). The national levee policy is in a state of flux following the impacts of Hurricane Katrina in 2005. Some levees in Humboldt County are recognized as 100-year levees on the FIRM, while others are not. The age of the maps raises questions about the current level of protection provided by the levees. Certifying levees in their current condition requires costly, detailed risk-based analyses.

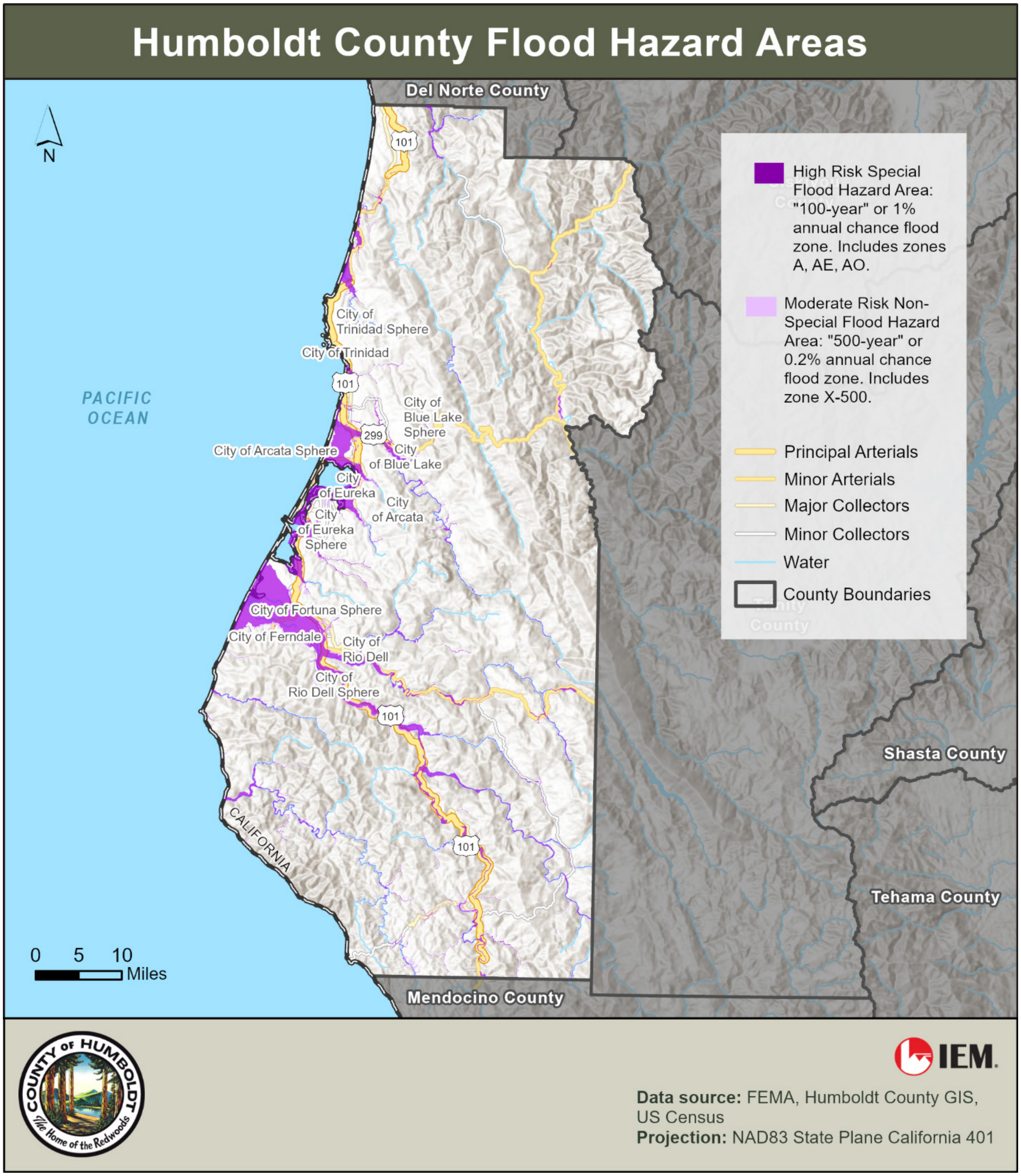

Figure 66: Humboldt County Flood Hazard Areas

5.10.3. Extent

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with a slow velocity. Wave action has significant velocity, and waves as small as 1.5 feet can cause substantial damage to structures and other development.

Flood severity for riverine flooding is often evaluated by examining peak discharges; Table 58 lists peak flows used by FEMA to map the floodplains of the planning area. Peak discharge is generally described using the measurement cubic feet per second. For context, a discharge rate of 20,000 cubic feet per second would fill an Olympic size swimming pool in about four seconds.

Table 58: Summary of Peak Discharges (cubic feet/second) in the Planning Area

Source/Location	10% Annual Chance Discharge	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Dave's Creek: Downstream of Tributary near Hatchery Road	580	890	1,000	1,260
Dave's Creek: Upstream of Tributary near Hatchery Road	520	800	900	1,130
Eastside Channel: Upstream of Van Ness Avenue	-	-	140	-
Eel River: At the Mouth	390,000	601,000	695,000	924,000
Eel River: At Scotia	331,000	521,000	680,000	820,000
Van Duzen River: At the Mouth	60,000	84,000	94,000	117,000
Van Duzen River: At the confluence with Yaeger Creek	39,000	54,000	60,000	75,000
Francis Creek: Grizzly Bluff Road to confluence with Salt River	-	-	831	-
Freshwater Creek: At Myrtle Avenue downstream of confluence of Little Freshwater Creek	54,00	8,600	10,000	14,200
Freshwater Creek: Upstream of confluence of Little Freshwater Creek	4,050	64,00	7,400	10,700
Hillside Creek: At the confluence with Rohner Creek	-	-	249	-

Source/Location	10% Annual Chance Discharge	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Jacoby Creek: At Myrtle Avenue	3,110	4,560	5,070	6,290
Janes Creek: At the upper limit of the detailed study	520	800	900	1,120
Janes Creek: At Q Street	610	920	1,030	1,290
Jolly Giant Creek: At Alliance Road	180	270	310	380
Jolly Giant Creek: At 11th Street	200	300	340	420
Mad River: At the USGS Gaging Station near Arcata (No. 11481000)	58’360	81,270	90,960	113,480
Mad River: Downstream of the confluence with the North Fork Mad River	53,790	74,910	83,840	104,600
Mad River: Below the confluence with the North Fork Mad River	47,500	66,900	74,700	92,100
Mad River: Above the confluence with the North Fork Mad River	42,900	60,500	67,600	83,300
North Fork Mad River: Above the confluence with the Mad River	12,700	18,300	20,500	26,000
Redwood Creek: At Orick	39,000	52,600	57,700	68,000
Redwood Creek: At the USGS Gaging Station at Orick (No. 11482500)	40,563	54,044	58,868	68,395
Rohner Creek: Upstream of Strongs Creek	760	1,150	1,290	1,620
Rohner Creek: Upstream of Hillside Creek	640	980	1,100	1,380

Source/Location	10% Annual Chance Discharge	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Rohner Creek: At Corporate Limits	550	840	940	1,180
South Fork Eel River: At Redway	104,000	159,000	166,000	213,000
Strongs Creek: At Southern Pacific Railroad	1,990	3,000	3,350	4,210
Strongs Creek: Upstream of Mill Creek	1,660	,2510	2,810	3,520
Strongs Creek: Downstream of Jameson Creek	1,620	2,440	2,730	3,430
Strongs Creek: Downstream of Loop Road Drainage	1,280	1,940	2,170	2,720
Strongs Creek: Upstream of Loop Road Drainage	1,260	1,910	2,140	2,690
Trinity River: Downstream of the confluence with Kirkham Creek	98,800	158,000	184,000	250,000
Williams Creek: At Grizzly Bluff Road, at the confluence with Salt River	*	*	1,985	*

5.10.4. History of Previous Hazard Events

Seventy percent of precipitation in Humboldt County occurs from November to March; major floods have resulted from successions of intense storms during these months. Table 59 summarizes the 19 federally declared disasters in Humboldt County related to flooding between 1955 and 2025. The two worst flood events in Humboldt County occurred in December 1955 and December 1964. These events caused tens of millions of dollars in damage and numerous fatalities. The following table provides disaster declarations on all events which have occurred since 2019.

Table 59: Federally Declared Disaster Events for Flooding in Humboldt County

Date	Declaration #	Type of Event	Assistance Type	Estimated Damage
April 3, 2023	4699	Severe winter storms, straight-line winds, flooding, landslides and mudslides	Public Assistance (PA)	Unknown
March 10, 2023	3592	Severe winter storms, flooding, landslides and mudslides	PA	Unknown
Jan. 14, 2023	4683	Severe winter storms, flooding, landslides and mudslides	PA	Unknown
Jan. 9, 2023	3591	Severe winter storms, flooding, and mudslides	PA	Unknown
May 18, 2019	4434	Severe winter storms, flooding, landslides and mudslides	Individual Assistance (IA), PA, Hazard Mitigation Grant Program (HMGP)	N/A

According to the NCEI Storm Events Database, since 2019, there have been 14 days with flood, flash flood or coastal flood events reported in Humboldt County. The NCEI records no damages from these events. The events are described in Table 60. The Humboldt County EOC activated twice over three days due to flooding during this time period. These activations are included in the table. Further, California state historic floods as defined in the 2023 State Hazard Mitigation Plan are included as well.

Table 60: Notable Flood Events Since 2019

Date	Type of Event	Description
Dec. 29, 2024	Flood, heavy rain	Old Arcata Road flooded at Jacoby Creek. Hookton Road closed due to flooding. The on- and off-ramps to Highway 101 were also flooded and closed at the intersection with Hookton Road.
Dec. 24, 2024	Flood, heavy rain	On- and off-ramp to Highway 101 at Hookton Road closed due to flooding of the creek running into the slough.

Date	Type of Event	Description
March 5, 2024	Flood, heavy rain	Highway 254 flooded.
Feb. 5, 2024	Flood, heavy rain	Hookton Slough off-ramp of Highway 101 closed due to flooding. Up to 2 feet of water reported on the roadway. Highway 36 closed due to flooding near Carlotta.
Jan. 31, 2024	Flood, heavy rain	Widespread rain resulted in small stream flooding across the region. Highways 211 and 36 closed due to flooding from nearby creeks. The offramp of Highway 101 and adjacent streets closed due to flooding at Hookton Slough. A local proclamation was declared for the event.
Jan. 13, 2024	Flood	An atmospheric river moved south and stalled over Humboldt, Del Norte and western Trinity counties, bringing widespread rains between 3 and 7 inches to the region within 8 to 10 hours. Jacoby Creek flooded Old Arcata Road and other secondary roads.
March 10, 2023	Flood	Salmon Creek flooded across Hookton Road, causing a full closure of the Highway 101 southbound off-ramp. Jacoby Creek flooded causing impassible roadways. A local emergency proclamation was approved by the County Sheriff due to the significant public safety and damages to property. A local proclamation was declared for the event.
Jan. 7, 2023	Flood, heavy rain	A multi-day atmospheric river caused flooding from Holmes Flat Road to Barkdull Road.
Jan. 5, 2023	Flood, heavy rain	Atmospheric rivers resulted in roadway closures due to flooding near Shively as well as flooding on Howard Heights Road, Freshwater Road and Old Arcata Road. Four homes in Shelter Cove were damaged by large surf and tides.
Jan. 4, 2023	Flood, heavy rain	Heavy rain caused widespread flooding, wind damage and a landslide across Highway 101.
Dec. 30, 2022	Flood, heavy rain	Widespread impacts from heavy rains and strong winds felt across the region. Flooding reported across Glendale Road north of Blue Lake, Old Arcata Road, Eel River Drive, Hookton Road, Davidson Road in Redwood National Park, Crannell Road, and the Southbound Highway 101 off-ramp.

Date	Type of Event	Description
Dec. 29, 2022	Flood, heavy rain	Multi-day atmospheric river caused widespread impacts. Flooding across Howard Heights Road and the road along Freshwater Creek made them impassable due to floodwaters. Minor flooding across Waterfront Drive near the marina in Eureka.
Dec. 27, 2022	Flood, heavy rain	Multi-day atmospheric river caused widespread impacts. The roadway at Old Arcata Road and Graham Road was flooded.
Jan. 10 to Jan. 12, 2021	Coastal flooding	High tide resulted in coastal flooding along multiple locations across the northwest California coast.
Nov. 15, 2020	Coastal flooding	High tide caused minor flooding across the California coast.
Sept. 18, 2019	Flash flood	Localized urban flash flooding occurred in and around the city of Arcata including the intersection of Lewis Avenue and Daina Court. Six to eight inches of floodwater were observed.
Feb. 26 to Feb. 27, 2019	Heavy rain, flood	Heavy rain caused the cresting of the Eel River at Fernbridge, leading to flooding in Ferndale and the evacuation of Rio Dell. One death occurred during a crossing of the Eel River. Water was estimated to be 4 to 5 feet deep and fast-moving.
Feb. 13, 2019	Winter storms, flood	Winter storms, with heavy rain, caused flooding and damage to roads.

5.10.5. Probability of Future Hazard Events

Assigning recurrence intervals to the discharges of historical floods on different rivers can help indicate the intensity of a storm over a large area. For example, the 1964 flood event was determined to have a 290-year recurrence interval on the Eel River, while the recurrence interval for the Mad River was determined to be a 50-year event. Given the historic frequency of flooding in the planning area, such flood hazards are likely to occur annually.

5.10.5.1. CLIMATE CHANGE CONSIDERATIONS

Flood risks are likely to increase in the future due to climate change. According to California's Fourth Climate Change Assessment, annual precipitation in the North Coast region, which includes Humboldt, is likely to stay within historical ranges but trend toward the slightly higher end of the range by the end of the century. The region is already the wettest part of California.

However, precipitation rates will change, including a shorter wet season and more intense storms.

Increased frequency of extreme precipitation events can result in increased flooding. Extreme precipitation events, or periods of heavy precipitation in a short amount of time, can overwhelm stormwater infrastructure and cause coastal flooding. Cal-Adapt projects that the amount of water involved in extreme precipitations events will increase in Humboldt County from 8.44 inches to up to 9.92 inches by mid-century and up to 11.24 inches by the end of the century. This effect can be coupled with precipitation whiplash, which refers to climate extremes between dry years, where soil dries out, and wet years, where soil becomes too saturated to absorb more water.

The National Climate Assessment projects a wide variation in the number of extreme precipitation events per year by the end of the century, depending on the average global temperature. If global temperature rise is limited to 2.7 F, Humboldt County is projected to experience two days of extreme precipitation events a year. A 3.6-degree change would result in that number more than quadrupling to nine days, and a 7.2-degree change — the highest projected for the county by this model — would result in 34 days of extreme precipitation annually. This significant difference indicates that climate change could heavily impact the likelihood of flooding across Humboldt County in the future if not addressed.

Coastal communities in Humboldt County also have to factor in sea-level rise as part of their future flood risk. Climate change is expected to have a significant impact on sea-level rise in California in this century. Sea-level rise will expand flood-impacted areas. Flood damage that occurred only rarely during extreme storms will become more frequent and commonplace. National Oceanic and Atmospheric Administration's (NOAA) Interagency Sea Level Rise Scenario Tool estimates that Humboldt Bay will see an increase of 0.88 to 1.78 feet by 2050 and 1.78 to 7.28 feet by 2100, depending on the emissions scenario.

As the sea rises, low-lying areas will be inundated, and groundwater will be infiltrated with saline water. The State of California Sea Level Rise Guidance 2024 Science & Policy Update indicates Humboldt County is one of the most vulnerable areas in the state to coastal flooding, including sea-level rise. Tectonic subsidence, in combination with sea-level rise, puts Humboldt County on the front lines of climate change and flooding. Figure 67 shows the impact that a 2-foot sea level rise would have on Humboldt County; due to the topography, the City of Eureka would be heavily affected.

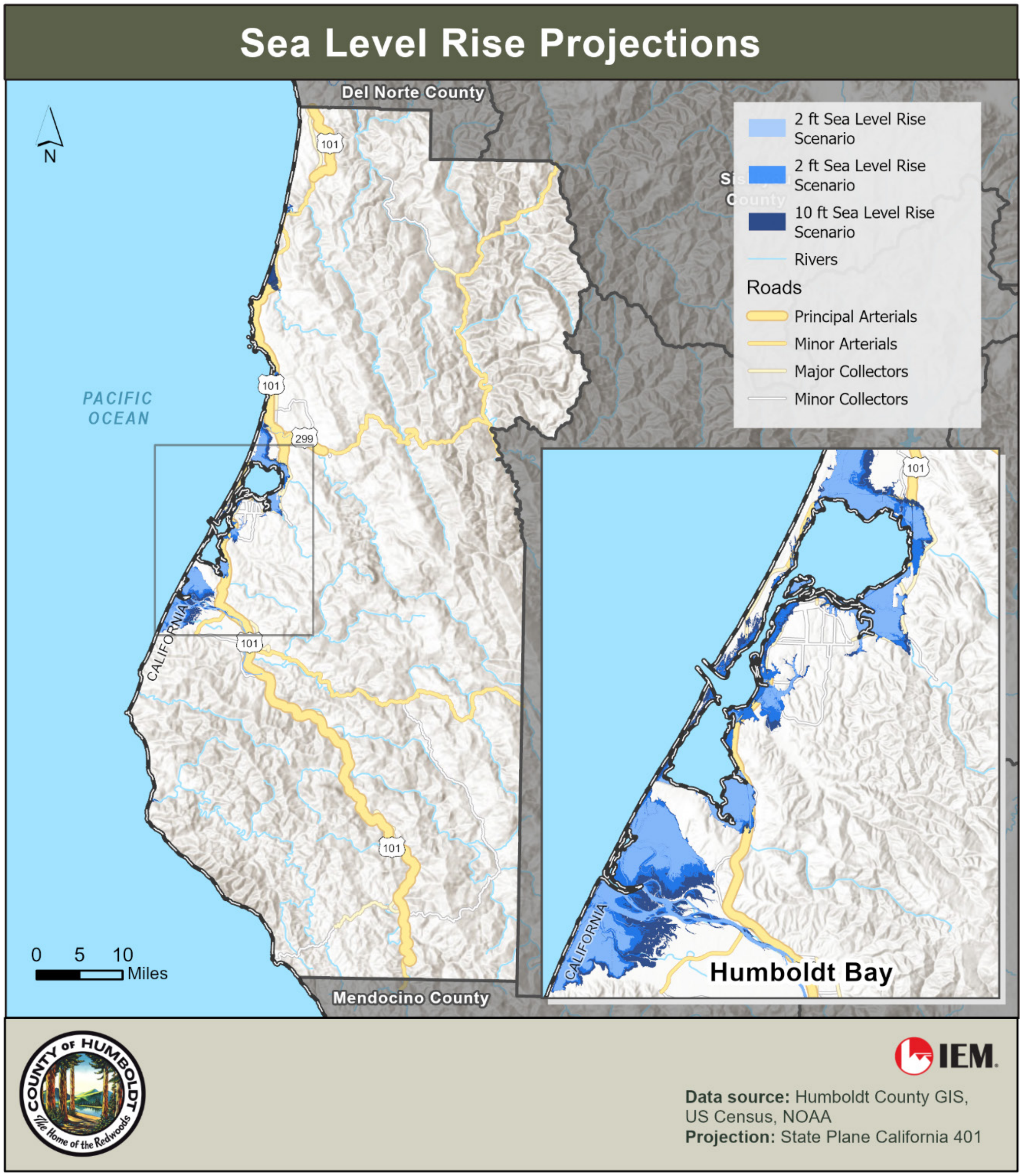

Figure 67: Humboldt Sea Level Rise Projections

5.10.6. Vulnerability

All people, property, systems, and infrastructure, including community lifelines, are at risk of flooding in Humboldt County. For this plan update, a quantitative and qualitative analysis of vulnerability was conducted. The quantitative analysis was conducted using FEMA's Hazus risk assessment modeling methodology. This program determines potential losses from hazards, including flooding.

Older properties may be at increased risk if they were built prior to modern building codes and current flood maps. Homes in Humboldt County are on average 47 years old. The current effective FEMA FIRM is dated Nov. 16, 2016. The oldest homes are located in the city of Eureka, the oldest city in Humboldt County.

The prevalence of flood insurance is another indicator of whether a community is prepared for a flood event. Obtaining flood insurance is an effective way to reduce flood risk exposure. In total, the planning area has over $125 million in flood insurance coverage through the NFIP and has received almost $3 million in flood insurance claim payouts. Table 61 breaks down OpenFEMA data on the total policy and losses by community.

Table 61: National Flood Insurance Program HUDEX* Policy and Loss Data by Geography

Community Name	Total Policy Count	Total Coverage	Total Premium	Total Losses	Total Net Dollars Paid
City of Arcata	65	$17,365,000	$64,317	18	$186,653
City of Blue Lake	12	$2,859,000	$10,831	2	$7,852
City of Eureka	22	$7,376,000	$37,096	4	$30,890
City of Ferndale	6	$1,528,000	$4,224	3	$19,741
City of Fortuna	30	$9,626,000	$30,538	4	$5,969
Humboldt County	351	$86,699,000	$448,041	171	$2,599,748
City of Rio Dell	0	$-	$-	5	$30,940
Total	**486**	**$125,453,000**	**$595,047**	**207**	**$2,881,793**

*HUDEX: Housing and Urban Development Review Exchange

Since the last plan update, the total number of policies has decreased by 319 across the county. All communities lost policies except for Eureka, where there was no change. One reason for this may be the rising cost of flood insurance. Between 2021 and 2023, FEMA phased in a new pricing approach known as Risk Rating 2.0. This rating approach was adopted to make NFIP rates more actuarially sound and took into account a wide range of flood risk variables and unique characteristics of each insured property.

The American Association of State Floodplain Managers estimated that this new approach would result in policy increases for the majority of policyholders in California. Most policyholders (63.2%) were expected to experience increases of $0 to $10 a month, while 6.3% would see increases of $10 to $20 per month, and 3.8% would see larger increases. Meanwhile, 26.8% would see a discount. Coupled with economic uncertainties, such as the global COVID-19 pandemic, rate increases could have influenced the reduction in flood insurance premiums, leaving more uninsured assets in Humboldt County exposed to flood impacts.

The NFIP also tracks repetitive losses. Repetitive loss properties can help identify high-risk areas. A repetitive loss property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP in any rolling 10-year period since 1978. FEMA provided the Repetitive Loss Summary for the planning area for Jan. 7, 2025. It indicated there is a grand total of 13 repetitive loss properties in the planning area. This means that there are three more repetitive loss properties, all in unincorporated Humboldt County, than reported in the last plan update. All repetitive loss properties are residential. Table 62 summarizes repetitive loss data per community.

Table 62: Repetitive Loss Summary

Community Name	# of Repetitive Loss Properties	Type of Structure	Total Losses	Total Building Payments	Total Contents Payments
City of Arcata	1	Residential	3	$57,710	$16,032
City of Blue Lake	0	N/A	N/A	N/A	N/A
City of Eureka	0	N/A	N/A	N/A	N/A
City of Ferndale	0	N/A	N/A	N/A	N/A
City of Fortuna	0	N/A	N/A	N/A	N/A
Humboldt County	12	Residential	31	$1,141,679	$134,133
City of Rio Dell	0	N/A	N/A	N/A	N/A
Total	**13**	**Residential (13)**	**34**	**$1,469,389**	**$150,165**

Severe repetitive loss properties are properties that have filed at least four separate flood insurance claims, each exceeding $5,000, or two claims that exceed the market value of the property. There are no severe repetitive loss properties in the planning area. Note that the special district planning partners to this plan have no identified repetitive loss or severe repetitive loss properties because districts are not eligible participants in the NFIP.

As reported in the prior hazard mitigation plan, the repetitive loss area appears to be contiguous with the currently mapped and regulated 1% annual chance floodplain. However, this data may be limited by the decline of flood insurance policies and, therefore, claims in the planning area. Repetitive loss properties are defined by the NFIP; thus, non-NFIP insured properties are not included in this analysis. Properties that have been repeatedly flooded may fall outside of the regulated floodplain, as anywhere it rains, it can flood. Nationally, the NFIP reports that 25% of claims came from outside the high-risk flood zone. Therefore, all communities in Humboldt County may be vulnerable to flooding.

5.10.7. Impacts

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil and hazardous materials, can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments, levees and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

In addition to impacting the environment, flooding can impact many assets in Humboldt County, including people, systems, structures and infrastructure. For this plan update, a quantitative analysis was undertaken to understand the impacts of flooding on the planning area. The planning team utilized FEMA's Hazus 6.1 software to estimate losses from flooding.

5.10.7.1.SCENARIO DESCRIPTIONS

The data included in the countywide analysis include general building stock data and population data from the 2020 Census. Based on the Hazus data, there are over 56,000 households, with a total population of 135,972. There are an estimated 54,700 buildings in the region, with a replacement value of over $28 billion. Flood depth grids were generated using FEMA FIRM flood zone boundaries and Hazus models the losses to different building occupancy types and critical facilities according to the depth grids.

5.10.7.2. CRITICAL INFRASTRUCTURE

The Hazus model estimates the amount of structural damage anticipated to affect critical facilities in the county and provides an estimate of the impacts on their functionality. These impacts are summarized for both 1% annual chance floods (Table 63) and 0.2% annual chance floods (Table 64). A total of 215 facilities, including hospitals, schools, EOCs, police stations and fire stations, were included in the model. The scenarios indicate minimal disruptions to the functionality of these facilities immediately following a flood.

Table 63: Critical Facility Impacts for 1% Annual Chance Flood Scenario

Classification	Total Facilities	Moderate Damage	Substantial Damage	Loss of Functionality on Day 1
Hospitals	21	0	0	0
Schools	105	0	0	0
EOCs	1	0	0	0
Police Stations	17	1	0	0

Classification	Total Facilities	Moderate Damage	Substantial Damage	Loss of Functionality on Day 1
Fire Stations	71	4	0	1

Table 64: Critical Facility Impacts for 0.2% Annual Chance Flood Scenario

Classification	Total Facilities	Moderate Damage	Substantial Damage	Loss of Functionality on Day 1
Hospitals	21	0	0	0
Schools	105	1	0	0
EOCs	1	0	0	0
Police Stations	17	2	0	0
Fire Stations	71	6	0	1

5.10.7.3. STRUCTURAL LOSSES

Hazus estimates that there are 54,000 buildings in the region, which have an aggregate total replacement value of over $28 billion. Hazus models the effects of flood in each scenario on different building construction and occupancy types. Hazus provides loss estimates for direct building damage, the cost of repairing or replacing the damage caused to a building and its contents. It also estimates business interruption losses associated with the inability to operate a business because of damage caused by a flood.

The total economic loss for a 1% annual chance flood is $580,170,000. Direct building losses account for $316,210,000 or 54.5% of the total losses and approximately 45.5% is related to business interruption. Damage to residences accounts for over 31% of the loss.

The total economic loss for a 0.2% annual chance flood is $639,730,000. Direct building losses account for $336,750,000 or 52.6% of the total losses and approximately 47% is related to business interruption. Damage to residences accounts for over 30.66% of the loss.

A summary of direct and business interruption losses by different building occupancy categories for 1% annual chance scenario is in Table 65, and the 0.2% annual chance scenario in Table 66. The “Other” occupancy category includes agricultural, educational, government and religion/nonprofit structures.

Table 65: Building-Related Economic Loss Estimates for 1% Annual Chance Flood Scenario

Occupancy Type	Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Residential	$82,110,000	$46,930,000	$0	$2,900,000	$28,760,000	$15,130,000	$6,850,000	$182,680,000
Commercial	$22,350,000	$76,760,000	$6,810,000	$66,010,000	$19,170,000	$13,190,000	$76,430,000	$280,720,000
Industrial	$17,550,000	$44,920,000	$5,910,000	$2,010,000	$3,310,000	$630,000	$2,710,000	$77,040,000
Other	$1,830,000	$9,180,000	$1,870,000	$4,480,000	$2,510,000	$280,000	$19,600,000	$39,750,000
Total Loss	**$123,840,000**	**$177,790,000**	**$14,590,000**	**$75,400,000**	**$53,750,000**	**$29,230,000**	**$105,590,000**	**$580,190,000**

Table 66: Building-Related Economic Loss Estimates for 0.2% Annual Chance Flood Scenario

Occupancy Type	Structural Loss	Contents Loss	Inventory Loss	Wage Loss	Income Loss	Rental Income Loss	Relocation Loss	Total Loss
Residential	$87,620,000	$50,020,000	$0	$7,520,000	$3,190,000	$16,510,000	$31,300,000	$196,160,000
Commercial	$25,050,000	$84,320,000	$7,840,000	$85,540,000	$78,370,000	$15,670,000	$22,580,000	$319,370,000
Industrial	$17,590,000	$45,070,000	$5,930,000	$2,760,000	$2,060,000	$640,000	$3,360,000	$77,410,000
Other	$1,880,000	$9,560,000	$1,870,000	$25,270,000	$5,060,000	$300,000	$2,860,000	$46,800,000
Total Loss	**$132,130,000**	**$188,980,000**	**$15,640,000**	**$88,660,000**	**$60,100,000**	**$33,120,000**	**$121,100,000**	**$639,730,000**

5.10.7.4. POPULATION IMPACTS

Damage to residences from a flood will displace people from their homes. Each flood scenario includes an estimate of the number of households that will be displaced, and the number of people expected to seek public shelter out of a total population of 135,972. These values are summarized in Table 67.

Table 67: Shelter Requirements for Flood Scenarios

Flood Scenario	Households Displaced	Individuals Displaced	Number of Individuals Seeking Public Shelter
1% Annual Chance	2,024	6,073	1,016
0.2% Annual Chance	2,404	7,213	1,266

5.10.8. Changes in Development

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; riverine floodplain land is fertile and suitable for farming; transportation by water is easily accessible; land is flatter and easier to develop; and there is value placed on ocean views. However, the presence of human development in the floodplain can result in losses from flooding. Furthermore, human activity itself can create new local flooding problems by altering or confining drainage channels or causing erosion of natural flood protection systems such as dunes. Flood potential can be increased in several ways: by reducing a stream's capacity to contain flows; by increasing flow rates or velocities downstream; and by allowing waves to extend further inland. Effective mitigation is necessary to live around high-risk floodplains.

All communities in Humboldt County participate in the NFIP except for the City of Trinidad. To participate in the NFIP, communities are required to adopt minimum floodplain management standards. Some communities go above and beyond these standards voluntarily as well. For example, Humboldt County requires new construction or substantial improvements to a structure to be built to 1 foot above the base flood elevation. The elevation supports flood risk reduction for new and improved structures. However, communities adopt and enforce their own standards, and there are no uniform standards across the planning area. This is also true of efforts to address sea-level rise. The Humboldt Bay Sea Level Rise Regional Planning Feasibility Study identified a regional framework to address this growing concern as a need that remains unaddressed in Humboldt County.

5.10.9. Community Lifelines

Table 68 lists the impacts on community lifelines and their vulnerability to flooding.

Table 68: FEMA Community Lifelines Impacted by Flooding

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
 **Water Systems**	New and improved water systems in Humboldt County are required to minimize flood damage. Humboldt County public health and emergency services have messaged the importance of reducing exposure to contaminated water for residents reliant on individual water supplies such as wells and Onsite Wastewater Treatment Systems (OWTSs).	• Infrastructure damage: Water treatment facilities, pumping stations and storage tanks can be destroyed by floodwaters. • Contamination of water supply: Excessive sediment, debris and chemicals can infiltrate drinking water sources. • Loss of potable water: Damage to pipelines and treatment plants can leave communities without drinking water for extended periods. • Disruption of wastewater treatment: Overflows and damage to wastewater plants can allow raw sewage to enter water bodies, posing public health risks. • Discharge backup: Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers and streams. • Increased erosion and sedimentation: Massive water surges can alter riverbeds, reducing water quality.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	Transportation routes, including highways and low-lying roads alongside rivers and Humboldt Bay, are routinely impacted by flood events in Humboldt County. Even flood events that do not reach the threshold for a disaster declaration are likely to flood roadways in the planning area. Floods have caused transportation disruptions, closed roadways and washed out roads, trapping people in Humboldt County.	• Infrastructure destruction: Roads, bridges and railways can be washed away by floodwaters, severing critical transportation routes. • Traffic gridlock and evacuation challenges: Flooding can overwhelm escape routes, delaying emergency evacuations. • Loss of access to emergency services: Emergency response efforts may be hindered by impassable roads. • Long-term transportation disruption: Rebuilding roads and bridges may take months or years, limiting access to resources and economic activity.
Energy	Parts of Humboldt County have experienced power outages following storm and flooding events. Power outages can last minutes to days. Localized flooding has reduced the ability of utility companies to make repairs.	• Power outages: Floodwaters can damage power plants, substations and transmission lines, leading to widespread blackouts. • Disruption of fuel supply: Gas and oil storage tanks may be damaged, causing fuel shortages. • Worker safety risks: Flooded power plants and substations create electrocution and explosion hazards.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	Homes have been impacted by flood damage. In addition, flooding has impacted local farmers and ranchers by disrupting transportation routes necessary for distribution and directly impacting crops and grazing lands. Food resilience includes ensuring that the local food bank and food trucks are able to provide food for residents. These efforts have also been impacted by flood events in Humboldt County.	• Food supply disruption: Washed-out roads and railways delay food transportation, leading to shortages. • Loss of agricultural land: Farmland can be inundated, killing crops and reducing food production. • Damage to shelters and homes: Flooded shelters may become uninhabitable, worsening displacement issues. • Emergency response challenges: Flooded roads delay aid distribution, leaving affected populations without basic necessities. • Economic impact: The destruction of businesses and agricultural land reduces long-term food security.
Safety and Security	Flooding has resulted in deaths and injuries in Humboldt County. Flooding often occurs along roads and the coast, which can prove deadly. Flooding has required flood rescue operations, putting first responders at risk.	• Loss of life: Flooding can lead to casualties, particularly near rivers, the coast and roadways where deaths in vehicles can occur. • Displacement crisis: Thousands may be forced to evacuate, straining shelters and emergency services. • Mental health trauma: Survivors may experience long-term psychological distress due to sudden displacement and loss of property. • Challenges for first responders: Emergency response personnel may struggle to access affected areas due to impassable roads. • Impacts to facilities: Structures related to safety and security can be damaged or destroyed.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	Health care facilities have largely avoided being flooded during past events. Medical response has been required in response to flood events in Humboldt County, and transportation routes, including highways, are routinely impacted. Furthermore, medical professionals have worked to remind people of the dangers of waterborne diseases to reduce exposure.	• Damage to hospitals and clinics: Flooding can incapacitate health care facilities, reducing the ability to treat injuries. • Injuries and fatalities: Floodwaters can cause drowning, crush injuries and electrocutions. • Waterborne diseases: Stagnant floodwaters can lead to outbreaks of cholera, dysentery and other illnesses. • Disruptions in medical supply chains: Flooded roads can prevent medical supplies from reaching affected areas. • Long-term health effects: Exposure to mold, contaminated water and hazardous debris can cause chronic illnesses.
Communications	Power outages have been experienced following storm and flooding events, but communication infrastructure has been minimally impacted in past flooding events.	• Damage to communication infrastructure: Cell towers, radio stations and internet infrastructure may be damaged or destroyed. • Loss of emergency communication: Emergency services may struggle to coordinate rescue operations without reliable communication. • Power loss to communications infrastructure: Without electricity, phones, radios and the internet may be inaccessible. • Increased demand on communication networks: Network congestion can slow down or block critical calls and emergency alerts. • Long-term outages: Repairing communications networks can take weeks or months, delaying information sharing.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials **Hazardous Materials**	Flooding has had minimal impacts on hazardous materials in past flooding events.	• Chemical spills: Industrial sites, wastewater treatment plants and hazardous material storage facilities may be flooded, releasing toxic chemicals into the environment. • Water contamination: Flooding can introduce oil, pesticides and sewage into rivers and drinking water supplies. • Fire and explosion risks: Damage to industrial storage tanks can cause fires and explosions. • Soil and ecosystem contamination: Pollutants from floodwaters can seep into the ground, causing long-term environmental damage. • Health risks to communities: Exposure to hazardous materials can lead to acute and chronic health effects, including respiratory illnesses and poisoning.

5.11. Landslide

5.11.1. Hazard Description

Landslides are commonly categorized by the type of initial ground failure. The most common type of slide is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. The largest and most destructive are deep-seated slides, which are less common than other types.

According to the California Department of Conservation, other landslide types also include the following:

- **Block Slides**: Blocks of rock that slide along a slip plane as a unit down a slope.
- **Creep**: A slow-moving landslide often only noticed through crooked trees and disturbed structures.
- **Debris Avalanche**: A debris flow that travels faster than about 10 miles per hour (mph). Speeds in excess of 20 mph are not uncommon, and speeds in excess of 100 mph, although rare, can occur. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars and anything else in its path.
- **Earth Flows**: Fine-grained sediments that flow downhill and typically form a fan structure.
- **Mudslides or Debris Flows**: Rivers of rock, earth, organic matter and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt.
- **Rock Falls**: Blocks of rock that fall away from a bedrock unit without a rotational component.
- **Rock Topples**: Blocks of rock that fall away from a bedrock unit with a rotational component.
- **Rotational Slumps**: Blocks of fine-grained sediment that rotate and move down slope.
- **Transitional Slides**: Sediments that move along a flat surface without a rotational component.

Vulnerable areas are affected by residential, agricultural, commercial and industrial development and the infrastructure that supports it. Factors causing landslides fall into two categories:

- Factors that increase driving forces:
  - Steepening of the slope
  - Adding weight to (loading) the slope, especially the upper parts

- Increasing the height of a slope (either by human or natural downcutting)
- Seismic shaking

- Factors that reduce resisting forces:
  - Adding water to the slope, which causes increased pore pressure, reducing frictional strength
  - Steepening the slope, which reduces normal stress, and thus reduces internal friction
  - Bedding, jointing or foliation parallel to slope or dipping out of slope — these discontinuities are low-strength zones along which the rock can fail and slide out of the slope
  - Intrinsically weak materials (e.g., deeply weathered, sheared, unconsolidated, or clay-rich materials)
  - Undercutting the slope, which reduces support
  - Removing vegetation, especially trees, which reduces root strength and leads to increased water in soil due to reduced evaporation losses
  - Seismic shaking
  - Coastal bluff erosion caused by wave action

5.11.1.1.CASCADING HAZARDS

Landslides can cause multiple secondary hazards, particularly around water bodies. Landslides can cause tsunamis or seiches. Landslides can also impact rivers, change the pattern of the water flow or impact water quality. Landslides can — and frequently have — blocked roadways in Humboldt County, potentially blocking evacuation routes or delaying emergency services. In addition, landslides themselves are often secondary hazards of other event types, such as earthquakes, severe weather or wildfires. For example, severe thunderstorms over steep slopes denatured by wildfire can be susceptible to landslides.

5.11.2. Location

One of the best predictors of where landslides might occur is the location of past landslides, which can be recognized by distinctive topographic shapes that can remain in place for thousands of years (Figure 68). Such sites range from a few acres to several square miles. Many show no evidence of recent movement and are not currently active. A few may become active in any given year. The recognition of ancient dormant landslide sites is important in the identification of areas susceptible to landslides because they can be reactivated by earthquakes or by exceptionally wet weather. These dormant sites are also vulnerable to construction-triggered sliding. The shoreline contains many large, deep-seated dormant landslides.

In 2011, the California Geological Survey conducted a statewide analysis using a combination of regional rock strength and slope data to create classes of susceptibility to deep-seated landslides. The analysis assumed, in general, that susceptibility to deep-seated landslides is low on very low slopes in all rock materials and increases with slope and in weak rocks. The analysis also factored in locations of past landslides. Figure 69 shows deep-seated landslide susceptibility classes. As demonstrated in this map, the majority of the planning area is at high risk from landslides. Areas at low risk are predominantly low-lying bay and riverine areas.

