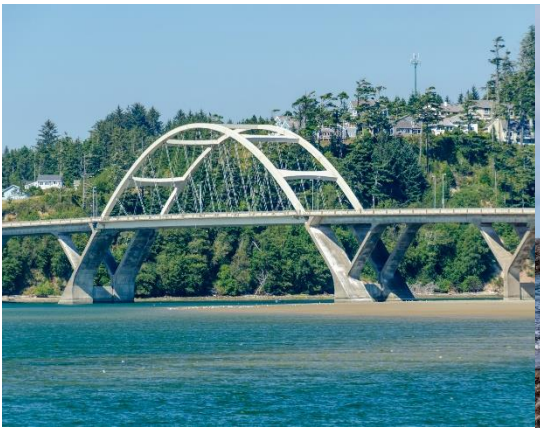
Lincoln County Multi-jurisdictional
Natural Hazards Mitigation Plan



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Effective: December XX, 2025 through December XX, 2030

Participating Jurisdictions:

Lincoln County
City of Depoe Bay
City of Lincoln City
City of Newport
City of Siletz
City of Toledo
City of Waldport
City of Yachats
Beverly Beach Water District
Central Lincoln People's Utility District
Central Oregon Coast Fire & Rescue District
Depoe Bay Fire District
Gleneden Beach Sanitary District
Kernville-Gleneden Beach-Lincoln Beach Water District
Lincoln County School District
North Lincoln Fire & Rescue District
Otter Rock Water District
Panther Creek Water District
Salishan Sanitary District
Seal Rock Water District
Siletz Valley Fire District
SW Lincoln County Water People's Utility District

Prepared for
Lincoln County
Emergency Management
225 W Olive St # 103
Newport, OR 97365

Prepared by
The University of Oregon
Institute for Policy Research & Engagement
School of Planning, Public Policy, and Management

UNIVERSITY OF OREGON | Institute for Policy Research and Engagement

This Natural Hazard Mitigation Plan was prepared by:

UNIVERSITY OF OREGON | School of Planning, Public Policy and Management | Institute for Policy Research and Engagement

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About the Institute for Policy Research and Engagement

The Institute for Policy Research and Engagement (IPRE), a research center affiliated with the School of Planning, Public Policy and Management at the University of Oregon, is an interdisciplinary organization that assists Oregon communities by providing planning and technical assistance to help solve local issues and improve the quality of life for Oregon residents. The role of the IPRE is to link the skills, expertise and innovation of higher education with the transportation, economic development and environmental needs of communities and regions in the State of Oregon, thereby providing service to Oregon and learning opportunities to the students involved.

About the Oregon Partnership for Disaster Resilience

The Oregon Partnership for Disaster Resilience (OPDR) is a coalition of public, private and professional organizations working collectively toward the mission of creating a disaster-resilient and sustainable state. Developed and coordinated by the Institute for Policy Research and Engagement at the University of Oregon, the OPDR employs a service-learning model to increase community capacity and enhance disaster safety and resilience statewide.

NHMP Template Disclaimer

This NHMP is based in part on a plan template developed by the Oregon Partnership for Disaster Resilience. The template is structured to address the requirements contained in 44 CFR 201.6; where language is applicable to communities throughout Oregon, OPDR encourages the use of standardized language. As part of this regional planning initiative, OPDR provided copies of the plan templates to communities for use in developing or updating their hazards mitigation plans. OPDR hereby authorizes the use of all content and language provided to Lincoln County in the plan template.

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Volume I:
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Plan Summary

Lincoln County updated this Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP) to prepare for the long-term effects resulting from hazards. It is impossible to predict exactly when these hazards will occur, or the extent to which they will affect the community. However, with careful planning and collaboration among public agencies, private sector organizations and citizens within the community, it is possible to create a resilient community that will benefit from long-term recovery planning efforts.

44 CFR 201.6 – The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. . . .

FEMA defines mitigation as ". . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk." Said another way, hazard mitigation is a method of permanently reducing or alleviating the losses of life, property and injuries resulting from hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances; projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as non-English speaking residents or the elderly. Hazard mitigation is the responsibility of the "Whole Community." FEMA defines Whole Community as, "private and nonprofit sectors, including businesses, faith-based and disability organizations and the public, in conjunction with the participation of local, tribal, state, territorial and Federal governmental partners."

What is Mitigation?

"Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event."

- U.S. Federal Emergency Management Agency

Why Develop this Mitigation Plan?

44 CFR 201.6(a)(1) – A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants . . .

The Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP to receive FEMA Hazard Mitigation Assistance (HMA) funds for mitigation projects. To that end, Lincoln County is involved in a broad range of hazard and emergency management planning activities. Local and federal

approval of this NHMP ensures that the County and listed jurisdictions will (1) remain eligible for disaster mitigation project grants and (2) promote local mechanisms to accomplish risk reduction strategies.

Who Participated in Developing the Plan?

The Lincoln County NHMP is the result of a collaborative effort between the County, cities, special districts, citizens, public agencies, non-profit organizations, the private sector, and regional organizations. County, city, and special district Steering Committees guided the NHMP development process.

44 CFR 201.6(c)(1) – Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

For a list of specific County steering committee participants, refer to the acknowledgements section. The Lincoln County Emergency Manager convened the planning process and will take the lead in implementing, maintaining and updating the plan. Each of the participating cities and special districts have also named a local convener who is responsible for implementing, maintaining and updating their Jurisdictional Addendum (see addenda for specific names and positions). Lincoln County is dedicated to directly involving the public in the continual review and update of the NHMP. The County achieves this through systematic engagement of a wide variety of active groups, organizations or committees, public and private infrastructure partners, watershed and neighborhood groups and numerous others. Although members of the steering committee represent the public to some extent, the public will continue to provide feedback about the NHMP throughout the implementation and maintenance period.

How does Mitigation Planning Reduce Risk?

The NHMP is a tool for Lincoln County to use to mitigate the impacts of natural hazards by identifying resources, information, and strategies for risk reduction. It is also intended to guide and coordinate mitigation activities throughout the County. A risk assessment consists of three phases: hazard identification, vulnerability assessment and risk analysis, as illustrated in Figure 2-1.

By identifying and understanding the relationship between hazards, vulnerable systems and existing capacity, Lincoln County is better equipped to identify and implement actions aimed at reducing the overall risk to hazards.

Hazard Identification and Overall Risk

Lincoln County identifies 16 natural hazards that could have an impact on the County and participating cities and special districts. Table PS-1 lists the hazards identified and their general location and extent, and the overall risk (total threat score) identified in the hazard analysis matrix (Table 2-1).

44 CFR 201.6(c)(2) – A Risk Assessment that provides the factual basis for activities proposed in the strategy . . .

Table PS-1 Lincoln County Hazard Identification

Hazard	General Location and Extent	Total Threat Score
Windstorm	**Countywide:** Severe winter storms occur annually and can bring high winds. These winds often down trees and power lines, damaging homes, infrastructure, and causing widespread power outages.	**240**
Winter Storm	**Countywide:** While heavy snow is uncommon in Lincoln County due to its maritime climate, occasional winter weather events can bring freezing rain and ice, particularly in the eastern hills, leading to hazardous road conditions and additional strain on utilities and emergency services.	**213**
Landslide/ Debris Flow	**Countywide:** Steep coastal bluffs, saturated soils, and heavy rainfall contribute to landslide risk, especially in areas like Highway 101 corridors and near burn scars from recent wildfires.	**210**
Wildfire	**Countywide:** While coastal areas are generally wetter, Lincoln County still faces wildfire risk, particularly in forested inland areas and during periods of dry, windy conditions. East wind events (when hot, dry air is pushed from the interior toward the coast) can rapidly intensify fire behavior, making wildfires more difficult to control and increasing the threat to homes, infrastructure, and natural resources. These events can severely disrupt transportation, tourism, and emergency response efforts, especially in areas with dense vegetation and limited access routes.	**205**
Earthquake (CSZ Event)	**Countywide:** A major subduction zone earthquake could cause widespread structural damage, landslides, and infrastructure failure across the county.	**201**
Local Tsunami	**Coastal Areas:** A local tsunami, triggered by a nearby offshore earthquake, could reach the coast within 15–30 minutes. Low-lying areas such as Newport, Waldport, Bayshore, and Lincoln City are especially vulnerable.	**191**
Flood (Riverine)	**Localized:** Flooding occurs along rivers such as the Siletz, Alsea, and Yaquina, especially during prolonged rainfall or rapid snowmelt. Flood-prone areas include parts of Siletz, Toledo, and Tidewater.	**180**
Extreme Heat	**Countywide;** defined as days with a heat index above 90 degrees; impacts many vulnerable populations, including children, houseless people, older adults, and those without air conditioning.	**162**
Flood (Coastal)	**Coastal Areas:** High tides, storm surge, and sea level rise contribute to coastal flooding, particularly in low-lying areas like Lincoln City, Salishan, and parts of Newport	**160**
Drought	**Countywide:** Periodic droughts affect water supply, agriculture, and forest health. Coastal communities may experience water restrictions during prolonged dry periods.	**155**

Table PS-1 Lincoln County Hazard Identification

Hazard	General Location and Extent	Total Threat Score
Air Quality/ Smoke	**Countywide:** Smoke from wildfires in Oregon or neighboring states can significantly degrade air quality, affecting health—especially for children, older adults, and those with respiratory conditions.	**146**
Coastal Erosion	**Coastal Areas:** Erosion of cliffs and beaches is ongoing, particularly during winter storms. Areas like Gleneden Beach and Beverly Beach are especially vulnerable.	**135**
Tornado	**Coastal Areas:** Tornadoes are uncommon in Lincoln County, but waterspouts (tornado-like columns of rotating air that form over the ocean) can occasionally come ashore, especially during strong coastal storms. When they do, they can cause localized damage to structures, trees, and power lines in coastal communities. These events are typically short-lived but can be dangerous due to their sudden onset and limited warning time.	**104**
Distant Tsunami	**Coastal Areas:** A tsunami generated by a distant earthquake (e.g., in Alaska or Japan) could reach the Oregon coast in several hours. While less destructive than a local tsunami, it still poses a risk to low-lying coastal zones.	**100**
Earthquake (Crustal Event)	**Countywide:** Earthquakes from local faults could cause significant localized damage to infrastructure and buildings.	**91**
Volcanic Event	**Countywide:** While Lincoln County is not near an active volcano, ashfall from eruptions of Cascade Range volcanoes (e.g., Mount Hood or Mount St. Helens) could impact air quality, transportation, and infrastructure.	**54**

Source: Lincolnr County NHMP Steering Committee (2025). Analysis by OPDR.

Community Vulnerability

Community vulnerabilities are an important component of the NHMP risk assessment. For more in-depth information regarding specific community vulnerabilities, see Volume II, Appendix C. Changes to population, economy, built environment, critical facilities, and infrastructure have not significantly influenced vulnerability. New development has complied with the standards of the Oregon Building Code and the County's development code including their floodplain ordinance. Data sources for the following community vulnerability information can be found in Volume II, Appendix C unless otherwise noted below. The primary data source is the U.S. Census Bureau's American Community Survey 2018-2022.

Population

The socio-demographic qualities of the community population such as language, race and ethnicity, age, income, and educational attainment are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. Historically, 80 percent

of the disaster burden falls on the public.[1] Of this number, a disproportionate burden is placed upon special needs groups, particularly children, the elderly, the disabled, minorities, and low-income persons. Population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning.

Population Vulnerabilities

- Aging Population: 28% of residents are over 64, projected to rise to 32% by 2045, increasing needs for age-specific mitigation and evacuation planning.
- Language Barriers: 8% speak a language other than English; 3% have limited English proficiency, complicating outreach and emergency communication.
- Tourism & Temporary Residents: Up to 55,000 temporary residents during peak season, especially in coastal areas, are unfamiliar with local hazards and evacuation routes.
- Vulnerable Groups: High proportions of individuals with disabilities (22%, 36% for the population over age 65), uninsured (9%), and homeless (517 individuals counted in 2024) increase response and recovery challenges.
- Children & Single-Parent Households: 8% of households are single-parent families; children and elderly are more dependent during disasters.

Economy

Economic diversification, employment and industry are measures of economic capacity. However, economic resilience to natural disasters is far more complex than merely restoring employment or income in the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources, and infrastructure are interconnected in the existing economic picture. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families, and the community to absorb disaster impacts for a quick recovery.

Economic Vulnerabilities

- Income & Poverty: Median household income is $57,794, but 15% live below the poverty line. Deep poverty is concentrated in rural areas.
- Housing Cost Burden: 20% of homeowners and renters are cost-burdened; in some areas, 100% of renters exceed the 30% income threshold.
- Economic Diversity: Lincoln County ranks 31st out of 36 Oregon counties in economic diversity, indicating vulnerability to sector-specific disruptions.
- Employment Sectors: Leisure & Hospitality (26%) and Local Government (16%) dominate employment—both sensitive to disaster impacts.
- Commuting Patterns: 46% of residents work outside the county; 34% of workers commute in, increasing vulnerability during daytime disasters.

[1] Hazards Workshop Session Summary #16: Disasters, Diversity and Equity. (2000). *Natural Hazards Center,* University of Colorado, Boulder.

Environment

The capacity of the natural environment is essential in sustaining all forms of life including human life, yet it often plays an underrepresented role in community resiliency. The natural environment includes land, air, water, and other resources that support and provide space to live, work and recreate.[2] Natural assets such as wetlands and forested hill slopes play significant roles in protecting communities and the environment from natural hazards, such as flooding and landslides. When natural systems are impacted or depleted by human activities, those activities can adversely affect community resilience to natural hazard events.

- Geography & Climate: Coastal location with steep, landslide-prone slopes and high precipitation (65–85+ inches annually) increases flood and erosion risks.
- Climate Variability and Trends: Projected increases in temperature, intense rainfall, and sea level rise will exacerbate flooding, landslides, and wildfire risks.
- Natural Systems: Wetlands and forests provide natural hazard buffers but are threatened by development and logging, reducing resilience.

Environmental Vulnerabilities

Lincoln County has very wet winters and springs, and relatively dry summers and falls. The coastal topography makes the area especially prone to windstorm events and landslides. Managing natural capitals with hazards in mind can increase the county's resiliency.

Built Environment and Physical Infrastructure

Critical facilities (i.e., police, fire, and government facilities), housing supply, and physical infrastructure are vital during a disaster and are essential for proper functioning and response. The lack or poor condition of infrastructure can negatively affect a community's ability to respond to and recover from a natural disaster. Following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions force communities to rely on local and immediately available resources.

- Aging Housing Stock: 67% of homes built before 1990 (pre-modern seismic codes); 33% built before 1970 (pre-floodplain ordinances).
- Mobile Homes: 16% of housing stock are mobile homes, highly vulnerable to wind and seismic hazards.
- Critical Infrastructure:
    - Dams: 5 high-hazard dams pose significant downstream risk.
    - Bridges: 24% of county-owned and 31% of state-owned bridges are distressed.
    - Utilities: Above-ground power and communication lines are vulnerable to wind and ice storms.
    - Transportation: Highway 101 and other key routes are lifelines but susceptible to landslides, flooding, and seismic damage.

[2] Mayunga, J. (2007). *Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach.* Summer Academy for Social Vulnerability and Resilience Building.

- Healthcare & Emergency Services: Two hospitals and multiple clinics exist, but rural areas may face access challenges during disasters.

Capability to Perform Hazard Mitigation Activities

Effective capability to implement natural hazard mitigation relies on several key components. These include a well-structured and collaborative government framework, integration of hazard mitigation into existing plans and policies (such as land use, transportation, and emergency management), and access to accurate data and risk assessments. Strong political and community support, adequate funding, trained personnel, and inter-agency coordination are also essential. Additionally, public education, stakeholder engagement, and the ability to adapt plans based on evolving risks and community needs are critical to ensuring long-term resilience and successful mitigation outcomes.

- Government Structure: Managed by a Board of Commissioners with active departments in planning, emergency management, and public works.
- Plans & Policies: Strong integration of NHMP with land use, transportation, wildfire, and economic development plans.
- Mitigation Programs:
    - Public outreach and education (e.g., radio, printed materials, website).
    - GIS mapping of hazard zones and critical facilities.
    - Regular drills and inter-agency coordination.
- Challenges:
    - Coordination across jurisdictions and agencies is complex.
    - Effectiveness of political capital and plan integration needs further evaluation.
    - Limited resources in rural areas may hinder implementation.

Community Survey

The Lincoln County Community Survey (Appendix F), conducted from May to July 2024, collected input from 73 respondents on hazard awareness, preparedness, and mitigation. Residents expressed the greatest concern about earthquakes, wildfires, coastal erosion, and tsunamis. While many have taken basic preparedness actions, such as trimming trees and securing heavy items, fewer have made larger investments like purchasing insurance or retrofitting homes. Evacuation awareness is strong for tsunamis, but uncertainty remains for other scenarios and locations. Barriers to preparedness include financial constraints, lack of knowledge, and time limitations.

The survey also highlighted critical vulnerabilities in infrastructure, particularly aging water systems, limited backup power, and emergency communication gaps. Respondents, primarily older and long-term residents from Otter Rock and Newport, also reported socioeconomic challenges such as housing affordability, healthcare access, and insurance costs, which further hinder preparedness. These findings emphasize the need for targeted outreach, investment in resilient infrastructure, and inclusive public education to enhance disaster readiness across the county. For full details, see Appendix F. Key takeaways include:

Hazard Concerns: Earthquakes, wildfires, coastal erosion, and tsunamis top the list; volcanic events and extreme heat are of lesser concern.

Preparedness Levels: Basic steps are common, but financial investments in mitigation are less frequent.

(certainly for awareness, but less for understanding)

Evacuation Awareness: High for tsunamis, but gaps exist for other contexts.

Barriers to Preparedness: Cost, lack of knowledge, and time are the most cited obstacles.

Infrastructure Vulnerabilities: Water systems, power supply, and public buildings face significant risks.

Demographics: Older, long-term residents from Otter Rock and Newport were most represented; younger and rural populations were underrepresented.

Socioeconomic Challenges: Many face housing, healthcare, and food insecurity, limiting their ability to prepare.

Communication Gaps: Digital alerts are preferred, but power outages reveal the need for resilient backup systems.

How are the Action Items Organized?

The action items are organized within an action matrix included within Section 3, Mitigation Strategy.

44 CFR 201.6(c)(3)(ii) – A section that identifies and analyzes a comprehensive range of specific mitigation actions . . .

Data collection, research and the public participation process resulted in the development of the action items. The Action Item Matrix portrays the plan framework and identifies linkages between the plan goals and actions. The matrix documents the title of each action along with, the coordinating organization, timeline and the NHMP goals addressed. City and special district specific action items are included in Volume III, Jurisdictional Addenda.

Comprehensive Action Plan

Action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. The Steering Committee will prioritize the following actions to focus their attention, and resource availability, upon an achievable set of high leverage activities over the next five-years.

- To be provided

How will the NHMP be implemented?

44 CFR 201.6(c)(3)(iii) – An action plan describing how the actions . . . will be prioritized, implemented and administered . . .

44 CFR 201.6(c)(4) – A plan maintenance process . . .

Volume I, Section 4 of this NHMP details the formal process that will ensure that the Lincoln County NHMP remains an active and relevant document. The NHMP will be implemented, maintained, and updated by a designated convener. The Lincoln County Emergency Manager is the designated convener (NHMP Convener) and is responsible for overseeing the review and implementation processes (see jurisdictional Addenda for local conveners). The NHMP maintenance process includes a schedule for monitoring and evaluating the NHMP quarterly and producing a NHMP revision every five years. This section also describes how the communities will integrate public participation throughout the NHMP maintenance process.

NHMP Adoption

44 CFR 201.6(c)(5) – Documentation that the plan has been formally adopted by the governing body of the jurisdiction . . .

44 CFR 201.6(d) – Plan review [process] . . .

Once the NHMP is locally reviewed and deemed complete the NHMP Convener (or their designee) submits it to the State Hazard Mitigation Officer at the Oregon Department of Emergency Management (OEM). OEM reviews the NHMP and submits it to FEMA Region X for pre-approval. This review will address the federal criteria outlined in 44 CFR Part 201.6. Once pre-approved by FEMA, the County, cities, and special districts may formally adopt it via resolution.

The Lincoln County NHMP Convener will be responsible for ensuring local adoption of the NHMP and providing the support necessary to ensure NHMP implementation. Once the resolution is executed at the local level and documentation is provided to FEMA, the NHMP will be formally approved by FEMA and the County, participating cities, and special districts will regain eligibility for Hazard Mitigation Assistance (HMA) grant programs

Did we lose eligibility?

The accomplishment of the NHMP mission and goals and actions depends upon regular Steering Committee participation and adequate support from County, City, and special district leadership. Thorough familiarity with this NHMP will result in the efficient and effective implementation of appropriate mitigation activities and a reduction in the risk and the potential for loss from future natural hazard events.

The Steering Committees for Lincoln County and participating cities and special districts each met to review the NHMP update process, and their governing bodies adopted the NHMP. The county date of adoption, FEMA approval, and plan expiration is shown below. See Volume III for dates specific to each participating city and special district.

Lincoln County adopted the NHMP on [DATE, 2025]. FEMA Region X approved the Lincoln County NHMP on [DATE, 2025]. With approval of this NHMP, the County is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through [DATE, 2025].

Section I: Introduction

This section provides a general introduction to natural hazard mitigation planning in Lincoln County. In addition, it addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). The section concludes with a general description of how the NHMP is organized.

What is Natural Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines mitigation as ". . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk."[3] Said another way, natural hazard mitigation is a method of permanently reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances, projects, seismic retrofits to critical facilities and education and outreach to targeted audiences, such as Spanish speaking residents or the elderly. Natural hazard mitigation is the responsibility of the "Whole Community"; individuals, private businesses and industries, state and local governments and the federal government.

Engaging in mitigation activities provides jurisdictions (counties, cities, special districts, etc.) with many benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why Develop a Mitigation Plan?

Lincoln County updated this Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) to reduce future loss of life and damage to property resulting from natural hazards. It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. However, with careful planning and collaboration among public agencies, private sector organizations and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

[3] FEMA, *What is Mitigation?* http://www.fema.gov/what-mitigation

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption and federal approval of this NHMP ensures that the County and listed cities will remain eligible for disaster mitigation project grants.

What Federal Requirements Does This NHMP Address?

DMA2K is the latest federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that State and local jurisdictions' proposed mitigation measures are based on a sound planning process that accounts for the risk to people, local jurisdictions, and the State.

Chapter 44 Code of Federal Regulations (CFR), section 201.6, also requires a local government to have an approved NHMP in order to receive HMGP project grants.[4] Pursuant of Chapter 44 CFR, the NHMP planning processes shall include opportunity for the public to comment on the NHMP during review and the updated NHMP shall include documentation of the public planning process used to develop the NHMP.[5] The NHMP update must also contain a risk assessment, mitigation strategy and a NHMP maintenance process that has been formally adopted by the governing body of the jurisdiction.[6] Lastly, the NHMP must be submitted to the Oregon Department of Emergency Management (OEM) for initial review and then sent to FEMA for federal approval.[7] Additionally, a recent change in the way OEM administers the Emergency Management Performance Grant (EMPG), which helps fund local emergency management programs, also requires a FEMA-approved NHMP.

What is the Policy Framework for Natural Hazards Planning in Oregon?

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The

[4] Code of Federal Regulations, Chapter 44. Section 201.6, subsection (a), 2015
[5] ibid, subsection (b). 2015
[6] ibid, subsection (c). 2015
[7] ibid, subsection (d). 2015

challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

Statewide land use planning Goal 7: Areas Subject to Natural Hazards calls for local plans to include inventories, policies and ordinances to guide development in or away from hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this NHMP aligns with the goals of the jurisdiction's Comprehensive Plan and helps each jurisdiction meet the requirements of statewide land use planning Goal 7.

The primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions. However, additional resources exist at the state and federal levels. Some of the key agencies in this area include OEM, Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI) and the Department of Land Conservation and Development (DLCD).

How was the NHMP Developed?

The NHMP was developed by the Lincoln County NHMP Steering Committee and the Steering Committees for participating jurisdictions (cities and special districts). The Lincoln County Steering Committee formally convened on three occasions to discuss and revise the NHMP. Each of the participating city and special district steering committees participated in the County NHMP update process. Steering Committee members contributed data and maps, reviewed and updated the community profile, risk assessment, action items, and implementation and maintenance plan.

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunity for the public, neighboring communities, local and regional agencies, as well as, private and non-profit entities to comment on the NHMP during review.[8] Lincoln County provided an accessible project website for the public to provide feedback on the draft NHMP: https://www.co.lincoln.or.us/planning/page/natural-hazards-mitigation-plan (invalid URL)

In addition, Lincoln County provided a press release on their website to encourage the public to offer feedback on the NHMP update. The County, city, and special district websites continue to be a focal point for distribution natural hazard information using hazard viewers, emergency alerts, hazard preparation and annual natural hazard progress reports. In addition, the County administered a survey (see Appendix F) that was used to inform the content of, and prioritization, of action items.

[8] Code of Federal Regulations, Title 44. Section 201.6, subsection (b). 2015

How is the NHMP Organized?

Each volume of the NHMP provides specific information and resources to assist readers in understanding the hazard-specific issues facing county and city residents, businesses and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to reduce or eliminate long-term risk to people and their property from hazards and their effects. This NHMP structure enables stakeholders to use the section(s) of interest to them.

Volume I: Basic Plan

Plan Summary

The NHMP summary provides an overview of the FEMA requirements, planning process and highlights the key elements of the risk assessment, mitigation strategy and implementation and maintenance strategy.

Section 1: Introduction

The Introduction briefly describes the countywide mitigation planning efforts, and the methodology used to develop the NHMP.

Section 2: Hazard Identification and Risk Assessment

This section provides the factual basis for the mitigation strategies contained in Volume I, Section 3. (Additional information is included within Volume II, Appendix C, which contains an overall description of Lincoln County and the incorporated cities.) This section includes a brief description of community sensitivities and vulnerabilities. The Risk Assessment allows readers to gain an understanding of each jurisdiction's vulnerability and resilience to natural hazards.

A hazard summary is provided for each of the hazards addressed in the NHMP. The summary includes hazard history, location, extent, vulnerability, impacts and probability. This NHMP addresses the following hazards:

Air Quality
Coastal Erosion
Earthquake (CSZ and crustal)
Tsunami (local and distant)
Drought
Flood
Landslide
Severe Weather:
- Extreme Heat
- Windstorm (& Tornado)
- Winter Storm (snow/ice)

Volcanic Event
Wildfire

Additionally, this section provides information on each jurisdictions' participation in the National Flood Insurance Program (NFIP).

Section 3: Mitigation Strategy

This section documents the NHMP vision, mission, goals and actions (mitigation strategy) and describes the components that guide implementation of the identified actions. Actions are based on community sensitivity and resilience factors and the risk assessments in Volume I, Section 2 and Volume III.

Section 4: Plan Implementation and Maintenance

This section provides information on the implementation and maintenance of the NHMP. It describes the process for prioritizing projects and includes a suggested list of tasks for updating the NHMP, to be completed at the semi-annual and five-year review meetings.

Volume II: Appendices

The appendices are designed to provide users of the Lincoln County NHMP with additional information to assist them in understanding the contents of the NHMP and provide them with potential resources to assist with NHMP implementation.

Appendix A: Glossary and Acronyms

This appendix includes a list of terms, and their acronyms, related to natural hazard mitigation that are found throughout this NHMP.

Appendix B: Planning and Public Process

This appendix includes documentation of all the countywide public processes utilized to develop the NHMP. It includes invitation lists, agendas and sign-in sheets of Steering Committee meetings as well as any other public involvement methods.

Appendix C: Community Profile

The community profile describes the County from several perspectives to help define and understand the region's sensitivity and resilience to natural hazards. The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the region when the NHMP was updated.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix describes the FEMA requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

Appendix E: Grant Programs and Resources

This appendix lists state and federal resources and programs by hazard.

Appendix F: Community Survey

This appendix includes the survey instrument and results from the community survey administered by OPDR and Lincoln County.

Volume III: Jurisdictional Addenda

Volume III of the NHMP is reserved for any city or special district addenda developed through this multi-jurisdictional planning process. Each of the cities with a FEMA approved addendum went through an update to coincide with the county's update. As such, the five-year update cycle will be the same for the participating cities, special districts, and the county.

The NHMP includes addenda for the following cities and special districts:

City of Depoe Bay
City of Lincoln City
City of Newport
City of Siletz
City of Toledo
City of Waldport
City of Yachats

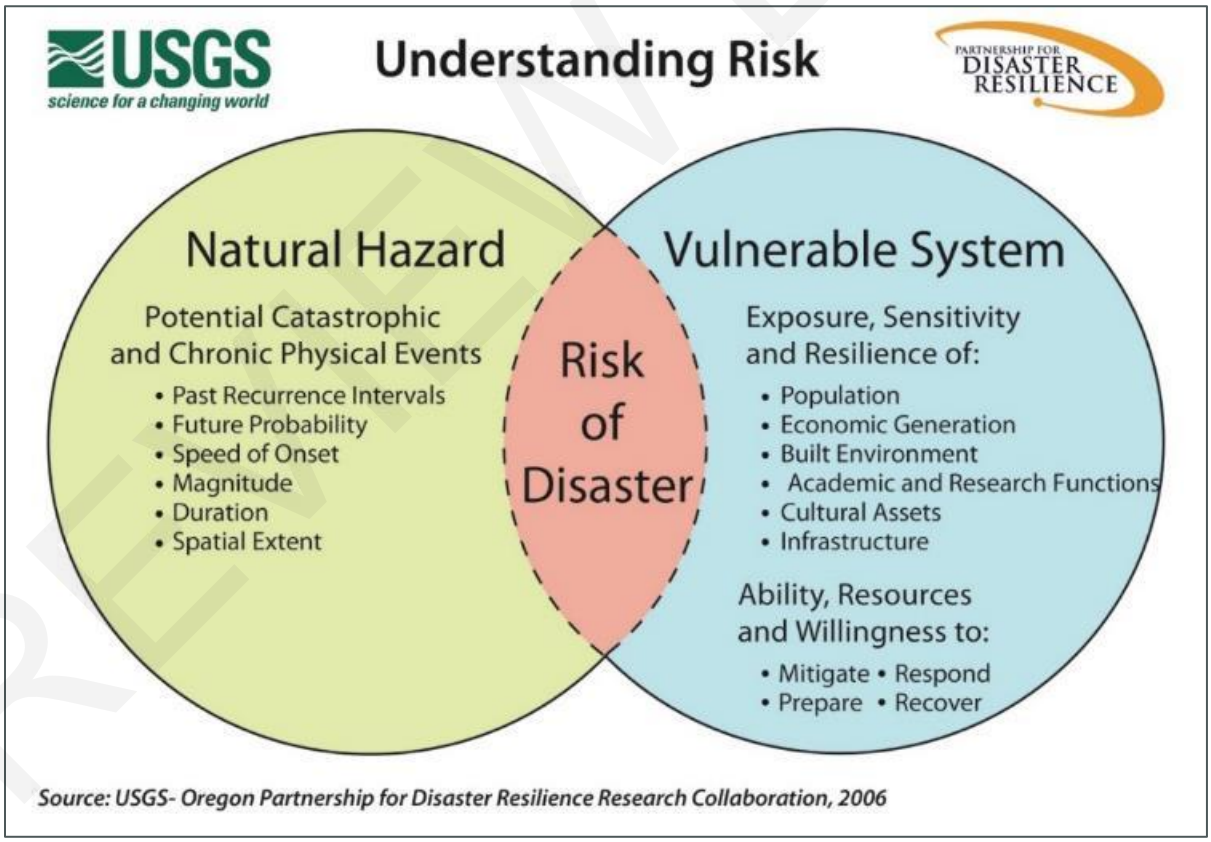
Beverly Beach Water District
Central Lincoln People's Utility District
Central Oregon Coast Fire & Rescue District
Depoe Bay Fire District
Gleneden Sanitary District
Kernville-Gleneden Beach-Lincoln Beach Water District
Lincoln County School District
North Lincoln Fire & Rescue District
Otter Rock Water District
Panther Creek Water District
Salishan Sanitary District
Seal Rock Water District
Siletz Valley Fire District
Southwest Lincoln County Water People's Utility District

Section 2: Hazard Identification and Risk Assessment

This section of the NHMP addresses 44 CFR 201.6(c)(2) - Risk Assessment. The Risk Assessment applies to Lincoln County and the city addenda included in the NHMP. We address city specific information where relevant. In addition, this section can assist with addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards.

We use the information presented in this section, along with community characteristics presented in Volume III, Appendix C to inform the risk reduction actions identified Volume I, Section 3. Figure 2-1 shows how we conceptualize risk in this NHMP. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

Figure 2-1 Understanding Risk



Source: Oregon Partnership for Disaster Resilience.

What is a Risk Assessment?

A risk assessment consists of three phases: hazard identification, vulnerability assessment and risk analysis.

Phase 1: Identify hazards that can affect the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.

Phase 2: Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.

Phase 3: Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

This three-phase approach to developing a risk assessment should be conducted sequentially because each phase builds upon data from prior phases. However, gathering data for a risk assessment need not occur sequentially.

Hazard Identification, Hazard Analysis Matrix, and Methodology

Lincoln County identifies 16 natural hazards that could have an impact on the County and participating cities and special districts (Table PS-1).

For local governments, conducting hazard analysis is a useful step in planning for hazard mitigation, response and recovery. The method provides the jurisdiction with a sense of hazard priorities but does not predict the occurrence of hazards.

For the purposes of this NHMP, the County, cities, and special districts utilized the Oregon Department of Emergency Management (OEM) Hazard Analysis methodology. The hazard analysis methodology in Oregon was first developed by FEMA circa 1983 and gradually refined by OEM over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score and probability approximately 40%. We include the hazard analysis summary here to ensure consistency between the EOP and NHMP.

The Oregon method provides jurisdictions with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused on where the risk is greatest.

In this analysis, severity ratings and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario) and probability.

Table 2-1 presents the updated hazard analysis matrix for Lincoln County. The hazards are listed in rank order from high to low, with scores influenced by past historical events, the probability or likelihood of a hazard event occurring, the vulnerability to the community, and the maximum threat. Windstorm, winter storm, landslide, wildfire, Cascadia Subduction Zone (CSZ) earthquake, and local tsunami are the **high hazard threats** to the county. Riverine flood, extreme heat event, coastal flood, drought, air quality, and coastal erosion are the **moderate hazard threats** to the county. Tornado, distant tsunami, crustal earthquake, and volcanic event are the **low hazard threats** to the county. For more information see Volume I, Section 2.

Table 2-1 Hazard Analysis Matrix

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Windstorm	20	50	100	70	240	#1	
Winter Storm (snow/ice)	18	35	90	70	213	#2	
Landslide	20	40	80	70	210	#3	*Top Tier*
Wildfire	20	25	90	70	205	#4	
Earthquake (Cascadia)	2	50	100	49	201	#5	
Tsunami (Local)	2	40	100	49	191	#6	
Flood (Riverine)	20	30	60	70	180	#7	
Extreme Heat Event	16	20	70	56	162	#8	
Flood (Coastal)	20	30	40	70	160	#9	*Middle Tier*
Drought	20	25	40	70	155	#10	
Air Quality	10	10	70	56	146	#11	
Coastal Erosion	20	15	30	70	135	#12	
Tornado	8	10	30	56	104	#13	
Tsunami (Distant)	10	15	40	35	100	#14	*Bottom Tier*
Earthquake (Crustal)	10	20	40	21	91	#15	
Volcanic Event	2	5	40	7	54	#16	

Source: Lincoln County Steering Committe

Federal Disaster and Emergency Declarations

Reviewing past events can provide a general sense of the hazards that have caused significant damage in the county. Where trends emerge, disaster declarations can help inform hazard mitigation project priorities.

President Dwight D. Eisenhower approved the first federal disaster declaration in May 1953 following a tornado in Georgia. Since then, federally declared disasters have been approved within every state because of natural hazard related events. As of September 17, 2020, FEMA has approved a total of 42 major disaster declarations, 78 fire management assistance

declarations, 36 fire suppression authorizations, and four (4) emergency declarations in Oregon.[9] When governors ask for presidential declarations of major disaster or emergency, they stipulate which counties in their state they want included in the declaration.

Table 2-2 summarizes the major disasters declared in Oregon that affected Lincoln County, since 1955. The table shows that there have been 18 major disaster declarations for Lincoln County. Most of which were related to weather events resulting primarily in floods, landslides, winter storms (snow, ice), wildfires and related damage. There has been one disaster declaration for distant tsunami and for the 2020 COVID-19 Pandemic.

Table 2-2 FEMA Major Disaster Declarations

Declaration Number	Declaration Date	Incident Period	Incident
DR-184	12/24/1964	12/24/64	Heavy Rains and Flooding
DR-319	1/21/1972	1/21/72	Severe Storms, Flooding
DR-413	1/25/1974	1/25/72	Severe Storms, Snowmelt, Flooding
DR-1099	2/9/1996	2/4/96-2/21/96	Severe Storms, Flooding
DR-1107	3/19/1997	12/10/96-12/12/96	Severe Storms, High Winds
DR-1510	2/19/2004	12/26/03-01/14/04	Severe Winter Storm
DR-1632	3/20/2006	12/18/05-1/21/06	Severe Storms, Flooding, Landslides, Mudslides
DR-1672	12/29/2006	11/5/06-11/8/06	Severe Storms, Flooding, Landslides, and Mudslides
DR-1683	2/22/2007	12/14/06-12/15/06	Severe Winter Storm and Flooding
DR-1733	12/8/2007	12/1/07-12/17/07	Severe Storms, Flooding, Landslides, and Mudslides
DR-1956	2/17/2011	1/13/11-1/21/11	Severe Winter Storm, Flooding, Mudslides, Landslides, And Debris Flows
DR-1964	3/25/2011	3/11/11	Tsunami Wave Surge
DR-4055	3/2/2012	1/17/12-1/21/12	Severe Winter Storm, Flooding, Landslides, and Mudslides
DR-4169	4/4/2014	2/6/14-2/10/14	Severe Winter Storm
DR-4258	2/17/2016	12/6/15-12/23/15	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides
DR-4499	3/28/2020	1/20/20-5/11/23	COVID-19 Pandemic
DR-4562	6/7/2020	9/7/20-11/3/20	Wildfires, Straight-line Winds
DR-4768	4/13/2024	1/10/24-1/22/24	Severe Winter Storms, Straight-Line Winds, Landslides, and Mudslides

Source: FEMA, Oregon Disaster History. Major Disaster Declarations.

Table 2-3 summarizes fire management assistance, fire suppression authorizations, and emergency declarations. Fire Management Assistance may be provided after a State submits a

[9] FEMA, *Declared Disasters by Year or State*, https://www.fema.gov/disasters/#. Accessed July 1, 2020.

request for assistance to the FEMA Regional Director at the time a "threat of major disaster" for a fire emergency exists. There is one fire management assistance declaration or fire suppression authorization on record for the county related to the 2020 Echo Mountain Fire Complex.

An Emergency Declaration is more limited in scope and without the long-term federal recovery programs of a Major Disaster Declaration. Generally, federal assistance and funding are provided to meet a specific emergency need or to help prevent a major disaster from occurring. Lincoln County has two recorded Emergency Declarations related to the 2005 Hurricane Katrina evacuation, the 2020 COVID-19 Pandemic, and the 2020 Oregon wildfires.

Table 2-3 FEMA Fire Management (FM) and Emergency Declarations (EM)

Declaration Number	Declaration Date	Incident Period	Incident
FM-5362	9/9/2020	9/8/20-10/14/20	Echo Mountain Fire Complex
EM-3228	9/7/2005	8/29/05-10/1/05	Hurricane Katrina Evacuation
EM-3429	3/13/2020	1/20/20-5/11/23	COVID-19 Pandemic
EM-3542	9/10/2020	9/8/20-9/15/20	Oregon Wildfires

Source: FEMA, Oregon Disaster History. Major Disaster Declarations.
Note: Oregon was granted an Emergency Declaration to support the Hurricane Katrina Evacuation. The Oregon National Guard deployed over 2,100 soldiers and their equipment to New Orleans in less than three days.

State Emergency Declarations

In addition to federal major disaster and fire management assistance declarations, the Governor of Oregon also issues state-level emergency declarations for natural hazard events. When issuing a declaration, the Governor specifies which counties are affected by the event. Not all events that receive a state emergency declaration receive a declaration from FEMA.

Table 2-4 lists the 12 natural hazard events affecting Lincoln County since 2003 (the first year for which data is readily available) for which an emergency declaration was issued only by the Governor of Oregon and not FEMA.

Table 2-4 Oregon State of Emergency Declarations

Declaration Number	Declaration Date	Incident Period	Incident
09-04	1/20/2009	12/31/08-1/20/09	Severe winter weather, flooding, landslides, and wind
12-06	5/8/2012	3/11/12	Severe weather, damaging winds, heavy rains, flooding, mudslides, and landslides
16-02	1/25/2015	12/7/14	Severe winter storm, heavy rains, high winds, flooding, landslides, and erosion
18-19	8/14/2018	8/14/18-12/31/18	Drought, extremely low stream flows, and hot/dry conditions
21-01	2/4/2021	1/1/21-1/15/21	Severe winter storm, heavy rains, high winds, flooding, landslides, and erosion
21-25	7/21/2021	6/22/21-12/31/21	Drought, lack of precipitation, high temperatures, and low streamflow

21-26	7/29/2021	7/29/21-7/31/21	Excessive high temperatures
22-01	1/26/2022	12/30/21-1/10/22	Severe winter storm, heavy rains, high winds, flooding, landslides, and erosion
23-07	3/9/2023	12/22/22-1/6/23	Severe winter storm, heavy rain, high winds, flooding, ice accumulation, landslides, and erosion
23-22	9/1/2023	8/16/23-12/31/23	Drought, low streamflow, low precipitation, and low soil moisture
24-10	7/5/2024	7/5/24-7/9/24	Extreme Heat
25-03	2/6/2025	12/16/24-1/6/25	Heavy Rain and Flooding

Source: Office of Oregon Governor (2025). *Executive Orders: 2003 to Present.* Retrieved June 12, 2025, from https://www.oregon.gov/gov/pages/executive-orders.aspx.

Future Climate Variability10

Temperatures have increased across Oregon by 2.2 ˚F in the period 1895–2015 (the observed record). In that same timeframe, Cascade Mountain snowpacks have declined, and higher temperatures are causing earlier spring snowmelt and spring peak stream flows. In Oregon's forested areas, large areas have been impacted by disturbances that include wildfire in recent years, and climate change is probably one major factor. [11]

Climate models for Oregon suggest increases in temperature around 0.2-1°F per decade in the 21st Century, along with warmer and drier summers, and some evidence that extreme precipitation will increase in the future. By the 2050s Oregon is expected to see temperature increases between 3.6°F and 5.0°F depending on global emissions.

The Department of Land Conservation and Development (DLCD) contracted with the Oregon Climate Change Research Initiative (OCCRI) to provide an analysis of climate change influences on natural hazards. OCCRI's *Future Climate Projections: Lincoln County* provides important information regarding the influence and impacts of climate change on existing natural hazards events such as heavy rain, river flooding, drought, heat waves, cold waves, wildfire, air quality, coastal erosion and flooding, and ocean temperature and chemistry.

The basis of the research prepared by OCCRI uses future climate projections that are derived from 10–20 global climate models and have been "downscaled"—made locally relevant. Several climate metrics that relate to natural hazards are being calculated for historical and mid-21st century periods under two future emissions scenarios that result in varying future temperature increases for the State of Oregon.

The report describes county-specific projected changes in climate metrics related to the selected natural hazards. The reports present future climate projections for the 2020s (2010-2039 average) and the 2050s (2040-2069 average) compared to the 1971-2000 average historical

[10] Oregon Climate Change Research Institute (OCCRI), 4th Oregon Climate Assessment Report (2019) and Northwest Climate Assessment Report (2013). http://www.occri.net/publications-and-reports/publications/

[11] Ibid.

baseline. Each hazard in the report has a box highlighting "key messages" that call out the main points of the research and analysis for that hazard.

Figure 2-2 provides an overview of expected climate change impacts for Lincoln County. The table shows the direction of change (increasing, decreasing, unchanging) and indicates the level of confidence in direction of change (high, medium, low). According to the OCCRI reports there is very high confidence that heat waves will increase and that cold waves will decrease. The table also shows that there is high confidence that heavy rains, river flooding, wildfire, loss of wetland ecosystems, ocean temperature and chemistry changes, and coastal hazards will increase. The overview describes results for the natural hazards using climate metrics in summary and as a comparison. For more information see the OCCRI report (Link).

Figure 2-2 Summary of projected direction of change along with the level of confidence in climate change related risk of natural hazard occurrence.

	Low Confidence	Medium Confidence	High Confidence	Very High Confidence
Risk Increasing ↑	Poor Air Quality	Drought Increased Invasive Species Risk	Heavy Rains Flooding Wildfire Loss of Wetland Ecosystems Ocean Temp & Chemistry Changes Coastal Hazards	Heat Waves
Risk Unchanging =	Windstorms			
Risk Decreasing ↓				Cold Waves

Source: OCCRI. 2020. *Future Climate Projections Lincoln County* (Link).

Very high confidence means all models agree on the direction of change and there is strong evidence in the published literature. High confidence means most models agree on the direction of change and there is strong to medium evidence in the published literature. Medium confidence means that there is medium evidence and consensus on the direction of change with some caveats. Low confidence means the direction of change is small compared to the range of model responses or there is limited evidence in the published literature.

Hazard Profiles

The following subsections briefly describe relevant information for each hazard. For additional background on the hazards, vulnerabilities, and general risk assessment information for hazards in Lincoln County, refer to the Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP (2020).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the cities of Lincoln City, Depoe Bay, Siletz, Newport, Toledo, Waldport, and Yachats, and the Confederated Tribes of Siletz Indians, and the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach. The study was funded through the FEMA Risk MAP program and was published in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The County hereby incorporates the Risk Report into this NHMP by reference (DOGAMI, O-20-11).

Air Quality/Smoke

Summary			
Hazard Ranking:	#11	**Probability:**	High
Total Threat Score:	146	**Vulnerability:**	Low

Significant Changes Since Previous Update

This hazard was not profiled in the previous version of this NHMP.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) the risk of wildfire smoke exposure is projected to increase in Lincoln County. In Lincoln County, the number of "smoke wave" days is projected to decrease by 7% while the intensity of "smoke waves" is projected to increase by 89% by 2046–2051 under a medium emissions scenario compared with 2004–2009.

Increasingly poor outdoor air quality will have exponentially high impacts upon those living in older homes, manufactured housing, RVs, and campgrounds, or the unhoused. The need to install new or upgraded air conditioning systems or HVAC filtration systems will impact the cost of housing. The population of adults aged 65 and older is increasing within this jurisdiction. As a result, the impact of the air quality hazard may increase.

Characteristics

Air Quality is impacted by airborne particles like dust, soot, smoke, and droplets. These particles can be measured by the amount of particulate matter or "PM" in the air. PM is a mixture of not only very small particles and liquid droplets but also many different components like acids, organic chemicals, metals, and dust. PM is measured in micrometers (microns, µm). PM2.5 is less than or equal to 2.5µm in diameter. Health studies show that there are harmful effects from breathing PM particles. PM can be inhaled deep into the lungs and can lodge there for weeks and months, aggravating asthma, heart disease, and other respiratory and heart conditions.[12]

The Clean Air Act of 1970 and the U.S. Environmental Protection Agency (EPA) established health-based National Ambient Air Quality Standards (NAAQS) for these relevant air pollutants:

- **Carbon Monoxide:** Carbon monoxide (CO) is a colorless and odorless gas that interferes with the body's ability to use oxygen. CO in ambient air is formed primarily by the incomplete combustion of carbon-containing fuels and photochemical reactions in the atmosphere, with on-road mobile sources representing significant sources of CO to ambient air. Microenvironments influenced by on-road mobile sources are important contributors to ambient CO exposures, particularly in urban areas. Where present, other

[12] Oregon Department of Environmental Quality (n.d.). *Particulate Matter*. https://www.oregon.gov/deq/aq/pages/particulate-matter.aspx.

(non-ambient) CO sources can also be important influences on total CO exposure and on the impact of ambient CO exposure.

- **Ozone:** Ozone (O3) is part of the ozone layer in the Earth's stratosphere. Ozone is harmful outside of the ozone layer in our lower atmosphere and at that point it is often referred to as smog, ground level ozone, or ozone pollution. Ozone typically forms on days when the temperature is warm and stable. Ground level ozone is not emitted directly into the air but is instead created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC. Breathing ozone can trigger a variety of health problems, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma. Ground level ozone can also have harmful effects on sensitive vegetation and ecosystems.
- **Particulate Matter:** Particulate matter (PM10 and PM2.5) is the generic term for a broad class of chemically and physically diverse substances that exist as discrete liquid and/or solid particles over a wide range of sizes. PM particles originate from a variety of anthropogenic stationary and mobile sources, as well as from natural sources; they are mostly from smoke, dust, and vehicle exhaust. Particles may be emitted directly or formed in the atmosphere by transformations of gaseous emissions such as sulfur oxides (SOX), NOX, and VOCs.

The Oregon Department of Environmental Quality (DEQ) is a regulatory agency with the responsibility to protect and enhance the quality of Oregon's environment. DEQ is responsible for providing accurate scientific data concerning the State of Oregon's air quality to ensure that the state meets the NAAQS set by the EPA. Regions that fail to meet the NAAQS are designated "non-attainment" and are required to develop plans to come into compliance with the standards. Once compliance with the standard is achieved, a maintenance plan is developed to safeguard against future compromised air quality.

Location and Extent

The coastal parts of the County are at a lower risk of poor air quality events. Coastal air wind keeps particulates from staying in the air. However, further inland the coastal hills and mountains can trap air and particulates, making the air quality worse for longer periods of time. The extent of poor air quality events can depend greatly on fires in the area, whether from yard debris fires, controlled burns, or large-scale wildfires.

History

The 2020 Labor Day fires marked one of Oregon's most severe wildfire seasons, with the Echo Mountain Complex in Lincoln County producing hazardous smoke that triggered evacuations and health alerts. Although other wildfire seasons were less intense, they occasionally bring days of poor air quality, particularly during late summer and early fall.

Probability

Based on the available data and research, **the NHMP Steering Committee rated the probability of occurrence as "high",** meaning one incident in the next 10 to 35 years may occur. Major air quality/smoke events occur every few years within the region, and while they are generally not long lasting, they are growing in both intensity and occurrence as wildfires continue to intensify in the region, in Oregon, and across the Western U.S.

Vulnerabilities

Due to insufficient data, Lincoln County is currently unable to perform a quantitative risk assessment or exposure analysis for this hazard. However, based on the potential impacts discussed in this section, **the NHMP Steering Committee rated the vulnerability to air quality/smoke events as "low",** less than < 1% of the region's population or assets could be affected by a major disaster.

The DOGAMI Risk Report does not describe air quality/smoke impacts.

Air pollution affects health in several ways. Impacts range from upper respiratory tract irritation, coughing and shortness of breath to aggravating conditions such as asthma, emphysema, and bronchitis. Long-term exposure to PM2.5 is associated with reduced lung function, development of chronic bronchitis, heart disease and premature death. The small size of these particles allows them to get deep into the lungs and reach the bloodstream.

Exposure to Carbon Monoxide can reduce the oxygen-carrying capacity of the blood. People with heart disease already have a reduced capacity for pumping oxygenated blood to the heart, which can cause them to experience myocardial ischemia (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising or under increased stress. For these people, short-term CO exposure further affects their body's already compromised ability to respond to the increased oxygen demands of exercise or exertion.

Exposure to ground-level Ozone can aggravate asthma and cause respiratory symptoms like coughing and lung inflammation. Repeated exposure may cause permanent damage to lung tissue. While the effects of acute, short-term episodes of ozone exposure are reversible, the human body's response to long-term exposure may not be reversible. Exposure to ozone at commonly encountered levels permanently scars lungs, causing long-term impairment of lung capacity, or the volume of air that can be expelled from fully inflated lungs. Ozone may have similar effects on human lungs. Studies in animals also suggest that ozone may reduce the human immune system's ability to fight bacterial infections in the respiratory system.

Exposure to Particulate Matter is directly linked to the size of the PM regarding their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into lungs and the bloodstream. Exposure to such particles can affect both the lungs and heart. People with heart or lung diseases, children, and older adults are the most likely to be affected by particle pollution exposure. Numerous scientific studies have linked particle pollution exposure to problems, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma,

decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

In addition to these health impacts, air quality is also a constraining factor on transportation choices and commercial/industrial development. Cars, trucks, industry and commerce and diverse activities discharge pollutants into the air, while individuals who commute via walking, cycling or public transportation may be unable to safely travel to and from work. Poor air quality may have a significant impact on the economic life of Lincoln County.

Additional information can be found on the Lincoln County website: https://www.co.lincoln.or.us/742/Hazards-Air-Quality.

Coastal Erosion

Summary			
Hazard Ranking:	#10	Probability:	High
Total Threat Score:	135	Vulnerability:	Low

Significant Changes Since Previous Update

Several points of data throughout this section were updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) coastal erosion risks are expected to rise due to sea level rise and shifting wave patterns, posing threats to homes, businesses, and infrastructure, particularly in low-lying areas. Low-income and elderly residents are especially vulnerable to coastal erosion, as they may face financial barriers to relocation or home reinforcement and may also struggle with evacuation or adaptation due to health or mobility challenges (Table 2-5). Economic consequences include damage to tourism and increased infrastructure costs. Properties located in high erosion hazard zones on steep dunes or cliffs are most at risk. Otter Rock has the highest percentage of exposed buildings while Salishan-Lincoln Beach and Seal Rock-Bayshore face the greatest financial risk (Table 2-6).

Characteristics

Coastal erosion is a natural process that continually affects the entire coast. Erosion becomes a hazard when human development, life and safety are threatened. Waves, currents, tides and storms resulting in episodic and recurrent erosion constantly affect beaches, sand spits, dunes and bluffs. Shoreline retreat may be gradual over a season or many years, or it can be drastic, with the loss of substantial upland area during a single storm event.

king tides,

Various combinations of large waves, storm surges, rip cell embayments, high winds, rain, runoff, flooding, or increased water levels and ocean conditions caused by periodic El Niño events cause coastal? ~~Ocean~~ erosion. Coastal bluffs comprised of uplifted marine terrace deposits and especially coastal dunes are vulnerable to both chronic erosion hazards.

Coastal erosion hazard poses a threat to structures and other development through the retreat of the shoreline from periodic high rates of beach, dune and bluff erosion and from mass wasting of sea cliffs in the form of landslides and slumps due to wave attack and geologic instability.

Coastal erosion is considered a chronic hazard, meaning it is usually local in nature, and the threats to human life and property that arise from it are generally less severe than those associated with catastrophic hazards. However, the wide distribution and frequent occurrence of chronic hazards such as coastal erosion makes them more of an immediate concern.

The damage caused by coastal erosion is usually gradual and cumulative. However, storms that produce large winter waves, heavy rainfall and/or high winds may result in very rapid erosion or other damage that can affect properties and infrastructure in a matter of hours. The regional, oceanic and climatic environments that result in intense winter storms determine the severity of chronic erosion hazards along the Oregon coast.

Location and Extent

50% to 70% of the

Coastal erosion is a chronic hazard affecting ~~the entire~~ Lincoln County Coast. There are a variety of identifiable factors which affect shoreline stability. Dune-backed shorelines, which are most susceptible to wave attack, make up only a small portion of the Lincoln County coast. Processes of wave attack, including undercutting and wave overtopping, are the primary processes affecting shoreline stability in these areas. Bluff-backed shorelines, while less susceptible to rapid shoreline retreat from wave attack, are nonetheless impacted over time by coastal erosion, particularly during large storm events which result in the formation of rip cell embayments.

Coastal recession rates for Lincoln County were estimated and mapped in the Environmental Hazard Inventory of Coastal Lincoln County, RNKR Associates, 1978.

For more information, see the following DOGAMI reports:

- Coastal flood hazard study, Lincoln County, Oregon (2018, O-15-06)
- Evaluation of erosion hazard zones along the Alsea Bay shoreline between the Alsea Bay Bridge and the Port of Alsea, Lincoln County, Oregon (2013, O-13-20)
- Evaluation of Coastal Erosion Hazard Zones along Dune and Bluff-Backed Shorelines for southern Lincoln County: Seal Rock to Cape Perpetua (Open File Report O-07-03)
- Evaluation of coastal erosion hazard zones along dune and bluff backed shorelines in Lincoln County Oregon: Cascade Head to Seal Rock - Technical report to Lincoln County (Open File Report O-04-09)

Additional reports are available via DOGAMI's Publications Search website.

History

Chronic coastal erosion has impacted development along the Lincoln County coast for decades. Examples include the Jump Off Joe area in Newport, where a landslide, undermined by ocean wave attack, accelerated during the mid-1940s, carrying roads, drain pipes, and 15 houses seaward to their destruction.[13] Other examples include the severe erosion which took place on the Salishan Spit in the early 1970s, resulting in the destruction of one home under construction. Only a massive effort to armor the shoreline saved the remaining development on the spit. In similar episodes, development on the Bayshore Spit at the mouth of Alsea Bay was threatened by rapid erosion, first in the 1985 El Nino, and again in similar conditions in the winter of 1998.

13 DOGAMI. Geologic Hazards on the Oregon Coast: Coastal Landslides. http://www.oregongeology.com/sub/earthquakes/Coastal/CoastalLandslides.htm

Emergency shore front hardening was employed to save several homes in the Gleneden Beach area that were threatened by bluff face failure.

Probability Assessment

Based on the available data and research the Steering Committee (Steering Committee) assessed the **probability of experiencing coastal erosion is "high,"** meaning at least one incident is likely within the next 35 years.

Coastal erosion can, and does, occur along the entire Lincoln County coastline. The probability of a coastal erosion event happening is based in part on probabilistic (waves) and deterministic (water levels) values. The active hazard zone for Lincoln County includes coastal bluff and dunes that undergo erosion whether by waves, near-shore sediment transport, or mass wasting processes. The active-hazard zone for dune-backed shorelines reflects the area of historic transformation and for bluff-backed shorelines the active-hazard zone includes the beach, bluff toe, and escarpment. DOGAMI has completed coastal erosion hazard maps for Lincoln County that depict the following hazard zones:[14]

Active-Hazard Zone: Area of active, ongoing erosion.

High-Hazard Zone: High likelihood that the area could be affected by active erosion in the next 60 years.

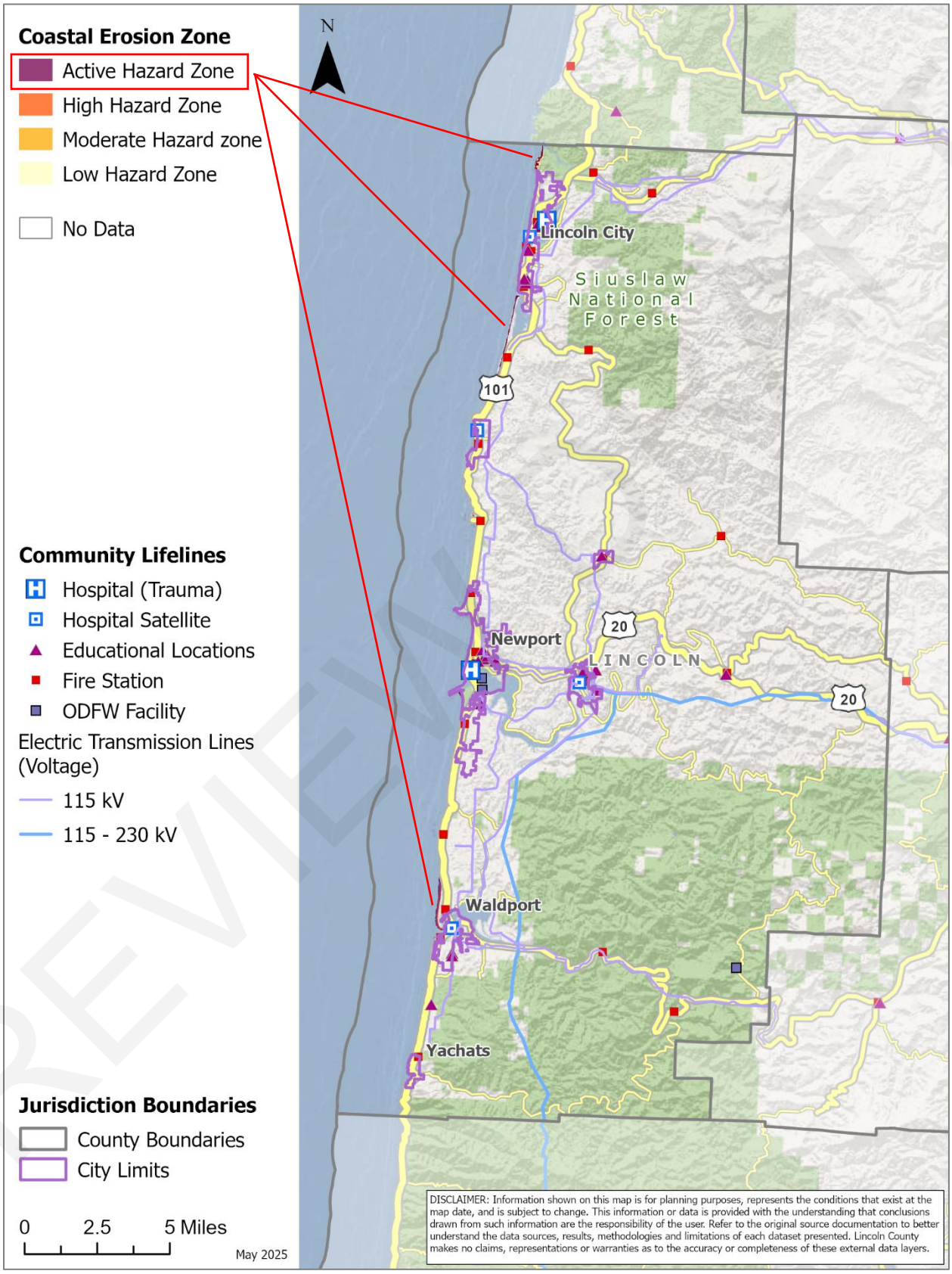
Moderate-Hazard Zone: Moderate likelihood that the area could be affected by active erosion in the next 60 to 100 years.

Low-Hazard Zone: Low but significant likelihood that the area could be affected by active erosion in the next 60 to 100 years.

Within Lincoln County the active-hazard zone varies in width from a few meters on cliffy headlands to hundreds of meters on low slopping beaches. Along dune-backed beaches the active-hazard zone experiences near constant change due to the movement of dunes, while on bluff-backed shorelines the active-hazard zone includes large areas of active, or potentially, active landslides. For more information see Appendix A "Erosion Hazard Maps" of Open-File Report O-04-09 and Plate 1 of Open-File Report O-07-03.

[14] DOGAMI. 2007. Evaluation of Coastal Erosion Hazard Zones Along Dune and Bluff Backed Shorelines In Southern Lincoln County, Oregon: Seal Rock to Cape Perpetua. Open-File Report O-07-03.

Map 2-1 Coastal Erosion Hazard



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Vulnerability Assessment

The Steering Committee rated the County as having **a "low" vulnerability to the coastal erosion hazard**; meaning less than 1% of the region's population or property could be affected by a major emergency or disaster.

Buildings, parks and various infrastructure located along the ocean shore are vulnerable to coastal erosion. This is most obvious in low-lying, dune backed shoreline areas adjacent to bays or the ocean; it is also the case in areas of bluff backed beaches where buildings and infrastructure have been located on readily erodible materials (e.g., consolidated sand, weakly cemented sandstone, siltstone, etc.). The problem is historic.

There are numerous examples of buildings and infrastructure threatened or damaged by wave attack/erosion (e.g. Salishan Spit, Bayshore Spit).

The Oregon SNHMP's Risk Assessment[15] considers Lincoln County to be the second most vulnerable county to coastal hazards (erosion). Particularly susceptible are the areas listed below:

- Yachats to Alsea Spit (erosion)
- Waldport (erosion and flooding)
- Alsea Spit (erosion; replaced by recent sand inundation)
- Seal Rock (erosion and landsliding)
- Ona Beach to South Beach (erosion and landsliding)
- Newport (landsliding)
- Beverly Beach (erosion and landsliding)
- Gleneden Beach to Siletz (erosion, landsliding, and flooding)
- Lincoln City (erosion and landsliding)

Highway 101 is the major infrastructure component vulnerable to coastal erosion. In Lincoln County, much of the problem is linked to local geology. Bedrock conditions can and do change abruptly within very short distances. This results in an inconsistent highway foundation; some sections are more susceptible to erosion than others and require continuous maintenance. There is no practical solution outside of relocation of the highway; in most cases, this option is not financially feasible now.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

[15] DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled coastal erosion scenario.

Population Vulnerability (Residents)

Approximately one percent of unincorporated Lincoln County's population (186 people) may be displaced by coastal erosion within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal erosion. It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event. Seal Rock-Bayshore has the most population at risk (105), however, no area has more than five percent of its population impacted by coastal erosion.

Table 2-5 Potentially Displaced Residents, Coastal Erosion

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	0	0%
Otis-Rose Lodge	1,926	0	0%
Otter Rock	489	26	5%
Salishan-Lincoln Beach	2,093	39	2%
Seal Rock-Bayshore	2,766	105	4%
Wakonda Beach	1,326	16	1%
Total Unincorporated	18,893	186	1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Just under two percent (358 buildings) of unincorporated Lincoln County buildings are exposed to the high coastal erosion hazard zone. The percentage of exposed buildings is greatest in the Otter Rock (8.7%). However, Salishan-Lincoln Beach and Seal Rock-Bayshore have more total building value at risk (about $25 million is at risk in each community). The value of exposed buildings is $63.8 million.[16]

[16] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-1 through A-11.

Table 2-6 Exposed Buildings, Coastal Erosion, by Unincorporated Area

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate ($)	Loss Ratio
"Rural" Lincoln County	12,637	2	0.0%	$197,000	< 1%
Otis-Rose Lodge	1,747	0	0.0%	$0	0.0%
Otter Rock	634	55	8.7%	$6,469,000	7.9%
Salishan-Lincoln Beach	2,847	102	3.6%	$26,168,000	6.7%
Seal Rock-Bayshore	3,345	155	4.6%	$25,329,000	7.3%
Wakonda Beach	1,614	44	2.7%	$5,629,000	4.6%
Total Unincorporated	22,824	358	1.6%	$63,792,000	3.5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability

There are no critical facilities exposed to the high coastal erosion zone.

Risk Report Identified Areas of Vulnerability[17]

- Almost every building built adjacent to the shoreline in Lincoln County has some exposure to coastal erosion. During times of high tide occurring along with powerful storms, the rate of erosion can greatly increase.
- Coastal erosion risk is particularly high for the communities of Newport and Otter Rock.

[17] Ibid. Page 31.

Drought

Summary			
Hazard Ranking:	#10	**Probability:**	High
Total Threat Score:	155	**Vulnerability:**	Moderate

Significant Changes Since Previous Update

Several points of data throughout this section were updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard. In addition, development and population forecasts are not expected to increase or decrease the impact of this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s. These conditions pose significant risks to people and property, particularly in rural and coastal communities that rely on surface water and shallow wells. Vulnerable populations—such as the elderly, low-income households, and those dependent on agriculture or tourism—face heightened exposure to water scarcity, wildfire risk, and economic disruption.

Characteristics

A drought is a period of drier than normal conditions. Drought occurs in virtually every climatic zone, but its characteristics vary significantly from one region to another. Drought is a temporary condition; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate. The extent of drought events depends upon the degree of moisture deficiency and the duration and size of the affected area. Typically, droughts occur as regional events and often affect more than one city and county.

There are four types of drought: meteorological, agricultural, hydrological and socioeconomic. *Meteorological drought* is based on the degree of dryness. *Agricultural drought* focuses the amount of soil moisture versus the needs of the crops. *Hydrological drought* is associated with shortfalls of surface and subsurface water supply. *Socioeconomic drought* refers to physical water shortages and its human effect and occurs when the need for water exceeds the supply resulting in a shortfall.

Location and Extent

Droughts occur in every climate zone and can vary from region to region. Drought may occur throughout Lincoln County and may have profound effects on the economy, particularly the agricultural sector. The extent of drought depends upon the degree of moisture deficiency, and the duration and size of the affected area. Typically, droughts occur as regional events and often

affect more than one county. In severe droughts, environmental and economic consequences can be significant. The extent of the hazard is shown in Figure 2-3.

History

Lincoln County experiences annual dry conditions typically during the summer months from July through September. Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. Most federal agencies use the Palmer Method which incorporates precipitation, runoff, evaporation and soil moisture. However, the Palmer Method does not incorporate snowpack as a variable. Therefore, it is not believed to provide a very accurate indication of drought conditions in Oregon and the Pacific Northwest.

The Standardized Precipitation-Evapotranspiration Index (SPEI) is an index of water conditions throughout the state. The index is designed to account for precipitation and evapotranspiration to determine drought. The lowest SPEI values, below -2.0, indicate extreme drought conditions. Severe drought occurs at SPEI values between -2.0 and -1.5, and moderate drought occurs between -1.5 and -1.0.

Figure 2-3 shows the water year (October 1 – September 30) history of SPEI from 1895 to 2024 for Lincoln County. The SPEI record indicates that Lincoln County has experienced two periods of extreme drought (water years 1977, and 2001), eight periods of severe drought (water years 1924, 1929, 1930, 1931, 1944, 1992, 1994, and 2005), and nine periods of moderate drought (1915, 1926, 1939, 1941, 1973, 1979, 2014, 2015, and 2020). Five (5) executive orders declaring drought emergencies by the Governor occurred in 1992, 2018, 2021, 2023, and 2025 and a federally declared drought occurred in 2015.[18]

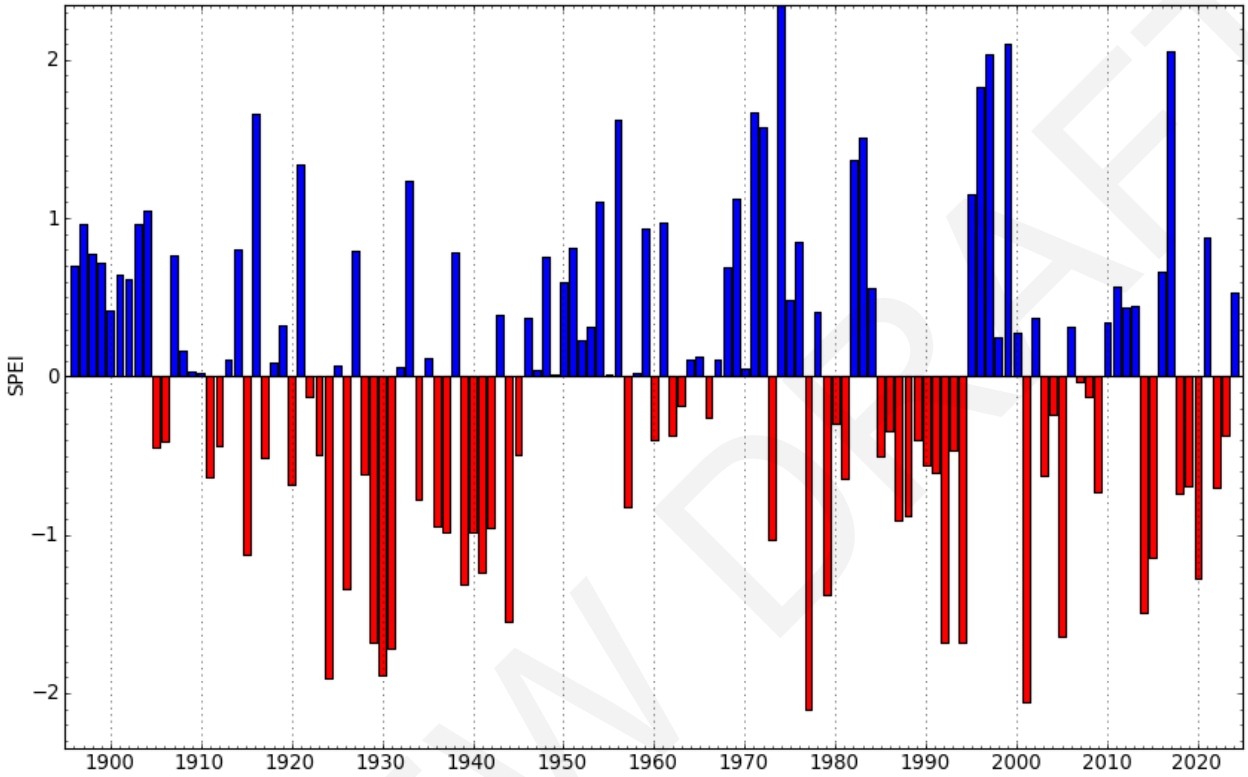
El Niño/La Nina

El Niño Southern Oscillation (ENSO) weather patterns can increase the frequency and severity of drought. During El Niño periods, alterations in atmospheric pressure in equatorial regions yield an increase in the surface temperature off the west coast of North America. This gradual warming sets off a chain reaction affecting major air and water currents throughout the Pacific Ocean; La Niña periods are the reverse with sustained cooling of these same areas. In the North Pacific, the Jet Stream is pushed north, carrying moisture laden air up and away from its normal landfall along the Pacific Northwest coast. In Oregon, this shift results in reduced precipitation and warmer temperatures, normally experienced several months after the initial onset of the El Niño. These periods tend to last nine to twelve months, after which surface temperatures begin to trend back towards the long-term average. El Niño periods tend to develop between March and June, and peak from December to April. ENSO generally follows a two to seven-year cycle, with El Niño or La Niña periods occurring every three to five years. However, the cycle is highly irregular, and no set pattern exists. The last major El Niño was during 2015-2016 Oregon

[18] Oregon Water Resources Department Public Declaration Status Report, http://apps.wrd.state.or.us/apps/wr/wr_drought/declaration_status_report.aspx, accessed March 4, 2025.

experienced a “super” El Niño (the strongest in 15 years, other events occurred in 1992, 1995, 1998, 2003, 2007, and 2010) that included record rainfall and snowpack in areas of the state.[19]

Figure 2-3 Standardized Precipitation-Evapotranspiration Index, 12-Months Ending in September, Lincoln County, OR (1896-2024)



Source: Western Regional Climate Center. West Wide Drought Tracker. https://wrcc.dri.edu/wwdt/time/. June 13, 2025.

Probability Assessment

Based on the available data and research the Steering Committee (Steering Committee) assessed the **probability of experiencing a locally severe drought as “high”** meaning at least one incident is likely within the next 35 years.

Droughts are not uncommon in the State of Oregon, nor are they just an “east of the mountains” phenomenon. They occur in all parts of the state, in both summer and winter. Oregon’s drought history reveals many short-term and a few long-term events. The average recurrence interval for severe droughts in Oregon is somewhere between 8 and 12 years. Droughts are particularly a concern in parts of Lincoln County that rely on surface water.

[19] NOAA, What years are ENSO years? https://psl.noaa.gov/enso/past_events.html , Accessed June 13, 2025

Vulnerability Assessment

The Steering Committee rated the County as having **a "moderate" vulnerability to drought hazards**, meaning it is expected that between 1% and 10% of the unincorporated County's population or property could be affected by a major drought emergency or disaster.

The environmental and economic consequences can be significant, especially for the agricultural sector. Drought also increases the probability of wildfires – a major natural hazard concern for Lincoln County. Drought can affect all segments of Lincoln County's population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Also, domestic water-users may be subject to stringent conservation measures (e.g., rationing) as per the County's water management plan.

All parts of Lincoln County are susceptible to drought. Potential impacts to county water supplies and the agriculture industry are the greatest threats. Additionally, long-term drought periods of more than a year can impact forest conditions and set the stage for potentially destructive wildfires. The following issues are also of concern: drinking water sources and systems, power and water enterprises, residential and community wells in rural areas, fire response capabilities, and fish and wildlife.

Drought conditions have become increasingly frequent in Oregon in recent years, and projections indicate that these events will intensify as climate change progresses. For electric utilities, the implications of drought are multifaceted and increasingly severe. One of the most critical threats is the heightened risk of wildfires. Prolonged dry periods lead to dead and desiccated vegetation, which serves as highly combustible fuel. This significantly increases the likelihood of wildfires that can damage or destroy transmission infrastructure, disrupt service, and pose serious safety risks to both utility workers and the public.

In addition to wildfire risk, drought also places stress on timberlands, weakening or killing trees and making them more prone to falling during storms. These weakened trees can fall onto power lines, causing outages and necessitating costly repairs and vegetation management efforts. Furthermore, drought can reduce the availability of hydroelectric power—a key energy source in Oregon—forcing utilities to rely more heavily on alternative, often more expensive or carbon-intensive, energy sources.

As droughts become more frequent and severe, electric utilities must adapt by investing in grid hardening, enhancing wildfire mitigation strategies, and diversifying energy portfolios to ensure resilience and reliability in a changing climate.

Earthquake

Summary					
Event:	CSZ	Crustal		CSZ	Crustal
Hazard Ranking:	5	15	Probability:	Moderate	Low
Total Threat Score:	201	91	Vulnerability:	High	Moderate

Significant Changes Since Previous Update

New data is included from DOGAMI Open-file reports: O-21-02, O-25-01. Risk and vulnerability information has also been integrated from the Lincoln County Evacuation Plan. Several other points of data throughout this section were also updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard. In addition, development and population forecasts are not expected to increase or decrease the impact of this hazard.

Future Projections

Lincoln County is expected to experience modest population growth through 2045. This growth is not anticipated to significantly alter the county's overall vulnerability to earthquakes, as the geographic distribution of development is not expected to shift dramatically into higher-risk zones. However, even incremental increases in population and development density can amplify the potential impact of a major seismic event, particularly in coastal and low-lying areas prone to liquefaction or tsunami inundation.

While current forecasts suggest that development and population changes will not drastically increase or decrease the county's exposure to earthquake hazards, proactive planning remains essential. Integrating seismic risk assessments into future land use decisions, infrastructure investments, and emergency preparedness initiatives will be key to minimizing long-term impacts.

Characteristics

The Pacific Northwest in general is susceptible to earthquakes from ~~four~~ three sources: 1) the offshore Cascadia Subduction Zone, 2) deep intraplate events within the subducting Juan de Fuca Plate, and 3) shallow crustal events within the North American Plate.

Crustal Fault Earthquakes

Crustal fault earthquakes are the most common earthquakes and occur at relatively shallow depths of 6-12 miles below the surface.[20] While most crustal fault earthquakes are smaller than magnitude 4 and generally create little or no damage, they can produce earthquakes of magnitudes up to 7, which cause extensive damage.

[20] Madin, Ian P. and Zhenming Wang. Relative Earthquake Hazard Maps Report. (1999) DOGAMI.

Deep Intraplate Earthquakes

Occurring at depths from 25 to 40 miles below the earth's surface in the subducting oceanic crust, deep intraplate earthquakes can reach up to magnitude 7.5.[21] The February 28, 2001 earthquake in Washington State was a deep intraplate earthquake. It produced a rolling motion that was felt from Vancouver, British Columbia to Coos Bay, Oregon and east to Salt Lake City, Utah. A 1965 magnitude 6.5 intraplate earthquake centered south of Seattle-Tacoma International Airport caused seven deaths.[22]

Subduction Zone Earthquakes

The Pacific Northwest is located at a convergent plate boundary, where the Juan de Fuca and North American tectonic plates meet (Figure 2-4). The two plates are converging at a rate of about 1-2 inches per year. This boundary is called the Cascadia Subduction Zone (CSZ). It extends from British Columbia to northern California. Subduction zone earthquakes are caused by the abrupt release of slowly accumulated stress.[23]

Subduction zones like the CSZ have produced earthquakes with Magnitudes (M) of 8 or larger. Historic subduction zone earthquakes include the 1960 Chile (M 9.5) and 1964 southern Alaska (M 9.2) earthquakes[24] with more recent events being the 2004 Indian Ocean (M 9.1) and 2011 Japan (M 9). A M9.5 earthquake is 3.2 times bigger and 5.6 times stronger (energy release) than a M9.0 earthquake, according to the USGS Magnitude Comparator.

The specific hazards associated with earthquakes are explained below:

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. Ground shaking is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault that is slipping, quake depth, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

Ground Shaking Amplification

Ground shaking amplification refers to the soils and soft sedimentary rocks near the surface that can modify ground shaking from an earthquake. Such factors can increase or decrease the amplification (i.e., strength) as well as the frequency of the shaking. The thickness of the geologic materials and their physical properties determine how much amplification will occur. Ground motion amplification increases the risk for buildings and structures built on soft and unconsolidated soils.

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[21] Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000), Ch. 8, pp. 8.

[22] The Oregonian. "*A region at risk*." March 4, 2001.

[23] Questions and Answers on Earthquakes in Washington and Oregon (February 2001) www.geophys.washington.edu/seis/pnsn/info_general/faq.html.

[24] The Oregonian. "*A region at risk*." March 4, 2001.

Surface Faulting

Faults

~~Surface faulting~~ are planes or surfaces in Earth materials along which failure occurs. Such faults can be found deep within the earth or on the surface. Earthquakes occurring from deep lying faults usually create only ground shaking.

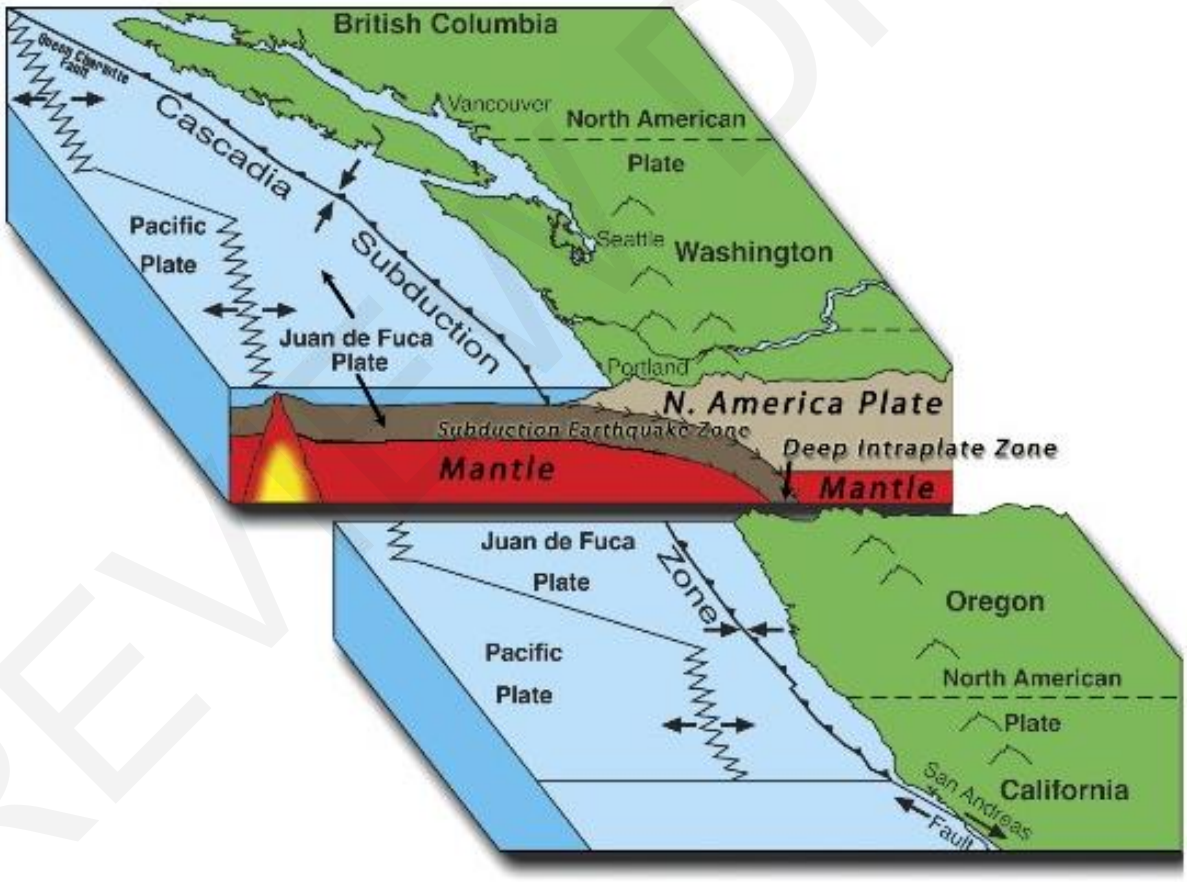
Even a "deep lying", but strong earthquake, can yield surface fault scarps.

Liquefaction and Subsidence

Liquefaction occurs when ground shaking causes wet, granular soils to change from a solid state into a liquid state. This results in the loss of soil strength and the soil's ability to support weight. When the ground can no longer support buildings and structures (subsidence), buildings and their occupants are at risk.

The severity of an earthquake is dependent upon a number of factors including: 1) the distance from the earthquake's source (or epicenter); 2) the ability of the soil and rock to conduct the earthquake's seismic energy; 3) the degree (i.e., angle) of slope materials; 4) the composition of slope materials; 5) the magnitude of the earthquake; and 6) the type of earthquake. Add quake depth?

Figure 2-4 Cascadia Subduction Zone



Source: Oreggon Department of Emergency Management, Cascadia Subduction Zone, Link, Accessed June 13, 2025

Earthquake-Induced Landslides and Rockfalls

Earthquake-induced landslides are secondary hazards that occur from ground shaking and can destroy roads, buildings, utilities and critical facilities necessary to recovery efforts after an earthquake. Some Lincoln County communities are built in areas with steep slopes. These areas often have a higher risk of landslides and rockfalls triggered by earthquakes. Landslide hazard is addressed in detail in a separate section.

Tsunamis

Tsunamis are another secondary earthquake hazard created by events occurring under the ocean. A tsunami, often incorrectly referred to a "tidal wave," is a series of gravity-induced waves that can travel great distances from the earthquake's origin and can cause serious flooding and damage to coastal communities. Tsunami hazard is addressed in detail in a separate section.

Location and Extent

The seismic hazard for Lincoln County arises predominantly from major earthquakes on the Cascadia Subduction Zone. Additional fault zones throughout the county and region may produce localized crustal earthquakes up to M6.0 and will be less damaging than a CSZ earthquake event which will impact the entire western portion of Oregon. Table 2-7 presents a list of the different Class A faults in, and offshore, of the county that are shown in Map 2-2.

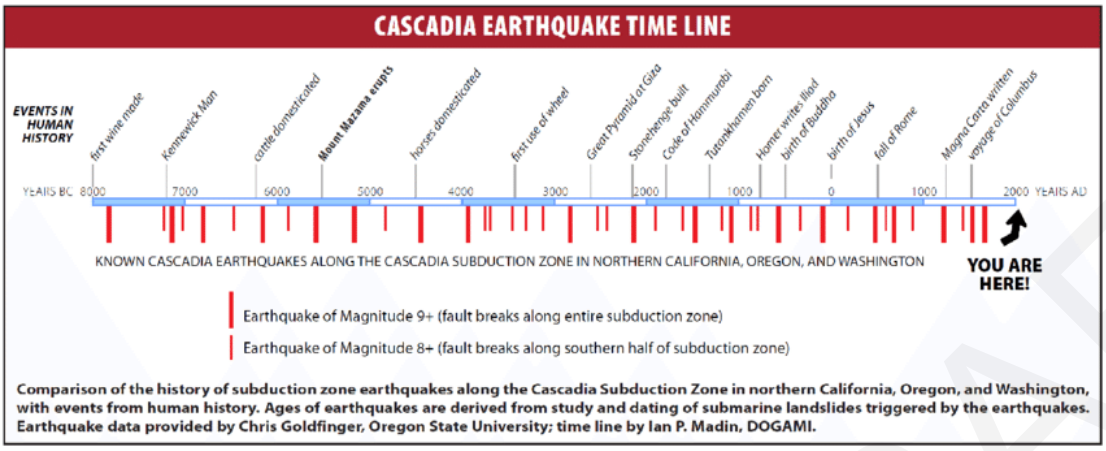
Lincoln County frequently experiences minor earthquake activity. The events depicted in Map 2-2 are considered relatively insignificant, having been detected by seismic instruments but resulting in little to no structural or property damage. The map highlights clusters of earthquakes occurring offshore from Lincoln County.

There is no historical record of significant crustal earthquakes originating within the region over the past 150 years. However, Oregon has experienced crustal earthquakes that began outside this area. Geological evidence indicates that fault movement has occurred along numerous offshore faults, as well as some onshore faults, over the past 20,000 years.

More recently there have been several earthquakes off the Lincoln County coast. In 2003 there was a magnitude 6.3 earthquake along the Blanco Fracture Zone, one of several seismically active transform faults off the coast of Oregon. In July of 2004 there was a magnitude 4.9 earthquake located 19 miles west of Yachats. Within a three-week period in April of 2008, there were more than 600 tremors, three of which were magnitude 5 or higher.

Geologic evidence shows that the Cascadia Subduction Zone has generated great earthquakes, most recently about 300 years ago. It is generally accepted to have been magnitude 9 or greater. The average recurrence interval of these great Cascadia earthquakes is approximately 500 years, with gaps between events as small as 200 years and as large as 1,000 years. The last known great earthquake to hit the Lincoln County area was in January of 1700 (Figure 2-5). This CSZ event also produced a tsunami, which is discussed in the Tsunami chapter.

Figure 2-5 Cascadia Earthquake Timeline



Source: OSSPAC, The Oregon Resilience Plan (2013)

For more information on Class A faults located in Lincoln County see the US Geological Survey, Quaternary Fault and Fold Database: https://earthquake.usgs.gov/hazards/qfaults/.

A local earthquake of M 6.0 or a regional M 9.0 earthquake is likely to cause substantial structural damage to bridges, buildings (residential, commercial, industrial), utilities, and communications systems, as well as the following impacts to infrastructure and the environment:

- Floods and landslides
- Fires, explosions, and hazardous materials incidents
- Disruption of vital services such as water, sewer, power, gas, and transportation routes
- Disruption of emergency response systems and services
- Displaced Households
- Economic losses for buildings
- Economic loss to highways, airports, communications
- Generated debris
- Illness, injury, and death
- Significant damage to critical and essential facilities, including schools, hospitals, fire stations, police departments, city hall

Table 2-7 Class A Faults Located near Lincoln County

Name	Class	Fault ID	Primary County, State	Length (km)	Time of Most Recent Deformation	Slip-Rate Category
Cascadia Megathrust	A	781	Offshore	754km	Latest Quaternary	Greater than 5.0 mm/yr
Cascadia Fold and Fault Bed	A	784	Offshore	484km	Latest Quaternary	Between 1.0 & 5.0 mm/yr
unnamed offshore faults	A	785	Offshore	280km	Latest Quaternary	Between 1.0 & 5.0 mm/yr
Stonewall Anticline	A	786	Offshore	49km	Quaternary (<1.6 Ma)	Less than 0.2 mm/yr
Siletz Bay Faults	A	883	Offshore	10km	Late Quaternary	Less than 0.2 mm/yr
Cape Foulweather Fault	A	884	Lincoln County	10km	Late Quaternary	Less than 0.2 mm/yr
Yaquina Faults	A	885	Lincoln County	13km	Late Quaternary	Between 0.2 & 1.0 mm/yr
Waldport Faults	A	886	Lincoln County	14km	Late Quaternary	Less than 0.2 mm/yr

Source: Source: US Geological Survey (USGS), Quaternary Fault and Fold Database
Note: The Quaternary Period is the most recent period in the geologic time scale, spanning from about 2.58 million years ago to the present

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. DOGAMI has published several seismic hazard maps that are available for Oregon communities to use. The maps show liquefaction, ground motion amplification, landslide susceptibility, and relative earthquake hazards.

The extent of the earthquake hazard is measured in magnitude. Map 2-2 shows areas for liquefaction hazards, active faults, and recent earthquake magnitude. Lincoln County can expect similar crustal earthquake magnitudes to occur in the future. The Cascadia Subduction Zone earthquake has the capacity to cause a magnitude 8.5 or greater earthquake. Due to the proximity of the fault zone the damage locally is expected to be significant.

For more information, see the following DOGAMI reports:

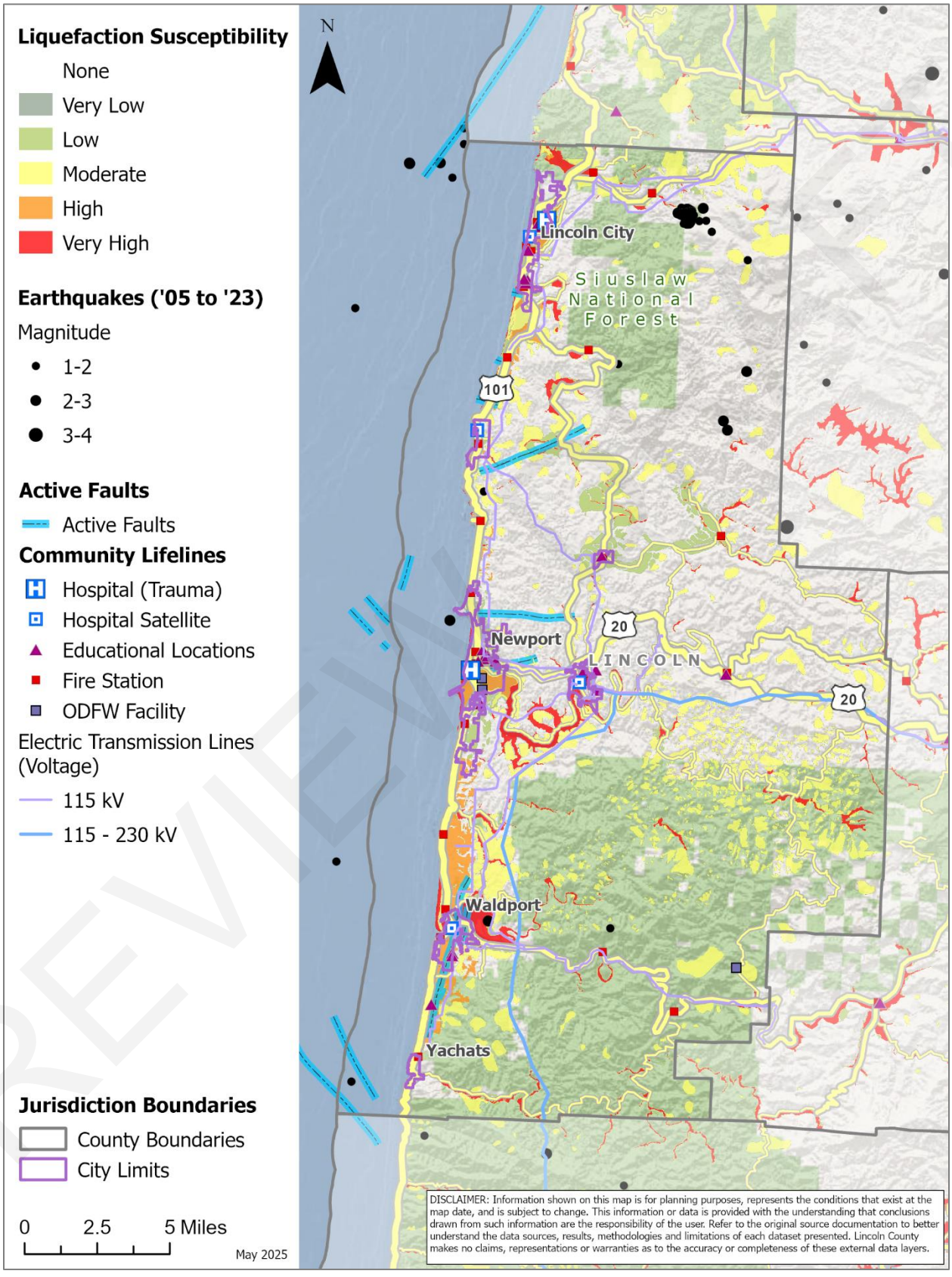
- Earthquake and tsunami impact analysis for the Oregon Coast (2025,O-25-01)
- Improved Cascadia Earthquake Source Models and Tsunami Hazard Assessment (2024, O-24-11)
- Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, O-21-02)
- Natural Hazard Risk Report for Lincoln County, Oregon (2020, O-20-11)

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, O-20-03)
- Oregon Coastal Hospital Resilience Project (2020, O-20-02)
- Resilience guidance for Oregon hospitals (2019, O-19-02)
- Oregon coastal hospitals preparing for Cascadia (2018, O-18-03)
- Oregon Hospital and Water System Earthquake Risk Evaluation Pilot Study (2017, O-17-01)
- Statewide Cascadia earthquake hazard data (2013, O-13-06)
- Cascadia Subduction Zone earthquakes: A magnitude 9.0 earthquake scenario, (2012, O-13-22)
- Statewide seismic needs assessment: Implementation of Oregon 2005 Senate Bill 2 relating to public safety, earthquakes, and seismic rehabilitation of public buildings, (2007, O-07-02).
- Map of selected earthquakes for Oregon: 1841-2002 (2003, O-03-02).
- Relative earthquake hazard maps for selected coastal communities in Oregon: Astoria-Warrenton, Brookings, Coquille, Florence-Dunes City, Lincoln City, Newport, Reedsport-Winchester Bay, Seaside-Gearhart-Cannon Beach, Tillamook (1999, IMS-10)
- Earthquake damage in Oregon: Preliminary estimate for future earthquake losses (1999, SP-29)

Additional reports are available via DOGAMI's Publications Search website.

Other agency/ consultant reports: Oregon Resilience Plan (2013)

Map 2-2 Earthquake Liquefaction (Soft Soil) Hazard and Active Faults



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a Cascadia Subduction Zone (CSZ) is "moderate",** meaning one incident may occur within the next 35 to 75 years. The Steering Committee determined the **probability of experiencing a crustal earthquake is "low",** meaning one incident may occur within the next 75 to 100-year period.

Lincoln County is susceptible to deep intraplate events within the Cascadia Subduction Zone (CSZ), where the Juan de Fuca Plate is diving beneath the North American Plate and shallow crustal events within the North American Plate. According to DOGAMI's OSHD Release 1 (Plate 3)[25], the County faces a moderate to high probability of experiencing ground shaking within the next 50 years that is strong enough to damage vulnerable or poorly constructed buildings. (Map 2-3).

The return period for the largest of the CSZ earthquakes (Magnitude 9.0+) is 530 years with the last CSZ event occurring 314 years ago in January of 1700 (Figure 2-5). The probability of a major Cascadia Subduction Zone (CSZ) earthquake occurring in the next 50 years is estimated at approximately 10–15% for a full-margin rupture (magnitude 8.7–9.2). However, the southern segment of the CSZ—off the coast of southern Oregon and northern California—has a significantly higher estimated probability of about 37% for a magnitude 8.0 or greater event.[26] These estimates are based on geological records, recurrence intervals, and seismic modeling.

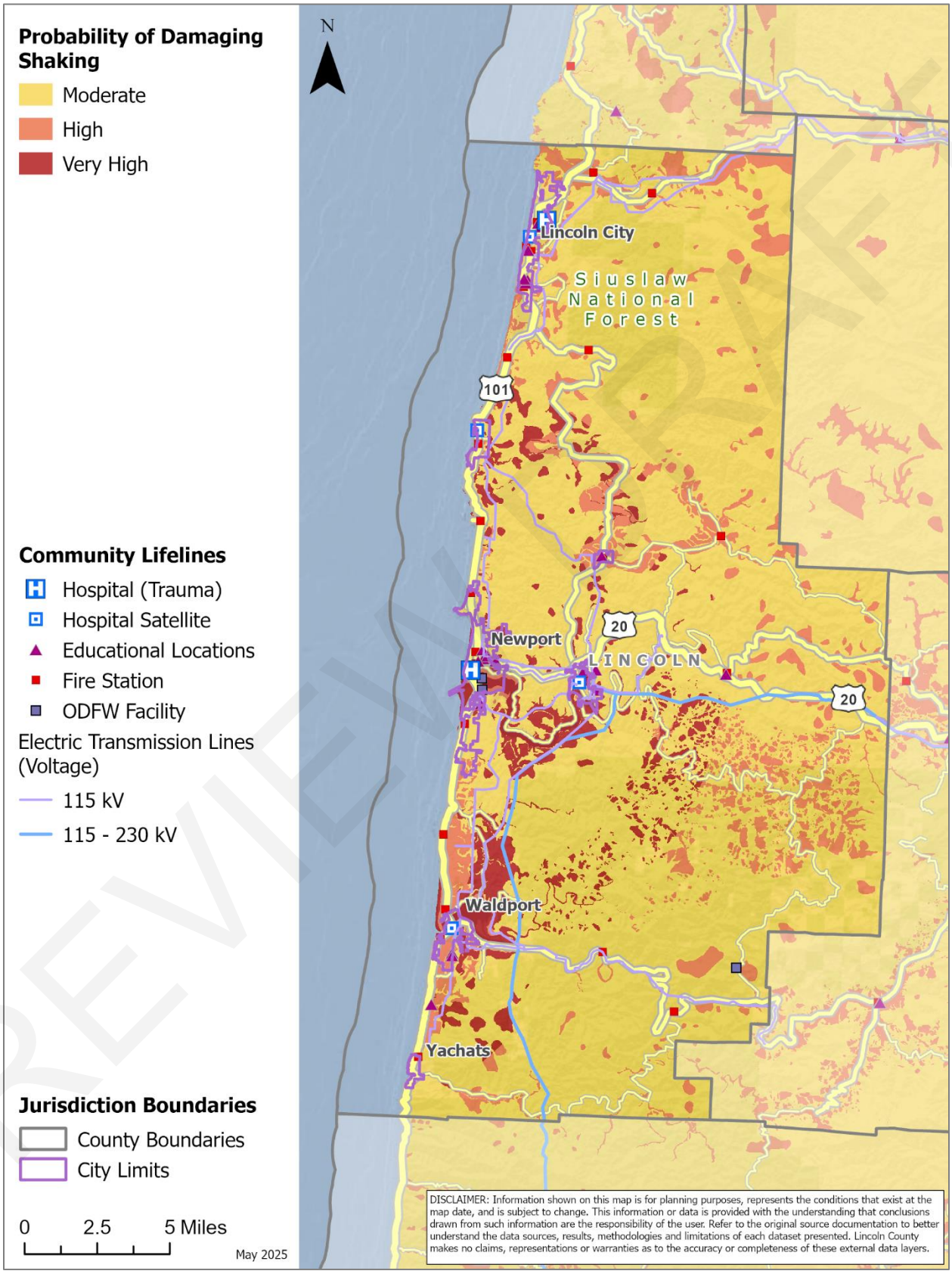
According to DOGAMI's Oregon Seismic Hazard Database (OSHD-1.0), there is a 2% probability that the County will experience severe to violent ground shaking (Modified Mercalli Intensity VIII–X) within the next 50 years (Map 2-4).[27] This level of shaking represents the most intense ground motion expected from all potential earthquake sources, including both crustal faults and the Cascadia Subduction Zone. While crustal earthquakes are more frequent and can cause localized damage, the most extreme shaking scenarios—especially those affecting broad regions—are primarily associated with magnitude 9.0 Cascadia Subduction Zone events. OSHD-1.0 incorporates an ensemble of 30 simulated CSZ earthquakes to capture the variability in shaking patterns and includes probabilistic models for crustal sources based on the USGS 2018 National Seismic Hazard Maps. Together, these models highlight that while the probability of a CSZ event is lower than that of smaller crustal events, its potential for widespread and catastrophic shaking is significantly higher

[25] Madin, Ian P., Jon J. Francyzk, John M. Bauer, and Carlie J.M. Azzopardi. 2021 Oregon Seismic Hazard Database: Purpose and Methods. Digital Data Series. Portland, OR: Oregon Department of Geology and Mineral Industries, 2021. https://pubs.oregon.gov/dogami/dds/oshd/OSHD_v1_report.pdf

[26] DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

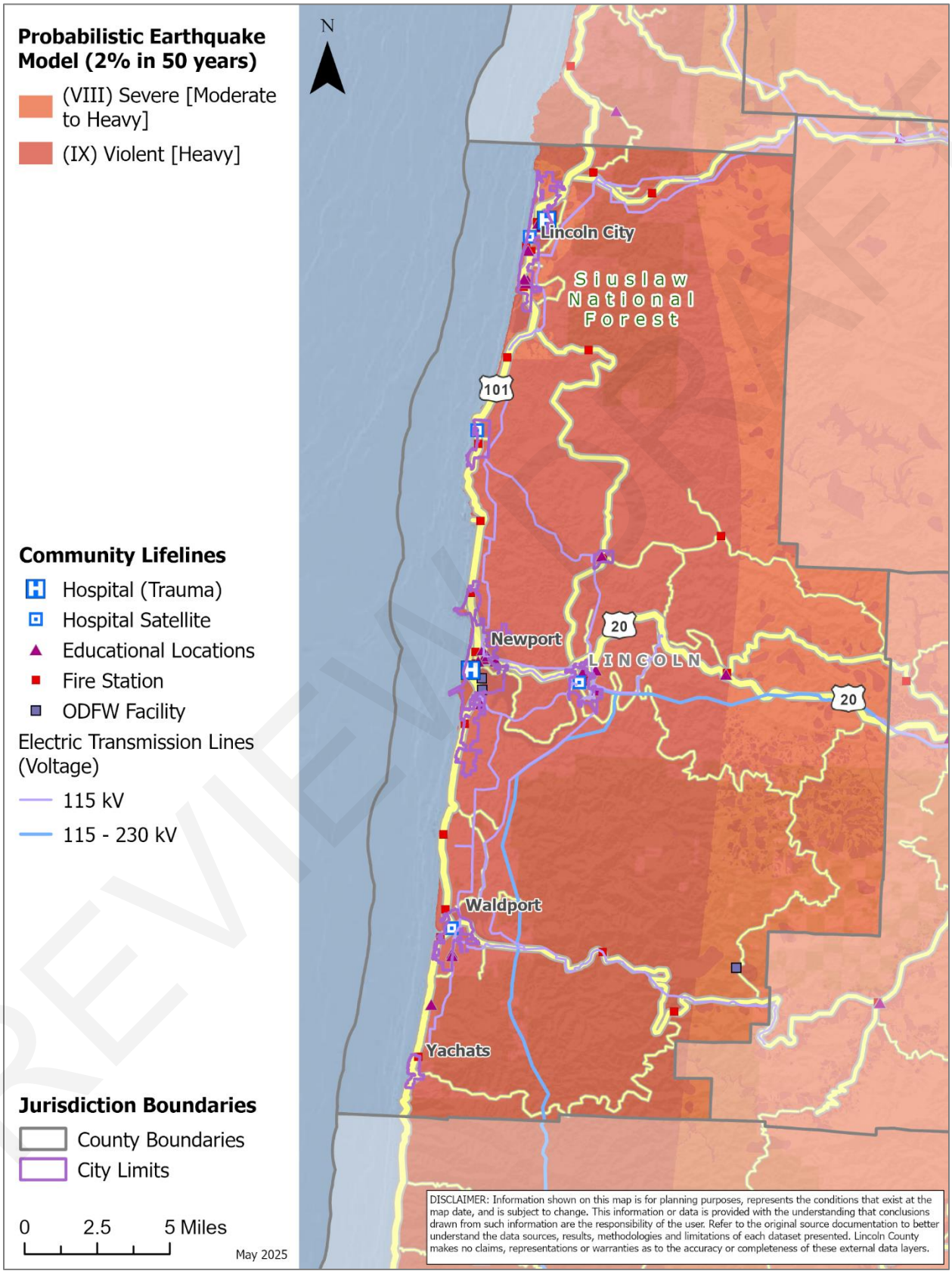
[27] Madin, Ian P., Jon J. Francyzk, John M. Bauer, and Carlie J.M. Azzopardi. 2021 Oregon Seismic Hazard Database: Purpose and Methods. Digital Data Series. Portland, OR: Oregon Department of Geology and Mineral Industries, 2021. https://pubs.oregon.gov/dogami/dds/oshd/OSHD_v1_report.pdf

Map 2-3 Probability of Damaging Shaking



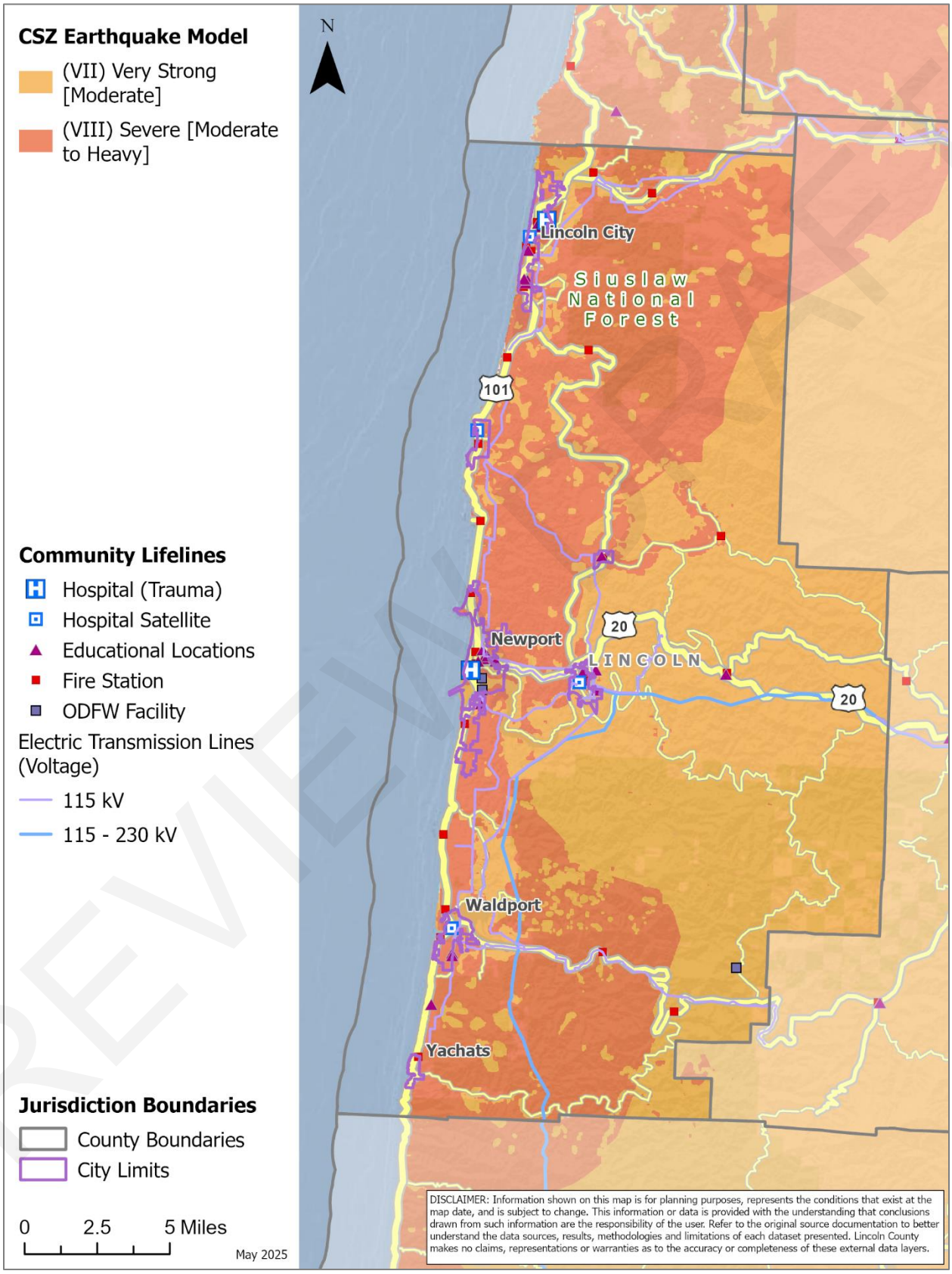
Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Map 2-4 Perceived Shaking and Damage Potential, Probabilistic Earthquake Model



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Map 2-5 Perceived Shaking and Damage Potential, CSZ Earthquake Model



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left..

Vulnerability Assessment

The Steering Committee rated the County as having a **"high" vulnerability to the Cascadia Subduction Zone (CSZ) earthquake hazard** meaning that more than 10% of the unincorporated County's population or property could be affected by a major CSZ event. The Steering Committee rated the County as having a **"moderate" vulnerability to a crustal earthquake hazard**, meaning that between 1% and 10% of the unincorporated County's population or property could be affected by a major crustal earthquake event.

The local crustal faults, the county's proximity to the Cascadia Subduction Zone, potential slope instability and the prevalence of certain soils subject to liquefaction and amplification combine to give the county a high-risk profile.

Factors included in an assessment of earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the county due to an earthquake event in a specific location.

Seismic activity can cause great loss to businesses, either a large-scale corporation or a small retail shop. Losses not only result in rebuilding cost, but fragile inventory and equipment can be destroyed. When a company is forced to stop production for just a day, business loss can be tremendous. Residents, businesses and industry all suffer temporary loss of income when their source of finances is damaged or disrupted. A major earthquake poses a significant threat to electric utility infrastructure across all service areas. The impact of such an event would likely be widespread and severe, potentially resulting in catastrophic damage to power systems. Restoration of service could take many months, especially in areas with extensive damage. Common consequences include fallen trees, landslides, and soil liquefaction, all of which can destroy utility poles, transformers, and other critical components. Recovery efforts would be slow and complex, requiring coordination with utility crews from outside the affected region to assist in repairs and rebuilding efforts.

This level of shaking illustrated in Map 2-4 represents the most intense ground motion anticipated from all potential earthquake sources, including both crustal faults and the Cascadia Subduction Zone (CSZ). Map 2-5 further details the expected shaking and potential damage specifically for Lincoln County in the event of a CSZ earthquake. According to the map, the county is projected to experience "very strong" to "severe" shaking lasting between two to four minutes. Such prolonged and intense ground motion is expected to cause significant damage to critical lifeline transportation routes, including Highway 101 and key corridors connecting to the Willamette Valley. For a more comprehensive analysis of the expected impacts and recovery challenges associated with a CSZ event, refer to the Oregon Resilience Plan.

Natural Hazard Risk Report for Lincoln County

See *Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon* (2021, O-21-02) and *Earthquake and tsunami impact analysis for the Oregon* coast (2025, O-25-01) for additional information.

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to the Cascadia subduction zone earthquake. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled earthquake scenarios. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.* [28]

Population Vulnerability (Residents)

Approximately 30% of unincorporated Lincoln County's population (5,653 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately 20% will be impacted by the accompanying tsunami. The communities of Otis-Rose Lodge and Wakonda Beach have the highest percent of potentially displaced residents. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.*

Table 2-8 Potentially Displaced Residents, CSZ M9.0 Earthquake and Tsunami by Unincorporated Area

	CSZ M9.0 Earthquake		Tsunami	Combined Total	
	Resident Population	Potentially Displaced Residents	Potentially Displaced Residents	Number	Percent
"Rural" Lincoln County	10,293	2,374	459	2,833	28%
Otis-Rose Lodge	1,926	746	0	746	39%
Otter Rock	489	76	5	81	17%
Salishan-Lincoln Beach	2,093	465	118	583	28%
Seal Rock-Bayshore	2,766	546	289	835	30%
Wakonda Beach	1,326	307	268	575	43%
Total Unincorporated	18,893	4,514	1,139	5,653	30%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

[28] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-1 through A-11.