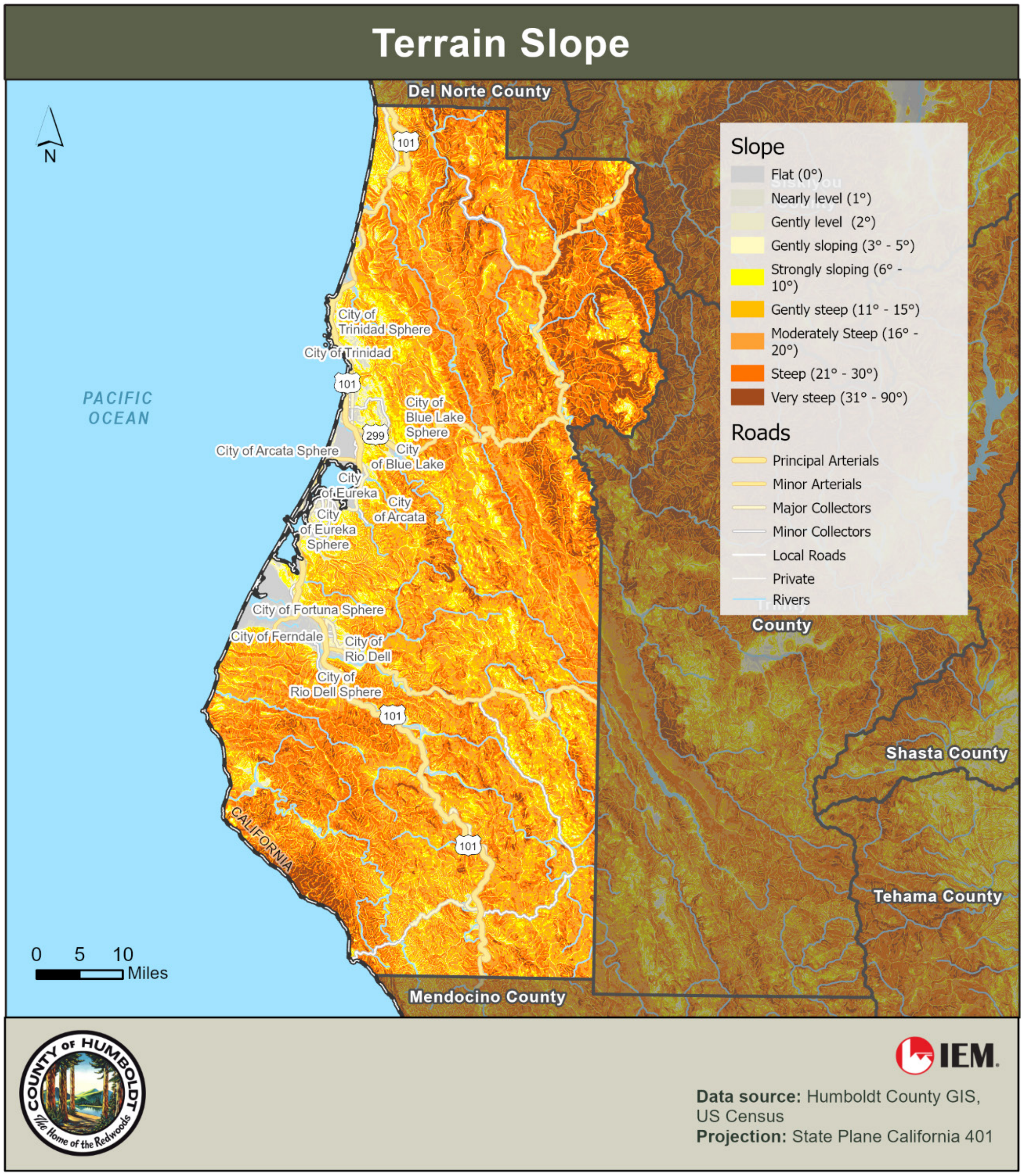

Figure 68: Humboldt County Terrain Slope

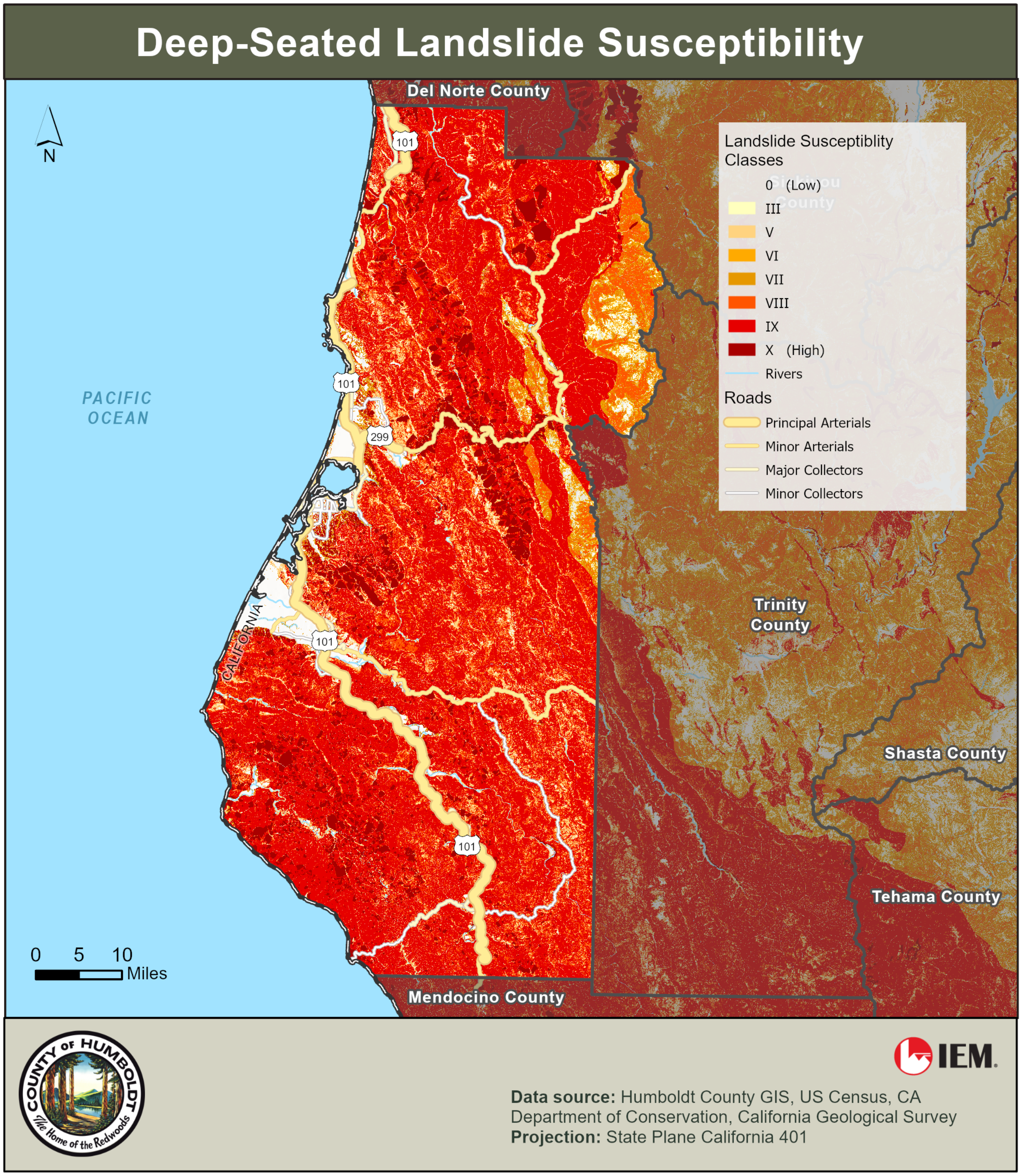

Figure 69: Humboldt County Landslide Susceptibility

5.11.3. Extent

Landslide extent, or severity, is based on multiple factors, including the type and the size of the landslide including exposed assets, soil type, volume of flow and slope steepness. Exposed assets are described later in the vulnerability section. Major landslides in Humboldt County occur as a result of soil conditions that have been affected by severe storms, groundwater or human development. Landslides are most likely during late winter when the water table is high. After heavy rains, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope.

5.11.4. History of Previous Hazard Events

Landside activity is frequent in Humboldt County, with the impacts ranging from minor to severe. Table 69 lists the known damage-causing landslides that have occurred in the county. Historic landslide events are documented in FEMA's Disaster Declarations, the prior two Humboldt County hazard mitigation plans (dated 2014 and 2019), and the NCEI Storm Events Database. Since the last plan update in 2019, the Humboldt County EOC has not activated specifically for a landslide event. However, there have been multiple reported landslides.

Table 69: Landslide Events in Humboldt

Date of Event	Primary Event Type	FEMA Disaster Number	Losses/Impacts
3/2025	Landslide	N/A	State Route 36 experienced landslides multiple times in March and April 2025, causing traffic delays near the Devil's Elbow picnic area, and in some cases completely shutting down the highway.
3/23/2024	Heavy Rain	N/A	Mattole road slid out 3 miles south southwest of Capetown. Highway 254 closed due to a slide, debris flow or flooding, 2 miles north northwest of Weott.
3/22/2024	Seismic Activity	N/A	This landslide resulted in the re-routing of Centerville Road and closure of the Fleener Creek Trail.
3/6/2024	Heavy Rain	N/A	Kneeland road at Hwy 36 closed due to a landslide near Bridgeville.
3/5/2024	Heavy Rain	N/A	Landslide blocked most of Hwy 101 two miles southeast of Scotia.

Date of Event	Primary Event Type	FEMA Disaster Number	Losses/Impacts
3/3/2024	Heavy Rain	N/A	Debris flow blocking both north and south lanes of traffic about 3 miles south southwest of Orick.
3/2/2024	Heavy Rain	N/A	Landslide closed Hwy 96 one mile south of Hoopa.
2/19/2024	Heavy Rain	N/A*	Landslide completely blocking Highway 299 west of Salyer. Proclamation of a State of Emergency was issued during this period.
1/8/2023	Heavy Rain	EM-3591-CA	Rock and mud slide caused a full closure of Highway 36.
1/7/2023	Heavy Rain	N/A*	A roadway near Hoopa was blocked by a rockslide due to heavy rain during a multiday atmospheric river.
1/4/2023	Heavy Rain	N/A	Heavy rain from an atmospheric river caused an earth slides across Highway 101.
12/30/2022	Heavy Rain	N/A	Heavy rain from a multi-day atmospheric river initiated an active landslide across one lane of Highway 299 west of Willow Creek. A landslide blocked one lane of Redwood Drive between Redway and Garberville. Heavy rain caused a rockslide across one lane of Freshwater Road near Kneeland.
12/29/2022	Heavy Rain	N/A	A landslide occurred along Hwy 96 south of Hoopa due to a multi-day atmospheric river. Heavy rain caused mud, dirt, and rock to slide across Hwy 36 between Carlotta and Bridgeville. The road was closed throughout slide removal.
12/26/2022	Heavy Rain	N/A	Heavy rain cause rocks to slide over a highway.

Date of Event	Primary Event Type	FEMA Disaster Number	Losses/Impacts
4/4/2020	Heavy Rain	N/A	Small rockslides occurred across Hwy 101 due to flowing water.
12/13/2019	Heavy Rain	N/A	Mudslide occurred on Hwy 96 north of Willow Creek.
5/18/2019	Severe Winter Storms	DR-4434	Flooding, landslides and mudslides

*Separately from FEMA declarations, the State of California proclaimed a state of emergency for this event.

5.11.5. Probability of Future Hazard Events

Landslides are often triggered by other natural hazards such as earthquakes, heavy rain, floods or wildfires, so their frequency is often related to the frequency of the precipitating hazards. In Humboldt County, landslides typically occur during and after severe storms, so the potential for landslides largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils. Most weather-induced landslides in the county occur in the winter after the water table has risen.

Since 1993, there have been eight disaster declarations where landslide impacts were known to occur, an average of about one such event every four years. Many smaller-scale landslides occur in the planning area every year. Given the historical frequency of landslides in a given year, the probability of a landslide event occurring in the county in any given year is high.

5.11.5.1.CLIMATE CHANGE CONSIDERATIONS

Climate change can increase the frequency of landslides in Humboldt County. Landslides are frequently related to other hazards including heavy rain, drought and wildfire. According to the 2023 California State Hazard Mitigation plan, landslides will become more frequent as the climate becomes drier, drought and wildfires increase, and extreme downpours occur. Under a medium emissions scenario, Cal-Adapt anticipates minimal change to the frequency of extreme precipitation events in Humboldt County throughout the century, receiving on average two events per year. Under a high emission scenario, this is projected to increase to three events per year by the end of the century. The seasonality of landslides may also change. As the wildfire season extends and conditions remain dry, intense rain in early winter may cause additional landslides.

5.11.6. Vulnerability

Assets vulnerable to landslides in Humboldt County include people, property, critical facilities and infrastructure, the economy, and natural and cultural resources. All people exposed the landslide hazard are potentially vulnerable to landslide impacts. In particular, people who live and work in the more mountainous parts of Humboldt County are at greater risk of landslides. Populations with access and functional needs as well as elderly populations and the very young are more vulnerable to the landslide hazards as they may not be able to evacuate quickly enough to avoid the impacts of a landslide. In addition, people traveling along at-risk roadways, such as U.S. Highway 101, are vulnerable. Landslides can serve beneficial functions to the natural environment, supplying sediment and large wood to stream channel networks and contributing to complexity and dynamic channel behavior critical for aquatic and riparian ecological diversity.

Highly susceptible areas of the county include mountain and coastal roads and transportation infrastructure. At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available. In particular, U.S. Highway 101, the main transportation corridor in northern coastal California and Humboldt County, traverses a landslide-prone area. Landslides along this corridor, especially at Confusion Hill in Mendocino County to the south, have been an ongoing problem for decades and regularly shut down the highway. Hazardous materials, which could be transported by road through Humboldt County, may also be a concern.

In addition to impacts due to major transportation routes to and from the area being damaged by landslides, like Highway 101, the economy could experience impacts particularly in the agricultural and timber industry. Landslides can have major consequences to such resources, primarily timberland, due to the large percentage of such land in remote locations on steep slopes. Roads accessing timberlands are often susceptible to slides and frequently are contributing factors to landslides. Landslide activity on these roads can remove them from production. However, landslides also can cause numerous problems for the environment:

- Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality.
- Hillsides that provide wildlife habitat can be lost due to landslides.
- Endangered species and their critical habitat in the planning area may be located in landslide hazard areas.
- Landslides can have major consequences for timberland due to the large portion of it on steep slopes in remote locations. Roads accessing timberlands are often susceptible to slides and erosional events and frequently are contributing factors to landslides. Landslide activity on these roads can remove them from production.
- Landslides can visually impact coastal views or prevent access to views.

- Scenic roads are frequently located in less developed areas and are therefore susceptible to landslides.

Humboldt County features a broad range of scenic resources, including the Pacific Ocean and its coastline, mountains, hills, ridgelines, inland water features, forests, agricultural features and distinctive rural communities. Many of these resources or access routes to them are exposed and vulnerable to landslides.

- **Coastal Views:** Landslides can impact Humboldt County's varied and extensive coastline and the scenic vistas near U.S. 101 and on beaches, state parks and coastal access points.
- **Forests:** Forestlands shape the visual character of Humboldt County, offering scenic natural resources valued both internally and externally. Landslides, a natural occurrence in these areas, can significantly affect their landscape and functionality.
- **Scenic Highways:** Several highways and major roads in Humboldt County are near the coastline, next to carved sections of mountains and hills, and in the forests which provide unique scenic qualities. These scenic qualities also cause varying types of landslides to occur (e.g., rockfalls, topples and debris flows).

Landslides can destroy natural assets that are highly valued by the community. All natural resources and habitats in the mapped landslide susceptibility class areas are exposed to the landslide hazard. Many cultural sites are at risk from landslides, which can destroy artifacts and structures.

5.11.7. Impacts

Landslides destroy property and infrastructure and can claim human lives. They can result in injuries or death when people are impacted. They have the potential to destabilize the foundation of structures, which may result in monetary loss for residents. According to the U.S. Geological Survey, slope failures in the United States result in an average of 25 to 50 lives lost per year and an annual cost to society of about $1.5 billion. Landslides can pose a serious hazard to properties on or below hillsides. They can block access to roads, which can isolate residents and businesses and delay commercial, public and private transportation. This can result in economic losses for businesses. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Power outages can last days to weeks, potentially endangering lives especially for those that depend on electricity for medical devices. Landslides also can damage rivers or streams, potentially harming water quality, fisheries and spawning habitat.

Figure 70: Photo of a Landslide in Humboldt County, Provided by Humboldt County OES, 2024

5.11.8. Changes in Development

Since the last plan update, Humboldt County has seen a small decline in population. However, population is expected to continue to grow at a slow but consistent rate. As the population continues to grow, more people may build and live on or otherwise modify areas with marginal stability. Humboldt County's steep coastal bluffs and riverfront and stream-front properties are the sites of debris flows and other types of landslides, but many landslides there cannot be seen from aerial reconnaissance. These failures are only clearly visible from close quarters on the ground. These are areas of intense development pressure. An accurate picture of where landslides were triggered during previous storms is vital for making intelligent land use planning decisions. Consideration of existing landslide susceptibilities and potential hazards will reduce the risk to people and property both now and with future development. In the past, many landslide losses may have gone unrecorded because insurance companies do not cover such damages. Transportation network damage has often been repaired under the general category of maintenance.

The county and its planning partners are equipped to handle future growth in landslide hazard areas. All municipal planning partners have general plans that address landslide risk areas in their safety elements. The Humboldt County Building Division utilizes the Humboldt County GIS to understand the hazard risk of proposed sites. New construction on slopes over 15% require additional engineering and soil reports.

Implementing building codes reduces risk to new development. The California Building Standards Code has adopted the International Building Code (IBC) by reference. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions ensure that new construction is built to standards that reduce the vulnerability to landslide risk. The Humboldt County General Plan (2017) contains policies relating to managing risk to development in landslide hazard areas.

5.11.9. Community Lifelines

Table 70 lists the impacts on community lifelines and their vulnerability to landslide.

Table 70: FEMA Community Lifelines Impacted by Landslide

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
 **Water Systems**	Landslides can cause adverse impacts to waterlines. In Humboldt County, slides have occurred that impact pipelines, resulting in 100,000+ gallons of water spilling.	• Infrastructure damage: Water supply and treatment facilities, including pipelines and water sources, can be damaged or destroyed by landslides. • Contamination of water supply: Landslides can deposit soil, debris and hazardous materials into water sources and pipelines. • Excessive sediment, debris and hazardous materials can infiltrate drinking water sources. • Loss of potable water: Damage to pipelines and treatment plants can leave communities without drinking water for extended periods.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	Transportation routes including highways, roads and trails have been substantially impacted by landslides in Humboldt County. Depending on the location and size of the slide, routes can remain closed for days to weeks. Some roads, including highways, have been repeatedly closed due to landslides. Some closures have required long detours and/or wait times	• Infrastructure destruction: Roads, bridges and railways can be damaged or destroyed by landslides, severing critical transportation routes. • Traffic gridlock and evacuation challenges: Landslides can and have disrupted transportation routes in Humboldt County, including along highways. • Loss of access to emergency services: Emergency response efforts may be hindered due to impassable roads. • Long-term transportation disruption: Rebuilding roads and bridges may take months or years, limiting access to resources and economic activity.
Energy	Landslides have brought down trees and power lines in Humboldt County previously. Power lines at times have remained active, increasing fire risk and creating hazards for residents.	• Power outages: Landslides can damage transmission lines, leading to blackouts. • Disruption of fuel supply: Gas and oil storage tanks may be damaged, causing fuel shortages. Transportation routes may also be disrupted, which could reduce fuel supply. • Worker safety risks: Landslide damage to energy lifelines and roadways can harm staff or delay their ability to work. • Cascading hazards: Broken lines can lead to wildfires.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	Landslide risk is reduced in Humboldt County by building restrictions near high-risk areas. However, landslides have still impacted residential areas, including destroying multiple homes and threatening access routes to homes and ranches.	• Food and water supply disruption: Impacted communities, particularly residential structures cut off by landslides, could experience food and water supply shortages. • Loss of agricultural land: Farmland, including crops, can be damaged by landslides. Landslides can spread debris, sediment and hazardous materials, which can reduce usable land. • Damage to shelters and homes: Residential structures and shelters, especially in rural Humboldt County, may be damaged or destroyed. • Emergency response challenges: Damaged roads delay aid distribution, leaving affected populations without basic necessities. • Economic impact: The destruction of businesses and agricultural land reduces long-term food security. Transportation delays due to landslides impacting roads can also cost the economy.
Safety and Security	Residents and first responders have been put at risk by landslide events in Humboldt County. Homes have been destroyed, resulting in displacement of residents. Further, when routes are closed, emergency personnel must take alternative routes, delaying response.	• Loss of lives: Sudden landslides can result in injuries and casualties in impacted areas. • Displacement: If residential structures or evacuation routes are impacted, affected residents may need to temporarily relocate. • Challenges for first responders: Emergency response personnel may struggle to access affected areas due to impassable roads.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	Medical services have not been overwhelmed due to landslide events in Humboldt County. Emergency medical service personnel may have to select alternative routes when roads are closed due to landslides, potentially delaying response.	• Injuries and fatalities: Landslides can result in injuries and fatalities. Hospital and medical services would be called upon to respond to a landslide event with casualties. • Damage to medical transportation routes: Hospitals in Humboldt County are unlikely to be directly impacted by landslides, but routes to hospitals could experience transportation disruptions or delays due to landslides resulting in longer time for staff and patients to reach the medical facility. • Disruptions in medical supply chains: Damaged roads can prevent medical supplies from reaching affected areas.
Communications	Communication infrastructure has not been significantly impacted by landslides in Humboldt County previously.	• Damage to communication infrastructure: Cell towers, radio stations and internet infrastructure may be damaged or destroyed. • Loss of emergency communication: Emergency services may struggle to coordinate rescue operations without reliable communication. • Power loss impacts communication: Without electricity, phones, radios and the internet may be inoperable. • Long-term outages: Repairing communication networks can take weeks or months, delaying information sharing.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	None	• Chemical spills: Industrial sites and hazardous material storage facilities may be hit by a landslide, releasing toxic chemicals into the environment. • Water contamination: Landslides can introduce debris and hazardous materials into water sources, reducing water quality. Landslides can result in flooding including from dam failure, which can further spread hazardous materials. • Soil and ecosystem contamination: Pollutants can seep into the ground, causing long-term environmental damage.

5.12. Tsunami

5.12.1. Hazard Description

A tsunami is a series of high-energy waves that radiate outward like pond ripples from an area where a generating event occurs, arriving at shorelines over an extended period. Tsunamis can be induced by earthquakes, landslides and submarine volcanic explosions. Tsunamis are typically classified as local or distant, depending on the location of their source in relation to where the waves reach:

- Waves generated near the point of origin constitute a local tsunami. Such events have minimal warning time, leaving few options except to run to high ground after an intense, prolonged local earthquake. Damage from the tsunami adds to damage from the triggering earthquake due to ground shaking, surface faulting, liquefaction and landslides.
- The waves far from the generating source represent a distant tsunami. Distant tsunamis may travel for hours before striking a coastline, allowing a community to implement evacuation plans if a warning is received.

In the open ocean, a tsunami may be only a few inches or feet high but can travel at speeds approaching 600 mph. As a tsunami enters the shoaling waters near a coastline, its speed diminishes, wavelength decreases, and height increases significantly. At the shoreline, tsunamis may take the form of a fast-rising tide, a cresting wave or a bore: a large, turbulent wall-like wave. The bore resembles a step-like change in the water level, and it advances at speeds from 10 to 60 mph. Several larger and more destructive waves usually follow the first wave.

The configuration of the coastline, the shape of the ocean floor and the characteristics of advancing waves play essential roles in the destructiveness of the waves. Bays, sounds, inlets, rivers, streams, offshore canyons, islands and flood control channels may cause various effects that alter the level of damage. Offshore canyons can focus tsunami wave energy, and islands can filter the energy. It has been estimated that a tsunami wave entering a flood control channel could reach a mile or more inland, especially at high tide. The orientation of the coastline determines whether the waves strike head-on or are refracted from other parts of the coastline. A wave may be small at one point on a coast and much more significant at other points.

5.12.1.1. CASCADING HAZARDS

The massive hydraulic force of tsunami waves poses a significant threat, but the dangers extend beyond the water itself. Floating debris swept up by the tsunami can jeopardize human safety, damage infrastructure and transport hazardous or flammable materials. In addition, flooding caused by tsunamis can lead to contamination of drinking water supplies, increasing the risk of disease outbreaks.

5.12.2. Location

The Tsunami Hazard Area Map (see Figure 71), provided by the California Department of Conservation, shows the extent and the location of the tsunami inundation areas for the Humboldt County planning area. This map does not represent the risk from a single event; instead, it delineates a composite area of risk that combines the inundation areas from several local and distant potential sources, including the CSZ, the Central Aleutians Island subduction zone, historical earthquake events, and other sources. The inundation areas represent the maximum considered tsunami runup from several extreme yet realistic tsunami sources. A local source mainly influences the tsunami hazard zone, the Cascadia event; however, distant sources can result in notable wave run-ups. Additional tsunami mapping information is available from the California Department of Conservation and the Redwood Coast Tsunami Work Group.

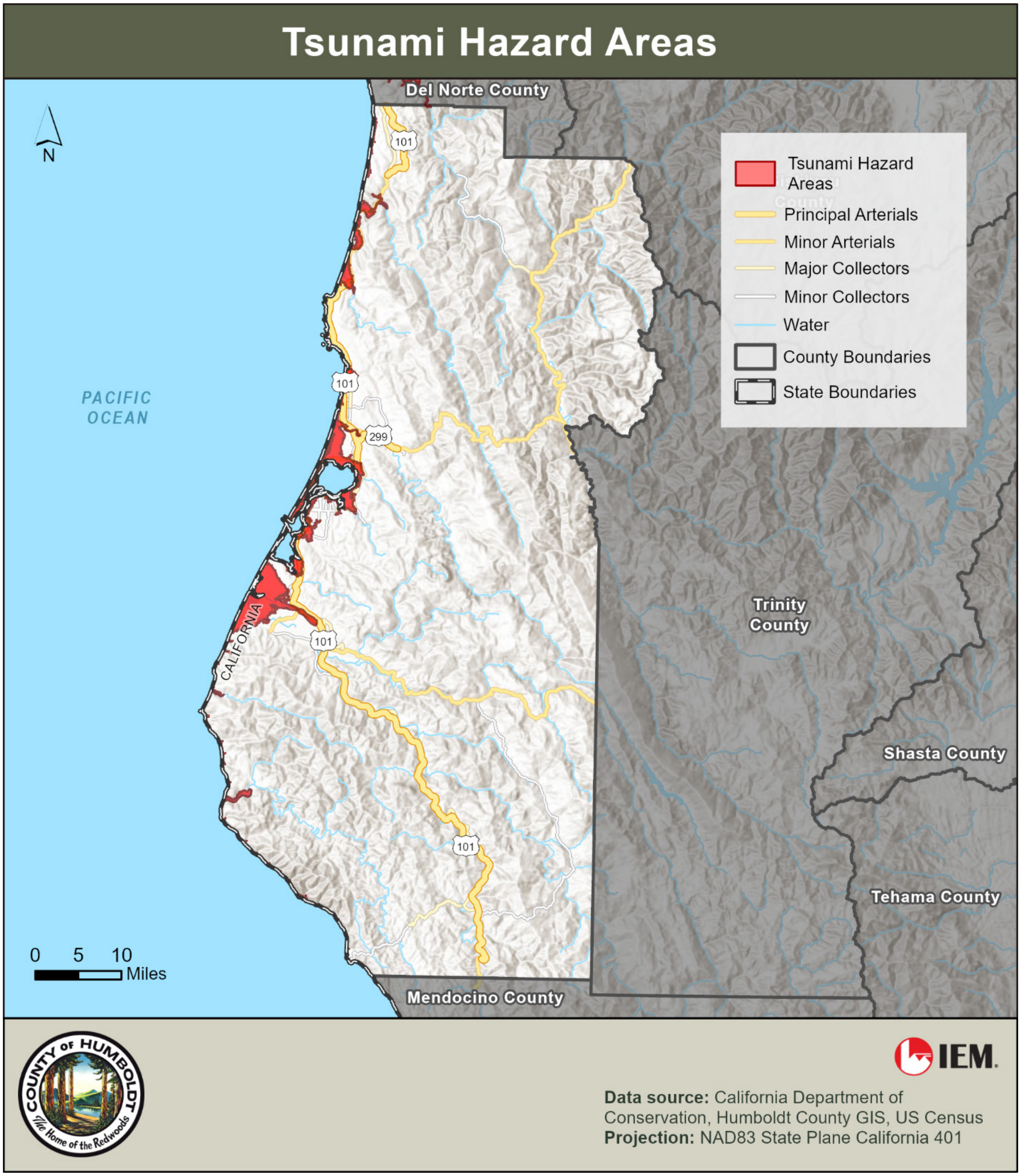

Figure 71: Tsunami Inundation Areas for Humboldt County

5.12.3. Extent

As seen in Table 71, the 12-grade tsunami intensity scale is a comprehensive framework used to assess the severity and impact of tsunami events. It serves to categorize tsunamis based on wave height, inundation extent, the resultant damage and other factors. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), this scale consists of 12 divisions, which correspond to the 12-grade seismic intensity scale. These divisions are organized based on their effects on humans, nature and various objects, including vessels of different sizes as well as buildings and other engineered structures.

Table 71: 12-Grade Tsunami Intensity Scale

Extent	Description
Not Felt	• Not felt even under the most favorable circumstances. • No effect. • No damage.
Scarcely Felt	• Felt by a few people on board in small vessels. Not observed on the coast. • No effect. • No damage.
Weak	• Felt by most people on board in small vessels. Observed by a few people on the coast. • No effect. • No damage.
Largely Observed	• Felt by everyone on board in small vessels and by a few people on board in large vessels. Observed by most people on the coast. • Some small vessels move slightly onshore. • No damage.
Strong	• Felt by everyone on board in large vessels and observed by everyone on the coast. Some people are frightened and evacuate to higher ground. • Many small vessels move strongly onshore, and some crash into each other or overturn. Layers of sand are left behind in the ground when conditions are favorable. Limited flooding of cultivated land. • Limited flooding of outdoor facilities (e.g., gardens) of near-shore structures.
Slightly Damaging	• Many people are frightened and evacuate to higher ground. • Most small vessels move violently onshore, crash powerfully into each other or overturn. • Damage and flooding in a few wooden structures. Most masonry buildings withstand.

Extent	Description
Damaging	• Most people are frightened and try to evacuate to higher ground. • Many small vessels are damaged. Some large vessels oscillate violently. Objects of variable size and stability overturn and drift. Sand layers and accumulations of pebbles are left behind. Some aquaculture rafts washed away. • Many wooden structures are damaged, and some are demolished or washed away. Slight damage and flooding occur in some masonry buildings.
Heavily Damaging	• Most people escape to higher ground; a few are washed away. • Most small vessels are damaged, and many are washed away. Some large vessels are moved ashore or crash into each other. Big objects drift away. Erosion and littering occur on the beach. Extensive flooding occurs. Slight damage occurs in the tsunami control forest and stop-drifts. Many aquaculture rafts wash away, and some are partially damaged. • Most wooden structures are washed away or demolished. Moderate damage occurs in a few masonry buildings. Most reinforced concrete buildings sustain damage; slight damage and flooding are observed.
Destructive	• Many people are washed away. • Most small vessels are destroyed or washed away. Many large vessels are moved violently ashore, and some are destroyed. Extensive erosion and littering of the beach occur. There is local ground subsidence. Partial destruction of the tsunami control forest reduces drift barriers. Most aquaculture rafts wash away, and many are partially damaged. • There is heavy damage in many masonry buildings, and few reinforced concrete buildings suffer moderate damage.
Very Destructive	• General panic. Most people are washed away. • Most large vessels are moved violently ashore; many are destroyed or collide with buildings. Small boulders from the sea bottom are moved inland. Cars are overturned and carried adrift. Oil spills and fires start. Extensive ground subsidence occurs. • Total damage is seen in many masonry buildings, and some reinforced concrete buildings suffer heavy damage. Artificial embankments collapse, and port water breaks are damaged.
Devastating	• All major infrastructure is affected. Extensive fires occur. Water backwash carries cars and other objects into the sea. Large boulders from the sea bottom are moved inland. • Many masonry buildings are destroyed. Some reinforced concrete buildings suffer total damage, and many suffer heavy damage.

Extent	Description
Completely Devastating	• Practically all masonry buildings are demolished. Most reinforced concrete buildings suffer at least heavy damage.

5.12.4. History of Previous Hazard Events

According to the NCEI, two recorded tsunamis occurred in Humboldt County from 1950 through 2025, as seen in Table 72; none were federally declared by FEMA.

Table 72: Previous Tsunami Events

Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Redwood Coast	11/15/2006	0	0	$12.2 million	$0
Redwood Coast	03/11/2011	1	0	$3 million	$0

Tohoku Tsunami 2011: Tsunami waves produced near Japan traveled across the Pacific Ocean and impacted several coastal communities in California 9 to 11 hours after the earthquake (see Figure 72). The 2011 Tohoku tsunami significantly affected California, despite the distance from Japan. Coastal damage was extensive, especially in Crescent City, where tsunami-generated waves destroyed docks, boats and infrastructure. Erosion and localized flooding in various coastal regions affected public access and ecosystems. California's damage exceeded $100 million, mainly affecting coastal harbors and ports. According to the California Department of Conservation, data collected from buoys and tide gauges helped federal, state and local officials assess the incoming threat, determine the urgency of notifications, and evaluate the potential need for evacuations.

As stated in the "California Impacts from the 2011 Tohoku Tsunami" StoryMap, although the currents were strong near the mouth of the Humboldt Bay, the harbors in the bay faced minimal issues. Prior to the tsunami's arrival, harbor personnel successfully positioned some vessels from a perpendicular position to the flow, to a parallel position with the current flow direction, reducing drag on the boats. In addition, Humboldt Bay was a safe harbor for many ships that evacuated from Crescent City Harbor before the tsunami struck.

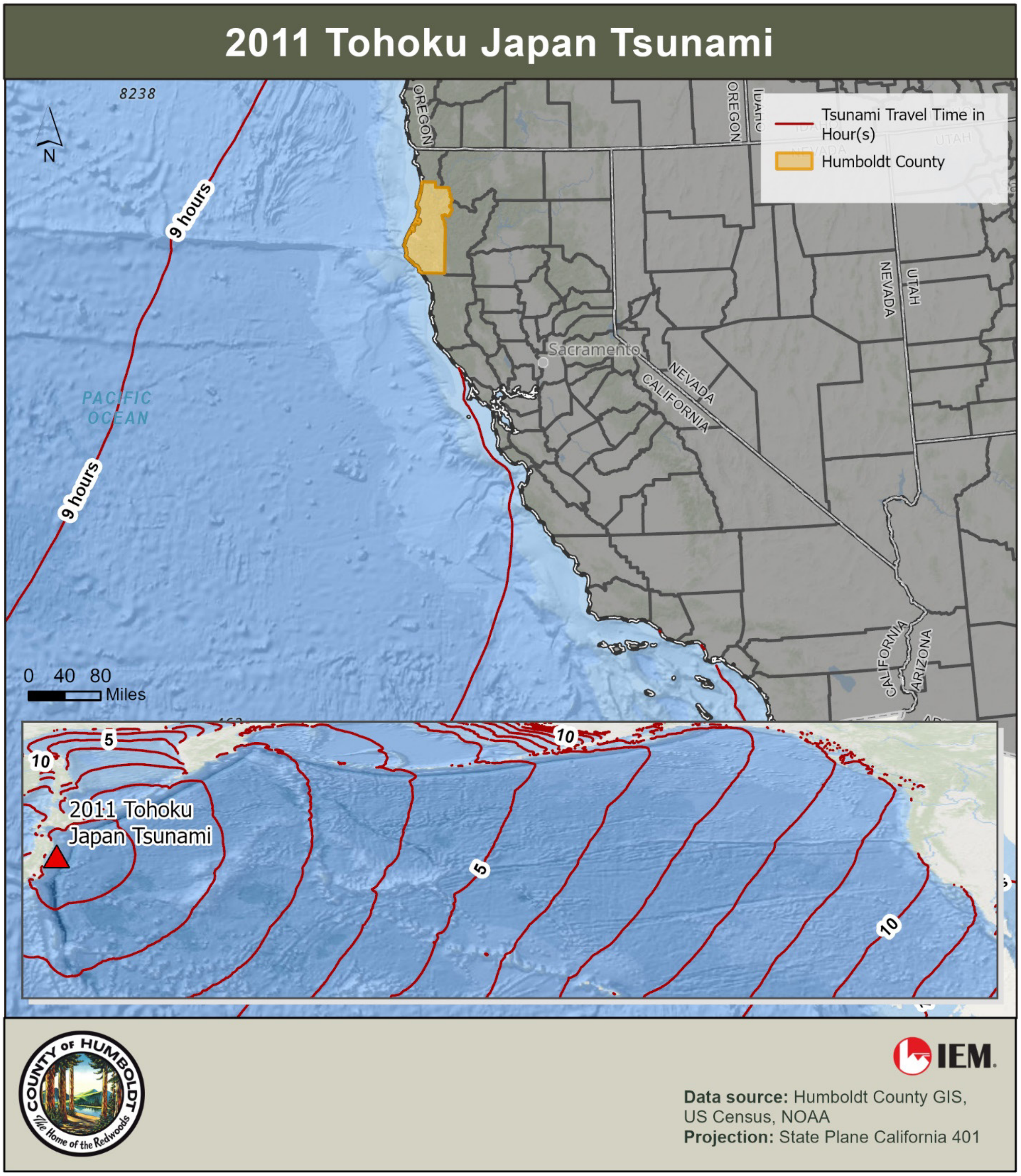

Figure 72: 2011 Tohoku Japan Tsunami

In addition to these recorded events, a significant tsunami impacted the area on January 26, 1700, after a major earthquake in the CSZ. The tsunami left markers in the geologic record from Humboldt County to Vancouver Island in Canada and is noted in written documents in Japan.

The 1964 Alaskan earthquake caused significant run-up elevations in several areas of Humboldt County. Figure 73 indicates that it took approximately 4 hours after the event until Humboldt County felt the impact. According to the NCEI Natural Hazards Viewer, North Split in Humboldt Bay recorded maximum elevations of 3.1 feet above tide levels. The Eureka Boat Basin in Humboldt Bay experienced water over the ten-foot seawall, flooding eight feet into the streets. The Municipal Marina also measured run-up elevations of 3.1 feet above the tide stage. Pacific Gas and Electric reported a run-up elevation of 3.8 feet, while King Solomon Slough recorded approximately 4.5 feet.

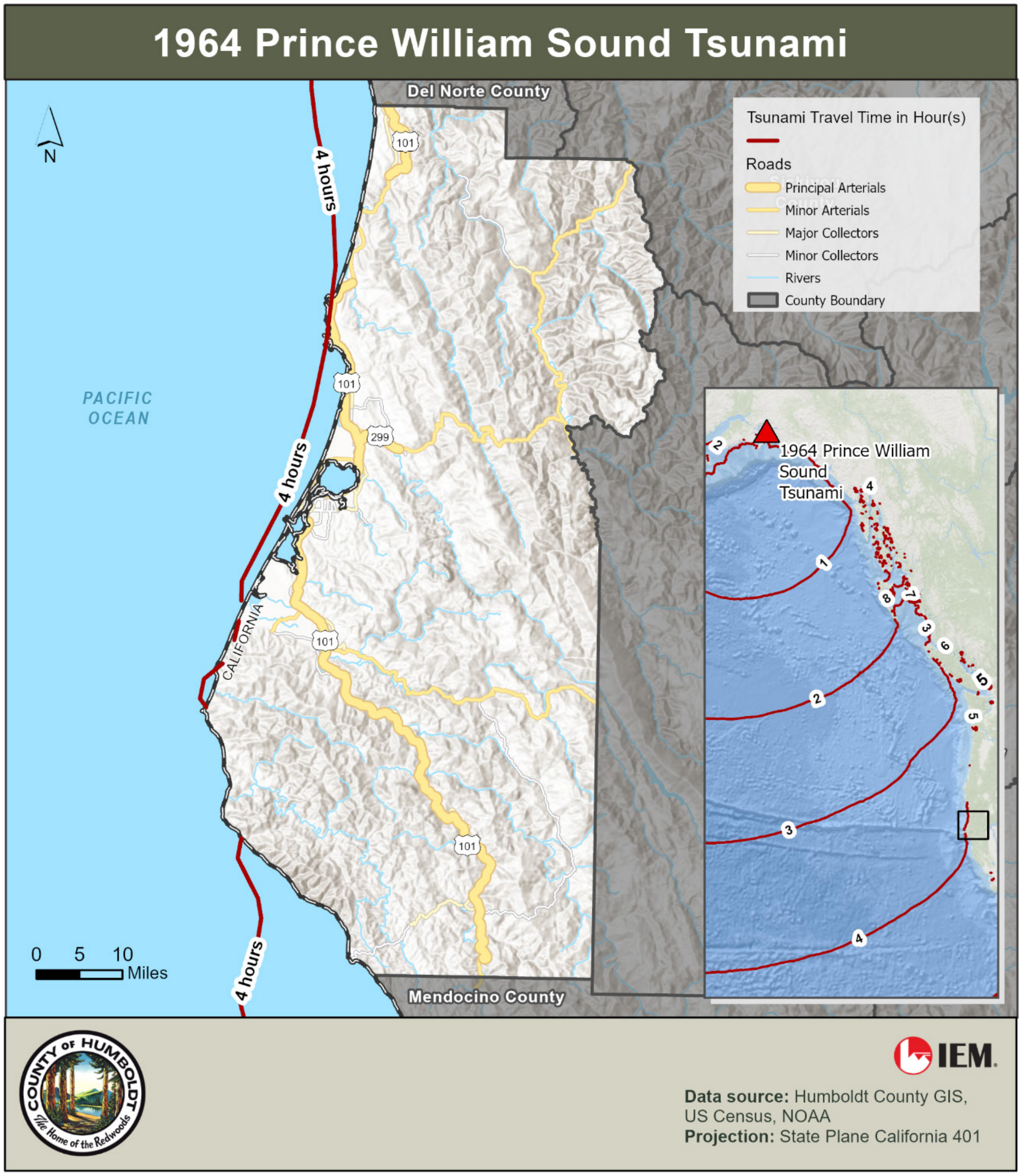

Figure 73: 1964 Prince William Sound Tsunami Travel Time

5.12.5. Probability of Future Hazard Events

The probability of future tsunamis in Humboldt County is generally considered "likely," though specific assessments can vary based on several factors.

Humboldt County, located along the Pacific coast, is at risk for tsunamis due to seismic activity, particularly from the CSZ. Historical events such as the 1964 Alaska earthquake and the 2011 Tohoku tsunami exhibit this risk. Local geology and ocean conditions further influence tsunami potential. While uncommon, these factors suggest that Humboldt County has a significant chance of experiencing future tsunamis.

5.12.5.1.CLIMATE CHANGE CONSIDERATIONS

The impact of climate change on the likelihood of tsunamis is poorly understood. Some scientists suggest that melting glaciers could trigger tectonic activity, leading to earthquakes. In addition, other researchers point out that underwater avalanches, also resulting from melting glaciers, may contribute to the formation of tsunamis. Even if climate change does not increase the frequency of tsunamis, it could lead to more destructive waves. As sea levels continue to rise, areas that tsunamis could flood may extend further into communities than current mapping indicates. As the land area that tsunamis could impact grows, the exposure and vulnerability of populations, properties, critical facilities and the environment to tsunami hazards may also increase. Climate change might alter the tsunami threat, leading to more significant economic impacts on many businesses, economic centers and infrastructure systems that support them.

5.12.6. Vulnerability

All of coastal Humboldt County is in the mapped Tsunami Hazard Area and is therefore projected to be vulnerable to tsunamis. People, structures, and infrastructure are vulnerable to tsunamis. Eureka, Arcata and other key towns and communities along Humboldt Bay are particularly vulnerable. The most vulnerable are those on the front line of the tsunami impact and structures that are unsound.

Figure 74 shows the critical facilities in the tsunami hazard area.

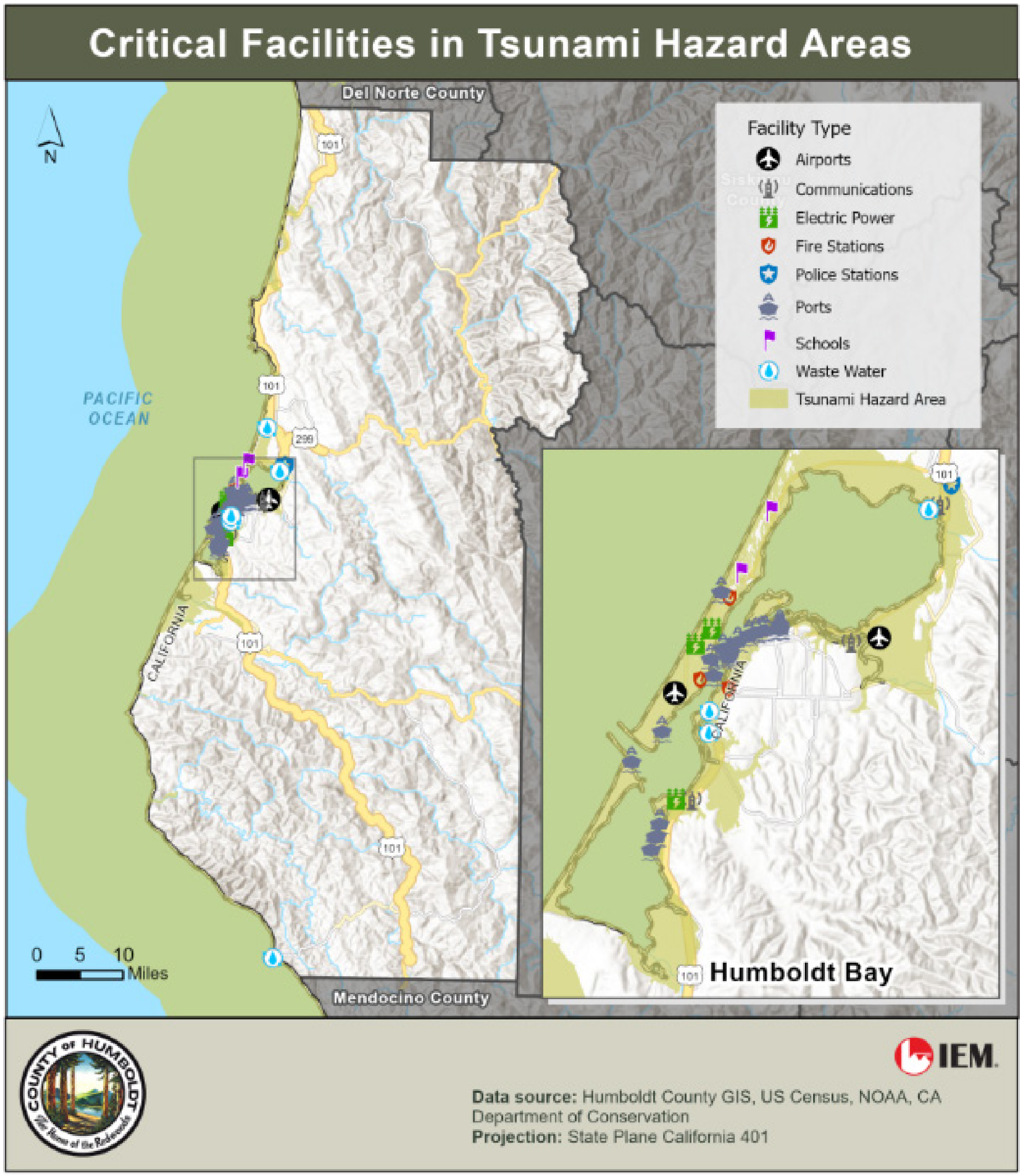

Figure 74 Critical Facilities in Tsunami Hazard Areas

5.12.7. Impacts

Tsunamis pose a significant threat to coastal areas in Humboldt County. Tsunami waves and the debris can damage structures along beaches, low-lying coastal areas, tidal flats and river deltas. Critical facilities could be damaged or destroyed by tsunamis. The type, count, and replacement cost of potentially impacted facilities is shown in Table 73.

Table 73: Projected Tsunami Critical Facilities Impacts

Facility Type	Count of Structures	Replacement Cost in Thousands of Dollars
Airport Facilities	2	$10,600
Communication Facilities	3	$354
Electric Power Facilities	3	$440,637
Police Station Facilities	3	$4,102
Port Facilities	1	$3,598
School Facilities	22	$83,861
Waste Water Facilities	2	$4,577

Tsunami waves pose a significant danger to people in the water or near the shore. People in the tsunami inundation area may be injured or killed. Residents of the affected area may be required to evacuate temporarily and could be displaced due to homes and community lifelines being damaged or destroyed. Roads and bridges may be unstable if the tsunami is caused by an earthquake, posing a threat to residents trying to evacuate. Multiple waves may occur, threatening the community for hours to days after the initial event. First responders are also vulnerable when responding to a tsunami event.

5.12.8. Changes in Development

According to population projections by the California Department of Finance, Humboldt County’s population should increase by 3.63% by 2040. The county is subject to state general planning laws and the California Coastal Act. The county and its cities have adopted critical areas and resource land regulations pursuant to these laws. The county’s policy in the past was not to allow for an increase in exposure in its floodplains. The information in this plan provides the county and its planning partners with a tool to ensure no exposure increases in the mapped tsunami inundation area of the planning area.

5.12.9. Community Lifelines

Community lifelines are essential services and systems that support communities' recovery and resilience during and after disasters. They help identify and prioritize the critical needs of affected populations. Table 74 lists the community lifelines and their vulnerability to tsunamis.

Table 74: FEMA Community Lifelines Impacted by Tsunamis

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems	Humboldt County is fortunate to report that no FEMA community lifelines were directly impacted by tsunamis. However, the potential hazard vulnerabilities of these essential services should not be overlooked; they are listed in the hazard vulnerabilities column.	• Infrastructure damage: Treatment plants, pumping stations, storage tanks, and distribution pipelines can be damaged, disrupting water supply. • Contamination of water supply: Freshwater sources may become contaminated, making water unsafe for drinking and irrigation. • Flooding risks: Facilities in low-lying areas can flood, causing equipment failure and longer outages. • Disruption of distribution systems: Damage to pipelines can lead to leaks and reduced water pressure. • Erosion and sedimentation: Tsunami waves erode riverbanks and shorelines, changing water flow patterns and potentially lowering water quality. • Increased water demand: Recovery efforts raise the need for clean water, straining damaged systems. • Long-term recovery challenges: Fixing damaged infrastructure can take a long time, leading to extended periods without safe drinking water. • Health risks: Poor water quality and limited access can cause waterborne diseases and other health issues.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	None	• Infrastructure damage: Strong water flow, debris and erosion can harm structures. • Flooding: Low roads can flood, disrupting normal activities and isolating communities. • Debris fields: Debris like cars and trees can block roads and train lines, impeding recovery. • Long-term disruption: Recovery can take time, limiting access to help and resources. • Risk of secondary hazards: Tsunamis may cause landslides and spills, complicating recovery. • Emergency evacuations: Transport systems must allow quick evacuations. Damage or traffic can put lives at risk. • Economic impact: Damage to transport can hurt the economy and disrupt trade and local businesses.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Energy	None	• Infrastructure damage: Tsunami waves can harm energy facilities, endangering safety and operations. • Flooding: Tsunamis can flood coastal energy sites, causing power outages. • Contamination: Tsunami water can mix with hazardous substances from energy facilities, impacting health and environment. • Disruption of supply chains: Damage to transportation routes can delay fuel and material deliveries, leading to shortages. • Long-term recovery: Repairing energy infrastructure can take a long time, leaving communities without power. • Operational safety risks: Tsunamis can create danger for workers, complicating emergency response operations. • Economic implications: Energy disruptions can harm local economies and industries reliant on stable energy supply. • System interconnectedness: Damage in one area can affect other regions, causing wider outages and complicating recovery.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	None	• Infrastructure damage: Tsunamis can damage storage facilities and markets, leading to food shortages and farming disruptions. • Flooding and contamination: Saltwater can contaminate fresh water, making drinking water unsafe, and flooding can introduce contaminants into food. • Disruption of supply chains: Debris can block transport routes, hindering food and water delivery and causing shortages. • Loss of agricultural land: Tsunami waves or saltwater can flood and erode farmland, threatening food production. • Shelter damage: Destroyed homes leave people without safe shelter, increasing the health risks from exposure. • Emergency response challenges: Damaged infrastructure complicates aid efforts, making it harder to provide food, water and shelter. • Economic impact: The loss of food and shelter causes economic instability for families relying on local markets and farming. • Health risks: The loss of food, potable water and shelter can lead to malnutrition, dehydration and increased risk of disease.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Safety and Security	None	• Loss of lives • Infrastructure collapse: Damage to hospitals and emergency centers can delay emergency responses and jeopardize public safety. • Displacement and refugee crisis: Many people may be forced to evacuate, leading to overcrowding and under-resourced shelters. • Increased vulnerability to crime: Limited police presence can lead to increased crime and civil unrest. • Mental health impacts: Trauma can result in long-term mental health issues. • Compromised emergency services: The destruction of roads can delay rescue operations and medical help. • Infrastructure for hazard response: Damage to communication systems can cause the disruption of alerts and delays in evacuations • Long-term safety risks: Landslides, contaminated water supplies, and other aftereffects can pose ongoing threats. • Infrastructure resilience: Weak and old structures may fail, complicating safety efforts.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	None	• Infrastructure damage: Health facilities can suffer severe damage, leading to lost medical supplies and an inability to treat patients. • Disruption of services: Damage can interrupt medical services and affect routine and emergency care, which can increase the number of health crises and deaths. • Injuries and trauma: many people get injured from drowning and from falling debris, overwhelming medical facilities. • Contamination of water supply: Floodwaters can contaminate drinking waters, causing outbreaks of diseases. • Mental health impacts: Trauma and anxiety can lead to long-term mental health issues. • Increased vulnerability of populations: Vulnerable groups face increased risks and need targeted recovery efforts after a tsunami. • Epidemic risks: Overcrowding of evacuation centers can heighten the risk of a disease outbreak. • Disruption of supply chains: Essential medical supplies may stop, delaying effective treatment. • Long-term health effects: Damage can lead to lasting public health issues, including chronic conditions from inaccessibility to care.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Communications	None	• Infrastructure damage: Tsunamis can damage communications, such as cell towers and internet providers, disrupting services and information access. • Power outages: Power outages may occur, making communications systems fail. • Flooding: Low-lying facilities might flood, leading to equipment failure and hindering repairs. • Disruption of supply chains: Damage to transport can delay delivery of equipment needed to repair communication systems. • Loss of satellite communication: Satellite stations can be disrupted, causing connectivity loss. • Increased demand: Many people seek information and contact family and friends during emergencies, which can overload networks. • Emergency alerts: Poor communication systems can delay emergency alerts, increasing community risk. • Long-term disruptions: Recovery may take time, slowing information flow and complicating distribution of aid.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	None	• Infrastructure damage: Facilities can be severely damaged, leading to the release of hazardous materials into the environment. • Contamination of water supplies: Floodwaters can mix with dangerous substances, polluting drinking water and harming ecosystems. • Release of hazardous materials: Tsunami waves can break containment systems, exposing people and wildlife to pollutants. • Increased risk of fires and explosions: Damage can disrupt storage for flammable materials, resulting in fires and explosions. • Debris field contamination: Tsunamis carry hazardous materials and debris, complicating cleanup and posing risks. • Disruption of emergency responses: Road damage can slow emergency responses, delaying containment and cleanup. • Long-term environmental impact: Releasing hazardous materials can cause long-term harm to soil, water quality, and ecosystems. • Health risks to communities: Hazardous materials, if released into the environment, can harm the health of residents. • Economic consequences: Land and water pollution can create economic problems for industries that rely on safe environments. • Regulatory challenges: Coordinating cleanup and following environmental rules after a tsunami can be difficult.

5.13. Wildfire

The Humboldt County Community Wildfire Protection Plan (CWPP), approved by the County Board of Supervisors in 2019, is effectively the wildfire hazard mitigation plan for the Humboldt Operational Area. The CWPP is hereby linked to this hazard mitigation plan by reference, and key components of it are referenced in this chapter, which provides an overview of the wildfire hazard. The complete document is available online at this link: https://humboldtgov.org/2431/Community-Wildfire-Protection-Plan.

5.13.1. Hazard Description

A wildfire is any uncontrolled fire on undeveloped land that requires fire suppression. Wildfires can occur naturally and are important to many ecosystem processes, but most are started by people. CAL FIRE has modeled and mapped wildfire hazard zones using a computer model that designates fire hazard severity zones (FHSZ) as Moderate, High or Very High. FHSZ ratings are derived from a combination of fire frequency (how often an area burns) and expected fire behavior under severe weather conditions. CAL FIRE's model derives fire frequency from 50 years of fire history data. Fire behavior is based on factors such as the following:

- **Fuel:** Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees and above the ground in tree canopies. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite. Trees killed or defoliated by forest insects and diseases are more susceptible to wildfire.
- **Weather:** Relevant weather conditions include temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere. When the temperature is high, relative humidity is low, wind speed is increasing and coming from the east (offshore flow) and there has been little or no precipitation, so vegetation is dry and conditions are very favorable for extensive and severe wildfires. These conditions occur more frequently inland where temperatures are higher and fog is less prevalent.
- **Terrain:** Topography includes slope and elevation. The topography of a region influences the amount and moisture of fuel; the impact of weather conditions such as temperature and wind; potential barriers to fire spread, such as highways and lakes; and elevation and slope of landforms (fire spreads more easily uphill than downhill).

The model also is based on frequency of fire weather, ignition patterns and expected rate of spread. It accounts for flying ember production, which is the principal driver of the wildfire hazard in densely developed areas. A related concern in built-out areas is the relative density of vegetative fuels that can serve as sites for new spot fires in the urban core and spread to adjacent structures. The model refines the zones to characterize fire exposure mechanisms that cause ignitions to structures. Significant land-use changes need to be accounted for through periodic model updates. Detailed discussions of the zones and how they are developed are available on the CAL FIRE website.

5.13.1.1. CASCADING HAZARDS

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire.

Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding. Fire weather conditions can contribute to power interruptions due to Public Safety Power Shutoff (PSPS) scenarios initiated by public utility service providers. These secondary impacts of wildfire can also affect the quantity and quality of water, which can pose a significant challenge to drinking water utilities. Smoke from wildfires negatively affects air quality.

5.13.2. Location

CAL FIRE's FHSZs are based on modeled burn probability and fire behavior considering weather, fuel and terrain. They are derived from a combination of fire frequency (how often an area has burned) and expected fire behavior under severe weather conditions, along with other factors such as ignition patterns, rate of spread, ember production and other fire exposure mechanisms. Additional details on these classifications are described in Figure 74.

***Fire Hazard Severity* as Determined by CAL FIRE**
❖ The 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.
❖ Zone boundaries and hazard levels are determined based on vegetation. For wildland areas, the current FHSZ model uses burn probability and expected fire behavior based on weather, fuel, and terrain conditions. For urban areas, zone boundaries and hazard levels are based on vegetation density, adjacent wildland FHSZ scores, and distance from wildlands.
❖ Each area of the map gets a score for flame length, embers, and the likelihood of the area burning. Scores are then averaged over the zone areas.

Figure 75: Fire Hazard Severity Zone Criteria

Humboldt County exhibits a range of severity classification from Moderate to Very High. In State Responsibility Area (SRA) lands shown in Figure 75, the map generally reflects a High rating in the western portions of Humboldt County, where the fuel potential is high, but the climate is damp. Humboldt's Very High ratings are generally in the drier, eastern portions of the county or in very steep terrain, such as found along the Lost Coast. Moderate ratings are in valley bottom areas, which are generally urban or agricultural. Areas with lower fire risk are concentrated in coastal and estuary lands. There are no Very High classifications in the local responsibility area in Humboldt County. In Humboldt County, 2.13 million acres are in a High or Very High FHSZ. This represents over 82% of the area of the county.

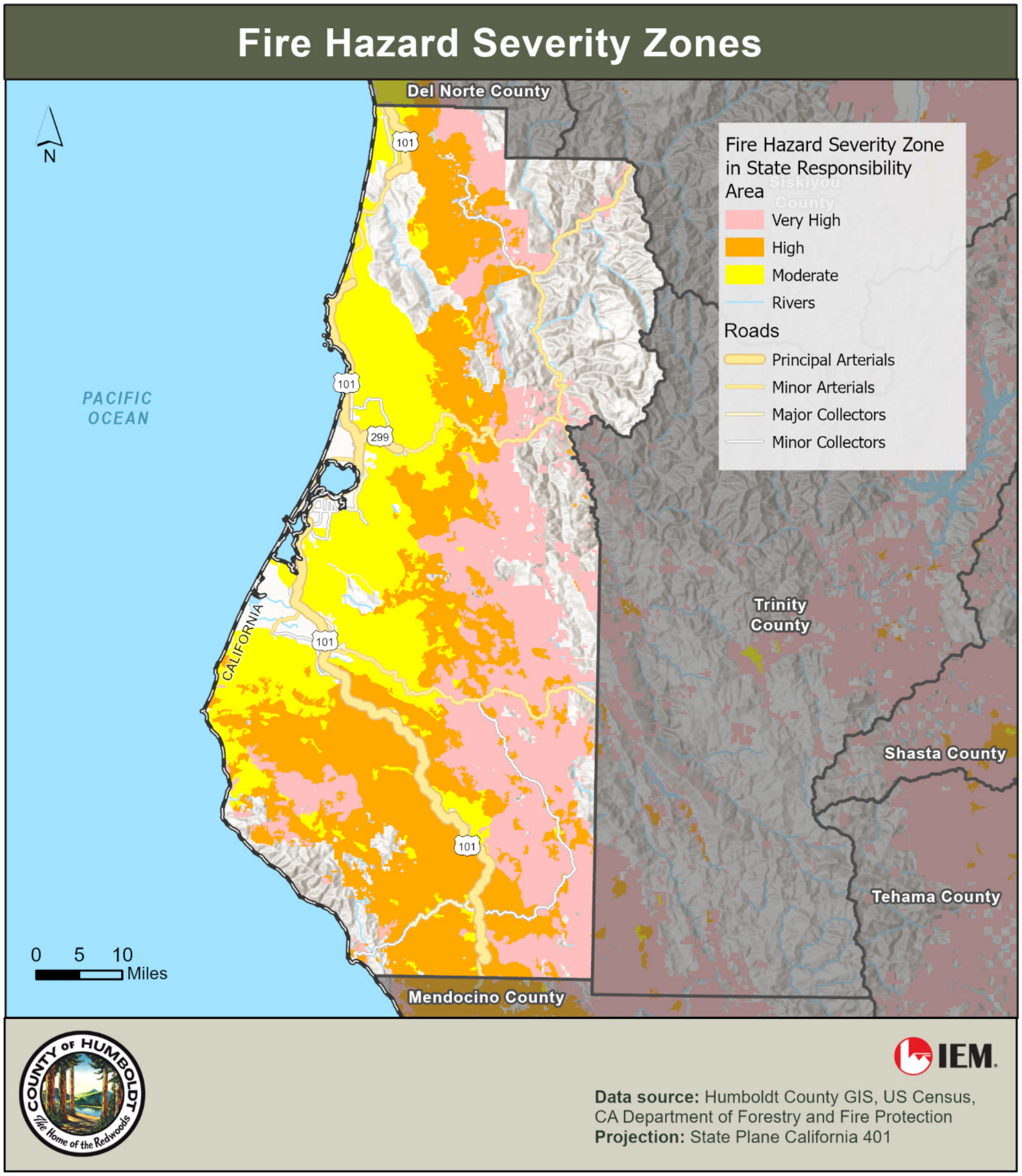

Figure 76: Humboldt County Fire Hazard Severity Zones

Between 2012 and 2019, California experienced an unprecedented drought. The drought, combined with the increased infestation of native bark beetles and record temperatures, contributed to the death of millions of trees across California. Dead trees heighten wildfire risk and can be hazardous if they fall. To monitor where tree mortality poses a threat to public safety, Governor Brown issued an emergency declaration in 2015 requiring public agencies to identify areas of tree mortality. CAL FIRE's Fire and Resource Assessment Program (FRAP) High Hazard Zone Viewer, shown in Figure 76, displays the areas of greatest concern, known as High Hazard Zones. These zones are areas where tree mortality and assets to be protected, such as structures, utility lines or other infrastructure, directly overlap and are in greatest need of dead tree removal. The viewer was last updated in October 2022, which may capture some effects of drought conditions in 2020-2022.

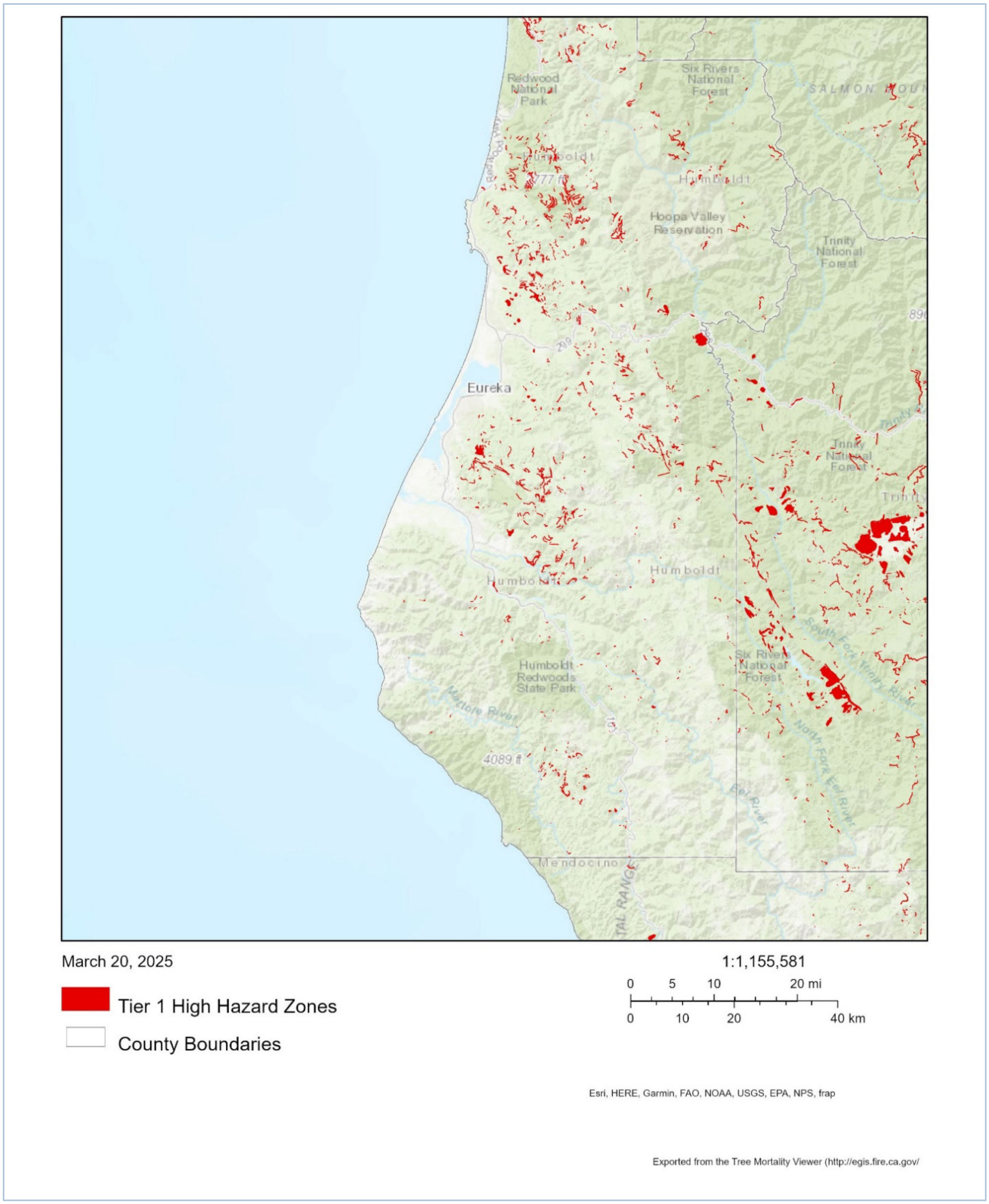

Figure 77: Tier 1 High Hazard Zones

5.13.3. Extent

The National Fire Danger Rating System (NFDRS) is a system that enables fire managers to estimate the fire danger for a given area. The model includes input such as fuels, weather, topography and risks. The NFDRS uses five color-code levels to identify fire potential, understand the current conditions and help mitigate actions to prevent human-caused wildfires. Figure 77 and Table 75 describe the characteristics for each danger level.

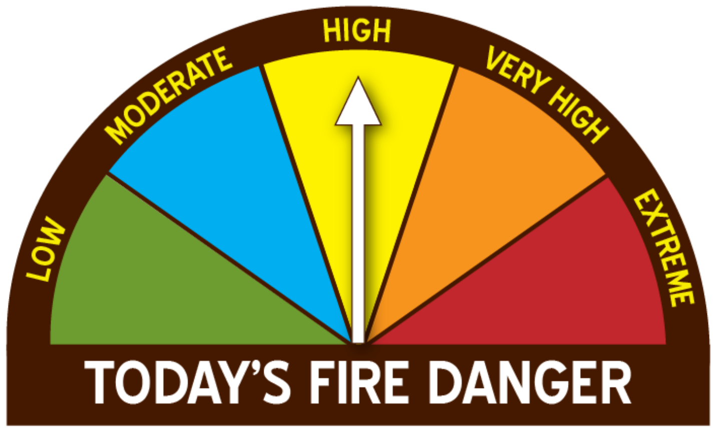

Figure 78: National Fire Danger Rating System

Table 75: National Fire Danger Rating System Descriptions

NFDRS Level	Description
Low (Green)	Fuels do not ignite easily from small embers, but a more intense heat source, such as lightning, may start fires in duff or dry rotten wood. Fires in open, dry grasslands may easily burn a few hours after a rain, but most wood fires will spread slowly, creeping or smoldering. Control of fires is generally easy.
Moderate (Blue)	Fires can start from most accidental causes, but the number of fire starts is likely to be pretty low. If a fire does start in an open, dry grassland, it will burn and spread quickly on windy days. Most wood fires will spread slowly to moderately. Average fire intensity will be moderate except in heavy concentrations of fuel, which may burn hot. Fires are still not likely to become serious and are often easy to control.
High (Yellow)	Fires can start easily from most causes and small fuels such as grasses and needles will ignite readily. Unattended campfires and brush fires are likely to escape. Fires will spread easily, with some areas of high-intensity burning on slopes or concentrated fuels. Fires can become serious and difficult to control unless they are put out while they are still small.

NFDRS Level	Description
Very High (Orange)	Fires will start easily from most causes. The fires will spread rapidly and have a quick increase in intensity right after ignition. Small fires can quickly become large fires and exhibit extreme fire intensity, such as long-distance spotting and fire whirls. These fires can be difficult to control and will often become much larger and longer-lasting fires.
Extreme (Red)	Fires of all types start quickly and burn intensely. All fires are potentially serious and can spread very quickly with intense burning. Small fires become big fires much faster than at the “very high” level. Spot fires are probable, with long-distance spotting likely. These fires are very difficult to fight and may become very dangerous and often last for several days.

5.13.4. History of Previous Hazard Events

According to historic fire perimeter data provided by CAL FIRE, 674 fires have burned areas of Humboldt County between 1908 and 2023. A total of 1,020,719 acres burned in Humboldt County during that time, 149 of those since Jan. 1, 2000. This data includes details on recent large fires, which are those that have burned more than 5,000 acres between 2019 and 2023. Five such incidents affected Humboldt County, as shown in Figure 78.

- **2020 Red Salmon Complex Fire**: This fire began on June 26 due to lightning activity. It burned 143,835 acres by Oct. 18. The perimeter included portions of Humboldt, Trinity and Siskiyou counties.
- **2022 Campbell Fire**: A total of 30,132 acres burned in eastern Humboldt County and western Trinity County between Aug. 5 and Sept. 9 as part of the larger 2022 SRF (Six Rivers) Lightning Complex fire.
- **2022 Ammon Fire**: This fire burned 11,465 acres in eastern Humboldt County, also part of the 2022 SRF Lightning Complex fire.
- **2023 Pearch Fire**: A total of 12,152 acres burned in northeast Humboldt County and western Siskiyou County between July 16 and Sept. 24 from this lightning-caused fire that was part of the 2023 SRF Lightning Complex fire.
- **2023 Mosquito Fire**: This fire burned 34,188 acres in this portion of the 2023 SRF Lightning Complex. Much of the fire perimeter was in Del Norte and Siskiyou counties, but a portion occurred in northern Humboldt County.

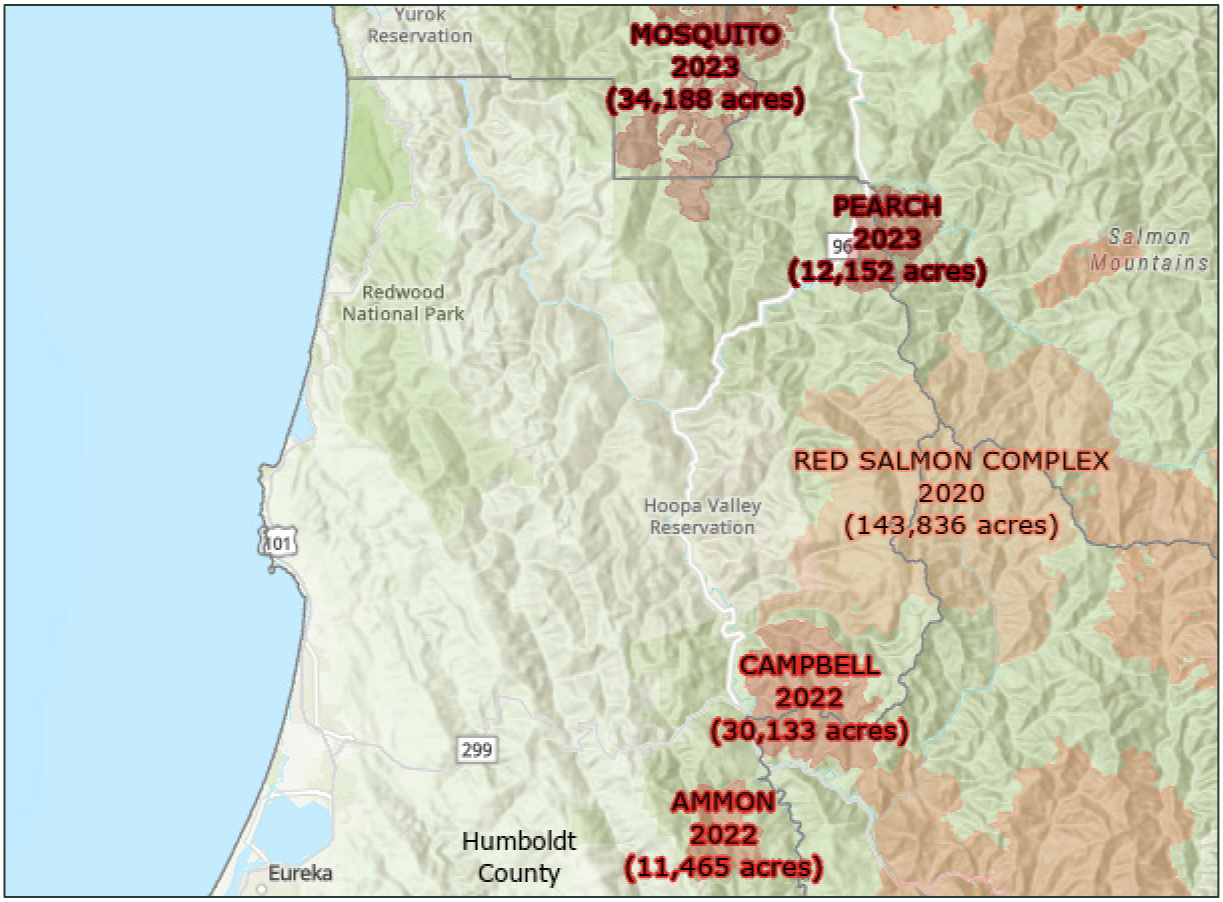

Figure 79: California Recent Large Fire Perimeters

Figure 79 illustrates the spatial extent of past wildfires across the County of Humboldt. Areas shaded in orange represent historical fire perimeters compiled from state and local fire records. The map reveals a notable concentration of wildfire activity in the inland and eastern portions of the county, particularly along the boundary with Trinity County and in forested, mountainous terrain. Western portions near coastal communities such as Arcata, Eureka and Fortuna show relatively fewer historical wildfire perimeters, reflecting lower fire incidence in these more urbanized and humid coastal areas. Transportation routes, including U.S. Highway 101 and key arterial and collector roads, are overlaid to contextualize access and potential evacuation corridors. City spheres of influence are marked for major municipalities, further emphasizing the proximity of some wildland-urban interface (WUI) areas to population centers.