Property Vulnerability

Earthquakes will impact every building in Lincoln County, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The communities of Wakonda Beach (57%) and Otis-Rose Lodge (50%) are expected to see the highest percent of their buildings damaged by a CSZ earthquake and tsunami event. Salishan-Lincoln Beach (1,093 buildings), Seal Rock-Bayshore (1,418 buildings), and "Rural" Lincoln County (5,194 buildings) have the highest number of buildings expected to be damaged. The combined (earthquake and tsunami) value of building damage losses is $677 million ($402.5 million from earthquake alone).[29]

Table 2-9 Damaged and Exposed Buildings, CSZ M9.0 Earthquake and Tsunami by Unincorporated Area

	CSZ M9.0 Earthquake		Tsunami	Combined Total	
	Total Buildings	Damaged Buildings	Exposed Buildings	Number	Percent
"Rural" Lincoln County	12,637	4,386	808	5,194	41%
Otis-Rose Lodge	1,747	871	0	871	50%
Otter Rock	634	202	22	224	35%
Salishan-Lincoln Beach	2,847	866	227	1,093	38%
Seal Rock-Bayshore	3,345	968	450	1,418	42%
Wakonda Beach	1,614	414	506	920	57%
Total Unincorporated	22,824	7,707	2,013	9,720	43%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

As discussed in the Risk Report seismic building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and the early 2000s. As noted in the Community Profile (Appendix C), about 65% of residential buildings were built prior to 1990, which increases the county's vulnerability to the earthquake hazard. The Risk Report indicates that approximately 53% of unincorporated Lincoln County buildings were built prior to modern seismic building code enforcement (pre-code); 72% are either pre-code or low code.[30]

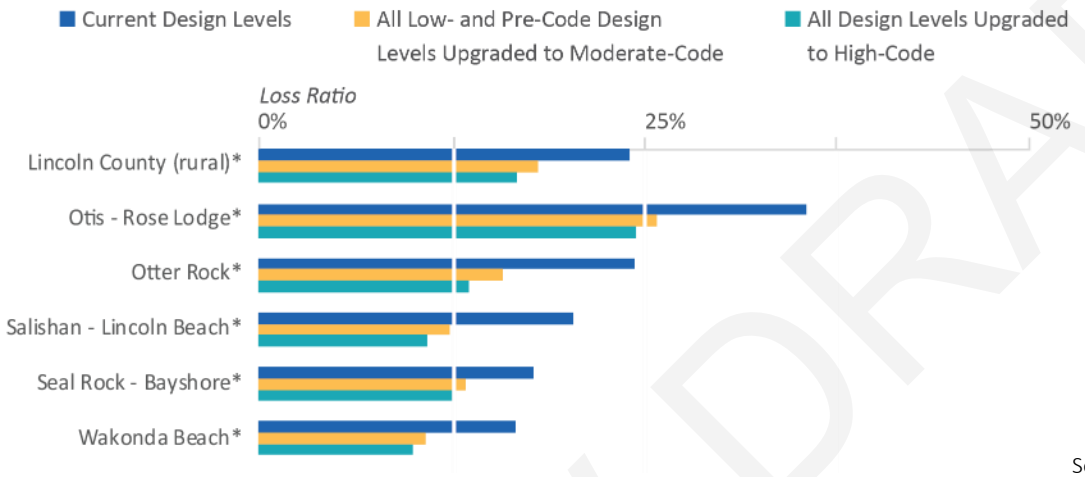
The age of the building stock is therefore a primary indicator of vulnerability and communities with older building stocks are expected to experience more damage from an earthquake event. If buildings were retrofitted to moderate or high-code standards (see Appendix C) the impact of

[29] Ibid.

[30] Ibid. Table D-2.

the CSZ event would be reduced. Figure 2-6 shows the reduction in loss estimates from a magnitude 9.0 CSZ earthquake event via two scenarios where all buildings have been retrofitted to moderate-code or high-code design standards. Communities that have a high percent of buildings within the tsunami inundation zone would benefit the least from seismic retrofits and would need additional tsunami retrofits to reduce risk.

Figure 2-6 Reduction in Damage with simulated seismic building code upgrades, CSZ M9.0 Earthquake



Source: Figure modified from DOGAMI. 2020. Lincoln County Natural Hazard Risk Report. Figure 3-3. Note: * - Unincorporated community. "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this figure.

Critical Facility Vulnerability

Critical facilities determined to be particularly exposed to a CSZ earthquake include:

- Central Oregon Coast Fire Station 7300 (Tidewater, Central Oregon Coast Fire & Rescue District)
- Depoe Bay Fire Station 2400 (Otter Rock, Depoe Bay Fire District)
- Eddyville Charter School (Charter School, Lincoln County School District)
- North Lincoln Fire Station 1200 (Rose Lodge, North Lincoln Fire & Rescue District)
- North Lincoln Fire Station 1300 (Otis, North Lincoln Fire & Rescue District)
- North Lincoln Fire Station 1700 (Kernville, North Lincoln Fire & Rescue District)
- Seal Rock Fire Station (Seal Rock, Seal Rock Rural Fire Protection District)
- Siletz Bay Airport (Gleneden Beach)
- Toledo High School (Toledo area, Lincoln County School District)
- Toledo State Airport (Toledo area); also exposed to Tsunami (medium-sized)
- Wakonda Beach Airport (Wakonda Beach)
- Waldport Water Treatment Plant (Waldport Area, City of Waldport)
- Yachats Fire Station (outside Waldport, Yachats Rural Fire Protection District)

The following vulnerable critical facilities were identified by the County but not included in the Risk Report analysis:

- Depoe Bay RFPD Fire Station 2200 (Gleneden Beach)

Risk Report Identified Areas of Vulnerability[31]

- Although every building in Lincoln County will experience shaking from a CSZ earthquake, many of the buildings within the communities of Lincoln City, Salishan-Lincoln Beach, Newport, Seal Beach-Bayshore, and Waldport are located on soils with a high liquefaction potential, which increases the likelihood of substantial ground deformation and building damage. Especially for areas close to the several estuaries within the study area.
- Many of the buildings in the communities of Newport, Siletz, Toledo, and Otis-Rose Lodge are older, less likely to meet modern building design standards, and are more vulnerable to catastrophic damage during an earthquake.
- Because of the liquefaction and landslides, these communities will likely be "islands" disconnected from other communities by severed transportation routes. With losses up to 44%, it is very important for the community to be able to respond to emergencies within its own community.
- Fifty-two (56 when including areas of tsunami inundation) of the 72 critical facilities in the study area are estimated to be non-functioning due to a CSZ earthquake.

Other DOGAMI Reports

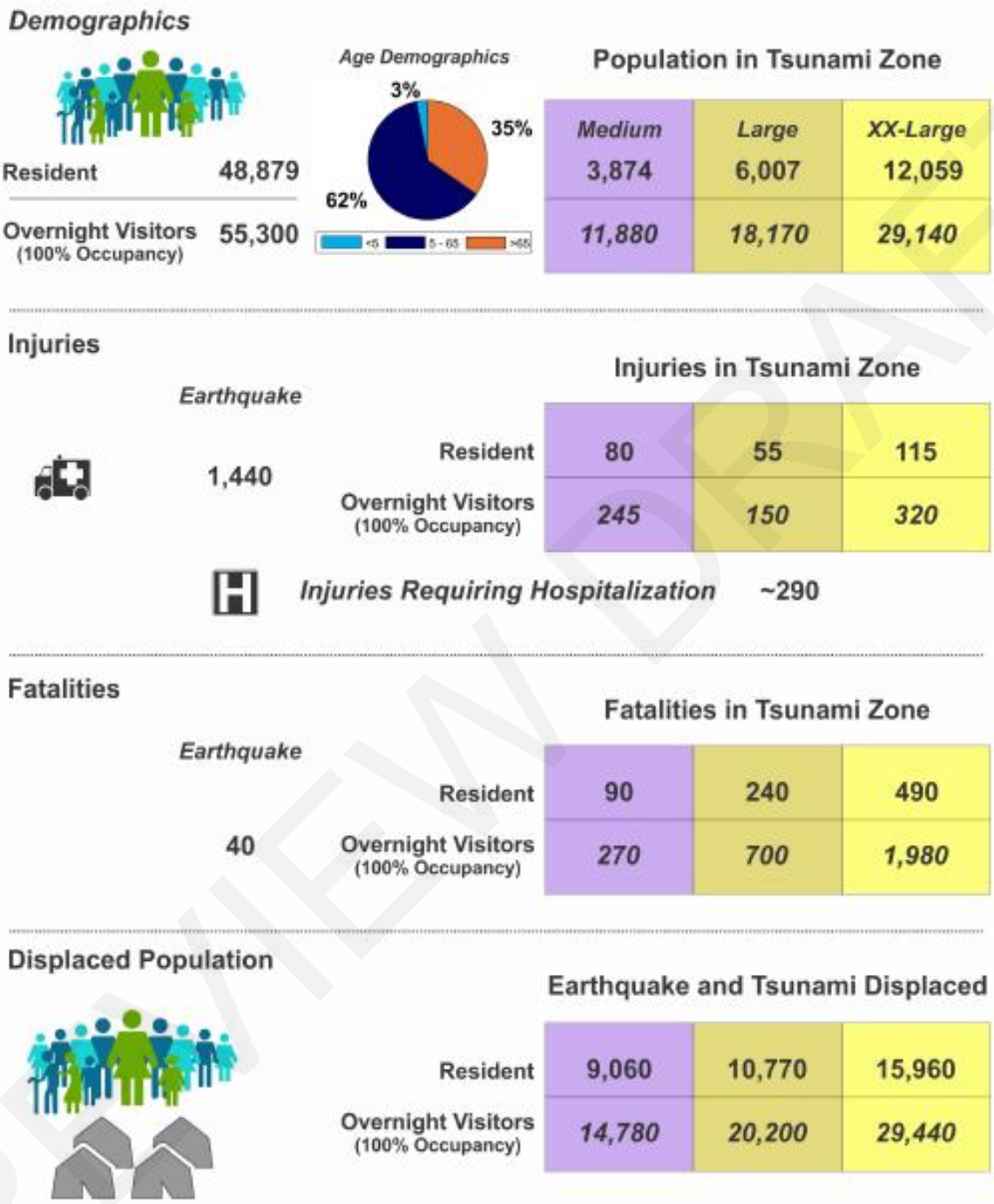
The DOGAMI Analysis of Earthquake and Tsunami Impacts for People and Structures Inside the Tsunami Zone for Five Oregon Coastal Communities (O-20-03) includes Lincoln City and Newport as two of the five communities.

The DOGAMI Earthquake and Tsunami Impact Analysis for Coastal Lincoln County, Oregon (O-21-02) provides an evaluation of the potential impacts of a Cascadia earthquake and accompanying tsunami in coastal Lincoln County. The analysis includes an assessment of the numbers of people, businesses, and critical facilities located in three Cascadia tsunami inundation zones (M1, L1, and XXL1). XXL1 represents the maximum considered inundation scenario given our knowledge of the Cascadia subduction zone (CSZ). Large (L1) and Medium (M1) inundation zones reflect earthquake and tsunami scenarios that are more likely to occur than XXL1 but are characterized with less slip on the subduction zone (critical for tsunami generation) and thus carry more risk because they are less conservative.

The DOGAMI Earthquake and Tsunami Impact Analysis for the Oregon Coast (O-25-01) is the final report in a series evaluating the potential impacts of a Cascadia Subduction Zone (CSZ) earthquake and accompanying tsunami on communities and parks along the Oregon Coast. This analysis updates previous countywide studies conducted by the Oregon Department of Geology and Mineral Industries (DOGAMI) between 2020 and 2023, incorporating the latest U.S. Geological Survey (USGS) megathrust earthquake scenarios with a moment magnitude of 9.0, improved DOGAMI geology and soil classifications, and updated demographic data from the 2020 U.S. Census. Figure 2-7 illustrates the county's demographic and loss estimates across three selected scenarios.

[31] Ibid. Page 24.

Figure 2-7 Summary population demographics and casualties for Lincoln County



Source: Oregon Department of Geology and Mineral Industries, Open File Report O-25-01 (2025), *Earthquake and Tsunami Impact Analysis for the Oregon Coast,* Figure 3.6 p. 43

2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community profile, approximately 67% of residential buildings in Lincoln County were constructed before 1990, increasing the county's vulnerability to earthquake hazards. In 2007, the Oregon Department of Geology and Mineral Industries (DOGAMI) assessed the estimated seismic resistance of key public buildings, including schools and public safety facilities, within the county. For more information click this link O-07-02.

Additional information can be found on the Lincoln County website: https://www.co.lincoln.or.us/749/Hazards-Earthquake

Tsunami

Summary					
Event:	Local	Distant		Local	Distant
Hazard Ranking:	#6	#14	Probability:	Moderate	Moderate
Total Threat Score:	191	100	Vulnerability:	High	Low

Significant Changes Since Previous Update

New data is included from DOGAMI Open-file reports: O-21-02, O-25-01. Risk and vulnerability information has also been integrated from the Lincoln County Evacuation Plan. Several other points of data throughout this section were also updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard. In addition, development and population forecasts are not expected to increase or decrease the impact of this hazard.

Future Projections

Lincoln County is expected to experience modest population growth through 2045. While this growth is not anticipated to significantly alter the county's overall vulnerability to earthquakes, it may have important implications for tsunami risk, particularly in coastal and low-lying areas. These regions are especially susceptible to tsunami inundation following a major offshore seismic event, such as a Cascadia Subduction Zone earthquake.

Even incremental increases in population and development density in tsunami-prone zones can amplify the potential human and economic impacts of such events. This includes increased demand for evacuation infrastructure, emergency services, and resilient building practices in areas within the tsunami inundation zone.

Although current forecasts suggest that development patterns will not drastically increase the county's exposure to seismic hazards, including tsunamis, proactive planning remains essential. Integrating both seismic and tsunami risk assessments into future land use decisions, infrastructure investments, and emergency preparedness initiatives will be key to minimizing long-term impacts. Special attention should be given to public education, vertical evacuation strategies, and land use policies that discourage high-density development in high-risk coastal areas.

Characteristics

disturbance

A tsunami generally begins as a single ~~wave~~ but quickly evolves into a series of ocean waves, generated by disturbances from earthquakes, underwater volcanic eruptions, or landslides (includes landslides that start below the water surface and landslides that enter a deep body of water from above the water surface). In these cases, the initial tsunami wave mimics the shape and size of the sea floor deformation that causes it.

The wavelength of a tsunami generated by sea floor deformation may be 100 miles or more in the deep ocean, with a wave height of only a few feet or less. These waves may reach speeds of up to 500 m.p.h. As tsunamis approach land where the water depth decreases, the forward

speed of the tsunami will slow, but wave heights increase to as much as 100 feet. For simplicity, tsunamis can be divided geographically into two categories: those of distant origin and those generated locally. The distant tsunami is one that is usually generated by a subduction zone earthquake elsewhere in the Pacific and would take up to 24 hours to reach the Oregon coastline. A local tsunami is generated by a subduction earthquake off the Oregon Coast and would take minutes to reach the Oregon coastline. The Oregon Coast has experienced both types.[32] In addition to earthquakes, tsunamis can be generated by sub-aerial and submarine landslides, volcanoes, meteorological events, oceanic impacts of meteorites.

A tsunami from a local source will probably be stronger, higher and travel farther inland (overland and upriver) than a distant tsunami. The tsunami wave may be traveling at 30 mph when it hits the coastline and have heights of 20 to 60 feet, potentially higher depending on the coastal bathymetry (water depths) and geometry (shoreline features). The tsunami wave from a nearby earthquake will break up into a series of waves that will continue to strike the coast over an 8 to 10-hour period. Tsunami activity can continue even longer for a major Pacific-wide tsunami. The first wave is not always the most destructive; for example, some computer simulations for the Central Oregon Coast, show that waves arriving in the second or third hour may be as big or bigger than the initial wave. The deep ocean trenches off the coasts of Alaska, Japan, and South America are known for their underwater subduction zone earthquakes and are the source of many tsunamis.

The Pacific Northwest is located at a convergent plate boundary, where the Juan de Fuca and North American tectonic plates meet. The two plates are converging at a rate of about 1-2 inches per year. This boundary is called the Cascadia Subduction Zone. It extends from British Columbia to northern California. Subduction zone earthquakes are caused by the abrupt release of slowly accumulated stress. Subduction zones like the Cascadia Subduction Zone have produced earthquakes with magnitudes of 8 or larger. Historic subduction zone earthquakes include the 1960 Chile (magnitude 9.5) and 1964 southern Alaska (magnitude 9.2) earthquakes. These types of earthquakes have been known to produce tsunamis.

Tsunami destruction can come from both the tsunami wave and from the rapid retreat of the water from the coastline. Tsunami waves tend to be fast moving rising surges of water. As a tsunami wave enters coastal bays and rivers, it may move as a high velocity current or a breaking wave that travels up an estuary as a bore (wall of turbulent water like the waves at the coast after they break). This inland surge of water can often cause most or all the damage from a distant tsunami. For example, in Seaside the damage from the 1964 Alaskan tsunami occurred along the Necanicum River and Neawanna Creek, well inland from the coast. In addition, storm waves ride on top of the tsunami waves and may cause even more destruction.[33]

Location and Extent

Tsunami inundation modeling attempts to identify areas affected by tsunamis, and the water depths, current strengths, wave heights, and wave arrival times associated with an event.

[32] State of Oregon Emergency Management Plan. Natural Hazards Mitigation Plan: Tsunami. 2002

[33] State of Oregon Emergency Management Plan: Natural Hazards Mitigation Plan: Tsunami, March 2002

Generally, this analysis is conducted for "worst case" scenarios, but it can also be used to look at damages from tsunamis of lesser magnitude Areas along the coast, low-lying areas along bays or inlets that connect to the ocean should be designated as hazard zones. Areas along rivers that connect to the ocean should also be designated as tsunami hazard areas for at least three kilometers inland and as far as ten kilometers inland for large, flat coastal rivers.[34] In the event of an 8.8 magnitude earthquake, 60-200 miles off the coast, and during high tide, the inundation elevations would be: Siletz Bay, 40 feet; Depoe Bay, 31 feet; Newport, 31 feet; Yaquina Joe Point (Waldport), 26 feet; and Yachats, 27 feet.[35]The Cascadia Fault is about 50-80 miles offshore.

DOGAMI has conducted analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami hazard maps were produced to help implement Senate Bill 379 (SB 379), which was passed by the 1995 regular session of the Oregon Legislature. SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005 limits construction of new essential facilities and special occupancy structures in tsunami flooding zones. In this analysis they have considered topography, bathymetry data, and information about potential regional tsunami sources. It should be noted that these maps were produced in 1995. Since then DOGAMI and other agencies have conducted many tsunami inundation studies. An update of these maps was completed in 2013, as described below. Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building "new essential facilities, hazardous facilities, major structures, and special occupancy structures" inside the tsunami inundation zone (SB 379 line):[36]

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities.[37] There are 30 tsunami inundation map panels for Lincoln County (15 for the local source tsunami scenarios and 15 for the distant source tsunami scenarios).

The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as "T-shirt" sizes S, M, L, XL, and XXL. The transition line between the wet and dry zones is termed the Wet/ Dry Zone, only the XXL Wet/ Dry Zone is shown on the map. The distant source tsunami inundation maps show the affects of tsunamis generated by earthquakes along the "Ring of Fire" (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

[34] Geohazards International. Preparing Your Community for Tsunamis: A Guidebook for Local Advocates. 2007

[35] Lincoln County Emergency Services, June 2007. Lincoln County Hazard Analysis

[36] Oregon Legislature. HB 3309 (2019). https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309

[37] DOGAMI website and Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm (Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:
http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes. There are twelve (12) evacuation brochures created for Lincoln County covering the following communities: Lincoln City North, Lincoln City South, Gleneden Beach/ Salishan Spit, Lincoln Beach, Depoe Bay, Newport North, Newport South, Toledo, Seal Rock, Waldport, Yachats North (San Marine), and Yachats.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm

A free application is also available that displays the evacuation routes in coastal areas of Oregon:
http://www.nanoos.org/mobile/tsunami_evac_app.php

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, O-20-03)
- Oregon Coastal Hospital Resilience Project (2020, O-20-02)
- Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, O-19-06)
- Comparison of Oregon tsunami hazard scenarios to a probabilistic tsunami hazard analysis (PTHA) (2019, O-19-04)
- Resilience guidance for Oregon hospitals (2019, O-19-02)
- Coastal flood hazard study, Lincoln County, Oregon (2018, O-15-06)

Additional reports are available via DOGAMI's Publications Search website.

History

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on

average every 500 years over the last 3,500 years in the Pacific Northwest (Figure 2-5). The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).[38] Numerous distant tsunami events have also occurred in the past, including 28 documented by Oregon wave gauges since 1854, notable events are listed below.

In March 2011, a 9.0 magnitude earthquake generated tsunami originating from Japan caused approximately $7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; $6.7 million), as well as the Port of Depoe Bay (Lincoln County; $182,000), and Charleston Harbor (Coos County; $200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast, local officials activated the Emergency Alert System and sirens, implemented "reverse 9-1-1" and conducted door-to-door notices in order to evacuate people form the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center.

In March 1964, a tsunami struck southeastern Alaska following an earthquake beneath Prince William Sound and arrived along the Alaska coastline between 20 and 30 minutes after the quake, devastating villages. Damages were estimated to be over $100 million. Approximately 120 people drowned. The tsunami spread across the Pacific Ocean and caused damage and fatalities in other coastal areas. Four children drowned at Beverly Beach and significant property damaged was incurred, including $5,000 in Depoe Bay. Along the entire Oregon Coast damage was estimated to be between $750,000 and $1 million. Tsunamis of lesser magnitude occurred along the Oregon Coast in 1946, 1960, and 1968. Tsunami wave heights reached 10-11.5 feet at Depoe Bay and 11.5 feet at Newport.[39]

Probability Assessment

Lincoln County's Natural Hazards Mitigation Steering Committee believes that the County's **probability of experiencing a local or distance source tsunami event is "moderate"**, meaning one incident of either type is likely within the next 35 to 75-year period.

It is difficult to predict when the next tsunami will occur. With respect to distant sources, Oregon has experienced 25 tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources is about six (6) years. However, the time interval between events has been as little as one year and

[38] DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

[39] DOGAMI Distant Tsunami Inundation Map (2013)

as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for this region.

A tsunami originating from a Cascadia Subduction Zone earthquake could be exceedingly destructive and thus is of greater concern than distant tsunamis. The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3,500 years with time between individual events varying from 150 to 1,000 years. The last CSZ event occurred approximately 300 years ago. According to the Oregon NHMP, the return period for the largest of the CSZ earthquakes (Magnitude 9.0+) is 530 years with the last CSZ event occurring 314 years ago in January of 1700 (Figure 2-5). The probability of a 9.0+ CSZ event occurring in the next 50 years ranges from 7 - 12%. Notably, 10 - 20 "smaller" Magnitude 8.3 - 8.5 earthquakes occurred over the past 10,000 years that primarily affected the southern half of Oregon and northern California. The average return period for these events is roughly 240 years. The combined probability of any CSZ earthquake occurring in the next 50 years is 37 - 43%.[40]

Vulnerability Assessment

The Lincoln County Natural Hazards Steering Committee rated the County as having a **"high" vulnerability to the local source tsunami event**, meaning that more than 10% of the county's population or property could be affected by a major emergency or disaster; the committee rated the County as having a **"low" vulnerability to the distant source tsunami event**, meaning that less than 1% of the county's population or property could be affected by a major emergency or disaster.

The Oregon coast is at risk from tsunamis that originate from local and distant sources. Lincoln County has six communities in the tsunami inundation zone (from north to south): Lincoln City, Depoe Bay, Newport, Toledo, Waldport, and Yachats. Figure 2-8 shows the amount and percentage of developed land within the SB 379 tsunami-inundation zone as of 2007; the data shows that Waldport and Yachats have the most developed land within the tsunami inundation zone; Lincoln City, Newport, and unincorporated areas also have significant percentages in the inundation zone.

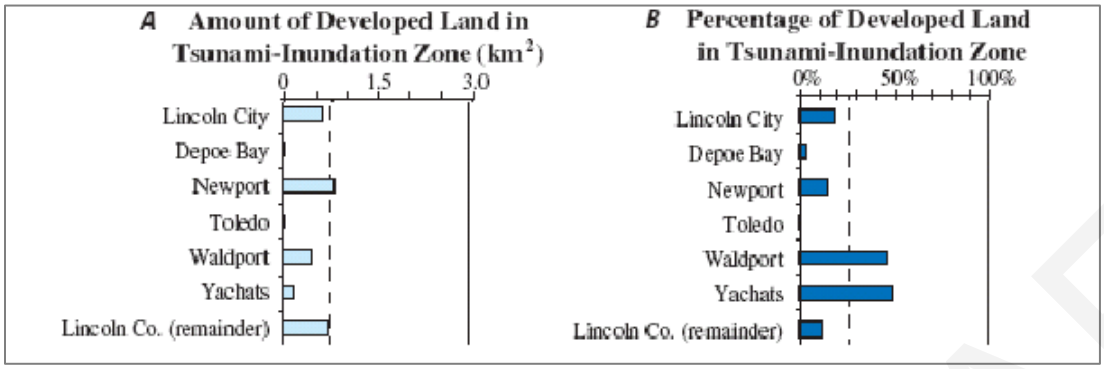
Severe damage could occur to low-lying areas of the county in a local source tsunami event, including roads, bridges, communication systems, and infrastructure. Some damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami).

There are about 4,600 manufactured housing units (mobile homes) in unincorporated Lincoln County.[41] Manufactured homes built prior to 2003 are subject to slipping off their foundations, potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation from a tsunami event.

[40] DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

[41] Social Explorer, Table A10032, U.S. Census Bureau, 2018-2022 American Community Survey Estimates.

Figure 2-8 Developed Land in Tsunami-Inundation Zone



Source: Wood N (2007) Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. USGS. http://pubs.usgs.gov/sir/2007/5283/sir2007-5283.pdf

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.[42] Safety is reached when evacuees have reached "high ground", or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for cities and unincorporated areas of the county including: (1) the Siletz Bay area, and (2) the South County area.

Siletz Bay Area

The Siletz Bay area is divided into two distinct zones. The first includes Siletz Spit, Salishan, and Siletz Keys which are low-lying communities adjacent to the Siletz Bay that are susceptible to significant tsunami inundation and high liquefaction susceptibility. The second area includes Gleneden Beach, Lincoln Beach, and Fogarty Creek which are bluff backed open coast areas that have limited inundation potential and low liquefaction susceptibility. According to the model the first waves arrive along the open coast 20 minutes after the start of earthquake shaking with most of the Study Area inundated about 8 minutes later. Siletz Spit, Siletz Keys, and much of the remaining areas are expected to be completely inundated under the XXL tsunami inundation scenario. High ground is generally accessible at a slow walking speed of 2 feet per second (fps) or 1.4 mph to a walking speed of 4 fps or 2.7 mph in the communities of Gleneden Beach, Lincoln Beach, Fogarty Creek, and Salishan (parts of Salishan may need faster walking speeds up to 2.7-4.1 mph).

Evacuees in Siletz Keys (see Figure 2-9) and Siletz Spit (see Figure 2-10) will need to move faster in order to beat the wave and make it to high ground. Prompt evacuation, knowledge of the route, signage, and alternative route designation due landslide activity is necessary to improve evacuation speeds.

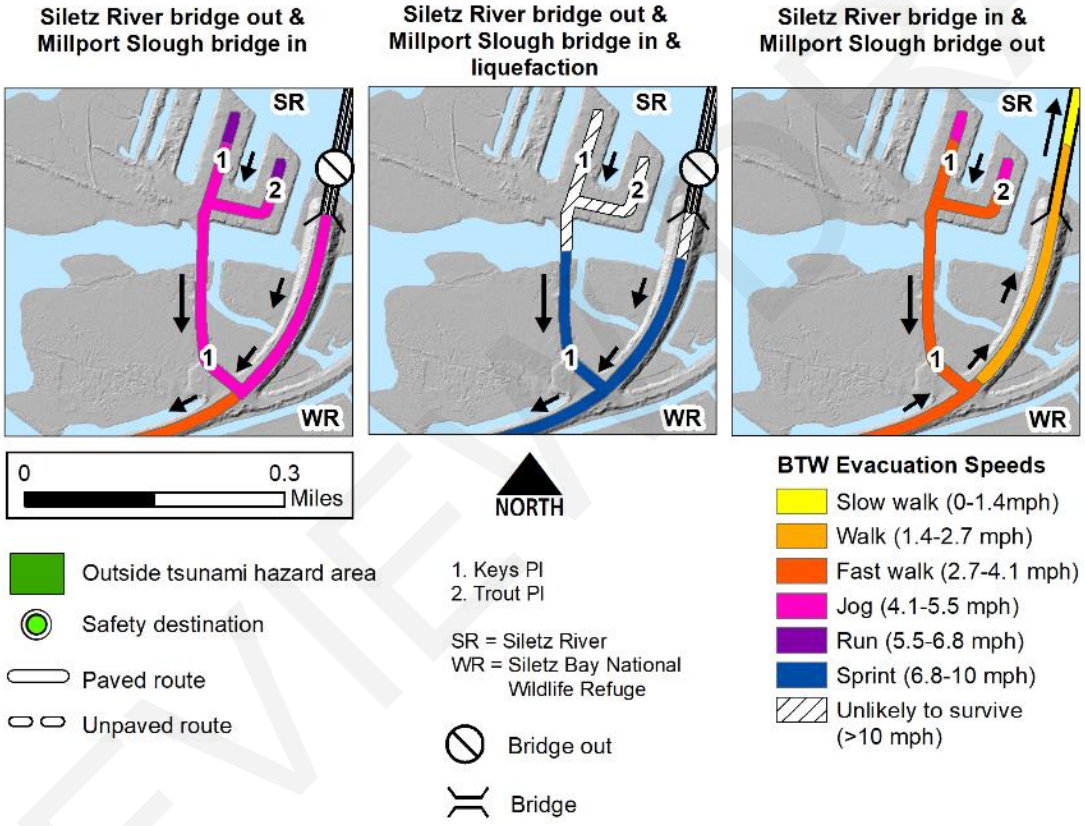
Evacuation speeds in Siletz Spit will need to be a maximum of a sprint (15 fps or 10 mph) and those north of Salishan Loop are unlikely to survive (require sprinting speeds above 10 mph). Mitigation strategies may include developing a shortcut across South Lagoon (including a

[42] DOGAMI, Open-File Report O-19-06. "…20 [horizontal] feet beyond the limit of tsunami inundation" (also in O-18-05)

footbridge) to decrease distances needed for evacuation to the hills near Dune Point Drive during a L tsunami inundation.

Near Siletz Keys it is expected that the Millport Slough Bridge will survive, however, the Siletz River Bridge is likely to fail separating the area from high ground to the north. As such, evacuation south over the Millport Slough Bridge will be necessary (although it is about 0.4 further than potential evacuation to the north over the Siletz River Bridge). Evacuation speeds to the south (to Salishan Lodge) from Siletz Keys will need to be a maximum of a sprint (15 fps or 10 mph) with a small area unlikely to survive (require sprinting speeds above 10 mph). Retrofitting the Siletz River Bridge could decrease distances and travel speed.

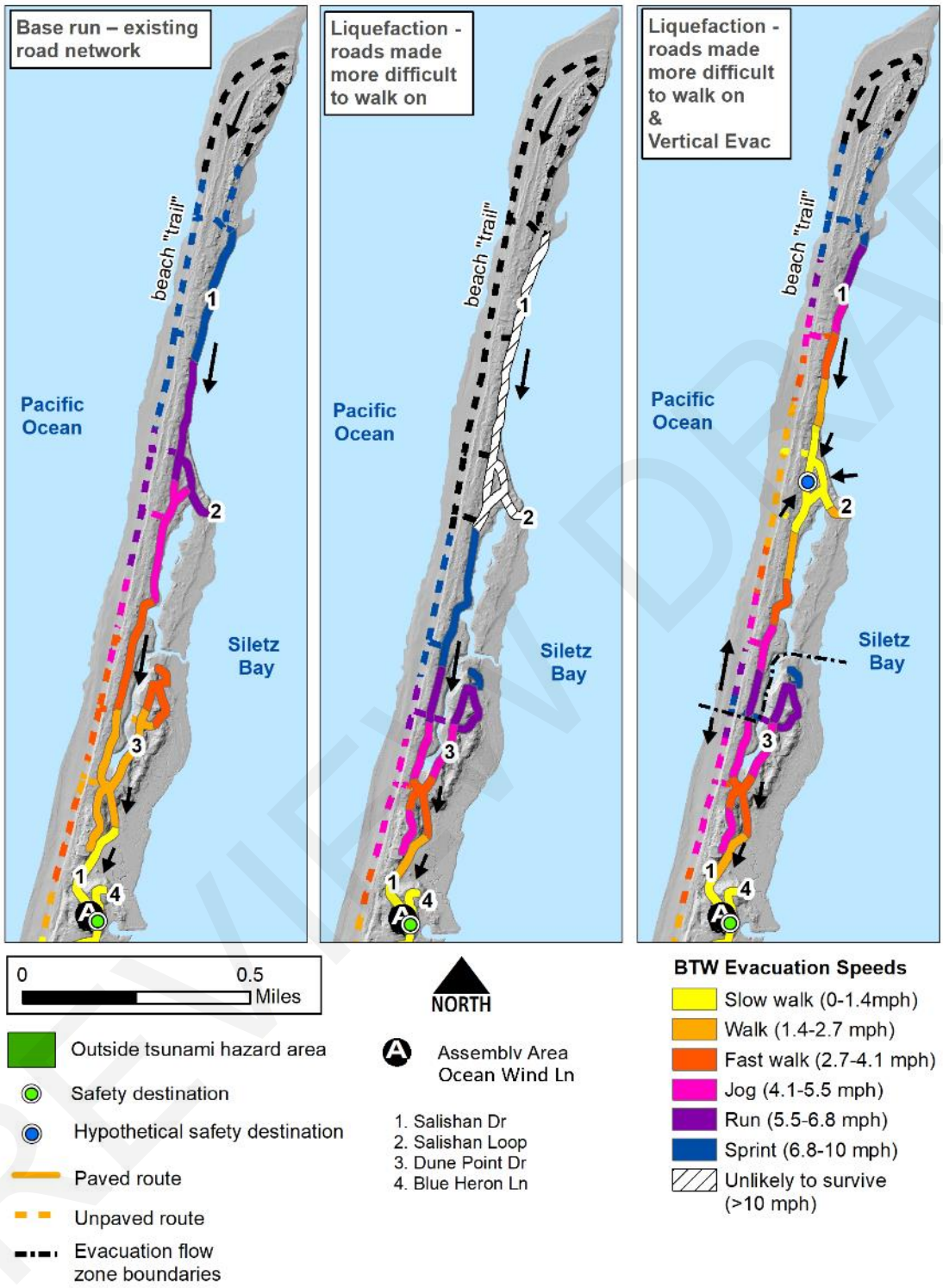
Figure 2-9 Beat the Wave modeling in Siletz Keys (CSZ earthquake XXL inundation zone)



Source: DOGAMI, Open-File Report O-19-06.

Note: Beat the Wave modeling in Siletz Keys for base scenario assuming the Siletz River Bridge fails and Millport Slough bridge survives (left), with liquefaction (middle), and with the hypothetical retrofitted of the Siletz River Bridge surviving and Millport Slough bridge failing (right).

Figure 2-10 Beat the Wave modeling in Siletz Spit (CSZ earthquake XXL inundation zone)



Source: DOGAMI, Open-File Report O-19-06.
Note: Beat the Wave modeling in Siletz Spit for base scenario/existing conditions (left), with liquefaction (middle), and hypothetical vertical evacuation structure (right).

South County Area

The South County area is also divided into two distinct zones. The first includes the low-lying communities adjacent to the Alsea Bay that are susceptible to significant tsunami inundation and high liquefaction susceptibility. The second area includes the open coast areas that have limited inundation potential, low liquefaction susceptibility, and higher elevations. According to the model the first waves arrive along the open coast 26 minutes after the start of earthquake shaking with most of the Study Area inundated about 5 to 10 minutes later. The southern half of the Alsea Spit, Beaver Creek, Tillicum Beach, and Yachats north are expected to be completely inundated under the XXL tsunami inundation scenario. High ground is generally accessible for most of this area at walking speed of 4 feet per second (fps) or 2.7 mph. The most challenging unincorporated area is south Alsea Spit where faster walking speeds may be needed.

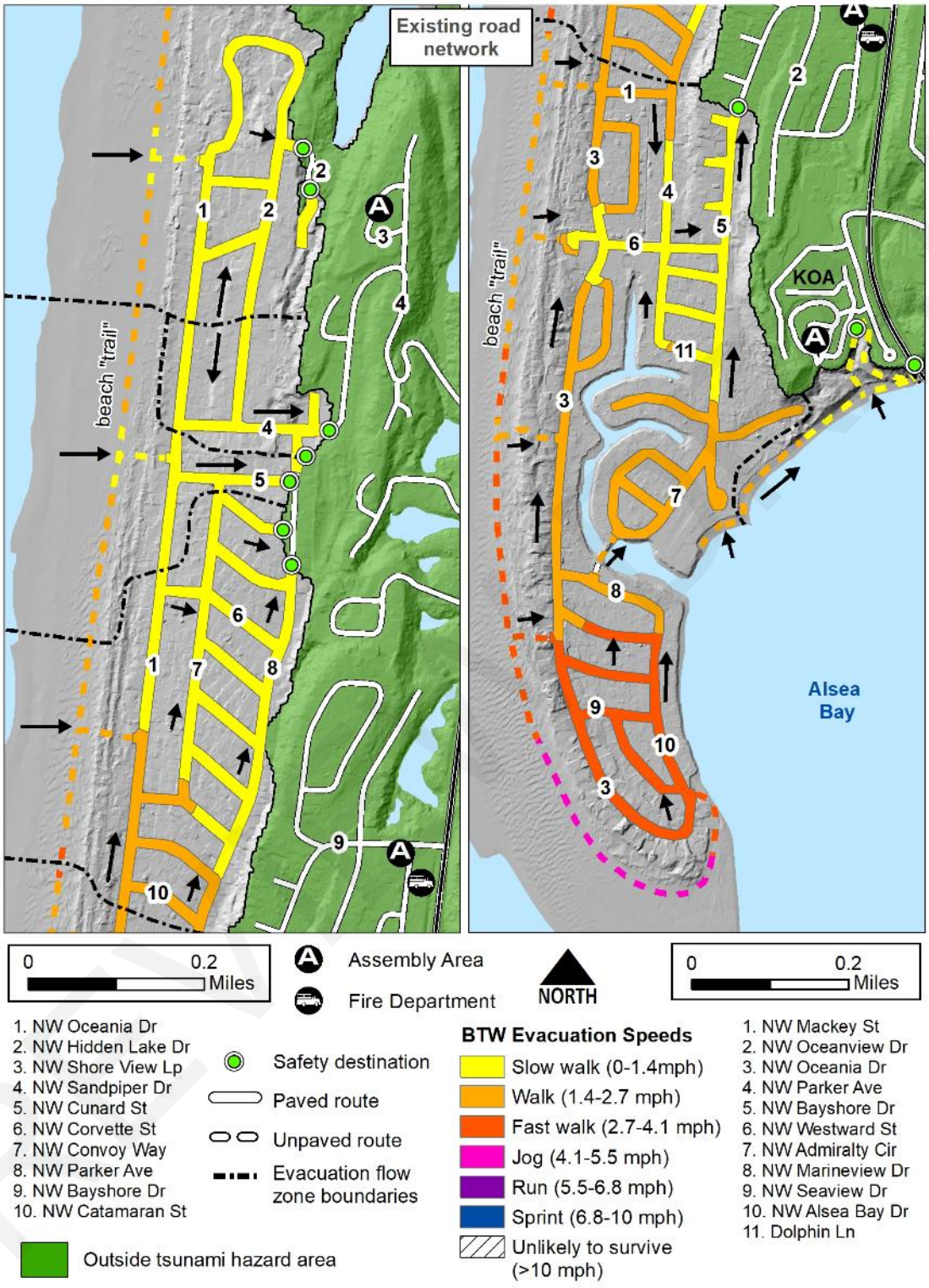
Most evacuees in the Alsea Spit (aka Bayshore) can make it to high ground at slow walk or walk speeds (see Figure 2-11). However, those in the southern end of Alsea Spit that is expected to be overtopped by an XXL tsunami will need to move faster in order to beat the wave and make it to high ground approximately one mile north. Evacuation speeds to the north from the southernmost portions of Alsea Spit will need to be a minimum of a fast walk (6 fps or 4.1 mph); following liquefaction the minimum speeds increase to a run (10 fps or 6.8 mph). Prompt evacuation, knowledge of the route, signage, and alternative route designation due to landslide activity is necessary to improve evacuation speeds. If the private road off NW Bayshore Drive near NW Admiralty Circle becomes sanctioned and signed route, it would reduce travel distance and minimum speeds, to reach a secondary safety destination at the Waldport/Newport Kampgrounds of America (KOA). The most significant change at this area would decrease minimum speeds from a fast walk to a walk.

The following is a summary of expected inundation, wave arrival time, and minimum expected evacuation speed for each profiled area:

- Beaver Creek (expected full inundation, 40-minutes until first wave, slow walk to walk speed required for safe evacuation),
- Seal Rock (mostly out of inundation, 26-minutes until first wave, slow walk speed required for safe evacuation),
- Waldport East (Hwy 234 area in inundation area, 34 minutes until first wave, slow walk to walk speed required for safe evacuation),
- Governor Patterson and Beachside recreation areas (Hwy 101, Yachats RFPD Station, and residential area west of Hwy 101 is in inundation area, 26 minutes until first wave, slow walk to walk speed required for safe evacuation),
- Tillicum Beach (expected full inundation, 26 minutes until first wave, walk to fast walk speed required for safe evacuation), and
- Yachats north (expected full inundation, 26 minutes until first wave, walk speed required for safe evacuation).

For detailed information see Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (DOGAMI, 2019, O-19-06).

Figure 2-11 Beat the Wave modeling in Alsea Spit (CSZ earthquake XXL inundation zone)



Source: DOGAMI, Open-File Report O-19-06.
Note: For additional Beat the Wave scenario maps for liquefaction and hypothetical trail to KOA see report.

Natural Hazard Risk Report for Lincoln County

See *Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon* (2021, O-21-02) and *Earthquake and tsunami impact analysis for the Oregon* coast (2025, O-25-01) for additional information.

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to the Cascadia subduction zone earthquake. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled tsunami scenarios.

Population Vulnerability (Residents)

Approximately six percent of unincorporated Lincoln County's population (1,139 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly fewer people than those exposed within the Senate Bill 379 line (1,303 people). The communities of Wakonda Beach (20%) and Seal Rock-Bayshore (10%) have the highest percent of potentially displaced residents. However, the dispersed "rural" Lincoln County has the highest number (459). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.*

Table 2-10 Potentially Displaced Residents, CSZ M9.0 Tsunami, by Unincorporated Area

	Resident Population	Potentially Displaced Residents			
		CSZ M9.0 (Medium)		SB 379	
		Number	Percent	Number	Percent
"Rural" Lincoln County	10,293	459	4%	466	5%
Otis-Rose Lodge	1,926	0	0%	0	0%
Otter Rock	489	5	1%	6	1%
Salishan-Lincoln Beach	2,093	118	6%	172	8%
Seal Rock-Bayshore	2,766	289	10%	309	11%
Wakonda Beach	1,326	268	20%	350	26%
Total Unincorporated	18,893	1,139	6%	1,303	7%

Source: IPRE.

Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

A tsunami will impact every building in Lincoln County within the CSZ M9.0 "Medium" zone (note, this is slightly fewer buildings than are predicted to be impacted under the SB 379 event scenario). Building damage (loss) estimates are reported for buildings expected to by damaged by the tsunami inundation zone (medium-sized and SB 379). All buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The communities

of Wakonda Beach (31%) and Seal Rock-Bayshore (13%) are expected to see the highest percent of their buildings damaged by a tsunami event. "Rural" Lincoln County (808 buildings), Wakonda Beach (506 buildings), and Seal Rock-Bayshore (450 buildings) have the highest number of buildings expected to be damaged under the SCA M9.0 tsunami scenario. The value of building damage losses due to the tsunami is $274.6 million (another $402.5 million will be attributed to the related earthquake).[43]

Table 2-11 Damaged and Exposed Buildings, CSZ M9.0 Tsunami, by Unincorporated Area

		Exposed Buildings			
		CSZ M9.0 (Medium)		SB 379	
	Total Buildings	Number	Percent	Number	Percent
"Rural" Lincoln County	12,637	808	6%	864	7%
Otis-Rose Lodge	1,747	0	0%	0	0%
Otter Rock	634	22	3%	5	1%
Salishan-Lincoln Beach	2,847	227	8%	367	13%
Seal Rock-Bayshore	3,345	450	13%	476	14%
Wakonda Beach	1,614	506	31%	497	31%
Total Unincorporated	22,824	2,013	9%	2,013	9%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability[44]

Critical facilities determined to be exposed to a CSZ tsunami include (additional critical facilities will be impacted by the related earthquake):

- Toledo State Airport (*Toledo area*)

The following vulnerable critical facilities were identified by the County but not included in the Risk Report analysis:

- Depoe Bay RFPD Fire Station 2200 (Gleneden Beach)

Risk Report Identified Areas of Vulnerability[45]

- Residential areas built on the "Salishan Spit" in Salishan-Lincoln Beach are extremely vulnerable to tsunami hazard.
- Low-laying coastal areas and estuarine zones in Yachats, Wakonda Beach, Newport, and Lincoln City are exposed to tsunami hazard.

[43] Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidtlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

[44] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

[45] Ibid. Page 26.

Other DOGAMI Reports

The **DOGAMI Earthquake and Tsunami Impact Analysis for Coastal Lincoln County, Oregon (O-21-02)** provides an evaluation of the potential impacts of a Cascadia earthquake and accompanying tsunami in coastal Lincoln County. The analyses include an assessment of the numbers of people, businesses, and critical facilities located in three Cascadia tsunami inundation zones (M1, L1, and XXL1). XXL1 represents the maximum considered inundation scenario given our knowledge of the Cascadia subduction zone (CSZ). Large (L1) and Medium (M1) inundation zones reflect earthquake and tsunami scenarios that are more likely to occur than XXL1 but are characterized with less slip on the subduction zone (critical for tsunami generation) and thus carry more risk because they are less conservative.

The **DOGAMI Earthquake and Tsunami Impact Analysis for the Oregon Coast (O-25-01)** is the final in a series of evaluations of the potential impacts of a Cascadia Subduction Zone (CSZ) earthquake and accompanying tsunami affecting communities and parks along the length of the Oregon Coast. The analyses presented here update previous countywide studies completed by the Oregon Department of Geology and Mineral Industries (DOGAMI) between 2020 and 2023. This important update includes latest U.S. Geological Survey (USGS) megathrust (moment magnitude (MW) 9.0) earthquake scenarios, improved DOGAMI geology and soil classifications, and the most recent U.S. census data (2020). Figure 2-7 shows the demographic and loss data for the county in each of the three selected earthquake and tsunami scenarios.

Community Clusters of Tsunami Vulnerability

Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.[46] The tables below provide community specific information and identify the most vulnerable communities based upon the cluster analysis. Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds.[47] The study placed all communities within Lincoln County within the following cluster category: "Relatively low numbers of residents, employees, or customer-heavy businesses in the tsunami hazard zones that will likely have sufficient time to reach high ground before tsunami wave arrival".[48] Lincoln City and Toledo were noted to have slightly higher percentages of their population in the over age 65 category which may benefit from specific age related mitigation measures. The report suggests that education efforts that recognize demographic differences may be the best evacuation related mitigation measure for the Lincoln County communities.[49]

[46] Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidtlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

[47] Ibid.

[48] Ibid.

[49] Ibid.

Table 2-12 provides exposure analysis for the total number of residents, employees, public venues, dependent care facilities, and community businesses that are located within the "Large" local tsunami-hazard zone. The table shows that the unincorporated county (2,222) and Lincoln City (1,257) have the largest number of residents in the "Large" local tsunami-hazard zone; while Newport (1,445) and Lincoln City (584) have the largest number of employees located in the zone. The cities of Lincoln City (23) and Newport (10) have the largest number of public venues in the "Large" local tsunami-hazard zone; while Waldport (10) has the largest number of dependent care facilities in the zone and Newport (53) has the largest number of community businesses in the zone. Based upon the cluster analysis all the communities within Lincoln County are categorized within the least vulnerable group with regard to people or facilities in tsunami-hazard zones; although the report notes that Newport does have a high number of employees exposed to the tsunami-hazard zone.[50]

Table 2-12 Total Number in Tsunami-hazard Zones

	Total number in tsunami-hazard zones				
Community	Residents	Employees	Public Venues	Dependent Care Facilities	Community Businesses
Lincoln City	1,257	584	23	1	27
Depoe Bay	27	0	0	0	0
Newport	578	1,445	10	1	53
Toledo	104	44	0	1	0
Waldport	552	283	6	10	32
Yachats	289	10	0	0	3
Unincorporated	2,222	341	8	0	17

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

The sensitivity of communities within Lincoln County is also related to demographic characteristics of the population. Table 2-13 shows the results of an analysis of commonly used demographic variables associated with block level data in the 2010 US Census.[51] The data shows that Yachats (42%), Waldport (27%), and Lincoln City (16%) have the highest percentage of their populations within the tsunami-hazard zone. In addition, the table shows that Depoe Bay (40%), Yachats (33%), Waldport (28%), and the unincorporated county (29%) have a relatively high percentage of their population greater than 65 years of age. In addition, the table shows that Waldport (60%) has a high percentage of renter-occupied households. The cluster analysis (Wood et al) suggests that Lincoln County communities have relatively minor variability in racial composition, housing tenure, and age compared to other communities in the study.[52] The study does suggest that mitigation efforts may want to focus on the needs of older residents within

[50] Ibid.

[51] Ibid.

[52] Ibid.

Depoe Bay, Newport, Waldport, Yachats, and unincorporated Lincoln County; while the needs of renters and Hispanic or Latino populations may be more important in Lincoln City and Toledo.

Table 2-13 Characteristics of Residents in Tsunami-hazard Zones

Community	Total Residents in Hazard Zone	Hispanic or Latino	American Indian or Alaska Native	Under 5 years in age	Single-mother households	More than 65 years in age	Living in group quarters	Renter-occupied households
Lincoln City	16%	6%	5%	4%	6%	21%	1%	46%
Depoe Bay	2%	2%	1%	1%	1%	40%	0%	37%
Newport	6%	4%	2%	5%	6%	24%	1%	39%
Toledo	3%	7%	12%	4%	8%	12%	0%	48%
Waldport	27%	3%	4%	2%	6%	28%	0%	60%
Yachats	42%	6%	3%	2%	3%	33%	0%	41%
Unincorporated	10%	3%	4%	3%	4%	29%	3%	25%

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

Reaching higher ground before tsunami arrival is key to reducing vulnerability in Lincoln County. Table 2-14 estimates the number of residents and employees who may not evacuate in time during a local tsunami, assuming a slow walking speed (1.1 m/s). It also highlights public venues, care facilities, and businesses with significant foot traffic in areas where evacuation times exceed wave arrival times.[53] While most individuals are likely to evacuate successfully, Lincoln City has the highest number of people at risk.

Table 2-14 People at Risk (Assuming a Slow Walk)

Community	Residents	Employees	Public Venues	Dependent Care Facilities	Community Businesses
Lincoln City	233	16	1	0	0
Depoe Bay	0	0	0	0	0
Newport	0	0	0	0	0
Toledo	0	0	0	0	0
Waldport	2	0	0	0	0
Yachats	0	0	0	0	0
Unincorporated	42	0	0	0	0

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

An individual's ability to move faster during evacuation is another element of short-term resilience to tsunamis. Table 2-15 shows the number of individuals that may not be able to evacuate a local tsunami assuming a faster walk speed (1.52 m/s). Like the slow walk evacuation (above) there are few individuals that would have difficulty evacuating within Lincoln County.

[53] Ibid.

Table 2-15 People at Risk (Assuming a Fast Walk)

Community	Residents	Employees	Public Venues	Dependent Care Facilities	Community Businesses
Lincoln City	15	0	0	0	0
Depoe Bay	0	0	0	0	0
Newport	0	0	0	0	0
Toledo	0	0	0	0	0
Waldport	0	0	0	0	0
Yachats	0	0	0	0	0
Unincorporated	26	0	0	0	0

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

Additional information can be found on the Lincoln County website: https://www.co.lincoln.or.us/772/Hazards-Tsunamis

Flood

Summary					
Event:	Riverine	Coastal		Riverine	Coastal
Hazard Ranking:	#7	#9	Probability:	High	High
Total Threat Score:	180	160	Vulnerability:	Moderate	Moderate

Significant Changes Since Previous Update

NFIP information has been updated including repetitive loss properties. The hazard history was updated with historic hazard events not recorded in the previous NHMP. Several other points of data throughout this section were also updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) extreme precipitation events are projected to intensify, with the wettest days increasing in magnitude by approximately 13% by the 2050s under high emissions scenarios. Warmer winters will likely result in more rainfall instead of snow, increasing the risk of winter flooding in rain-dominated watersheds like the Siletz River. Additionally, atmospheric river events are expected to become more frequent, further elevating flood risks. These changes will coincide with demographic shifts, including an aging population and increased development in low-lying coastal areas, which may strain emergency services, infrastructure, and housing. As more people move to the coast for its natural beauty and milder climate, the demand for resilient infrastructure and effective land-use planning will grow.

Sea Level Rise and Coastal Flooding Impacts

Sea level rise (SLR) poses a significant long-term threat to Lincoln County's coastal communities. Projections indicate a rise of 1.7 to 5.7 feet by 2100, which, combined with changing wave dynamics and El Niño-driven storm surges, will increase the frequency and severity of coastal flooding. FEMA-designated V zones and AO/AH zones highlight areas at risk from wave action and sheet-flow flooding. Tidal wetlands and estuaries, which naturally buffer floodwaters, are also expected to shrink or shift, reducing their protective capacity. According to Oregon's Sea Level Rise Planning Guide, even modest increases in sea level can dramatically expand flood-prone areas, particularly during high tides and storm events. This underscores the need for proactive adaptation strategies, such as updated floodplain mapping, resilient infrastructure design, and community education, to mitigate future risks.

Characteristics

Flooding results when rain and snowmelt create water flow that exceeds the carrying capacity of rivers, streams, channels, ditches, and other watercourses. In Oregon, flooding is most common

from October through April when storms from the Pacific Ocean bring intense rainfall. Most of Oregon's destructive natural disasters have been floods.[54]

Three types of flooding affect Lincoln County: (1) riverine flooding, caused mostly by prolonged, high intensity rainfall events, (2) ocean/coastal flooding from high tides and large, wind-driven waves, and (3) urban flooding.

Riverine Flooding

Riverine floods occur when water levels in rivers and streams overflow their banks. In Lincoln County, riverine flooding occurs primarily on lands in the five major river valleys (Alsea, Salmon, Siletz, Yachats, and Yaquina rivers) and along the larger tributaries. Most communities located along such water bodies have the potential to experience this type of flooding after spring rains, heavy thunderstorms or rapid runoff from snow melt. Riverine floods can be slow or fast rising but usually develop over a period of days.

The danger of riverine flooding occurs mainly during the winter months, with the onset of persistent, heavy rainfall, and during the spring, with melting of snow in the Cascade and Coast Ranges.

Coastal Flooding

Coastal flooding occurs in low-lying coastal areas and is caused by heavy rain, storms, large waves, and even tsunamis produced by underwater seismic events. Areas exposed to this intensive wave action are termed by FEMA as high velocity zone, or "V-zones". Special regulations are usually applied in these areas.

Urban Flooding

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in floodwaters that rise very rapidly and peak with violent force.

During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding.

Location and Extent

Lincoln County located along the central Oregon Coast. Its western edge is the Pacific Ocean and its eastern edge lies in the Coast Range. Weather patterns generally move west to east where air masses from the Pacific Ocean rise over the Coast Range, cool, and become saturated.

The principal flood sources for the unincorporated area of Lincoln County include the: Salmon River, Siletz River, Yaquina River, Alsea River, Little Elk Creek, and the Pacific Ocean. The

[54] Taylor, George H. and Chris Hannan. *The Oregon Weather Book*. Grants Pass, OR: Oregon State University Press. 1999

incorporated areas of the county are affected by many of the same rivers and the following: Alsea Bay, Big Creek, Depoe Bay, Depoe Creek/ Slough, Devils Lake, Drift Creek, Olalla Creek/ Slough, Red River, Schooner Creek, Siletz Bay, Yachats River, and Yaquina Bay.[55] *See the City addenda for a listing of main flood sources for each community.*

Flooding is most common from October through April, when storms from the Pacific Ocean bring intense rainfall to the area. During the rainy season, monthly rainfall totals average far higher than other months of the year. This results in high water, particularly in December and January. The larger floods are the result of heavy rains of two-day to five-day durations augmented by snowmelt at a time when the soil is near saturation from previous rains.

Floods can result in loss of life and property, with the extent of the damage dependent on the depth and velocity of the floodwaters. Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwater) and the related probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of occurrence for floods of different magnitudes.

FEMA has mapped most flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (1% annual chance) serves as the national standard for floodplain management and is referred to as the base flood. FEMA's Flood Insurance Rate Maps (FIRMs) are the primary source for identifying these flood zones and support the National Flood Insurance Program (NFIP).

FIRMs delineate Special Flood Hazard Areas (SFHAs), which include both 100-year and 500-year (0.2% annual chance) floodplains. These maps inform flood insurance requirements and land-use planning but represent conditions at the time of their creation. Since then, development and natural changes have altered floodplain characteristics in Lincoln County.