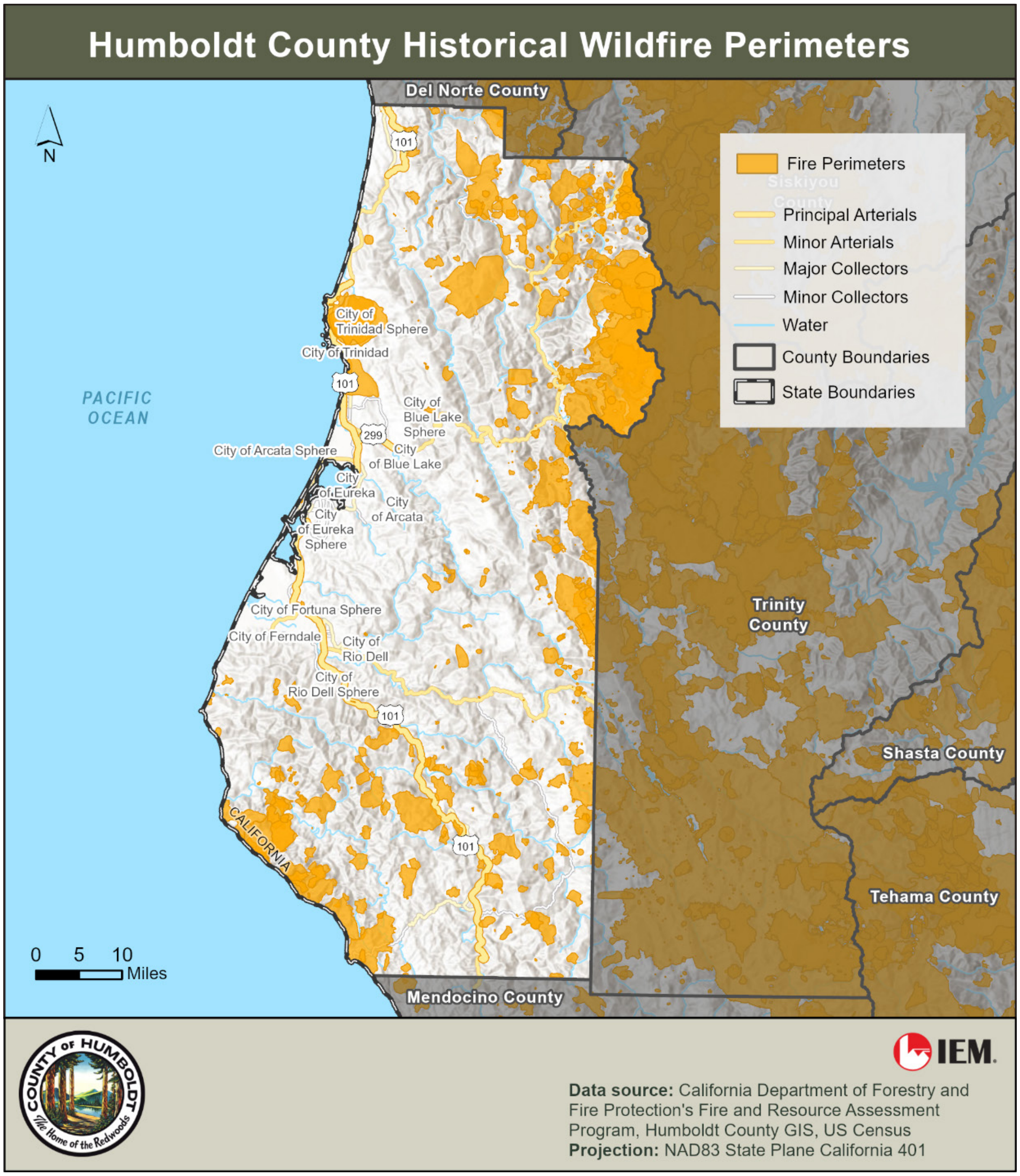

Figure 80: Humboldt County Historical Wildfire Perimeters

The following events prompted activation of the Humboldt County EOC, including the 2022 and 2023 SRF Lightning Complex fire mentioned earlier. Humboldt County provided the following details regarding those activations:

- **2006 – The Orleans Fire** burned over 15,000 acres, physically threatened the community of Orleans for several weeks, and caused dangerous air quality levels for area citizens in the northeastern Humboldt region.
- **2021 – The Knob Fire** began on Aug. 29 at approximately 2:30 p.m. from an undetermined cause. The fire reached 100% containment on Sept. 12, totaling 2,421 acres. Due to the

potential risk to human life and property damage, evacuation orders and warnings were issued in the greater Willow Creek area. Evacuation notices were communicated via Humboldt Alert system, Everbridge, the Integrated Public Alert and Warning System (IPAWS) and through physical evacuations via door-to-door or patrol notifications. The Humboldt County EOC was activated primarily to provide public information and issue emergency notifications via Humboldt Alert and to coordinate any logistics as necessary for Humboldt County Sheriff's Office field operations. Shelters were managed and staffed by the American Red Cross throughout the incident.

- **2022 – The Six Rivers Lightning Complex fire** in the Willow Creek area burned up to 27,000 acres. The EOC put out evacuation warnings and orders for the Willow Creek area.
- **2023 – The August Lightning Fires** began on Aug. 15 following several weeks of warm/dry weather coupled with a dry thunderstorm on Aug. 14. As of Aug. 16, there were 23 identified fires in the Six Rivers National Forest, all with varying acreage and levels of containment. No evacuation warnings or orders were initiated for the Lone Pine fire or other fires in the county.
- **2023 – SRF (Six Rivers) Lightning Fires:** The EOC activated to provide emergency alerts and warnings for evacuations, guidance to and coordination with incident management teams, and public information regarding the numerous fires that occurred in eastern Humboldt.

5.13.5. Probability of Future Hazard Events

As mentioned in the wildfire event history, there have been 149 wildfires in Humboldt County since 2000. This indicates an average of six events each year. As noted in the California State Hazard Mitigation Plan, fires are likely to grow in both size and intensity due to fuel buildup from past forest management policies, a longer fire season predicted by many climate models, tree mortality from pest infestations, and other factors.

CAL FIRE's Fire and Resource Assessment Program used modeling tools to project the annual probability of wildfire occurrence based on four different climate models. The data represents mean projected annual probability of wildfire occurrence for the period 2021-2050 using four climate models. The results, shown in Figure 80, indicate that Humboldt County is projected to have between a 0.29% annual chance of wildfire in some areas and up to a 2.0% annual chance of wildfire in others.

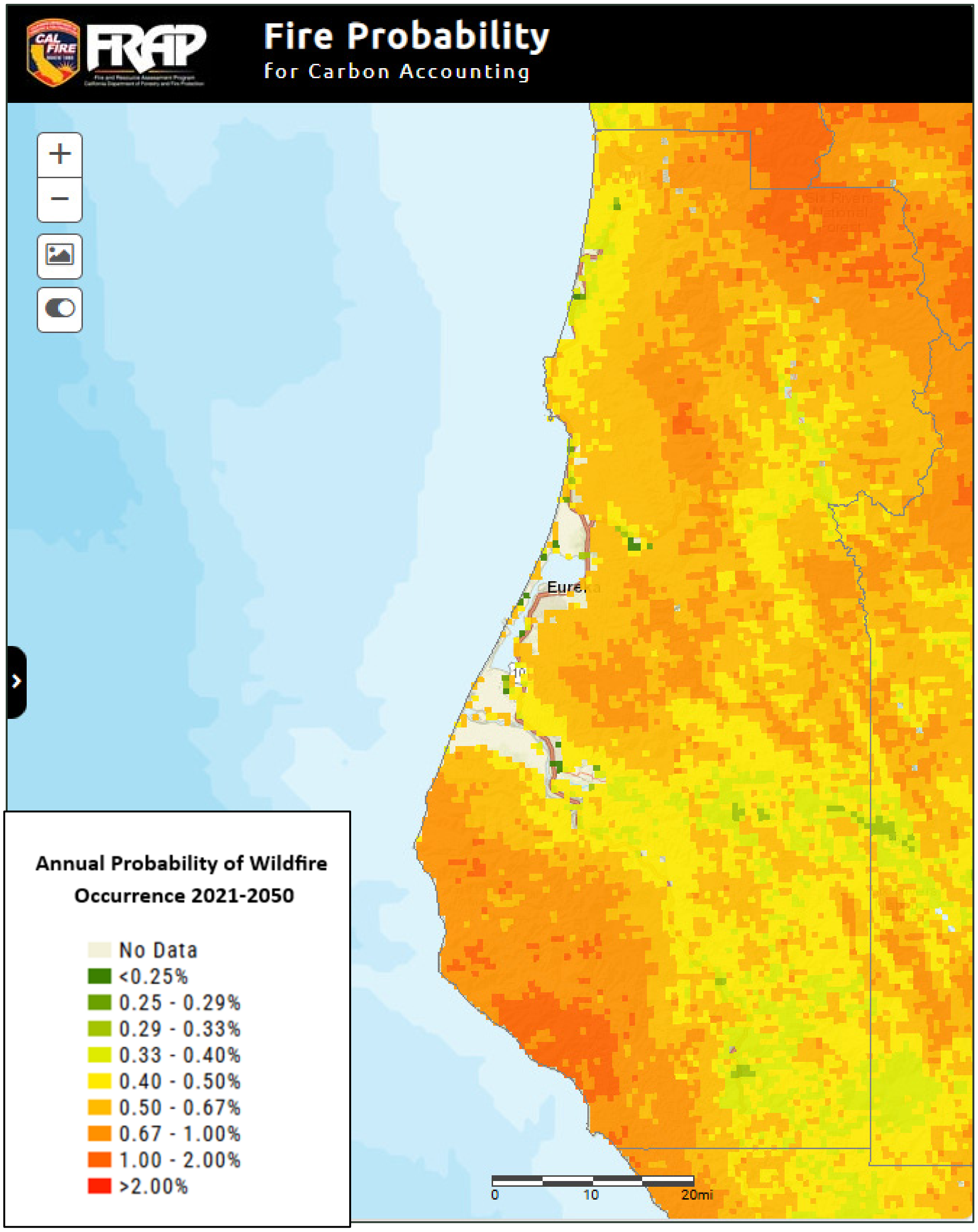

Figure 81: Future Annual Fire Probability

5.13.5.1. CLIMATE CHANGE CONSIDERATIONS

Climate change can affect the frequency, severity and impacts of wildfire. Changes in temperature, wind patterns, precipitation, pest and insect infestations, and human impacts and development patterns can all affect wildfire risk. According to Cal-Adapt, much of California can expect a wildfire season that starts earlier, runs longer and has more extreme fire events. As stated in the 2023 State Hazard Mitigation Plan, based on California's Fourth Climate Change

Assessment, California is likely to see a 50% increase in fires larger than 25,000 acres and a 77% increase in average area burned by the end of the century.

Humboldt County's CWPP notes significant climate trends that could affect wildfire risk and behavior. One is the trend toward lower snowmelt water equivalent and earlier snowmelt, which could mean less water availability in summer and fall. Also, minimum nighttime temperatures have risen. Changes in temperature, precipitation, fire frequency and severity in Humboldt County could lead to less predictable fire behavior and an overall increase in fire risk.

Cal-Adapt provides data and tools for climate adaptation planning based on California's Fourth Climate Change Assessment. The graph in Figure 81 shows projections for the most likely outcome and range of potential areas that could burn in the future based on different emissions scenarios. Humboldt County can expect an increased risk of wildfire that starts earlier, runs longer and experiences more extreme fire events.

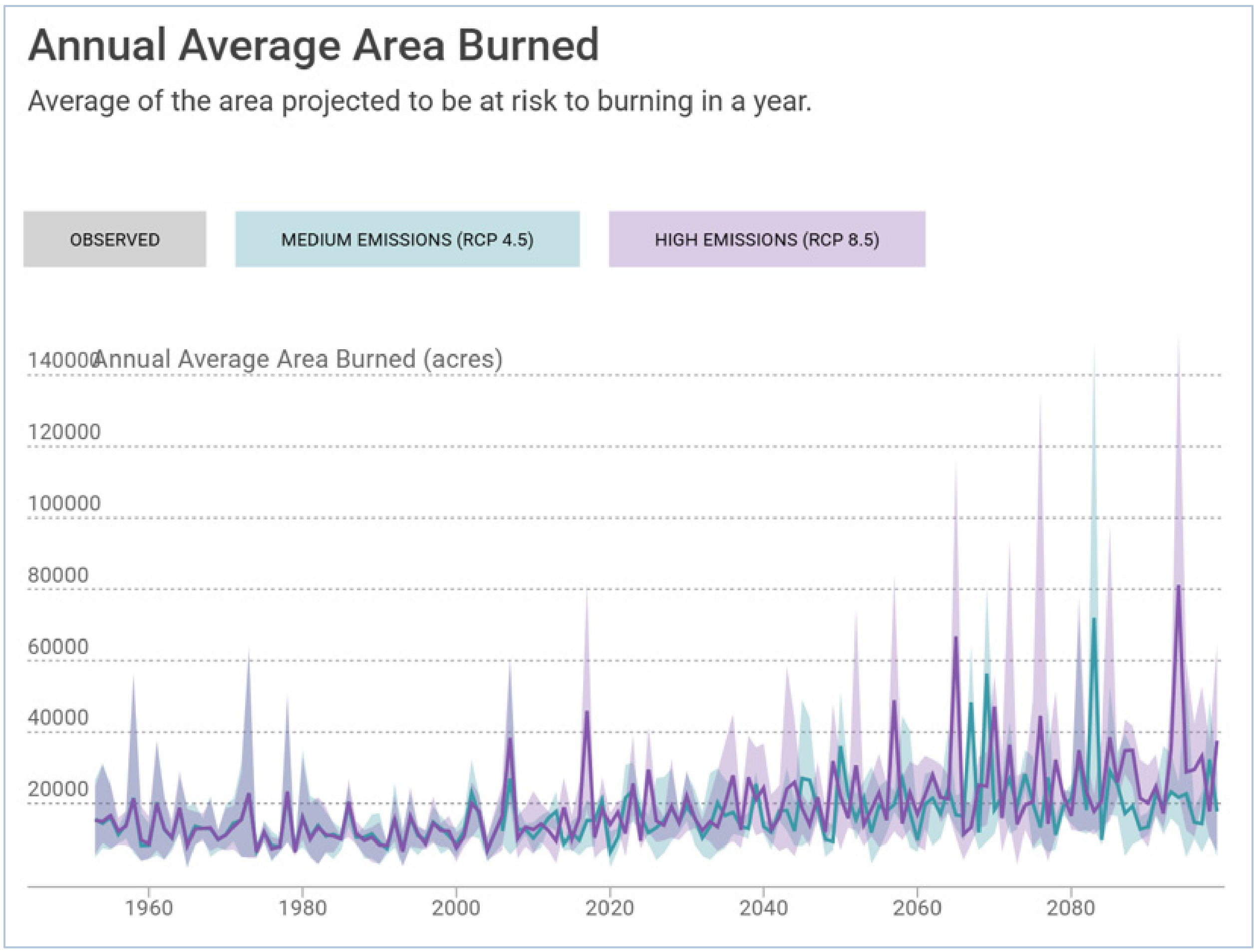

Figure 82: Cal-Adapt's Projected Average Area at Risk of Fire in Humboldt County

5.13.6. Vulnerability

Humboldt County is large, with much of the county covered in forested, hilly terrain and identified as a moderate to very high hazard for fire. The physical conditions and history of frequent wildfires indicate a high probability of future wildfires. The resident population is widely distributed across the county, and response times can be very long. Some areas have narrow roads that are difficult for emergency response access and residential evacuation, and where alternative access routes are not available.

All people and property exposed to wildfire hazard are vulnerable. Vulnerability includes potential loss of life, damage or destruction of buildings and infrastructure, and damage to natural resources including vegetation, wildlife and water resources. Fires can move quickly and overwhelm an initial response. Smoke and air pollution from wildfires can be a health hazard, especially for children, the elderly and those with respiratory and cardiovascular diseases. People with access and functional needs may be especially vulnerable if an evacuation is needed. Wildfires also threaten the health and safety of responders.

According to the Humboldt County CWPP, the Department of Interior's "Notice of Urban-Wildland Interface Communities in the Vicinity of Federal Lands That Are a High Risk from Wildfire" and the analysis of the CWPP determined that the following populations are at high risk of wildfire: Arcata, Bayside, Beatrice, Berry Glen, Big Lagoon, Big Lagoon Rancheria, Blue Lake, Blue Lake Rancheria, Bracut, Bridgeville, Ettersburg, Friday/Morton Ranch, Honeydew, Hoopa Valley Indian Reservation, Kuhn Ranch/Ammon, Maple Creek, Myrtletown, Orick, Orleans, Patrick's Point, Rohnerville, Shelter Cove, Trinidad Rancheria, Weitchpec, Westhaven-Moonstone, Willow Creek.-

Figure 83 shows the critical infrastructure in the planning area vulnerable to wildfire.

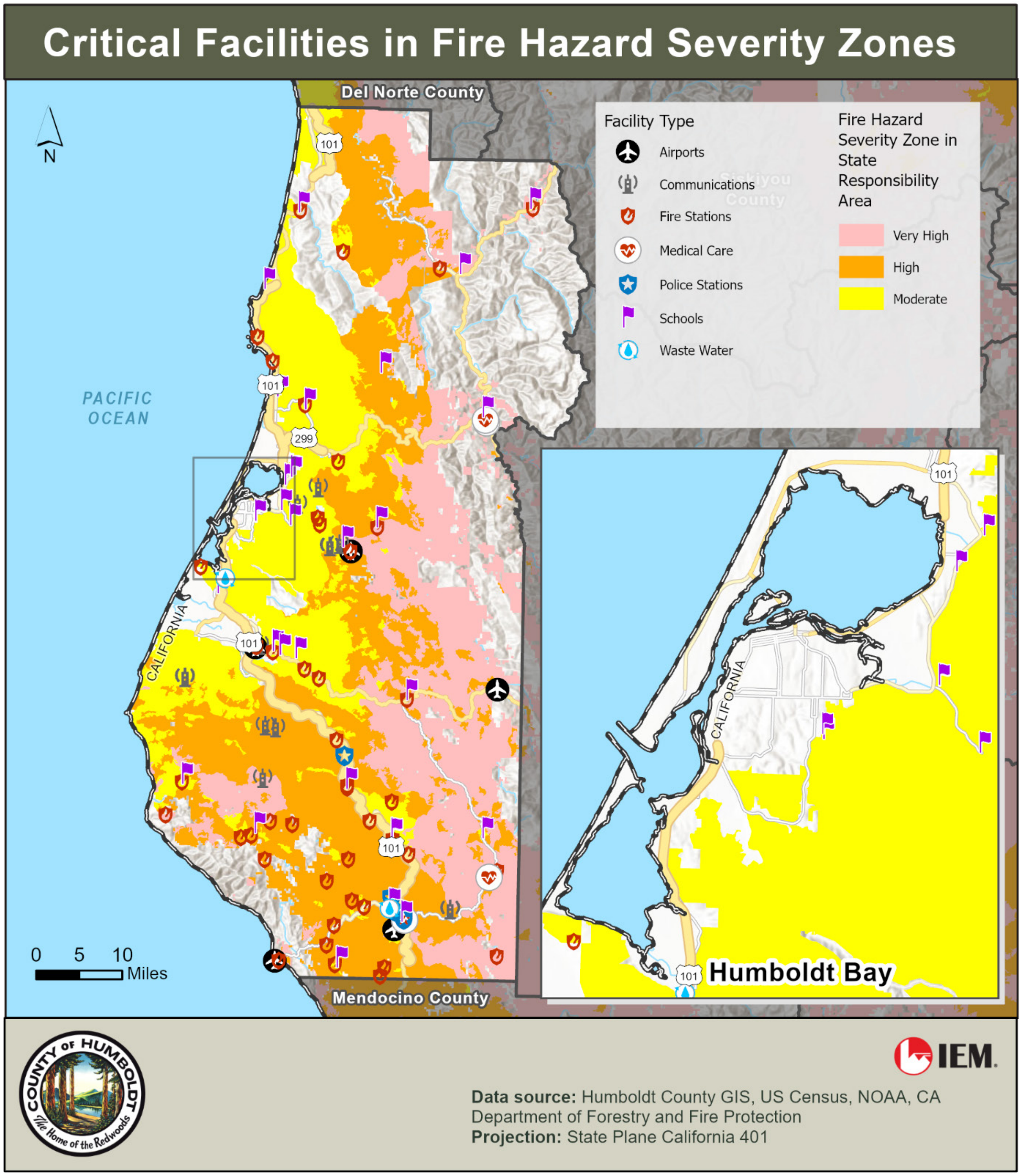

Figure 83 Critical Infrastructure in Fire Hazard Severity Zones

Table shows the count of critical infrastructure facilities at risk of wildfire.

Facility Type	Severity Zone	Count of Structures	Replacement Cost in Thousands of Dollars
Airport Facilities	Moderate	2	$10,600
	High	2	$10,600
	Very High	1	$5,300
Communications Facilities	Moderate	16	$1,888
	High	3	$354
	Very High	2	$236
Fire Station Facilities	Moderate	21	$24,055
	High	21	$24,676
	Very High	6	$6,651
Medical Care Facilities	Moderate	0	$0
	High	2	$22,024
	Very High	2	$6,001
Police Station Facilities	Moderate	1	$3,598
	High	3	$10,795
	Very High	0	$0
School Facilities	Moderate	23	$51,480
	High	6	$11,631
	Very High	5	$5,103
Waste Water Facilities	Moderate	1	$171,952
	High	1	$171,952
	Very High	0	$0

5.13.7. Impacts

Wildfires can have widespread impacts on the people, property, critical infrastructure and natural environment of Humboldt County. People who live, work or recreate in areas where fires may occur are at risk for injury or loss of life from wildfire. Some residences are in remote locations and may have limited egress routes. Residents may experience short-term displacement from their homes due to evacuations or long-term displacement if their residence is damaged or destroyed by fire. Hikers, campers and other outdoor recreationists may be exposed to wildfires and may have less awareness of appropriate actions to avoid danger. Tourists may lack understanding of routes for evacuation or where to seek shelter. Individuals with access and functional needs may need additional support to evacuate to safe locations. Poor air quality from wildfire smoke can negatively affect the health of populations that are not in close proximity to the active wildfire.

Wildfires can physically damage or destroy residences, businesses and other structures. Many homes in the area are wood-frame construction, built prior to the implementation of 2008 wildfire building code standards, and are located in high and very high severity zones, which means they may be at greater risk of damage. In addition to the cost of physical damage, businesses may experience financial losses during a wildfire due to closures from evacuation, inaccessible transportation routes, employees unable to come to work, or power or communication systems damaged or disrupted by wildfire.

Critical facilities and infrastructure can also be damaged or disrupted by wildfires. Roads and bridges can be blocked by debris or be impassable due to unsafe wildfire-related conditions. Utility poles or lines, including power and communication systems, can be damaged by fire, or power service may be disrupted due to PSPS protocols. Reliable water supplies are critical for fire response and suppression in high-risk wildfire areas.

Fire is a natural and critical process in most terrestrial ecosystems. However, it can also cause severe negative environmental impacts. Fire destroys vegetation and has negative consequences for wildlife habitat. Increased water temperature, sedimentation and other changes to water quality can damage habitat for fish and other species. Soil can lose nutrients or become sterilized by extreme heat. Exposed soil is also more susceptible to erosion. The topsoil can become water-repellent, which along with loss of vegetation contributes to increased runoff and the potential for post-fire debris flows.

As accelerated soil erosion occurs, landslides may be more likely, and additional damage to aquatic habitats may follow. Non-native plants can invade burned areas, dominate broad landscapes, and become difficult and costly to control. Timber can be destroyed, leading to smaller timber harvests. Other agricultural resources such as grazing land could also be affected. Wildfire can also destroy cultural and historic resources, including scenic vistas and recreational areas, which can contribute to economic losses.

5.13.8. Changes in Development

The California Building Code sets minimum standards for designing and constructing buildings in fire hazard zones. Newly permitted buildings in Humboldt County’s SRA in must adhere to defensible space laws, which manage flammable materials around the building, and use fire-resistant materials as specified in Chapter 7A of the Building Code. Since January 1, 2008, new residential construction permitted in these areas have been built according to the standards outlined in the 2007 California Building Code Chapter 7A, "Materials and Construction Methods for Exterior Wildfire Exposure."

In addition, the Humboldt County General Plan and the plans for each municipal planning partner include policies for managing development in fire hazard severity zones. The planning area is well equipped with these tools, and this process has asked each planning partner to assess its capabilities with regards to the tools. As the planning area grows and if the recommendations of this plan are implemented, it is anticipated that exposure to this hazard will remain as assessed or even decrease over time due to these capabilities.

State and local policies and regulations require landowners to carry out activities such as maintaining defensible space and reducing vulnerability to damage or loss from wildfire. The most important policies and regulations related to residential wildfire safety in Humboldt County are as follows:

- **General Plan Safety Element Review:** Government Code 65302.5 — The Board of Forestry and Fire Protection (BOF) must provide recommendations to a local jurisdiction's General Plan Safety Element at the time that the General Plan is being amended. BOF recommendations include goals and policies that provide for contemporary fire-prevention standards for the jurisdiction. This is not a direct and binding fire-prevention requirement for individuals.
- **Sprinkler Systems:** California Residential Code, Chapter 3, Section R313 — All new dwellings, dwelling units and one- and two-family townhomes must be equipped with an automatic fire-sprinkler system that can protect the entirety of the dwelling. Dwellings and homes constructed prior to January 1, 2011, that do not have a sprinkler system may be retrofitted, but it is not required. This code is locally enforced by the Humboldt County Planning and Building Department.
- **Fire Safety Standards:** California Public Resources Code 4290 and 14 California Code of Regulations (CCR) 1270 — These regulations govern roads, driveway width, clearance, turnarounds, signing and water related to fire safety throughout California. Public Resources Code 4290 is typically enacted through regulation at the county level, as described below.
- **SRA Fire Safe Regulations:** Humboldt County Code Title III, Div. 11 — These standards to reduce the risk of fire apply to proposed development in the SRA. They are a locally adopted equivalent to the state's SRA Fire Safe Regulations and have been approved by the BOF as meeting or exceeding state regulation. The Humboldt County Planning and Building Department, with CAL FIRE, oversees the development permitting process to ensure that these standards are met. County Building Division staff inspect vegetation clearance and other improvements at the time of construction.
- **Wildland-Urban Interface Building Standards:** California Government Code 51189 — The Office of the State Fire Marshal is required to create building standards for wildfire

resistance. Construction of buildings in the wildland-urban interface must use fire-resistant materials to save life and property. As of 2011, the standards relevant to fire-safe construction for all new structures in the SRA are the California Building Code, Chapter 7A (for commercial construction) and the California Residential Code, Chapter 3, Section R327 (for residential construction). Humboldt County has adopted these codes.

- **State Responsibility Area:** Public Resources Code 4102, 4125-4229 and 14 CCR 1220 — These statutes and regulations establish the locations where CAL FIRE has the financial responsibility for preventing and suppressing fires. These designations define financial arrangements for fire protection services and establish the locations where fire-safe and defensible space laws or regulations apply.
- **Hazardous Fire Areas:** Public Resources Code 4251-4255 and 14 CCR 1200 — These laws and regulations allow petitioners to the BOF or CAL FIRE to establish hazardous fire areas, providing for area closures and other restrictions for fire prevention.
- **Defensible Vegetation Clearing Around Structures:** Public Resources Code 4291/14 CCR 1299 — Public Resources Code 4291 regulates fuel management around a property. It states that a person who owns or controls a building or structure in or adjoining forest, brush, or grass-covered lands shall follow certain guidelines outlined in the code. At least 100 feet of defensible space is required. The owner of the property is liable for making these changes to protect habitable structures. The 100 feet is separated into two zones, with the closer zone, 30 feet out from the structure, being managed more intensively.

5.13.9. Community Lifelines

Table 76 lists the impacts on community lifelines and their vulnerability to wildfire.

Table 76: FEMA Community Lifelines Impacted by Wildfire

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Water Systems	There are no recorded incidents of damage to water systems from wildfire in Humboldt County.	• Infrastructure damage: Water treatment facilities, pumping stations, storage tanks and wastewater facilities can be damaged by wildfire. • Contamination of water supply: Excessive sediment, debris and chemicals can infiltrate drinking water sources following a wildfire. • Disruption of wastewater treatment: Overflows and damage to wastewater plants can result in raw sewage entering water bodies, posing public health risks. • Increased erosion and sedimentation from runoff after a wildfire, reducing water quality.
Transportation	The Point Fire and Hill Fire in 2024 both required several road closures.	• Critical transportation routes may be inaccessible due to wildfire. Routes may need to be closed to travel or restricted to emergency response and evacuation. • Evacuation may lead to traffic gridlock and other challenges. Extreme or fast-moving fire may block routes, delaying emergency evacuations and response. • Roads in hilly terrain are sometimes narrow and winding, which can be difficult for emergency vehicles to navigate. Some are dead-end spur roads that don't offer alternative egress.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Energy	There are no recorded incidents of damage to energy systems from wildfire in Humboldt County.	• Power outages: Wildfire can damage power plants, substations and transmission lines, leading to widespread blackouts. • Disruption of fuel supply: Gas and oil storage tanks may be damaged, causing fuel shortages. • Public Safety Power Shutoffs: planned power outages initiated high wildfire risk conditions, such as high winds and other severe weather. These are intended to reduce the risk of wildfire ignition from power sources that pose a disruption to the provision of energy service to the community.
Food, Hydration, Shelter	The 2021 Knob Fire required evacuations and sheltering of residents who were temporarily displaced.	• Food supply disruption: If major transportation routes are closed due to wildfire, shortages of food and other basic necessities may occur. • Loss of agricultural land: Farmland, pastures and other agricultural resources can be burned by wildfire, killing crops or livestock and reducing food production. • Damage to shelters and homes: Wildfire can destroy homes, leading to displacement. • Economic impact: The destruction of homes, businesses and agricultural land reduces long-term food security.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Safety and Security **Safety and Security**	Several past fire incidents have required evacuations or evacuation warnings that require involvement of safety and security lifeline resources.	• Loss of lives: Wildfire can lead to casualties if residents are not able to evacuate ahead of a quick-moving fire. • Displacement crisis: Thousands may be forced to evacuate, which would strain shelters and emergency services. • Increased crime risks: Disruptions to law enforcement and emergency response can lead to looting and civil unrest. • Mental health trauma: Survivors may experience long-term psychological distress due to sudden displacement and loss of property. • Challenges for first responders: Emergency response personnel may struggle to access affected areas due to impassable roads.
Health and Medical **Health and Medical**	Poor air quality is associated with most wildfires. This has likely had health impacts for residents over a large area, but documentation of specific historic impacts is not currently available. A firefighter was killed by a falling tree while responding to the Lone Pine fire in 2023. Fourteen people were injured in the 2015 Humboldt Complex fire.	• Damage to hospitals and clinics: Wildfire can incapacitate health care facilities, or a surge in people requiring treatment may reduce the ability to treat injuries. • Injuries and fatalities: Wildfire can cause burn injuries or fatalities. Poor air quality can also have health impacts, particularly for those with other cardiac or pulmonary health conditions. Burned trees can fall and cause injuries to residents or responders. • Long-term health effects: Wildfire can leave contaminants in the soil and water. This may require testing and soil remediation to reduce negative health impacts. These efforts can be time-consuming and costly.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Communications	There are no recorded incidents of damage to communications lifelines from wildfire in Humboldt County.	• Damage to communication infrastructure: Cell towers, radio stations and internet infrastructure may be damaged or destroyed. • Loss of emergency communication: Emergency services may struggle to coordinate rescue operations without reliable communication. • Power loss impacts communication: Without electricity, phones, radios and the internet may be inaccessible. • Increased demand on communication networks: Network congestion can slow down or block critical calls and emergency alerts. • Long-term outages: Repairing communication networks can take weeks or months, delaying information sharing.
Hazardous Materials	There are no recorded incidents related to hazardous materials from wildfire in Humboldt County.	• Chemical releases: Industrial sites, wastewater treatment plants and hazardous material storage facilities may be damaged by wildfire, releasing toxic chemicals into the environment. • Fire and explosion risks: Damage to industrial storage tanks can cause fires and explosions. Some materials are reactive to heat and can cause explosions or other reactions if exposed to fire. • Health risks to communities: Exposure to hazardous materials can lead to acute and chronic health effects, including respiratory illnesses and poisoning.

5.14. Wind

5.14.1. Hazard Description

Strong winds are defined as damaging winds that exceed 58 mph. Damaging winds are one of the most common types of severe weather often associated with severe thunderstorms. The types of damaging winds defined in this section are straight-line winds, downdrafts, downbursts, microbursts and gust fronts, as detailed in Table 77.

Table 77: High Wind Definitions

Type of High Wind	Definition
Straight-line Winds	Wind that comes out of a thunderstorm but is not associated with rotation.
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 of damaging winds on or near the ground.
Microburst	A small, short-lived, concentrated downburst that produces an outward burst of damaging winds at the surface.
Gust Front	A wind shift, temperature drop and gusty winds out ahead of a thunderstorm. Sometimes the winds push up the air above them, forming a shelf cloud or a detached roll cloud.

Humboldt County might also experience strong winds associated with atmospheric rivers (called the "Pineapple Express" because moisture builds up in the tropical Pacific around Hawaii and can wallop the U.S. and Canada's West Coasts with heavy rainfall and snow) that are responsible for extreme rainfall and subsequent flooding. These events can affect the entire west coast of North America, often disrupting travel and damaging property in the process.

5.14.1.1. CASCADING HAZARDS

One of the most substantial cascading hazards associated with severe wind is wildfire. Downed power lines due to severe wind can ignite wildfires. Recent wildfires in California, including some of the most deadly and costly wildfires in California history, have had a wind-driven component. Wind can increase the updraft generated by wildfires. High winds spread embers and accelerate rapid wildfire spread. Wind-blown vegetative debris can also accumulate, igniting additional wildfires. High winds and rapidly intensifying wildfires can surprise residents and first responders, overwhelming firefighting capabilities and endangering lives.

Wind can also interact with other coastal hazards such as coastal erosion and flooding. Wind blowing in from offshore can cause high surf, which can lead to coastal erosion and threaten lives on the beach or in the water. Atmospheric river conditions can combine the threat of both strong winds and a flood event.

5.14.2. Location

Humboldt County experiences hot, dry easterly winds during the fall (August to November, peaking in October) in the eastern region of the county. These events are weaker and more inconsistent compared to other parts of California due to the region's complex coastal terrain. These winds are typically localized to higher elevations, where they can be extremely dry (relative humidity below 5%) and strong, while struggling to reach the coast and populated areas. Easterly wind events are often unpredictable and vary widely by location. The northern part of the county (e.g., Bald Hills) sees stronger signals, though the southern areas (e.g., King Range) also experience them.

5.14.2.1. WIND ZONES

Figure 82 illustrates the wind zone for the coastal northwestern portion of the state as Zone I, with a wind speed potential of 130 miles per hour. Segments of inland areas are designated as special wind regions of the state.

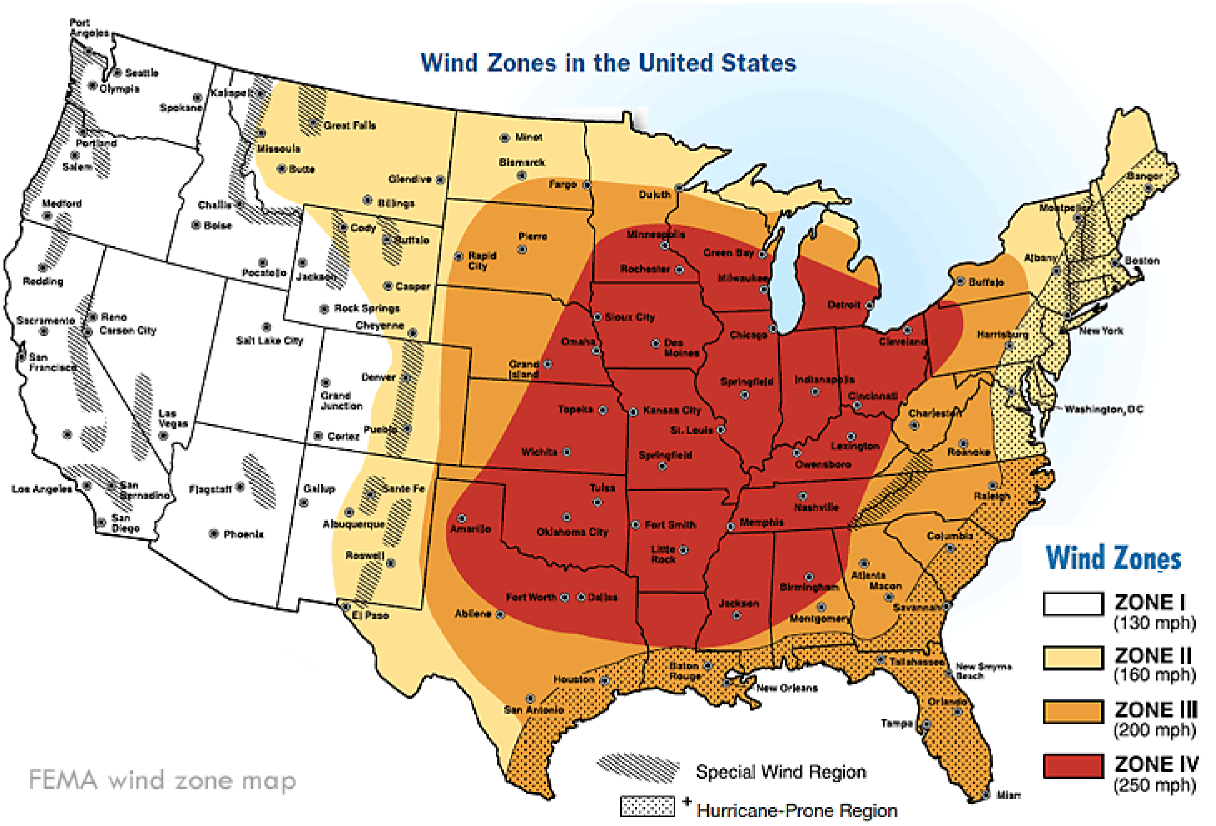

Figure 84: Federal Emergency Management Agency Wind Zone Map of the United States

5.14.2.2. ATMOSPHERIC RIVERS

Atmospheric rivers have made landfall across Humboldt County. Atmospheric rivers typically begin in tropical regions and travel along weather systems toward cooler areas, typically west to east. According to the Center for Western Weather and Water Extremes, Humboldt County has experienced atmospheric rivers most frequently in November, December and January.

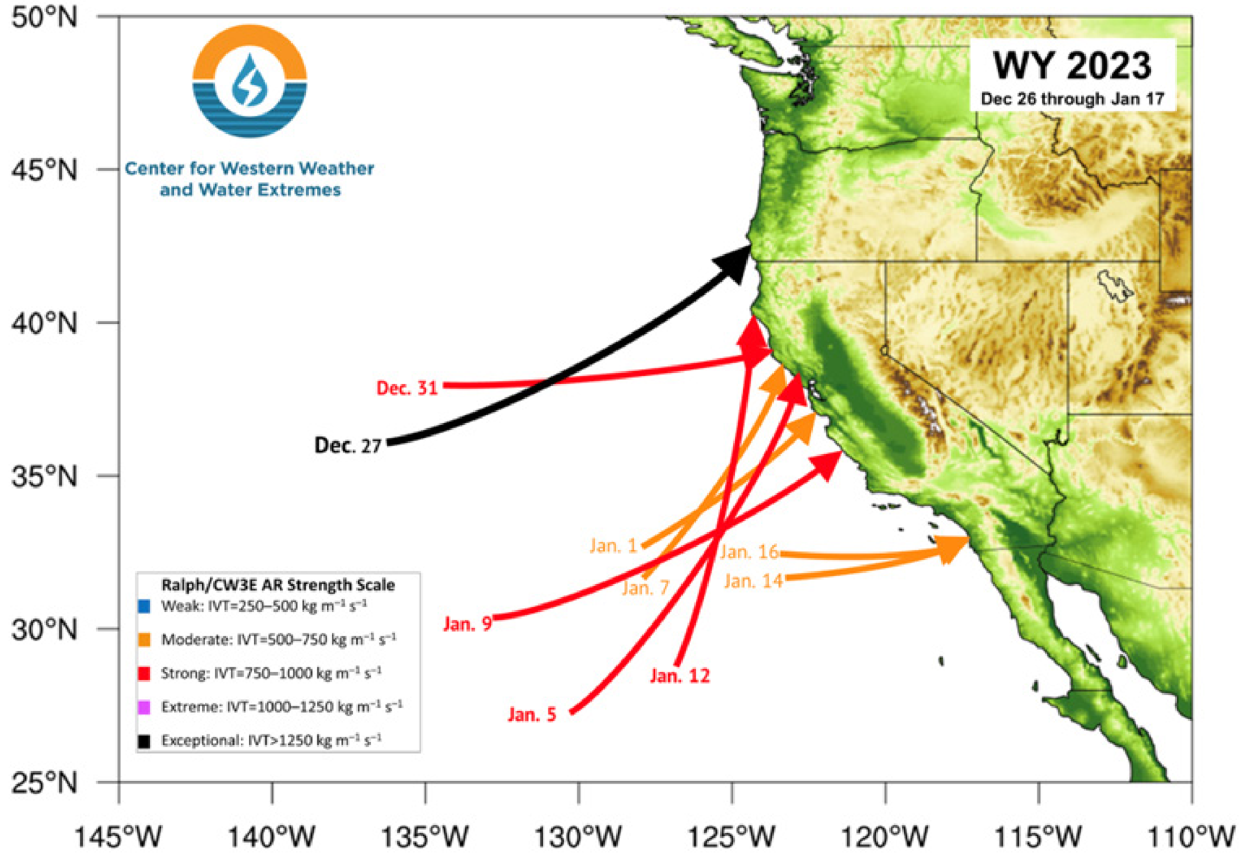

Figure 85: Center for Western Weather and Water Extremes Atmospheric Rivers, December 2022–January 2023

5.14.3. Extent

To estimate the wind strength and measure the extent or magnitude of a windstorm, we use the Beaufort scale. The scale ranges from 0 (calm winds) to 12 (hurricane-force winds). Invented by Sir Francis Beaufort (1774-1857), it was once used to help sailors estimate wind conditions. Now, it is the standard tool for measuring wind strength. Table 78 shows the Beaufort Wind Scale Ratings, which describe the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

Table 78: Beaufort Wind Scale Ratings

Force	Wind (mph)	World Meteorology Organization Classification	Appearance of Wind Effects
0	Less than 1	Calm	Calm, smoke rises vertically

Force	Wind (mph)	World Meteorology Organization Classification	Appearance of Wind Effects
1	1-3	Light Air	Smoke drift indicates wind direction; wind vanes are still
2	4-8	Light Breeze	Wind felt on face, leaves rustle, wind vanes begin to move
3	9-14	Gentle Breeze	Leaves and small twigs constantly moving, light flags are extended
4	15-21	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	22-28	Fresh Breeze	Small trees and leaves begin to sway
6	29-36	Strong Breeze	Larger tree branches moving, whistling in wires
7	37-44	Near Gale	Whole trees moving, resistance felt when walking against wind
8	45-53	Gale	Breaks twigs off trees; generally impedes progress
9	54-62	Strong Gale	Slight structural damage occurs; slate blows off roofs
10	63-72	Storm	Seldom experienced on land, trees broken or uprooted; considerable structural damage
11	73-83	Violent Storm	If experienced on land, widespread damage
12	84+	Hurricane	Violence and destruction

We also use the services of the NWS, which issues wind advisories and warnings that are normally site-specific. High wind advisories, watches and warnings are issued by the NWS when wind speeds may pose a hazard or may be life-threatening. The criteria for each of these varies from state to state. Table 79 describes the NWS Wind Watches and Warnings to alert the public about high wind events.

Table 79: National Weather Service Wind Warnings, Watches and Advisories

Watches and Warning Types	Description of Alert Action
High Wind Warning	**Take Action!** Sustained, strong winds with even stronger gusts are happening. Seek shelter. If you are driving, keep both hands on the wheel and slow down. The NWS offices issue this product based on local criteria.
High Wind Watch	**Be Prepared!** Sustained, strong winds are possible. Secure loose outdoor items and adjust plans as necessary so you're not caught outside. The NWS offices issue this product based on local criteria.
Wind Advisory	**Take Action!** A Wind Advisory is issued when strong winds are occurring but not so strong as to warrant a High Wind Warning. Objects that are outdoors should be secured and caution should be taken when driving. The NWS offices issue this product based on local criteria.
Dust Storm Warning	**Take Action!** A Dust Storm Warning is issued when visibility is 1/2 mile or less due to blowing dust or sand, and wind speeds are 30 miles per hour or more.
Severe Thunderstorm Watch	**Be Prepared!** A Severe Thunderstorm Watch is issued when severe thunderstorms are possible in and near the watch area. Winds of 58 mph or higher and/or hail 1 inch or larger are possible in a severe thunderstorm. Secure items outdoors that may blow around in high winds. Stay informed and be ready to take action.
Severe Thunderstorm Warning	**Take Action!** A Severe Thunderstorm Warning is issued when severe thunderstorms are happening or are imminent in the warning area. Severe thunderstorms have wind 58 mph or higher and/or hail 1 inch or larger. Seek shelter inside a sturdy building, away from windows.
Gale Warning	**Take Action!** Gale Warnings are issued for locations along the water when one or both of the following conditions are expected to begin within 36 hours and are not directly associated with a tropical cyclone: sustained winds of 34 to 47 knots (39 to 55 mph) or frequent gusts (duration of two or more hours) between 34 knots and 47 knots. Make sure your vessel is secure in port.
Hurricane Force Wind Warning	**Take Action!** Hurricane Force Wind Warnings are issued for locations along the water when one or both of the following conditions are expected to begin within 36 hours and are not directly associated with a tropical cyclone: sustained winds of 64 knots or greater or frequent gusts (duration of two or more hours) of 64 knots (74 mph) or greater. Make sure your vessel is secure in port.

5.14.4. History of Previous Hazard Events

Based on the FEMA Disaster Declarations Database, Humboldt County has received three major disaster declarations for severe weather that included severe wind damage between 2019 and 2024.

NOAA's NCEI database for the period between 2019 and 2024 in Humboldt County reports that there were 108 recorded High Wind, Marine High Wind, Marine Strong Wind, Marine Thunderstorm Wind, Strong Wind and Thunderstorm Wind events documented in NCEI reports. There were no deaths and two injuries, $10.318 million in property damage, and no reported crop damage associated with the incidents reported.

Although the NCEI data establishes a record of wind events during this time period since the last plan update, it does not provide a complete picture of the weather as a result of each reported event, or the impacts felt in the entire planning area. Table 80 provides an overview of significant wind events in Humboldt County from 2019 to December 2024.

Table 80: NOAA-NCEI Previous Hazard Events, 2019-2024

Date	Event Type	FEMA Declaration Number	Description of Damages
Feb. 24, 2019, to March 1, 2019	Severe Winter Storms and Flooding	DR-4434	A series of heavy precipitation, snow, flooding and winds impacted Northern California. Numerous downed trees caused power outages and closed roadways. Property damage was estimated at over $1,000,000.00.
Jan. 26, 2021	Strong Wind	N/A	A series of strong upper waves moved east-southeast across northwest California, resulting in periods of strong winds and mountain snow. Multiple trees were down on Highway 96 north of Willow Creek, leading to a full overnight road closure. The nearest wind observation reported gusts up to 37 mph. Property damage was reported at $6,000.

Date	Event Type	FEMA Declaration Number	Description of Damages
Dec. 10, 2022	Strong Wind	N/A	Deep-layer westerly flow occurring along a zonally oriented quasi-stationary frontal boundary yielded a multiday atmospheric river event across northwest California. Widespread impacts due to heavy rain and strong winds were observed across the region. One victim was trapped in a vehicle for 12 hours and sustained major injuries from a fallen tree. Another vehicle hit a tree that had fallen across Highway 101. Property damage was reported at $30,000.
April 29, 2022	Strong Wind	N/A	A tightening pressure gradient between building high pressure over the East Pacific and a low over the Central Valley led to gusty north winds across northwest California. A large tree fell on a house, causing damage but no injuries. Power lines were also knocked down. The exact wind speed is unknown. Property damage was reported at $7,500.
Jan. 4, 2023	Strong Wind	N/A	A quasi-stationary westerly upper flow regime yielded multiple atmospheric rivers over Northwest California. The impacts in the county were widespread. Fallen trees resulted in the closure of portions of Highway 101, including a section near Big Lagoon and Sue-meg State Park. In addition, multiple secondary roads were closed, power lines destroyed, and homes damaged. Wind speeds estimated at 65 mph and property damage was reported at $160,000.

Date	Event Type	FEMA Declaration Number	Description of Damages
Feb. 21, 2023, to July 10, 2023	Severe Winter Storms, Straight-line Winds, Flooding, Landslides and Mudslides	DR-4699	Winter storms, including an atmospheric river system, prompted the NWS to issue freeze warnings, frost advisories and flood watches. Heavy rain, snow and gusty winds caused by these storms continued throughout the state, especially in the mountains and foothill regions, resulting in significant travel impacts and residents being snowed in or stranded. The storms brought significant precipitation, avalanche and flood concerns, and triggered evacuation warnings. The storms caused damage and forced the closure of federal and state highways and roads and also damaged and continue to threaten critical infrastructure, homes and buildings.
Dec. 27, 2022, to Jan. 31, 2023	Severe Winter Storms, Flooding, Landslides and Mudslides	DR-4683	Storms related to a series of atmospheric river systems brought heavy rainfall, flooding, strong winds and wind gusts, falling debris, downed trees and widespread power outages. The storms forced closures and caused damage to highways and roads, levee and culvert failures and mandatory evacuations.
March 2023	High Wind	N/A	Steep pressure gradients accompanied active winter weather, with peak winds and wind gusts causing damage and road closures as well as heavy rain. Fallen trees resulted in the closure of portions of Highway 101, including areas near Orick. The high winds also caused downed power lines and other property damage throughout the county. Property damage was reported at $10,000,000.

Date	Event Type	FEMA Declaration Number	Description of Damages
March 1, 2024	High Wind	N/A	A deep trough brought widespread hail showers and snow to northwest California. The mountains received heavy snowfall, while hail showers along the coast caused numerous traffic accidents. High winds led to power outages across various locations: 1,600 people affected near Hoopa, 576 customers 5 miles north of Trinidad, 1,144 people 1 mile north-northwest of Miranda, and 1,431 customers 1 mile south-southeast of Eureka. Additional outages ranged from 1 to 49 customers near Fieldbrook and 94 customers near Westhaven-Moonstone. Property damage was reported at $52,500.

Table 81 provides California state wind event declarations since the last plan update.

Table 81: California State Declarations

Date	Event Type	Description of Damages
March 1, 2023	Straight-line Winds	Governor Gavin Newsom proclaimed a state of emergency due to winter storms that struck California beginning in late February. Humboldt County declared a local emergency. The county estimated local losses at $150,000 for emergency protective measures and $4.6 million in permanent work projects. A community water supply also ruptured, and residents had to evacuate.
June 21, 2024	Severe Winter Storms with High Winds	Governor Gavin Newsom proclaimed a state of emergency for the February 2024 severe winter storms (“February 2024 Storms”), including a series of atmospheric river events, that struck California between February 9, 2024, and February 29, 2024, impacting Humboldt County. The February 2024 storms brought heavy rain, flooding and high winds across the state, which caused landslides, slip-outs, potholes, various road closures, debris flows and widespread power outages.

5.14.5. Probability of Future Hazard Events

There is no specific data that shows the probability of future wind hazards for Humboldt County, but based on historical evidence, the probability of future severe weather events occurring is highly likely. The 2023 California State Hazard Mitigation Plan states the following regarding probability of future severe weather events, including wind hazards: "According to FEMA, NOAA and the 2018 State Hazard Mitigation Plan, the State of California experienced over 2,500 severe weather events between 1950 and 2022. This equates to an average of 35 severe weather events each year. Overall, the State can expect to experience at least a similar average frequency of these events in the future, with the possibility of an increase in frequency due to the impacts from climate change."

5.14.5.1. CLIMATE CHANGE CONSIDERATIONS

In a 2014 research article in Science titled "Climate Change and Wind Intensification in Coastal Upwelling Ecosystems," Sydeman et al. found that wind intensity had been increasing along California's coast over the last 60 years. As global temperatures increase, higher temperatures and sea-level pressure gradients, which drive wind patterns, interact, causing an intensification of wind along coastal communities during the warm season (May-August). Climate change is also projected to increase the intensity of atmospheric rivers.

5.14.6. Vulnerability

Thunderstorm winds often result in widespread power outages, increasing the risk to vulnerable portions of the population who rely on power for health and/or life safety. These vulnerable populations include people who are elderly, low-income and/or linguistically isolated, people with life-threatening illnesses, and residents living in isolated areas. Power outages can be life-threatening to those dependent on electricity for life support.

5.14.7. Impacts

Strong winds can have a broad range of potential impacts on buildings, infrastructure, transportation routes, people and communities. Road closures are a significant concern in Humboldt County. Falling tree limbs, downed trees and downed power lines can close roads, disrupting transportation routes and causing delays. Winds can create treacherous driving situations, even when roads are passable. Vehicles, including high-profile trucks, are at higher risk of being blown over. Accidents pose a risk to public safety.

High winds can additionally damage or destroy terminals, hangars, runways, taxiways and aprons at airports. Bridges may be closed when winds reach a sustained speed, leading to travel delays or the inability to travel at all if the bridge leads off an island. Wind loading occurs when strong winds impose lateral forces on bridges, potentially leading to structural damage or collapse. Fallen trees and blown tree limbs or other debris can block roads. Fallen trees and flying debris can also damage communication infrastructure, including antennas, satellite dishes and transmission lines, causing service interruptions.

Damage to buildings can include collapsed roofs and damage to equipment, doors and windows, and structural components. Impact damage from wind-borne debris during storms or other hazards can cause doors, windows and walls to warp, crack or shatter, compromising a building's envelope and allowing water, wind and debris to enter. This can result in injuries from shattered glass and expose the building's interior to the elements.

Asphalt shingle roofs are susceptible to damage from strong winds, particularly if they are not properly installed or if the shingles are aged or worn. High winds can lift or tear off shingles, leaving the underlying structure exposed to further damage. Large debris or falling trees can cause partial or complete roof damage/failure, denting or buckling.

Strong winds or flying debris can cause physical damage to heating, ventilation and air conditioning (HVAC) equipment, such as bending and dislodging outdoor units, damaging ventilation systems and puncturing ductwork. Contaminant infiltration occurs when dust and debris from windstorms infiltrate HVAC systems — clogging filters, impairing airflow and reducing system efficiency. High winds can damage external plumbing fixtures and exposed pipes, which can cause water leaks, loss of water supply and potential water damage in a building.

Infrastructure damage can occur from wind-blown debris and downed trees or limbs. Wind can down power lines and damage transformers, substations and other equipment, causing power outages. Utility poles can be blown over, trees can fall on power lines and power substations, and wind can cause power lines to swing into one another, resulting in a fault or a short circuit, interrupting power services. Strong winds and flying debris can damage gas distribution facilities, pipelines and equipment.

5.14.8. Changes in Development

The Humboldt County Economic Development division reports that Humboldt County is at the forefront of renewable energy advances in the western United States. Recently, Humboldt was part of the first-ever federal action to build massive wind farms off California's coastline. This action, the first on the West Coast, netted bids exceeding $331 million for Humboldt and included two wind development areas located 20 miles offshore.

Future projects include foreign direct investment and supply chain opportunities expected to emerge from the nation's first commercial-scale floating wind turbine project off California's coast. The county is making efforts to foster valuable business-to-business connections and provide insights into supply chain opportunities arising in Northern California for port development, renewable energy and offshore wind. The vast potential of California's renewable energy landscape will lead to explorations into the synergies between technology, policy, community engagement and the pivotal role many organizations play in the renewable energy sector.

These development changes in the county indicate that vulnerability to wind events has remained unchanged since the last plan update.

5.14.9. Community Lifelines

Severe wind events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Table 82 lists the impacts on community lifelines and their vulnerability to wind events.

Table 82: FEMA Community Lifelines Impacted by Wind Events

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
 **Transportation**	Severe winds have created hazardous road conditions, causing accidents, road closures and disruptions in supply chains. Downed trees across roadways make travel dangerous and disrupt transportation routes.	• Supply chain disruptions: Blocked roads prevent deliveries of essential goods, including fuel and medical supplies. • Limited public transportation: Ice and snow can suspend bus and rail services, isolating communities. • Downed power lines may make roadways unsafe for use, preventing first responders from answering calls for assistance or rescue. During exceptionally heavy wind events, first responders may be prevented from responding to calls, as the winds may reach a speed at which their vehicles and equipment are unsafe to operate.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Energy	Power lines are particularly susceptible to high wind events. In heavily wooded Humboldt County, downed trees and falling tree limbs can commonly impact power lines. In some parts of the community, power outages largely due to wind can occur up to a dozen times a year.	• Power outages: Wind can damage power lines, leading to extended blackouts. • Worker safety concerns: Utility crews face hazardous conditions while restoring power.
Food, Hydration, Shelter	Residential structures have been impacted by wind, including from windborne debris such as tree limbs and falling trees. The public reported concerns with vulnerable populations like low-income residents being able to repair these damages. Sometimes, damages have gone unrepaired.	• Emergency shelter strain: Sudden demand for charging, cooling and warming centers during prolonged power outages from downed power lines may overwhelm resources.
Safety and Security	Severe storms with accompanying wind have resulted in increased calls for emergency service, downed trees blocking critical emergency service routes and loss of life from falling trees/debris.	• Increased fire hazards during prolonged power outages: Improper use of space heaters and fireplaces can cause house fires.
Health and Medical	There have not been significant reported impacts to health and medical lifelines in Humboldt County previously. That does not mean there have not been events, but that they may have been more limited in size and scope, such as responding to a wind-related injury.	• Power outages due to downed power lines may disrupt medical facilities, while road conditions can delay emergency medical response.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Communications	Severe wind events can damage communication infrastructure, disrupting phone and internet services. This impacts emergency alerts and coordination efforts during extreme weather events. The Alert Warning System for Humboldt County was impacted by wind in January 2023.	• Downed trees from severe wind to communication lines: Severe winds can snap power and communication lines. • Power outages impact communication: Blackouts limit access to information and emergency services. • Network congestion: Increased use of emergency calls and online updates can overload systems. • Challenges in emergency notifications: Service disruptions may delay weather warnings and alerts. • Prolonged service outages: Repairing communication infrastructure may take an extended time in severe conditions.
Hazardous Materials	Severe wind events can lead to hazardous material spills due to transportation accidents and infrastructure failures. Severe wind has not led to notable hazardous materials incidents to date in the planning area.	• Increased risk of transportation accidents: Strong winds can lead to hazardous material spills on roads. • Groundwater contamination: Runoff from road salt and other chemicals can impact water quality. • Exposure to toxic substances: Fires and spills caused by windstorm damage may pose health risks.

5.15. Winter Weather

5.15.1. Hazard Description

Severe winter weather in Humboldt County can bring heavy snowfall, freezing rain, ice, sleet and occasional blizzard conditions. These storms vary in intensity and size, often accompanied by dangerously low temperatures and strong winds. Significant snowfall or ice accumulation can lead to structural damage by causing roofs and power lines to collapse, resulting in extended power outages. Road conditions can quickly become treacherous, reducing visibility and creating hazards for motorists, emergency responders and essential service providers. In addition, those without adequate shelter during severe winter storms face increased risks of frostbite, hypothermia and, in extreme cases, loss of life.

5.15.1.1.BLIZZARDS AND EXTREME COLD

Blizzards occur when temperatures plummet, winds exceed 35 mph, and snow — whether falling or being blown around — reduces visibility to near zero for at least three hours. These conditions create dangerous travel hazards and increase the risk of power outages due to downed power lines and fallen trees.

Extreme cold events happen when temperatures drop significantly below average, often for an extended period. While freezing temperatures are not uncommon in Humboldt County, dangerously low temperatures can increase the risk of frostbite, hypothermia and other cold-related illnesses. Extreme cold can occur alongside severe weather, such as blizzards or ice storms, but can also strike on clear, sunny days.

5.15.1.2.HEAVY SNOW AND SNOW SQUALLS

Heavy snowfall, as defined by the NWS, occurs when at least 4 inches accumulate within 12 hours or 6 inches within 24 hours. Snow squalls — short-lived but intense bursts of heavy snow combined with strong winds — can create whiteout conditions and hazardous travel conditions. Snowstorms, which involve sustained heavy snow and strong winds, can significantly impact local infrastructure, transportation and the economy, with effects influenced by factors such as terrain, temperature and storm duration.

5.15.1.3.SLEET AND FREEZING RAIN

Sleet and freezing rain present major hazards during winter storms. Sleet consists of ice pellets formed from partially melted snowflakes that refreeze before reaching the ground, often bouncing upon impact. Freezing rain, however, remains liquid until it contacts a surface at or below 32 F, forming a hazardous layer of ice. Even small amounts of freezing rain can create dangerous conditions for pedestrians and motorists, while significant ice accumulation can bring down power lines and trees, leading to widespread outages. When ice accumulations reach damaging levels, these conditions are classified as ice storms, which pose serious risks to infrastructure, transportation and public safety.

5.15.1.4. CASCADING HAZARDS

Severe winter weather can set off a chain reaction of hazards that intensify the overall impact on communities. One of the most immediate threats is power outages, as heavy snow, ice accumulation and strong winds can bring down power lines and utility poles, leaving residents without electricity for extended periods. Without power, heating systems fail, increasing the risk of hypothermia and other cold-related health concerns. Transportation disruptions are another major issue, as snow and ice create treacherous road conditions that lead to accidents and road closures. Public transportation may also experience severe delays or cancellations, making it difficult for people to travel and hindering emergency response efforts.

Winter storms can also cause significant infrastructure damage, as the weight of accumulated snow and ice, combined with freeze-thaw cycles, can weaken buildings, roads and bridges. Structural damage can lead to costly repairs and, in severe cases, potential collapses. In addition, cold weather poses serious health risks, with prolonged exposure increasing the likelihood of frostbite, hypothermia and respiratory issues. The widespread use of heating devices during extreme cold events also raises the risk of carbon monoxide poisoning if proper ventilation is not maintained.

Water supply issues are another major concern during severe winter weather. Freezing temperatures can cause pipes to burst, leading to water supply disruptions and localized flooding. Such incidents can compromise drinking water availability and sanitation, further endangering public health. These cascading hazards highlight the far-reaching consequences of winter storms, emphasizing the need for preparedness and resilience in affected communities.

5.15.2. Location

Severe winter storms are expected to impact all areas of Humboldt County. While these weather conditions affect the region as a whole, Humboldt County’s varied geography, ranging from coastal areas to inland valleys and mountainous terrain, means that different locations may experience different levels of impact. No single part of Humboldt County is completely immune to natural hazards, though some areas, particularly those at higher elevations or along major waterways, such as Willow Creek in the inland mountains and Bridgeville along the Van Duzen River, may be more vulnerable to extreme conditions.

Winter storms are common throughout Humboldt County, especially in the eastern mountainous regions, where heavy snowfall, high winds and icy conditions can make travel hazardous. Along the coast and in lower elevations, storms can bring torrential rain, leading to localized flooding, landslides and road closures. High winds may bring down trees and power lines, causing outages that affect homes, businesses and critical infrastructure. In heavily forested areas, falling limbs and debris can pose additional risks to property and public safety.

5.15.3. Extent

The severity of winter weather can be assessed through meteorological data and its impact on communities. The NWS developed the Winter Storm Severity Index (WSSI) to help anticipate the potential effects of winter storms across the United States. This tool provides forecasts on expected disruptions, including damage to property and trees, as well as the overall impact on infrastructure and daily life. Table 83 details the WSSI, which categorizes potential impacts from winter storms. This index provides insight into how severe a storm's effects might be on daily life, infrastructure and travel, helping individuals and communities prepare accordingly. Each category reflects a progressively greater level of disruption and hazard.

Table 83: Winter Storm Severity Index

Impacts	Potential Winter Storm Impacts
Minor	• Expect a few inconveniences to daily life. › Winter driving conditions. Use caution while driving.
Moderate	• Expect disruptions to daily life. › Hazardous driving conditions. Use extra caution while driving. › Closure and disruptions to infrastructure may occur.
Major	• Expect considerable disruptions to daily life. › Dangerous or impossible driving conditions. Avoid travel if possible. › Widespread closures and disruptions to infrastructure may occur.
Extreme	• Expect substantial disruptions to daily life. › Extremely dangerous or impossible driving conditions. Travel is not advised. › Extensive and widespread closures and disruptions to infrastructure may occur. › Life-saving actions may be needed.

5.15.4. History of Previous Hazard Events

The NCEI Storm Events Database has recorded 227 severe winter weather incidents in Humboldt County since 1996. Since the previous plan update, 21 major winter storms have impacted the area. Table 84 lists each storm event and its classification.

Table 84: Severe Winter Weather Events Since the Last Plan Update

Date	Type
1/15/2020	Heavy Snow

Date	Type
3/13/2020	Heavy Snow
1/26/2021	Heavy Snow
2/2/2021	Heavy Snow
3/5/2021	Heavy Snow
3/14/2021	Heavy Snow
12/15/2021	Heavy Snow
12/24/2021	Heavy Snow
12/25/2021	Heavy Snow
12/26/2021	Heavy Snow
12/27/2021	Heavy Snow
11/7/2022	Heavy Snow
1/8/2023	Heavy Snow
2/21/2023	Winter Storm
2/22/2023	Winter Storm
2/22/2023	Heavy Snow
2/27/2023	Heavy Snow
2/27/2023	Winter Storm
2/28/2023	Winter Storm
3/1/2024	Winter Storm
3/2/2024	Winter Storm

Since the last plan update, 21 severe winter weather events have impacted the region, primarily consisting of heavy snow and winter storms. The most frequent occurrences were heavy snow events, accounting for 16 out of 21 recorded storms, with multiple instances occurring in December 2021 and February 2023. Winter storms were recorded five times, particularly in late February and early March in 2023 and 2024. These events highlight the recurring pattern of severe winter weather in the area, with significant snowfall and storm activity concentrated in the winter and early spring months.

5.15.5. Probability of Future Hazard Events

As mentioned earlier, the NCEI Storm Events Database has documented 227 severe winter weather events in Humboldt County since 1996. This equates to a 7.83 (100% annual occurrence) annual chance of occurrence or an average annual occurrence rate of approximately seven to eight events per year, indicating a high likelihood of severe winter weather, with multiple significant events occurring each year.

5.15.5.1.CLIMATE CHANGE CONSIDERATIONS

Climate change is altering weather patterns in Humboldt County, leading to shifts in the frequency and intensity of severe winter storms. Rising global temperatures have caused fluctuations in precipitation patterns, resulting in more extreme weather events. While warmer temperatures can lead to reduced snowfall at lower elevations, they may also increase the potential for heavier snowfall in higher elevations due to enhanced atmospheric moisture. As ocean temperatures rise, storms forming over the Pacific Ocean can carry more moisture inland, leading to intense rainfall, flooding and occasional heavy snowfall in the county's mountainous regions. In addition, the increased variability in seasonal temperatures may contribute to more unpredictable storm events, including periods of unseasonably warm conditions followed by sudden cold snaps, which can exacerbate hazardous winter weather.

Figure 84 presents the annual average minimum temperature for Humboldt County per Cal-Adapt. This visualization highlights temperature trends over time, offering insights into climate patterns and potential environmental changes in the region. Understanding these averages is valuable for assessing seasonal weather behavior and planning accordingly.

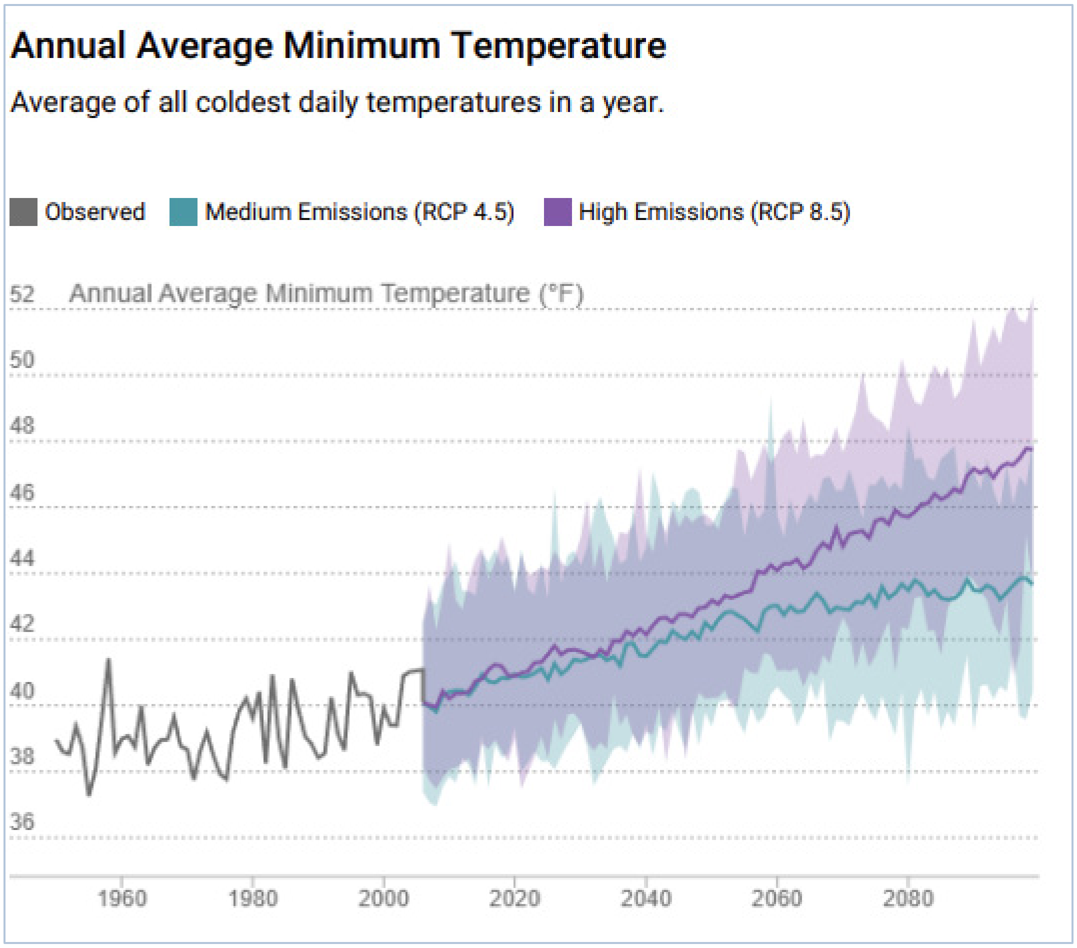

Figure 86: Annual Average Minimum Temperature for Humboldt County

Beyond changes in precipitation, Humboldt County faces increased risks from secondary impacts of climate-driven winter storms. More frequent and intense storms heighten the likelihood of road closures, landslides and power outages, especially in heavily forested and coastal areas. Warming trends also contribute to faster snowmelt, increasing the potential for flooding in river basins and low-lying communities. These shifts can strain infrastructure, disrupt transportation and threaten ecosystems that depend on stable seasonal weather patterns. As climate change continues to influence atmospheric conditions, Humboldt County must adapt to evolving winter hazards by improving storm preparedness, enhancing infrastructure resilience and implementing sustainable land and water management practices.

5.15.6. Vulnerability

Severe winter weather is a recurring hazard in Humboldt County, impacting transportation, infrastructure, public safety and local communities. The severity and duration of winter storms vary, with climate change potentially influencing their frequency and intensity. The NWS and the California Department of Transportation monitor winter weather conditions through atmospheric data, temperature records and storm tracking systems. Severe winter weather is classified based on various meteorological indicators, including snowfall accumulation, freezing temperatures, wind speeds and road icing conditions.

5.15.6.1. ESTIMATED IMPACTS AND LOSSES

Since 1996, the NCEI Storm Events Database estimates that there has been $1,800.00 in property damage as a result of 227 storms in the Humboldt County planning area. This figure is based solely on damages recorded in the NCEI Storm Events Database and should be interpreted with caution as the best available data, recognizing that actual losses, particularly from major storms, are often significantly higher. Table 85 presents a breakdown of property/crop damage costs, along with the number of injuries/fatalities from events that caused significant damage.

Table 85: Severe Winter Weather Events Since the Last Plan Update

Date	Type	Fatalities	Injuries	Property Damage	Crop Damage
3/1/2024	Winter Weather	0	0	$300.00	$0.00
3/2/2024	Winter Storm	0	0	$300.00	$0.00
3/3/2024	Winter Weather	0	0	$1,200.00	$0.00

5.15.6.2. VULNERABLE POPULATIONS

Certain populations in Humboldt County are especially vulnerable during severe winter weather due to their dependence on accessible infrastructure and emergency resources. Rural and remote communities often face the greatest challenges, such as heavy snowfall, icy roads and power outages can cut off access to essential services, including medical care and food supplies. Low-income households may struggle with rising heating costs and experience difficulty securing adequate shelter during extreme cold. Indigenous communities, whose traditional lands and cultural practices are closely tied to the environment, may experience disruptions due to hazardous road conditions, flooding or damage to natural resources. The local economy, particularly in sectors such as tourism and outdoor recreation, can also suffer when winter storms lead to road closures, travel disruptions and unsafe conditions for visitors. In addition, elderly and disabled individuals, especially those with limited mobility or reliance on powered medical equipment, are at greater risk during power failures and extreme cold. These challenges emphasize the importance of proactive winter storm preparedness and targeted assistance for the most vulnerable populations in Humboldt County.

5.15.7. Impacts

Severe winter weather in Humboldt County can have widespread effects on public safety, the local economy, infrastructure and the environment. Heavy snowfall, freezing temperatures and intense storms can create hazardous conditions, leading to road closures, power outages and disruptions to emergency services. These conditions pose risks for residents, particularly those in remote areas, as icy roads and downed power lines can delay response times for medical and emergency personnel. Extreme cold and prolonged winter storms can also impact vulnerable populations, including people who are elderly and those with limited access to heating resources, increasing health concerns such as hypothermia and frostbite. In addition, heavy snowfall can cause structural damage to homes and businesses by accumulating on roofs, leading to costly repairs and potential safety hazards.

Economically, severe winter storms can hinder local businesses, disrupt supply chains and slow transportation, impacting Humboldt County's tourism, fishing and timber industries. The county's roadways, particularly in mountainous regions, can become impassable due to snow accumulation or landslides, delaying deliveries and limiting access to essential goods and services. Storm-related power outages may also affect businesses, resulting in lost revenue and additional expenses for repairs and backup energy sources. Environmental consequences include increased erosion and flooding risks due to rapid snowmelt, which can damage ecosystems, affect water quality and disrupt local fisheries. Severe winter weather can also threaten cultural traditions tied to the region's natural landscape, such as fishing, outdoor recreation and Indigenous practices. Addressing these challenges requires continued investment in infrastructure resilience, emergency preparedness and sustainable land management to mitigate the long-term impacts of winter storms on the community.

5.15.8. Changes in Development

Development in Humboldt County has influenced the way severe winter storms impact communities, infrastructure and the environment. As urban areas expand and more land is converted for residential, commercial and industrial use, natural landscapes that once helped absorb excess precipitation are being altered. Increased impervious surfaces, such as roads, parking lots and buildings, reduce the ability of soil and vegetation to absorb rainfall, leading to greater stormwater runoff. This exacerbates flood risks during severe winter storms, particularly in low-lying and coastal areas. In addition, deforestation and land clearing for development can increase the likelihood of landslides in steep, rain-soaked areas, as tree roots that stabilize the soil are removed. The loss of natural buffers, such as wetlands and forested areas, further intensifies the impacts of heavy rain and snowmelt, increasing the vulnerability of infrastructure and communities to winter storm hazards.

As development continues, the strain on public services and infrastructure during severe winter storms also grows. More homes and businesses mean greater demand for electricity, water and emergency services, all of which can be disrupted by winter storm events. Power outages become more frequent as expanding electrical grids face increased exposure to falling trees and high winds. Transportation networks, already challenged by Humboldt County's rugged terrain, experience more significant disruptions due to road closures, flooding and icy conditions, affecting both residents and emergency response efforts. Without strategic planning and investment in resilient infrastructure, ongoing development may amplify the challenges posed by severe winter weather, making it essential for local authorities to incorporate climate-adaptive strategies into future growth plans.

5.15.9. Community Lifelines

Table 86 lists the impacts on community lifelines and their vulnerability to severe winter weather.

Table 86: FEMA Community Lifelines Impacted by Severe Winter Weather

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
 **Water Systems**	Severe winter weather can impact water infrastructure by causing pipe bursts and contamination due to freezing temperatures. Heavy snowfall and ice can obstruct access to water treatment facilities, affecting both rural and urban areas.	• Damage to water infrastructure: Freezing temperatures can cause pipes to burst, leading to service disruptions. • Water contamination risks: Ice and snowmelt can introduce pollutants into the water supply. • Limited potable water access: Power outages may disrupt water treatment and distribution. • Wastewater system complications: Frozen sewage lines and blocked treatment facilities may lead to backups. • Ecosystem disruptions: Rapid snowmelt can cause flooding, affecting local water sources.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Transportation	Severe winter storms create hazardous road conditions, causing accidents, road closures and disruptions in supply chains. Snow, ice and downed trees can make travel dangerous and delay emergency response efforts.	• Traffic accidents: Slick roads and low visibility lead to an increase in collisions. • Supply chain disruptions: Blocked roads prevent deliveries of essential goods, including fuel and medical supplies. • Limited public transportation: Ice and snow can suspend bus and rail services, isolating communities. • Increased risk for stranded motorists: Heavy snowfall can trap drivers, requiring emergency rescues.
Energy	Winter storms can cause widespread power outages due to ice accumulation on power lines and fallen trees. Increased energy demand for heating also strains the power grid.	• Power outages: Ice and snow damage power lines, leading to extended blackouts. • Increased heating demand: Cold temperatures cause higher energy use, straining utility systems. • Fuel shortages: Snow-covered roads and transportation delays disrupt fuel deliveries. • Risk of carbon monoxide poisoning: Improper use of backup heating sources can lead to toxic exposure. • Worker safety concerns: Utility crews face hazardous conditions while restoring power.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Food, Hydration, Shelter	Severe winter weather can disrupt food supply chains, increase heating costs and force evacuations due to flooding or extreme cold. Vulnerable populations, including low-income and elderly residents, may struggle to access necessities.	• Food supply chain disruptions: Snow and ice delay shipments, leading to shortages. • Increased cost of heating: Cold temperatures raise utility costs, burdening low-income households. • Shelter challenges: Homeless populations and those in inadequate housing face increased risk of exposure. • Water supply disruptions: Frozen pipes may prevent access to clean drinking water. • Emergency shelter strain: Sudden demand for warming centers may overwhelm resources.
Safety and Security	Severe winter storms can increase the risk of hypothermia, frostbite and other cold-related illnesses. Heavy snowfall and ice can isolate communities, delaying emergency response.	• Increased cold-related health risks: Exposure to freezing temperatures can cause hypothermia and frostbite. • Population displacement: Flooding from snowmelt or power outages may force residents to evacuate. • Increased fire hazards: Improper use of space heaters and fireplaces can cause house fires. • Emergency response delays: Snow-covered roads and icy conditions hinder first responders. • Stranded individuals: Winter storms can trap travelers in their homes or vehicles without access to emergency services.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Health and Medical	Harsh winter conditions can overwhelm health care systems due to weather-related injuries and illnesses. Power outages may disrupt medical facilities, while road conditions can delay emergency medical response.	• Limited emergency medical response: Icy roads and snow accumulation delay ambulance services. • Increased risk of illness: Cold weather can worsen respiratory conditions and lead to flu outbreaks. • Medication supply disruptions: Transportation issues can delay pharmaceutical deliveries. • Mental health impacts: Seasonal depression and stress from winter storms can affect mental well-being. • Strained health care facilities: Patient intake may increase due to cold-related injuries and illnesses.
Communications	Severe winter weather can damage communication infrastructure, disrupting phone and internet services. This impacts emergency alerts and coordination efforts during extreme weather events.	• Ice damage to communication lines: Heavy ice buildup can snap power and communication lines. • Power outages impact communication: Blackouts limit access to information and emergency services. • Network congestion: Increased use of emergency calls and online updates can overload systems. • Challenges in emergency notifications: Service disruptions may delay weather warnings and alerts. • Prolonged service outages: Repairing communication infrastructure may take extended time in severe conditions.

Community Lifeline	Historical Impacts	Hazard Vulnerabilities
Hazardous Materials	Winter storms can lead to hazardous material spills due to transportation accidents and infrastructure failures. Extreme cold may also cause chemical leaks from industrial facilities.	• Increased risk of transportation accidents: Snow and ice can lead to hazardous material spills on roads. • Infrastructure damage: Frozen pipes and structural failures may cause industrial chemical leaks. • Fuel storage and transport challenges: Extreme cold can affect gas and oil storage, increasing risks. • Groundwater contamination: Runoff from road salt and other chemicals can impact water quality. • Exposure to toxic substances: Fires and spills caused by winter storm damage may pose health risks.