Map 2-6 provides a comprehensive view of the 100- and 500-year floodplains across Lincoln County, including small waterways, reservoirs, and less populated areas not covered in earlier FIRMs.

Floods are described by their extent—both area and depth—and their probability of occurrence. Historical data, such as streamflow records, are used to estimate the likelihood of floods of varying magnitudes, expressed as annual probabilities.

The magnitude of flood used as the standard for floodplain management in the United States is a flood having a one percent probability of occurrence in any given year. This flood is also known as the 100-year flood or base flood. The most readily available source of information regarding the 100-year flood is the system of Flood Insurance Rate Maps (FIRMs) prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP). The FIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as

[55] FEMA, Lincoln County Flood Insurance Study, effective December 18, 2009, and FEMA, Risk MAP Discovery Report, January 10, 2013 (MAS-05-03).

Special Flood Hazard Areas (SFHAs) and are the basis for flood insurance and floodplain management requirements. In 2019 FEMA completed an update of all FIRMs in Lincoln County.

For detailed information, refer to the following Flood Insurance Study (FIS) and associated Flood Insurance Rate Maps (FIRMs):

- Lincoln County FIS: Volume I (2019)
- Lincoln County FIS: Volume 2 (2019)

Additional reports are available via FEMA's Flood Map Service Center website: Link

https://msc.fema.gov/portal/advanceSearchRefer to the following DOGAMI reports for additional information:

- Coastal flood hazard study, Lincoln County, Oregon (2018, O-15-06)
- Statewide subbasin-level channel migration screening (2017, IMS-56).

Additional reports are available via DOGAMI's Publications Search website.

History

Riverine flooding events with significant damage potential are relatively frequent; historically, floods with an estimated recurrence interval of 10 to 15 years have caused substantial property damage. Records for coastal flooding are mostly anecdotal, but the recurrence of damaging coastal floods has been less frequent than riverine floods.

Riverine flooding in Lincoln County typically occurs following snow accumulation in the upper reaches of watersheds in combination with southwestern storms that may bring warmer temperatures and heavy precipitation. Along the coast the high spring tides combined with storm surges produced by strong winds from winter storms often cause flooding.

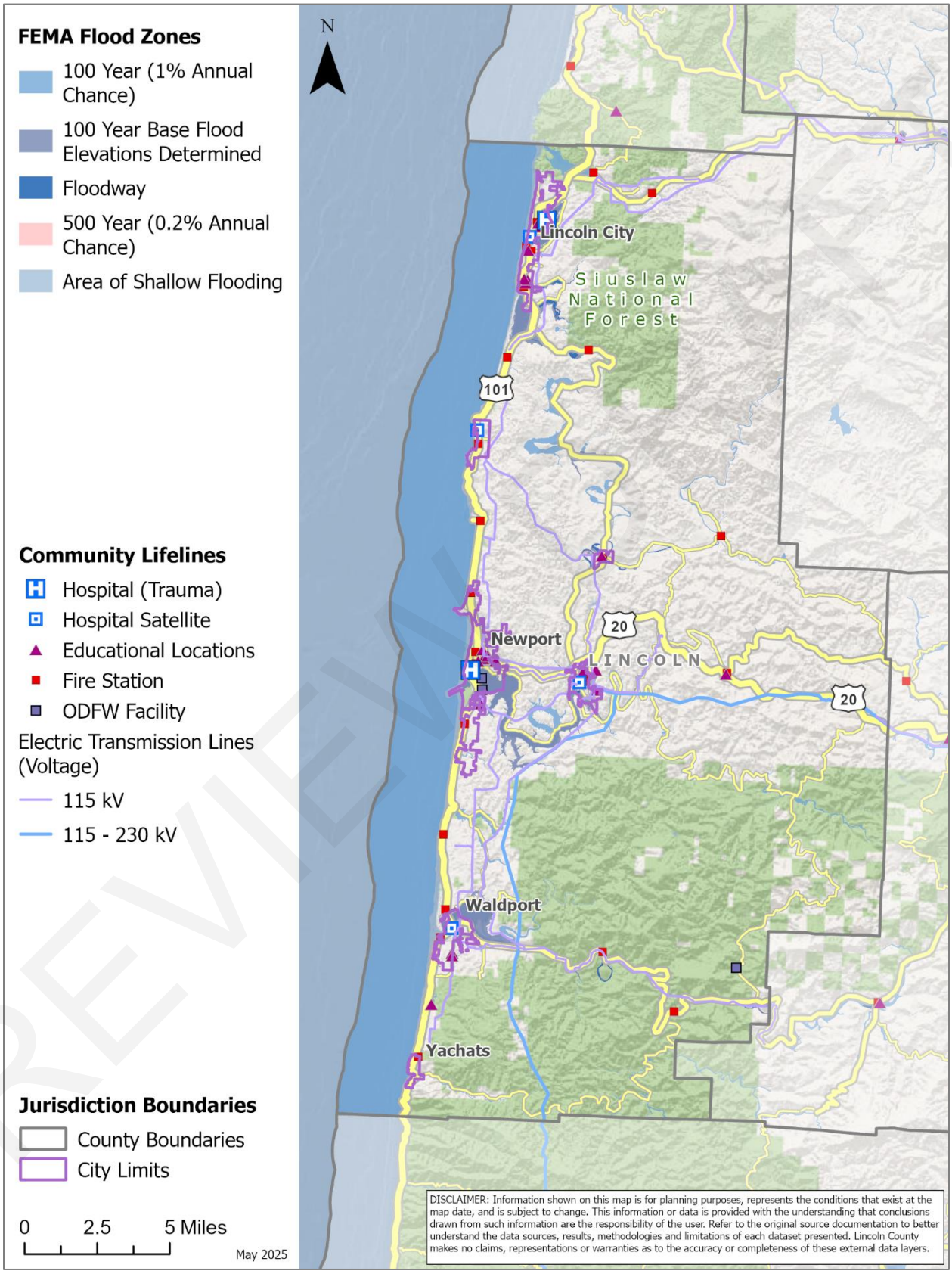
The county has received presidential disaster declarations designation for the following events that included flooding: DR 184 (1964), DR 319 (1972), DR 413 (1974), DR 1099 (1996), DR 1107 (1997), DR 1632 (2006), DR 1672 (2006), DR 1683 (2007), DR 1733 (2007), DR 1956 (2011), DR 1964 (2011, Tsunami), and DR 4055 (2012), and DR 4258 (2016). Other recent flooding events occurred in December 2014, December 2015, November 2016, January 2021, January 2022, December 2022, January 2024 (DR 4768).

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a coastal or riverine flood is "high",** meaning at least one incident is likely within the next 35-year period.

FEMA's Flood Hazard Zones (Map 2-6) identify areas at risk, including V Zones (100-year coastal flood zones) and AO/AH Zones (areas vulnerable to wave overtopping). While ocean storms are common, coastal flood damage in Lincoln County remains rare. However, climate change is expected to increase flood risks by reducing snowpack and shifting winter precipitation to rain, resulting in faster runoff and more intense flooding.

Map 2-6 Flood Hazard Zones (100- and 500-year floodplains)



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left

Vulnerability Assessment

The Steering Committee rated the county as having a **"Moderate" vulnerability to coastal and riverine flood hazards**, meaning that between 1% and 10% of the unincorporated County's population or property could be affected by a major coastal or riverine flood event.

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

Lincoln County development regulations restrict, but do not prohibit, new development in areas identified as floodplain. This reduces the impact of flooding on future buildings. As new land has been brought into the regional Urban Growth Boundary, the applicable development codes have been applied to prevent the siting of new structures in flood prone areas.

For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. Other portions of the county outside of the mapped floodplains may also be at relatively high risk from over bank flooding from streams too small to be mapped by FEMA, from channel migration, from local storm water drainage, from local and distant tsunamis, or from king tides.

Low-lying areas along the lower portions of the County's major rivers (Salmon, Siletz, Yaquina, Alsea, Yachats) and larger tributaries are most vulnerable to flood hazards. Here, riverine flooding can be exacerbated by high tides (especially King Tides). Also, along the lower portions of the Salmon, Siletz and Alsea Rivers, rural subdivisions and substantial recreational and second home development took place in the 1960s and 1970s, (before Lincoln County entered the National Flood Insurance Program and implemented a system of flood hazard area regulation.) As a result, there are numerous structures located in flood hazard areas along these rivers that are classified as 'pre-FIRM" meaning their construction predates requirements to elevate above the base flood level, and are therefore subject to damage during larger flood events. The county has worked actively, mostly along the Siletz River (Lower Siletz Mitigation Project,) to assist property owners in retrofitting many of these pre-FIRM residences to meet current elevation requirements. This project has been a success for both homeowners and the government agencies that assisted. Having these homes elevated and out of harm's way will certainly reduce the amount of property losses as well as insurance payments in the future. There are still, however, substantial numbers of structures in harm's way in these areas.

Also, some areas along major rivers, highways and roads, in particular Highway 229 along the lower Siletz River, are subject to inundation and damage by flood waters.

In general, the following are subject to damage by riverine flooding:

- Pre-FIRM residential structures, especially repetitive loss structures/properties
- Manufactured homes inside manufactured home parks
- Roads and highways

The primary economic activities at risk from riverine flood events include:

- RV park and campground operations
- Other businesses that rely on road and highway transportation corridors that may be interrupted by flooding.

Coastal developments within FEMA-designated Velocity (V) zones and A-O zones include the Bayshore development on Alsea spit and the Salishan development on the Siletz spit. Most residences in both developments are post-FIRM, meaning that they are built in compliance with current flood hazard area regulations. There has been no record of significant damage from flooding in either of these areas.

Natural Hazard Risk Report for Lincoln County

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to riverine and coastal flooding. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the "Rural" portions of Lincoln County, Otter Rock, Salishan-Lincoln Beach, Seal Rock-Bayshore, and Wakonda Beach. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled flood scenario.

Population Vulnerability (Residents)

Approximately 7% of unincorporated Lincoln County's population (1,257 people) may be displaced by flooding within Lincoln County. These people are expected to have mobility or access issues due to surrounding water. It is important to note that impact from flooding may vary depending on which rivers are flooding. "Rural" Lincoln County has the most population at risk (963), although the population is dispersed throughout the County. The communities of Otis-Rose Lodge are vulnerable to flooding of the Salmon River.

Table 2-16 Potentially Displaced Residents, 1% Flood, by Unincorporated Area

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	963	9%
Otis-Rose Lodge	1,926	127	7%
Otter Rock	489	0	0%
Salishan-Lincoln Beach	2,093	83	4%
Seal Rock-Bayshore	2,766	43	2%
Wakonda Beach	1,326	41	3%
Total Unincorporated	18,893	1,257	7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Riverine and coastal flooding have a significant impact on Lincoln County particularly within the floodplain and low-lying coastal areas. Approximately seven percent (1,660 buildings) of unincorporated Lincoln County buildings are exposed to the 1% Flood. An additional 499 are exposed but above the height of the 100-year flood extent. Elevating more of these exposed structures would reduce the potential damages sustained from flooding. The percent of exposed buildings is greatest in the dispersed "rural" Lincoln County (11.6%) and within Otis-Rose Lodge (4.6%). The value of losses is greatest in "rural" Lincoln County ($15.6 million, loss ratio of 1.9%) and Salishan-Lincoln Beach ($4.8 million, loss ratio of 1.2%). The value of exposed buildings is $21.5 million.

Table 2-17 At-Risk Buildings, 1% annual chance Flood

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate ($)	Loss Ratio
"Rural" Lincoln County	12,637	1,467	11.6%	$15,579,000	1.9%
Otis-Rose Lodge	1,747	81	4.6%	$300,000	0.4%
Otter Rock	634	0	0.0%	$0	0.0%
Salishan-Lincoln Beach	2,847	66	2.3%	$4,838,000	1.2%
Seal Rock-Bayshore	3,345	17	0.5%	$372,000	0.1%
Wakonda Beach	1,614	29	1.8%	$442,000	0.4%
Total Unincorporated	22,824	1,660	7.3%	$21,531,000	1.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability[56]

The following vulnerable critical facilities were determined to be within the 1% flood zone. Elevating these exposed structures would reduce the potential damages sustained from flooding.

- North Lincoln Fire Station 1700 (Kernville, North Lincoln Fire & Rescue District)
- Toledo State Airport

Risk Report Identified Areas of Vulnerability[57]

- The Port of Toledo and the Georgia Pacific manufacturing facility in the City of Toledo are highly vulnerable to flooding from the Yaquina River.
- Developed areas along the Siletz River in the unincorporated county and in Lincoln City are exposed to the 100-year flood.
- Many buildings in the low-lying business area of Waldport is particularly vulnerable to flooding. This area, along the riverbank, is subject to the 100-year flood due to the proximity of the Alsea River. Mitigation actions, such as elevating buildings, have alleviated some problems.
- Coastal flooding threatens many residences in Wakonda Beach and Salishan-Lincoln Beach.

High Hazard Potential Dams

There are five high-hazard potential dams in Lincoln County (Table C-27). There are two dams, Big Creek #1 (Lower) and Big Creek #2 (Upper), that are eligible for the *Rehabilitation of High Hazard Potential Dam Grant Program* as of 5/30/2025. Both dams are owned by the City of Newport (see City of Newport addendum for additional information). Dam owners need to consult the Oregon Water Resources Department (OWRD), an eligible non-federal governmental organization, that can meet the compliance requirements to apply to the HHPD grant program.

The Oregon Water Resources Department (OWRD) has performed Emergency Action Plans (EAPs) for all high hazard potential dams in the County. The EAPs include mitigation opportunities for internal erosion, landslide or major deformation, water flowing over the crest, and other damage. loss estimate for McMullen Dam (contact OWRD for details of each EAP).

Data Limitations

Most, if not all, dams in Oregon have a data limitation related to extreme precipitation estimates. OWRD Dam Safety, is currently funding an updated precipitation frequency analysis which will address this issue.

National Flood Insurance Program (NFIP)

FEMA updated the Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) in 2019 (effective October 10, 2019). The County does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

[56] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

[57] Ibid. Page 31.

The County complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program. Their flood prevention code section is based on the Oregon Model Flood Hazard Prevention code, which includes provisions addressing substantial improvement/substantial damage.

The county has 807 National Flood Insurance Program (NFIP) policies in force, representing almost $230.1 million in coverage.

The Community Repetitive Loss record for Lincoln County identifies 55 Repetitive Loss Properties[58], of which 10 are Severe Repetitive Loss Properties[59]. Fifty (50) of the repetitive loss properties are single-family residential (seven of these are severe repetitive loss properties), three (3) are condominium associations (all three are severe repetitive loss properties), and two are non-residential.

RL and SRL properties are troublesome because they continue to expose lives and valuable property to the flooding hazard. Local governments as well as federal agencies such as FEMA attempt to address losses through floodplain insurance and attempts to remove the risk from repetitive loss of properties through projects such as acquiring land and improvements, relocating homes or elevating structures. Continued repetitive loss claims from flood events lead to an increased amount of damage caused by floods, higher insurance rates, and contribute to the rising cost of taxpayer funded disaster relief for flood victims.

Additional information can be found on the Lincoln County website:
https://www.co.lincoln.or.us/757/Hazards-Flooding-River-Levels

[58] A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

[59] A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000, and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Landslide

Summary			
Hazard Ranking:	#3	Probability:	High
Total Threat Score:	211	Vulnerability:	High

Significant Changes Since Previous Update

New data is included from DOGAMI Open-file reports: O-21-11. Risk and vulnerability information has been integrated from the Lincoln County Evacuation Plan. The hazard history was updated with historic hazard events not recorded in the previous NHMP. Several other points of data throughout this section were also updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) extreme precipitation events are expected to intensify as the climate warms. By the 2050s, the wettest days and the wettest consecutive five-day periods could increase in intensity by approximately 13% (ranging from 4% to 28%) under a high emissions scenario. While overall landslide risk is not projected to change significantly, the increasing intensity of storms may still lead to more frequent or severe localized landslides.

Demographic changes and land use patterns also play a critical role. As Lincoln County continues to grow, development is expanding into higher-risk areas such as steep slopes and riverbanks. These areas are particularly susceptible to landslides, and future construction in these zones increases the potential for property damage, infrastructure disruption, and challenges for emergency response. This trend is occurring throughout the county and may amplify the impacts of landslides, even if their frequency remains relatively stable.

Characteristics

A landslide is any detached mass of soil, rock, or debris that falls, slides, or flows down a slope or a stream channel. Landslides are classified according to the type and rate of movement and the type of materials that are transported. In a landslide, two forces are at work: 1) the driving forces that cause the material to move down slope, and 2) the friction forces and strength of materials that act to retard the movement and stabilize the slope. When the driving forces exceed the resisting forces, a landslide occurs.

Lincoln County is subject to shallow- and deep-seated landslides and debris flows (mudslides) especially in the Coast Range in the eastern portion of the county, which may affect buildings, roads, and utilities.

Landslide risk is influenced by a combination of natural hazards such as precipitation, earthquakes, and wildfires, which can destabilize slopes and increase the likelihood of slope failure, especially when these events occur in close succession. For example, wildfire can remove vegetation that normally stabilizes soil, making the land more susceptible to landslides during

heavy rainfall. Earthquakes can trigger various types of slope failures, from minor rockfalls to large-scale slides, while intense or prolonged rainfall can saturate the ground, reducing slope stability and leading to landslides. Additionally, landslides can pose indirect threats to infrastructure, such as dams, by displacing water in reservoirs or directly impacting dam structures. These interconnected hazards often amplify each other, making landslide risk a complex and multifaceted hazard.

Location and Extent

In Lincoln County, DOGAMI reports the slopes nearest to rivers are at greatest risk of landslides (Map 2-7). Weak, low-permeability marine sediments overlain by basalts, and clay rich residual soils overlying basalts are susceptible to water-induce landslides on steep slopes and within existing slide masses. Features such as hummocky topography, disrupted drainage patterns, sag ponds, springs, back-tilted bedrock blocks, and subdued head scarps are indicative of landslide terrain. For Lincoln County, most landslide areas are found in less populated eastern hills, historic landslide areas are also present in or adjacent to urban areas. Landslides in these areas could cause disruptions in transportation and potable water systems.

More detailed landslide hazard assessment at specific locations requires a site-specific analysis of the slope, soil/rock and groundwater characteristics at a specific site. Such assessments are often conducted prior to major development projects in areas with moderate to high landslide potential, to evaluate the specific hazard at the development site.

Landslide susceptibility exposure for Lincoln County is shown in Map 2-7 and Table 2-18 show landslide susceptibility exposure for Lincoln County and the incorporated cities. Approximately 73% of the county has high or very high landslide susceptibility exposure. These are concentrated in areas of high slopes, and close to river valleys. In general cities within the County have a lower landslide susceptibility exposure than does the unincorporated area of the County. *Note that even if a County or City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries, or take lives.

Table 2-18 Landslide Susceptibility Exposure

Jurisdiction	Area, ft^2	Low	Moderate	High	Very High
Lincoln County	27,673,176,599	7.0%	21.1%	61.8%	11.1%
Depoe Bay	50,271,265	19.6%	26.0%	42.3%	12.1%
Lincoln City	166,883,441	22.9%	24.0%	49.6%	3.5%
Newport	291,240,190	44.2%	19.5%	28.7%	7.5%
Siletz	17,593,580	68.5%	21.4%	10.1%	0.0%
Toledo	64,963,983	26.4%	13.8%	39.3%	20.5%
Waldport	85,619,621	40.2%	26.7%	30.8%	2.3%
Yachats	25,746,552	32.6%	25.3%	32.5%	9.6%

Source: DOGAMI Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon (2016)

For more information, refer to the following report and maps provided by DOGAMI:

- Landslide Inventory Map for the Coastal Portion of Lincoln County, Oregon (O-21-11)
- Preparing for Landside Hazards, A Land Use Guide for Oregon Communities (2019, Link)
- Statewide Landslide Susceptibility (O-16-02).
- Landslide Susceptibility of Lifeline Routes in the Oregon Coast Range (O-15-01)
- Lidar data and landslide inventory maps of the North Fork Siuslaw River and Big Elk Creek watersheds, Lane, Lincoln, and Benton Counties, Oregon (O-12-07)
- Johnson Creek landslide research project, Lincoln County, Oregon: Final report to the Oregon Department of Transportation(2008, SP-40)
    - Slope failures in Oregon: GIS inventory for three 1996/97 storm events (2000, Special Paper 34).
    - Storm Impacts and Landslides of 1996: Final Report

Additional reports are available via DOGAMI's Publications Search website.

History

Landslides can occur year-round and are commonly triggered by a combination of slope instability and water saturation. Earthquakes can also initiate landslides, especially when soil is already saturated. Areas prone to seismic landslides typically overlap with those vulnerable to non-seismic ones.

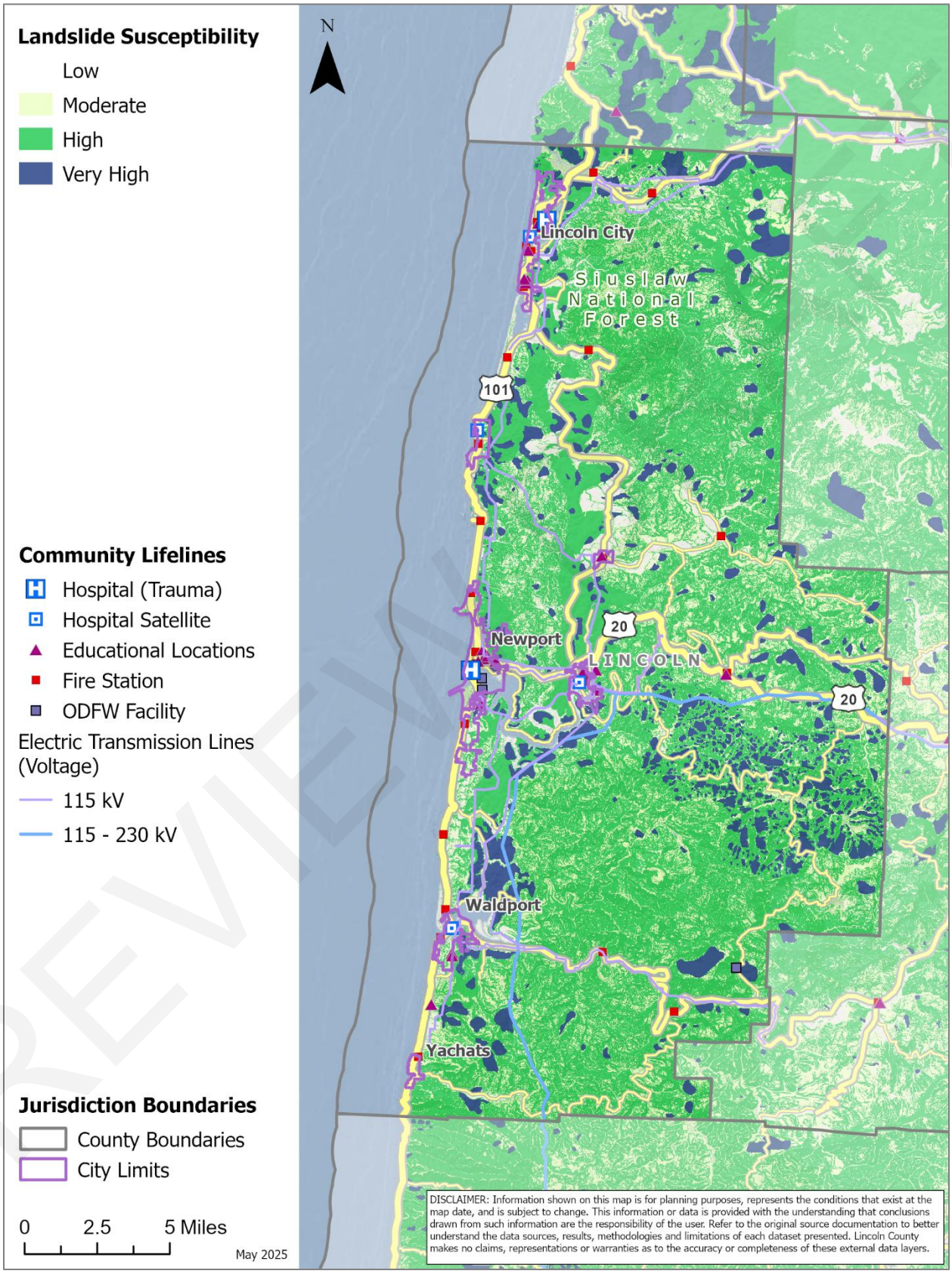
In Lincoln County, landslides and debris flows are frequent, particularly during major storms. While many occur in undeveloped areas and go unreported, they become a concern when they threaten infrastructure, such as buildings, roads, and utilities. Notable storm-related landslides occurred in 1964, 1982, 1996, 2006 (DR-1632), and 2024 (DR-4768), with the 1996 storm alone causing over 9,500 landslides statewide. Recent events have damaged key routes like Highways 101 and 18, disrupting transportation and emergency services, and have impacted private properties in Newport and Toledo. A major slide near Immonen Road, active since 2006, continues to affect infrastructure.

Slow-moving landslides also affect coastal areas, including the large Johnson Creek slide south of Cape Foulweather. This slide, driven by coastal processes, has repeatedly impacted U.S. Highway 101. Measuring up to 26 meters thick, 200 meters long, and 360 meters wide, it has shifted 28 meters horizontally and 6 meters vertically over time. Its most recent significant movement was in early 2002, when it moved about 25 centimeters horizontally.[60]

Map 2-8 shows the landslide inventory for Lincoln County from the Statewide Landslide Information Database for Oregon.

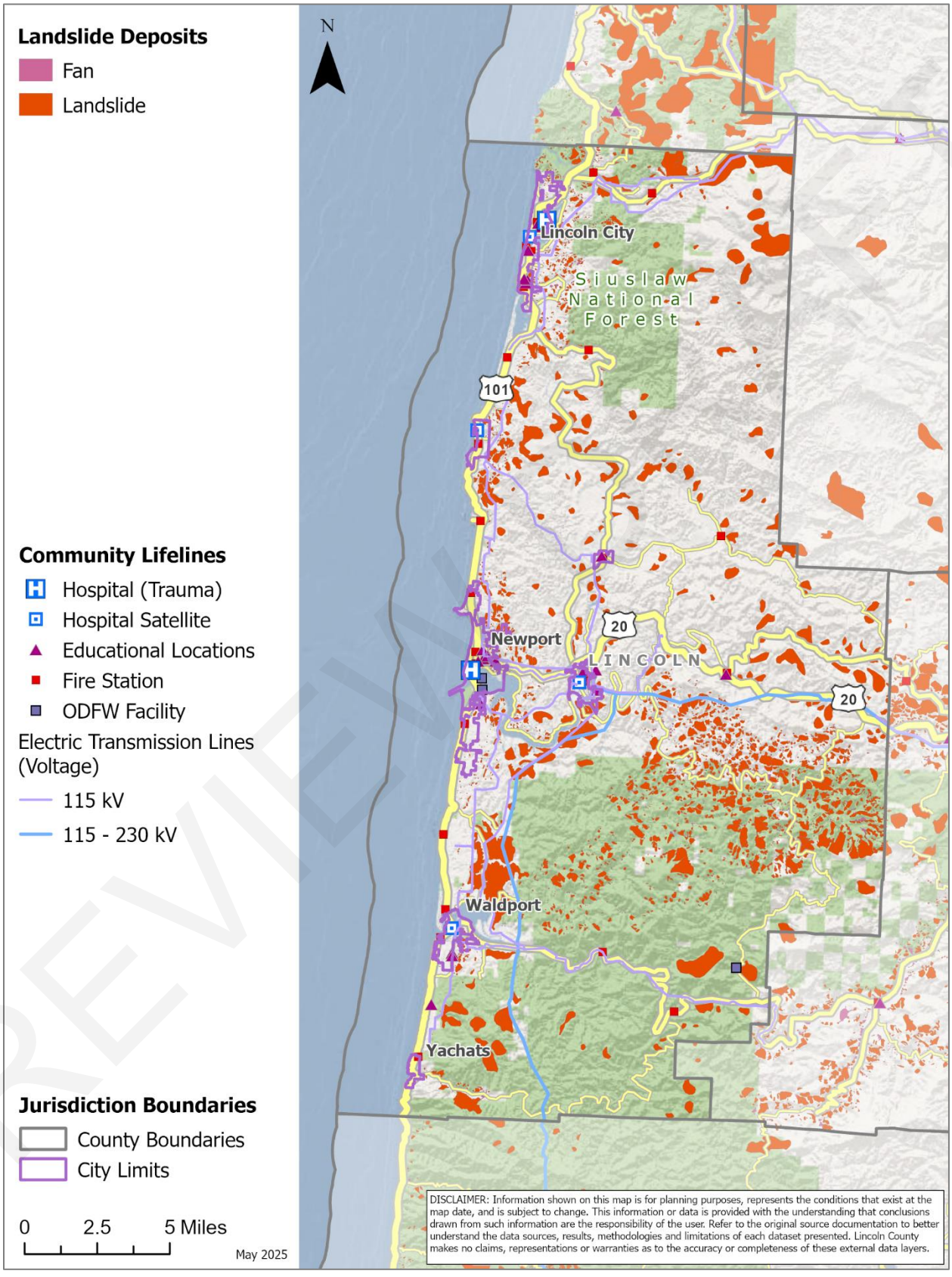
[60] USGS. March, 16, 2007. Johnson Creek Landslide. http://landslides.usgs.gov/monitoring/johnson_creek/

Map 2-7 Landslide Susceptibility Exposure



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Map 2-8 Landslide Inventory



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a landslide or debris flow is "high",** meaning at least one incident is likely within the next 35-year period.

The probability of rapidly moving landslide occurring depends on several factors, including steepness of slope, slope materials, local geology, vegetative cover, human activity, and water. There is a strong correlation between intensive winter rainstorms and the occurrence of rapidly moving landslides (debris flows). Consequently, the National Weather Service tracks storms during the rainy season, monitors rain gauges and snow melt and issues warnings as conditions warrant. Given the correlation between precipitation, snowmelt, and rapidly moving landslides, it would be feasible to construct a probability curve. The installation of slope indicators or the use of more advanced measuring techniques could provide information on slower moving slides.

Geo-engineers with DOGAMI estimate widespread landslides about every 20 years; landslides at a local level can be expected every two or three years.[61]

Vulnerability Assessment

The Steering Committee rated the County as having a **"high" vulnerability to landslide hazards,** meaning that more than 10% of the unincorporated County's population or property could be affected by a major hazard event.

To a large degree, landslides are very difficult to predict. Landslides can impact major transportation arteries, blocking residents from essential services and businesses. Many aspects of the county are vulnerable to landslides. This includes land use and development patterns, the economy, population segments, ecosystem services and cultural assets.

A quantitative landslide hazard assessment requires overlay of landslide hazards (frequency and severity of landslides) with the inventory exposed to the hazard (value and vulnerability) by considering:

- Extent of landslide susceptible areas;
- Inventory of buildings and infrastructure in landslide susceptible areas;
- Severity of earthquakes or winter storm event (inches of rainfall in 24 hours);
- Percentage of landslide susceptible areas that will move and the range of movements (displacements) likely; and
- Vulnerability (amount of damage for various ranges of movement).

Roads and Bridges

Large losses incurred from landslide hazards in Lincoln County have been associated with roads. The Lincoln County Public Works Department is responsible for responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The department does its best to

[61] Mills, K. 2002. Oregon's Debris Flow Warning System. Cordilleran Section–98th Annual Meeting. Corvallis.

communicate with residents impacted by landslides, but can usually only repair the road itself, as well as the areas adjacent to the slide where the county has the right of way.

It is not cost effective to mitigate all slides because of limited funds and the fact that some historical slides are likely to become active again even with mitigation measures. The Public Works Department alleviates problem areas by grading slides, and by installing new drainage systems on the slopes to divert water from the landslides. This type of response activity is often the most cost-effective in the short-term but is only temporary. Unfortunately, many property owners are unaware of slides and the dangers associated with them.

Natural Hazard Risk Report for Lincoln County

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslides. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled landslide scenario.

Population Vulnerability (Residents)

Approximately 32% of unincorporated Lincoln County's population (6,033 people) may be displaced by landslides within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. "Rural" Lincoln County has the most population at risk (4,530), although the population is dispersed throughout the County. About one-third of Otis-Rose Lodge and one-fifth of Otter Rock residents are exposed.

Table 2-19 Potentially Displaced Residents, High and Very High Landslide, by Unincorporated Area

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	4,530	44%
Otis-Rose Lodge	1,926	666	35%
Otter Rock	489	105	21%
Salishan-Lincoln Beach	2,093	256	12%
Seal Rock-Bayshore	2,766	364	13%
Wakonda Beach	1,326	112	8%
Total Unincorporated	18,893	6,033	32%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Properties that are most vulnerable to landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 30% (5,135 buildings) of unincorporated Lincoln County buildings are exposed to the High or Very High landslide susceptibility zones. The percent of exposed buildings is greatest in the dispersed "rural" Lincoln County (40.6%), Otis-Rose Lodge (34.5%), and Otter Rock (26.5%). The value of exposed buildings is $526 million.

Table 2-20 Exposed Buildings, High & Very High Landslide, by Unincorporated Area

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate ($)	Loss Ratio
"Rural" Lincoln County	12,637	5,135	40.6%	$354,114,000	43.0%
Otis-Rose Lodge	1,747	602	34.5%	$21,495,000	31.8%
Otter Rock	634	168	26.5%	$23,648,000	28.8%
Salishan-Lincoln Beach	2,847	369	13.0%	$63,765,000	16.4%
Seal Rock-Bayshore	3,345	445	13.3%	$55,334,000	15.9%
Wakonda Beach	1,614	108	6.7%	$7,879,000	6.4%
Total Unincorporated	22,824	6,827	29.9%	$526,235,000	28.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability[62]

The following vulnerable critical facilities were determined to be exposed to the High or Very High landslide susceptibility zones.

- Central Oregon Coast Fire Station 7300 (Tidewater, Central Oregon Coast Fire & Rescue District)
- Toledo High School (Toledo area, Lincoln County School District)
- Waldport Water Treatment Plant (*Waldport Area, City of Waldport)*
- Seal Rock Water District
- Yachats Fire Station (outside Waldport, Yachats Rural Fire Protection District)

Risk Report Identified Areas of Vulnerability[63]

- Many residential buildings in the unincorporated county and the City of Newport, along the Yaquina River, are exposed to high and very high landslide hazard.
- An area deemed very high susceptibility to landslides exists just to the east of the community of Seal Rock-Bayshore.

[62] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-2, A-9, A-11.

[63] Ibid. Page 33.

- Several places within the City of Toledo where there is exposure to very high landslide susceptibility. Nearly half of the buildings in the city, including all of its critical facilities, are threatened by landslide hazard.
- Nearly a quarter of the building in the community of Otis-Rose Lodge is exposed to very high landslide susceptibility.

Additional information can be found on the Lincoln County website:
https://www.co.lincoln.or.us/762/Hazards-Landslides

Severe Weather:
Extreme Heat, Windstorm, Tornado and Winter Storm

Severe weather in Lincoln County includes a variety of intense and potentially damaging weather events. These events include extreme heat, tornados, windstorms, and winter storms. Due to the similarity in vulnerability, tornado and windstorm will be in the same subsection. The following section describes the unique probability and vulnerability of each identified weather hazard. Other more abrupt or irregular events such as hail are also described in this section.

Extreme Heat

Summary			
Hazard Ranking:	#8	**Probability:**	High
Total Threat Score:	162	**Vulnerability:**	Moderate

Significant Changes Since Previous Update

This hazard was not profiled in the previous version of this NHMP.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) the county is expected to face increasing vulnerabilities to extreme heat as average temperatures rise throughout the 21st century. By the 2050s, the number of days exceeding 90°F and the intensity of the hottest days are projected to increase by an average of six degrees Fahrenheit. These changes will disproportionately affect vulnerable populations, including the growing number of adults aged 65 and older, children under 18, agricultural and outdoor workers, individuals with pre-existing health conditions, low-income households, and residents living in older or temporary housing that may lack adequate cooling. Additionally, communities with limited tree cover, large, paved surfaces, and aging infrastructure—particularly in more densely populated areas like Newport and Lincoln City—are at greater risk due to the urban heat island effect.

Characteristics

Extreme heat describes either a singular instance of dangerously high temperatures occurring on a given day or a prolonged period of high temperatures lasting over several days. Heat waves generally describe consecutive days of higher temperatures and most often occurring during summer. One approach to categorizing hazardous heat is when local temperatures exceed a heat index of 90 degrees Fahrenheit. This threshold is when the human body begins to suffer adverse effects of prolonged exposure to heat.

Extreme heat events are hazardous due to their risks to human health and potential impacts on infrastructure operability and reliability. Prolonged exposure to heat can increase the likelihood of exhaustion, dehydration, heat cramps, heat stroke, and even death. Between 1999 and 2020, there were nearly 16,000 heat-related deaths in the US, according to the Centers for Disease

Control and Prevention.[64] That is more deaths than hurricanes, lightning, tornadoes, floods, and earthquakes combined.[65]

As a result of these public health risks, hospitals see a spike in heat-related illnesses, especially from people working outdoors, who are at are at increased risk due to prolonged exposure, as well as impacts economic activities that be disrupted due to hazardous working conditions. In addition, extremely hot and consecutive days of high heat contribute to increased wildfire risk due to such reasons at the presence of dryer fuel load. Experiencing multiple heat waves in a season, and over several years, can also drive drought conditions and put stress wildlife such as trees and riverine species such as salmon.

Location and Extent

The coastal parts of the County are at a lower risk of extreme heat hazard events. These parts may experience just one day (or fewer) per year above 90 degrees Fahrenheit (° F). However, communities that are further inland may experience multiple days per of temperatures more than 90 degrees Fahrenheit (° F).

While the entire region is at risk, developed areas—such as the more urbanized parts of Newport and Lincoln City—tend to experience higher localized temperatures. These areas often feature large concrete buildings, expansive parking lots, and limited vegetation, which reduce natural cooling through evaporation. Additionally, the presence of vehicles and infrastructure contributes to localized warming. These conditions can create urban heat island effects, where temperatures in built-up areas may be 5°F to 18°F higher than in surrounding rural or forested zones. Despite the coastal influence, these microclimates pose increasing risks to public health and infrastructure.

History

Lincoln County has experienced several extreme heat events in recent years, reflecting a broader trend of rising temperatures across the Pacific Northwest. One of the most significant events was the June 2021 heat dome, which brought record-breaking temperatures to the region. While inland areas like Salem reached a scorching 117°F, coastal areas such as Lincoln County also faced unusually high temperatures and heat-related stress, particularly affecting vulnerable populations. In the summer of 2022, the Oregon Health Authority reported continued heat wave activity, leading to increased emergency department visits for heat-related illnesses and prompting local responses like cooling centers and public health advisories. Long-term climate data from NOAA and the Oregon Climate Office indicate a growing frequency and intensity of extreme heat days across Oregon since the early 2000s. Although Lincoln County typically

[64] Centers for Disease Control and Prevention. (2022, August 26). *QuickStats: Deaths Involving Exposure to Excessive Heat, by Sex — National Vital Statistics System, United States, 1999–2020.* https://www.cdc.gov/mmwr/volumes/71/wr/mm7134a5.htm.

[65] National Weather Service (2023). *Weather Fatalities 2023*. National Oceanic and Atmospheric Administration. Retrieved August 27, 2024, from https://www.weather.gov/hazstat/.

benefits from the moderating influence of the Pacific Ocean, it is not immune to the impacts of these increasingly common heat events.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a n extreme heat event is "high",** meaning at least one incident is likely within the next 35-year period.

Extreme heat events occur every few years within the region, and while they are generally not long lasting, they are growing in length, intensity, and occurrence. Predicted average increases in summer temperatures will make heat waves a greater likelihood.

Vulnerability Assessment

The NHMP Steering Committee rated the County as having a **"moderate" vulnerability to extreme heat events**, meaning that between 1-10% of the region's population or assets would be affected by a major disaster.

The DOGAMI Risk Report does not describe extreme heat impacts.

Very high temperatures can create serious health problems. Heath problems related to high heat can include headache, dizziness, and weakness. In extreme cases, heat-related illness can cause convulsions, sudden loss of consciousness, and even death. Those at greatest risk for heat-related illness include infants and children up to 4 years of age, people 65 and older, people who are overweight, and people who are ill or on certain medications, as well as those who work outdoors such as farmworkers (many of whom live in farmworker housing that lacks air conditioning and/or are migrants).[66]

Without mitigation, increased numbers of extreme heat events will likely result in additional heat related morbidity and mortality, especially among vulnerable populations. As the length and intensity of extreme heat events grow, so does the need for air conditioning, which poses an inequitably high cost burden on those who are financially insecure.

Additional information can be found on the Lincoln County website: https://www.co.lincoln.or.us/755/Hazards-Extreme-Heat

[66] Ibid.

Windstorm and Tornado

Summary					
Event:	Windstorm	Tornado		Windstorm	Tornado
Hazard Ranking:	#1	#13	Probability:	High	High
Total Threat Score:	240	104	Vulnerability:	High	Low

Significant Changes Since Previous Update

The hazard history was updated with historic hazard events not recorded in the previous NHMP. Several other points of data throughout this section were also updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) the frequency of windstorms in Lincoln County is not projected to increase significantly under future climate scenarios, existing vulnerabilities to wind events will remain a concern. Communities with older residential or commercial developments, particularly those with above-ground utilities, outdated construction, poor insulation, or heavy tree canopies, are especially susceptible to wind-related damage. Inadequate storm drainage systems can also exacerbate the impacts of high winds by contributing to localized flooding and infrastructure strain. Coastal towns like Newport and Lincoln City, where exposure to strong coastal winds is already a factor, may continue to face challenges related to power outages, falling trees, and structural damage. As such, maintaining and upgrading infrastructure, especially in vulnerable areas, will be essential to reduce future risks associated with wind events.

Characteristics

A windstorm is generally a short duration event involving straight-line winds and/or gusts more than 50 mph. Although windstorms can affect the entirety of Lincoln County, they are especially dangerous near developed areas with large trees or tree stands.

The most common type of wind pattern affecting Lincoln County is straight-line winds, which originate as a downdraft of rain-cooled air and reach the ground and spread out rapidly. Straight-line winds can produce gusts of 100 mph or greater. Records of major Pacific windstorms are documented by state agencies and weather stations throughout Oregon, including several official weather stations in Lincoln County.

A windstorm is generally a short duration event involving straight-line winds and/or gusts more than 50 mph. Windstorms can affect developed areas of the county with significant tree stands and major infrastructure, especially above ground utility lines.

Tornado

Though tornadoes are not common in Oregon, these events do occasionally occur and sometime produce significant property damage and even injury. They are created by a vortex of rotating winds and strong vertical motion, which possess remarkable strength and cause widespread damage. The low pressure at the center of a tornado can destroy buildings and other structures it passes over. Tornadoes are the most concentrated and violent storms produced by earth's atmosphere, and can produce winds more than 300 mph. They have been reported in most of the counties throughout the state since 1887. Oregon's tornadoes can be formed in association with large Pacific storms arriving from the west. Lincoln County tornadoes are most common to originate offshore of Lincoln County during winter months. Waterspouts often form off the Lincoln County coast but decay before reaching land. Tornado intensity is measured by the Fujita Scale (F), or the Enhanced Fujita Scale (EF) since 2007, which is based on the damage tornadoes inflict upon human and natural infrastructure and vegetation. Since 1876 there have been six (6) documented tornadoes in Lincoln County (there have been six additional tornadoes in nearby Tillamook County). All tornadoes in Lincoln County have been rated F0 (sustained winds under 73 mph). However, there has been one F1 (1975, sustained winds between 73-112 mph) and one EF2 (2016, sustained winds between 111-135 mph) in the northern part of Tillamook County.

Location and Extent

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.[67] Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months. [68] In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

The Oregon Residential Specialty Code, Oregon Basic Wind Speeds for 50 Year Mean Recurrence Interval, lists Lincoln County within the highest wind speed category as an area impacted by 85-110 mph wind speeds.

The extent of any windstorm, including tornadoes, is determined by its track, intensity, and local terrain.[69] A windstorm will frequently knock down trees and power lines, damage homes, businesses, public facilities and create tons of storm related debris. Windstorms are a common, chronic hazard in Lincoln County.

[67] US Department of Agriculture. http://www.fsa.usda.gov/or/Notice/Flp104.pdf.

[68] Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

[69] DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

Along the Oregon Coast wind speed is typically 75 mph for 25-year storm events, 80 mph for 50-year storm events and 90 mph for 100-year storm events. Lincoln County has experienced multiple 25-, 50-, and 100-year windstorm events over the past century with impacts often occurring countywide (Table 2-21).

History

For winter weather events (including high winds) the National Weather Service monitors gauging stations and provides public warnings for storms and high winds.

Windstorms in Lincoln County usually occur from October to March, and their extent is determined by their track, intensity (the air pressure gradient they generate), and local terrain.[70] The National Weather Service uses weather forecast models to predict oncoming windstorms, while monitoring storms with weather stations in protected valley locations throughout Oregon.[71]

The most destructive windstorm ever recorded in Oregon, in terms of loss of life and property damage, was the Columbus Day storm of 1962. Damage was most severe in the Willamette Valley. The storm killed thirty-eight people and did upwards of $200 million in damage (over $1.7 billion in today's dollars). Hundreds of thousands of homes were without power for short periods of time, while others were without power for two to three weeks. More than 50,000 homes were seriously damaged, and nearly 100 were destroyed. The storm destroyed fruit and nut orchards and killed scores of livestock. Intense wind speeds were recorded in the metropolitan areas with gusts of 116 mph on Portland's Morrison Bridge.

Several additional, small windstorm events have occurred since the previous NHMP, see the Storm Events Database provided by the National Oceanic and Atmospheric Administration for more information. Recent disaster declarations including high winds include DR-1107 (1996), DR 4258 (2016), DR-4562 (2020), and DR-4768 (2024). See the "Tornado" section above for tornado event history. Many of the winter storm declared disasters included high winds.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a windstorm or tornado is "high",** meaning at least one severe incident is likely within the next 35-year period.

Table 2-21 shows the wind speed probability intervals that structures 33 feet above the ground would expect to be exposed to within a 25, 50 and 100-year period. The table shows that structures in Region 1, which includes Lincoln County, can expect to be exposed to 75 mph winds in a 25-year recurrence interval (4% annual probability).

[70] Ibid.
[71] "Some of the Area's Windstorms." National Weather Service, Portland. http://www.wrh.noaa.gov/pqr/paststorms/wind.php

Table 2-21 Probability of Severe Wind Events (Region 2)

	25-Year Event (4% annual probability)	50-Year Event (2% annual probability)	100-Year Event (1% annual probability)
Region 1: Oregon Coast	75 mph	80 mph	90 mph

Source: DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

Vulnerability Assessment

The Steering Committee rated the county as having a **"high" vulnerability to windstorm hazards**, meaning that more than 10% of the unincorporated County's population or property could be affected by a major disaster. The Steering Committee rated the County as having a **"low" vulnerability to a tornado hazard**, meaning that less than 1% of the unincorporated County's population or property could be affected by a major tornado event.

Many buildings, utilities, and transportation systems within Lincoln County are vulnerable to wind damage. This is especially true in open areas, such as natural grasslands or farmlands. It is also true in forested areas, along tree-lined roads and electrical transmission lines and on residential parcels where trees have been planted or left for aesthetic purposes. Structures most vulnerable to high winds include insufficiently anchored manufactured homes and older buildings in need of roof repair.

Windstorms pose a significant threat to electric utility infrastructure, often causing extensive damage due to broken or uprooted trees. This risk increases when high winds are accompanied by rain or when the ground is already saturated, making trees more likely to fall. While damaging wind events are not uncommon, electric utilities should anticipate an increase in both their frequency and severity because of climate change. Rising temperatures and prolonged dry periods are expected to weaken trees, making them more vulnerable to wind damage. At the same time, climate change is projected to drive more frequent and intense extreme weather events, including windstorms, beyond what historical climate patterns would suggest.

Fallen trees are especially troublesome. They can block roads and rails for long periods of time, impacting emergency operations. In addition, uprooted or shattered trees can down power and/or utility lines and effectively bring local economic activity and other critical facilities to a standstill. Much of the problem may be attributed to a shallow or weakened root system in saturated ground. In Lincoln County, trees are more likely to blow over during the winter (wet season).

Winter Storm (Snow/Ice)

Summary			
Hazard Ranking:	#2	**Probability:**	High
Total Threat Score:	213	**Vulnerability:**	Moderate

Significant Changes Since Previous Update

The hazard history was updated with historic hazard events not recorded in the previous NHMP. Several points of data throughout this section were updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) winter storms are expected to evolve in character due to climate change. While the frequency of freezing temperatures may decline, the intensity of extreme precipitation events is projected to increase as a warming atmosphere holds more moisture. This shift poses significant risks to the county's built infrastructure, particularly in low-lying coastal areas where saturated soils and aging stormwater systems may be ill-equipped to handle heavier rainfall. Roads, bridges, and utility lines are especially vulnerable to damage from flooding, landslides, and falling trees during intense winter storms.

These changing storm dynamics also heighten risks for vulnerable populations, including the unhoused, elderly, and those living in substandard housing. Increased precipitation without the insulating effects of snow can still lead to cold, wet conditions that exacerbate health risks and limit access to emergency services.

Characteristics

Winter storms occurring in Lincoln County result in several natural hazards— including floods, landslides/debris flows, snow, ice, and wind. Each on its own, or in combination, can completely immobilize emergency response activities, close transportation corridors, and disrupt transportation and utilities. Each of these natural hazards is individually discussed in detail in their respective sections.

Winter storms in Lincoln County can bring rain as well as snow or can be followed by rising temperatures that melt newly fallen snow. Either scenario often causes flooding; most floods in western Oregon occur because of winter storms. The flood hazard is described in detail in flood section of this document.

As is the case with flood, wind as a hazard in Lincoln County most frequently occurs as part of a winter storm. The nature, history, location, extent, and probability of future events for wind, including winter storm wind, are explored in detail in the wind section of this plan.

The winter storms that affect Lincoln County typically are not local events affecting only small geographic areas. Rather, winter storms are usually large cyclonic low-pressure systems that

move in from the Pacific Ocean and affect large areas of Oregon and/or the whole Pacific Northwest. These storms are most common from October through March.

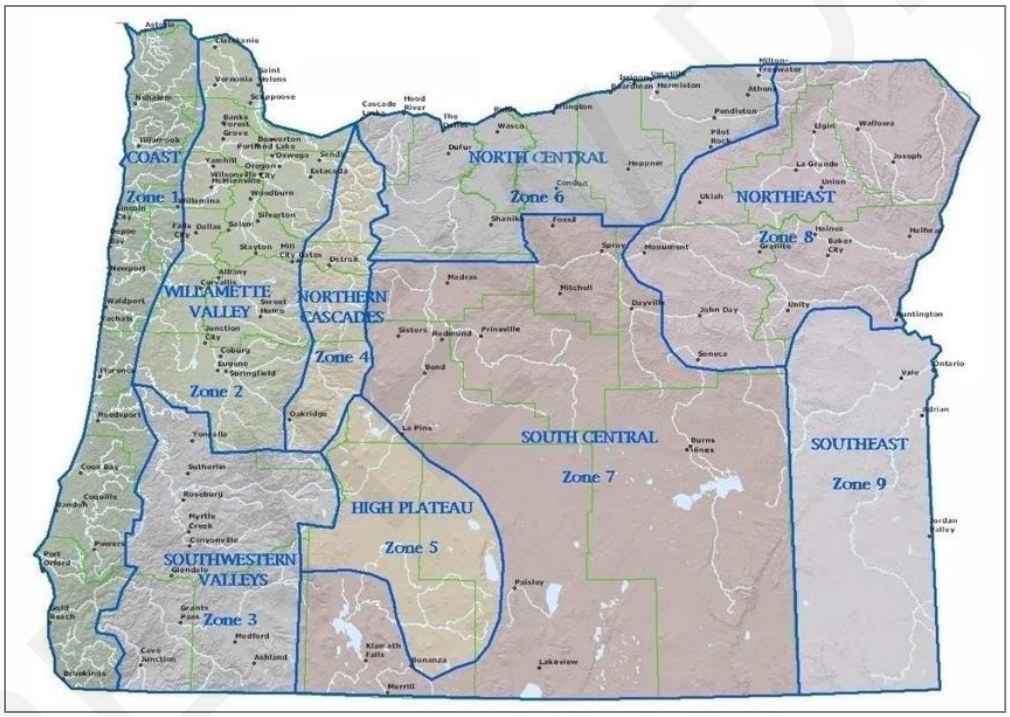
Ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation which may include freezing rain, sleet and hail. Of these, freezing rain can be the most damaging of ice formations.

Outside of mountainous areas, significant snow accumulations are much less likely in western Oregon than on the east side of the Cascades.

Location and Extent

The National Climatic Data Center has established climate zones in the United States for areas that have similar temperature and precipitation characteristics. Oregon's latitude, topography and proximity to the Pacific Ocean give the state diversified climates. Map 2-9 shows that Lincoln County is located within Zone 1: Coast. Winter storm events have relatively predictable and longer speeds of onset and the effects of winter storms are often long lasting.

Map 2-9 Oregon Climate Divisions



Source: Oregon Climate Service

The principal types of winter storms that occur include:

Snowstorms: require three ingredients: cold air, moisture, and air disturbance. The result is snow, small ice particles that fall from the sky. In Oregon, the further inland and north one moves, the more snowfall can be expected. Blizzards are included in this category.

Ice storms: are a type of winter storm that forms when a layer of warm air is sandwiched by two layers of cold air. Frozen precipitation melts when it hits the warm layer and refreezes when

hitting the cold layer below the inversion. Ice storms can include sleet (when the rain refreezes before hitting the ground) or freezing rain (when the rain freezes once hitting the ground).

Extreme Cold: Dangerously low temperatures accompany many winter storms. This is particularly dangerous because snow and ice storms can cause power outages, leaving many people without adequate heating.

Unlike most other hazards, it is not simple to systematically map winter storm hazard zones. The entire County is susceptible to damaging severe weather. Winter storms that bring snow and ice can impact infrastructure, business, and individuals. Those resources that exist at higher elevations will experience more risk of snow and ice, but the entire County can face damage from winter storms and, for example, the hail or life threateningly cold temperatures that winter storms bring.

History

Winter storms occur yearly; more destructive storms occur once or twice per decade, most recently in 2012 (DR-4055), 2014 (DR-4169), 2015 (DR-4258), 2016, 2017,2019, 2021, 2022, 2023, and 2024 (DR-4768).

Downed trees disrupted power to several portions of the county, leaving many residents without heat or water for several days. Residential care facilities, home-bound ill personnel requiring daily treatment, hospital patients, and anyone requiring emergency assistance was affected by this winter storm because obstructed roadways prevented emergency vehicle movement. The damage to fire stations, equipment, roads, and other infrastructure affected the ability to effectively respond, as well as reducing the operating budgets of these facilities.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a winter storm is "high",** meaning at least one incident is likely within the next 35-year period.

The recurrence interval for a moderate to severe winter storm is about once every year; however, there can be many localized storms between these periods. Severe winter storms occur in western Oregon regularly from October through March. Lincoln County experiences moderate winter storms every year to every other year, more damaging winter storms happen less often.

Vulnerability Assessment

The Steering Committee rated the County as having a **"moderate" vulnerability to winter storm hazards**, meaning that between 1% and 10% of the unincorporated County's population or property could be affected by a major disaster.

Given current available data, no quantitative assessment of the risk of winter storm was possible at the time of this NHMP update. However, assessing the risk to the County from winter storms should remain an ongoing process determined by community characteristics and physical vulnerabilities. Weather forecasting can give County resources (emergency vehicles, warming

shelters) time to prepare for an impending storm, but the changing character of the County population and resources will determine the impact of winter storms on life and property in Lincoln County.

The most likely impact of snow and ice events on Lincoln County are road closures limiting access/egress to/from some areas, especially roads to higher elevations. Winter storms with heavy wet snow or high winds and ice storms may also result in power outages from downed transmission lines and/or poles.

Electric utilities that operate in rural and heavily forested areas often face significant challenges during winter storms. This is particularly evident in regions where utilities do not serve cities or towns, but instead provide power to dispersed rural communities. In such areas, snow and ice accumulation can cause severe damage to utility infrastructure. Heavy loading from snow and ice frequently breaks tree limbs and trunks, and when the ground is saturated, entire trees, including their root systems, can topple under the weight. When this occurs near powerlines, the resulting damage can lead to prolonged outages and substantial repair costs.

Due to the frequency of these events, the vulnerability of rural infrastructure, the critical need for electricity during the coldest months, and the high costs associated with storm recovery, major winter storms are considered among the most serious natural disaster scenarios for electric utilities operating in these environments.

Winter storms which bring snow, ice and high winds can cause significant impacts on life and property. Many severe winter storm deaths occur because of traffic accidents on icy roads, heart attacks may occur from exertion while shoveling snow and hypothermia from prolonged exposure to the cold. The temporary loss of home heating can be particularly hard on the elderly, young children, and other vulnerable individuals.

Property is at risk due to flooding and landslides that may result if there is a heavy snowmelt. Additionally, ice, wind and snow can affect the stability of trees, power and telephone lines and TV and radio antennas. Downed trees and limbs can become major hazards for houses, cars, utilities, and other property. Such damage in turn can become major obstacles to providing critical emergency response, police, fire, and other disaster recovery services.

Severe winter weather also can cause the temporary closure of key roads and highways, air and train operations, businesses, schools, government offices and other important community services. Below freezing temperatures can also lead to breaks in un-insulated water lines serving schools, businesses, industries, and individual homes. All these effects, if lasting more than several days, can create significant economic impacts for the affected communities and the surrounding region. In the rural areas of the county severe winter storms can isolate small communities, farms, and ranches.