6. Mitigation Strategy

6.1. Guiding Principle, Goals and Objectives

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR, Section 201.6(c)(3)(i)). The Steering Committee reviewed the guiding principle, goals and objectives from the 2020 Hazard Mitigation Plan. It was determined that the 2020 plan's guiding principle and objectives continue to reflect community priorities and the results of the risk assessment. However, the goals were updated to reflect the new FEMA Mitigation Planning Policy Guidance. The guiding principle, goals, objectives and actions in this plan all support each other. Goals were selected to support the guiding principle. Objectives were selected that met multiple goals. Mitigation actions were prioritized based on their ability to meet multiple objectives.

6.1.1. Guiding Principle

A guiding principle focuses on the range of objectives and actions to be considered. It is not a goal because it does not describe a hazard mitigation outcome, and it is broader than a hazard-specific objective.

GUIDING PRINCIPLE FOR THIS HAZARD MITIGATION PLAN

Through partnerships and careful planning, identify and reduce the vulnerability to hazards in order to protect the health, safety, quality of life, environment and economy of the communities in the Humboldt Operational Area.

6.1.2. Goals

The following are the mitigation goals for this plan:

1. **Reduce Risk and Enhance Resilience:** Significantly reduce risks to life, community lifelines, the environment, property and infrastructure by planning and implementing comprehensive risk reduction and resilience strategies for the whole community.
2. **Build Disaster Resilience Capacity:** Strengthen capacity and capabilities in the Humboldt County Operational Area, with a focus on supporting underserved populations.
3. **Integrate Metrics and Tools:** Incorporate effective metrics, tools and strategies into all hazard mitigation planning and outreach efforts to ensure measurable progress and impactful results.

4. **Leverage Science and Data:** Apply the best available science and authoritative data to design, implement and prioritize projects that enhance resilience to natural hazards and climate change impacts.
5. **Streamline Planning and Action:** Eliminate barriers to timely, efficient, and effective hazard mitigation planning and implementation.
6. **Safeguard Economy and Quality of Life:** Protect the local economy and quality of life by proactively addressing vulnerabilities and improving community and landscape resilience.
7. **Foster Collaborative Partnerships:** Encourage partnerships to promote collaborative actions to develop more comprehensive and sustainable resilience strategies.

The effectiveness of a mitigation strategy is assessed by determining how well these goals are achieved.

6.1.3. Objectives

The selected objectives address multiple goals, as outlined in Table 87. Therefore, the objectives serve as independent measures of the effectiveness of a mitigation action rather than as a subset of a goal. In addition, the objectives are used to help establish priorities.

Table 87: Objectives for the Hazard Mitigation Plan

Objective #	Objective Statement	Goals for Which It Can Be Applied
1	Minimize disruption of local government operations caused by hazards.	3
2	Increase resilience of infrastructure and critical facilities.	1, 2, 3
3	Reduce hazard-related risks and vulnerability of populations in Humboldt County.	1, 2, 3, 4, 5
4	Sustain reliable local emergency operations and facilities during and after a disaster.	1, 2, 3
5	Enhance emergency response capabilities and participation in the planning area.	1, 2, 5, 6
6	Enhance understanding of hazards and the risk they pose through public education that emphasizes awareness, preparation, mitigation, response and recovery alternatives.	1, 2, 3, 4, 5, 6

Objective #	Objective Statement	Goals for Which It Can Be Applied
7	Continuously improve understanding of the location and potential impacts of hazards affecting the planning area, utilizing the best available data and science as it becomes available, and share this information with all stakeholders.	1, 2, 3, 4, 5, 6
8	Establish a partnership among all levels of government and the business community to improve and implement methods to protect property.	2, 6
9	Develop and implement hazard mitigation strategies that reduce losses to wildlife habitats and protect water supplies and quality, while also minimizing damage to development.	2, 4, 5
10	Integrate hazard identification information and mitigation policies into other planning-based processes that direct or impact land uses in the planning area.	1, 5
11	Enhance building codes and their proper implementation so that new construction can withstand the impacts of hazards and lessen the impact of that development on the environment's ability to absorb the impact of hazards.	2, 5
12	Seek to integrate and coordinate all phases of emergency management in the planning area.	1, 2, 3, 4, 5, 6

6.2. Definitions

6.2.1. Timeframe

The timeframe categories throughout the plan were defined as follows:

- **Short-Term:** To be completed in one to two years.
- **Medium-Term:** To be completed in three to five years.
- **Long-Term:** To be completed in more than five years.
- **Ongoing:** Currently being funded and implemented under existing programs.

6.2.2. Cost

The cost rating categories throughout the plan were defined as follows:

- **High:** $100,000 and above
- **Medium:** $10,000 to $100,000
- **Low:** Less than $10,000

6.2.3. Area-Wide Mitigation Actions

Area-wide or county wide mitigation actions differ from county specific actions because they apply to all planning partners. This provides a unique opportunity for collaborative brainstorming collaboration among all municipalities.

6.2.4. All Hazards

When “all hazards” is referenced, it indicates all identified hazards in the plan update, which include the following: dam failure, drought, earthquake, extreme temperatures, flooding, landslide, tsunami, wildfire, wind and winter weather.

6.3. Previous Area-Wide Action Plan Status

Table 88 shows the status of the previous actions identified in the 2020 plan. These area-wide actions were carried forward into the updated plan because they remain significant for all planning partners in Humboldt County.

Table 88: Previous Area-Wide Mitigation Actions

Mitigation Action	Description	Status
CW-1	Continue to participate in the planning partnership and, to the extent possible based on available resources, provide coordination and technical assistance for applications for grant funding that include assistance in cost-versus-benefit analysis.	**Ongoing and carried forward:** Humboldt County OES sends out notice of funding opportunities for all communities to further utilize resources to fund mitigation actions.

Mitigation Action	Description	Status
CW-2	Encourage the development and implementation of an operational area-wide hazard mitigation public-information strategy that meets the needs of all planning partners.	**Ongoing and carried forward:** The public information strategy has been implemented. Following are some campaigns that have been implemented in the last five years: • Wildfire Defensible Space • Tsunami awareness: Know Your Zone In addition, the 2022 earthquake resulted in significant promotion of earthquake safety and mitigation techniques via social media, press releases and other media avenues. Moving forward, we will change the wording from “all communities” to “planning partners” to be more inclusive of identified stakeholders.
CW-3	Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards and seek a regulatory cohesiveness in the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.	**Ongoing and carried forward:** Currently, there is a regional climate action plan that includes most planning partners. There are new California fire severity zone maps that need to be adopted and incorporated into the land use and building codes.

Mitigation Action	Description	Status
CW-4	Sponsor and maintain a natural hazards informational website to include the following types of information: • Hazard-specific information, such as GIS layers, private property mitigation alternatives and important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • Links to planning partners' pages: FEMA, Red Cross, NOAA, USGS and the NWS • Hazard mitigation plan information, such as progress reports, mitigation success stories, update strategies and Steering Committee meetings	**Deferred** due to the COVID-19 pandemic and limited staffing. Humboldt County wants to add public awareness campaigns on this website to share best practices.
CW-5	Maintain the Hazard Mitigation Plan Steering Committee as a viable body over time to monitor progress on the plan, provide technical assistance to planning partners and oversee the update of the plan according to the schedule. This body will continue to operate under the ground rules established at its inception.	**Deferred** due to the COVID-19 pandemic and limited dedicated staff.

Mitigation Action	Description	Status
CW-6	Amend or enhance the Humboldt County Operational Area Hazard Mitigation Plan as well as the general plans for each municipality as needed to comply with state or federal mandates as guidance for compliance with these programs becomes available.	**Ongoing and carried forward:** This action will be expanded moving forward to focus on plan integration for multiple types of plans, as applicable. Incorporation of the Hazard Mitigation Plan into the General Plan Safety Element can be a municipality-specific action. Funding under Assembly Bill 2140 is not guaranteed.
CW-7	Work with the Humboldt County Assessor to begin the capture of general building stock information, such as area, date of construction and foundation type, to better support future risk assessments.	**Ongoing and carried forward:** The Humboldt County Assessor mentioned efforts from the special districts; Humboldt County OES works with the assessor post-disaster to determine where this information is available and for grant applications or post-disaster recovery programs.

6.4. Updated Area-Wide Actions

6.4.1. Recommended Mitigation Actions

The Steering Committee and planning partners reviewed the catalogs of hazard mitigation actions and selected three new area-wide actions to be included in a hazard mitigation action plan. The area-wide actions were selected based on the risk assessment of identified hazards of concern and the defined hazard mitigation goals and objectives. Table 89 lists the hazard mitigation actions that make up the new mitigation action plan.

Table 89: 2025 Mitigation Action Plan[3]

#	Action Description	Priority	Lead Agency	Hazard Mitigated	Potential Funding Source(s)	Estimated Cost	New and/or Existing Asset	Timeframe	Vulnerable Population Benefit?	Community Lifelines Benefit?
CW-1	Continue to participate in the planning partnership and, to the extent possible based on available resources, provide coordination and technical assistance for applications for grant funding that include assistance in cost-versus-benefit analysis.	High	2025 planning partners	All hazards	HMGP, general funds	Low	Both	Short-term	Yes	All
CW-2	Encourage the development and implementation of an operational area-wide hazard mitigation public-information strategy that meets the needs of all communities.	High	2025 planning partners	All hazards	Staff time and general funds	Low	Both	Medium-term	Yes	All
CW-3	Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards and seek a regulatory cohesiveness in the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.	High	2025 planning partners	All hazards	Staff time and general funds	Medium	Both	Long-term	Yes	All

[3] HMGP: Hazard Mitigation Grant Program

#	Action Description	Priority	Lead Agency	Hazard Mitigated	Potential Funding Source(s)	Estimated Cost	New and/or Existing Asset	Timeframe	Vulnerable Population Benefit?	Community Lifelines Benefit?
CW-4	Sponsor and maintain a natural hazards informational website to include the following types of information: • Hazard-specific information, such as geographic information system (GIS) layers, private property mitigation alternatives and important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • Links to planning partners' pages: FEMA, Red Cross, NOAA, USGS and the NWS • Public awareness campaigns • Hazard mitigation plan information, such as progress reports, mitigation success stories, update strategies and Steering Committee meetings	High	2025 planning partners	All hazards	HMGP, staff time, general funds	Medium	Both	Medium-term	Yes	All
CW-5	Maintain the Hazard Mitigation Plan Steering Committee as a viable body over time to monitor progress on the plan, provide technical assistance to planning partners and oversee the update of the plan according to the schedule. This body will continue to operate under the ground rules established at its inception.	Medium	2025 planning partners	All hazards	HMGP, staff time, general funds	Low	Both		Yes	All
CW-6	Amend or enhance the Humboldt County Operational Area Hazard Mitigation Plan as well as the general plans for each municipality as needed to comply with state or federal mandates (e.g., California Assembly Bill 2140) as guidance for plan integration and compliance with these programs becomes available.	High	2025 planning partners	All hazards	Staff time, general funds	Low	Both		Yes	All

#	Action Description	Priority	Lead Agency	Hazard Mitigated	Potential Funding Source(s)	Estimated Cost	New and/or Existing Asset	Timeframe	Vulnerable Population Benefit?	Community Lifelines Benefit?
CW-7	Work with the Humboldt County Assessor to begin the capture of general building stock information, such as area, date of construction and foundation type, to better support future risk assessments.	Medium	2025 planning partners	All hazards	Staff time, general funds	Low	Both		Yes	All
CW-8	Develop a countywide debris management plan that can help identify resource priorities and maximize reimbursement.	High	2025 planning partners	All hazards	Staff time, general funds	Medium	Both		Yes	All
CW-9	Develop a countywide energy and fuel distribution plan that can fully utilize resources and minimize limitations.	High	2025 planning partners	All hazards	Staff time, general funds	Medium	Both		Yes	Energy, Transportation
CW-10	Develop a contact list to be able to quickly share information with planning partners and stakeholders.	High	2025 planning partners	All hazards	Staff time, general funds	Low	Both		Yes	All

6.5. Action Plan Prioritization

Each plan participant prioritized its own action as high, medium, or low priority. The priority is a subjective evaluation of whether the benefits of the action outweigh the cost. For each action, the plan participants considered the following questions:

- Will the action result in life safety?
- Will the action result in property protection?
- Will the action be cost-effective?
- Does this action align with the County Strategic Plan?
- Will this action reduce risk to more than one hazard?
- Does this action benefit underserved populations?
- Will this action have a positive impact on the natural environment?
- Would this action take five years or less?

For each question, the plan participants scored them from 0 to 2 as follows:

- **Promising:** Using your current information and analysis, the action is highly likely = 2 points
- **Potential:** The action seems probable, but there is not enough current information or analysis = 1 point
- **Improbable:** Using your current information and analysis, the action is highly unlikely = 0 points

The priorities are assigned based on the following metrics:

- **13 or more points** = High Priority
- **8 to 12 points** = Medium Priority
- **0 to 7 points** = Low Priority

The annexes contain the specific action priorities of each respective plan participant. Table 90 lists the priority of each area-wide action.

Table 90: Prioritization of Area-Wide Mitigation Actions

Action #	Will the action result in life safety?	Will the action result in property protection?	Will the action be cost-effective?	Does this action align with the County Strategic Plan?	Will this action reduce risk to more than one hazard?	Does this action benefit underserved populations?	Will this action have a positive impact on the natural environment?	Would this action take five years or less?	Total Score	Priority
1	1	2	2	2	2	2	2	1	14	High
2	2	1	2	2	2	2	1	1	13	High
3	1	2	2	2	2	2	2	1	14	High
4	2	1	2	2	2	2	2	1	14	High
5	1	1	2	2	2	2	1	1	12	Medium
6	1	1	2	2	2	2	2	1	13	High
7	1	1	2	2	2	2	1	1	12	Medium
8	1	2	2	2	2	2	2	1	14	High
9	1	1	2	2	2	2	2	2	14	High
10	2	1	2	2	2	2	1	2	14	High

6.6. Action Plan Implementation

The area-wide action plan, as well as jurisdiction-specific action plans in Volume 2, present a range of action items for reducing losses from natural hazard events. The planning partners have prioritized actions and will begin implementing actions over the next five years. The effectiveness of the hazard mitigation plan depends on its effective implementation and incorporation of the outlined action items into all partners' existing plans, policies and programs. Some action items do not require implementation through regulation but can be achieved through the creation of new educational programs, continued interagency coordination or enhanced public participation.

The County of Humboldt will have primary responsibility for overseeing the implementation and maintenance strategy of the plan. Plan implementation will be a shared responsibility among all planning partnership members and agencies identified as lead agencies in the area-wide and jurisdiction-specific action plans.

6.7. Integration into Other Planning Mechanisms

Integrating relevant information from this Hazard Mitigation Plan into other plans and programs where opportunities arise will be the ongoing responsibility of the governing bodies for all planning partners covered by this plan. By adopting general plans and zoning ordinances, the planning partners have planned for the impact of natural hazards, and these documents are integral parts of this Hazard Mitigation Plan. The hazard mitigation planning process provided the partners with an opportunity to review and expand on policies contained in these documents, based on the best science and technology available at the time this plan was prepared. The partners should use their general plans and the Hazard Mitigation Plan as complementary documents to achieve the goal of reducing risk exposure to the citizens of the planning area. A comprehensive update to a general plan may trigger an update to the hazard mitigation plan.

All municipal planning partners have committed to creating a linkage between the hazard mitigation plan and their individual general plans or similar plans identified in the core capability assessment. Each municipal jurisdiction-specific action plan includes a high-priority mitigation action to create such a linkage.

Other planning processes and programs to be coordinated with the recommendations of the Hazard Mitigation Plan may include the following:

- Emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines

- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Climate action/adaptation plans
- Debris management plans
- Post-disaster action/recovery plans

All planning partners have identified opportunities and strategies for integration in their annexes in Volume 2 of this plan.

7. Plan Maintenance and Implementation

This section discusses the maintenance and implementation of the plan and the processes for monitoring, evaluating, and updating the LHMP to ensure that it remains relevant and continues to address the changing environment in the county and cities. In addition, this section describes how the LHMP will be incorporated into the planning mechanisms of the County of Humboldt, participating municipalities and all participating special districts and how they will continue to engage the public.

7.1. Monitoring, Evaluating and Updating the Plan

This section describes the schedule and process for monitoring, evaluating and updating the LHMP.

7.1.1. Steering Committee

The purpose of the Steering Committee is to monitor and review hazard mitigation plan priorities, strategies, projects and grants, as appropriate, and report out to provide updates and recommendations to jurisdictions' voting entities. In addition, the Steering Committee will support plan participants' efforts to integrate the ideas, information and strategy of this hazard mitigation plan into local planning mechanisms, as appropriate.

7.1.1.1.MEMBERSHIP

The Steering Committee will be made up of two co-chairs and four general members, with one alternate for each general member.

- Co-Chair: Emergency Services Program Manager
- Co-Chair: Humboldt OES Hazard Mitigation Program Coordinator
- One municipality representative
- One community services district or public services agency representative
- One fire district representative
- One employee of the County of Humboldt representative

7.1.2. Steering Committee Schedule

Monitoring the progress of the mitigation actions will continue until the next update of the LHMP. The schedule will commence upon FEMA approval of this plan. The first Steering Committee meeting will take place within one month of the final plan approval and/or adoption. The next regularly scheduled Steering Committee plan review meeting will take place on or near the first anniversary of the adoption of this plan. Within two months after the Annual Steering Committee Review Meeting, an annual report with potential recommendations will be provided to the Humboldt County Board of Supervisors.

The Steering Committee will meet at least once a year for the first three years of the planning period to review progress reports and/or other topics or events that require the committee to meet (Table 91). In addition, the Steering Committee will meet twice a year to review and discuss mitigation actions and projects and provide support to planning partners engaged in mitigation projects. After the first three years of the planning period, the Steering Committee will meet biannually, or as needed, to begin the planning process for the new hazard mitigation plan cycle. Once the new hazard mitigation plan request for proposal has been approved, the Steering Committee will meet at least once per month until the next plan is approved by FEMA.

Table 91: Steering Committee Schedule of Activities

Activities	Timetable
2025 LHMP Approval and Adoption	TBD
First Meeting of Steering Committee	30 days after plan approval and/or adoption
First Steering Committee Hazard Mitigation Plan Review	On or near first anniversary of plan approval and/or adoption
Annual Progress Report Questionnaire	Send to all participating jurisdictions for completion
Annual Steering Committee Plan Review Meeting	Held annually
Submission of Annual Report to Humboldt County Board of Supervisors	Within two months of Annual Steering Committee Plan Review Meeting
Steering Committee Mitigation Projects Progress Review Meeting	At least once a year for first three years of planning period
Steering Committee Planning Partners Mitigation Project Support Meeting	Biannually for the entire planning period
2030 LHMP Planning Cycle Steering Committee Meetings	Monthly, once the Request For Proposal for the 2030 LHMP has been approved

7.1.2.1.PLAN UPDATES

The LHMP will be updated every five years, as required by the Disaster Mitigation Act of 2000. The update process will begin at least two years before approval of the 2025 LHMP expires. Additional time may be allocated to acquiring a grant to support the next plan update. The

Steering Committee will help facilitate these discussions and identify the best available grant funding mechanisms at the time of the next plan update.

Should a significant disaster occur in the county before the next plan update, the participating jurisdictions will reconvene within 30 days of the disaster to review and update the LHMP, as appropriate. The Humboldt County Board of Supervisors, the participating municipalities and all the special districts should adopt written updates to the LHMP. The next update will be adopted before this plan expires, ensuring that the communities remain eligible for mitigation grants.

7.1.3. Progress Reports

The Steering Committee will coordinate with responsible departments, agencies, and organizations identified for each mitigation action. These responsible agencies and organizations will monitor and evaluate the progress made in implementing mitigation actions and report to the participating jurisdiction on an annual basis. Working together, the participating jurisdictions will assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate.

An LHMP Annual Progress Report Questionnaire has been developed as part of this LHMP to assist the jurisdictions in reporting on the status and assessing the effectiveness of the mitigation actions. The questionnaire will ask jurisdictions to consider their hazard mitigation plan priorities, actions, projects, grants, hazard events, impact and inclusion of other plans, and any jurisdictional changes. Responses from each participating jurisdiction will be included in the LHMP Annual Progress Report submitted to the Humboldt County Board of Supervisors.

In addition, information culled from the annual meeting to monitor mitigation actions can be used for the annual evaluation of the LHMP. All jurisdictions who participated in the 2025 hazard mitigation plan and prospective jurisdictions that want to be included in the 2030 plan will be sent the progress report.

7.1.3.1. EVALUATION CRITERIA

The following questions will be considered as criteria for evaluating the effectiveness of the LHMP and its actions:

- Has the mitigation action been completed?
- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that can impact the county?
- Do the goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Have the mitigation actions led to the expected outcomes?

- Are current resources adequate to implement the LHMP?
- Should additional local resources be committed to addressing identified hazards?

Future updates to the LHMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the LHMP, which require changes to the risk assessment, mitigation strategy, and other components of the LHMP, will also be incorporated into the next update of the Humboldt County LHMP in 2030.

7.1.4. Continued Public Participation

The Steering Committee is committed to ensuring continued public involvement in the LHMP maintenance process. The Steering Committee will support jurisdiction participants in their efforts to involve the public during the monitoring, evaluating, and updating of the LHMP through various public workshops and meetings. The Steering Committee reporting to the County Board of Supervisors will include a public comment period for review.

In addition, information on upcoming public events related to the LHMP or solicitation for comments will be announced through newsletters, newspapers, mailings, on the Humboldt County Office of Emergency Services website (https://humboldtgov.org/356/Office-of-Emergency-Services) and on county social media platforms. An electronic copy of the current LHMP will be accessible through the Humboldt County website, with a hard copy available for review at the Humboldt County Office of Emergency Services office. All relevant public comments will be incorporated when appropriate, including in the next plan update.

During the development of this LHMP, the Planning Team implemented a rigorous public engagement strategy that involved a public hazard mitigation survey circulated on county social media platforms and the County primary website. A follow-up public survey will be initiated during this planning period to continue public outreach and engagement in the plan maintenance process.

In the future, additional efforts can be targeted toward community groups and other community events or meetings. Further outreach could be completed with access and functional needs communities specifically as part of a continued public engagement strategy and during this plan maintenance process.

7.1.5. Documentation

All reports and meeting agenda/minutes will be completed and filed with the Humboldt County Office of Emergency Services. All published documents will be available on the Humboldt County Office of Emergency Services website or by contacting the Humboldt County Office of Emergency Services for copies or access.

In addition, all hazard mitigation plans, strategies, projects and other information will be housed on an electronic dashboard for easy access by all plan participants. This dashboard will help the Steering Committee and other jurisdictions and planning entities to clearly visualize current local hazard mitigation plan information. Access to documentation on the dashboard will facilitate plan participants' efforts to incorporate the recommendations and underlying principles of this LHMP into other community planning mechanisms, such as local land use development and community decision-making, including budgets, comprehensive plans, capital improvement plans, or other long-range plans, codes, and ordinances.

Appendix A: Public Involvement Materials and Planning Process

Appendix A: Public Involvement Materials and Planning Process

A.1. Hazard Mitigation Plan Steering Committee Meetings

A.1.1. HUMBOLDT COUNTY HAZARD MITIGATION STEERING COMMITTEE MEETING 1/16/2025

A.1.1.1. ATTENDEES

Name	Agency/Organization	Title
Patric Esh	Humboldt County Office of Emergency Services (OES)	Hazard Mitigation Program Coordinator
Pat Kaspari	McKinleyville Community Services District (CSD)	General Manager
Samantha Karges	California Governor's Office of Emergency Services (Cal OES)	Emergency services coordinator
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Kelsey Younker	Humboldt County OES	Administrative Secretary
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Cybelle Immitt	County of Humboldt	Natural Resources Manager, Public Works
Patrick Lynch	North Coast Emergency Medical Services (EMS)	Disaster Liaison for Humboldt County
Hank Seeman	Deputy Public Works Director	Humboldt County Public Works
Kim Anthony	IEM	Lead Planner
Casey Garnett	IEM	Hazard Mitigation Planner

A.1.1.2. INTRODUCTION AND AGENDA

The first Humboldt County Multi-Jurisdiction Hazard Mitigation Plan Steering Committee Meeting was held online on January 16, 2025. This virtual meeting was open to the public. Kim

Anthony, IEM Lead Planner, established expectations for public input, including a one-minute comment period and guidelines for respectful conduct. Kim welcomed everyone to introduce themselves before providing context for the plan update.

A.1.1.3. HAZARDS TO PROFILE

Kim introduced the hazards previously considered for inclusion in the plan and asked the Steering Committee to decide which hazards should be finalized.

Hank mentioned that landslides are curious to define and inquired whether they include erosion and subsidence.

Ryan asked about dam failure and its inclusion in the plan. Shelter Cove relies on a dam and would like it to be maintained in the plan. He also questioned whether levee failure should be considered, noting that levees can fail even if updated when their capacity is exceeded.

Danielle asked about thunderstorms and whether they will be separated. Danielle is not sure what action will address thunderstorms.

Hank asked whether erosion is considered part of flooding. Casey clarified that in the previous plan, sections addressed sea-level rise and included discussions of erosion.

Pat K. and Cybelle discussed the inclusion of coastal hazards and possible grants. Patric suggested approaching them as sub-hazards. Kim agreed to consult with California Governor's Office of Emergency Services (Cal OES) about any grant implications and report back at the next meeting.

Kim summarized that there will be no thunderstorms and possibly add coastal hazards or a sub-hazard. Levee failures were discussed again, and the Steering Committee questioned whether a levee district was participating in the plan update process. Hank noted that levees are important. There was a discussion on whether there were levees in Humboldt.

Patric provided a list of levees but said to move forward without levees. No one disagreed, and it was recommended that levees could be noted under other hazards. Ryan proposed adopting the hazard list as-is, excluding thunderstorms. Hank supported including coastal and levee failure as sub-hazards under flooding. Patric seconded this suggestion, and the Steering Committee moved on.

A.1.1.4. REVIEW OF HAZARD MITIGATION PLAN GOALS

The Steering Committee was asked to review the goals developed by the consultant IEM following the feedback provided at the plan Kickoff Meeting.

Goal #1: Reduce Risk and Enhance Resilience: Significantly reduce risks to life, community lifelines, the environment, property and infrastructure by planning and implementing comprehensive risk reduction and resilience strategies for the whole community.

Goal #1 was approved as-is.

Goal #2: Build Capacity for Underserved Populations: Strengthen capacity and capabilities in Humboldt County to increase disaster resilience, with a focus on supporting underserved populations.

Pat noted that capacity should be built countywide. Ryan highlighted competitive grant programs that emphasize support for underserved populations, adding that much of Humboldt County qualifies as underserved. Multiple different wordings were discussed. Cybelle suggested simplifying the title while keeping the focus on underserved populations. Kim recommended expanding the language to include all jurisdictions. Ryan proposed referring to the Humboldt Operational Area, encompassing special districts and jurisdictions.

New **Goal #2: Build Disaster Resilience Capacity:** Strengthen capacity and capabilities in the Humboldt County Operational Area, with a focus on supporting underserved populations.

Goal #3: Integrate Metrics and Tools: Incorporate effective metrics, tools and strategies into all hazard mitigation planning and outreach efforts to ensure measurable progress and impactful results.

Hank questioned the use of "tools." Kim explained federal tools and toolkits. While Hank suggested using "measures," the Committee agreed to retain the original language. Approved as-is.

Goal #3 was approved as-is.

Goal #4: Leverage Science and Data: Apply the best available science and authoritative data to design, implement and prioritize projects that enhance resilience to natural hazards and climate change impacts.

Hank asked about the word “authoritative” being used. Kim suggested it could be deleted. Ryan said it would be okay to keep it. Hank suggested the term was a little prescriptive and suggested removing “authoritative data” entirely. Danielle and Ryan agreed.

New **Goal #4**: **Leverage Science and Data:** Apply the best available science and data to design, implement and prioritize projects that enhance resilience to natural hazards and climate change impacts.

Goal #5: Leverage Science and Data: Eliminate barriers to timely, efficient and effective hazard mitigation planning and implementation.

Goal #5 was approved as-is.

Goal #6: Safeguard Economy and Quality of Life: Protect the local economy and quality of life by proactively addressing vulnerabilities and improving community resilience.

Cybelle suggested adding “and landscape” to state “community and landscape resilience.” Hank proposed refining "economy" to "economic productivity" or "prosperity." "Landscape" was approved.

New **Goal #6: Safeguard Economy and Quality of Life:** Protect the local economy and quality of life by proactively addressing vulnerabilities and improving community and landscape resilience.

Goal #7: Foster Collaborative Partnerships: Promote partnerships to encourage collaborative actions and develop more comprehensive and sustainable resilience strategies

Cybelle and Danielle suggested revising the language of this goal to be clearer on what the objective of this goal is as comprehensive strategy development could be its own goal. Revisions were approved.

New **Goal #7: Foster Collaborative Partnerships:** Encourage partnerships to promote collaborative actions to develop more comprehensive and sustainable resilience strategies.

A.1.1.5. CAPABILITY ASSESSMENT SURVEY

Kim said in the essence of time the survey will not be reviewed during this meeting, but all jurisdictions are invited to review and complete this survey in order to update this portion of the plan. Ryan asked if the jurisdictions could have multiple people fill out the survey or only one survey per jurisdictions. Kim shared that all survey submissions will be saved and there can be multiple surveys completed per jurisdiction as it is expected people will have different inputs into the survey.

A.1.1.6. HAZARD MITIGATION PLAN PUBLIC SURVEY

Kim announced that the public survey had been translated into Hmong, Spanish and English. The IEM graphics team is creating a flyer to promote the survey. All participants are encouraged to share it.

A.1.1.7. UPCOMING EVENTS:

- Risk Assessment Meeting: February 5 at 1 p.m.
- Steering Meeting: February 13 at 1 p.m.

A.1.2. HUMBOLDT COUNTY HAZARD MITIGATION STEERING COMMITTEE MEETING 2/13/2025

A.1.2.1. ATTENDEES

Name	Agency/Organization	Title
Patric Esh	Humboldt County OES	Hazard Mitigation Program Coordinator
Pat Kaspari	McKinleyville CSD	General Manager
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Kelsey Younker	Humboldt County OES	Administrative Secretary
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Cybelle Immitt	County of Humboldt	Natural Resources Manager, Public Works
Chris Christianson	General Manager	Shelter Cove
Jeanne Bunting	IEM	Project Manager
Kim Anthony	IEM	Lead Planner
Casey Garnett	IEM	Hazard Mitigation Planner

A.1.2.2. INTRODUCTION AND AGENDA

The second Humboldt County Multi-Jurisdiction Hazard Mitigation Plan Steering Committee Meeting was held online on 2/13/2025. This meeting was held virtually, and the public was invited to attend. Kim Anthony, IEM Lead Planner, spoke with the Steering Committee about using the dedicated SharePoint site for this project to review meeting agendas and minutes. Then, she turned the meeting over to Patric Esh with Humboldt County OES.

A.1.2.3. HAZARD MITIGATION PLAN SURVEY

Patric emphasized that the prior survey was really focusing on the individual preparedness. Now, the survey is designed to understand the public’s concerns and what they want to focus on. Further, there is a new question on climate resilience. Climate resilience is important to understand both for the hazard mitigation plan as well as other plans.

Patric then lead a review of each question on the public survey for the Steering Committee. He provided context on seeking demographics, including which individual town participant’s live near. Then, he explained how the questions evolve to ask more specific information on the public's familiarity with the hazards in the community, the hazards profiled in this plan and what assets are most vulnerable. He mentioned that there will be multiple open-ended questions which will provide for a broader range of feedback from the public as well.

Pat Kaspari asked to add a demographic question on whether the respondent had a chronic health condition that depends on electricity as well as identifying if they have a generator in question #12. Cybelle asks if it's possible to add "Other" in addition to the towns. She also suggests adding "for instance…" following impacts of climate change in order to clarify. Ryan agreed with Cybelle. It was also noted that this survey will be translated into Spanish and Hmong as well as English, thereby making it more accessible to the whole community. Ryan also suggested adding the demographic question as this is a serious concern particularly following recent winter storm. The Steering Committee decided to add the demographic question "I use an electricity-dependent medical devices." The Steering Committee debated whether to add "Other" to the list of towns and whether that would be beneficial for the community as there are quite specific areas in the community. Cybelle also noted that there was some communities so as a compromise, others could include a few additional communities. The Steering Committee elected to add additional census designated places as well as an "Other" category.

Ryan asked about how the survey will be open. Kim said it can remain open as long as the plan participants want. Ryan suggested that typically the County does a 30-day public review period.

Patric spoke on how the survey will be distributed. He shared that it should go via social media, press release, the County website and in partnership with DHHS including to welfare and Medicare recipients in paper format. It will also be posted in other communities that are public facing. He reached out to tribes and HTA, who will put it on their buses. Food for People and Senior News will also be handing it out or sharing it with people. Ryan confirmed there will be both QR code and URL available to distribute. Cybelle suggested sharing it via Nextdoor as well. Cybelle also suggested Facebook groups. Patric says he wants to get more input than last time (200+). Casey reminded everyone to spread the news of the public survey's availability and that each plan participant needs to share the survey including specifically with their unique vulnerable populations.

A.1.2.4. JURISDICTIONAL ATTENDANCE

Patric emphasized how important it is for all the plan participants to attend the meetings. However, there are a few that have not attended either meeting yet. The Steering Committee reviewed the list of missing participants. Patric shared that he texted and emailed the participants after the meetings. Pat volunteered to conduct outreach to two of the missing participants as well. Ryan volunteered to connect with another one and make sure they attend. Kim shared that individual jurisdictional meetings will be an option if they are not able to attend entirely, but we're still encouraging plan participants to come to the group meetings at this time and reach out if they have any questions.

A.1.2.5. UPCOMING MEETINGS AND DEADLINE:

Kim reminded the Steering Committee of the upcoming meetings and deadlines. Then, she shared how IEM and Humboldt County is tracking whether the plan participant survey has been completed. Patric noted that as the deadlines come closer, there will be outreach to anyone who is missing data. Ryan asked if there was any data missing. Kim shares that the IEM team will probably need to reach out to specific individuals once the hazard profiles are further along. The Steering Committee discussed getting into the specifics of dating requests. Ryan emphasized how the new data incorporated should focus on new data, items that have been updated in the last five years. Further, data should align with the projects that the plan participants want to propose.

- Deadlines:
  - February 14: Risk Assessment Form
  - February 21: Capability Assessment Survey
- Meeting
  - February 19: Capability Assessment Survey Q/A (Optional)
  - February 27: Eligible Mitigation Actions Meeting (Virtual)
  - March 19 & March 20: Mitigation Actions Workshop (In-person)

A.1.3. HUMBOLDT COUNTY HAZARD MITIGATION STEERING COMMITTEE MEETING 3/13/2025

A.1.3.1. ATTENDEES

Name	Agency/Organization	Title
Patric Esh	Humboldt County OES	Hazard Mitigation Program Coordinator
Pat Kaspari	McKinleyville CSD	General Manager
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Patrick Lynch	North Coast Emergency Medical Services	Disaster Liaison for Humboldt County
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Cybelle Immitt	County of Humboldt	Natural Resources Manager, Public Works

Name	Agency/Organization	Title
Chris Christianson	Shelter Cove	General Manager
Kim Anthony	IEM	Lead Planner
Casey Garnett	IEM	Hazard Mitigation Planner

a. Introduction and Agenda

The Humboldt County Multi-Jurisdiction Hazard Mitigation Plan Steering met on 3/13/2025. This meeting was held virtually, and the public was invited to attend. Kim Anthony, IEM Lead Planner, reviewed the agenda with the Steering Committee and shared there were two questions to follow up with from the last meeting regarding data. First, she asked in regard to the sea level rise data from the upcoming climate action plan — is there any updated sea-level rise data? Secondly, are there are any updated fire hazard severity map for Humboldt County? Ryan shared there was a new update to the fire hazard maps for Humboldt County last month. He will provide the IEM team the information. He confirmed that new sea level rise data does not need to be incorporated into the plan pending its publication as it has not been published yet, but he will follow up with County Geographic Information System (GIS).

b. Ongoing Public Outreach Efforts

Kim noted that there is 198 responses in English, 1 in Spanish and 0 in Hmong. She confirmed with the Steering Committee that they are receiving her summary emails. Danielle asked if there was a way to tell where the most respondents were coming from so the committee could identify any gaps. Kim said she will share this information.

Some other highlights from what the respondents had shared included:

- People are very concerned about earthquake.
- 41% of people do not think their community is equipped to handle the impacts of climate change.
- People are most concerned about public infrastructure including bridges, water and wastewater.
- People find Humboldt Alerts the most valuable response to get information.

Kim asked what stakeholders or organizations are we missing and how can we get more information for this survey? Patric shared that he reached out to the County Public Information Officer (PIO) to see if we can share this survey countywide again. Social media outreach is going and Patric confirms that the jurisdictions are actively seeking public participation, including innovative approaches like mailing post cards with the survey. Kim noted one opportunity to continue sharing the survey is sharing it on the Humboldt County Facebook page, in addition to the Humboldt County OES page where it has been shared already. Danielle shared that Arcata is focusing on outreach to vulnerable populations, especially those that are high-risk to natural hazards. She said they have posted the survey flyer at a mobile home park and in public housing. Kim noted that the survey has reached many people who do not have employment, which is a vulnerable population the survey is effectively reaching. Patrick Lynch said that the Humboldt Community Emergency Response Team (CERT) coalition could help spread the survey among the CERT volunteers throughout the county. Ryan said the County will share the survey with them. Patrick added the Pacific Outfitters Clean Up Team volunteers could also be surveyed and he will share the outreach materials. Cybelle asked to confirm whether the Chiefs Association received the survey. Ryan will follow-up to confirm it was received. Chris suggested sharing it via Redheaded Blackbelt and noted that the district is actively sharing the survey. Patric noted that the local media has been contacted, including Redheaded Blackbelt and Lost Coast.

Kim thanked everyone for their contributions so far and noted how important it was to do public outreach, including reaching socially vulnerable populations, which sounds like exactly what the plan participants are doing.

c. Review of Plan Maintenance Phase Draft

Patric introduced the concept of plan maintenance. He noted that last time, the plan was not used as much, but this time the County wants to use this plan and maintain it moving forward. He said he has reviewed federal guidelines and recommendations and wanted to share a draft plan maintenance process with the Steering Committee. Patric presented the draft plan maintenance document for consideration. The proposed plan maintenance would be a phased approach with multiple opportunities for the broader planning team and Steering Committee to meet each year. The Steering Committee considered the specific meeting schedule and recommended meeting membership. Patric proposed that in addition to regular meetings, progress reports should also be submitted on a regular basis. This would help with the next plan update, and to keep in touch on progress and current contact information. Finally, he noted how the public will continue to be engaged throughout the planning lifecycle and how this process will be documented. The County is currently considering developing a dashboard to support this effort.

After Patric presented, Ryan asked if the membership in the regular meetings would serve as a liaison to the rest of the jurisdiction. Patric said it could be an additional duty, but he had not incorporated that into the plan yet. Cybelle noted that plan maintenance is very necessary to maintain progress on these plans, including identifying who will be tracking, maintaining and celebrating success of this plan. She noted that there is a CWPP hub site already, but that focuses on wildfire, so a site with other hazards would be appreciated. Pat suggested not limiting meetings to the Steering Committee but inviting all plan participant representatives to see who may want to add. He noted in the last plan there was no follow-up on certain County actions, so he would welcome presentations and status updates on them. Patric confirms these meetings will include all plan participants and key stakeholders. The goal of the plan maintenance will be to provide status update and identify partners, so that will be included.