At the time of this update, enough data was not available to determine winter storm vulnerability in terms of explicit types and numbers of existing and future buildings, infrastructure or critical infrastructure.

Additional information can be found on the Lincoln County website:
https://www.co.lincoln.or.us/765/Hazards-Severe-Weather

Volcanic Event

Summary			
Hazard Ranking:	#16	Probability:	Low
Total Threat Score:	54	Vulnerability:	Low

Significant Changes Since Previous Update

Several points of data throughout this section were updated with the most recently available data.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections
Development and population forecasts are not expected to increase or decrease the impact of this hazard.

Characteristics

The Pacific Northwest lies within the "ring of fire," an area of very active volcanic activity surrounding the Pacific Basin. Volcanic eruptions occur regularly along the ring of fire, in part because of the movement of the Earth's tectonic plates. The Earth's outermost shell, the lithosphere, is broken into a series of slabs known as tectonic plates. These plates are rigid, but they float on a hotter, softer layer in the Earth's mantle. As the plates move about on the layer beneath them, they spread apart, collide, or slide past each other. ~~Volcanoes occur most frequently at the boundaries of these plates and volcanic eruptions occur when molten material, or magma, rises to the surface~~.

Actually, the volcanoes form about 180 miles form the plate boundary.

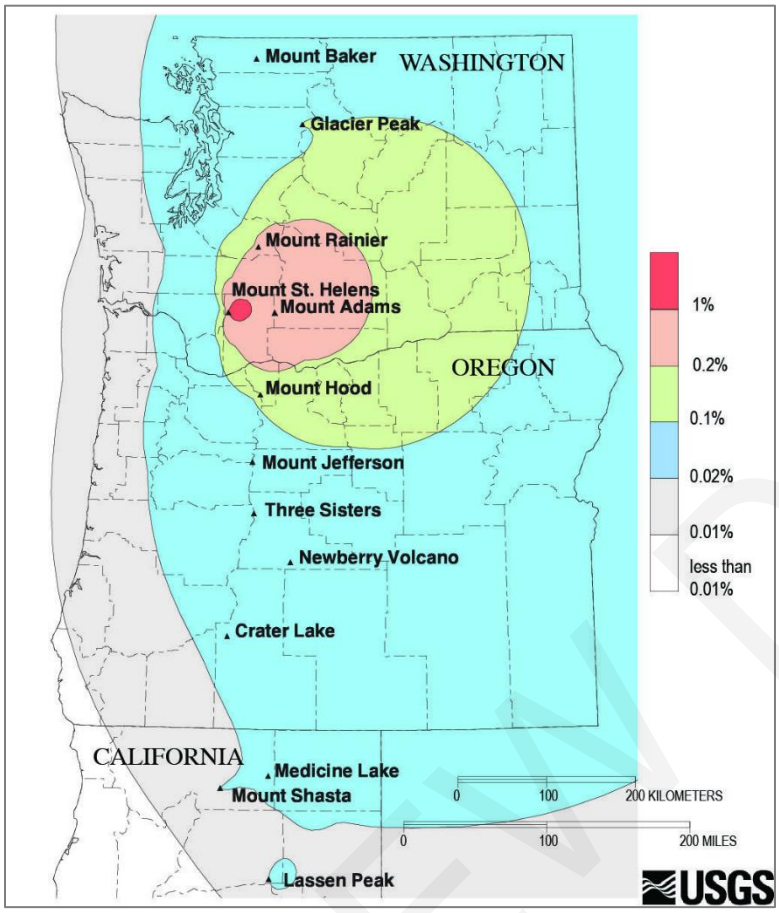
Location and Extent

Three closest three volcanoes to Lincoln County, Mount St. Helens, Mount Hood, and Mount Jefferson, all lie to the east. Map 2-10 depicts the potential and geographical extent of volcanic ash fall more than one centimeter from a large eruption of Mt. St. Helens.

Scientists use wind direction to predict areas that might be affected by volcanic ash; during an eruption that emits ash, the ash fall deposition is controlled by the prevailing wind direction. The predominant wind pattern over the Cascades originates from the west and previous eruptions seen in the geologic record have resulted in most ash fall drifting to the east of the volcanoes. Volcanic activity from ash clouds that drift downwind to the county from near or distant eruptions is possible from Mount Saint Helens, Mount Hood, the Three Sisters, Mount Bachelor, and the Newberry Crater areas. Because the distance to these potentially active volcanic areas is so great, the only adverse effect that would impact areas of Lincoln County is ash fallout, with potential impact on water supplies. The area affected by ash fallout depends upon the height attained by the eruption column and the atmospheric conditions at the time of the eruption. Volcanic ash can contaminate water supplies, cause electrical storms, create health problems

and collapse roofs. Regional tephra fall shows the annual probability of ten centimeters or more of ash accumulation from Pacific Northwest volcanoes.

Map 2-10 Mount St Helens Tephra Map



Source: USGS "Volcano Hazards in the Mount Jefferson Region, Oregon"

Geologic hazard maps have been created for most of the volcanoes in the Cascade Range (including Mt. St Helens, Mt. Adams, Mt. Hood, and Mt. Jefferson) by the USGS Volcano Program at the Cascade Volcano Observatory in Vancouver, WA and are available at http://vulcan.wr.usgs.gov/Publications/hazards_reports.html. Volcanic activity from more distant volcanoes will have less impact upon the County.

Additional reports are available via DOGAMI's Publications Search website:

http://www.oregongeology.org/pubs/search.php

Other agency/ consultant reports:

Ewert, J.W., Diefenbach, A.K., and Ramsey, D.W., 2018, 2018 update to the U.S. Geological Survey national volcanic threat assessment: U.S. Geological Survey Scientific Investigations Report 2018–5140, 40 p., https://doi.org/10.3133/sir20185140.

History

Mount St. Helens has been the most active volcano in the Cascade Range during the past 10,000 years. Mount St. Helens is in southern Washington State and has been active throughout its 50,000-year lifetime. Mount Hood is just over 100 miles northeast of the county and is more than 500,000 years old. It has had two significant eruptive periods in the past 1,500 years.

In the past 200 years, seven of the Cascade volcanoes have erupted, including (from north to south): Mt. Baker, Glacier Peak, Mt. Rainier, Mount St. Helens (Washington), Mt. Hood (Oregon), Mt. Shasta and Mt. Lassen (Califor nia).

There has been no recent volcanic activity near the county associated with Mount Hood. The 1980 explosion of Mount St. Helens in southern Washington State is the latest on record; both Mount St. Helens and Mount Hood remain listed as active volcanoes.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing volcanic activity is "low",** meaning one incident is likely within the next 75 to 100-year period.

The United States Geological Survey-Cascades Volcano Observatory (CVO) produced volcanic hazard zonation reports for Mount St. Helens and Mount Hood in 1995 and 1997. The reports include a description of potential hazards that may occur to immediate communities. The CVO created an updated annual probability of tephra (ash) fall map for the Cascade region in 2001, which could be a rough guide for Lincoln County in forecasting potential tephra hazard problems (Map 2-10). The map identifies the location and extent of the hazard.

The CVO Volcanic tephra fall map is based on the combined likelihood of tephra-producing eruptions occurring at Cascade volcanoes. Probability zones extend farther east of the range because winds blow from westerly directions most of the time. The map shows annual probabilities for a fall of one centimeter (about 0.4 inch). The patterns on the map show the dominating influence of Mount St. Helens as a tephra producer. Because small eruptions are more numerous than large eruptions, the probability of a thick tephra fall at a given locality is lower than that of a thin tephra fall. The USGS estimates there is annual probability of 0.2 to 1 percent that 10 centimeters or more of tephra (ash) accumulation will occur in Lincoln County.[72]

Vulnerability Assessment

The Steering Committee rated the county as having a **"low" vulnerability to volcanic activity**, meaning that between less than 1% of the unincorporated County's population or property could be affected by a major disaster (volcanic ash/lahar).

The U.S. Geological Survey (USGS) lists the threat potential of volcanoes. According to the USGS there are nine volcanoes with Very High or High threat potentials in Oregon and Washington

[72] USGS, 1999, Volcano Hazards in the Mount Jefferson Region, Oregon, Open-File Report 99-24

(listed here in order of threat potential): Mount St. Helens, Mount Rainier, Mount Hood, Three Sisters, Newberry, Mount Baker, Glacier Peak, Crater Lake, and Mount Adams (High).[73]

The primary threat to lives and property from active volcanoes is from violent eruptions that unleash tremendous blast forces, generate mud and debris flows (lahars), or produce flying debris and ash clouds. Volcano hazards are divided into proximal (near the volcano) and distal (far from the volcano). Ashfall, and tephra, distal eruptive hazards, are of the greatest concern in Lincoln County. There are no proximal eruptive hazards in Lincoln County.

A major volcanic eruption can be catastrophic for communities near the eruption site. While many electric utilities may not be located directly adjacent to active volcanoes, the effects of volcanic ashfall can extend far beyond the immediate vicinity and cause widespread disruption. One of the most direct impacts to electric utility infrastructure is the accumulation of ash on transformers and other electrical equipment, which can lead to electrical shorts and widespread outages that are difficult to address.

Volcanic ash is also extremely heavy, and its buildup on trees can cause limb and tree failures like those seen during heavy snow or ice storms. As a result, a significant ashfall event could lead to extensive damage to overhead power lines and other components of the electrical grid.

In the aftermath of a major volcanic eruption, electric utilities in the affected region would likely need to coordinate mutual aid efforts, calling in crews from unaffected areas to assist with damage assessment, repairs, and power restoration. Preparedness planning and inter-utility cooperation are essential to ensure a rapid and effective response to such a natural disaster.

[73] Ewert, J.W., Diefenbach, A.K., and Ramsey, D.W., 2018, 2018 update to the U.S. Geological Survey national volcanic threat assessment: U.S. Geological Survey Scientific Investigations Report 2018–5140, 40 p., https://doi.org/10.3133/sir20185140.

Wildfire

Summary			
Hazard Ranking:	#4	Probability:	High
Total Threat Score:	205	Vulnerability:	Moderate

Significant Changes Since Previous Update

Risk and vulnerability information has also been integrated from the Lincoln County Evacuation Plan. Several other points of data throughout this section were also updated with the most recently available data including data from the 2024 update to the Lincoln County Community Wildfire Protection Plan.

No development or population changes affected the jurisdiction's overall vulnerability to this hazard.

Future Projections

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Link) the number of high fire danger days is projected to rise by 37% by the 2050s under a high emissions scenario, compared to the historical baseline. This increase is driven by rising average temperatures, prolonged periods of drought, and more frequent extreme weather events, including strong east wind events that can rapidly intensify wildfire behavior. These climatic shifts are expected to dry out vegetation more quickly and extend the length of the fire season, making wildfires more likely, more intense, and harder to control.

In addition to environmental changes, evolving population demographics and patterns of development are compounding wildfire risk. Lincoln County has seen growth in residential development within the Wildland-Urban Interface (WUI), where homes and infrastructure are interspersed with flammable vegetation. This expansion increases the number of people and structures at risk during a wildfire event. Furthermore, increased recreational use of forested areas and the aging population, many of whom may have limited mobility, pose additional challenges for evacuation and emergency response.

The Lincoln County Community Wildfire Protection Plan (CWPP) was completed in 2024. The CWPP is hereby incorporated into this NHMP by reference, and it will serve to supplement this wildfire section. The following presents a summary of key information; refer to the full CWPP for a complete description and evaluation of the wildfire hazard.

Characteristics

Wildfire occurs in areas with large amounts of flammable vegetation that require a suppression response due to uncontrolled burning. Fire is an essential part of Oregon's ecosystem but can also pose a serious threat to life and property particularly in the state's growing rural communities. Wildfire can be divided into three categories: interface, wildland, and firestorms. The increase in residential development in interface areas has resulted in greater wildfire risk. Fire has historically been a natural wildland element and can sweep through vegetation that is adjacent to a combustible home. New residents in remote locations are often surprised to learn

that in the process of moving away from built-up urban areas, they have also left behind readily available fire services providing structural protection. Recent fires in Oregon and across the western United States have increased public awareness over the potential losses to life, property, and natural and cultural resources that fire can pose.

The following three factors contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas.

Topography: As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread, since fire spreads more slowly or may even be unable to spread downhill.

Fuel: The type and condition of vegetation plays a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"). The ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel's continuity, both horizontally and vertically, is also an important factor.

Weather: The most variable factor affecting wildfire behavior is weather. Temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced Wildfire occurrence and easier containment.

The frequency and severity of wildfires is also dependent upon other hazards, such as lightning, drought, equipment use, railroads, recreation use, arson, and infestations. If not promptly controlled, wildfires may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildfires may severely affect livestock and pets. Such events may require emergency watering/feeding, evacuation, and shelter.

The indirect effects of wildfires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above.

Location and Extent

Wildfire hazard areas are commonly identified in regions as the Wildland Urban Interface (WUI). The interface is the urban-rural fringe where homes and other structures are built into a densely forested or natural landscape. If left unchecked, it is likely that fires in these areas will threaten lives and property. One challenge Lincoln County faces is from the increasing number of houses being built in the urban/rural fringe and areas with heavy fuel loads. The "interface" between urban or suburban areas and the resource lands has significantly increased the threat to life and

property from fires. Responding to fires in the expanding Wildland Urban Interface area may tax existing fire protection systems beyond original design or current capability.

The ease of fire ignition further determines ranges of the wildfire hazard due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control, such as the surrounding fuel load, weather, topography and property characteristics.

Fire susceptibility throughout the county dramatically increases in late summer and early autumn as summer thunderstorms with lightning strikes increases and vegetation dries out, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. However, various other factors, including humidity, wind speed and direction, fuel load and fuel type and topography can contribute to the intensity and spread of wildland. In addition, common causes of wildfires include arson and negligence from industrial and recreational activities.

Wildland/Urban Conflagrations primarily burn vegetative fuels outside of highly urbanized areas. The extent of the hazard is greatest along the county's mountainous eastern boundary (Map 2-11) In these areas, there is typically a low burn probability, with expected flame lengths generally less than 4 to 8 feet under normal weather conditions. Most of the developed portion of the county has less severe wildfire burn probability (unburnable to low), with less than a 1 in 5,000 chance of a wildfire greater than 250 acres in a single year. Expected flame lengths in these areas are generally less than 8 feet under normal conditions, except in the far eastern parts of the county where flame lengths may exceed 11 feet.

However, wildfire conditions can vary widely depending on local topography, fuel types, and weather patterns. One of the most significant weather-related risk factors in Lincoln County is the occurrence of east wind events. These dry, downslope winds originate from the interior of Oregon and can rapidly increase wildfire risk by dramatically lowering humidity and increasing wind speeds. When east winds coincide with warm, dry, and drought conditions, they can lead to a much higher likelihood of fire ignition, rapid fire spread, increased ember activity, and more intense and difficult-to-control wildfires. These conditions can significantly amplify fire effects and impacts, even in areas that typically have low burn probability.

History

The two most significant fires in Lincoln County occurred more than one hundred years ago. In 1849, the Siletz Fire claimed more than 800,000 acres between Lincoln and Polk County. The 1853 Yaquina Fire burned more than 450,000 acres of Douglas fir, Sitka spruce, and western cedar within Lincoln County. In the 20th century, four major fires known as the Tillamook Burn occurred between 1933 and 1951, with each fire consuming between 180,000 and 240,000 acres. In 1987, the Silver Fire burned 97,000 acres. Recent major fires include the 2002 Biscuit Fire that burned nearly 500,000 total acres (about 471,000 acres in Oregon and nearly 29,000

This quote from UO (2024) is confusing. Plus, in the original document, the numbers differ on pp. 43 and 44. Moreover, most of this should be in quotes.

acres in California), the 2003 B&B Complex fire that burned 90,769 acres, and the 2020 fire season in Oregon that burned 1,141,613 acres.[74]

The Big Creek Fire (near Yachats) in 1936 burned buildings and a schoolhouse near a logging camp. Flames destroyed an "auto camp" near Yachats, and then continued toward the town. Some residences were lost, but the town was saved. Depoe Bay also lost homes to the flames, but firefighters kept the town from burning. The 1987 fire season included the Shady Lane Fire and the Rockhouse Creek fire burning 6,291 acres. In 2016, the 2500 Road fire burned over 200 acres 2 miles east of Depoe Bay.

Map 2-11 shows fire starts from 1992 to 2022, fires ignited by humans are shown in red, lightning caused fires are shown in yellow. In the past 10 years 3% of all fires were caused by lightning and 97% of fires were caused by human activity (ranging from arson and debris burning to equipment use and fires caused along powerlines).

In general, the human caused wildfires are in populated areas and within river and stream corridors near transportation routes, while lightning caused wildfires are often in more remote locations. Wildland/Urban Conflagrations are not common on the Coast.

Urban fires are the most preventable type of fire, and future events depend largely on prevention measures. Although no historical urban conflagrations have occurred, educating residents, building and maintenance code enforcement, and firefighting equipment, staff, and response systems upkeep are all steps that can ensure that highly likely localized urban fires do not become large-scale conflagrations.

While most fire ignitions occur along travel corridors and the edges of major urban areas, the fires that escape initial suppression efforts tend to be in more remote areas and are more likely to occur in some portions of the landscape than others.

Likely the most devastating wildfire year in Oregon is 2020. The Echo Mountain Fire Complex burn began in the Otis and Rose Lodge communities east of Lincoln City during the night of September 7, 2020. It was caused by the same conditions as fires throughout the rest of the state: prolonged dry conditions, severe drought, unusually high temperatures, and a series of historic east wind events moving through river corridors.[75] By the time the fire was contained on September 21, it had burned 2,552 acres, destroyed 288 homes and 399 additional structures, and caused thousands of county residents to evacuate their homes. Over 600 firefighters from Lincoln County fire agencies, neighboring county's fire agencies, the Oregon Department of Forestry (ODF), several out-of-state fire agencies, and volunteer homeowners and large forestland owners worked together to contain the fire.[76]

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[74] Northwest Interagency Coordination Center (2021). *Northwest Annual Fire Report 2020.* https://gacc.nifc.gov/nwcc/content/pdfs/archives/2020_NWCC_Annual_Fire_Report.pdf.

[75] Northwest Interagency Coordination Center (2021). *Northwest Annual Fire Report 2020.* 2020_NWCC_Annual_Fire_Report.pdf

[76] Explore Lincoln City (2021). *Reflecting on Echo Mountain Fire.* Oregon Coast.

Reflecting on Echo Mountain Fire | Explore Lincoln City

The prevalence of many homes in WUI areas, along with severe power losses due to Public Safety Power Shutoffs (PSPSs) initiated by local utility companies, increased the severity of the wildfire's impact.[77] The fire was sparked and rapidly spread due to unusually strong east winds, with gusts reaching up to 50 mph, which contributed significantly to the fire's intensity and rapid expansion.

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a Wildfire is "high",** meaning at least one incident is likely within the next 35-year period.

Certain conditions must be present for significant interface fires to occur. The most common are hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel, topography, weather, drought and development. Many of these conditions are demonstrated across large areas within Lincoln County, creating a significant collective risk.

The Lincoln County CWPP addresses wildfires countywide and defined as either Strategic Planning Area (SPA) 1 or 2. SPA 1, the western one-third of the county, is characterized by urban development within incorporated cities and unincorporated communities. Wildfire potential in SPA 1 is considered moderate to low. SPA 2, the eastern portion of the county, is heavily forested with development along transportation routes. Most of the land in SPA 2 is owned by timber companies, investors, the Confederated Tribes of the Siletz Indians, and state or federal agencies. Wildfire potential in SPA 2 is moderate to low due to the moderate and wet climate that prevails throughout the year.

Map 2-11 illustrates the wildfire burn probability within Lincoln County. Burn probability varies across the county, with most incorporated areas—such as Newport, Lincoln City, and Waldport—classified as having "low" to "low-moderate" wildfire burn probabilities. However, the forested coastal mountain regions to the east of these communities exhibit higher burn probabilities.

These elevated risk areas are particularly vulnerable due to their dense vegetation, steep terrain, and limited access. The wildfire hazard in these eastern zones is further exacerbated by east wind events, which bring hot, dry air from the interior of Oregon. These winds can rapidly dry out fuels, increase fire spread rates, and make suppression efforts more difficult. When combined with drought conditions, east winds significantly heighten the potential for severe wildfire behavior.

[77] Oregon Office of Emergency Management (n.d.). *2020 Oregon Wildfire Spotlight.*

2020 Oregon Wildfire Spotlight

Vulnerability Assessment

The Steering Committee rated the county as having a **"moderate" vulnerability to wildfire hazards**, meaning that between 1% and 10% of the County's population or property could be affected by a major disaster.

Overall potential wildfire impact is shown using integrated conditional net value change (Map 2-12) from the Pacific Northwest Quantitative Wildfire Risk Assessment (2023).[78] Overall Potential Impact measures the potential consequences of wildfire on valuable assets and resources—such as infrastructure, housing, forests, and wildlife habitat—without considering the likelihood (probability) of fire occurring. It reflects a spectrum from very negative impacts (e.g., damage to structures or sensitive ecosystems) to positive impacts (e.g., ecological benefits like improved vegetation or habitat conditions). Not all resources are present everywhere, so the map displays risk only for what's within the mapped area.

As the map illustrates, much of the eastern portion of Lincoln County—characterized by its forested coastal mountains—lies within areas designated as having "moderate" to "very high" potential wildfire impact, indicating elevated wildfire hazard wen a wildfire occurs. These areas are particularly vulnerable due to dense vegetation, steep terrain, and limited access for firefighting. Additionally, areas along rivers that support human activity and contain critical infrastructure such as powerlines are also at heightened risk. The combination of natural fuel loads and human presence in these corridors increases the likelihood of ignition and complicates suppression efforts, especially during extreme weather events such as east wind conditions.

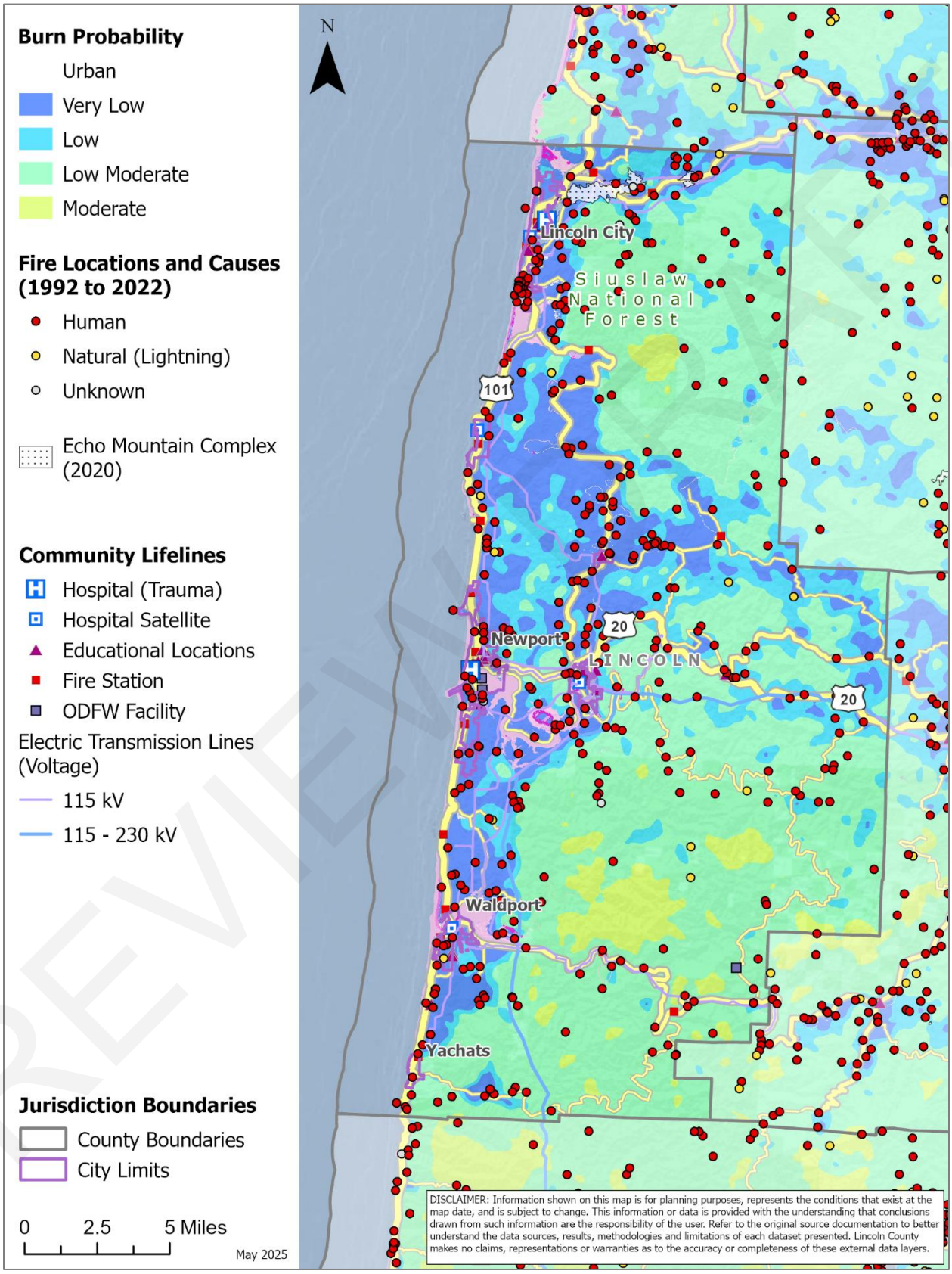
Natural Hazard Risk Report for Lincoln County

The **Risk Report** (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslides. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment's Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. In general, the forested unincorporated areas of the county are most vulnerable to wildfire. Although the High Hazard category was used for analysis, it is noted that almost all communities have 30-60% exposure to the moderate wildfire hazard. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by wildfire.

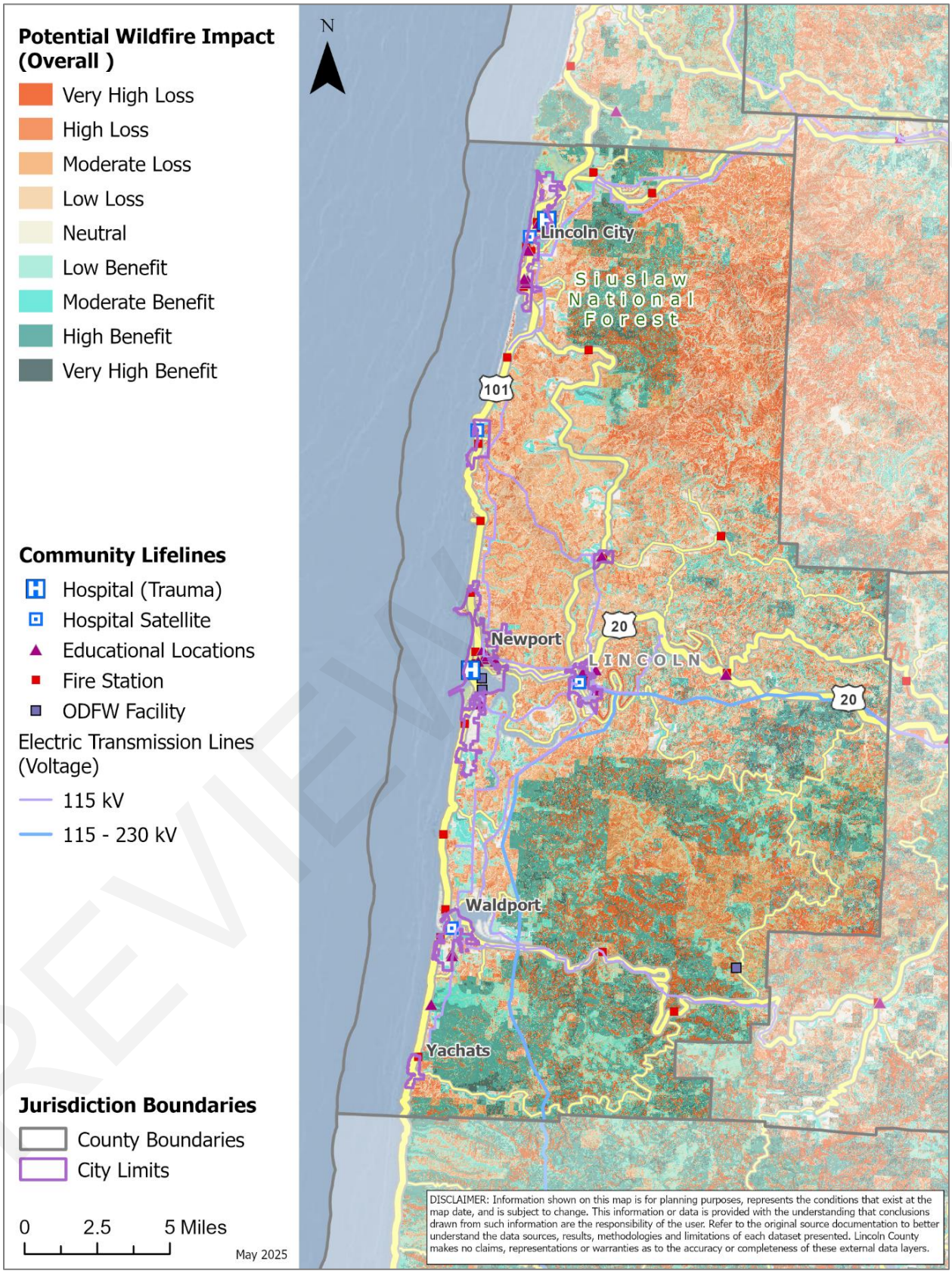
[78] Full documentation of methods for the 2023 update to the Pacific Northwest QWRA can be found here: https://oe.oregonexplorer.info/externalcontent/wildfire/PNW_QWRA_2023Methods.pdf

Map 2-11 Burn Probability and Fire History (1992-2022)



Source: Oregon Explorer: Map Viewer – To view map detail click hyperlink to left.

Map 2-12 Integrated Conditional Net Value Change



Source: PNW Quantitative Wildfire Risk Assessment (2023, layer name = icNVC), To view map detail click hyperlink to left

Population Vulnerability (Residents)

Approximately five percent of unincorporated Lincoln County's population (875 people) may be displaced by wildfires within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. "Rural" Lincoln County has the most population at risk (725), although the population is dispersed throughout the County. About 21% of Otter Rock residents are exposed.

Table 2-22 Potentially Displaced Residents, Wildfire, by Unincorporated Area

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	725	7%
Otis-Rose Lodge	1,926	0	0%
Otter Rock	489	101	21%
Salishan-Lincoln Beach	2,093	42	2%
Seal Rock-Bayshore	2,766	0	0%
Wakonda Beach	1,326	7	1%
Total Unincorporated	18,893	875	5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Properties that are most vulnerable to the wildfire hazard are those that are developed in the high hazard zone. Approximately five percent (1,091 buildings) of unincorporated Lincoln County buildings are exposed to the High Hazard wildfire zone. The percent of exposed buildings is greatest in Otter Rock (21%), however, the dispersed "rural" Lincoln County has the most exposed buildings (915). The value of exposed buildings is $68.5 million.

Table 2-23 Exposed Buildings, Wildfire, by Unincorporated Area

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate ($)	Loss Ratio
"Rural" Lincoln County	12,637	915	7.2%	$53,619,000	6.5%
Otis-Rose Lodge	1,747	0	0.0%	$0	0.0%
Otter Rock	634	133	21.0%	$11,658,000	14.2%
Salishan-Lincoln Beach	2,847	38	1.3%	$2,885,000	0.7%
Seal Rock-Bayshore	3,345	0	0.0%	$0	0.0%
Wakonda Beach	1,614	5	0.3%	$292,000	0.2%
Total Unincorporated	22,824	1,091	4.8%	$68,454,000	3.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability[79]

The following vulnerable critical facilities were determined to be exposed to the High wildfire hazard zone.

- North Lincoln Fire Station 1700 (Kernville, North Lincoln Fire & Rescue District)
- Siletz Bay Airport (*Gleneden Beach)*
- Toledo High School (Toledo area, Lincoln County School District)

Risk Report Identified Areas of Vulnerability[80]

- Wildfire risk is high for hundreds of homes in the forested areas in the eastern portion of unincorporated Lincoln County (rural).

Additional information can be found on the Lincoln County website: https://www.co.lincoln.or.us/770/Hazards-Wildfire and https://www.co.lincoln.or.us/783/Public-Safety-Power-Shut-Offs

[79] DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

[80] Ibid. Page 39.

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Section 3: Mitigation Strategy

This section outlines Lincoln County's strategy to reduce or avoid long-term vulnerabilities to the identified hazards. Specifically, this section presents a mission and specific goals and actions thereby addressing the mitigation strategy requirements contained in 44 CFR 201.6(c). The NHMP Steering Committee viewed and updated the mission, goals, and action items documented in this NHMP. Additional planning process documentation is in Volume II, Appendix B.

Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.

The 2025 NHMP update Steering Committee reviewed the 2020 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2015 and 2020 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public and private partners can take while working to reduce the county's risk from natural hazards. These statements of direction form a bridge between the broad mission statement and particular action items. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

Public participation was a key aspect in developing the plan goals. Meetings with the project steering committee, stakeholder interviews, and public workshops all served as methods to obtain input and priorities in developing goals for reducing risk and preventing loss for natural hazards in Lincoln County.

All the plan goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it

establishes which action items to consider implementing first, should funding become available. Below is a list of the re-confirmed plan goals:

Goal 1: Protect life and reduce injuries resulting from natural hazards.

Goal 2: Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

Goal 3: Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

Goal 4: Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

Goal 5: Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

Goal 6: Document and evaluate progress in achieving hazard mitigation strategies and action items.

Goal 7: Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

Goal 8: Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

Goal 9: Mitigate damage to historic and cultural resources from natural hazards.

Goal 10: Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

Goal 11: Integrate local NHMPs with comprehensive plans and implementing measures.

(Note: although numbered the goals are not prioritized.)

Action Item Development Process

Action items identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. Development of action items was a multi-step, iterative process that involved brainstorming, discussion, review, and revisions. Action items can be developed through many sources. Figure 3-1 illustrates some of these sources.

Most of the action items were first created during the previous NHMP planning processes. During these processes, the Steering Committee developed maps of local vulnerable populations, facilities, and infrastructure in respect to each identified hazard. Review of these maps generated discussion around potential actions to mitigate impacts to the vulnerable areas. The Oregon Partnership for Disaster Resilience (OPDR) provided guidance in the development of action items by presenting and discussing actions that were used in other communities. OPDR

also took note of ideas that came up in Steering Committee meetings and drafted specific actions that met the intent of the Steering Committee. All actions were then reviewed by the Steering Committee, discussed at length and revised as necessary before becoming a part of this document.

Figure 3-1 Development of Action Items

Action Item Matrix

The action item matrix (Table 2-1) portrays the overall action plan framework and identifies linkages between the NHMP goals, partnerships (coordination and partner organizations), and actions. The matrix documents a brief description of the action, coordinating organization(s), timeline (ongoing, short, medium, or long), priority, and other jurisdictions that are partners to the action.

Action Item Framework

Many of the Lincoln County NHMP's recommendations are consistent with the goals and objectives of the County's existing plans and policies. Where possible, Lincoln County will implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence have support from residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. *See Volume III for the actions for each participating city or special district.*

Action Item Prioritization

Table 3-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown with orange highlight. The County will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority.

See Volume II, Appendix B for information on changes including actions completed since the previous NHMP.

See Volume III for the action items for each participating jurisdiction.

Table 3-1 Action Items

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
1	Develop and implement a Countywide Local Energy Assurance Plan (LEAP) to ensure the resilience and rapid restoration of energy services to critical facilities and infrastructure during and after emergency events. This plan will identify and prioritize critical assets requiring backup power systems, establish clear communication protocols and operational procedures for energy restoration, and outline both immediate and long-term strategies to reduce vulnerability to energy disruptions. The LEAP will include coordination with utility providers, fuel suppliers, and emergency management agencies, and will incorporate regular training, drills, and updates to reflect evolving risks and technologies. By doing so, the County will enhance its ability to maintain essential services and protect public safety during energy emergencies.				X		X	X	X		X	X	X	Local Funding resources, HMA, U.S. DOE Local Energy Assurance Planning Initiative	Emergency Management	Long	L to M
2	Strengthen the technological capacity of Lincoln County's emergency management systems to enhance hazard mapping, public warning dissemination, and community education. This includes expanding the use of GIS and communication technologies to identify tsunami evacuation needs, assess the adequacy of evacuation routes, and support real-time decision-making during emergencies. Leverage existing Risk Report data and Emergency Alert System upgrades to inform mitigation strategies for all natural hazards. Continue to improve and maintain tsunami signage and wayfinding systems in parks and along county roads to ensure residents and visitors are aware of their location and evacuation options. Extend these technological improvements to address other hazards, ensuring a comprehensive, county-wide approach to risk reduction and public safety.	X			X	X	X	X	X		X	X	X	Local Funding, DOGAMI, DLCD, FEMA	Emergency Management	Ongoing	L to M
3	Develop, enhance, and implement a comprehensive debris management strategy to ensure rapid and coordinated removal of debris following natural hazard events such as windstorms, winter storms, and tsunamis in Lincoln County. This strategy will prioritize maintaining clear transportation routes for emergency services by coordinating with local public works, emergency management, and private contractors to pre-identify critical roadways and debris disposal sites. The plan will include pre-event agreements for		X		X		X	X	X		X	X	X	Public Works, ODOT, Regional recycling facilities	Emergency Management, Solid Waste District	Short	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	equipment and personnel, public communication protocols for alternative routes, and designated drop-off locations for residents to safely dispose of debris. Regular training exercises and public awareness campaigns will ensure readiness and community participation in post-disaster cleanup efforts.																
4	Collaborate with coastal communities, citizen groups, property owners, recreational areas, emergency responders, schools, and businesses to enhance resilience to natural hazards through a comprehensive public outreach and education initiative. This includes distributing updated hazard information and evacuation route brochures, conducting targeted awareness campaigns on seismic retrofitting benefits, and leveraging existing outreach networks such as SWCD, NRCS, watershed councils, and OSU Extension. Additionally, develop and implement a community water resiliency education plan to address both emergency and long-term water supply concerns. These efforts aim to empower residents, visitors, and stakeholders with the knowledge and tools necessary to reduce risk and improve preparedness for natural disasters.	X	X	X	X	X	X	X	X	X	X	X	X	Local Funding, public grants, private foundations, Local/State/Federal agencies, NOAA Coastal Resiliency Grant	Planning and Development, Emergency Management	Ongoing	L
5	To reduce long-term risk from natural hazards such as earthquakes, tsunamis, and floods in Lincoln County, the county will actively promote the purchase of hazard insurance among homeowners and businesses. This will be achieved by forming strategic partnerships with local insurance and real estate professionals to disseminate up-to-date insurance information. The county will maintain regular communication with insurance industry representatives to stay informed about evolving coverage options, rates, and eligibility requirements. Additionally, collaboration with real estate agents will focus on educating them—and by extension, potential buyers—about resilient building practices and structures that offer better protection against seismic activity. These efforts will be integrated into public outreach initiatives, including emergency readiness fairs, radio programs, and community events, where local insurance agencies will be invited to engage directly with residents and promote preparedness through insurance literacy.						X				X			Local Funding Resources, OEM, DLCD, DOGAMI	Emergency Management	Ongoing	L
6	Conduct a comprehensive policy crosswalk between the County's Natural Hazard Mitigation Plan (NHMP) and its Comprehensive Plan to identify and implement opportunities for integration. This process	X	X	X	X	X	X	X	X		X	X	X	City and County Decision making	Planning and Development	Medium	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	will align hazard mitigation goals with land use planning, ensuring that natural hazard data, risk reduction strategies, and resilience-building policies are embedded into the County's long-term development framework. The integration will include incorporating relevant guidance from the DLCD Tsunami and Landslide Land Use Guides, evaluating zoning in high liquefaction areas, and establishing a coordinated schedule for future updates. This alignment will provide legal authority for NHMP action items, streamline implementation, and enhance the County's capacity to recover from natural disasters.													bodies, Emergency Management			
7	Develop and adopt a comprehensive long-term post-disaster recovery plan that integrates hazard mitigation strategies into every phase of recovery and reconstruction. This plan will proactively identify critical decisions with long-term implications for community safety and resilience, ensuring they are addressed before disaster strikes. By establishing a dedicated Recovery Management Team—comprising local officials, emergency managers, and community stakeholders—Lincoln County will be equipped to guide recovery efforts that prioritize rebuilding safer, more resilient infrastructure. The plan will also include strategies for securing external funding, maintaining community engagement, and aligning pre-disaster mitigation goals with post-disaster opportunities, thereby reducing future vulnerabilities and enhancing the county's capacity to withstand and recover from catastrophic events.				X		X		X		X	X	X	Local Funding Resources, DLCD, OEM, NOAA Coastal Resiliency Grant	Board of Commissioners/ Policy Group	Long	M
8	Conduct a comprehensive review of recommended mitigation strategies outlined in DOGAMI reports O-19-06, O-20-03, O-20-11,)-21-2, and 0-25-01 with a focus on enhancing tsunami evacuation and earthquake resilience in Lincoln City and unincorporated areas of Lincoln County. This review will include evaluating strategies to reduce evacuation travel times in high-risk zones (e.g., Siletz Bay, Gleneden Beach, South County), assessing structural and population vulnerabilities, and analyzing cost-effectiveness of proposed actions. Based on this analysis, develop a prioritized list of long-term mitigation strategies and present actionable recommendations to the Board of Commissioners (BOC) for implementation, emphasizing solutions that offer the greatest benefit to community safety and resilience.		X		X		X	X	X		X			Local Funding Resources, DLCD Technical Assistance	Planning and Development	Short	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
9	Enhance Lincoln County's resilience to coastal erosion by improving public and institutional knowledge of climate change impacts and vulnerability to erosion-related hazards. This will be achieved by integrating the latest scientific data—including DOGAMI coastal erosion hazard zone mapping, OCCRI climate projections, and ground movement monitoring—into the county's Natural Hazard Mitigation Plan (NHMP) and comprehensive plan inventory. The county will identify and map high-risk erosion zones, assess the vulnerability of critical infrastructure and buildings, and develop targeted public outreach materials that emphasize the economic and safety risks of development in erosion-prone areas. These efforts will support informed land-use planning, emergency preparedness, and long-term risk reduction strategies.		X											Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners	Planning and Development	Ongoing	L
10	Evaluate and revise Lincoln County's existing coastal hazard area regulations using the DOGAMI coastal erosion hazard zone mapping and the Lincoln County Risk Report as foundational data. This process will identify high-risk dune and bluff-backed shoreline areas from Cascade Head to Cape Perpetua and inform updated land use codes that reflect relative erosion risk. The revised regulations will incorporate financial incentives and disincentives to guide development away from high-risk zones, maintain existing erosion control structures, and integrate projected land value losses into future risk assessments.		X											Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners	Planning and Development	Ongoing	L
11	Enhance Lincoln County's earthquake resilience by integrating updated, high-resolution earthquake hazard mapping data and localized HAZUS risk assessments into a centralized GIS-based data repository. This initiative will support improved technical analysis and public awareness by making current hazard information widely accessible to planners, emergency managers, and the public. Utilizing the Lincoln County Risk Report and DOGAMI datasets, the County will conduct a comprehensive GIS-based risk analysis to identify high-risk areas, prioritize mitigation efforts, and evaluate the adequacy of existing land use policies. Ongoing collaboration with local, state, and federal partners will ensure continuous updates to hazard models and data, supporting adaptive and informed decision-making.				X								Local Funding Resources, HMA, DOGAMI	GIS	Short	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
12	Conduct a comprehensive update and expansion of the county's inventory of critical facilities using current seismic vulnerability data, including facilities not assessed in the 2007 RVS. Prioritize the identification and structural and non-structural retrofitting of county-controlled critical infrastructure—such as emergency response buildings, water towers, and port facilities—based on risk of collapse and tsunami exposure. Develop and implement a local seismic rehabilitation program that leverages state and federal funding opportunities, including those enabled by Oregon Senate Bill 3, to support retrofitting efforts. This proactive mitigation strategy will ensure continuity of government operations, minimize service disruptions, and enhance life safety and community resilience in the aftermath of a Cascadia Subduction Zone event.				X									Seismic Rehabilitation Grants (IFA), Local Funding Resources	Emergency Management	Long	H
13	Continuously integrate the latest earthquake and landslide data from DOGAMI, ODOT, and other authoritative sources to proactively assess and mitigate vulnerabilities in critical transportation infrastructure, particularly along Highway 101 and key access routes to the valley and coast. Collaborate with ODOT to prioritize seismic retrofitting and reconstruction of essential bridges and corridors to meet or exceed current seismic resilience standards. This effort is vital for ensuring post-tsunami access, supporting emergency response, and guiding long-term redevelopment of coastal cities, which will likely align with existing transportation corridors. Future planning will include identifying alternative routes and recovery pathways, informed by the Oregon Resiliency Plan and local hazard assessments, to maintain regional connectivity and economic viability.				X									Local Funding Resources, ODOT (Seismic Plus)	Roads/ Public Works	Long	L to VH
14	Relocate county-controlled critical and essential facilities and actively encourage the relocation or structural retrofitting of other key facilities—particularly those housing vulnerable populations such as hospitals, nursing homes, and schools—currently located within the tsunami inundation zone. Coordinate with local, state, and federal agencies to assess and prioritize relocation alternatives for high-risk structures, including those identified by Lincoln County GIS and DOGAMI. Enhance local emergency preparedness by improving tsunami hazard mapping, investing in real-time forecasting systems, and conducting regular evacuation training for emergency								X					Operational general funds, bond's, continued search for grant funding to relocate services.	Emergency Management	Long	H

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	responders. This action aims to reduce the risk of loss of life, ensure continuity of essential services, and minimize infrastructure damage in the event of a significant tsunami.																
15	Implement targeted land use strategies to enhance tsunami resilience by utilizing the Oregon Department of Land Conservation and Development's (DLCD) Tsunami Land Use Guidance. This includes updating comprehensive plans and zoning codes to reflect tsunami risk. Communities should prioritize the relocation or retrofitting of critical facilities—such as schools, hospitals, and nursing homes—located in high-risk zones. Additionally, relevant elements from DLCD's Landslide Land Use Guide should be incorporated to address compound hazards. These efforts will be tailored to local conditions using updated Tsunami Inundation Maps (TIMs) and supported by DLCD technical assistance to ensure effective, place-based resilience planning.								X					Local Funding Resources, DLCD	Planning and Development	Medium	L
16	Enhance Lincoln County's flood resilience and reduce residents' flood insurance costs by qualifying the county for participation in the National Flood Insurance Program (NFIP) Community Rating System (CRS). This will involve a comprehensive review of CRS eligibility requirements, documentation of existing floodplain management activities that exceed NFIP minimum standards, and identification of additional actions that could improve the county's CRS score. The county will compile and organize all necessary documentation, engage with relevant stakeholders, and complete the CRS application process. Successful enrollment in the CRS will support long-term risk reduction, improve public awareness of flood hazards, and provide financial benefits through discounted flood insurance premiums.						X							Local Funding Resources, public grants and private foundations	Planning and Development	Short	L to M
17	Update the Lower Siletz Flood Mitigation Action Plan to reflect completed implementation measures and identify new strategies to address ongoing flood risks. Building on the success of this model, develop comprehensive flood mitigation action plans for other high-risk areas, including the lower Alsea River, Salmon River, Drift Creek, and additional flood-prone zones. These plans should assess local vulnerabilities, engage community stakeholders, and outline prioritized mitigation projects. Actively pursue grant funding opportunities to support both the update of the Siletz plan and the						X							Local Funding Resources, public grants and private foundations	Planning and Development	Short	L to M

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	creation of new, site-specific plans, ensuring a coordinated and resilient approach to flood hazard reduction across the region.																
18	Collaborate with property owners in identified flood-prone areas—particularly Elk City, Little Albany, and the Lower Siletz River corridor—to elevate or relocate non-conforming, pre-FIRM structures that are vulnerable to frequent flooding. Prioritize properties with a history of repetitive loss and those situated at the lowest elevations. Implement a comprehensive outreach campaign to educate residents about flood risks and available mitigation options, including elevation, relocation, or voluntary buyouts through FEMA's Hazard Mitigation Grant Program. Establish clear eligibility criteria and assist property owners in securing grant funding to support these efforts. Ensure all elevated structures meet or exceed County floodplain management standards, with the lowest floor at least one foot above the base flood elevation, to significantly reduce future flood damage and enhance community resilience.						X							Local Funding Resources, public grants, and private foundations, HMA, FMA, CDBG	Planning and Development	Ongoing	H
19	Ensure continued compliance with the National Flood Insurance Program (NFIP) by maintaining and enhancing Lincoln County's floodplain management practices. This includes actively participating in Community Assistance Visits (CAVs) with the Department of Land Conservation and Development (DLCD) and FEMA to assess and improve local floodplain regulations and enforcement. Lincoln County will regularly review and update its floodplain ordinances to reflect evolving flood hazard data. County staff will monitor changes in federal NFIP requirements and integrate updated standards into daily operations. These efforts aim to reduce flood risk, minimize property damage, and maintain eligibility for federally backed flood insurance, ensuring long-term community resilience.						X							Local Funding Resources, public grants and private foundations	Planning and Development	Ongoing	L
20	Promote resilient construction practices and land use planning in Lincoln County by encouraging site selection, building design, and construction techniques that are appropriate for steep slopes and landslide-prone areas. In collaboration with Lincoln County Public Works and Planning and Development departments, implement erosion control measures—such as straw bales, diversion dams, and stormwater management systems—during construction to minimize runoff and soil destabilization. Educate property owners on reducing							X						Local Funding Resources, public grants and private foundations	Planning and Development	Ongoing	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	water input into slopes through proper drainage management, and advocate for minimizing site disturbance by limiting the number of building pads and preserving natural vegetation and contours. Strengthen interdepartmental coordination and integrate best practices from the DLCD's "Preparing for Landslide Hazards: A Land Use Guide for Oregon Communities" to guide policy updates and development review processes, ultimately reducing landslide risks to infrastructure and residents.																
21	Enhance community resilience to landslides through a comprehensive public education and infrastructure maintenance program. This includes distributing FEMA-endorsed materials such as the Homeowners Landslide Guide and Hillside Drainage Flier to raise awareness of landslide risks and prevention strategies. Promote the use of conservation easements to limit development on high-risk slopes. Implement and maintain physical mitigation measures such as debris flow diversions, slope armoring, and culvert upgrades designed for 50- to 100-year flood events. Conduct annual inspections and clearing of stormwater systems, bridge areas, and active landslide zones before the wet season. Monitor ground movement in susceptible areas and respond with stabilization techniques like riprap and gabion baskets as needed. Engage the public through Planning Department outreach and emergency readiness fairs to ensure widespread understanding and participation in landslide risk reduction.							X						Local Funding Resources – general operational fund	Emergency Management, Public Works	Ongoing	L to H
22	Collaborate with the Oregon Department of Geology and Mineral Industries (DOGAMI) to reduce landslide risk in Lincoln County by developing and integrating a comprehensive, data-driven approach to hazard mitigation. This includes creating a modern landslide inventory and susceptibility maps using high-resolution lidar data to identify existing landslides and model future susceptibility. Conduct detailed landslide risk analyses to inform land use planning, zoning, and development regulations. Prioritize and implement targeted risk reduction actions based on these analyses. Update or develop local landslide ordinances in alignment with DOGAMI's 2020 Open-File Report O-16-02 and incorporate best practices from the DLCD's "Preparing for Landslide Hazards" land use guide to ensure resilient community development.							X						Local funding, DOGAMI, DLCD, FEMA, PDM, HMGP	Planning and Development	Long	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
23	Develop and implement a comprehensive tree hazard mitigation program aimed at reducing risks to life, property, commerce, and public infrastructure during severe weather events such as windstorms, tornadoes, and winter storms. This program will include proactive identification and removal of hazardous trees in urban areas, utility corridors, and near critical infrastructure. Public Works will collaborate with utility providers, local governments, and land management agencies (e.g., BLM, USFS, State Parks) to document high-risk areas and coordinate mitigation efforts. Educational outreach will be conducted in partnership with relevant organizations to inform property owners about tree maintenance and risk reduction strategies. Additionally, landscaping and tree planting guidelines will be developed to minimize future conflicts with aboveground utilities and roadways. All activities will be conducted in compliance with environmental regulations to protect endangered and threatened species. Public Works will continue to train staff in hazard tree identification and maintain ongoing removal efforts along county roads and bridges, especially following timber harvests.											X	X	Local Funding Resources, public grants and private foundations	Public Works	Ongoing	L to H
24	Enhance the resilience of Lincoln County's critical infrastructure and utilities to severe weather events—particularly windstorms and winter storms—by expanding the use of wind- and storm-resistant construction methods and prioritizing the conversion of overhead utility lines to underground systems. This includes identifying and designating "undergrounding districts" in collaboration with consumer-owned electric utility providers, especially in areas with high vulnerability such as mountaintop communication sites and densely wooded developed zones. Utilize a combination of utility franchise fees, urban renewal funds, and state and federal grants to support these efforts. Continue enforcing wind-resistant building codes, requiring underground utilities in new developments, and providing technical guidance to utilities and developers. Prioritize undergrounding in areas prone to tree fall and difficult access for repair crews to reduce outage durations and ensure continuity of emergency communications during disasters.								X		X	X	X	Local Funding Resources, public grants, and private foundations, HMA	Public Works	Ongoing	L
25	Strengthen wildfire resilience in Lincoln County by implementing and regularly updating the Community Wildfire Protection Plan (CWPP) through coordinated efforts with local, regional, and rural fire										X			Local Funding Resources, ODF, DLCD, HMA	Emergency Management	Ongoing	L to H

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	protection agencies. Prioritize mitigation projects that reduce wildfire risk in wildland-urban interface (WUI) communities, including maintaining defensible space and fuel breaks around structures and forestland buffers. Integrate the latest fire risk and climate data into CWPP updates to ensure relevance and effectiveness. Additionally, assess and address secondary hazards such as post-wildfire flooding, debris flows, and landslides to protect vulnerable communities and infrastructure. These actions will enhance community safety and support a comprehensive, adaptive wildfire risk management strategy.																
26	To enhance the protection of heritage resources from natural hazards, the county will coordinate with local governments and heritage organizations to develop a Disaster Resilience Plan for Heritage Resources (DRHR). This plan involves forming a task force, assessing vulnerabilities, mapping risks, and creating a framework that includes mitigation strategies, emergency protocols, and recovery plans. The DRHR should be integrated into broader planning efforts, supported by training and public engagement, and funded through grants and partnerships. Regular updates and evaluations ensure the plan remains effective, ultimately strengthening community resilience and safeguarding cultural heritage. For more information on resources that are available visit: https://www.oregon.gov/oprd/OH/Pages/DisasterPrep.aspx.		X		X		X	X	X	X	X	X	X	Local funding resources, HMA, SHPO	Planning and Development	Long	L to M
27	Conduct a countywide assessment and install backup generators at all critical community facilities lacking them, including water systems, communication towers, and emergency shelters in (e.g., Otter Rock and Gleneden Beach).		X		X		X	X	X		X	X	X	Local funding resources, HMA	Emergency Management	Short	L
28	Identify and develop at least three alternative evacuation routes in tsunami and landslide-prone areas (use the Lincoln County Evacuation Plan to identify potential strategies). This includes installing signage and conducting public evacuation drills to ensure community readiness and reduce the risk of isolation during disasters.							X	X					Local funding resources, HMA	Emergency Management	Short	L
29	Complete a vulnerability assessment and begin phased upgrades of aging water infrastructure (e.g. Otter Rock). The plan will prioritize seismic retrofits, contamination prevention, and long-term water access improvements.			X	X		X	X	X		X			Local funding resources, HMA	Public Works	Short	L to VH

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
30	Enhance unincorporated community-specific content in the Natural Hazard Mitigation Plan (e.g., Otter Rock, Lincoln Beach). These annexes will address localized risks, such as highway slippage, and tsunami exposure, and will include tailored mitigation strategies.	X	X	X	X	X	X	X	X	X	X	X	X	Local funding resources, HMA	Emergency Management	Medium	L
31	Expand Lincoln Alerts to include a countywide emergency communication program targeting elderly and isolated residents. This program will include a voluntary registry, wellness checks, and neighborhood response teams to ensure timely communication and support during emergencies.	X	X	X	X	X	X	X	X	X	X	X	X	Local funding resources, HMA	Emergency Management	Short	L
Consumer Power Inc. Specific Actions																	
32	To strengthen community resilience and ensure continuity of essential services during natural disasters, CPI will implement a comprehensive infrastructure modernization initiative. This includes retrofitting existing systems and constructing new utility networks using high-durability materials such as metal and fiberglass power poles, composite crossarms, and covered conductors. Additionally, CPI will prioritize the installation of underground cabling in high-risk areas and apply fire-resistant wraps to wooden poles in wildfire-prone zones. These upgrades aim to reduce system vulnerabilities, minimize service disruptions, and enhance public safety in the face of increasing climate-related hazards.										X	X	X	CPI operating budget, HMA, government grants from the state and federal levels	CPI	Ongoing	L to VH
33	To enhance the resilience and responsiveness of CPI's electrical grid, the utility will implement a phased upgrade of its communication infrastructure by installing fiberoptic lines and integrating remote control capabilities for critical field devices, such as reclosers, into the SCADA system. This initiative aims to significantly reduce system threat response times from hours to minutes, thereby mitigating the impact of outages and improving operational efficiency. Progress will be measured by the number of components successfully integrated into the SCADA network, with each phase targeting specific geographic zones and asset groups to ensure systematic and trackable implementation.										X	X	X	CPI operating budget, HMA, government grants from the state and federal levels	CPI	Ongoing	L to VH
34	CPI will strengthen wildfire resilience by deploying 20–40 Tempest Weatherflow sensors across its rural electrical infrastructure as soon as the cellular-enabled models are commercially available. This initiative will address the critical gap in hyperlocal weather data										X			CPI operating budget	CPI	Short	L

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	caused by reliance on distant or elevated public weather stations. By capturing real-time, site-specific environmental conditions such as wind speed, humidity, and temperature, CPI will enhance its ability to anticipate and respond to wildfire threats. The data will directly inform operational decisions, such as preemptive power shutoffs or vegetation management. Implementation progress and sensor performance will be reviewed annually to ensure the system remains effective, scalable, and aligned with evolving wildfire risk profiles.																
Samaritan Health Services Actions																	
35	Increase the on-site fuel storage capacity at Samaritan Pacific Communities Hospital in Newport to support continuous generator operation for a minimum of 30 days during power outages caused by severe weather or seismic events. This includes evaluating current capacity, securing funding (estimated $250,000–$500,000), and installing additional tanks and generator support for urgent care and the future STARS facility.											X	X	Local funding resources, HMA	Samaritan Health	S	H
36	Expand fuel storage and install backup generators at Samaritan North Lincoln Hospital and affiliated urgent and primary care clinics to ensure a minimum 30-day power supply during emergencies. This action addresses vulnerabilities identified in the NHMP and supports continuity of care in a region prone to winter storms and potential isolation.											X	X	Local funding resources, HMA	Samaritan Health	S	H
37	Complete the installation of emergency water supply systems at both Newport and Lincoln City hospitals, consider wells or tanks. These projects will enhance water resilience during earthquakes and other disasters, ensuring uninterrupted medical operations.				X		X		X		X	X	X	Local funding resources, HMA	Samaritan Health	M	H
38	Conduct a site assessment and feasibility study to identify and prioritize alternative locations for clinics currently located in tsunami inundation zones, such as the Depoe Bay clinic. The goal is to relocate or establish satellite facilities in safer areas to maintain healthcare access post-tsunami.								X					Local funding resources, HMA	Samaritan Health	M	M
39	Develop and equip at least one permanent alternative care site south of the Yaquina Bay Bridge to serve communities between Newport and Yachats. This site, potentially located at Oregon Coast Community College (OCCC), will provide essential medical services in				X				X					Local funding resources, HMA	Samaritan Health	L	VH

Mitigation Strategies		Impacted Hazard												Implementation and Maintenance			
Action Item #	Statement	Air Quality	Coastal Erosion	Drought	Earthquake	Extreme Heat	Flood	Landslide	Tsunami	Volcanic Event	Wildfire	Windstorm*	Winter Storm	Potential Funding Resources	Lead	Timeline	Cost
	the event of bridge failure or isolation due to a Cascadia earthquake or tsunami.																
40	Install upgraded air filtration systems (e.g., MERV 13+ filters and odor control) in all leased and owned clinics, especially in wildfire-prone areas like Toledo and Waldport, to protect patients and staff during smoke events.	X												Local funding resources, HMA	Samaritan Health	S	L
41	Initiate a seismic assessment of all non-hospital facilities (e.g., urgent care, hospice, dialysis centers) and develop a phased retrofit plan to improve structural safety and operational continuity during a Cascadia Subduction Zone event.				X									Local funding resources, HMA	Samaritan Health	S	L
42	Create a plan to address transportation challenges during earthquakes, tsunamis, or landslides, particularly focusing on Highway 101 and key bridges (e.g., Newport and Waldport). This plan should include coordination with local transit, emergency services, and regional partners to ensure continuity of care and staff mobility.				X			X	X					Local funding resources, HMA	Samaritan Health	S	L

Source: Lincoln County NHMP steering committee, 2025.
Cost: L (less than $50,000), M ($50,000-$499,999), H ($500,000-$5 million), VH (more than $5 million),
Potential Funding Sources: HMA=FEMA's Hazard Mitigation Assistance disaster and non-disaster grant programs
Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)
Priority Actions: Identified with orange highlight
* - the windstorm hazard includes tornadoes (water spouts)

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Section 4: Plan Implementation and Maintenance

The common objective of every local mitigation plan is to reduce the community's risk from and exposure to natural hazards before they occur. One of the most effective ways of institutionalizing mitigation in the community is to incorporate natural hazard planning into the community's comprehensive planning activities. In Oregon, comprehensive plans address a wide range of community issues and sectors – from land use and transportation to natural resources and economics. Lincoln County's Comprehensive plan addresses the following broad categories:

- Land Use and Urbanization
- Intergovernmental Coordination
- Citizen Involvement
- Air, Land and Water Resources
- Natural Hazards
- Forest, Agriculture, Estuarine, Coastal, Beaches and Dunes, and Open Space
- Economy
- Transportation
- Energy
- Housing
- Recreation
- Public Facilities
- Natural Resources
- Historic and Cultural Resources

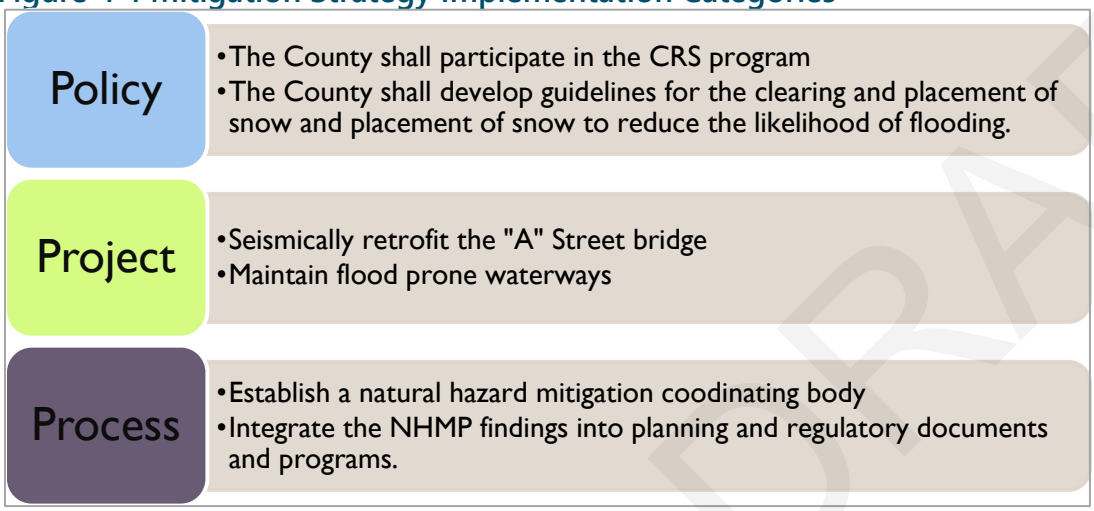
This section outlines a comprehensive approach to implement the mitigation strategies outline in this Multi-jurisdictional Natural Hazards Mitigation Plan (NHMP). This implementation strategy is informed by information collected and developed during the NHMP update process and concurrent Lincoln County Risk MAP project. The implementation strategy strives to demonstrate how risk specific data, both natural hazard and community vulnerability, can be integrated in existing programs, projects and policies.

For the purposes of this NHMP, the Plan Implementation and Maintenance section details the formal process that will ensure that the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP) remains an active and relevant document. This section includes a schedule for monitoring and evaluating the plan semi-annually, as well as producing an updated plan every five years. Finally, this section describes how the county will integrate public participation throughout the plan maintenance and implementation process.

Implementing the Plan

There are three primary ways mitigation strategies can be implemented at the local level: Policies, Projects, and Processes. Figure 4-1 illustrates these categories with examples.

Figure 4-1 Mitigation Strategy Implementation Categories



Source: Oregon Partnership for Disaster Resilience

The success of the Lincoln County NHMP depends on how well the outlined action items are implemented. To ensure that the activities identified are implemented, the following steps will be taken. The plan will be formally adopted, a coordinating body will be assigned, a convener shall be designated, the identified activities will be prioritized and evaluated, and finally, the plan will be implemented through existing plans, programs, and policies.

Table 4-1 on the following pages demonstrates how the actions will be implemented within Lincoln County. For detailed information on action item implementation see Table 4-2.

Plan Adoption

The Lincoln County NHMP was developed and will be implemented through a collaborative process. After the Plan is locally reviewed and deemed complete, the Lincoln County Convener submits it to the State Hazard Mitigation Officer (SHMO) at the Oregon Department of Emergency Management (OEM). OEM submits the plan to the Federal Emergency Management Agency (FEMA--Region X) for review. This review addresses the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the County and participating jurisdictions (cities and special districts) will adopt the plan via resolution. Once adopted and approved by FEMA the County and each participating jurisdiction that adopted their NHMP addendum will gain eligibility for the Building Resilient Infrastructure and Communities Grant Program, the Hazard Mitigation Grant Program, and the Flood Mitigation Assistance Grant Program.

Table 4-1 Mitigation Implementation Opportunities for Lincoln County Hazards/ Risks

System	Potential Risks/Challenges	Mitigation and Implementation Opportunities	Community Planning Connections
Infrastructure	Major Findings • Built infrastructure systems rely heavily on institutional standards for guidance, causing delayed implementation of new design or construction practices. • Aging infrastructure and population growth are expected to create supply issues over the next 20-50 years. • During an emergency, some of the different systems that make up the infrastructure sector are more prepared than others to meet operating and external standards. Crucial Vulnerabilities • Communities do not have adequate fire protection due to inadequate water distribution • US Highway 101 is at capacity during the summer months, including chokeholds at key city bridges • Rural areas do not have as much built-in redundancy • No redundancies exist in the wastewater system	Policy Opportunities: • Develop a long-term (20-50 year) infrastructure vision • Focus Capital Improvement Planning on long-term infrastructure resilience • Develop local energy assurance plans to increase redundancy and connectivity of energy systems. • Develop formal mutual aid agreements between governments, districts – particularly water utilities. • Comprehensive Plan Periodic Review Project Opportunities: • Utilize Risk Report data to identify areas of critical infrastructure vulnerability (roads, bridges, buildings, water storage, etc.) and mitigate. • Utilize Risk Report data to better assess community ability to evacuate residents/ tourists during a CSZ event. • Retrofit water tanks/ reservoirs to withstand a CSZ event. • Retrofit systems to withstand local tsunami events, include the development of system redundancies • Utilize Risk Report data to enhance understanding of coastal erosion and mitigate vulnerability to roads, bridges, water pump stations, etc. Process Opportunities: • Develop an infrastructure sub-committee to the NHMP coordinating body to prioritize and implement identified and new infrastructure actions. • Identify supply chain gaps and develop a system to address them.	• Natural Hazards Mitigation Plan • Transportation System/ Master Plans • Access Management Plans • Comprehensive Plans • Local land use ordinances • Port Business Strategic Plans and Capital Facilities Plans • Lincoln County School District Capital Facilities Plan • Solid Waste Management Plans • Wastewater System Master Plans • Water System Master Plans • Bayshore Foredune Management Plan (and Overlay Zone)
Public Safety	Major Findings • Public Safety (law enforcement, fire) relies on property tax for funding, which may not sustain needed service over the next 20-years • Resources that function on a day to day basis (volunteer fire departments, interagency mutual aid	Policy Opportunities: • Develop long-term public safety planning (CONOPS) to ensure the availability of resources during a catastrophic event (human, fuel, replacement/ repair parts, etc.) • Develop a plan to attract and retain career public safety personnel (fire, police, etc.)	• Natural Hazards Mitigation Plan • Capital Improvement Plans • Emergency Operations Plans • Local land use ordinances • Sherriff's Office Strategic Plan • Regional Economic Development Strategy

System	Potential Risks/Challenges	Mitigation and Implementation Opportunities	Community Planning Connections
	agreements, specialty teams), would be heavily stressed during long term, widespread events • Current budget and regulatory unknowns prevent planning beyond a two- to five-year timeframe Crucial Vulnerabilities • Hazards that impact the entire region reduce the availability of resources from partner agencies and neighboring jurisdictions • Extended events (more than 12 hours) tap available capacity • Available fuel is a key limiting factor	• Implement policy to require tourist accommodations to post evacuation routes to assembly areas (e.g., Newport policy). • Develop stable long-term funding strategy Project Opportunities: • Relocate critical and essential facilities out of the tsunami inundation area. • Relocate mitigate critical and essential facilities from the flood hazard. Process Opportunities: • Develop a Public Safety sub-committee to the NHMP coordinating body to prioritize and implement identified and new public safety actions.	
Social Services	Major Findings • Institutional and volunteer providers do their best to operate on a day to day basis; their ability to respond after a major disaster strikes is limited due to supplies, location of personnel, and lack of services • Urban migration is especially detrimental to social services and the ability to provide for those in more rural locations • The social fabric of the system county wide is strong and local leadership is supportive to planning efforts Crucial Vulnerabilities • An aging population combined with a patchwork of service providers and lack of services • Large number of residents vulnerable to disasters with limited ability to shelter them after a disaster • Medical supplies are limited to a 2-5 day supply at any given time	Policy Opportunities: • Develop aid agreements between jurisdictions and districts to support recovery efforts. Project Opportunities: • Develop communication redundancy for system. • Relocate critical and essential facilities out of the tsunami inundation area (e.g., mental health clinics, ambulance service, etc.). • Retrofit critical and essential facilities to address the earthquake hazard. • Develop redundancies within the social services sector to assure that supplies and personnel are distributed across the county. • Mitigate repetitive loss properties along the lower Siletz River near Lincoln City. Process Opportunities: • Develop a Social Services sub-committee to the NHMP coordinating body to prioritize and implement identified and new social services actions.	• Natural Hazards Mitigation Plan • Community Health Improvement Plan • Local land use ordinances • Housing strategy • Hospital/Clinics plan • Medical Reserve Corps • Regional Economic Development Strategy

Source: 2014 Risk MAP Resilience Workshop, revised 2020

Convener

The Lincoln County Emergency Manager will take responsibility for plan implementation and will facilitate the Natural Hazard Mitigation Coordinating body meetings and will assign tasks such as updating and presenting the plan to the rest of the members of the committee. Plan implementation and evaluation will be a shared responsibility among all the assigned Natural Hazard Mitigation Coordinating Body Members. The convener's responsibilities include:

- Coordinate steering committee meeting dates, times, locations, agendas, and member notification;
- Documenting the discussions and outcomes of committee meetings;
- Serving as a communication conduit between the steering committee and the public/stakeholders;
- Identifying emergency management-related funding sources for natural hazard mitigation projects; and
- Utilizing the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.

Coordinating Body

The Lincoln County convener will form a Natural Hazard Mitigation Coordinating Body (Steering Committee or Coordinating Body) for updating and implementing the NHMP. The coordinating body responsibilities include:

- Attending future maintenance and plan update meetings (or designating a representative to serve in your place);
- Serving as the local evaluation committee for funding programs such as the Hazard Mitigation Grant Program funds and Flood Mitigation Assistance program funds;
- Prioritizing and recommending funding for natural hazard risk reduction projects;
- Evaluating and updating the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule;
- Developing and coordinating ad hoc and/or standing subcommittees as needed; and
- Coordinating public involvement activities.

Members

Staff from County departments, cities, special districts, and other local, state, and federal partners—identified in the Acknowledgements section of this NHMP—comprise the NHMP steering committee. For a complete list of individuals and their affiliations, please refer to the Acknowledgements section.

To make the coordination and review of the NHMP as broad and useful as possible, the coordinating body will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. The roles of the internal and external partners are listed below.

Roles (Locals, DLCD, FEMA)

Implementation of the NHMP actions will be led primarily by local initiative through the identified implementation program (Table 4-1 and Table 4-2). FEMA, DLCD and other state agencies (OEM, DOGAMI, Business Oregon) will assist with project development and implementation when asked.

Locals

The local coordinating body as identified in the NHMP process will initiate the process of implementing the identified actions. The actions identified in this report will also be provided as distinct actions within the county's NHMP. Quarterly, and as needed, the committee will meet to review actions and report on progress. As needed, the local committee will call upon DLCD staff (Regional Solutions Team, Oregon Coastal Management Program) to provide technical assistance in moving an action forward.

DLCD

Governor Kitzhaber's Executive Order No. 11-12 signed on December 16, 2011 established 11 Regional Solutions Centers throughout the State of Oregon. State agency staff are co-located in Regional Solutions Centers and take a collaborative approach to problem-solving to maximize economic and community development opportunities at the state, regional and local level. Regional Advisory Committees adopt annual work plans that focus Team members' attention on projects that will leverage public, private and civic sector resources to address regional priorities. DLCD actively participates in the Regional Solutions framework along with the Oregon Military Department – Office of Emergency Management, Department of Environmental Quality, Department of Transportation, Business Oregon, the Infrastructure Finance Authority, and others. Key stakeholders include counties, cities, special districts, hospitals, utility providers, fire departments, business and property owners, volunteer groups (e.g., CERT), and citizens. Because the Regional Solutions Team is active in this region, it should be viewed as a potential resource during the implementation phase of this planning effort.[81]

FEMA

Staff from FEMA will assist on an as needed basis to provide technical assistance with action item implementation. They will aid with federal grant programs.

Implementation through Existing Programs

The NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the county. Within the plan, FEMA requires the identification of existing

[81] By way of example, Clatsop County and the cities of Gearhart, Seaside and Cannon Beach are served by the North Coast Regional Solutions Center located in the City of Tillamook. The North Coast Regional Solutions' adopted 2014-15 Work Plan identifies 'Resilience Planning' as one of its priority projects.

programs that might be used to implement these action items. Lincoln County, and the participating cities and special districts, currently address statewide planning goals and legislative requirements through their comprehensive land use plans, capital improvement plans, mandated standards and building codes. To the extent possible, Lincoln County, and participating jurisdictions (cities and special districts), will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the NHMP's recommendations are consistent with the goals and objectives of the participating cities', special districts', and county's existing plans and policies. Where possible, Lincoln County, and participating jurisdictions, should implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence often have support from residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Examples of plans, programs or agencies that may be used to implement mitigation activities include:

- City and County Budgets
- Community Wildfire Protection Plans
- Comprehensive Land Use Plans
- Economic Development Action Plans
- Zoning Ordinances & Building Codes

For additional examples of plans, programs or agencies that may be used to implement mitigation activities refer to list of plans in Volume II - Appendix C, *Community Profile* and Volume III, *Jurisdictional Addenda*.

Plan Maintenance

Plan maintenance is a critical component of the NHMP. Proper maintenance of the plan ensures that this plan will maximize the county and participating city's efforts to reduce the risks posed by natural hazards. This section was developed by the University of Oregon's Partnership for Disaster Resilience and includes a process to ensure that a regular review and update of the plan occurs. The convener, coordinating body, and local staff are responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Meetings

The convener will meet monthly to ensure implementation of the NHMP remains on schedule. The Coordinating Body will meet quarterly to complete the following tasks. During at least one meeting per year, the Coordinating Body will:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

During at least one other meeting the Coordinating Body will:

- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

These meetings are an opportunity for the cities and special districts to report back to the county on progress that has been made towards their components of the NHMP.

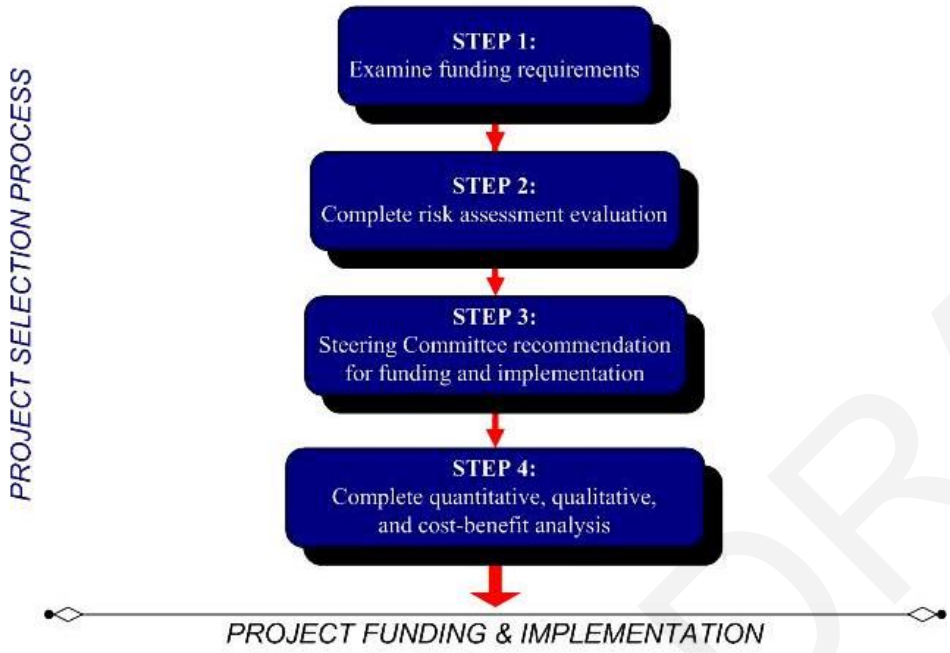
The Coordinating Body will meet quarterly and is scheduled to occur in October, January, April, and July of each year.

The convener will be responsible for documenting the outcome of the semi-annual meetings in Appendix B. The process the coordinating body will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the county and participating jurisdictions to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a NHMP that remains current and relevant to the participating jurisdictions.

Project Prioritization Process

The Disaster Mitigation Act of 2000 requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore, the project prioritization process needs to be flexible. Committee members, local government staff, other planning documents, or the risk assessment may be the source to identify projects. Figure 4-2 illustrates the project development and prioritization process.

Figure 4-2 Action Item and Project Review Process



Source: Oregon Partnership for Disaster Resilience, 2008.

Step 1: Examine funding requirements

The first step in prioritizing the plan's action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the county's proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA's Building Resilient Infrastructure and Communities competitive grant program (BRIC), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Please see Appendix E, *Grant Programs and Resources* for a more comprehensive list of potential grant programs.

Because grant programs open and close on differing schedules, the coordinating body will examine upcoming funding streams' requirements to determine which mitigation activities would be eligible. The coordinating body may consult with the funding entity, Oregon Military Department – Office of Emergency Management (OEM), or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the coordinating body's semi-annual plan maintenance meetings.

Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan's action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The coordinating body will determine whether the plan's risk assessment supports the

implementation of eligible mitigation activities. This determination will be based on the location of the potential activities, their proximity to known hazard areas, and whether community assets are at risk. The coordinating body will additionally consider whether the selected actions mitigate hazards that are likely to occur in the future or are likely to result in severe / catastrophic damages.

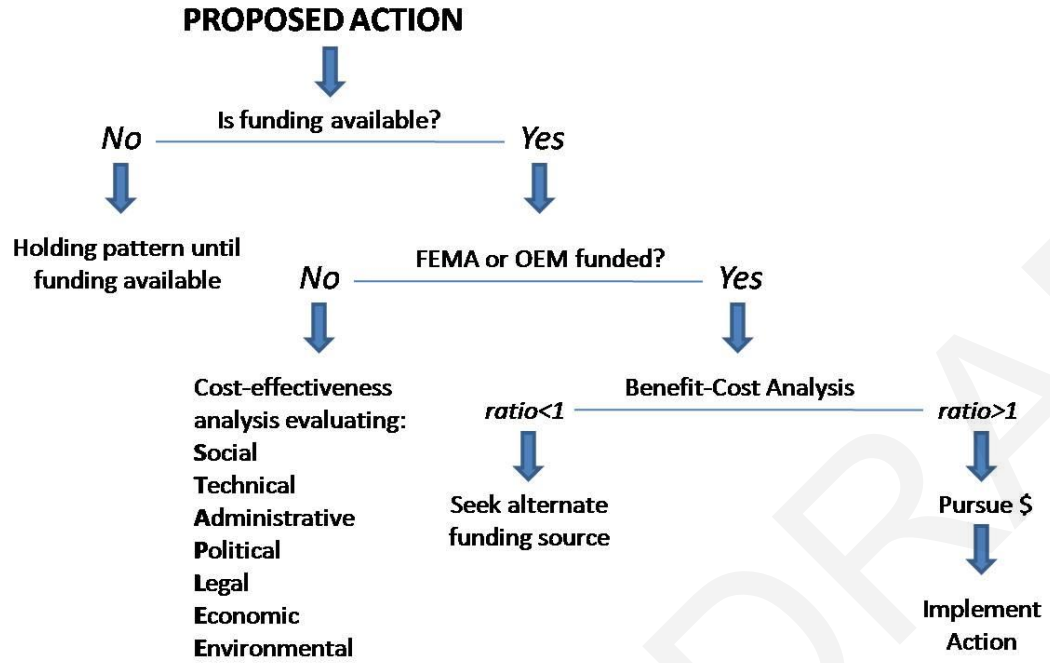
Step 3: Committee Recommendation

Based on the steps above, the coordinating body will recommend which mitigation activities should be moved forward. If the coordinating body decides to move forward with an action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The coordinating body will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

Step 4: Complete quantitative and qualitative assessment, and economic analysis

The fourth step is to identify the costs and benefits associated with the selected natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity assists in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Figure 4-3 shows decision criteria for selecting the appropriate method of analysis.

Figure 4-3 Benefit Cost Decision Criteria



Source: Oregon Partnership for Disaster Resilience, 2010.

If the activity requires federal funding for a structural project, the Committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee will use a multivariable assessment technique called STAPLE/E to prioritize these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. The Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center has tailored the STAPLE/E technique for use in natural hazard action item prioritization

Continued Public Involvement and Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Lincoln County NHMP. Although members of the Coordinating Body represent the public to some extent, the public will have the opportunity to continue to provide feedback about the Plan.

To ensure that these opportunities will continue, the County and participating jurisdictions will:

- Post copies of their plans on corresponding websites;
- Place articles in the local newspaper directing the public where to view and provide feedback; and
- Use existing newsletters such as schools and utility bills to inform the public where to view and provide feedback.

In addition to the involvement activities listed above, Lincoln County will ensure continued public involvement by posting the Lincoln County NHMP on the County's website (https://www.co.lincoln.or.us/planning/page/natural-hazards-mitigation-plan). The Plan will also be archived and posted on the University of Oregon Libraries' Scholar's Bank Digital Archive (https://scholarsbank.uoregon.edu).

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. The Lincoln County NHMP is due to be updated by [Date to be inserted] The convener will be responsible for organizing the coordinating body to address plan update needs. The coordinating body will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000's plan update requirements.

The following 'toolkit' (Table 4-2) can assist the convener in determining which plan update activities can be discussed during regularly scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.

Table 4-2 Natural Hazards Mitigation Plan Update Toolkit

Question	Yes	No	Plan Update Action
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			Document changes in vulnerability in the risk assessment section
Do future annexations include hazard prone areas?			Document changes in vulnerability in the risk assessment section
Are there new high risk populations?			Document changes in vulnerability in the risk assessment section
Are there completed mitigation actions that have decreased overall vulnerability?			Document changes in vulnerability in the risk assessment section
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status

Question	Yes	No	Plan Update Action
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

Source: Oregon Partnership for Disaster Resilience, 2010, revised 2020.

Volume II: Appendices

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Appendix A: Glossary and Acronyms

Glossary

100-year flood means a flooding condition which has a one percent chance of occurring each year. The 100-year flood level is used as the base planning level for floodplain management in the National Flood Insurance Program. https://www.fema.gov/flood-zones

Cascadia Subduction Zone (CSZ) is the area where the seafloor plate (the Juan de Fuca and Gorda) is sliding down and below the North American plate.
https://pnsn.org/outreach/earthquakesources/csz

Community Wildfire Protection Plan (CWPP) In 2003, Congress passed the federal Healthy Forests Restoration Act (HFRA), which encourages local communities to collaborate with federal land managers to develop comprehensive fuels reduction strategies. This is accomplished through the creation of a Community Wildfire Protection Plan (CWPP).
https://www.fs.usda.gov/managing-land/fire

Disaster Mitigation Act of 2000 (DMA2K) amended the Stafford Act, including: streamlining the administration of disaster relief; changing FEMA's post-disaster programs for individuals and families, including creating the Individuals and Households Program; establishing minimum standards for public and private structures; requiring local and state natural hazards mitigation plans that meet a FEMA standard (Section 322); revising - in part - FEMA funding for the repair, restoration and replacement of damaged facilities (Section 406); revising FEMA's participation in the costs of WUI fire suppression through an expanded and renamed Fire Management Assistance Grant Program (Section 420); removing the requirement for post-disaster IHMT or HMST meetings and reports; and other amendments.
https://www.fema.gov/sites/default/files/2020-11/fema_disaster-mitigation-act-of-2000_10-30-2000.pd

El Niño-Southern Oscillation is a cycle in the Pacific Basin involving water and air temperatures that has a profound effect on weather patterns around the world, events typically last 6-18 months. https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso-nutshell

Firewise is a program developed by the National Fire Protection Association (NFPA) featuring templates to help communities reduce risk and protect property form the dangers of wildland fires, an interactive resource-rich website and training programs throughout the nation.
http://www.firewise.org

Floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. These areas, if left undisturbed, act to store excess flood water. https://www.fema.gov/flood-zones

Floodplain Administrator/Manager is the person designated by the governing body in a flood-prone community who is responsible for making floodplain determinations for construction sites, issuing building permits for floodplain construction, ensuring compliance and other floodplain management activities. https://www.fema.gov/floodplain-managers

Floodway is the channel of a river and the portion of the floodplain that carries most of the flood flow. Floodways are usually the area where water velocities and forces are the greatest and most destructive. The National Flood Insurance Program (NFIP) definition of floodway is the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. NFIP regulations, adopted in local ordinances, require that floodway be kept open so that flood flows are not obstructed or diverted onto other properties. https://www.fema.gov/flood-zones

Goal 7 of the statewide land use planning program calls for local comprehensive plans to include inventories, policies and implementing measures to guide development in hazard areas thereby reducing losses from flooding, landslides, earthquakes, tsunamis, coastal erosion and wildfires. https://www.oregon.gov/lcd/OP/Pages/Goal-7.aspx

Hazard is any situation that has the potential of causing damage to people, property or the environment.

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. (44 CFR 201.2) https://www.fema.gov/hazard-mitigation-planning

Hazard Mitigation Grant Program is the program authorized under Section 404 of the Stafford Act and implemented at 44 CFR Part 206, Subpart N, which authorizes funding for certain mitigation measures identified through the evaluation of natural hazards conducted under Section 322 of the Stafford Act (44 CFR 201.2). https://www.fema.gov/hazard-mitigation-grant-program

Hazus-MH (HAZards United States Multi-Hazard) is a standardized loss estimation methodology that is also a FEMA software program using mathematical formulas and Geographical Information Systems (GIS) data about building stock, local geology, etc. and the location and size of potential hazards (earthquakes, floods and hurricanes) to estimate physical, economic and social impacts of disaster. https://www.fema.gov/hazus

Landslide is any detached mass of soil, rock or debris that moves down a slope or a stream channel. https://www.oregongeology.org/Landslide/landslidehome.htm

LiDAR (Light Detection and Ranging) is an optical remote sensing technology that can measure the distance to and other properties of a target, by illuminating the target with light, often using pulses from a laser. http://www.oregongeology.org/lidar/

Major disaster is any natural catastrophe including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm or drought, or, regardless of cause, any fire, flood, or explosion in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance to supplement the efforts and available resources of states, local governments and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby (44 CFR 206.2). https://www.fema.gov/disasters

National Fire Plan is a federal program that helps manage the impact of wildfires on communities, it has five main components: (1) firefighting, (2) rehabilitation and restoration, (3) hazardous fuel reduction, (4) community assistance and (5) accountability. https://www.hsdl.org/?abstract&did=480165

National Flood Insurance Program is the program run by the federal government to improve floodplain management, to reduce flood-related disaster costs and to provide low cost flood insurance for residents of flood-prone communities. https://www.fema.gov/national-flood-insurance-program

Natural Hazard Mitigation Plan is a plan resulting from a risk assessment of the nature and extent of vulnerability to the effects of natural hazards present in a geographic area and actions needed to minimize future vulnerability to those hazards, especially a plan developed and adopted which meets the requirements of 44 CFR Part 201.4/5/6. https://www.fema.gov/hazard-mitigation-planning

Public Assistance is the part of the disaster assistance program in which the federal government supplements the efforts and available resources of state and local governments to restore certain public facilities or services. Public Assistance includes emergency assistance, debris removal, community disaster loans and the permanent repair, restoration or replacement of public and designated private nonprofit facilities damaged or destroyed by a major disaster and is further described under Section 406 of the Stafford Act. https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit

Senate Bill 762 in 2021 directed the Oregon Department of Consumer and Business Services and the Oregon State Fire Marshal to update building codes and defensible space requirements for structures located in the Wildland Urban Interface (WUI) rated in high and extreme risk areas. As regulations are put in place to implement this legislation, Lincoln County should implement these updated requirements through their building and land use codes. https://www.oregon.gov/odf/pages/sb762.aspx

Special Flood Hazard Area is the land area covered by the floodwaters of the base flood and is where the NFIP's floodplain management regulations must be enforced; also the area where the mandatory purchase of flood insurance applies. https://www.fema.gov/flood-zones

Stafford Act is the Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 100-707, which amended PL 91-606 and PL 93-288; then was further amended by PL 106-390, the Disaster Mitigation Act of 2000; and PL 109-295, the Post-Katrina Emergency Reform Act).

https://www.fema.gov/robert-t-stafford-disaster-relief-and-emergency-assistance-act-public-law-93-288-amended

State Hazard Mitigation Officer is the official representative of state government who is the primary point of contact with FEMA, other federal agencies and local governments in mitigation planning and implementation of mitigation programs and activities required under the Stafford Act. In Oregon, this person is on the staff of Oregon Emergency Management. https://www.fema.gov/state-hazard-mitigation-officers

State Interagency Hazard Mitigation Team is a team of state agency officials who, in 1997, Governor Kitzhaber directed Oregon Emergency Management to make a permanent body and establish regular meeting dates to understand losses arising from natural hazards and coordinate recommended strategies to mitigate loss of life, property and natural resources. http://www.oregon.gov/oem/Councils-and-Committees/Pages/IHMT.aspx

Subduction zone is the area between two converging plates, one of which is sliding down and below the other. http://www.oregongeology.org/sub/publications/ims/ims-028/unit20.htm

Subduction zone earthquake is an earthquake along the subduction zone. In Oregon, this refers to the Cascadia Subduction Zone (CSZ), which lies offshore of the Oregon, California, and Washington Coasts. https://www.oregongeology.org/pubs/ims/ims-028/unit20.htm

Vulnerability is the susceptibility of life, property, or the environment to damage if a hazard manifests to potential.

Wildfire hazard zone (OAR Chapter 629, Division 44) is the portion of a local government jurisdiction that has been determined to be at risk of a catastrophic wildfire. https://secure.sos.state.or.us/oard/displayChapterRules.action?selectedChapter=82

Wildland-urban interface (WUI) is an area where structures are adjacent to or are intermingled with natural vegetation fuels which is prone to the occurrence of wildland fires. https://www.usfa.fema.gov/wui/

Acronyms

ASFPM – Association of State Floodplain Managers

BLM – Bureau of Land Management

CSZ – Cascadia Subduction Zone

CWPP – Community Wildfire Protection Plan

DEQ – Department of Environmental Quality

DLCD – Oregon Department of Land Conservation and Development

DOGAMI – Oregon Department of Geology and Mineral Industries

FEMA – Federal Emergency Management Agency

FMA – Flood Mitigation Assistance

HMA – Hazard Mitigation Assistance

HMGP – Hazard Mitigation Grant Program

NHMP – Natural Hazard Mitigation Plan

NFPA – National Fire Protection Association

ODF – Oregon Department of Forestry

OEM – Oregon Department of Emergency Management

OPRD – Oregon Parks and Recreation Department

OWRD – Oregon Water Resourced Department

RFPD – Rural Fire Protection District

SFHA – Special Flood Hazard Area

SRGP – Seismic Rehabilitation Grant Program

USFS – United States Forest Service

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Appendix B: Planning and Public Process

This appendix describes the changes made to the 2020 Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) during the 2025 NHMP update process.

Project Background

Lincoln County, its participating cities, and special districts collaborated with the Oregon Partnership for Disaster Resilience (OPDR) to update the multi-jurisdictional 2020 Lincoln County Natural Hazard Mitigation Plan (NHMP). In accordance with the Disaster Mitigation Act of 2000, communities must update their mitigation plans every five years to remain eligible for FEMA's Hazard Mitigation Assistance (HMA) programs. These include the Flood Mitigation Assistance (FMA) program, and the Hazard Mitigation Grant Program (HMGP). The 2025 HMA Program and Policy Guide, which went into effect on July 30, 2024, outlines updated eligibility criteria and expanded support for climate resilience and hazard-specific mitigation strategies. The Lincoln County NHMP update was funded through a FEMA mitigation planning grant, with the non-federal match provided by the Oregon Legislature.

OPDR and the Steering Committee made several changes to update and consolidate the previous NHMP. Twelve special districts were added to the NHMP. Major changes are documented and summarized in this appendix.

NHMP Update Changes

The sections below only discuss *major* changes made to the NHMPs during the NHMP update process. Major changes include the replacement or deletion of large portions of text, changes to the NHMP's organization, new mitigation action items, and the addition of jurisdictional addenda to the NHMP. If a section is not addressed in this memo, then it can be assumed that no significant changes occurred.

The NHMP's format and organization have been altered to fit within OPDR's NHMP templates. Table B-1 lists the 2020 Lincoln County NHMP section names and the corresponding 2025 section names, as updated (major Volumes are highlighted). This memo will use the 2025 NHMP update section names to reference any changes, additions, or deletions within the NHMP. As the table indicates, the structure of the NHMP has been modified. Most notably via the moving of the appendices to Volume II and the jurisdictional addenda to Volume III. The removal of the OCCRI Report and the action item forms to reduce plan length and complexity.

Table B-1 Changes to NHMP Organization

2020 Lincoln County MNHMP	2025 Lincoln County MNHMP
Acknowledgements	Acknowledgements
Table of Contents	Table of Contents
Approval Letters and Resolutions	Approval Letters and Resolutions
FEMA Review Tool	-
Volume I: Basic Plan	**Volume I: Basic Plan**
Plan Summary	Plan Summary
Section 1: Introduction	Section 1: Introduction
Section 2: Hazard Identification and Risk Assessment	Section 2: Hazard Identification and Risk Assessment
Section 3: Mitigation Strategy	Section 3: Mitigation Strategy
Section 4: Plan Implementation and Maintenance	Section 4: Plan Implementation and Maintenance
Volume III: Appendices	**Volume II: Appendices**
Appendix A: Action Item Forms	-
-	Appendix A: Acronyms and Glossary
Appendix B: Planning and Public Process	Appendix B: Planning and Public Process
Appendix C: Community Profile	Appendix C: Community Profile
Appendix D: Economic Analysis of Natural Hazard Mitigation Projects	Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
Appendix E: Grant Programs and Resources	Appendix E: Grant Programs and Resources
Appendix F: Community Survey	Appendix F: Community Survey
Appendix G: Future Climate Projections	-

Table B-1 Changes to NHMP Organization

2020 Lincoln County MNHMP	2025 Lincoln County MNHMP	
Volume II: Jurisdictional Addenda	**Volume II: Jurisdictional Addenda**	
Depoe Bay	Depoe Bay	Beverly Beach Water District
Lincoln City	Lincoln City	Central Oregon Coast Fire & Rescue District
Newport	Newport	Depoe Bay Fire District
Siletz	Siletz	Gleneden Sanitary District
Toledo	Toledo	Kernville-Gleneden Beach-Lincoln Beach Water District
Waldport	Waldport	North Lincoln Fire & Rescue District
Yachats	Yachats	Otter Rock Water District
Central Lincoln PUD	Central Lincoln People's Utility District	Panther Creek Water District
Lincoln County School District	Lincoln County School District	Salishan Sanitary District
Seal Rock Water District	Seal Rock Water District	Siletz Valley Fire District
		Southwest Lincoln County Water People's Utility District

Front Pages

- The NHMP's cover has been updated.
- Acknowledgements have been updated to include the 2025 project partners and planning participants.
- The FEMA approval letter and county documents of adoption are included.

Volume I: Basic Plan

Volume I provides the overall NHMP framework for the 2025 Multi-jurisdictional NHMP update. Volume I includes the following sections:

Plan Summary
The 2025 NHMP includes an updated NHMP summary that provides information about the purpose of natural hazard mitigation planning and describes how the NHMP will be implemented.

Section 1: Introduction
Section 1 introduces the concept of natural hazard mitigation planning and answers the question, "Why develop a mitigation plan?" Additionally, Section 1 summarizes the 2025 NHMP update process, and provides an overview of how the NHMP is organized. Section 1 also outlines the layout of the NHMP update, which has been altered as described herein.

Section 2: Hazard Identification and Risk Assessment
This section consists of three phases: hazard identification, vulnerability assessment, and risk analysis. The first phase involves the identification of hazard geographic extent, its intensity, and probability of occurrence. The second phase attempts to predict how different types of property and population groups will be affected by the hazard. The third phase involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period. Changes include:

- Two additional hazards were added: air quality/smoke and extreme heat.
- Hazard identification, characteristics, history, probability, vulnerability, and hazard specific mitigation activities were updated. Outdated and extraneous information was removed and links to technical reports were added as a replacement where relevant.
- Links to specific hazard studies and data are embedded directly into the NHMP where relevant and available.
- NFIP information was updated.
- The hazard vulnerability analysis has been updated for the county. City and special district hazard vulnerability is included with more detail within Volume III.

Section 3: Mitigation Strategy
This section provides the basis and justification for the mission, goals, and mitigation actions identified in the NHMP. The mission and goals were reviewed in relation to the State NHMP. The County and Steering Committee agreed to re-adopt the existing mission and plan goals.

Volume I, Section 3 details the County's mitigation strategy. Table B-2 includes the status of and changes to actions since the previous NHMP. All actions were renumbered in this update. Actions identified as still relevant are included in the updated action plan (Table 3-1, note that the mitigation action description has expanded to provide more detail).

Previous NHMP Actions that are Complete:
None

Previous NHMP Actions that are Not Complete and No Longer Relevant:
None

Table B-2 Status of All Hazard Mitigation Actions

2020 Action Item	2025 Action Item	Status	Still Relevant? (Yes/No)
Multi-Hazard #1	#1	Not Complete	Yes
Multi-Hazard #2	#2	Not Complete	Yes
Multi-Hazard #3	#3	Not Complete	Yes
Multi-Hazard #4	#4	Not Complete	Yes
Multi-Hazard #5	#5	Not Complete	Yes
Multi-Hazard #6	#6	Not Complete	Yes
Multi-Hazard #7	#7	Not Complete	Yes
Multi-Hazard #8	#8	Not Complete	Yes
Coastal Erosion #1	#9	Not Complete	Yes
Coastal Erosion #2	#10	Not Complete	Yes
Earthquake #1	#11	Not Complete	Yes
Earthquake #2	#12	Not Complete	Yes
Earthquake #3	#13	Not Complete	Yes
Tsunami #1	#14	Not Complete	Yes
Tsunami #2	#15	Not Complete	Yes
Flood #1	#16	Not Complete	Yes
Flood #2	#17	Not Complete	Yes

Table B-2 Status of All Hazard Mitigation Actions

2020 Action Item	2025 Action Item	Status	Still Relevant? (Yes/No)
Flood #3	#18	Not Complete	Yes
Flood #4	#19	Not Complete	Yes
Landslide #1	#20	Not Complete	No
Landslide #2	#21	Not Complete	Yes
Landslide #3	#22	Not Complete	Yes
Severe Weather #1	#23	Not Complete	Yes
Severe Weather #2	#24	Not Complete	Yes
Wildfire #1	#25	Not Complete	Yes
-	#26	New	-
-	#27	New	-
-	#28	New	-
-	#29	New	-
-	#30	New	-
-	#31	New	-
-	#32	New	-
-	#33	New	-
-	#34	New	-
-	#35	New	-
-	#36	New	-
-	#37	New	-
-	#38	New	-
-	#39	New	-
-	#40	New	-
-	#41	New	-
-	#42	New	-

Note: Actions 27-31 were developed in direct response to community engagement feedback.

Section 4: Plan Implementation and Maintenance
Lincoln County Emergency Management will now serve as the sole convener of the County Steering Committee, a role previously held by the Planning Department. Documentation for the City and Special District Steering Committees can be found in Volume III.

Volume II: Appendices

Below is a summary of the appendices included in the 2025 NHMP. Note that the OCCRI Report and action items forms included in the 2020 NHMP were removed from this update to reduce plan length and complexity.

Appendix A: Glossary and Acronyms
This appendix was updated with this version of the NHMP and includes common words and their acronyms found throughout the NHMP.

Appendix B: Planning and Public Process
This planning and public process appendix reflects changes made to the Lincoln County NHMP and documents the 2025 planning and public process.

Appendix C: Community Profile
The community profile has been updated.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
Updates are provided for the economic analysis of natural hazard mitigation projects.

Appendix E: Grant Programs and Resources
Updates have been made to grant programs and resources. This appendix will require continuous review and revision to reflect ongoing changes in the federal landscape

Appendix F: Community Survey
This survey was administered during the development of the NHMP by OPDR. This survey was utilized to inform the development of mitigation strategies and identification of community vulnerabilities. It is provided herein as documentation and to serve as a resource for future planning efforts.

Volume III: Jurisdictional Addenda

The addenda for the previously participating cities and special districts have been updated, as these jurisdictions have chosen to participate again in the Lincoln NHMP. Additionally, twelve new special districts have been added in this update.

Where appropriate, information has been consolidated, and references to relevant NHMP sections are provided within the addenda. New data and updated hazard information have been incorporated for the participating cities, and mitigation actions have been reviewed, revised, and prioritized as outlined in the addenda.

Public Participation Process

Lincoln County is committed to directly involving the public in the review and update of the NHMP. While Steering Committee members represent various public interests, residents were also given the opportunity to provide input through a community survey (Appendix F). The results of this survey were incorporated throughout the plan, including within the vulnerability assessment and the development and prioritization of mitigation actions.

The NHMP will be reviewed quarterly by the County NHMP Steering Committee and annually by the city and special district steering committees. Throughout the update process, the NHMP was made available on the Lincoln County website, and the updated version was open for public review and comment during the FEMA review period. Participating cities and special districts were included in the public press release (see link to press release to be added).

Engagement Summary

The planning process provided a variety of opportunities for the public and stakeholders to be involved.

The following agencies and organizations were provided multiple opportunities to inform the plan's content through a variety of mechanisms including the opportunity for comment on the draft plan via the meetings referenced above. The agencies and organizations represent local and regional agencies involved in hazard mitigation activities, those that have the authority to regulate development, neighboring communities, representatives of businesses, academia, and other private organizations, and representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to vulnerable populations. Additional agencies and organizations are identified within each jurisdictional addendum.

- List of agencies, organizations, non-profits, etc. that have been involved in the planning process.

Additionally, a survey was provided to the public during the early stages of the update cycle (Volume II, Appendix F). Information from this survey was used by the Steering Committee to help inform their risk assessment and mitigation strategies and was incorporated into several sections of the Community Profile (Volume II, Appendix C).

During the public review period there were several comments received that have been integrated into revisions of the NHMP. OPDR, the County Emergency Manager, and members of the Steering Committee also provided final edits and other updates to the NHMP prior to the public review period as reflected in the final document. The County Emergency Manager solicited public comments on the NHMP via a media release, Facebook, and County website.

Website Posting

The draft NHMP was made available for public comment from August 7 through 21, 2025. Members of the public were encouraged to send their feedback via email and a public feedback form connected to the website.

This information was shared on Lincoln County social media platforms and posted on the Lincoln County Emergency Management website (see link to press release/social media to be provided).

Figure B-1 Website Posting for Public Comment

To be provided

Lincoln County Steering Committee

Steering Committee members possessed familiarity with the community and hazard characteristics of Lincoln County. The Steering Committee guided the update process through NHMP mission and goal confirmation, hazard risk assessment completion, action item review and development, and other information sharing. The Steering Committee met formally on the following dates (virtually, unless otherwise indicated):

Meeting #1: September 25, 2024 – Kickoff
The meeting agenda focused on introducing the University of Oregon (UO) team to the Steering Committee and outlining the scope, deliverables, and timeline for the Natural Hazard Mitigation Plan (NHMP) update. Key topics included reviewing mapping methods for multi-hazard evacuation, discussing jurisdictional capabilities assessments, planning follow-up coordination with local jurisdictions, and confirming next steps and recurring meetings.

Meeting #2: February 28, 2024
The agenda focused on updating the Steering Committee on recent progress and providing a deeper understanding of Lincoln County's hazard landscape. The Oregon Department of Geology and Mineral Industries (DOGAMI) presented key findings from recent reports on earthquake, tsunami, and natural hazard risks. The committee also reviewed the county's hazard and vulnerability assessments and confirmed next steps, including scheduling upcoming meetings, distributing draft documents, and initiating community-level updates to mitigation strategies and capability assessments.

Meeting #3: April 21, 2025
The meeting focused on finalizing key components of the County NHMP. The Steering Committee aimed to approve the final County Hazard Vulnerability Assessment (HVA), review and refine the county-wide mission, goals, and mitigation strategy, and prioritize action items across various departments. Updates on recent progress were shared, and participants discussed edits to hazard scores, revisions to jurisdiction-specific actions, and the NHMP's implementation and maintenance program to ensure long-term effectiveness and accountability.

In addition to the meetings listed above, there were numerous informal meetings and email exchanges between the County, OPDR, Steering Committee members, and other local, state, and federal agencies. For jurisdiction-specific Steering Committee meetings, see the applicable

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Appendix C: Community Profile

The following section describes the county from several perspectives to help define and understand the county's sensitivity and resilience to natural hazards. Sensitivity and resilience indicators are identified through the examination of community capitals which include natural environment, social/demographic capacity, economic, physical infrastructure, community connectivity, and political capital. These community capitals can be defined as resources or assets that represent all aspects of community life. When paired together, community capitals can influence the decision-making process to ensure that the needs of the community are being met.[82]

Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs).

The Community Profile describes the sensitivity and resilience to natural hazards of Lincoln County, its Census Designated Places (CDPs), and its incorporated cities, as they relate to each capacity. It provides a snapshot in time when the plan was developed and will assist in preparation for a more resilient county. The information in this section, along with the hazard assessments located in Volume I, Section 2 should be used as the local level rationale for the risk reduction actions identified in Volume I, Section 3. The identification of actions that reduce the county's sensitivity and increase its resiliency assist in reducing overall risk of disaster, the area of overlap in Figure 2-1.

The U.S. Census delineates areas of settled population concentrations that are identifiable by name but are not legally incorporated as Census Designated Places (CDPs). There are two CDPs in Lincoln County as shown in Table C-1. Other unincorporated areas that are not included in the Census data include: Bayshore, Burnt Woods, Eddyville, Gleneden Beach, Harlan, Logsden, Otis, Otter Rock, Seal-Rock, Tidewater, and Wakonda Beach. In addition, the Confederated Tribes of Siletz Indians includes reservation and off-reservation trust lands within Lincoln County.

[82] Mary Emery and others, "Using Community Capitals to Develop Assets for Positive Community Change," *CD Practice* 13 (2006): 2

Table C-1 Lincoln County, Cities, and Census Designated Places

Incorporated Cities	Unincorporated Census Designated
Depoe Bay	Lincoln Beach
Newport	Rose Lodge
Lincoln City	
Siletz	
Toledo	
Waldport	
Yachats	

Source: Portland State University Population Research Center, U.S. Census Bureau Tiger Lines Files

The remainder of this appendix will provide detailed information for the unincorporated communities and summarized data for the incorporated cities. Detailed information for each incorporated city participating in this NHMP is provided within each city's addendum (Volume III).

Capability Assessment

The Capability Assessment includes the government and planning structures established within the community. In terms of hazard resilience, it is essential for political capital to encompass diverse government and non-government entities in collaboration; as disaster losses stem from a predictable result of interactions between the physical environment, social and demographic characteristics and the built environment.[83] Resilient political capital seeks to involve various stakeholders in hazard planning and works towards integrating the Natural Hazard Mitigation Plan with other community plans, so that all planning approaches are consistent.

Government Structure

Lincoln County government provides services citizens value and desire. The governance of Lincoln County is by three elected commissioners. The Board of County Commissioners manage Lincoln County affairs, in conjunction with other elected officials and Department heads. Figure C-1 is an organization chart illustrating county operations. See the appropriate city addendum for incorporated community government structure.

Existing Plans & Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include

[83] Mileti, D. 1999. Disaster by Design: a Reassessment of Natural Hazards in the United States. Washington D.C.: Joseph Henry Press.

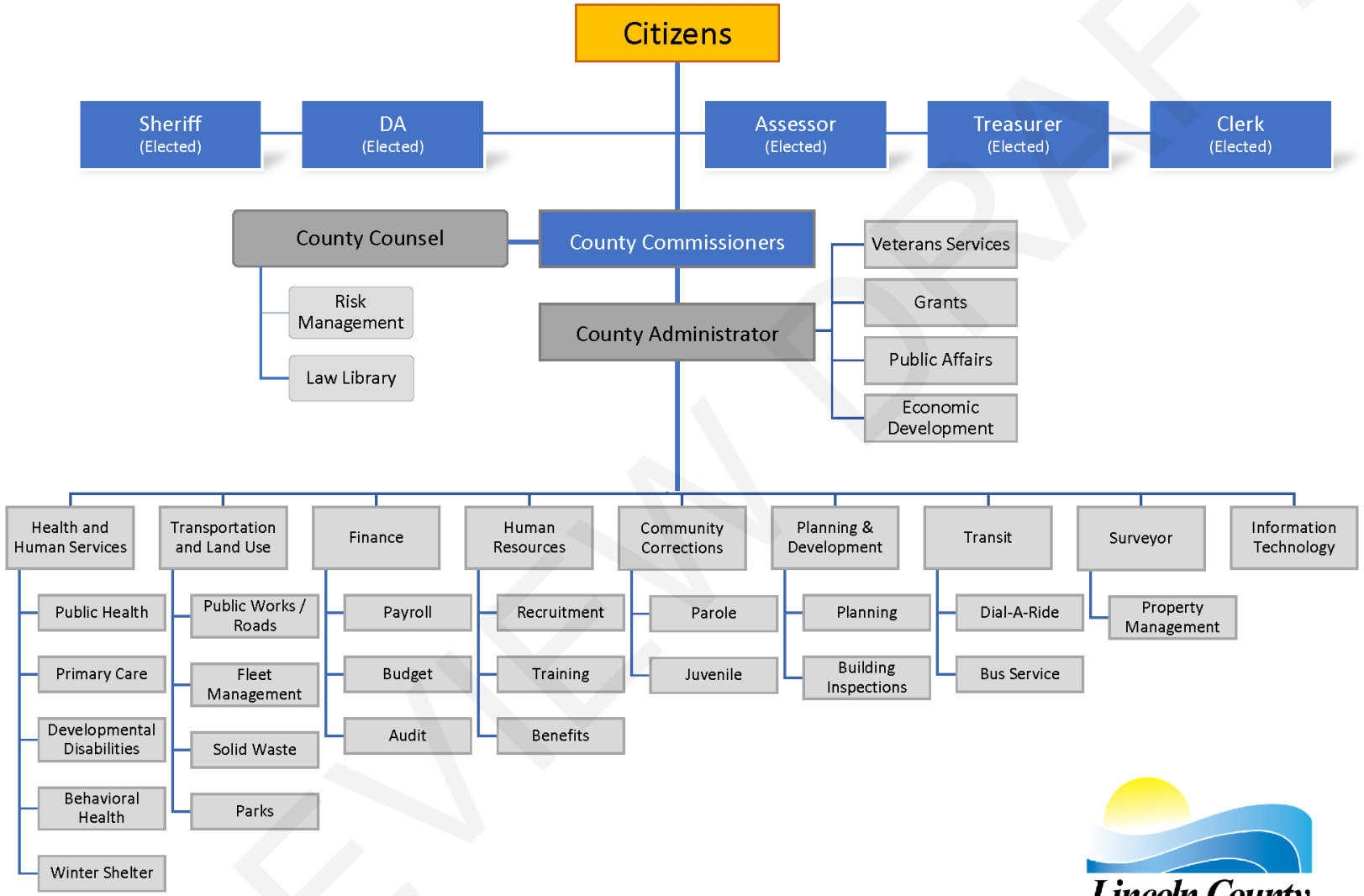
comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.[84]

The Lincoln County multi-jurisdictional Natural Hazard Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the County's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the County's existing plans and policies. Linking existing plans and policies to the Natural Hazard Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the county's resources.

Table C-2 existing plans related to Natural Hazards that are already in place within Lincoln County. For local plans see appropriate addendum in Volume III.

[84] Burby, Raymond J., ed. 1998. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.

Figure C-1 Lincoln County Organization Chart



Source: Lincoln County

Table C-2 Existing Plans

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
Lincoln County Land Use Code (2018)	Lincoln County Department of Planning and Development	Administer Development Code and zoning ordinance governing land uses in Lincoln County	Land use ordinances may be used or developed to direct future development away from known hazard areas.
Lincoln County Comprehensive Land Use Plan (2007)	Lincoln County Department of Planning and Development	To anticipate and plan for future land use within Lincoln County in accordance with Statewide Land Use Planning Program	Section VII, "Natural Disasters and Hazards Goal," outlines regulations related to flooding, earthquakes, erosion and deposition (landslides), wildfires, and hazardous soil conditions. It emphasizes that development in hazard-prone areas must include appropriate safeguards. Identifying and prioritizing these areas supports the creation of targeted action items.
Lincoln County Community Wildfire Protection Plan, updated (2024)	Lincoln County Fire Defense Board (Lincoln County)	Assists Lincoln County clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.	Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
Lincoln County Economic Development Strategic Plan, updated (2011)	Lincoln County Economic Development Alliance	The purpose of this document is to guide the activities of the Lincoln County Economic Development Council for the years of 2000 to 2020. The Plan should ensure that these activities are articulated to the residents of Lincoln County	An Economic Development Strategic Plan can be utilized to implement mitigation measures aimed at creating a disaster resilient economy.
Lincoln County Emergency Operations Plan (2020)	Lincoln County Sheriff's Office Emergency Management Division	The Lincoln County Emergency Operations Plan (EOP) outlines a coordinated framework for disaster response and recovery. It guides officials across agencies in managing emergencies and is regularly updated to reflect lessons learned from exercises and real events.	An EOP and NHMP are complementary plans that support community resilience. The NHMP focuses on reducing long-term risks from natural hazards through mitigation strategies, while the EOP outlines how to respond to and recover from emergencies. Together, they ensure a proactive and coordinated approach to disaster management.