Cybelle asks if there was a way to note that some actions are multi-jurisdictional. Patric says that will be a part of plan maintenance and that these meetings will provide the opportunity to communicate and work together to implement these projects. Kim noted it is important for each plan participant to note the actions they want to support in their respective plans.

A.1.3.2. JURISDICTION UPDATES

Kim said the team has successfully made contact with all 26 participating jurisdictions. All plan participants are now regularly keeping in touch and working on their plan participant forms. Kim went over where everyone was as far as turning in their forms and documenting public outreach. Ryan noted that Public Works could help with identifying some action status updates and Hank confirmed this has been completed.

A.1.3.3. UPCOMING MEETINGS AND DEADLINES

1. Deadlines:
    a. None
    b. Mitigation Action Worksheet is being shared this week and will be due Mar. 28
2. Meetings:
    a. March 19: Mitigation Action Workshop (In-Person)-Special Districts
    b. March 20: Mitigation Actions Workshop (In-person)-Municipality
    c. End of May/Early June: Draft of Plan?

A.1.4. HUMBOLDT COUNTY HAZARD MITIGATION STEERING COMMITTEE MEETING 4/10/2025

A.1.4.1. ATTENDEES

Name	Agency/Organization	Title
Patric Esh	Humboldt County OES	Hazard Mitigation Program Coordinator
Pat Kaspari	McKinleyville CSD	General Manager
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Danielle Allred	City of Arcata	Contracts & Special Projects Manager

Name	Agency/Organization	Title
Cybelle Immitt	County of Humboldt	Natural Resources Manager, Public Works
Chris Christianson	Shelter Cove	General Manager
Jeanne Bunting	IEM	Project Manager
Casey Garnett	IEM	Project Manager
Sabrina Lunsford	IEM	Planner

A.1.4.2. INTRODUCTION AND AGENDA

The Humboldt County Multi-Jurisdiction Hazard Mitigation Plan Steering Committee met on 04/10/2025. This meeting was held virtually, and the public was invited to attend. Casey Garnett, IEM Project Manager, reviewed the agenda with the Steering Committee.

A.1.4.3. PLAN STATUS UPDATE

IEM is currently editing and reviewing comments, and this information is being shared with the county. The draft base plan is now ready for editing and review.

A.1.4.4. JURISDICTION PROFILE UPDATE

Additional information is still required to complete the Annexes for the following jurisdictions:

- **Rio Dell:** The public outreach materials, risk assessment, capabilities, previous mitigation action statuses and new mitigation actions are missing. Pat Kaspari will contact others in Rio Dell for help getting information.
- **Fortuna Fire Protection:** The status of previous mitigation actions and new mitigation actions are missing.
- **Humboldt Bay Harbor Recreation and Conservation District:** There has been no public interaction, capabilities are missing, the status of previous mitigation actions is missing and new mitigation actions are missing.
- **Southern Humboldt Community Health District:** Capability assessment, information from previous mitigation actions status table and Mitigation Actions spreadsheet are missing.
- **Big Lagoon:** Mitigation Actions Spreadsheet
- **Willow Creek Community Services:** Mitigation Actions Spreadsheet
- **Manila Community Services:** Mitigation Actions Spreadsheet and Previous Mitigation Actions Status Table

A.1.4.5. MITIGATION ACTION UPDATES

- Six jurisdictions are working on mitigation actions.
- Each jurisdiction needs one mitigation action for each hazard.
- Prior actions can be included, if not completed, in the new actions.

A.1.4.6. UPCOMING MEETINGS AND DEADLINES

- Deadlines: Draft Review May 2025. There will be a 30-day period for public review. We will implement a rolling red review, and jurisdictional profiles will be sent to the respective jurisdictions and to experts for their input. The full plan will be reviewed during the public review period. Jurisdictions have two weeks to review their annex, which is due by May 12. IEM will develop graphics for the public review announcement.

A.1.4.7. QUESTIONS

How are Priority rankings determined? The directions/definitions for priority rankings are in the Mitigation Action Excel spreadsheet on the first tab labeled “definitions.”

Do they still consider BRIC a potential funding source? It can't be the only source, but it might be replaced by something else, so continue to list it.

A.2. Planning Team Meetings

A.2.1. HUMBOLDT COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN – KICKOFF MEETING

A.2.1.1. ATTENDEES

Name	Agency/Organization	Title
Ross McDonald	Arcata Fire District	Assistant Chief
Samantha Karges	Cal OES	Emergency services coordinator
Kelsey Younker	Humboldt County OES	Administrative Secretary
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
William Reynolds	Humboldt Bay Fire	Deputy Fire Chief
Patrick Kaspari	McKinleyville CSD	General manager
Joseph Blaine	McKinleyville CSD	Board Secretary

Name	Agency/Organization	Title
Chris Emmons	Arcata Fire District	Fire Chief
Amanda Mager	City of Blue Lake	City Manager
Dale Unea	Peninsula CSD/Samoa Fire	Fire Chief
Jay Parrish	City of Ferndale	City manager
Cody Ox	Redway CSD	General Manager
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Jeanne Bunting	IEM	Project Manager
Terrence Williams	Humboldt CSD	General Manager
Paul Rosenblatt	Westhaven CSD	General Manager
Shari Meads	City of Fortuna	Community Development Director
Christopher Christianson	Resort Improvement District No. 1	General Manager
John Friedenbach	Humboldt Bay Municipal Water District	General Manager
Andrew Gonzales	California Department of Forestry and Fire Protection (CAL FIRE)	Battalion Chief - Emergency Command Center
Susan O'Gorman	Willow Creek CSD	General Manager
Morguine Sefcik	Arcata	Environmental Programs Manager
Amos Pole	Yurok Tribe	Director - Senior Emergency Manager
Cheryl Kelly	Trinidad	Mayor
Kyle Knopp	City of Rio Dell	City Manager
Tina Phan	Cal OES	SR planner
Tyler Felt	Trinidad Rancheria	Emergency Operations Center Technician
Andrew Bogar	Blue Lake Rancheria OES	Emergency Manager
Cybelle Immitt	County of Humboldt	Natural Resources Manager, Public Works

Name	Agency/Organization	Title
Justin Legge	Friends of the Dunes	Stewardship Director
Sherry Constancio	California Department of Water Resources	Senior Water Resources Engineer
Simon Knopf	American Red Cross	Disaster Program Manager
Contessa Dickson	Humboldt Bay Municipal Water District	Executive Assistant/Board Secretary
Heidi Aldoroty	Patrick Creek Community Services District	Director- President
Amanda Gonzales	Bear River Band of the Rohnerville Rancheria	OES manager
Kyle Knopp	City of Rio Dell	City Manager
Kevin Caldwell	City of Rio Dell	Community Development Director
Chris Gilda	Petrolia Fire	Fire Chief
Kim Anthony	IEM	Planner

A.2.1.2. INTRODUCTION AND AGENDA

The Humboldt County Multi-Jurisdiction Hazard Mitigation Plan kicked off at a hybrid meeting in Eureka, Calif. on 12/17/2024. Representatives of the plan participants were invited to attend in-person while stakeholders participated online. The agenda included:

- Introductions
- Overview
- What Is Hazard Mitigation?
- Hazard Mitigation Planning
- Hazard Mitigation Grants
- Hazard Review
- Risk Assessment
- Mitigation Strategy
- Goals
- Stakeholder Expectations
- Next Steps

Kim Anthony, IEM Lead Planner, welcomed everyone to introduce themselves. Then, she described some important context for this plan update:

- Five-year hazard mitigation plan expires with FEMA on 3/9/2025
- **Draft Plan Ready:** 5/1/2025
- **Cal OES Submittal:** 5/23/2025

She noted that there will be a gap in coverage for the plan, which will mean people are not eligible for grants during this time. One plan participant asked if their boards were supposed to adopt the plan between 5/1 and 5/23 — Kim shared that this is not recommended as the state and FEMA still must review the plan. Ryan added that there will be an additional letter from FEMA coming that states that the plan is “approvable-pending-adoption” and that is when jurisdictions should adopt. Another question was asked about whether any disaster grants would be available during this gap and Kim clarified this gap only applies to eligibility for hazard mitigation grants.

A.2.1.3. HAZARD MITIGATION

Hazard mitigation was defined as any sustained action taken to reduce or eliminate long-term risks from hazards to people or property.

There are many benefits to mitigation, including breaking the cycle of disaster, damage, reconstruction and repetitive damage; increase public safety and prevent loss of life; speed up recovery and reduce business and economic interruption; and help with other community objectives, such as capital improvements, preserving open (green) space and increasing economic resiliency.

This hazard mitigation plan will be updated in accordance with the new federal guidance for mitigation planning, which was released in April 2023. There will be increased emphasis on topics like partnerships, climate change, the National Flood Insurance Program (NFIP) and High Hazard Potential Dams (HHPDs).

Hazard mitigation plans are prepared and adopted by jurisdictions to identify, assess and reduce the long-term risk to life and property based on natural and human-caused hazards.

This is the structure of the plan:

A FEMA-approved and adopted plan are required to receive funding through grant programs, such as:

- Hazard Mitigation Grant Program (HMGP)
- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- HHPD grants

Kim described how there is both pre- and post-disaster mitigation grant funding. One question was received on whether anyone in Humboldt County had gotten BRIC and FMA. BRIC is relatively new, so no one has gotten yet, but the hazard mitigation plan update serves as a perfect opportunity to identify BRIC-eligible funding projects.

A.2.1.4. COMMUNITY ENGAGEMENT

Public outreach was discussed as an important — and required to receive plan approval.

The participants agreed on March 31 as the deadline for public outreach.

Concerns were brought up with the Hmong new year as well as the quick turnaround during the slower time of the year and holidays.

Ideas generated during this process included reaching out to The Center in McKinleyville, utilizing feed for services flyers, media outlets, radio stations, senior centers, social media and city council meetings.

Populations that were discussed as at-risk and vulnerable were the senior, houseless, schools, ultra-rural.

Ryan shared that the CWPP and the EOP are also being updated.

A.2.1.5. RISK ASSESSMENT

Kim asks what additional hazards should be incorporated into the plan in addition to the ones from the prior plan:

- Climate Change
- Dam Failure
- Drought
- Earthquake
- Flooding
- Landslide
- Severe Weather
- Tsunami
- Wildfire

Human disease (pandemic - COVID-19) was immediately brought up. In addition, bridge failure was discussed. Ryan shares that bridge failure may be a side-effect of another. Severe weather was addressed and included as is. Sea-level rise is also being incorporated into other plans — asks if this is usually incorporated. In addition, the plan participants discussed extreme temperatures — adding both hot and cold as well. One participant identified that there are not much to address for hail and lightning, so they could potentially be removed. The National Risk Index identified that they were very low risk in the county. Online, participants emphasized tsunami and addressing water wells and drinking water.

Kim also asked to consider the previous hazard events based on National Oceanic and Atmospheric Administration (NOAA) data. **Kim asked for information on previous hazards like what impacts were there and photos. These can be emailed directly to her at** Kim.Anthony@iem.com. An immediate concern was the earthquake of 2022. Willow Creek snow in 2021 was also impactful. The County has shared with IEM the list of when the County was impacted.

Kim introduced the concept of *community lifelines.* This term refers to the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. This will be discussed further in the plan update.

The IEM Planning Team will be looking at critical infrastructure as well. The tool that the team uses pulls from national data. Local data is often best, and most updated, for these kinds of plan updates. Kim asks if a critical infrastructure list is available it should be shared with her as well.

A.2.1.6. MITIGATION STRATEGY

Mitigation Goals: The meeting participants considered the goals from the prior plan. Kim noted that they were very succinct. Additional goals could be clarified, such as in the California State Hazard Mitigation Plan (HMP). One participant noted the economy, quality of life and partnerships. Ryan mentioned adding a cultural component of the first goal as well. Also mentioned building codes and plan integration. A participant added that one is about everyone needing to build capacity — both historically underrepresented communities as well as anyone else. It was decided to table the goals for now and to revisit with the Steering Committee.

Mitigation Actions: Kim notes that it is important to identify the status update of the prior mitigation actions and determine what actions should be carried forward into the new plan or remove. She highlighted that there will be another meeting on what types of projects are eligible.

A.2.1.7. PLAN MAINTENANCE

Kim shares that the first community to submit their adoption resolution letter starts the five-year clock for the hazard mitigation plan. Ryan mentions AB 2140 again and how adopting the plan into the local Safety Element in order to get additional disaster funding. He shares the County can support this adoption.

A.2.1.8. PRIORITIES

Kim asked what additional priorities there are for this plan update. City of Arcata mentioned that they are waiting for a grant that is dependent on this plan. The Humboldt Community Services District (CSD) shared they are also waiting for a grant. City of Arcata had a great technical assistance help on their project and will confirm with Cal OES where their project is at, but they want to know the process for approval. Tina shares that it is taking four to six months for review. The State has 45 days to review before sending the plan. Phase 2 funding may be held up by the plan expiring as well. One option that was brought up to the City of Arcata would be adopting prior to submittal to FEMA. IEM can help create an adoption resolution letter that meets this requirement should it be necessary.

A.2.1.9. EXPECTATIONS

Kim noted that active participation, active communication and respect of deadlines will be important to share this. She asks what else is needed from the IEM staff. One participant asks for support with forms and adoption resolution letters as well as an example of the sections that they will be filling out. In addition, there needs to be additional native population information added. **Kim notes that the IEM team is here to help and can schedule additional meetings and Teams call for those that need it.** Ryan wants something that is more functional and more relevant to what they want to do. A participant asked how many actions are recommended. Kim noted that it is important to address each hazard via the mitigation actions.

A.2.1.10. SHAREPOINT

Each plan participant will receive a link to the SharePoint site. This site will be used to transfer and share files. The link will be coming out shortly. **Please accept the link in the email inviting you to SharePoint. Access to the site will expire in 90 days if not actively used.**

A.2.1.11. NEXT STEPS

Plan Participants: Review your previous plan annex.

- Capability changes
- Work with Floodplain manager
- Mitigation action status

Share hazard data with Kim or via the SharePoint site.

- Impacts
- Pictures of damage?

Stakeholders: Share hazard data and mitigation actions with Kim.

- Impacts
- Pictures of damage
- Mitigation actions ideas

Steering Committee: Danielle from the City of Arcata has been nominated. Ryan says this will be our city representative and we still need a special district rep. Pat was nominated. Pat suggested nominating a southern Humboldt representative. Cody was nominated. Danielle, Pat and Cody will think about it and get back to us. An alternate for southern Humboldt was also nominated. Both Cody and Danielle participated in the hazard mitigation plan update. The meeting wrapped up with sharing contact information for Kim and Jeanne.

A.3. Humboldt County Multi-Jurisdictional Hazard Mitigation Plan – Community Lifelines and Risk Assessment Meeting

- Date: February 5, 2025, 1-3 p.m.
- Location: Ferndale City Hall, 834 Main Street
- Total Number of Attendees: 45 participants

A.3.1. ATTENDEES

Name	Agency	Title
Joey Blaine	McKinleyville CSD	Board Secretary
Pat Kaspari	McKinleyville CSD	General Manager
Heidi Aldoroty	Patrick Creek CSD	Director President
Michiko Mares	Humboldt Bay Municipal Water District	General Manager
Amos Pole	Yurok Tribe	Office of Emergency Services-Director
Andrew Gonzales	CAL FIRE - Emergency Command Center	Battalion Chief - Public Safety Answering Point Manager
Contessa Dickson	Humboldt Bay Municipal Water District	Board Secretary/Executive Assistant
William Reynolds	Humboldt Bay Fire	Deputy Fire Chief
Michiko Mares	Humboldt Bay Municipal Water District	General Manager
Brendan Byrd	City of Fortuna	Public Works Director
Terrence Williams	Humboldt CSD	General Manager
Jay Parrish	City Ferndale	City Manager
Kyle Know-	City of Rio Dell	City Manager
Paul Rosenblatt	Westhaven CSD	General Manager
Rebecca Crow	Fieldbrook Glendale CSD	District Engineer
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
Shari Meads	City of Fortuna	Community Development Director
Patric Esh	Humboldt County OES	Program Coordinator
Ryan Derby	Humboldt OES	Program Manager
Amanda Gonzales	Bear River Band	OES Manager
Amanda Kruschke	City of Eureka/Eureka Main Street	Economic Development Coordinator
Andrew Bogar	Blue Lake Rancheria OES	Emergency Manager

Name	Agency	Title
Bryan Robinson	Humboldt Bay Harbor District	Facilities Manager
Chestine Anderson	Briceland CSD	Board President
Cody Cox	Redway CSD	General Manager
Dale Unea	Peninsula CSD/Samoa Fire	Fire Chief
Joe Tagliaboschi	City of Trinidad	City Manager
Samantha Karges	Cal OES Coastal Region	Emergency Services Coordinator
Kelly Allen	City of Eureka	Public Works Director
Kelsey Younker	Humboldt OES	Administrative Secretary
Kevin Caldwell	City of Rio Dell	Planner
Kyle Ebert	DWR Flood Operations Center	Staff Engineer
Kyle Kertscher	Fortuna Fire Protection District	Division Chief
Larry Henderson	Eureka Police Department	Emergency Manager
Michelle Nielson	City of Ferndale	Contract City Planner
Nickolas Pape	Fire Chief Shelter Cove Fire & Resort Improvement District No. 1	Fire Chief
Samantha Smith	Willow Creek Volunteer Fire Department (VFD)	Fire Chief
Susan O'Gorman	Willow Creek CSD	General Manager
Tyler Felt	Trinidad Rancheria	EOC Tech
Kim Anthony	IEM	Lead Planner
Joey Harris	IEM	Planner
Jeanne Bunting	IEM	Project Manager
Casey Garnett	IEM	Planner
Sabrina Lunsford	IEM	Planner

A.3.2. INTRODUCTION AND AGENDA

A hybrid meeting in Eureka, Calif., was held for the Humboldt County Multi-Jurisdiction Hazard Mitigation Plan on 2/5/2025. Representatives of the plan participants were invited to attend in-person while stakeholders participated online. The agenda included:

- Introductions
- Community Lifeline
- Community Lifelines Exercise
- Hazard Profiles and Previous Natural Hazards
- Risk Assessment Worksheet Workshop

A.3.3. JURISDICTION ANNEX PROCESS UPDATE

Kim, IEM Lead Planner, welcomed everyone to introduce themselves. She shared there are three major steps remaining:

- The Risk Assessment Form should be completed no later than **February 14** and sent to Kim.Anthony@iem.com when completed.
- The Capabilities Assessment will be sent February 7 and needs to be completed no later than **February 21**.
  - IEM will be hosting a Q/A session on the capability assessment survey on Wednesday February 19, from 11 a.m.-12 p.m.
- The Mitigation Action Status Meeting is March 19 (for special districts)-March 20 (for municipalities) from 1-3 p.m.

A.3.4. COMMUNITY LIFELINES

Kim went over the eight community lifelines identified by FEMA. Community lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. The community lifelines include:

- Safety and Security
- Food, Hydration, Shelter
- Health and Medical
- Energy (Power & Fuel)
- Communications
- Transportation
- Hazardous Materials
- Water Systems

Water systems are a new addition. By adding water systems as a separate category, FEMA acknowledges the vital importance of water in making communities whole. These lifelines are now a part of the mitigation planning guidance. This provides an opportunity for everyone to consider how they could be impacted by disasters and what can be done to mitigate the risk.

A.3.5. COMMUNITY LIFELINES EXERCISE

Kim asked participants to consider community lifelines, particularly one vulnerability, strength and mitigation action for the lifeline selected.

- **Group 1:** One vulnerability for the energy lifeline is from wildfire. Creating redundancy through the local energy generating facility would be essential.
- **Group 2:** During the 2022 earthquakes, power went out. Fuel was also a problem. For Fortuna, they removed gasoline and diesel storage facilities. However, because the power was out for so long, there was a concern with running out of fuel. Private facilities were able to provide fuel in this situation, but it is a concern.
- **Group 3:** One vulnerability is community target hazards. Fuels from the cannabis industry, including butane, create a vulnerability. This can be addressed through education and preplanning as well as code enforcement with fire and law enforcement. The hazardous fuels response team and close relationships with County stakeholders are also important factors in addressing this hazard.

A.3.6. HAZARD PROFILES

A.3.6.1. DAM FAILURE

Joey Harris, IEM, presented on the hazard profile. He shared a short map of dams, including one high hazard dam in the county and another outside of the county that could impact the planning area.

A.3.6.2. DROUGHT

Some concerns with drought include impacts to foundations, agricultural losses and wildfire.

A.3.6.3. EARTHQUAKE

The plan participants reviewed a video of the 7.0 magnitude earthquake that recently impacted the area.

A.3.6.4. TSUNAMI

This is important hazard for the area including as a cascading impact of an earthquake. Plan participants were invited to review Tsunami evacuation zones.

A.3.6.5. EXTREME TEMPERATURES

"Extreme" depends on the location when it comes to extreme temperatures.

A.3.6.6. FLOODING

Plan participants reviewed a video of the significant Humboldt County Flood of 1964, one of the floods of record in the planning area.

A.3.6.7. LANDSLIDES

Landslides are important hazard, including along the coast. Participants reviewed a video of a local landslide event.

A.3.6.8. WILDFIRE

Plan participants were invited to consider current wildfire events.

A.3.6.9. WIND

Plan participants were invited to consider how wind could impact the planning area, including redwoods.

A.3.6.10. WINTER WEATHER

As a coastal area, there will be different types of weather that impacts Humboldt compared to other areas. This may not impact the coastal region but could impact more in-land areas.

A.3.7. RISK ASSESSMENT WORKSHEET

Plan participants were asked to fill out one risk assessment per planning partner. IEM consultants provided an overview of key topics, including changes in development. Participants were asked to identify what hazards they do not want to profile. If a hazard is not selected to profile — such as dam failure in an area that may not be at-risk to dam failure — plan participants were requested to provide a rationale for why the hazard is not relevant to them. Joey and Kim reminded everyone that hazards and hazard priorities are up to the individual plan participant. One participant may select to profile that is a high risk to them, while another may not and that's okay.

Kim shared these worksheets are due in a week but encouraged everyone to fill them out during the meeting.

Patrick Esh, Humboldt County OES, reminded everyone that local input is very important and that the plan update relies upon them looking at what is being asked for and inputting their information.

One participant asked about how far back to look for the hazards. Kim shared this plan update is looking primarily at changes in the last five years. The plan participants worked on their worksheets for the remainder of the meeting.

A.4. Humboldt County Multi-Jurisdictional Hazard Mitigation Plan – Eligible Mitigation Actions, 02/27/2025

A.4.1. ATTENDEES

Name	Agency/Organization	Title
Amos Pole	Emergency Services	Director, Yurok Tribe
William (Bill) Reynolds	Humboldt Bay Fire	Deputy Fire Chief
Brendan Byrd	City of Fortuna	Public Works Director
Cheryl Kelly	Trinidad	Mayor
Sherry Constancio	California Department of Water Resources	Senior Water Resources Engineer
Contessa Dickson	Humboldt Bay Municipal Water District	Executive assistant/board secretary
Dale Unea	Peninsula CSD/Samoa Fire	Fire Chief
Danielle Allred	City of Arcata	Contracts & Special Projects Manager
David Caisse	City of Arcata	Assistant City Engineer
Ryan Derby	Humboldt County OES	Emergency Services Program Manager
Heidi Aldoroty	Patrick Creek CSD	Director- President
Samantha Karges	Cal OES	Emergency services coordinator
Kyle Knopp	City of Rio Dell	City Manager
Amanda Mager	City of Blue Lake	City Manager
Michael Hansen	City of Eureka	Deputy Public Works Director
Michelle Nielsen	City of Ferndale	Contract City Planner
Michiko Mares	Humboldt Bay Municipal Water District	General Manager
Patrick Kaspari	McKinleyville CSD	General manager

Name	Agency/Organization	Title
James Henry	McKinleyville CSD	Operations Director
Samantha Howard	McKinleyville CSD	Finance Director
Paul Rosenblatt	Westhaven CSD	General Manager
Shane Wilson	Rio Dell FPD	Fire Chief
Shari Meads	City of Fortuna	Community Development Director
Steven Luu	City of Arcata	Senior Project Manager
Terrence Williams	Humboldt CSD	General Manager
Kelsey Younker	Humboldt OES	Administrative Secretary
Nicholas Anderson	Bear River Band of Rohnerville Rancheria/OES	Coordinator
Amanda Gonzales	Bear River Band of Rohnerville Rancheria/OES	Emergency Manager
Patric Esh	Humboldt County OES	Program Coordinator
Jeanne Bunting	IEM	Project Manager
Casey Garnett	IEM	Project Manager
Kim Anthony	IEM	Planner
Kate Smith	IEM	Planner
Myrna Chase	IEM	Planner
Joseph Harris	IEM	Planner
Sabrina Lunsford	IEM	Planner

A.4.2. INTRODUCTION AND AGENDA

Humboldt County Multi-Jurisdiction Hazard Mitigation Plan participants and stakeholders attended a virtual Eligible Mitigation Actions Webinar on 02/27/2025. The agenda included:

- Welcome & Introductions
- Plan Status Update
- Mitigation Strategy Overview
- Humboldt County Mitigation Goals
- Eligible Funding Sources

- Types of Mitigation Actions
- Mitigation Action Plan
- Mitigation Action Prioritization
- Next Steps
- Questions & Discussion

A.4.3. PLAN STATUS UPDATE

Kim Anthony, IEM Lead Planner, introduced herself and turned introductions over to Casey Garnett and Patric Esh. She described some important plan updates:

- Mitigation actions worksheets will be going out in mid-March
- Mitigation Action meetings for special districts will be on **March 19**
- **March 20** for municipalities
- Public surveys (no close date yet) are available along with flyers, should have received the information via email
- Still working on the planning process
- Risk assessment is done
- Capabilities assessment is done
- Working the mitigation strategy

A.4.4. MITIGATION STRATEGY

- Kim gave example of mitigation action of culverts to expand the space available to address water collecting on roadways.
- Take information from your risk assessment, your capabilities and input from public and stakeholders to identify potential mitigation actions.
- Kim presented refresher on Humboldt County mitigation goals. Please review these seven goals and identify what actions relate to these goals. Identify if any goals are lacking actions. Goals should be broad umbrellas that can apply to multiple actions.
- Action: a measure — a specific project or plan that addresses current or future vulnerabilities
- Action plan: a matrix that describes all the components that go into implementing an action including estimated costs, funding options, timelines, priorities etc. Some may require more time, multiple phases etc. This helps evaluate criteria.

- What are benefits of actions, do they outweigh costs? They should be clearly linked to vulnerabilities and gaps in capabilities. Emphasize risk to existing buildings, structures, and infrastructure. Pay particular attention to vulnerable populations.
- Must have at least one action for each hazard identified (dam failure, drought, earthquake, tsunami, extreme temperatures, flooding, landslides, wildfire, wind, winter weather).
- Community Lifelines: Does mitigation action relate to a FEMA community lifeline? If so, highlight that connection.

A.4.5. FUNDING SOURCES

Presentation handed over to Casey.

- Casey gave suggestions of where to start identifying mitigation action ideas. Look at past examples, other plans, FEMA guides, study areas where more information about hazards are needed.
- Grant eligibility
- Funding sources:
  - Local budgets: what are you already planning to do in your public works or plans local
  - Public/nonprofit/private partnerships
  - State grant programs
  - U.S. Army Corps of Engineers
  - Environmental Protection Agency
  - Community Development Block Grant/Housing and Urban Development
  - FEMA Mitigation Grant Programs

A.4.6. MITIGATION FUNDING OPPORTUNITIES

- Pre-Disaster versus Post-Disaster funding opportunities/grants: Consider both options.
  - Pre-Disaster = BRIC, FMA, Pre-Disaster Mitigation (PDM)
  - Post-Disaster HMGP/404, HMGP Post fire, Public Assistance (PA) Mitigation 406, Community Development Block Grant Disaster Recovery (CDBG-DR), Community Development Block Grant Mitigation (CDBG-MIT)
- BRIC: community-wide efforts for capability and capacity building, partnerships. Good for large scale projects. Incentivizes natural hazard risk reduction. Community lifelines are important consideration. Prioritizes disadvantaged communities. Nature-based solutions are good. Project scoping or conducting study for something existing staff doesn’t have capability for.

  - FEMA's BRIC program provides funding for hazard mitigation plans and projects that reduce future disaster losses from natural disasters.
  - BRIC's guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.
    - Assistance funded under BRIC
      - Capability- and Capacity-Building
        - Building Codes
        - Partnerships
        - Project Scoping
        - Hazard Mitigation Planning and Planning-Related Activities
      - Mitigation projects (construction)
      - Management costs
    - Grant funding is available annually.
- FMA: competitive annual grant. Consider repetitive loss and severe repetitive loss structures.
- Swift Current: pilot program for NFIP policy owners with current flood insurance with a history of substantial damage or repetitive flooding. Project examples: Dry proofing, elevation, retrofits.
  - Federal money can cover:
    - Up to 100% of the cost of severe repetitive loss properties
    - Up to 90% of repetitive loss properties
    - Up to 90% of federal cost-share funding for NFIP-insured properties located in socially vulnerable areas
- HMGP: provides funding for hazard mitigation plans and projects that reduce future disaster losses.
- Post-Disaster: HMGP, available after a declared disaster — directed at the state level which makes it a little less competitive.
- HMGP Post-Fire; after wildfire with FMA Grant declaration. Mitigation such as defensible space, fuel reduction, slope and soil stabilization. Question about where fire grant funds are available — post-fire is in the county to people affected by the fire first.
- Public Assistance Mitigation 406 — build back facility to higher standards to reduce future losses

  - PA Mitigation activities
    - Rebuild according to the latest codes and standards
    - Replace drainage structure with a larger structure
    - Install submersible pumps in water or wastewater plants
    - Elevate equipment vulnerable to flood damage
    - Anchor storage tanks to prevent movement
    - Install shut-off valves on underground pipes
    - Elevate or dry floodproof buildings
    - Replace damaged power poles with higher-rated poles
    - Constructing floodwalls around damaged facilities
    - Installing new drainage facilities (including culverts) along a damaged road
    - Adding fire-suppression systems at facilities damaged by wildfire
- CDBG-DR can be used as the local match for FEMA funds
  - Congressionally allocated grant program through the Department of Housing and Urban Development that focuses on long-term recovery efforts and unmet needs
  - Each CDBG-DR activity must:
    - Address a disaster-related impact (direct or indirect)in a Presidentially declared area for the covered disaster
    - Be a CDBG eligible activity
    - Meet a CDBG national objective
- CDBG-MIT can be used as the local match for FEMA funds
  - Funds mitigation activities that increase resilience to disasters and eliminate the long-term risk of loss of life, injury, damage to and loss of property and suffering and hardship by lessening the impact of future disasters.
  - In order to be eligible, an activity must:
    - Meet the definition of “mitigation”
    - Address current and future risks as identified in the grantee’s mitigation needs assessment of most impacted and distressed (MID) areas
    - Be CDBG-eligible activities or meet a waiver/alternative requirement
    - Meet a national objective

- State Funding Sources
  - California Governor’s Office of Emergency Services (Cal OES) Prepare California
  - California Department of Forestry and Fire Protection (CAL FIRE) Grants
  - California Department of Transportation (Caltrans) Sustainable Transportation Planning Grants
  - California Governor’s Office of Land Use and Climate Innovation (LCI) Integrated Climate Adaptation and Resiliency Program (ICARP)
    - Adaptation Planning Grant Program — provides funding for plans, identifying climate resilience priorities and building the plan to project pipeline for climate resiliency projects.
    - Regional Resilience Planning and Implementation Grant Programs — funds regional climate resilience efforts including identifying climate resilience priorities, building capacity and implementing projects that respond to a region’s greatest climate risks
    - Extreme Heat and Community Resilience Grant program — funds and supports local, regional and tribal efforts to reduce the impacts of extreme heat
- Loans Programs
  - The Clean Water State Revolving Fund (CWSRF) from the Environmental Protection Agency (EPA) provides states the opportunity to offer low-interest loans for the construction, improvement, extension, expansion, repair or rehabilitation of wastewater collection, treatment of disposal facilities, storm water management and nonpoint source pollution controls.
  - FEMA’s Safeguarding Tomorrow Revolving Loan Fund provides low interest loans to jurisdictions to reduce vulnerability to natural disasters, foster greater community resilience and reduce disaster suffering. This is a state-led program.

A.4.7. COMMON CALIFORNIA MITIGATION ACTIONS

- Retrofitting (22)
- Vegetative Management (19)
- Public awareness (11)
- Retrofitting Public Structures
- Saferooms
- Generators
- Warning Systems
- Culverts

- Infrastructure Protective Measures (Roads and Bridges)
- Non-Structural Retrofitting/Rehabilitating Public Structures — Seismic
- Utility Protective Measures
- Elevation of Private Structures — Riverine
- Developing, Implementing and Enforcing Codes, Standards, Ordinances and Regulations
- Floodplain and Stream Restoration
- Landslide Stabilization
- Community Flood Mitigation Project

A.4.8. KEY RECOMMENDATIONS FOR IDENTIFYING FUNDING

- Different words are similar in context
  - Green infrastructure = nature-based solutions
  - Open space preservation = conservation
  - Hazard mitigation = climate adaptation
- Consider additional benefits
  - Example: water quality / water quantity
- Embrace partnerships

A.4.9. ACTION DEVELOPMENT TIPS

- Avoid terms like maintenance and ongoing.
  - Preparedness/response/prevention/recovery = not mitigation to your plan reviewer.
- Clarify action intent —
  - “Retrofitting” vs. “Support seismic retrofitting of high-risk critical infrastructure”
- Use strong verbs —
  - “Consider” vs “engage,” “implement,” “conduct,” “develop”
- Be specific — but not too specific —
  - No personally identifiable information (PII)
  - “Seismically retrofit XYZ school” vs. “Seismically retrofit critical infrastructure like XYZ school.”

A.4.10. TYPES OF MITIGATION ACTIONS

- Local plans and regulations
  - Include government authorities, policies, or codes that influence the way land and buildings are developed and built such as general plans, land use and zoning ordinances, stormwater management plans, transportation plans, community wildfire protection plans, etc.
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

A.4.11. ELIGIBLE CAPABILITY AND CAPACITY BUILDING ACTIVITIES

- New plans
- Plan Updates
- Planning-related activities
- Advance assistance — funding to help develop future projects, collect data, etc.
- Project scoping — activities which enable future project development such as engineering studies
- Technical assistance — support directly from FEMA or through funding to enable community programs like floodplain management, training, etc.
- Partnerships — activities that support partnership building including a gap analysis, training and identifying and engaging potential partners.
- Building codes and standards — incorporating hazard and mitigation information into other important community codes.

A.4.12. BRAINSTORMING SESSION 1

- What local plans and regulations could help reduce risk?
- Modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area
- Property acquisition
- Structural elevations
- Structural flood risk reduction such as enlarged culverts and flood-proofing (dry and wet)
- Aquifer recharge, storage and recovery projects such as confined acquirers and unconfined acquirers

- Wind retrofits.
- Safe room building retrofits
- Safe rooms: sole-use and multi-use
- Generators
- Microgrids
- Solar Photovoltaic systems
- Vertical evacuation refuge

A.4.13. BRAINSTORMING SESSION 2

What structure and infrastructure projects could help reduce risk?

- Natural Systems Protection: Includes green infrastructure and low impact development, nature-based solutions, engineering with nature and bioengineering to incorporate natural features or processes into the built environment
- Erosion & Landslide Stabilizations: Installing geosynthetics, stabilizing sod, installing vegetative buffer strips, preserving mature vegetation, decreasing slope angles and stabilizing with riprap and other means of slope anchoring.
- Wildfire Mitigation: Defensible space, ignition-resistant building materials, fire suppression systems, fuels reduction management.
- Nature-Based Solutions: Land conservation, greenways, green roofs, tree canopies, permeable pavement, green streets, rainwater harvesting, wetland restoration

A.4.14. BRAINSTORMING SESSION 3

What natural systems protection projects could help reduce risk?

- Education and Awareness Programs: Social media outreach, websites with maps and information, presentations to school groups of neighborhood organizations, radio or television spots, mailings to residents in hazard-prone areas, targeted outreach to underserved communities and socially vulnerable populations, outreach materials in languages other than English, etc.
- Warning Systems Projects: Warning sirens, Weather radios, reverse 911 systems, weather stations and rain gauges

A.4.15. BRAINSTORMING SESSION 4

What education and awareness projects could help reduce risk?

A.4.16. MITIGATION ACTION PLAN

Summary of methodology provided for priority of actions

- Project Title & Description
- Hazard Addressed
- Responsible Agency
- Potential Funding
- Cost Estimate
- Timeframe
- Associated Community Lifelines
- Priority

A.4.17. NEXT STEPS

- Mitigation actions worksheets will be going out in mid-March
- Mitigation Action meetings for special districts will be on March 19
- March 20 for municipalities
- Public surveys are available along with flyers; should have received the information via email

A.4.18. QUESTIONS

None

A.4.19. DUE DATES AND MEETINGS

Mitigation Action Workshops:

- March 19th — Special Districts
  - Time: 1-3 p.m.
  - Location: Redwood Lodge, 490 E Park Rd, Arcata
- March 20th — Municipalities
  - Time: 1-3 p.m.
  - Location: Mezzanine, 507 F St, Eureka, Calif.

A.5. Humboldt County Multi-Jurisdictional Hazard Mitigation Plan – Special Districts Specific Mitigation Action Workshop

A.5.1. ATTENDEES

Name	Title	Agency
William Reynolds	Deputy Fire Chief	Humboldt Bay Fire
Linda Barsanti	Secretary	Rio Dell Fire District
Nickolas Pape	Fire Chief	Resort Improvement District No. 1
Joe Timmerman	Commissioner	Rio Dell Fire
Patric Esh	Program Coordinator	Humboldt County OES
Marc Barsanti	Battalion Chief	Rio Dell Volunteer Fire Department
Patrick Kaspari	General Manager	McKinleyville CSD
James Henry	Operations Director	McKinleyville CSD
Heidi Aldoroty	Director	Patrick Creek CSD
Rebecca Crow	Engineer	Fieldbrook Glendale CSD
Contessa Dickson	Board Secretary/Executive Assistant	Humboldt Bay Municipal Water District
Michiko Mares	General Manager	Humboldt Bay Municipal Water District
Olivia Lopes	Clerk	Willow Creek Fire Protection District
Samantha smith	Chief	Willow Creek Volunteer Fire Department
Wayne Peabody	Assistant Chief	Arcata Fire
Paul Rosenblatt	General Manager	Westhaven CSD
Ryan Derby	Emergency Services Program Manager	Humboldt County OES
TK Williams	General Manager	Humboldt CSD
Kim Anthony	Lead Planner	IEM
Casey Garnett	Planner	IEM

A.5.2. INTRODUCTION AND AGENDA

An in-person meeting in Eureka, Calif. was held for the Humboldt County Multi-Jurisdiction Hazard Mitigation Plan on 3/20/2025. Representatives of the special districts participating in the plan were invited to attend. The agenda included:

- Public Survey Status, Outreach Requirements and Examples
- SharePoint Library Organization
- Area-wide Actions Conversation
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Kim reminded everyone of the importance of documenting the planning process. This can be submitted via the survey or if needed, it’s okay to send Kim an email. She shared examples, including posting the digital survey online via email and social media, particularly targeting vulnerable populations; posting the survey flyer in person, including in highly trafficked areas; creating and passing out flyers and posting the survey on the community bus. Patric shared that the survey was posted on the bus and he provided an impromptu presentation on the plan. He traveled from Eureka to Arcata and back to get a photo documenting the public outreach and share information on the plan in-person. Kim emphasized that it’s important to share information with vulnerable populations and this is a great example of how to do so.