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
Lincoln County Transportation System Plan (2007 - 2027)	Prepared by Lincoln County Planning and Development Dept., Angelo Planning Group, and CH2M Hill	The Lincoln County Transportation System Plan (TSP) outlines long-term transportation needs and guides the management and development of facilities. It fulfills state and federal requirements for urban area planning.	The Transportation Plan may be a resource to identify which roads and transportation systems are most vulnerable to natural disasters. Likewise, the TSP can be utilized to implement mitigation measures aimed at protecting "transportation disadvantaged" populations in emergency situations. When updated, the TSP can also include mitigation elements in its implementation considerations.
At Home in Lincoln County 2.0 Lincoln County Ten-Year Housing Plan (2012)	Lincoln County Commissioners	A plan to set the communities of Lincoln County on a path that will one day see homelessness disappear and every citizen has a decent, safe and affordable place to call home.	The Plan includes Planning and Zoning Policies: The County Planning Commission will review recommendations in the Ten-Year Plan addressing planning, zoning and fee issues related to housing creation and make recommendations to the Board of Commissioners for potential changes. The development of affordable housing needs to take into account high risk/vulnerability areas.
Bayshore Dune Management Plan (Background Report) (2012)	Lincoln County/ Terra Firma Geologic Services	Addresses requirements of Statewide Planning Goal 18: Beaches and Dunes.	Manages the dune at Bayshore on Alsea Spit, and area that was committed to development in the 1960s.

Source: Oregon Partnership for Disaster Resilience

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions in better understanding risk and can assist in documenting successes. Three County Departments are principally engaged in mitigation activities:

The Lincoln County Department of Planning and Development administers the Lincoln County Comprehensive Plan and Land Use Code, the State Structural Specialty Code (Building Division), and locally administers the Department of Environmental Quality On-Site Waste Management Program. Mitigation is approached in two ways- from a regulatory standpoint and by public outreach and education.

The mission of the Lincoln County Emergency Management Division is to coordinate and facilitate emergency plans, preparedness, response, and recovery within the County. The Lincoln County Emergency Management Division coordinates exercises, drills, training, and outreach activities that promote public awareness and educate audiences about all phases of natural hazards. Their function is also to support government agencies, volunteer organizations, private sector, and organizations with special needs.

The Lincoln County Department of Public Works is responsible for most of the physical assets of Lincoln County. It is the philosophy of the department that preventative maintenance is cost effective and preferable to repair or reconstruction.

Widely applied ongoing mitigation activities are described below.

The Lincoln County Code contains plan policies and zoning regulations addressing the following areas: LCC Section 1.005(3) Natural hazards, LCC Section 1.0010/0015: Land Use Planning Goals and Policies, LCC Section 1.0050/0055 Natural Hazards Goals and Policies, LCC Section 1.0060/0065 Forest Land Goals and Policies, LCC Section 1.0090/0095 Coastal Shorelands Goals and Policies, LCC Section 1.0100/1015 Beaches and Dunes Goals and Policies, LCC Section 1.1375 Timber Conservation Zone, LCC Section 1.1381 Coastal Shorelands Overlay Zone, LCC Section 1.1395 Flood Hazard Overlay Zone, LCC Section 1.1925 Geologic Hazards, and LCC Section 1.1930 Beaches and Dunes. The objective of implementing development standards pursuant to the above criteria is to mitigate for activities occurring in areas subject to a variety of natural hazards. In addition, the Lincoln County Department of Planning and Development makes available and distributes to the public a manual prepared by the Oregon Department of Geology and Mineral Industries in 199 entitled "Special Paper 31 Mitigating Geologic Hazards in Oregon: A Technical Reference manual". This manual takes a multi-hazard approach and covers a wide variety of topics ranging from characterizing hazards to legal considerations. A copy of this manual is included in Appendix E- Resource Directory. Finally, The Office of Information Technology produced a Geographic Information System map identifying the location of a variety of assets such as communications, education, medical, care, and utility facilities in relation to mapped 100-year flood and the tsunami inundation zones. This map is available for review at the Lincoln County Department of Planning and Development.

Lincoln County, in partnership with other local agencies and the American Red Cross, developed a booklet entitled, "Disaster Preparedness for You and Your Household- June 2007". A copy can be found on Appendix E-Resource Directory. Also, the Emergency Management Division has developed a program with the local fishing fleet and charter boats to assist in response and recovery in the event of a natural disaster. This is an ongoing program that will continue to evolve. The Auxiliary Communications Specialists (ACS) are an emergency communications unit that provides Lincoln County with a variety of unpaid professional skills, including administrative, technical, and operational support for governmental communications systems. ACS work as staff under the direct supervision of the Emergency Management Division. The Emergency Management Division makes regular appearances on radio broadcasts to educate and inform the public about all natural hazards potentially affecting the population and community of Lincoln County.

In addition to the above activities, Lincoln County is continuously engaged in a rigorous public awareness outreach campaign with regards to flood and coastal erosion hazards, earthquake and tsunami preparedness and annual windstorm activity. Lincoln County's website, www.co.lincoln.or.us, contains an abundance of information and links to other sites with respect to natural hazards in our coastal environment. The entire Lincoln County Code, including the Lincoln County Comprehensive Plan and Land Use Code, is accessible on the website. Special attention is paid to Flood, Earthquake and Tsunami preparedness on the Emergency Management Division's webpage. Numerous maps, explanations and evacuation routes are provided on this page.

Other current mitigation activities employed by these departments are described below.

Air Quality

Lincoln County actively addresses wildfire smoke and air quality through a combination of mitigation, preparedness, and recovery strategies. The county collaborates with state and federal agencies to provide public education, promote fire prevention, and support community planning. Resources include wildfire safety campaigns, defensible space guidelines, and emergency planning tools. The county also maintains seasonal updates and emergency alerts to keep residents informed during wildfire events.

To manage air quality, Lincoln County relies on data from the Oregon Department of Environmental Quality and shares public health guidance through its Emergency Management Division. This includes fact sheets, FAQs, and recommendations for schools and vulnerable populations during smoke events. Recovery efforts focus on health protection, safe cleanup, and environmental restoration after wildfires

Coastal Erosion

Lincoln County Department of Planning and Development

Lincoln County land use regulations addresses development on lands subject to ocean erosion. Section 1.1925 of the land use code establishes requirements for ocean front setbacks for new

development designed to compensate for identified shoreline recession. In addition, Section 1.1930 establishes standards for development in beach and dune areas intended to prevent development in identified critical hazard areas and reduce adverse impacts of development on shoreline stability.

As previously noted, coastal erosion hazards are identified in Environmental Hazard Inventory of Lincoln County, RNKR Associates, 1978, and in DOGAMI Open File Reports 0-04-09 and 0-07-01. Maps included in these studies are available at the Lincoln County Department of Planning and Development.

A copy of the Environmental Hazard Inventory for coastal Lincoln County can be found in Appendix E-Resource Directory. In addition, the Building Division applies requirements in areas subject to coastal erosion in accordance with the State Structural Specialty Code.

Drought

Lincoln County currently addresses the drought hazard through water conservation measures and water monitoring.

Drought Council

The Drought Council is responsible for assessing the impact of drought conditions and making recommendations to the Governor's senior advisors. The Water Availability Committee, a subcommittee of technical people who monitor conditions throughout the state and report these conditions monthly, advises the Drought Council. In this manner the Drought Council keeps up-to-date on water conditions.

Natural Resources Conservation Service

The United States Department of Agriculture Natural Resources Conservation Service (NRCS) has a regional service center located in Redmond (another is in Warm Springs). The NRCS is dedicated to three main priorities involving resource preservation one among them is water quantity and quality. The NRCS incorporates a conservation implementation strategy to preserve natural resources into the future.[85]

Earthquake

Lincoln County Department of Planning and Development

The Oregon State Building Codes Division adopts statewide standards for building construction that are administered by the state, cities, and counties throughout Oregon. The codes apply to new construction and to the alteration of, or addition to, existing structures. Within these

[85] NRCS – Lincoln County "Information for Partners and Participants," http://www.or.nrcs.usda.gov

standards are six levels of design and engineering specifications for seismic safety that are applied to areas according to the expected degree of ground motion and site conditions.

The structural code requires a site-specific seismic hazard report for critical facilities such as hospitals, fire and police stations, emergency response facilities, and special occupancy structures, such as schools and prisons. The seismic hazard report required by the structural code for essential facilities and special occupancy structures considers factors such as the seismic zone, soil characteristics including amplification and liquefaction potential, any known faults, and potential landslides. The findings of the seismic hazard report must be considered in the design of the building. The residential code incorporates prescriptive requirements for foundation reinforcement and framing connections based on the applicable seismic zone for the area.

Retrofitting of existing buildings may be required when such buildings are altered or their occupancy is changed. Requirements vary depending on the type and size of the alteration and whether there is a change in the use of the building that is considered more hazardous.

The Lincoln County Department of Planning and Development also makes available an informational hand-out entitled "Protect Your Home Against Earthquake Damage" produced by the Institute for Business and Home Safety.

Lincoln County Emergency Management Division

The Emergency Management Division works with the local community and coordinates with a variety of agencies, the business community, emergency responders, and institutions in outreach, education, and exercises regarding earthquake preparedness.

Lincoln County Department of Public Works

Once an earthquake occurs, an evaluation of roadways and bridges for damage will occur. Initial damage assessment will be logged and a plan of action developed. Life-line routes (arterial routes) have been identified and will receive priority. It is expected that inter-agency support will be critically needed. Lincoln County Public Works participates in inter-agency drills intended to improve their capability to respond to events such as earthquakes.

Lincoln County bridges are inspected every two years. Bridges are inspected in accordance with National Bridge Inspection Standards (NBIS). The County uses NBIS inspections to guide bridge maintenance work. In the event of a critical finding, emergency repair work may be initiated. Bridges found to be incapable of carrying legal loads are posted with load limits.

Geographic Information Systems (GIS) for Lincoln County has also mapped all the critical facilities and major public buildings so that inspections of these facilities can be assigned quickly when an earthquake occurs.

Tsunami (local and distant)

Lincoln County Department of Planning and Development

The department maintains the latest edition of Department of Geology and Mineral Industries' tsunami inundation zone map. The Building Division administers the State Structural Specialty Code which regulates construction or alteration of certain critical facilities and structures located within the Tsunami Inundation Zone. These regulations can be found in Oregon Revised Statute 455.

Lincoln County Emergency Management Division

The Emergency Management Division works with the local community and coordinates with a variety of agencies, the business community, emergency responders, and institutions in outreach, education, and exercises regarding earthquake preparedness.

Lincoln County Department of Public Works

Once a tsunami occurs, an evaluation of roadways and bridges for damages will occur. Initial damage assessment will be logged and a plan of action developed. Life-line routes (arterial routes) have been identified and will receive priority. It is expected that inter-agency support will be critically needed. Lincoln County Public Works Department participates in inter-agency drills intended to improve capability to respond to events such as a tsunami.

Lincoln County bridges are inspected for structural integrity every two years. Bridges are inspected in accordance with National Bridge Inspection Standards (NBIS). The County uses the NBIS inspections to guide bridge maintenance work. In the event of a critical finding, emergency repair work may be initiated. Bridges found to be incapable of carrying legal loads are posted with load limits.

Flood

Lincoln County Department of Planning and Development

Lincoln County administers the Comprehensive Plan and Land Use Code implementing land use regulations in compliance with ORS 197 and the Statewide Planning Goals. The County participates in the National Flood Insurance Program in accordance with FEMA requirements. Lincoln County Code Section 1.1395, Flood Hazard Overlay Zone, administers the NFIP at the local level. The purpose of the Flood Hazard Overlay Zone is to promote the public health, safety and welfare, and to minimize public and private losses due to flood conditions in specific areas, all in accordance with LCDC Statewide Planning Goal 7 and Lincoln County Comprehensive Plan Natural Hazard Policies. The zone applies to all areas within the 100-year flood boundary as identified on the Flood Boundary and Floodway Maps and the Flood Insurance Rate Maps (FIRM) as published by FEMA. The regulations are designed to reduce the risk of flood damage to new and substantially improved structures within known flood hazard areas. The County regularly distributes informational hand-outs, along with copies of LCC Section 1.1395 to the public,

agencies, insurance companies, lenders, among others. The County keeps detailed records of permit activity within flood hazard areas. The County also distributes several FEMA generated informational hand-outs, including but not limited to "Questions and Answers on the National Flood Insurance Program", and "Protect Your Home from Flood Damage- Mitigation Ideas for Reducing Flood Losses". A copy of the Lincoln County Comprehensive Plan and Land Use Code can be found in Appendix E: Resource Directory. Also in Appendix E is a copy of each of the informational hand-outs and permit forms and FEMA generated hand-outs referenced above.

Lower Siletz Flood Mitigation Project

Following the November 1999 flood, the County worked with Oregon Emergency Management and FEMA Region 10 to apply for and secure grant funds for flood mitigation activities. These grants may be used to fund mitigation activities that will reduce damage potential from future flood events. The first grants were secured in March 1999, with subsequent funding for further work received in both 2001 and 2002. The final grant-funded mitigation projects were completed in early 2003. Activities supported by this grant funding included the development of the Lower Siletz Flood Mitigation Plan along with mitigation activities pursuant to the plan on individual properties, primarily in the form of structure elevations. A copy of the Lower Siletz Flood Mitigation Plan and Final Report can be found in Appendix E: Resource Directory.

Digitized Flood Hazard Area Map

As part of the development of the County's Geographic Information System (LIS), the County has completed the digitizing of the Flood Insurance Rate Maps (FIRM) and the Flood Boundary and Floodway maps. This digital layer is now applied in conjunction with the County's digital tax lot layer to more readily identify individual properties and structures in relation to the mapped flood hazard area boundaries. It should be noted that this digital layer has no official status for regulatory or insurance purposes; the FIRMs are the officially adopted maps for these purposes. And, since the original source of this digital layer (the FIRMs) was produced at a large scale and low level of detail, the overlay of this information on the County's more geodetically accurate tax lot layer must be viewed as an approximation of the flood hazard area boundary. Nonetheless, this information has proven to be a very useful tool in assisting planners and property owners in generally identifying flood prone properties, and especially in identifying areas where more detailed field reconnaissance (e.g. elevation survey) is needed.

Lincoln County Emergency Management Division

Lincoln County Emergency Management utilizes the Everbridge alerting software to notify the public regarding flood conditions. The public can opt in to receive alerts specifically for the flood hazard areas along the County's major rivers. Additionally, addresses within the flood hazard area can be alerted using reverse 911 data or Emergency/Wireless Alert Systems in a life safety event. When a flood event is predicted, Emergency Management sends notification of the forecasted conditions. Throughout a flood event, Emergency Management maintains contact with the public through the Everbridge notification system to monitor current and forecasted conditions.

Lincoln County Department of Public Works

Lincoln County Road Department, using the culvert inventory, annually inspects and cleans culverts on county roads. Culverts needing to be replaced are identified and targeted for replacement. Culverts during past flooding events that could not handle the flow are identified for replacement with a larger capacity culvert.

County bridges have a structural inspection performed by an outside consulting firm every two years. The Lincoln County Public Works Department visually inspects bridges every six months. During flood events crews keep a visual check on bridges for drift buildup. After a major flood, crews are dispatched to recheck bridges for flood damage.

Landslide

Lincoln County Department of Planning and Development

The department maintains maps of areas subject to geologic hazards, including landslides. These maps include Oregon Department of Geology and Mineral Industries (DOGAMI) publications addressing the identification of areas subject to landslide hazards for Lincoln County: Environmental Geology of Lincoln County (Bulletin 81, 1973) and Evaluation of Coastal Erosion Hazard Zones in Lincoln County, Oregon (Open File Reports 0-04-01 and 0-07-01).

In addition, as part of the Lincoln County Comprehensive Plan, hazards along the developed coastal area were identified and mapped in Environmental Hazard Inventory of Coastal Lincoln County, RNKR Associates, 1978. Hazard areas may also be determined by other means including site specific geotechnical reports. Maps included in the RNKR study are part of the Lincoln County Comprehensive Plan Inventory and are available at the Department of Planning and Development.

Lincoln County addresses development in areas subject to geologic hazards in Section 1.1925 of the Lincoln County Code. This section outlines standards for development in identified landslide areas, including requirements for site specific engineering geologic reports.

In addition, the Building Division applies requirements in landslide prone areas in accordance with the State Structural Specialty Code. The Lincoln County Planning Department also provides an informational hand-out to the public entitled “Homeowner’s Landslide Guide- For Hillside Flooding, Debris Flows, Erosion and Landslide Control” prepared by FEMA and OEM. A copy can be found in the Appendix E-Resource Directory.

Lincoln County Department of Public Works

Lincoln County Public Works Department monitors areas in the county road system susceptible to landslides. Where feasible, the department will attempt to stabilize failing slopes with the use of rip rap, jersey barriers or other appropriate means. Likewise, trees within a slide area that are determined to be hazardous are removed. Once stable, hydro-seeding occurs to restart vegetation growth.

As noted, landslides usually occur during high precipitation events. Maintenance of culverts and other components of drainage systems are critical in preventing slope and roadbed failures and are monitored closely during storm events.

In the case of large landslides, such as the one that occurred on Immonen Road in the fall of 2006, the Public Works Department attempts to keep the road open to vehicular traffic. If this is not possible, the department attempts to provide a detour route. Large landslides generally cannot be "fixed." As they stabilize over time, the department makes repairs to the road. Large, stabilized landslides are monitored for new movements.

Severe Weather (Extreme Heat/Windstorm/Winter Storm)

Lincoln County Department of Planning and Development

The Oregon building code prescribes standards for structures which require specific design for identified wind load, with additional requirements addressing high exposure areas.

Lincoln County Emergency Management Division

The Emergency Management Division works with the local community and coordinates with a variety of agencies, the business community, emergency responders, and institutions in outreach, education, and exercises regarding severe weather preparedness. Emergency Management is alerted of any weather watches and in the event of high winds or an impending storm meeting the appropriate thresholds, a public notification is made using the Everbridge system.

Lincoln County Department of Public Works

Lincoln County Public Works faces a variety of winter related storms. The primary goal is to keep the roads open for emergency vehicles. Information is passed to different crews by radio. The county has two repeater sites and can communicate with Lincoln (dispatch service) as to emergency calls received. Lincoln County Road Dept. has access to the National Weather Service, which provides us with updated information.

Inter-agency agreements exist to coordinate services, manpower and equipment during major events. Managers constantly monitor weather reports during the late fall, winter and early spring seasons.

The Lincoln County Public Works Department works collaboratively with the Central Lincoln People's Utility District to identify and remove potentially hazardous trees near utility corridors, along roads, and near vital infrastructure. This often involves working with abutting property owners. This work is scheduled throughout the year in an attempt to reduce storm related events. However, in Lincoln County there are a great many trees and the problem can never be eliminated. Public Works also works collaboratively with the Lincoln County Solid Waste District in debris removal after a windstorm.

When a windstorm is forecasted, as one was in 2007, the road crew is placed on alert and assigned to different locations throughout the county for quick response. Each crew is in radio contact and notified when a hazard has occurred. Each crew carries a power saw for removal of trees that have blown over. The vehicle (pickup) is equipped with a snowplow that allows the crew to quickly push the tree off of the road. This reduces the amount of time exposed to additional trees blowing over and opens the road quickly and efficiently. Crews must evaluate each occurrence as to the possibility of down power lines and the potential for additional blow down.

Wildfire

Lincoln County Department of Planning and Development

Lincoln County has enacted a Comprehensive Land Use Plan and implementing land use regulations in compliance with ORS 197 and the Statewide Planning Goals. As a part of the comprehensive plan, the county has placed large portions of the county in farm and forest use zones, which serves to limit most forms of development in rural portions of the county, development that would likely increase wildfire hazard.

In addition, the county has enacted land use regulations which address fire protection for new development in both urban and rural settings, and include provisions for access, water supply, fuel breaks and similar fire safety issues.

The Lincoln County Planning Department makes available and readily distributes a manual prepared by the Oregon Department of Forestry entitled “Planning for Survival- How to protect your home from wildfire” Revised March 1988. A copy of the manual can be found in Appendix E- Resource Directory. The County is in the process of obtaining more current information available from Oregon Department of Forestry and local fire districts, which will be made available for public dissemination.

Lincoln County Emergency Management Division

Lincoln County Emergency Management partnered with other wildfire management agencies including Oregon Department of Forestry (ODF)in the development of the Community Wildfire Protection Plan (2024). ODF is involved with local fire chiefs and fire departments as well as rural fire protection districts to provide training. Firefighters get a broad range of experience from exposure to wildland firefighting. Local firefighters can also obtain their red card (wildland fire training documentation) and attend extensive workshops combining elements of structural and wildland firefighting, defending homes, and operations experience. ODF has been involved with emergency managers to provide support during non-fire events as well as working with industrial partners such as timber companies to share equipment in extremely large events.

Lincoln County Emergency Management Division also works with the local cooperators and community partners to provide outreach and education to the public on how they can mitigate possible wildfire damage to their properties and be prepared should they need to evacuate on an ongoing basis.

Synthesis

Lincoln County demonstrates a comprehensive and collaborative approach to hazard mitigation through the coordinated efforts of its Planning and Development, Emergency Management, and Public Works departments. The Planning and Development Department implements land use codes and hazard-specific regulations to address threats such as floods, landslides, coastal erosion, wildfires, and seismic events, while also providing public outreach and technical resources. The Emergency Management Division facilitates preparedness, response, and recovery initiatives, including public education campaigns, alert systems, and partnerships with local organizations such as the fishing fleet and Auxiliary Communications Specialists. Public Works emphasizes preventative maintenance and infrastructure resilience, conducting regular inspections and implementing mitigation strategies for roads, bridges, and drainage systems.

Lincoln County also engages in hazard-specific mitigation efforts, including wildfire smoke management, tsunami evacuation planning, drought monitoring, and severe weather response. Notable programs include the digitized flood hazard mapping system, the Lower Siletz Flood Mitigation Project, and the Community Wildfire Protection Plan (2024). These activities are supported by interagency coordination, GIS mapping, and public access to technical resources and educational materials. Overall, the county's proactive and integrated mitigation framework enhances its capacity to reduce vulnerability and build resilience against a wide spectrum of natural hazards.

Natural Environment Capacity

Natural environment capacity is recognized as the geography, climate, and land cover of the area such as, urban, water and forested lands that maintain clean water, air, and a stable climate.[86] Natural resources such as wetlands and forested hill slopes play significant roles in protecting communities and the environment from weather-related hazards, such as flooding and landslides. However, natural systems are often impacted or depleted by human activities adversely affecting community resilience.

Geography

Lincoln County is located on the Central Oregon Coast and covers an approximate area of 992 square miles in size or 634,880 acres. The Pacific Ocean and the Coast Range of The Cascade mountains border the county. Five major rivers run through Lincoln County and empty into the Pacific Ocean. The five major rivers are the Alsea, Salmon, Siletz, Yachats, and Yaquina rivers[87].

[86] Mayunga, J. 2007. Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach. Summer Academy for Social Vulnerability and Resilience Building.
[87] Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from http://www.coastbusiness.info/general_info.htm

Lincoln County is located within a 3rd level tier ecoregion described by the (EPA) as the Coast Range. The Coast Range is Lincoln County's dominant ecoregion. Mountains in the Coast Range are low in elevation and high in precipitation, creating lush evergreen forests. The Coast Range's naturally occurring diverse forests have given way to mono-crop plantings for timber harvest. Sedimentary soils are prone to failure following clear cuts and road building than areas with volcanic soils, which may be of concern as the commercial Douglas Fir forests located here are highly productive commercial logging areas. Landslides can impact the safety of nearby infrastructure and health of the region's waterways. The ecoregion's sedimentary soils can create more concerns for stream sedimentation than areas with volcanic soils. The Coast Range's lowlands include beaches, dunes, forests, lakes, marshes, and streams. Many wetlands in the ecoregion have been converted to dairy pastures.[88]

Lincoln County contains four sub eco-regions within the coast range: the Coastal Lowlands, the Coastal Uplands, the Volcanics, and the Mid-Coastal Sedimentary. The Coastal Lowlands is a diverse ecoregion and contains a variety of ecosystems and natural habitats. Typically, the coastal lowlands are comprised of beaches, dunes, and marine terraces. Wet forests, lakes, estuarine marshes, and tea-colored streams characterize the landscape. The Coastal Uplands ecoregion is characterized by headlands and low mountains surrounding the Coastal Lowlands. The Volcanics and Mid-Coastal Sedimentary are mainly forest areas with dense coniferous forests, steep grades, and areas of unstable soils; it also features intense anthropomorphic disturbances such as frequent logging activity and other resource extraction. The slopes in these ecoregions are prone to failure when disturbed[89].

Potential impacts of global climate change

Climate refers to the temperatures, weather patterns, and precipitation in Lincoln County. This section covers historic climate information. Estimated future climate conditions and possible impacts are also provided (for a more detailed analysis refer to the State Risk Assessment.) Lincoln County receives high levels of precipitation during winter months. It does not receive much snow, except for high peaks, and the temperature is moderate around the county. These climate patterns could see changes in the future due to climate change, affecting the overall geological and natural processes of the coast range ecosystems, topography, and habitats of the coast range ecoregion. Future climate projections indicate that the temperature is estimated warm 0.5 degrees Fahrenheit per decade. The Pacific Northwest is projected to have greater warming during summer than in the winter. Precipitation in the Pacific Northwest is expected to increase but to remain within historical ranges for rainfall. Winter precipitation is projected to increase, while summers will be longer and even drier than at present. Scientific data and research also anticipates an increase in intense precipitation events.[90]

[88] Ecoregions of Oregon. (n.d.). EPA. Retrieved March 8, 2014, from http://www.epa.gov/wed
[89] Thorson, T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik, J.M., Kagan, J., Pater, D.E., and Comstock, J.A., 2003. Ecoregions of Oregon (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).
[90] Oregon Wetlands Explorer. (2009). Coastal Climate Effects. Retrieved from http://oregonexplorer.info/wetlands/ClimateChange/CoastalClimateEffects

There is a consensus among the scientific community that global climate change is occurring and will have important ecological, social, and economic consequences over the next decades and beyond.[91] Extensive research shows that Oregon and other Western states already have experienced noticeable changes in climate and predicts that more change will occur in the future.[92]

In the Pacific Northwest, climate change is likely to (1) increase average annual temperatures, (2) increase the number and duration of heat waves, (3) increase the amount of precipitation falling as rain during the year, (4) increase the intensity of rainfall events, and 5) increase sea level. These changes are also likely to reduce winter snowpack and shift the timing of spring runoff earlier in the year. [93]

These anticipated changes point toward some of the ways that climate change is likely to impact ecological systems and the goods and services they provide. There is considerable uncertainty about how long it would take for some of the impacts to materialize, and the magnitude of the associated economic consequences. Assuming climate change proceeds as today's models predict, however, some of the potential economic impacts of climate change in the Pacific Northwest will likely include: [94]

Potential impact on agriculture and forestry

Climate change may impact Oregon's agriculture through changes in growing season, temperature ranges, and water availability. .[95] Climate change may impact Oregon's forestry

[91] Karl, T.R., J.M. Melillo, and T.C. Peterson, eds. 2009. *Global Climate Change Impacts in the United States.* U.S. Global Change Research Program. June. Retrieved June 16, 2009, from www.globalchange.gov/usimpacts; and Pachauri, R.K. and A. Reisinger, eds. 2007. ***Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.***

[92] Doppelt, B., R. Hamilton, C. Deacon Williams, et al. 2009. *Preparing for Climate Change in the Upper Willamette River Basin of Western Oregon.* Climate Leadership Initiative, Institute for a Sustainable Environment, University of Oregon. March. Retrieved June 16, 2009, from http://climlead.uoregon.edu/pdfs/willamette_report3.11FINAL.pdf and Doppelt, B., R. Hamilton, C. Deacon Williams, et al. 2009. *Preparing for Climate Change in the Rogue River Basin of Southwest Oregon.* Climate Leadership Initiative, Institute for a Sustainable Environment, University of Oregon. March. Retrieved June 16, 2009 from http://climlead.uoregon.edu/pdfs/ROGUE percent20WS_FINAL.pdf

[93] Mote, P., E. Salathe, V. Duliere, and E. Jump. 2008. Scenarios of Future Climate for the Pacific Northwest. Climate Impacts Group, University of Washington. March. Retrieved June 16, 2009, from http://cses.washington.edu/db/pdf/moteetal2008scenarios628.pdf; Littell, J.S., M. McGuire Elsner, L.C. Whitely Binder, and A.K. Snover (eds). 2009. "The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate - Executive Summary." In The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate, Climate Impacts Group, University of Washington. Retrieved June 16, 2009, from www.cses.washington.edu/db/pdf/wacciaexecsummary638.pdf; Madsen, T. and E. Figdor. 2007. When it Rains, it Pours: Global Warming and the Rising Frequency of Extreme Precipitation in the United States. Environment America Research & Policy Center and Frontier Group.; and Mote, P.W. 2006. "Climate-driven variability and trends in mountain snowpack in western North America." Journal of Climate 19(23): 6209-6220.

[94] The issue of global climate change is complex and there is a substantial amount of uncertainty about climate change. This discussion is not intended to describe all potential impacts of climate change but to present a few ways that climate change may impact the economy of cities in Oregon and the Pacific Northwest.

[95] "The Economic Impacts of Climate Change in Oregon: A preliminary Assessment," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, October 2005.

through increase in wildfires, decrease in the rate of tree growth, change in mix of tree species, and increases in disease and pests that damage trees. [96]

Potential impact on tourism and recreation

Impacts on tourism and recreation may range from: (1) decreases in snow-based recreation if snow-pack in the Cascades decreases, (2) negative impacts to tourism along the Oregon Coast as a result of damage and beach erosion from rising sea levels[97], (3) negative impacts on availability of water summer river recreation (e.g., river rafting or sports fishing) as a result of lower summer river flows, and (4) negative impacts on the availability of water for domestic and business uses.

Temperature

Temperatures in Lincoln County are generally moderate[98]. The temperature in the Coastal Lowlands during the coldest winter months usually maintains a temperature around 36 to 50 degrees Fahrenheit. The summer months are warmer, in July the temperature in the coastal lowlands is between 52 and 68 degrees Fahrenheit. Table C-3 below describes the typical average temperatures during winter and summer with a mean annual rainfall amount for each sub-eco-region in Lincoln County. Temperatures generally increase inland to the east.

Table C-3 Mean Precipitation and Temperature

Ecoregion	Mean Annual Rainfall Range (inches)	Mean Temperature Range (°F) January min/max	Mean Temperature Range (°F) July min/max
Coastal Lowlands	60-85	36/50	52/68
Coastal Uplands	70-125	36/48	52/68
Volcanics	70-200	30/46	50/76
Mid-Coastal Sedimentary	60-130	32/48	48/78

Source: US EPA. Ecoregions of Oregon: http://www.epa.gov/wed/pages/ecoregions/or_eco.htm

Precipitation and Snowpack

Lincoln County receives relatively high levels of precipitation when compared to Oregon as a whole, Oregon receives a mean annual precipitation amount of to 37 to 50 inches, and Lincoln County's mean annual precipitation data indicates higher than average precipitation levels. In the lower elevations or coastal lowlands, the normal annual precipitation is between 65 and 85 inches, while in the coastal uplands and inner areas precipitation rises precipitation levels are regularly over 85 inches annually. (Map C-1). November, December, and January are the rainiest

[96] "Economic Impacts of Climate Change on Forest Resources in Oregon: A Preliminary Analysis," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, May 2007.
[97] "The Economic Impacts of Climate Change in Oregon: A preliminary Assessment," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, October 2005.
[98] Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from http://www.coastbusiness.info/general_info.htm

months for which special attention should be paid to flood events during that time. In some locations, flood control dams have greatly reduced the incidence of damaging floods[99].

Snowpack is scarce in the county and the area usually only receives one to three inches annually; however, elevations above 3,500 feet are prone to snowfall that occasionally lasts into late spring[100]. For example, in January of 1982, Laurel Mountain (elevation 3,589') received 55 inches of snow. At Mary's Peak (elevation 4,097'), the highest peak in the Coast Range, snow often lasts into May.[101]

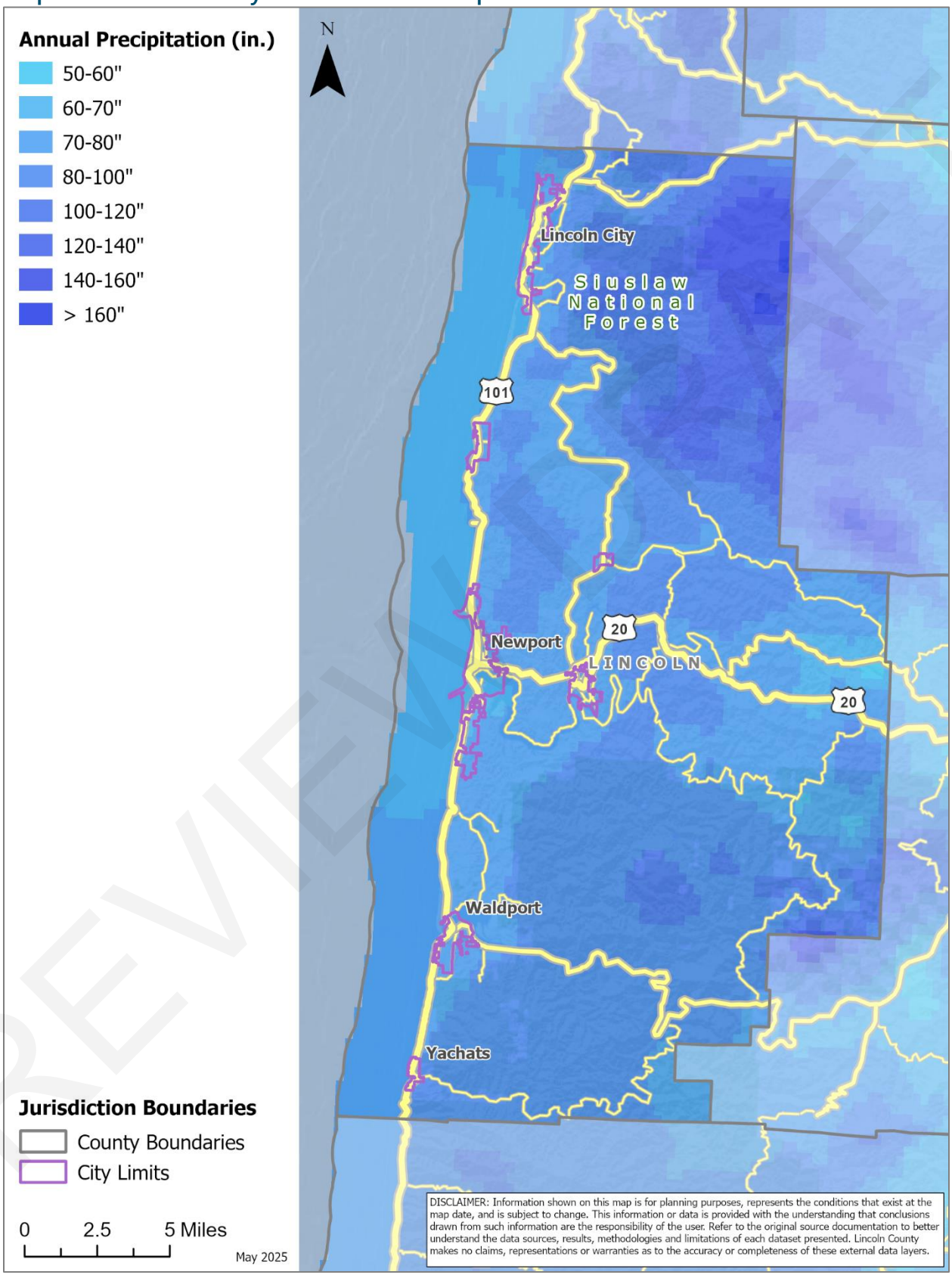
Projected Climate

The impacts of climate change in Oregon are largely driven by temperature and precipitation. Temperatures in the Pacific Northwest increased 1.3° Fahrenheit (F) over the historical period (1895-2011 observed period). Over the last 30 years, temperatures in Oregon have generally been above the 20th century average. The average annual temperatures in all but two years since 1998 have been above the average annual temperatures for the 20th century. Within the same historical period, annual precipitation amounts fall within the normal range of natural annual variability.[102] Temperatures in the Pacific Northwest region increased in the 20th Century by about 1.5° F. Climate projection models indicate that temperatures could rise by an average of 0.2° F to 1.0° F per decade. Average temperature change is projected to be 3.2° F by 2040 and 5.3° F by 2080. Temperature increases will occur throughout all seasons, with the greatest differences occurring in the summer months.[103]

Strong winds strike the Oregon Coast occasionally, in advance of winter storms. Wind speeds can exceed hurricane force, and in rare cases have caused significant damage to structures or vegetation. Damage is most likely at exposed coastal locations, but it may extend into inland valleys as well[104].

[99] Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top.
[100] Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from http://www.coastbusiness.info/general_info.htm
[101] Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top.
[102] Department of Land Conservation and Development. (2014). 2015 Oregon Natural Hazard Mitigation Plan. Retrieved from http://www.oregon.gov/LCD/HAZ/docs/2_State_Risk_Assessment.pdf
[103] Climate Impacts Group, "Climate Change," http://cses.washington.edu/cig/pnwc/cc.shtml#anchor6, accessed February 2013.
[104] Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top.

Map C-1 Lincoln County Mean Annual Precipitation



Source: Oregon Climate Service, map developed by OPDR

Synthesis

The physical geography, climate, and land use of an area interact to influence its vulnerability to natural hazards. In Oregon, factors such as heavy winter rainfall, river systems, rugged terrain, coastal storms, and human activities like logging and development increase the risk of hazards like flooding, erosion, and wind damage. High winds, especially in coastal and mountainous areas, can exceed 100–150 mph, causing structural damage and complicating emergency response.

Climate variability in the Pacific Northwest, driven by ocean-atmosphere interactions like El Niño and La Niña, is being intensified by human-induced climate change. This is altering the frequency and severity of natural hazards, including coastal flooding, wildfires, and heat-related illnesses. Rising temperatures and changing weather patterns demand proactive land and hazard management to protect lives, property, and economic stability.

Social/Demographic Capacity

Social/demographic capacity is a significant indicator of community hazard resilience. The characteristics and qualities of the community population such as language, race and ethnicity, age, income, educational attainment, and health are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. Population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning.

Population

Lincoln County is composed of seven incorporated municipalities and two census designated places. A substantial portion of the county's population resides in unincorporated areas administered by Lincoln County. Lincoln County experienced modest population growth between 2012 and 2018 (Table C-4).

Lincoln County accounts for roughly 1% of Oregon's population. Newport and Lincoln City are the county's largest cities at roughly 10,000 people for Newport and 9,000 for Lincoln City. Toledo is the third largest city with about a third of the population of the two larger cities (approximately 3,500). The unincorporated area of the county accounts for about 42% of the overall population (20,340) and is growing faster than the incorporated cities (0.8% AAGR). The rural unincorporated area of Lincoln County has a dispersed population, largely located near the coastline, of over 17,000 people.

Table C-4 Population Estimates and Change (2017 and 2020)

Jurisdiction	2017		2020		Change (2017-2020)		AAGR
	Number	Percent	Number	Percent	Number	Percent	
Oregon	4,025,127	-	4,237,256	-	212,129	5%	1.7%
Lincoln County	47,307	100%	50,395	100%	3,088	7%	2.1%
Incorporated	28,477	60%	29,605	59%	1,128	4%	1.3%
Unincorporated	18,830	40%	20,790	41%	1,960	10%	3.4%
Bayshore CDP	-	-	952	2%	-	-	-
Lincoln Beach CDP	1,571	3%	2,343	5%	772	49%	14.3%
Neotsu CDP	-	-	608	1%	-	-	-
Rose Lodge CDP	1,478	3%	1,933	4%	455	31%	9.4%
San Marine CDP	-	-	553	1%	-	-	-
Other Unincorporated	15,781	33%	14,401	30%	-	-	-3.0%

Source: Portland State University, Population Research Center, "Annual Population Estimates", 2020.
Social Explorer, U.S. Census Bureau, 2017 and 2022 American Community Survey 5-Year Estimates. Table B01003.

Tourists

Tourists are not counted in population statistics; and are therefore considered separately in this analysis. Table C-5 shows the estimated number of person nights in private homes, hotels and motels, and other types of accommodations. The table shows that, between 2021-2023, approximately 15% of all visitors to Lincoln County lodged in private homes, with 60% staying in hotels/motels, the remaining visitors stay on other accommodations (vacation homes/campgrounds). Tourists' lodging in hotels/motels suggests the prevalence of coastal tourism. For hazard preparedness and mitigation purposes, outreach to residents in Lincoln County will likely be transferred to these visitors in some capacity. Visitors staying at hotel/motels are less likely to benefit from local preparedness outreach efforts aimed at residents.

Table C-5 Annual Visitor Estimates in Person Nights

	Person-Nights (in 1000s)					
	2021		2022		2023	
	Total	%	Total	%	Total	%
All Overnight	5,131	100%	4,997	100%	4,702	100%
Hotel/Motel	3,097	60%	3,082	62%	2,750	58%
Private Home	834	16%	648	13%	647	14%
Other	1,199	23%	1,265	25%	1,304	28%

Source: Travel Oregon, The Economic Impact of Travel: 2023p, Dean Runyan Associates

Tourists are specifically vulnerable due to the difficulty of locating or accounting for travelers within the region. Tourists are often at greater risk during a natural disaster because of unfamiliarity with evacuation routes, communication outlets, or even the type of hazard that may occur. Knowing whether the region's visitors are staying in friends/relative's homes in hotels/motels, or elsewhere can be instructive when developing outreach efforts.

Temporary Residents

DOGAMI developed two key reports (Earthquake and Tsunami Impact Analysis for Coastal Lincoln County, Oregon (O-21-02) and Earthquake and Tsunami Impact Analysis for the Oregon Coast (O-25-01)) which include comprehensive economic and population impact assessments for the county.

In addition to evaluating impacts on the permanent population, the analysis also considers the total temporary population, a critical factor in coastal communities with high tourism and seasonal residency. This includes individuals staying in second homes, vacation rentals, condominium units, bed and breakfast facilities, hotels, motels, and campgrounds. For modeling purposes, the temporary population is estimated under the assumption of 100% occupancy of these facilities, reflecting peak-season conditions.

The reports estimate a temporary population of just under 55,000 throughout Lincoln County. Within the unincorporated areas of the county, temporary residents are especially concentrated in several key locations, including:

- Gleneden Beach: 3,869 temporary residents
- Bayshore: 2,207 temporary residents
- Lincoln Beach: 1,448 temporary residents
- South Beach State Park: 1,040 temporary residents
- Otter Rock: 1,040 temporary residents

This approach provides a more complete picture of potential human exposure and infrastructure demand during a major seismic event. Estimates of the permanent population within the tsunami inundation zone are derived from 2020 U.S. Census data and American Community Survey (ACS) data maintained by the U.S. Census Bureau.

Vulnerable Populations

Vulnerable populations include those with access and functional needs and may include seniors, disabled citizens, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. Vulnerability exists for migrant short-term workers for fish processing plants in Lincoln County. Hazard mitigation that targets the specific needs of these groups has the potential to greatly reduce their vulnerability. Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural hazards identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

Population size itself is not an indicator of vulnerability. More important is the location, composition, and capacity of the population within the community. Research by social scientists demonstrates that human capital indices such as language, race, age, income, education, and health can affect the integrity of a community. Therefore, these human capitals can impact community resilience to natural hazards.

Additional information on vulnerable populations is available via Lincoln County Public Health's Community Health Assessment and Strategic Plan.

Language Barriers

Special consideration should be given to populations who do not speak English as their primary language. Language barriers can be a challenge when disseminating hazard planning and mitigation resources to the public, and it is less likely they will be prepared if special attention is not given to language and culturally appropriate outreach techniques.

There are various languages spoken across Lincoln County; the primary language is English. Approximately 15% of the Lincoln County population speaks a language other than English, and about 5% of the population is not proficient in English (Table C-6). Rose Lodge (14%) the highest percentage of residents who have limited or no English language proficiency. Outreach materials used to communicate with, plan for, and respond to non-English speaking populations should take into consideration the language needs of these populations. The Lincoln County School District reports over 24 languages spoken within the District including Spanish, Mam, Akateko, Kanjobal, and Nahuatl.

Table C-6 Lincoln County Language Spoken at Home

Jurisdiction	Population 5 years and over	English Only		Multiple Languages		Limited or No English	
		Number	Percent	Number	Percent	Number	Percent
Oregon	4,013,618	3,401,404	85%	612,214	15%	212,163	5%
Lincoln County	48,425	44,445	92%	3,980	8%	1,568	3%
Incorporated	28,356	25,456	90%	2,900	10%	1,074	4%
Unincorporated	6,100	5,578	91%	522	9%	230	4%
Bayshore CDP	921	833	90%	88	10%	0	0%
Lincoln Beach CDP	2,701	2,648	98%	53	2%	12	< 1%
Neotsu CDP	502	492	98%	10	2%	0	0%
Rose Lodge CDP	1,448	1,105	76%	343	24%	197	14%
San Marine CDP	528	500	95%	28	5%	21	4%
Other Unincorporated	13,969	13,411	96%	558	4%	264	2%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table C16001.

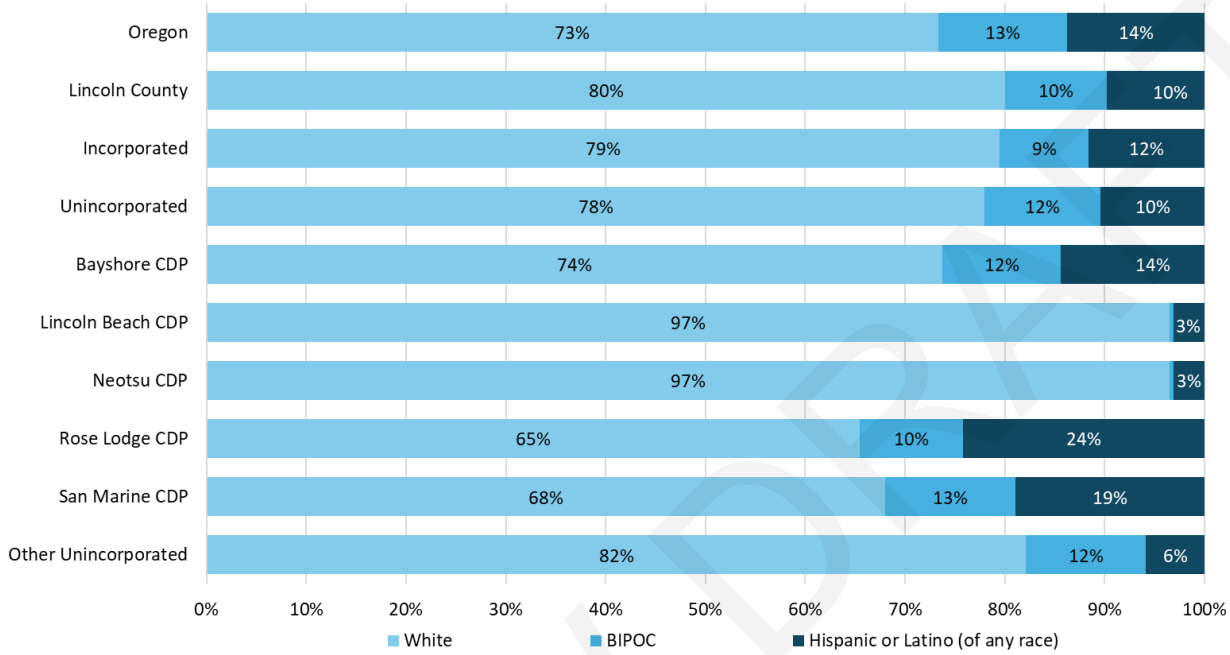
Race and Ethnicity

The impact in terms of loss and the ability to recover may also vary among minority population groups following a disaster. Studies have shown that racial and ethnic minorities can be more vulnerable to natural disaster events. This is not reflective of individual characteristics; instead, historic patterns of inequality along racial or ethnic divides have often resulted in minority communities that are more likely to have inferior building stock, degraded infrastructure, or less access to public services. Figure C-2 displays Lincoln County's population by race and Hispanic or Latino ethnicity.

Most of the population in Lincoln County is racially white (83%); Rose Lodge and San Marine have the largest percentages of BIPOC and Hispanic or Latino populations. 24% or Rose Lodge identifies as Hispanic or Latino, while 19% of San Marine identify as Hispanic or Latino. The

largest BIPOC community in the county is American Indian, which account for 1.7% of the county's population.

Figure C-2 White, BIPOC, and Hispanic or Latino



Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table A04001

It is important to identify specific ways to support all portions of the community through hazard mitigation, preparedness, and response. Culturally appropriate, and effective outreach can include both methods and messaging targeted to diverse audiences. For example, connecting to historically disenfranchised populations through already trusted sources or providing preparedness handouts and presentations in the languages spoken by the population will go a long way to increasing overall community resilience.

Sex

Lincoln County has slightly more females than males (Female 52%, Male: 48%). Of the unincorporated census-designated places, Rose Lodge has the largest male-female ratio at 55% males. San Marine has the largest female-male ratio at 59% female.[105] It is important to recognize that women tend to have more institutionalized obstacles than men during recovery due to sector-specific employment, lower wages, and family care responsibilities.

Age

Of the factors influencing socio demographic capacity, the most significant indicator in Lincoln County may be the age of the population. Depicted in Table C-7 as of 2022, 28% of the county

[105] Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates Table A02001

population is over the age of 64, a percentage that is projected to rise to 32% by 2045. The Lincoln County age dependency ratio is 77.9 (Bayshore and Neotsu have the largest age dependency ratios). The age dependency ratio indicates a higher percentage of dependent aged people to that of working age. The age dependency ratio for Lincoln County is expected to rise to 88.9 in 2045, largely because of the rise in the older age cohorts (population 65+). With a higher age-dependency ratio there will be fewer people of working age who can support mitigation and recovery from a natural disaster. In addition, as the population ages, the County may need to consider different mitigation and preparedness actions to address the specific needs of this group.

Table C-7 Population by Vulnerable Age Groups, 2022 and 2045 Forecast

Jurisdiction	Total	< 15 Years Old		> 64 Years Old		85+		15 to 64 Years Old	Age Dependency Ratio
		Number	Percent	Number	Percent	Number	Percent		
2022									
Oregon	4,229,374	705,391	17%	685,675	16%	87,583	2%	2,750,725	53.8
Lincoln County	50,334	6,676	13%	13,980	28%	1,392	3%	28,286	77.9
Incorporated	29,580	4,029	14%	7,646	26%	657	2%	17,248	71.5
Unincorporated	6,301	822	13%	1,887	30%	244	4%	3,348	88.2
Bayshore CDP	956	148	15%	397	42%	55	6%	356	168.5
Lincoln Beach CDP	2,779	295	11%	813	29%	149	5%	1,522	82.6
Neotsu CDP	547	76	14%	207	38%	0	0%	264	107.2
Rose Lodge CDP	1,491	270	18%	409	27%	15	1%	797	87.1
San Marine CDP	528	33	6%	61	12%	25	5%	409	29.1
Other Unincorporated	14,453	1,825	13%	4,447	31%	491	3%	7,690	87.9
2045									
Lincoln County	54,598	4,891	9%	17,246	32%	3,561	7%	28,900	88.9

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey Estimates Table A01001. Portland State University, Population Research Center, "Population Forecasts", 2020.

The age profile of an area has a direct impact both on what actions are prioritized for mitigation and how response to hazard incidents is carried out. School age children rarely make decisions about emergency management. Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Furthermore, children are more vulnerable to the heat and cold, have few transportation options and require assistance to access medical facilities. Older populations may also have special needs prior to, during and after a natural disaster. Older populations may require assistance in evacuation due to limited mobility or health issues. Additionally, older populations may require special medical equipment or medications, and can lack the social and economic resources needed for post-disaster recovery.

Families and Living Arrangements

Two ways the census defines households are by type of living arrangement and family structure. A householder may live in a “family household” (a group related to one another by birth, marriage or adoption living together); in a “nonfamily household” (a group of unrelated people living together); or alone. Table C-8 shows that family households (58%) are most households in the county. Of all households in the county, 34% are one-person non-family households

(householder living alone). As for people who are 65 years or older, 19% of them live alone in the county.

Table C-8 Household by Type, Including Living Alone

Jurisdiction	Total Households	Family Households		Householder Living Alone		Householder Living Alone (age 65+)	
	Estimate	Estimate	Percent	Estimate	Percent	Estimate	Percent
Oregon	1,680,800	1,042,388	62%	470,385	28%	203,513	12%
Lincoln County	22,483	13,039	58%	7,680	34%	4,357	19%
Incorporated	13,301	7,259	55%	4,999	38%	2,671	20%
Unincorporated	2,820	1,511	54%	1,058	38%	648	23%
Bayshore CDP	469	313	67%	141	30%	125	27%
Lincoln Beach CDP	1,358	672	49%	499	37%	309	23%
Neotsu CDP	257	169	66%	75	29%	42	16%
Rose Lodge CDP	502	319	64%	155	31%	106	21%
San Marine CDP	234	38	16%	188	80%	66	28%
Other Unincorporated	6,362	4,269	67%	1,623	26%	1,038	16%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table A10025

Table C-9 shows household structures for families with children. 10% of all households within the county are married family households that have children. Rose Lodge (17%) and Neotsu (6%) are the census-designated places that have the highest percentage of single-parent households. Outside of the census-designated places, the rest of unincorporated Lincoln County has 10% of all households are single-parent households. These populations will likely require additional support during a disaster and will inflict strain on the system if improperly managed.

Table C-9 Married-Couple and Single Parent Families with Children

Jurisdiction	Total Households	Married-Couple with Children		Single Parent with Children	
	Estimate	Estimate	Percent	Estimate	Percent
Oregon	1,680,800	313,165	19%	147,380	9%
Lincoln County	22,483	2,213	10%	1,848	8%
Incorporated	13,301	1,256	9%	1,100	8%
Unincorporated	2,820	264	9%	122	4%
Bayshore CDP	469	50	11%	4	1%
Lincoln Beach CDP	1,358	133	10%	9	1%
Neotsu CDP	257	33	13%	15	6%
Rose Lodge CDP	502	48	10%	86	17%
San Marine CDP	234	0	0%	8	3%
Other Unincorporated	6,362	693	11%	626	10%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table B11005

Table C-10 shows the number and percentage of residents in Lincoln County who permanently live in their residence, along with people who are temporarily living in the county, meaning they

are visiting. Temporary residents are more vulnerable to disasters because they may be uninformed on evacuation routes, have less community connections, or lack a geographic understanding of the county and its infrastructure.

Table C-10 Permanent and Temporary Residents

Jurisdiction	2018 Permanent Residents Number	2018 Permanent Residents Percent	2018 Temporary Residents Number	2018 Temporary Residents Percent	Total Population Number	Total Population Percent	Percent Permanent Residents
Lincoln County	47,685	100%	106,761	100%	154,447	100%	31%
Lincoln City	9,322	20%	17,227	16%	26,550	17%	35%
Gleneden Beach	1,015	2%	4,210	4%	5,225	3%	19%
Lincoln Beach	662	1%	1,649	2%	2,310	1%	29%
Depoe Bay	1,725	4%	2,239	2%	3,965	3%	44%
Otter Rock	299	1%	1,104	1%	1,403	1%	21%
Beverly Beach State Park	*0*	*0%*	*873*	*1%*	*873*	*1%*	*0%*
Newport	10,910	23%	10,472	10%	21,383	14%	51%
South Beach State Park	*0*	*0%*	*1,040*	*1%*	*1,040*	*1%*	*0%*
Siletz	1,283	3%	168	0%	1,451	1%	88%
Toledo	3,453	7%	993	1%	4,446	3%	78%
Seal Rock	381	1%	664	1%	1,044	1%	36%
Bayshore	1,171	2%	2,512	2%	3,683	2%	32%
Waldport	2,146	5%	1,464	1%	3,610	2%	59%
Beachside State Recreation Site	*0*	*0%*	*238*	*0%*	*238*	*0%*	*0%*
Tillicum Beach Campground	*0*	*0%*	*196*	*0%*	*196*	*0%*	*0%*
Yachats	847	2%	2,438	2%	3,285	2%	26%
Other	14,471	30%	11,589	11%	26,059	17%	56%

Source: Earthquake and Tsunami Impact Analysis for Coastal Lincoln County, Oregon, Oregon Department of Geology and Mineral Industries

Income

For the tables within this section, note that the percent change for some communities is incomplete. This is because in 2017, these communities were not Census Designated Places (CDP), meaning the census did not collect data for them at the time of the 2017 American Community Survey.

Household income and poverty status reflect socio-demographic capacity and local economic stability. While income helps compare economic areas, it doesn't show how income is distributed among residents. Table C-11 shows household income distribution 2017 and 2022.