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1. **Previous Mitigation Actions**: This document helps understand what has happened (or not happened) since the last plan update. Status updates should include whether the action is completed, deferred, or deleted. Actions should have a description of what these terms mean. Rarely, the term “ongoing” may also apply, such as for a phased project that has already been started.
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3. **Special Districts Specific – Mitigation Action Ideas**: This is an optional document that provides some ideas for what type of actions could be selected. These actions are broken out by hazard type. They were selected by the IEM team to reflect potentially eligible actions for municipalities specifically.

A.5.5. AREA-WIDE ACTIONS CONVERSATION

Attendees reviewed the previous countywide actions. Attendees shared status updates as well as evaluated if each action should be completed, deferred, deleted, or ongoing.

1. Continue to participate in the planning partnership and, to the extent possible based on available resources, provide coordination and technical assistance in applications for grant funding that include assistance in cost vs. benefit analysis.
   a. Some activity has been completed for CW-1; ongoing and carry forward — send out notice of funding; due to ongoing disaster and COVID-19.
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   a. Public information strategy has been implemented; ongoing and carry forward — wildfire defensible space, tsunami awareness: know your zone, 2022 earthquake — tabling and social media county OES; expand earthquake, wildfire, energy resilience (hazard-specific outreach). Change wording from planning partners to all communities.

3. Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards, to seek a regulatory cohesiveness in the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.
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4. Sponsor and maintain a natural hazards informational website to include the following types of information:
   a. Hazard-specific information such as GIS layers, private property mitigation alternatives, important facts on risk and vulnerability
   b. Pre- and post-disaster information such as notices of grant funding availability
   c. Links to Planning Partners' pages, FEMA, Red Cross, NOAA, USGS and the National Weather Service (NWS).
   d. Hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.
   e. GIS website on hazard at the county level is helpful — deferred due to COVID-19. Also add more public awareness campaigns on this website.
5. Maintain the Hazard Mitigation Plan Steering Committee as a viable body over time to monitor progress of the plan, provide technical assistance to Planning Partners and oversee the update of the plan according to schedule. This body will continue to operate under the ground rules established at its inception.
   a. Steering committee deferred due to COVID-19. Discussed plan maintenance and involvement of the steering committee moving forward. Patric received a volunteer (city of Trinidad) to support this. Meetings will be open to all planning partners, Patric confirms.
6. Amend or enhance the Humboldt County Operational Area Hazard Mitigation Plan as well as the general Plans for each municipality as needed to comply with state or federal mandates (i.e., CA Assembly Bill 2140 [AB-2140]) as guidance for compliance with these programs become available.
   a. Humboldt County Operational Hazard Mitigation Plan — This action should be expanded to focus on plan integration for multiple types of plans, as applicable. Incorporation of the HMP into the safety element can be a municipality-specific action; Humboldt county

and Rio Dell emphasized the need for the State of California to fill disaster response and recovery needs. AB-2140 funding is not guaranteed, ongoing and carry forward.

7. CW-7 — Work with the Humboldt County Assessor to begin the capture of general building stock information such as area, date of construction and foundation type, to better support future risk assessments.
    a. Humboldt County Assessor — mentioned efforts from the special districts; County OES works with assessor post-disaster — where is this information available — and for grant applications, ongoing and carry forward

In addition to the prior mitigation actions, the jurisdictions reviewed the two new countywide actions proposed on the debris management and an energy and fuel distribution plan. Both actions were confirmed.

A.5.6. MITIGATION ACTION REQUIREMENTS

Kim reviewed the hazards included in the plan and emphasized that each plan participant needs to identify at least one action per hazard. Prior plans and initiatives may have ideas for mitigation actions in them. Some projects may apply to multiple hazards, but this should be identified. This is an opportunity for plan integration as well.

A.5.7. REFRESHERS ON HAZARD SPECIFIC ACTIONS

Participants were encouraged to review the mitigation action ideas form. This form included a summary of public outreach feedback including feedback per hazard. In addition, the public feedback has been divided into areas, populations and assets of concern.

A.5.8. WORKSHOP AND DEVELOPMENT

Attendees worked on their forms. The IEM team answered questions as applicable.

A.5.9. NEXT STEPS AND QUESTIONS

Kim concluded by sharing that she will be sending out the annexes for review. She will send an email out with a request for any changes that each plan participant forms. She noted that these spreadsheet and previous mitigation action status forms are due by **March 28**. She will include in the annex email dates for each annex.

A.6. Humboldt County, CA Hazard Mitigation Plan – Special District Specific Mitigation Action Ideas

Mitigation actions are proactive measures to reduce or eliminate long-term risks from disasters. These include regulations, technological advancements and community initiatives that minimize harm and enhance resilience. They are cost-effective, prevent future damage, raise awareness and promote community readiness. Ultimately, they align with sustainable development goals for a safer, healthier future.

A.7. Humboldt County Multi-Jurisdictional Hazard Mitigation Plan – Municipality Specific Mitigation Action Workshop

A.7.1. ATTENDEES

Name	Title	Agency
Ryan Derby	Emergency Services Program Manager	Humboldt County OES
Joe Tagliaboschi	City Manager	City of Trinidad
Michelle Nielsen	Contract City Planner	City of Ferndale
Brendan Byrd	Pw Director	City of Fortuna
Joe Tagliaboschi	City Manager	City of Trinidad
Kelly Allen	Public Works Director	City of Eureka
Kristin Galt	Administrative Analyst	City of Eureka
Shari Meads	Community Development Director	City of Fortuna
Kyle Knopp	City Manager	City of Rio Dell
Patric Esh	Program Coordinator	Humboldt County OES
Amanda Mager	City Manager	City of Blue Lake
Kim Anthony	Lead Planner	IEM
Casey Garnett	Planner	IEM

A.7.2. INTRODUCTION AND AGENDA

An in-person meeting in Eureka, Calif. was held for the Humboldt County Multi-Jurisdiction Hazard Mitigation Plan on 3/20/2025. Representatives of the special districts participating in the plan were invited to attend. The agenda included:

- Public Survey Status, Outreach Requirements and Examples
- SharePoint Library Organization
- Area-wide Actions Conversation
- Mitigation Action Requirements

- Refreshers on Hazard Specific Actions
- Workshop and Development
- Questions

Kim Anthony, Lead Planner with IEM, introduced the workshop and identified that this workshop is specifically for jurisdictions. She noticed that the IEM team is still collecting public outreach evidence from local jurisdictions and encouraged jurisdictions to submit their photos and outreach summaries promptly. She introduced the rest of the agenda and noted that a large portion of the meeting will be focusing on identifying mitigation actions per jurisdiction that fits the needs and vulnerabilities of each specific jurisdiction participating in the plan update.

A.7.3. PUBLIC SURVEY STATUS, OUTREACH REQUIREMENTS AND EXAMPLES

Kim reminded everyone of the importance of documenting the planning process. This can be submitted via the survey, or if needed, it’s okay to send Kim an email. She shared examples including posting the digital survey online via email and social media, particularly targeting vulnerable populations; posting the survey flyer in person, including in highly trafficked areas; creating and passing out flyers; and posting the survey on the community bus. Patric shared that the survey was posted on the bus and he provided an impromptu presentation on the plan. He traveled from Eureka to Arcata and back to get a photo documenting the public outreach and share information on the plan in-person. Kim emphasized that it’s important to share information with vulnerable populations and this is a great example of how to do so.

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In addition to the prior mitigation actions, the jurisdictions reviewed the three new countywide actions proposed on the debris management, energy and fuel distribution plan and emergency planning integration. ALL actions were confirmed. Ryan also noted that developing a contact list for all partners would be helpful. Understanding who the primary points of contact for each plan participant would help engage partners moving forward. The jurisdictions agreed to include this countywide contact list development as a part of the countywide actions. In addition, the attendees discussed tsunami evacuations. The City of Eureka shared they have a Tsunami Steering Committee which is focused on identifying how to evacuate and incorporate tsunamis into their planning. Ryan noted that evacuation route planning and emergency alerts are part of the focus of the countywide Emergency Operations Plan update. More response-oriented plans can be utilized to address response concerns in addition to this mitigation plan, which is focused more on long-term, sustained mitigation efforts.

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Kim reviewed the hazards included in the plan and emphasized that each plan participant needs to identify at least one action per hazard. Prior plans and initiatives may have ideas for mitigation actions in them. Some projects may apply to multiple hazards, but this should be identified. This is an opportunity for plan integration as well.

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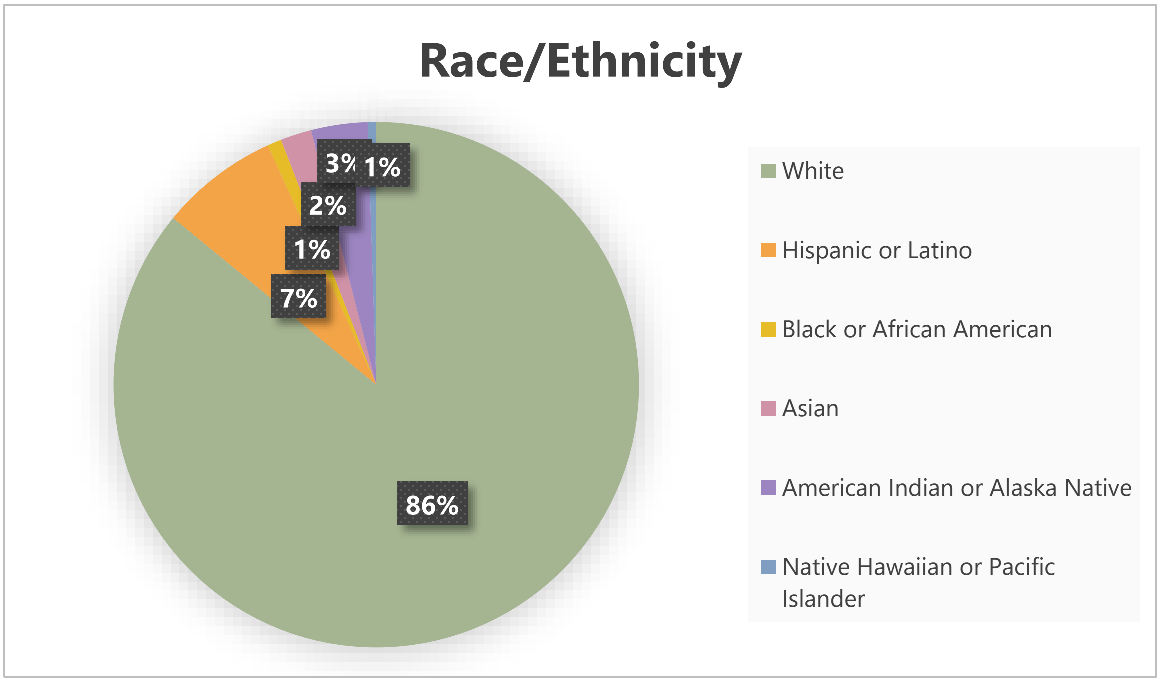
A.9. Public Survey Documentation

1. Which of the following statements applies to you? Check all that apply.

Table 92: Public Survey Demographics

Category	Number of Responses
Age 65 or older	150
Age 18 or younger	21
Veteran	30
Possess a physical or mental disability	65
Use an electricity-dependent medical device(s)	53
Primarily speak a language other than English at home	13
Single parent	72
Married and living together	275
Married and have children	143
Household income is less than the poverty level	52
Man	195
Woman	371
Transgender	10
Member of a tribe	17
Identify as LGBTQIA+ (lesbian, gay, bisexual, transgender, queer or questioning, intersex, asexual, and more)	71
Do not have stable housing	11
Own my own home	358

2. What is your race/ethnicity?



3. What town do you live in or near?

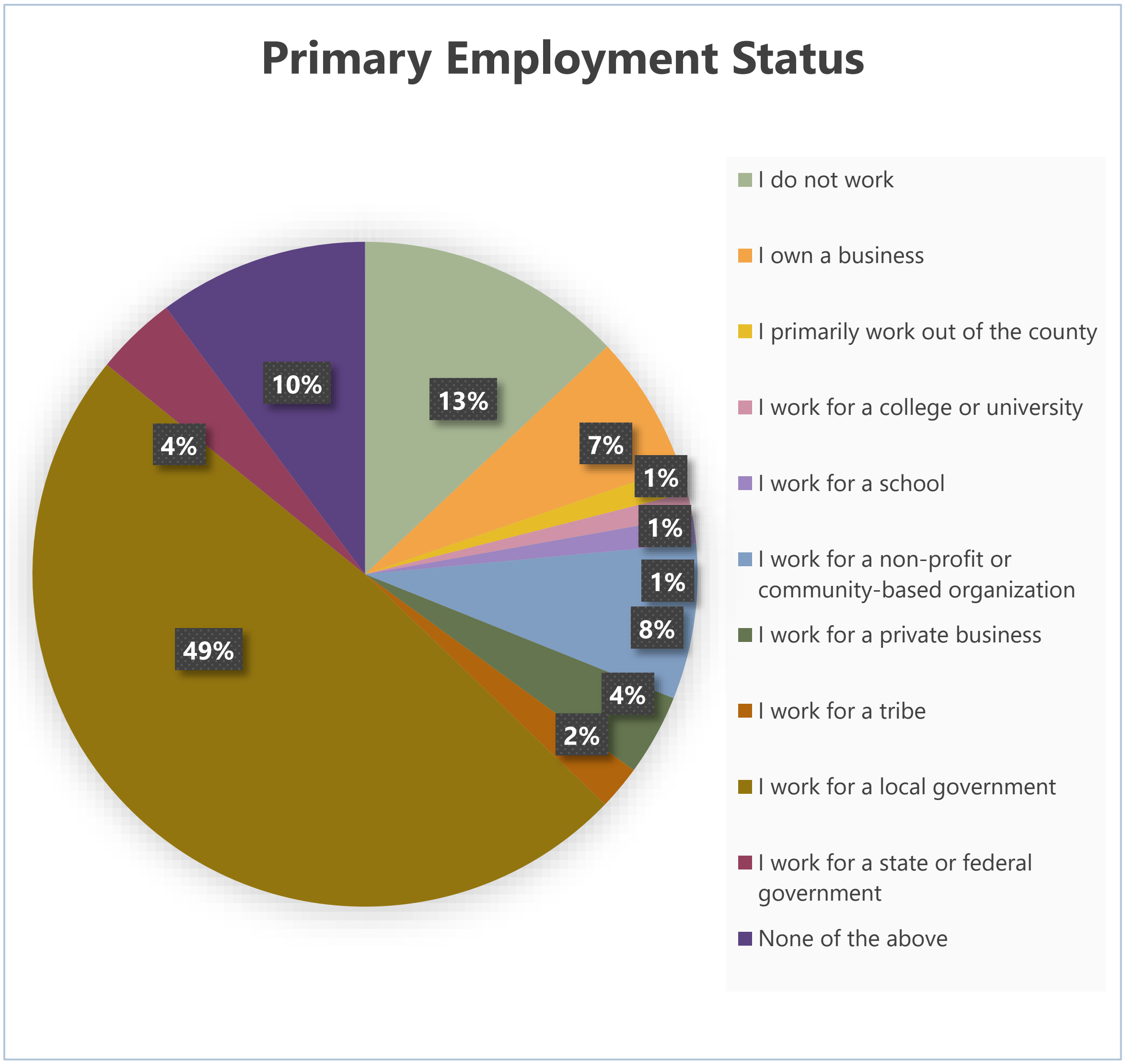
Table 93: Public Survey Respondent Location

Community Name (Including Unincorporated Communities)	Number of Respondents
Alderpoint	1
Arcata	79
Bayside	12
Bayview	3
Benbow	1
Big Lagoon	3
Blocksburg	1
Blue Lake	21
Briceland	1
Bridgeville	5
Carlotta	1
Cutten	18

Community Name (Including Unincorporated Communities)	Number of Respondents
Dinsmore	4
Ettersburg	3
Eureka	180
Fairhaven	2
Ferndale	12
Fieldbrook	21
Fields Landing	1
Fortuna	44
Fruitland Ridge	1
Garberville	7
Honeydew	4
Hoopa	3
Humboldt Hill	3
Hydesville	2
Indianola	1
Kep'el	0
Kneeland	4
Loleta	3
Manila	10
McKinleyville	72
Miranda	7
Myers Flat	0
Orick	0
Orleans	1
Palo Verde	2
Petrolia	16
Phillipsville	2
Redcrest	0

Community Name (Including Unincorporated Communities)	Number of Respondents
Redway	4
Rio Dell	4
Salmon Creek	1
Samoa Peninsula	5
Scotia	4
Shelter Cove	8
Sprowel Creek	0
Trinidad	8
Wautec	0
Weitchpec	2
Weott	0
Westhaven-Moonstone	1
Whale Gulch	3
Whitethorn	2
Willow Creek	13
Other	3

4. What is your primary employment status?



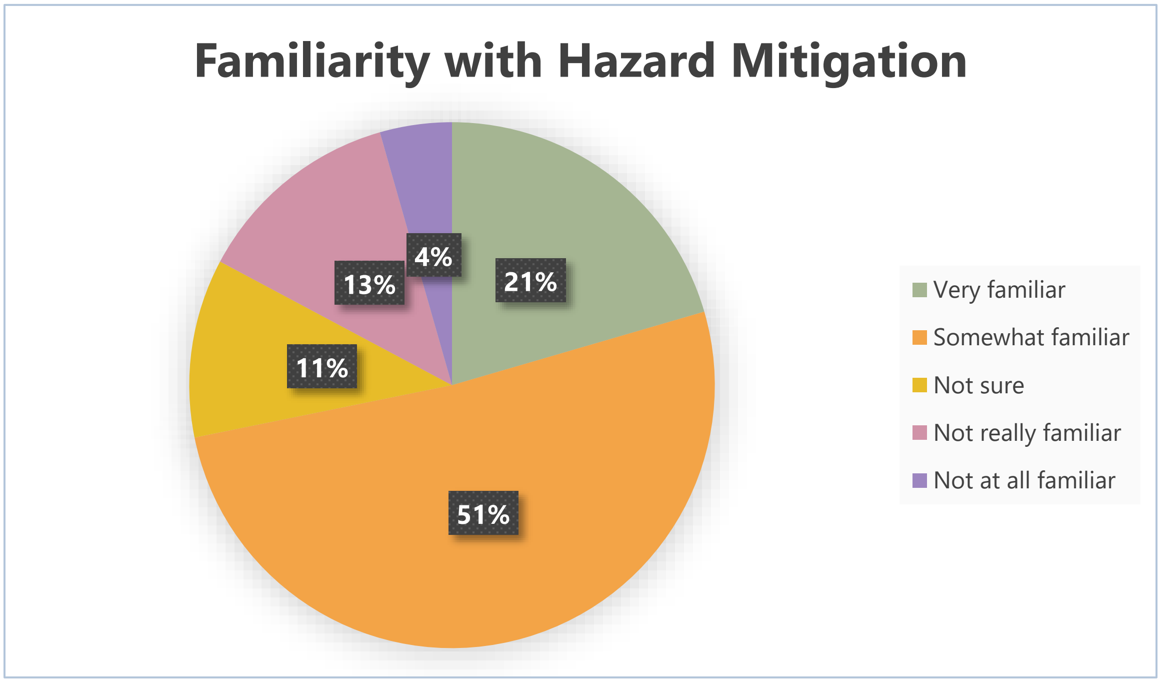
5. Rank what you value the most in your community

Table 94: Community Priorities for Assets

Rank	Asset Type
1	Infrastructure (Power, Water, Roads, etc.)
2	Emergency Services (Law Enforcement, Fire Service, Hospitals)
3	Natural Lands (Parks, Beaches, Open Spaces, etc.)
4	Housing
5	Cultural and Historical Landmarks

Rank	Asset Type
6	Economic and Financial Institutions (Banks, Credit Unions, etc.)

6. How familiar are you with hazard mitigation? Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.



7. How concerned are you about the following hazards impacting your community?

Table 95: Public Ranking of Hazards of Concern

Hazard	Very Concerned	Somewhat Concerned	Neutral	Somewhat Unconcerned	Very Unconcerned
Dam Failure	4%	13.8%	23.4%	23.3%	35.5%
Drought	17.4%	34.9%	16.7%	16.2%	14.9%
Earthquake	61.4%	31.3%	3.9%	2%	1.5%
Extreme Temperatures	16.2%	30.2%	21.6%	15.8%	16.2%
Flooding	30.3%	47.5%	10.5%	8%	3.8%
Landslides	28.7%	47.5%	13.1%	6.1%	4.6%
Tsunami	31.7%	38.1%	14.9%	8%	7.4%

Hazard	Very Concerned	Somewhat Concerned	Neutral	Somewhat Unconcerned	Very Unconcerned
Wildfire	45.8%	35.4%	8.8%	6.5%	3.4%
Wind	21%	47.9%	19.2%	6.9%	5.1%
Winter Weather	14%	40.4%	26.4%	11.4%	7.9%

8. Rank what part of your community is most at risk to your hazards of concern.

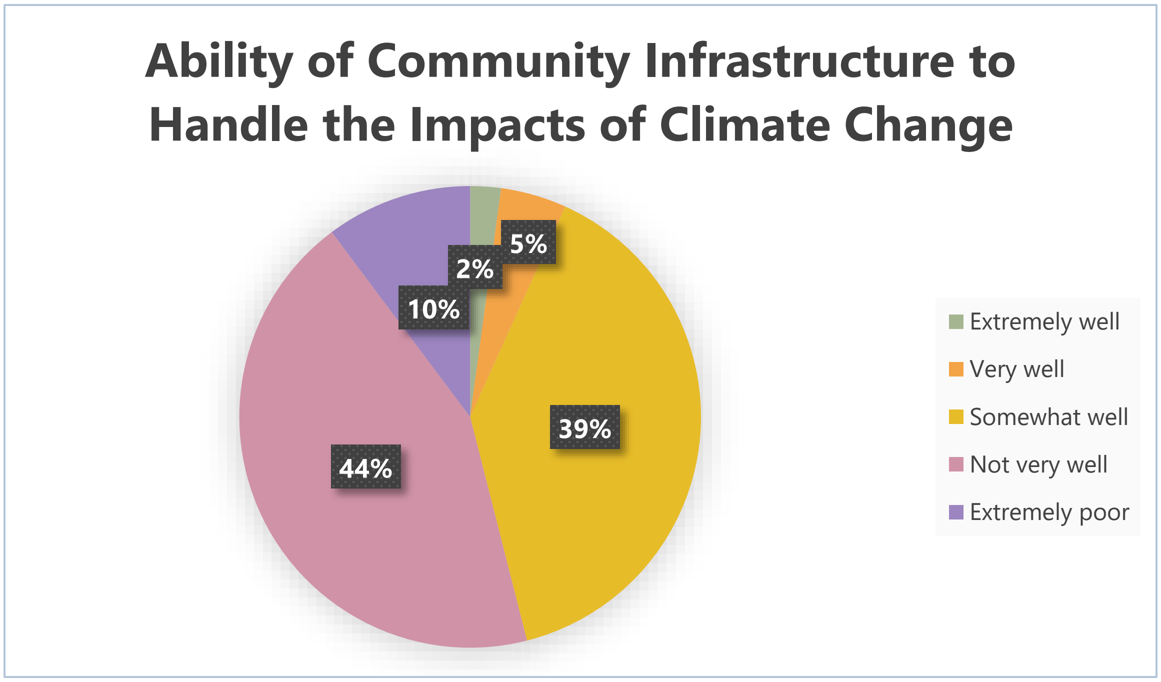
Table 96: Community Assessment of Most At Risk Assessments

Rank	Asset Type
1	Infrastructure (Power, Water, Roads, etc.)
2	Housing
3	Emergency Services (Law Enforcement, Fire Service, Hospitals)
4	Cultural and Historical Landmarks
5	Natural Lands (Parks, Beaches, Open Spaces, etc.)
6	Economic and Financial Institutions (Banks, Credit Unions, etc.)

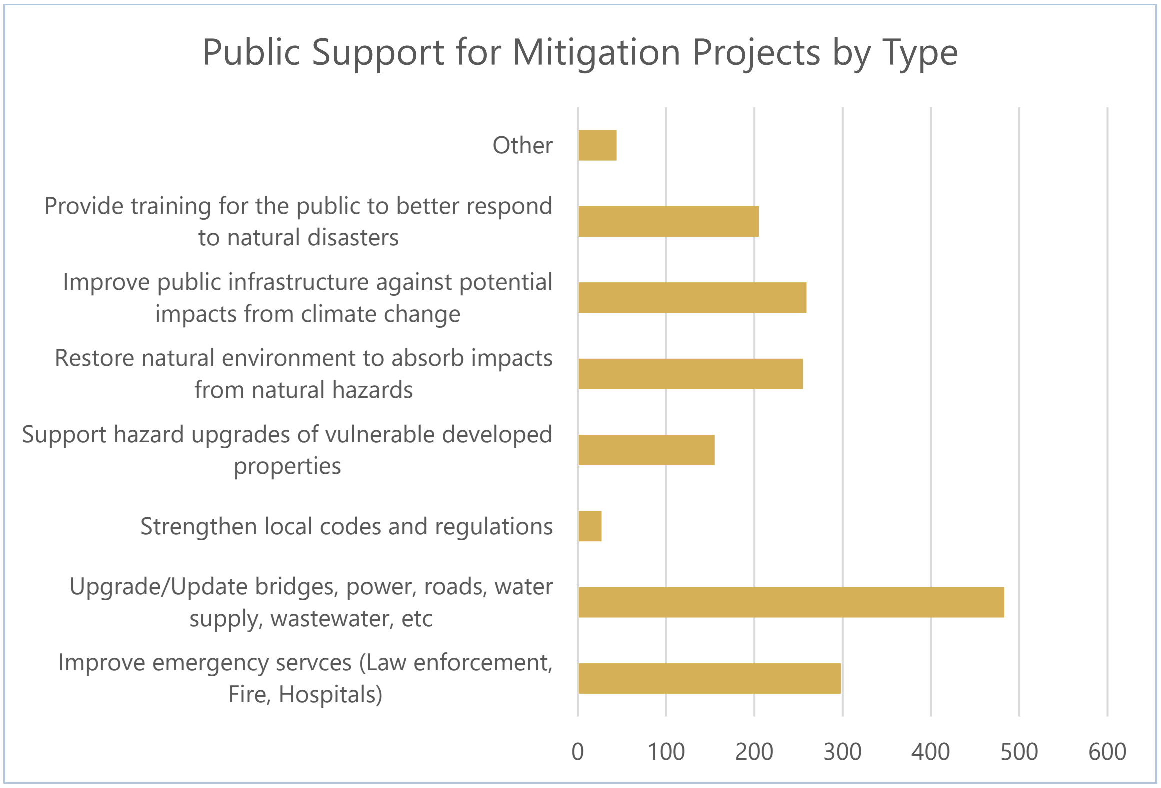
9. List any specific places, infrastructure, and/or vulnerable populations that are most at risk to your hazards of concern. (This includes structures, economic activities and events.)

   Specific responses to this question were reviewed by Humboldt County OES. Plan participants discussed mitigation action recommendations at the mitigation strategy workshops and through the SharePoint site for this project and incorporate them as appropriate into their mitigation action plans.

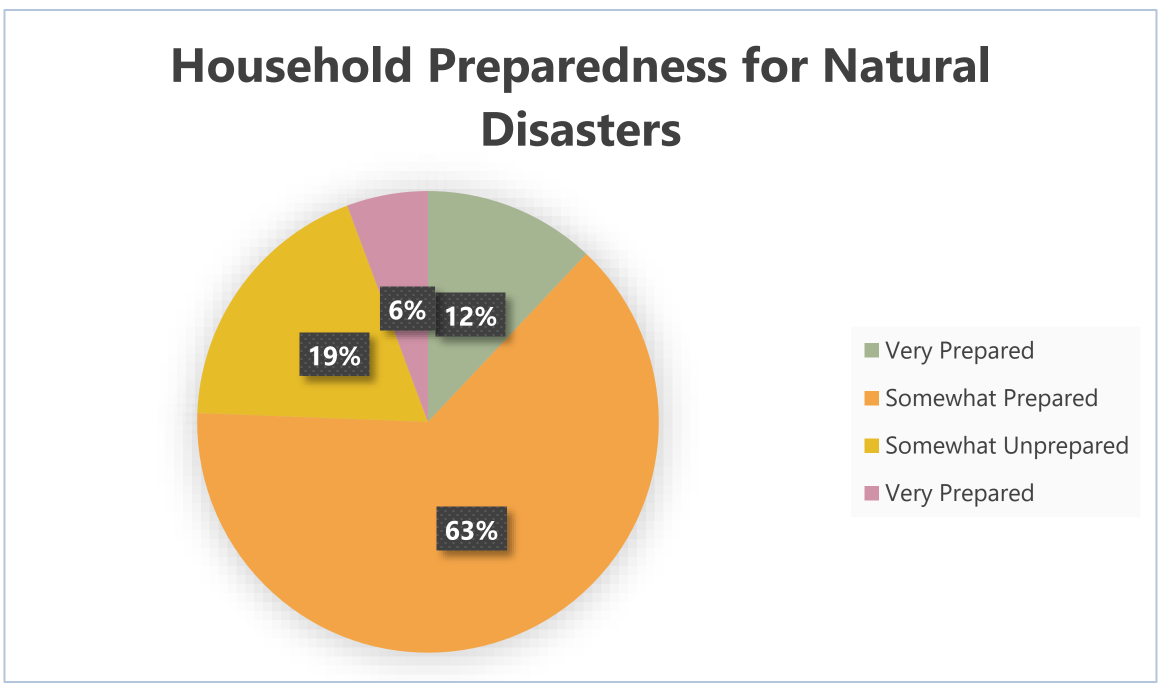
10. How well do you think our community's infrastructure is equipped to handle the impacts of climate change? Climate change impacts including rising temperatures, sea level rise, drought, flooding, wildfire, etc.



11. What types of projects do you believe the County and other local jurisdictions (cities and community service districts) should be doing to reduce damage and disruption from natural hazard events in Humboldt County?



12. How prepared is your household for a natural disaster?



13. What steps have you taken to prepare for a natural disaster? (Check all that apply.)

Table 97: Summary of Public Efforts to Prepare for a Natural Disaster

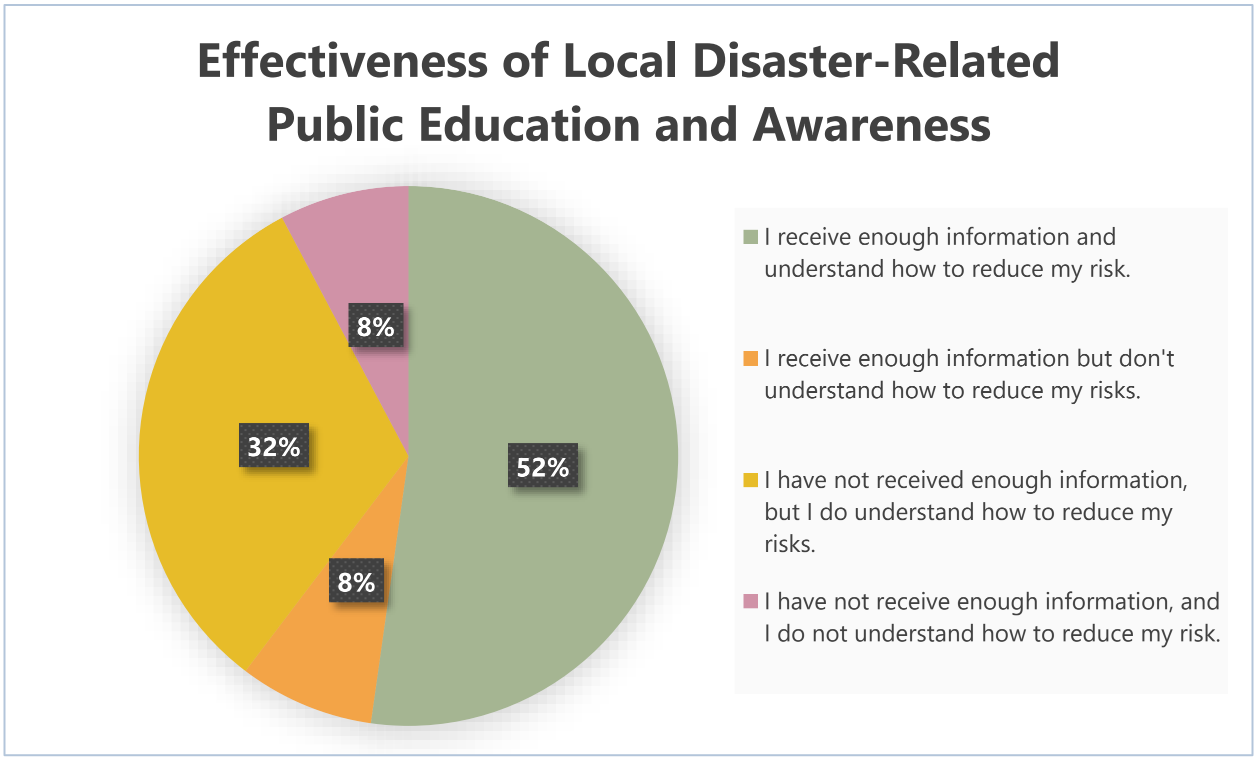
Task	Number of Respondents
Completed first aid/CPR training	360
Made a fire escape/evacuation plan	323
Identified utility shutoffs	433
Prepared a disaster supply kit	328
Installed smoke detectors on each level of the house	510
Stored food and water	417
Stored flashlights and batteries	510
Stored a battery-powered radio and/or program a NOAA Weather Radio	311
Stored a fire extinguisher	467
Stored medical supplies (first aid kit, medications)	427
Purchased natural hazard insurance (Flood, Earthquake, Wildfire)	111
Established a “defensible space” around your home	245
Use of fire resistive landscapes	100
I own a portable generator	293
Anchored service utilities to my home (water heater, wood stove, etc.)	274
None	8
Other	57

14. Which of the following sources of information do you find most valuable when helping you prepare for a natural disaster?

Source	Number of Respondents
Academic Institutions or school	81
American Red Cross	165
Books	81
Blogs and/or forums	87
CERT Classes	141
Chamber of Commerce	8

Source	Number of Respondents
Church (faith-based institutions)	21
City Newsletters	64
Community Safety Events	185
Emergency Service contact (Law enforcement, Fire, etc.)	240
Fair Booths	56
Humboldt alert/emergency alert systems	399
Informational Brochures	166
Newspaper	86
Podcast	43
Public Awareness Campaign (e.g., Tsunami Preparedness Week and Great California Shakeout)	269
Public Meetings	101
Radio Ads	75
Radio News	132
Social Media	237
TV ads	37
TV News	77
Word of Mouth	163
Workshops	118
Other	53

15. How would you rate the effectiveness of disaster-related public education and awareness activities in your community?



16. Any additional comments regarding hazard mitigation?

Specific responses to this question were reviewed by Humboldt County OES. Plan participants discussed mitigation action recommendations at the mitigation strategy workshops and through the SharePoint site for this project and incorporate them as appropriate into their mitigation action plans.

Appendix B: Plan Adoption Resolutions from Planning Partners

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<placeholder>

Appendix C: Acronyms

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Acronym	Meaning
AB	Assembly Bill
ACS	American Community Survey
ADA	Americans with Disabilities Act
AWTF	Advanced Water Treatment Facility
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BOF	Board of Forestry and Fire Protection
BRIC	Building Resilient Infrastructure and Communities
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Office of Emergency Services
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAV	Community Assistance Visit
CDBG	Community Development Block Grant
CDBG-DR	Community Development Block Grant Disaster Recovery
CDBG-MIT	Community Development Block Grant Mitigation
CCR	California Code of Regulations
CCTV	Closed-Circuit Television
CEDS	Comprehensive Economic Development Strategy
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CIP	Capital Improvement Program
COAD	Community Organizations Active in Disaster
CPAP	Continuous Positive Airway Pressure
CPI	Consumer Price Index
CPR	Cardiopulmonary Resuscitation

Acronym	Meaning
CRS	Community Rating System
CSD	Community Services District
CSZ	Cascadia Subduction Zone
CUNA	Comunidad Unida del Norte de Humboldt County
CWPP	Community Wildfire Protection Plan
CWSRF	Clean Water State Revolving Fund
DFIRM	Digital Flood Insurance Rate Map
DMA	Disaster Mitigation Act
DRP	Drought Resilience Plan
DSOD	Division of Safety of Dams
DWR	Department of Water Resources
DWSRF	Drinking Water State Revolving Fund
EAP	Emergency Action Plan
EDDM	Every Door Direct Mailer
EMPG	Emergency Management Performance Grant
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Act
ERP	Emergency Response Plan
ESDP	Economic Strategic Development Plan
F	Fahrenheit
FD	Fire District
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance

Acronym	Meaning
FMGP	Flood Management Grant Program
FNMA	Federal National Mortgage Association
FPD	Fire Protection District
FPF	Federal Policy Fee
FHSZ	Fire Hazard Severity Zones
FRAP	Fire and Resource Assessment Program
FTE	Full-Time Equivalent
GHG	Greenhouse Gas
GIS	Geographic Information System
GPM	Gallons per Minute
HBHD	Humboldt Bay Harbor District
HBMWD	Humboldt Bay Municipal Water District
HHPD	High Hazard Potential Dam
HMG	Hazard Mitigation Grant
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HSGP	Homeland Security Grant Program
HSU	Humboldt State University
HUDEX	Housing and Urban Development Review Exchange
HVAC	Heating, Ventilation and Air Conditioning
IA	Individual Assistance
IBC	International Building Code
ICARP	Integrated Climate Adaptation and Resiliency Program
IIG	Infrastructure Investment Grant
IPAWS	Integrated Public Alert and Warning System
KBDI	Keetch-Byram Drought Index
kV	Kilovolt
LAFCO	Local Agency Formation Commission
LCI	Governor’s Office of Land Use and Climate Innovation

Acronym	Meaning
LED	Light-Emitting Diode
LGBTQIA+	Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, Intersex, Asexual, and More
LHMP	Local Hazard Mitigation Plan
MCSD	Manila Community Services District
MOA	Memorandum of Agreement
mph	Miles Per Hour
NCEI	National Centers for Environmental Information
NEHRP	National Earthquake Hazards Reduction Program
NFDRS	National Fire Danger Rating System
NFIP	National Flood Insurance Program
NID	National Inventory of Dams
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Services
NRI	National Risk Index
NWS	National Weather Service
OA	Operational Area
OES	Office of Emergency Services
OWTS	Onsite Wastewater Treatment System
PA	Public Assistance
PCSD	Peninsula Community Services District
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
PGA	Peak Ground Acceleration
PG&E	Pacific Gas and Electric
PGV	Peak Ground Velocity
PHDI	Palmer Hydrologic Drought Index
PII	Personally Identifiable Information

Acronym	Meaning
PIO	Public Information Officer
PRV	Pressure Relief Valve
PSPS	Public Safety Power Shutoff
PV	Photovoltaic
RDFPD	Rio Dell Fire Protection District
Risk MAP	Risk Mapping, Assessment and Planning
RL	Repetitive Loss
SCADA	Supervisory Control and Data Acquisition
SFHA	Special Flood Hazard Area
SHMP	State Hazard Mitigation Plan
SLR	Sea Level Rise
SRA	State Responsibility Area
SRF	Six Rivers
SRL	Severe Repetitive Loss
SWRCB	California State Water Resources Control Board
TRT	Technical Rescue Team
UCERF	Uniform California Earthquake Rupture Forecast
UNESCO	United Nations Educational, Scientific and Cultural Organization
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VFD	Volunteer Fire Department
WSSI	Winter Storm Severity Index
WUI	Wildland-Urban Interface
WWTP	Wastewater Treatment Plant