Table C-11 Household Income

Household Income	2017^		2022		Change in Share	
	Households	Percent	Households	Percent	Households	Percent
Less than $15,000	2,098	10%	2,340	10%	242	< 1%
$15,000-$29,999	3,834	19%	3,040	14%	-794	-5%
$30,000-$44,999	3,219	16%	3,096	14%	-123	-2%
$45,000-$59,999	2,529	12%	3,242	14%	713	2%
$60,000-$74,999	2,253	11%	2,520	11%	267	< 1%
$75,000-$99,999	2,389	12%	2,801	13%	412	1%
$100,000-$199,999	3,530	17%	4,269	19%	739	2%
$200,000 or more	822	4%	1,175	5%	353	1%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates and 2013-2018 American Community Survey 5-Year Estimates, table A14001
Note: ^ - 2017 dollars adjusted for 2022 via Social Explorer's Inflation Calculator

Countywide, between 2017 and 2022 all income cohorts increased or decreased to differing degrees. For example, the share of people making $15,000-$29,000 decreased by 5%, while the share of people making $45,000-$59,000 increased by 2%. Overall, the county's income cohorts are trending upwards.

The 2022 median household income across Lincoln County is $57,794. This is higher than the inflation adjusted 2017 figure, representing a 12% increase in real incomes (Table C-12). Neotsu has the highest median household income while Rose Lodge has the lowest median household income.

Table C-12 Median Household Income

Jurisdiction	Median Household Income		Percent Change
	2017^	2022	
Oregon	$67,079	$76,632	14%
Lincoln County	$51,745	$57,794	12%
Incorporated	$52,314	$59,149	13%
Unincorporated	$45,896	$68,337	49%
Bayshore CDP	-	$58,259	-
Lincoln Beach CDP	$46,448	$60,508	30%
Neotsu CDP	-	$97,929	-
Rose Lodge CDP	$45,343	$51,964	15%
San Marine CDP	-	$73,025	-
Other Unincorporate	$46,465	$69,692	50%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates and 2013-2017 American Community Survey 5-Year Estimates, Table A14006
Note: ^ - 2017 dollars adjusted for 2022 via Social Explorer's Inflation Calculator

Table C-13 shows the average household income for the county. Neotsu has the highest average income, while San Marine has the lowest. While the incorporated cities saw a 24% increase in

average income since 2017, the unincorporated communities average income decreased by 10% in the same time frame.

Table C-13 Average Household Income

Jurisdiction	Average Household Income		Percent Change
	2017^	2022	
Oregon	$90,664	$103,330	14%
Lincoln County	$68,763	$78,457	14%
Incorporated	$64,770	$80,580	24%
Unincorporated	$76,296	$68,319	-10%
Bayshore CDP	-	$66,628	-
Lincoln Beach CDP	$82,792	$73,448	-11%
Neotsu CDP	-	$87,060	-
Rose Lodge CDP	$69,799	$59,090	-15%
San Marine CDP	-	$55,370	-
Other Unincorporated	$72,302	$70,443	-3%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates and 2013-2017 American Community Survey 5-Year Estimates, Table A14008
Note: ^ - 2017 dollars adjusted for 2022 via Social Explorer's Inflation Calculator

Table C-14 shows the per capita income for the county. Neotsu had the highest per capita income level at $40,988, while Rose Lodge had the lowest with $22,827. Rose Lodge also had the largest percent change decrease of per capita income at -32% since 2017.

Table C-14 Per Capita Income

Jurisdiction	Per Capita Income		Percent Change
	2017^	2022	
Oregon	$36,349	$41,805	15%
Lincoln County	$30,817	$35,295	15%
Incorporated	$29,506	$38,400	30%
Unincorporated	$39,860	$32,505	-18%
Bayshore CDP	-	$33,228	-
Lincoln Beach CDP	$45,970	$36,107	-21%
Neotsu CDP	-	$40,988	-
Rose Lodge CDP	$33,750	$22,827	-32%
San Marine CDP	-	$29,376	-
Other Unincorporated	$38,549	$35,610	-8%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates and 2013-2017 American Community Survey 5-Year Estimates, Table A14024

Table C-15 identifies the percentage of individuals and cohort groups that are below the poverty level in 2017. It is estimated that about 15% of individuals live below the poverty level across the

county. Rose Lodge (24%) and Bayshore (13%) have the highest total population poverty rates for CDPs.

Affluent communities are more likely to have both the collective and individual capacity to more quickly rebound from a hazard event, while impoverished communities and individuals may not have this capacity –leading to increased vulnerability. Wealth can help those affected by hazard incidents to absorb the impacts of a disaster more easily. Conversely, poverty, at both an individual and community level, can drastically alter recovery time and quality.[106]

Table C-15 Poverty Rates

Jurisdiction	People in Poverty		Children under 18 in Poverty		People 65 or over in Poverty	
	Number	Percent	Number	Percent	Number	Percent
Oregon	494,158	12%	112,868	13%	66,836	9%
Lincoln County	7,315	15%	1,596	20%	1,262	8%
Incorporated	4,196	14%	764	16%	719	9%
Unincorporated	724	12%	130	13%	185	9%
Bayshore CDP	123	13%	0	0%	29	6%
Lincoln Beach CDP	195	7%	8	2%	62	6%
Neotsu CDP	13	2%	0	0%	0	0%
Rose Lodge CDP	354	24%	111	37%	74	17%
San Marine CDP	39	10%	11	100%	20	23%
Other Unincorporated	2,395	17%	702	31%	358	7%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Tables A13003A, A13003B, A13003C

Public Assistance programs provide either cash or benefits to individuals or families. They are generally federal programs that are administered by a state. The participation of an individual or family in these programs is an indicator of poverty. Examples of these social assistance programs include the Supplemental Nutritional Assistance Program (SNAP) and Supplemental Security Income (SSI). In Lincoln County, SNAP helps to feed approximately 4,099 families per month and SSI reaches about 990 people per month.[107] In the case of SNAP, the Oregon Cascades West Council of Governments (OCWCOG) administers the program on behalf of the state. Those reliant on state and federal assistance are more vulnerable in the wake of disaster because of a lack of personal financial resources and reliance on government support.

Table C-16 shows the income to poverty ratio for the county. If someone is under 0.50 it means their income is less than 50% of the poverty threshold. A person who makes less than 50% of the poverty threshold is in “deep poverty”. Deep poverty is difficult to get out of and can lead to generational poverty, making families more vulnerable to disasters for generations. This

[106] Statewide Supplemental Nutrition Assistance Program Activity - (SSP, APD, and AAA combined); P. 3 of report. Temporary Assistance for Needy Families One and two Parent Families Combined; P. 3 of report. http://www.oregon.gov/dhs/assistance/Pages/data/main.aspx

[107] Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, tables B22003, A10014

indicates severe levels of poverty, and the highest percentage of people in severe poverty are in the rural parts of the county (9%).

Table C-16 Income to Poverty Ratio

Jurisdiction	Total Population	Income to Poverty Ratio			
		Under 0.50		Between 0.5 & 1	
		Estimate	Percent	Estimate	Percent
Oregon	4,149,034	230,483	6%	263,675	6%
Lincoln County	49,706	3,471	7%	3,844	8%
Incorporated	29,184	1,929	7%	2,267	8%
Unincorporated	6,076	177	3%	547	9%
Bayshore CDP	956	15	2%	108	11%
Lincoln Beach CDP	2,701	132	5%	63	2%
Neotsu CDP	547	0	0%	13	2%
Rose Lodge CDP	1,491	10	1%	344	23%
San Marine CDP	381	20	5%	19	5%
Other Unincorporated	14,446	1,365	9%	1,030	7%

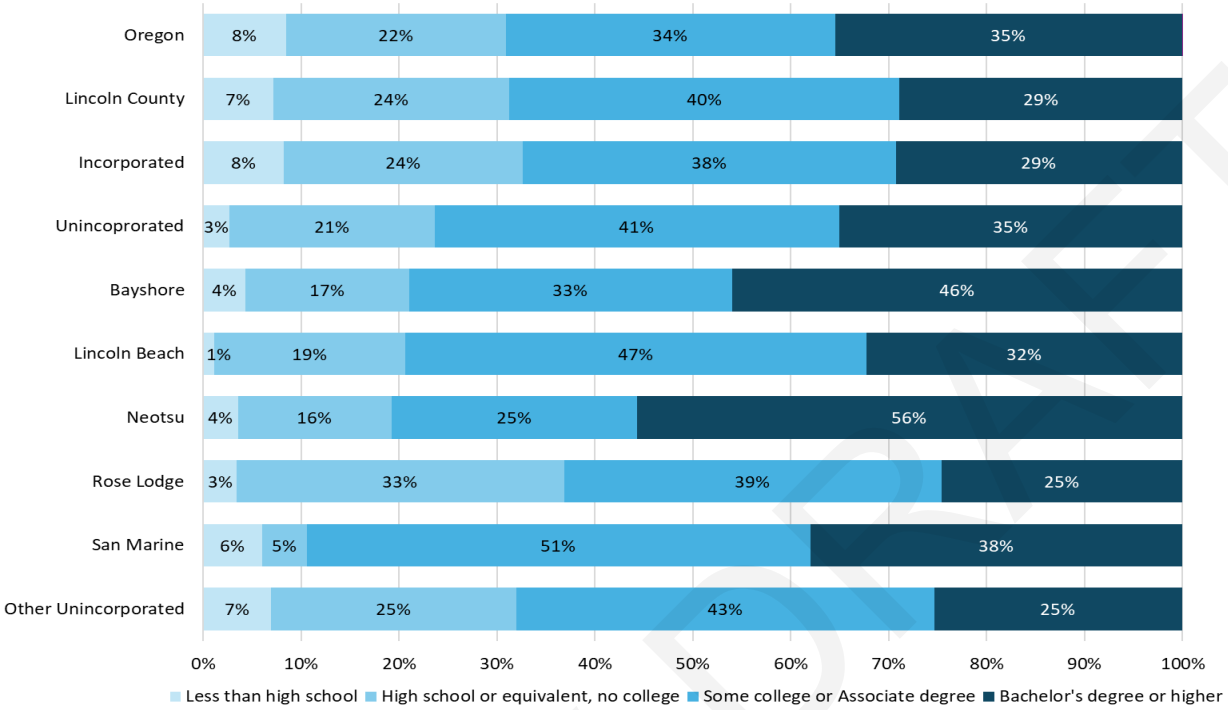
Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A13004

Education

Educational attainment of community residents is also identified as an influencing factor in socio demographic capacity. Educational attainment often reflects higher income and therefore higher self-reliance. Widespread educational attainment is also beneficial for the regional economy and employment sectors as there are potential employees for professional, service, and manual labor workforces. An oversaturation of either highly educated residents or low educational attainment can have negative effects on the resiliency of the community.

Approximately 7% of the Lincoln County population over 25 years does not have a high school degree or equivalent, while 24% have a high school degree or equivalent but do not have college experience. An additional 40% have some college or an associate degree and 29% have earned a bachelor's degree or higher (Figure C-3). San Marine and Neotsu have the lowest percentages of high school graduates, but they also have the first and third highest percentage of people with a bachelor's degree or higher, respectively.

Figure C-3 Educational Attainment



Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A12001

Health

Individual and community health play an integral role in community resiliency, as indicators such as health insurance, people with disabilities, dependencies, homelessness, and crime rate paint an overall picture of a community's well-being. These factors translate to a community's ability to prepare, respond to, and cope with the impacts of a disaster.

The Resilience Capacity Index recognizes those who lack health insurance or are impaired with sensory, mental, or physical disabilities, have higher vulnerability to hazards and will likely require additional community support and resources. Lincoln County has 9% of its population without health insurance; San Marine (19%) and the incorporated communities (10%) have the highest percentages of people without health insurance (Table C-17). The ability to provide services to the uninsured populations may burden local providers following a natural disaster.

Table C-17 Health Insurance Coverage

Jurisdiction	Total Population	Without Health Insurance	
		Number	Percent
Oregon	4,187,842	272,563	7%
Lincoln Conty	49,983	4,454	9%
Incorporated	29,229	2,815	10%
Unincorporated	6,301	375	6%
Bayshore CDP	956	0	0%
Lincoln Beach CDP	2,779	149	5%
Neotsu CDP	547	45	8%
Rose Lodge CDP	1,491	82	5%
San Marine CDP	528	99	19%
Other Unincorporated	14,453	1,264	9%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A20002

Table C-18 describes disability status of the population. Approximately 22% of the Lincoln County civilian non-institutionalized population identifies with one or more disabilities. Lincoln Beach and the other unincorporated communities have the highest percentage of their total population with a disability (both 24%). San Marine and Lincoln Beach have the highest percentage of people over the age of 65 with a disability (53% and 44%).

Table C-18 Disability Status

Jurisdiction	Population Estimate^	With a disability		65 years and over with a disability	
		Estimate	Percent	Estimate	Percent**
Oregon	4,187,842	625,076	15%	261,706	34%
Lincoln Conty	49,983	11,193	22%	5,499	36%
Incorporated	29,229	6,566	22%	2,910	36%
Unincorporated	6,301	1,206	19%	795	37%
Bayshore CDP	956	193	20%	127	28%
Lincoln Beach CDP	2,779	674	24%	423	44%
Neotsu CDP	547	32	6%	32	15%
Rose Lodge CDP	1,491	227	15%	167	39%
San Marine CDP	528	80	15%	46	53%
Other Unincorporated	14,453	3,421	24%	1,794	36%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table B18101
Notes: ^ Non-institutionalized civilian population, ** Percent of age group

In January of 2024, Community Services Consortium (CSC), based in Corvallis, OR conducted a point-in-time homeless count to identify the number of homeless and their demographics[108]. The

[108] Community Services Consortium (2024) Lincoln County PIT Snapshot, Unofficial PIT Data for Lincoln County 2024.xlsx

CSC found that 517 individuals in Lincoln County identify as homeless; 244 of them were sheltered, while 273 were unsheltered at the time of the count. People from the age of 45 to 54 were the largest group experiencing homelessness, at 86 people. Newport had the highest number of homeless people, at 78.

The homeless have little resources to rely on, especially during an emergency. It will likely be the responsibility of the county, cities, and local non-profit entities to provide services such as shelter, food, and medical assistance. Therefore, it is critical to foster collaborative relationships with agencies that will provide additional relief such as the American Red Cross and homeless shelters. It will also be important to identify how to communicate with these populations, since traditional means of communication may not be appropriate or available.

Household Characteristics – Vehicles Available

Countywide 5% of all occupied households, and 9% of renter-occupied households, have no vehicle available (Table C-19). The percentage of all occupied households without a vehicle available is greatest in San Marine (9%) and Lincoln Beach (6%); for renter occupied households the percentage is greatest in Lincoln Beach (14%) and the incorporated cities (11%). Household access to a vehicle is key to evacuating quickly and safely. Households that have no access to a vehicle or limited vehicles available may face delays, or need assistance, to evacuate. Lincoln County Transit District provides service to communities throughout Lincoln County to adjacent transit networks in Tillamook, Benton, Yamhill, and Lane counties.

Table C-19 Vehicles Available (All Households and Renter Occupied)

	Occupied Housing			Renter Occupied Housing		
Jurisdiction	Housing Units	No Vehicle (Percent)	One Vehicle (Percent)	Housing Units	No Vehicle (Percent)	One Vehicle (Percent)
Oregon	1,680,800	7%	31%	618,278	15%	44%
Lincoln County	22,483	5%	39%	6,587	9%	51%
Incorporated	13,301	6%	44%	5,087	11%	55%
Unincorporated	2,820	4%	41%	373	8%	35%
Bayshore CDP	469	2%	46%	39	0%	100%
Lincoln Beach CDP	1,358	6%	40%	228	14%	35%
Neotsu CDP	257	0%	34%	28	0%	0%
Rose Lodge CDP	502	3%	31%	61	0%	20%
San Marine CDP	234	9%	66%	17	0%	0%
Other Unincorporated	6,362	2%	27%	1,127	1%	42%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A10030

Synthesis

Socio-demographic capacity is a significant indicator of county hazard resiliency. Lincoln County is not the largest county in the state of Oregon in terms of population. With 50,334 residents, resiliency and hazard mitigation efforts can be a lot harder to manage. The characteristics and qualities of the community population such as age, race, education, income, and health and safety are significant factors that can influence the county's ability to cope, adapt to, and recover

from natural disasters. The current status of socio demographic capacity indicators can have long term impacts on the economy and stability ultimately affecting future resiliency of Lincoln County.

One important thing to consider is that there are hundreds of residents who are not proficient in English. Language barriers will often make it difficult to reach populations of residents who don't speak English. Resiliency efforts need to focus on targeting these populations as they will be most vulnerable and may have trouble knowing what to do in the event of a disaster. It is also important to think about the county's population in terms of its age groups; it is important to cater information towards each of these populations individually, as it is necessary to be able to reach out to all age groups. In 2022, the percentage of residents age 65 and older was 28%; by 2045, that percentage is expected to increase to 32%. While disasters don't affect certain age groups more than others, information can be dispersed and catered depending on who may be the most vulnerable.

Lincoln County socio-economic factors to consider include:

- The median household income across the county has increased to $57,794.
- Poverty affects 15% of the population, with Rose Lodge and Bayshore experiencing the most significant impact.
- Child poverty is greatest in San Marine, Rose Lodge, and all other non-CDP unincorporated areas.
- Single-parent families make up 17% of the parent population in Rose Lodge

Highlighting the above socio-economic factors and looking at the socio demographic capacity of the county is important as it affects the resiliency of the county and helps determine target areas and potential vulnerable populations for increased notification on mitigation and resiliency efforts.

Economic Capacity

Economic capacity refers to the financial resources present and revenue generated in the community to achieve a higher quality of life. Income equality, housing affordability, economic diversification, employment, and industry are measures of economic capacity. However, economic resilience to natural disasters is far more complex than merely restoring employment or income in the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources, and infrastructure are interconnected in the existing economic picture. Once any inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can act to increase the resilience of the local economy.

Regional Affordability

The evaluation of regional affordability supplements the identification of social/demographic capacity indicators, i.e. median income, and is a critical analysis tool to understanding the economic status of a community. This information can capture the likelihood of individuals' ability to prepare for hazards, through retrofitting homes or purchasing insurance. If the community reflects high-income inequality or housing cost burden, the potential for homeowners and renters to implement mitigation can be drastically reduced. Therefore, regional affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without Federal, State or local assistance.

Income Equality

Income equality is a measure of the distribution of economic resources, as measured by income, across a population. It is a statistic defining the degree to which all persons have a similar income. The table below illustrates the county and cities level of income inequality. The Gini index is a measure of income inequality. The index varies from zero to one. A value of one indicates perfect inequality (only one household has any income). A value of zero indicates perfect equality (all households have the same income).[109]

Table C-20 shows the Gini index of income inequality. The countywide income inequality coefficient is 0.46. The areas of greatest income inequality are Bayshore (0.37), Lincoln Beach (0.35), and Neotsu (0.32). The areas of greatest income equality are San Marine (0.29), and Rose Lodge (0.31). Based on social science research, the region's cohesive response to a hazard event may be affected by the distribution of wealth in communities that have less income equality[110].

[109]University of California Berkeley. Building Resilient Regions, Resilience Capacity Index. http://brr.berkeley.edu/rci/.
[110] Susan Cutter, Christopher G. Burton, and Christopher T. Emrich. 2010. "Disaster Resilience Indicators for Benchmarking Baseline Conditions," Journal of Homeland Security and Emergency Management 7, no.1: 1-22

Table C-20 Regional Income Inequality

Jurisdiction	Income Inequality Coefficient
Oregon	0.46
Lincoln Conty	0.46
Incorporated	-
Unincorporated	-
Bayshore CDP	0.37
Lincoln Beach CDP	0.35
Neotsu CDP	0.32
Rose Lodge CDP	0.31
San Marine CDP	0.29
Other Unincorporated	-

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table B19083

Housing Affordability

Housing affordability is a measure of economic security gauged by the percentage of an area's households paying less than 30% of their income on housing.[111] Households spending more than 30% are considered housing cost burdened. Table C-21 displays the percentage of homeowners and renters reflecting housing cost burden across the region.

Countywide roughly 20% of homeowners with a mortgage have a housing cost burden, which is equal to renters. San Marine (35%), Bayshore (24%), and the other unincorporated areas (41%), have the highest rates of owners with a mortgage with a housing cost burden. 100% of renters in San Marine and Neotsu are cost burdened. In general, the population that spends more of their income on housing has proportionally fewer resources and less flexibility for alternative investments in times of crisis.[112] This disparity imposes challenges for a community recovering from a disaster as housing costs may exceed the ability of residents to repair or move to a new location. These populations may live paycheck to paycheck and are extremely dependent on their employer, in the event their employer is also impacted it will further the detriment experienced by these individuals and families.

[111] University of California Berkeley. Building Resilient Regions, Resilience Capacity Index. http://brr.berkeley.edu/rci/.
[112] Ibid.

Table C-21 Households Spending > 30% of Income on Housing

Jurisdiction	Rent Burden		
	Owners With Mortgage	Owners Without Mortgage	Renters
Oregon	20%	5%	24%
Lincoln Conty	20%	6%	20%
Incorporated	37%	14%	21%
Unincorporated	35%	12%	26%
Bayshore CDP	24%	3%	0%
Lincoln Beach CDP	10%	13%	11%
Neotsu CDP	18%	0%	100%
Rose Lodge CDP	20%	0%	46%
San Marine CDP	35%	0%	100%
Other Unincorporated	41%	13%	14%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, tables B10040, B18002

Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. One method for measuring economic diversity is through use of the Herfindahl Index, a formula that compares the composition of county and regional economies with those of states or the nation. Using the Herfindahl Index, a diversity ranking of 1 indicates the county with the most diverse economic activity compared to the state, while a ranking of 36 corresponds with the least diverse county economy. The table below describes the Herfindahl Index Scores for counties in the region.

Table C-22 shows that Lincoln County has an economic diversity rank of 31 as of 2023, this is on a scale between all 36 counties in the state where 1 is the most diverse economic county in Oregon and 36 is the least diverse. The county's ranking has risen from 33 since 2016.

Table C-22 Regional Herfindahl Index Scores

	2016			2023		
County	Employment	Number of Industries	State Rank	Employment	Number of Industries	State Rank
Lincoln	14,023	182	33	14,856	192	31
Benton	27,115	198	22	28,925	217	20
Lane	126,198	259	6	131,787	265	5
Polk	14,319	169	11	16,562	195	17
Tillamook	7,469	148	24	8,069	165	23

Source: Oregon Employment Department

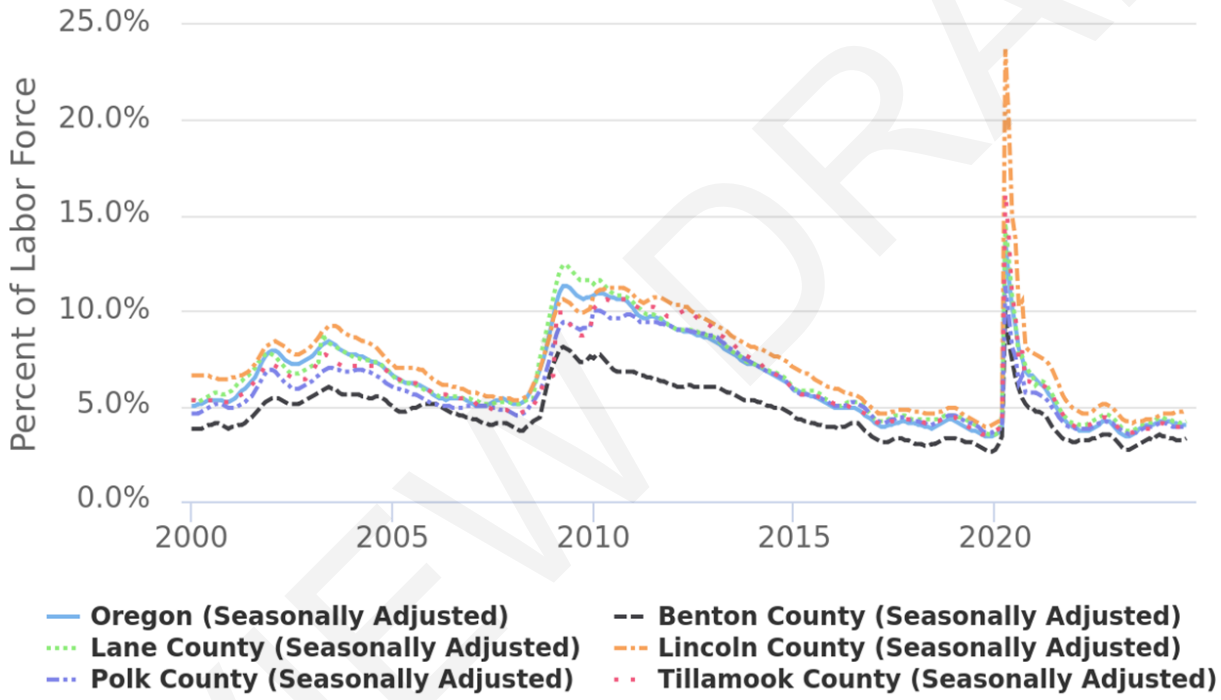
While illustrative, economic diversity is not a guarantor of economic vitality or resilience. Lincoln County, as of March 2019, is listed as an economically distressed community as prescribed by

Oregon Law. The economic distress measure is based on indicators of decreasing new jobs, average wages and income, and is associated with an increase of unemployment.[113]

Employment and Wages

According to the Oregon Employment Department (Figure C-4), unemployment in Lincoln County has declined since 2009 but remains at a rate like but still higher than the State of Oregon and other counties in the region. Note: there was a spike in unemployment related to the COVID-19 pandemic.

Figure C-4 Unemployment Rate



Source: Oregon Employment Department, "Local Area Employment Statistics", Qualityinfo.org .

Labor and Commute Shed

Most hazards can happen at any time during the day or night. It may be possible to give advance warning to residents and first responders who can take immediate preparedness and protection measures, but the variability of hazards is one part of why they can have such varied impact. A snowstorm during the workday will have different impacts than one that comes during the night. During the day, a hazard has the potential to segregate the population by age or type of employment (e.g., school children at school, office workers in downtown areas). This may complicate some aspects of initial response such as transportation or the identification of wounded or missing. Conversely, a hazard at midnight may occur when most people are asleep and unable to receive an advance warning through typical communication channels. The

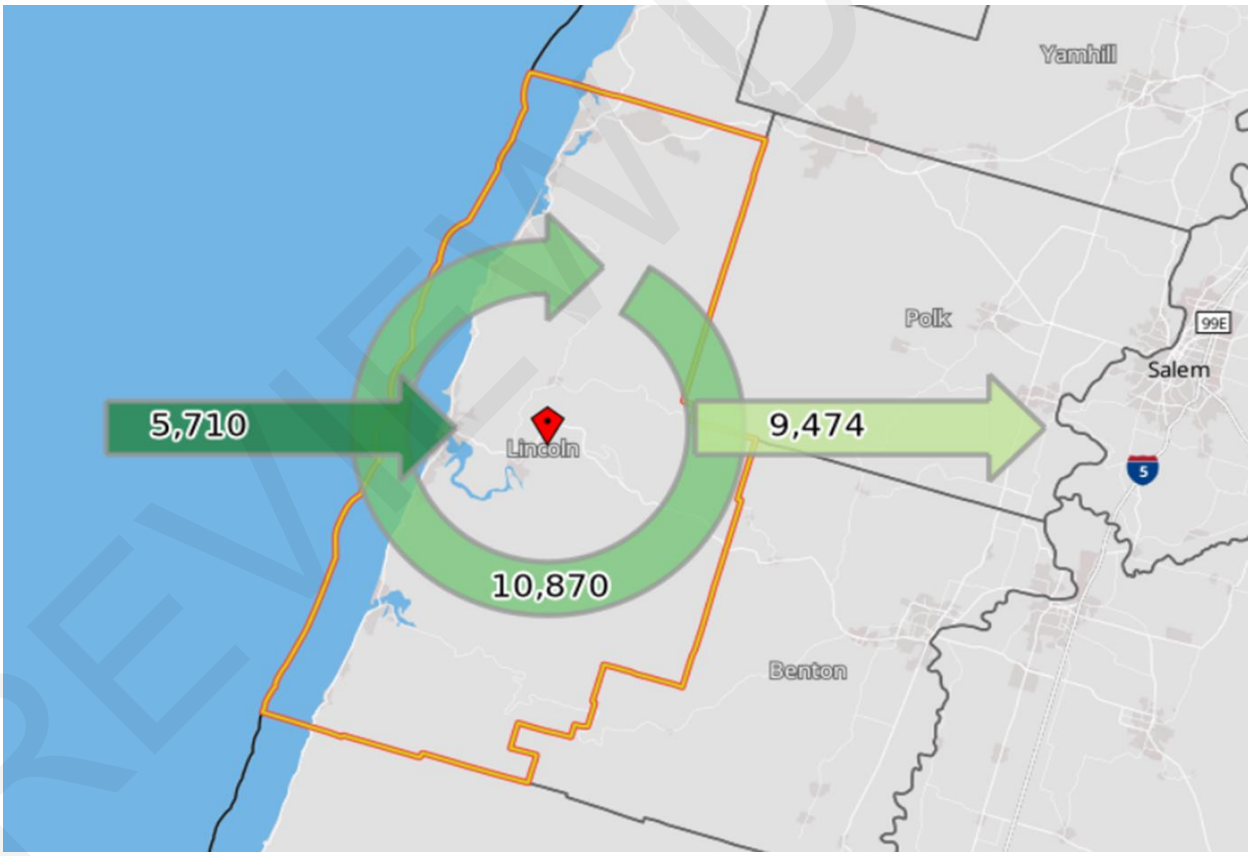
[113] Business Oregon – Oregon Economic Data "Distressed Communities List", http://www.oregon4biz.com/Publications/Distressed-List/

following labor shed and commute shed analysis is intended to document where county residents work and where people who work in Lincoln County reside.

Lincoln County, Oregon, exhibits a dynamic labor market characterized by significant commuting patterns both into and out of the county. According to data from the U.S. Census Bureau's OnTheMap tool (Figure C-5), approximately 46% of Lincoln County residents commute to jobs outside the county. This suggests that many residents rely on employment opportunities in neighboring areas, such as Benton, Lane, or Marion counties, possibly due to broader job availability or higher wages.

Conversely, about 34% of the workforce employed in Lincoln County lives outside its borders, indicating that the county also attracts workers from surrounding regions. Only around 66% of workers both live and work within Lincoln County. These patterns highlight the county's economic interdependence with nearby areas and underscore the importance of regional transportation infrastructure and workforce mobility. The data also suggests that while Lincoln County may offer specialized or seasonal employment—particularly in sectors like tourism, healthcare, or public services—it may not fully meet the employment needs of its residents.

Figure C-5 Lincoln County Laborshed



Source: U.S. Bureau of the Census, On The Map.

Many county residents work outside the county. Of the 20,344 employed residents, about 53% work locally, while the rest commute to nearby counties such as Benton, Lane, Marion, Polk, or

Linn. Similarly, many workers employed in Lincoln County live in those same neighboring counties.

It is important to note that during the COVID-19 pandemic many workers could work remotely from home at jobs that otherwise would have required a commute outside the county. As these jobs continue to exist, the data will reflect that people seem to travel great distances to work. In terms of mitigation planning, it is important to understand that as people continue to work from home, the greater disbursement of people throughout populated areas could make emergency notification systems and evacuations difficult.

Workers can be impacted during a disaster to varying levels based upon their means of transportation to work. Commuters who use motorized vehicles and public transportation that rely upon maintained roads, bridges, and other infrastructure may be delayed or unable to travel if infrastructure is impacted during an event (for example, earthquakes or heavy winter storms). Table C-23 shows that 83% of Lincoln County commuters utilized motorized vehicles (cars, trucks, vans, or motorcycles) and an additional 1% use public transportation. 4% of commuters bike or walk to work, and 12% work from home. San Marine (39%), Lincoln Beach (19%), and Bayshore (19%) have the highest percentage of workers who work from home.

Table C-23 Means of Transportation to Work

Jurisdiction	Workers (16 and older)	Motorized Vehicle^ (Percent)	Public Transportation (Percent)	Bike/Walked (Percent)	Other (Percent)	Worked at Home (Percent)
Oregon	2,007,255	76%	3%	5%	1%	15%
Lincoln County	19,621	83%	1%	4%	1%	12%
Incorporated	12,004	82%	1%	5%	1%	11%
Unincorporated	2,469	81%	0%	3%	0%	16%
Bayshore CDP	192	81%	0%	0%	0%	19%
Lincoln Beach CDP	1,177	78%	0%	4%	0%	19%
Neotsu CDP	185	91%	0%	0%	0%	9%
Rose Lodge CDP	659	96%	0%	0%	0%	4%
San Marine CDP	256	52%	0%	9%	0%	39%
Other Unincorporated	5,148	87%	1%	1%	< 1%	11%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A09005
Notes: ^ - includes car, truck, van, or motorcycle

Mitigation activities are needed at the business level to ensure the health and safety of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from all over the surrounding area to industrial and business centers. As daily transit rises, there is an increased risk that a natural hazard event will disrupt the travel plans of residents across the region and seriously hinder the ability of the economy to meet the needs of Lincoln County residents and businesses.

Industry

Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry specific discussions below. Identifying key industries in the region enables communities to target

mitigation activities towards those industries' specific sensitivities. It is important to recognize that the impact that a natural hazard event has on one industry can reverberate throughout the regional economy.

This is of specific concern when the businesses belong to the basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community; they bring money into a local community via employment. The farm and ranch, information, and wholesale trade industries are all examples of basic industries. Non-basic sector industries are those that are dependent on local sales for their business, such as retail trade, construction, and health services.

Employment by Industry

Economic resilience to natural disasters is particularly important for the major employment industries in the region. If these industries are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout the regional economy. Thus, understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

Table C-24 identifies Employment by industry. The industry sectors in Lincoln County with the highest percentage of the workforce are Leisure and Hospitality (26%), Local Government (16%), Trade, Transportation, and Utilities (17%), Retail Trade (15%), and Private Education and Health Services (12%).

Table C-24 Total Non-Farm Employment by Industry 2023, Expected Growth 2033

Employment Sector	2023				Percent Change in Employment (2018-2023)	Employment Forecast* (2023-2033)
	Firms	Employees	Percent Workforce	Average Wage		
Total Payroll Employment	2,181	18,548	100%	$ 48,751	0%	6%
Total Private	2,038	14,855	80%	$ 44,381	0%	8%
Natural Resources and Mining	75	264	1%	$ 58,432	-14%	-2%
Construction	221	823	4%	$ 53,163	1%	13%
Manufacturing	66	1,044	6%	$ 70,096	-5%	3%
Trade, Transportation & Utilities	386	3,219	17%	$ 37,575	-4%	4%
Wholesale Trade	44	168	1%	$ 63,306	4%	8%
Retail Trade	286	2,779	15%	$ 33,910	-3%	3%
Transportation, Warehousing, and Utilitie	56	272	1%	$ 59,126	-20%	6%
Information	43	121	1%	$ 60,766	-19%	8%
Financial Activities	161	851	5%	$ 49,068	38%	2%
Professional and Business Services	269	1,097	6%	$ 54,288	4%	12%
Private Educational and Health Services	255	2,189	12%	$ 60,797	3%	13%
Leisure and Hospitality	354	4,806	26%	$ 30,953	3%	9%
Other Services	170	430	2%	$ 34,009	-31%	5%
Unclassified	38	12	< 1%	$ 68,630	-14%	-
Government	144	3,692	20%	$ 66,349	-1%	3%
Federal	20	318	2%	$ 87,164	0%	-2%
State	30	328	2%	$ 70,270	12%	5%
Local	94	3,047	16%	$ 63,732	-2%	3%
Tribal Government	7	938	5%	$ 58,627	-8%	-

Source: Oregon Employment Department, "2018 and 2023 Covered Employment and Wages Summary Reports" and "Regional Employment Projections by Industry & Occupation 2023-2033". http://www.qualityinfo.org.

Basic industries encourage growth in non-basic industries and bring wealth into communities from outside markets. However, a high dependence on basic industries can lead to severe difficulties when recovering from a natural disaster if vital infrastructure or primary resource concentrations have been greatly damaged. While Lincoln County has some basic industries, such as Trade and Leisure Hospitality, five out of the six largest industrial sectors are of the non-basic nature and thus they rely on local sales and services. Trending towards basic industries can lead to higher community resilience.

Future Employment in Industry

Table C-23 shows that between 2018 and 2023, the sectors that experienced the largest percent growth were Financial Activities (38%), State Government (12%), Wholesale Trade (4%), and Professional and Business Services (4%). Some of these sectors often require more training and education, while others require less education and have lower wages.

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Table C-24 shows that, between 2023 and 2033, the largest employment growth in the region is anticipated within Construction (13%), Private Education and Health Services (13%), Professional and Business Services (12%), and Leisure and Hospitality. Mitigation activities that respond to the needs of these sectors may help to ensure the resilience of the economy and help the community stay open for business following a disaster.

Synthesis

Regional economic capacity refers to the present financial resources and revenue generated in the community to achieve a higher quality of life. Forms of economic capital include income equality, housing affordability, economic diversifications, employment, and industry. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families, and the county to absorb disaster impacts for a quick recovery.

The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families, and the community to absorb disaster impacts for a quick recovery. The county's economy is expected to grow by 2033. It is important to consider what might happen to the county economy if the largest revenue generators and employers are impacted by a disaster. Strategies and actions to reduce vulnerability from an economic focus are imperative and should focus on risk management for the county's dominant industries.

Several industries, such as Financial Activities, Wholesale Trade, Professional Business Services, and Leisure and Hospitality saw the most significant increases in employment from 2018 to 2023. While relying heavily on its top revenue-producing industries, Leisure and Hospitality,

Local Government, Trade, Transportation, and Utilities, Retail Trade, and Private Education and Health Services, it is important for the county to consider the economic impacts that affect its residents in the event of a disaster. Strategies and actions to reduce vulnerability from an economic focus are imperative and should focus on risk management for the county's dominant industries.

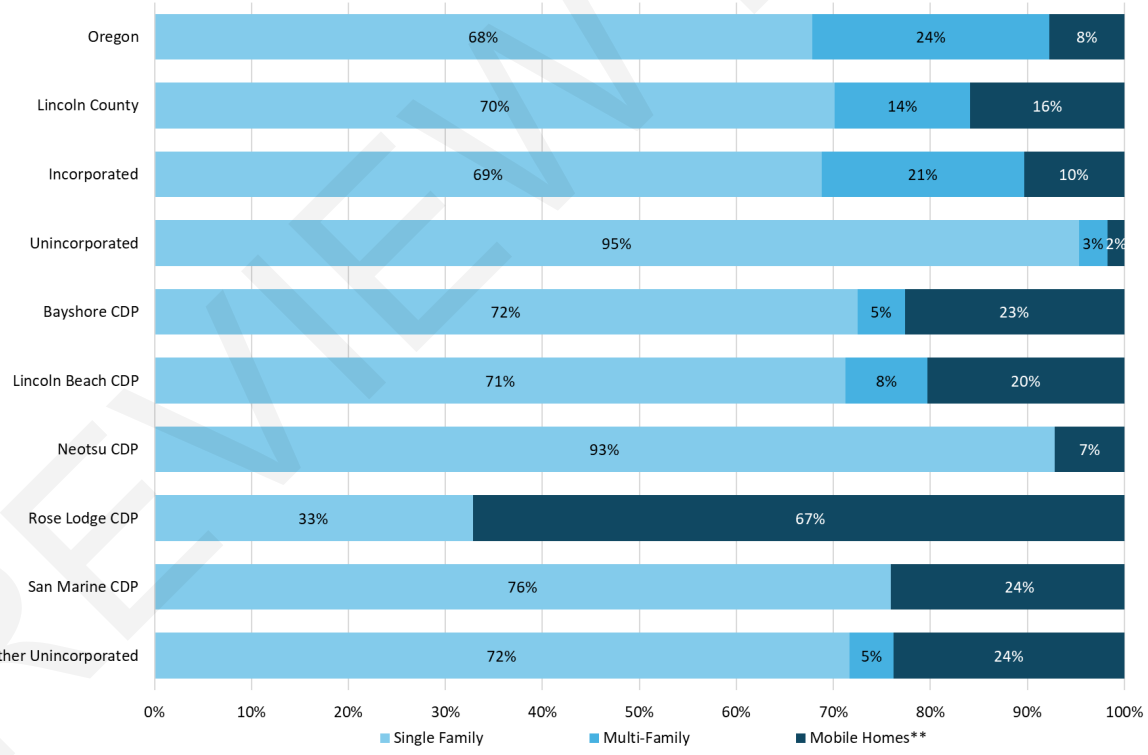
Physical Infrastructure Capacity

Physical infrastructure capacity refers to the built environment and infrastructure that supports the community. The various forms, quantity, and quality of built capital mentioned above contribute significantly to community resilience. Physical infrastructures, including utility and transportation lifelines, are critical during a disaster and are essential for proper functioning and response. The lack or poor condition of infrastructure can negatively affect a community's ability to cope, respond and recover from a natural disaster.

Housing

Figure C-6 identifies the types of housing most common throughout the county. Of interest are mobile homes, which account for about 16% of the housing countywide; and a full 67% in the Rose Lodge CDP. Mobile homes are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing the structures, because they are more prone to wind damage than wood-frame construction. In other natural hazard events, such as earthquakes and floods, moveable structures like mobile homes are more likely to shift on their foundations and create hazardous conditions for occupants.

Figure C-6 Housing Profile



Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table A10032
Note: ** Mobile homes refer to trailers, boats, RVs, vans, etc.

Aside from location and type of housing, the year structures were built has implications. In the 1970's, FEMA began assisting communities with floodplain mapping as a response to administer the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Upon receipt of floodplain maps, communities started to develop floodplain management ordinances to protect people and property from flood loss and damage. Housing within the floodplain is generally less vulnerable to flood if it was built after the implementation of floodplain development ordinances.

The National Flood Insurance Program's (NFIP's) Flood Insurance Rate Maps (FIRMs) delineate flood-prone areas. They are used to assess flood insurance premiums and to regulate construction so that in the event of a flood, damage minimized. The current FIRMs were developed for Lincoln County as part of a FEMA RiskMAP program. For more information about the flood hazard, NFIP, and FIRMs, please refer to Flood Hazard section of the Risk Assessment.

Seismic building standards were codified in Oregon building code starting in 1974; more rigorous building code standards were passed in 1993 that accounted for the Cascadia earthquake fault.[114] Therefore, homes built before 1993 are more vulnerable to seismic events. DOGAMI's interpretation of state building code histories and evolution as described by Judson (2012), Oregon Building Codes Division (2002, 2010) and Business Oregon (2015) is shown in Table C-25 .

Table C-25 Oregon's Seismic Design Level Benchmark Years

Building Type	Year Built	Design Level	Basis
Single Family Dwelling (including Duplexes)	prior to 1976	Pre Code	Interpretation of Judson (2012)
	1976-1991	Low Code	
	1992-2003	Moderate Code	
	2004-present	High Code	
Manufactured Housing	prior to 2003	Pre Code	Interpretation of Oregon Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002)
	2003-2010	Low Code	
	2011-present	Moderate Code	Interpretation of Oregon Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
All other buildings	prior to 1976	Pre Code	Interpretation of Oregon Benefit-Costs Analysis Tool (Business Oregon, 2015, p. 24)
	1976-190	Low Code	
	1991-present	Moderate Code	

Source: DOGAMI, Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft), Table 10.1.

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (DOGAMI, O-20-11) for Lincoln County including the unincorporated communities. The study was funded through the FEMA Risk MAP program and was published in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their

[114] State of Oregon Building Codes Division. *Earthquake Design History: A summary of Requirements in the State of Oregon*, February 7, 2012. http://www.oregon.gov/OMD/OEM/osspac/docs/history_seismic_codes_or.pdf

risks related to the following natural hazards: Cascadia Subduction Zone earthquake, flooding, landslide susceptibility, coastal erosion, and wildfire.

Within the Risk Report DOGAMI assigned a seismic design level to each building within the County, summarized the number of buildings and building value as shown in Table C-26 .

Table C-26 Building Statistics by Seismic Design Level

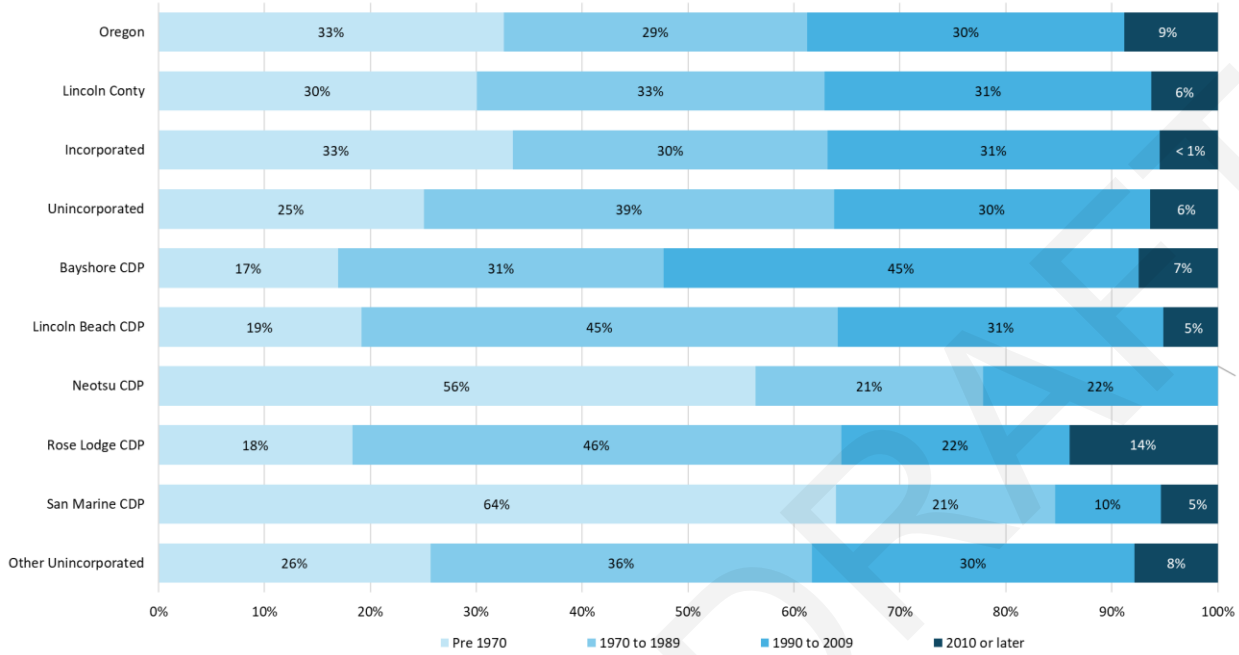
Community	Total Number of Buildings	Pre Code		Low Code		Moderate Code		High Code	
		#	%	#	%	#	%	#	%
Total Lincoln County	42,052	23,313	55%	7,469	18%	7,203	17%	4,067	10%
Incorporated	19,228	11,119	58%	3,113	16%	3,005	16%	1,991	10%
Depoe Bay	1,337	566	42%	294	22%	316	24%	161	12%
Lincoln City	6,687	3,664	55%	1,020	15%	1,252	19%	751	11%
Newport	5,602	3,516	63%	872	16%	601	11%	613	11%
Siletz	716	402	56%	180	25%	110	15%	24	3%
Siletz Tribe	184	164	89%	13	7%	6	3%	1	1%
Toledo	1,954	1,385	71%	226	12%	285	15%	58	3%
Waldport	1,698	932	55%	308	18%	277	16%	181	11%
Yachats	1,050	490	47%	200	19%	158	15%	202	19%
Unincorporated	22,824	12,194	53%	4,356	19%	4,198	18%	2,076	9%
Unincorp. County (rural)	12,637	7,199	57%	2,206	17%	2,318	18%	914	7%
Otis - Rose Lodge	1,747	1,078	62%	322	18%	256	15%	91	5%
Otter Rock	634	381	60%	89	14%	97	15%	67	11%
Salishan - Lincoln Beach	2,847	1,246	44%	788	28%	636	22%	177	6%
Seal Rock - Bayshore	3,345	1,282	38%	804	24%	660	20%	599	18%
Wakonda Beach	1,614	1,008	62%	147	9%	231	14%	228	14%

Source: DOGAMI, Natural Hazard Risk Report for Lincoln County, O-20-11 (2020)

Figure C-7 shows that, countywide, 33% of the housing stock was built prior to 1970, before the implementation of floodplain management ordinances; Toledo has over one-half of its housing units built prior to 1970.

Countywide, 67% of the housing stock was built before 1990 and the codification of stricter seismic building standards (Table C-25). Lincoln City (2%), Newport (2%), and the "other" unincorporated areas (2%) have had the largest percent growth since 2010.

Figure C-7 Year Structure Built



Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, table B25034

Infrastructure Profile

Physical infrastructure such as dams, roads, bridges, railways, and airports support Lincoln County communities and economies. Critical facilities are those facilities that are vital in government response and recovery activities and are important to consider as there can be serious secondary impacts to such facilities when disrupted. Critical facilities and infrastructure can be a wide range of things depending on the social, environmental, economic, and physical makeup of the area under consideration. Such facilities can include emergency services, communication services, transportation systems, government facilities, healthcare and public health facilities, information technology, water services, and energy generation and transmission. Given the critical role infrastructure plays before and after disasters, it is essential to prioritize it when building more resilient communities. The information provided in this section will outline important infrastructures throughout the county which will help provide a basis for informed decisions about how to reduce the county's infrastructural vulnerabilities to natural hazards.

Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel, and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Northwest Natural has a high-pressure transmission pipeline that traverses the northern half of Lincoln County. The pipeline enters the county along Highway 18, turns south along the eastern

edge of Devils Lake, cuts over the mountains to Siletz and proceeds south to Toledo. In Toledo the pipeline serves the paper mill for their processing, turns west, and terminates at the liquid natural gas (LNG) plant in Yaquina Bay.

This pipeline serves the residential and industrial gas needs in northern Lincoln County, and the LNG Plant. The LNG Plant was originally built to serve as an export facility, to load ships for transport across the Pacific. This market never developed, so the plant is now used for peak-shaving as an overflow capacity storage facility. In the summer months, Northwest Natural sends gas south to the plant for storage during low demand periods. In the winter, gas is pressurized and placed back in the pipeline to travel north to Salem and Portland to handle additional demands for gas heating and cooking and other needs that peak during the winter months.

Lincoln County has 11 rural water districts serving areas of Beverly Beach, Car-Mel Beach, Devils Lake (2), Kernville, Lower Siletz, Otter Rock, Panther Creek, Roads End, Seal Rock, and Southwest Lincoln. Pipelines often are in or near the public road right-of-way.

Energy Generation

Oregon is one of the nation's leading generators of hydroelectric power, ranking fourth, in net electricity generation from conventional hydroelectric power in 2023. In 2013, 70% of Oregon's net electricity generation was from conventional hydroelectric power plants and other renewable energy resources. Oregon's abundant hydroelectric power contributes to residential electricity prices that are well below the national median.[115]

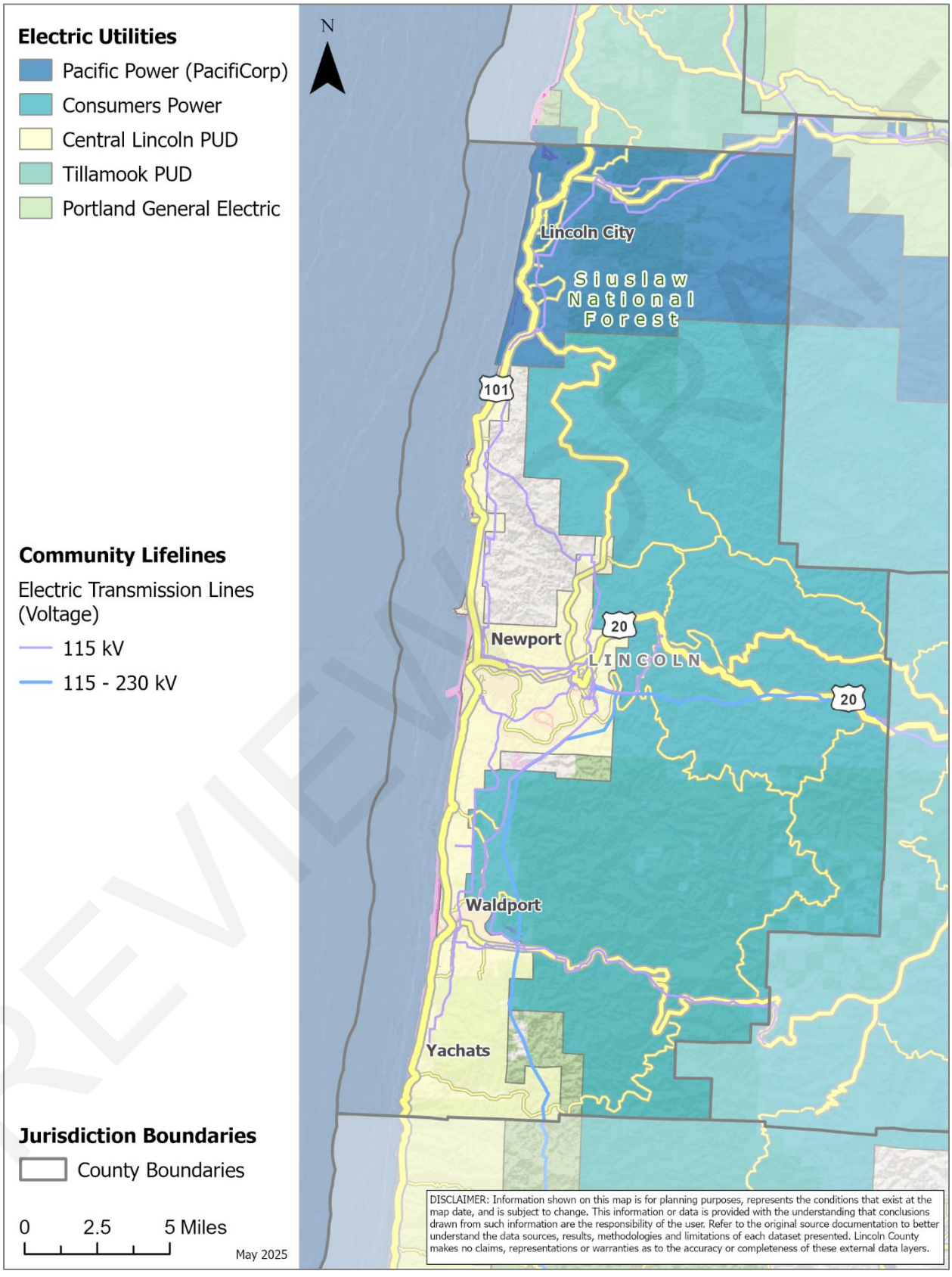
There are no major energy producing dams in the Oregon Coast region. A biomass facility in Toledo operated by The Georgia-Pacific Toledo Mill generates approximately 31.8 MW of net summer energy capacity production utilizing forest product materials.

Lincoln County Power Generation

Consumers Power, Inc., Central Lincoln People's Utility District (PUD), and Pacific Power provide electrical service to Lincoln County (Map C-2). Consumers Power is a privately owned non-profit rural electric cooperative with approximately 23,000 members in six counties including eastern Lincoln County. Central Lincoln PUD is the largest PUD in Oregon, with over 30,000 residential customers and over 5,000 commercial customers. Pacific Power is a for-profit utility have serving parts of Oregon (including the Lincoln City area), Washington, and California. Powerlines are generally above ground suspended between wooden single poles fixed with cross arm and post insulators, and perhaps at least one wooden H-frame suspension structure.

[115] US Energy Information Administration. 2023. SAS Output

Map C-2 Electric Utilities



Source: Oregon Department of Energy - Link

Dams

Dams are manmade structures built to impound water. Dams are built for many purposes including water storage for potable water supply, livestock water supply, irrigation, or fire suppression. Other dams are built for flood control, recreation, navigation, hydroelectric power, or to contain mine tailings. These critical infrastructure pieces not only protect water resources that are used for drinking, agriculture, and recreation, but they protect downstream development from inundation. Dams may also be multifunctional, serving two or more of these purposes.

The National Inventory of Dams (NID, Map C-3 and Table C-27),which is maintained by the United States Army Corps of Engineers, is a database of approximately 91,750 dams in the United States. The NID does not include all dams in the United States. Rather, the NID includes dams that are deemed to have a high or significant hazard potential and dams deemed to pose a low hazard if they meet inclusion criteria based on dam height and storage volume. Low hazard potential dams are included only if they meet either of the following selection criteria:

- exceed 25 feet in height and 15 acre-feet of storage, or
- exceed 6 feet in height and 50-acre feet of storage.

There are many thousands of dams too small to meet the NID selection criteria. However, these small dams are generally too small to have significant impacts if they fail and thus are generally not considered for purposes of risk assessment or mitigation planning.

NID potential hazard classification is solely a measure of the probable impacts if a dam fails. Thus, a dam classified as High Potential Hazard does not mean that the dam is unsafe or likely to fail. The level of risk (probability of failure) of a given dam is not even considered in this classification scheme. Rather, the High Potential Hazard classification simply means that there are people at risk downstream from the dam in the inundation area if the dam were to fail.

Dams assigned to the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life. Failure of dams in the high classification will generally also result in economic, environmental or lifeline losses, but the classification is based solely on probable loss of life.

There are five (5) High Hazard dams in Lincoln County. Big Creek #1 (Lower), Big Creek #2 (Upper), Mill Creek, Olalla, and Spring Lake.

Table C-27 Dam Inventory and Threat Potential

Threat Potential	Number of Dams	Dam Name
High	5	*Big Creek #1 & #2 (Big Creek), Olalla (W. Olalla Creek), Mill Creek (Mill Creek), Spring Lake*
Significant	0	-
Low	0	-
Total	**5**	**-**

Source: National Inventory of Dams - Link. Oregon Water Resources Department Inquiry on HHPD Eligibility (12/2/2024).

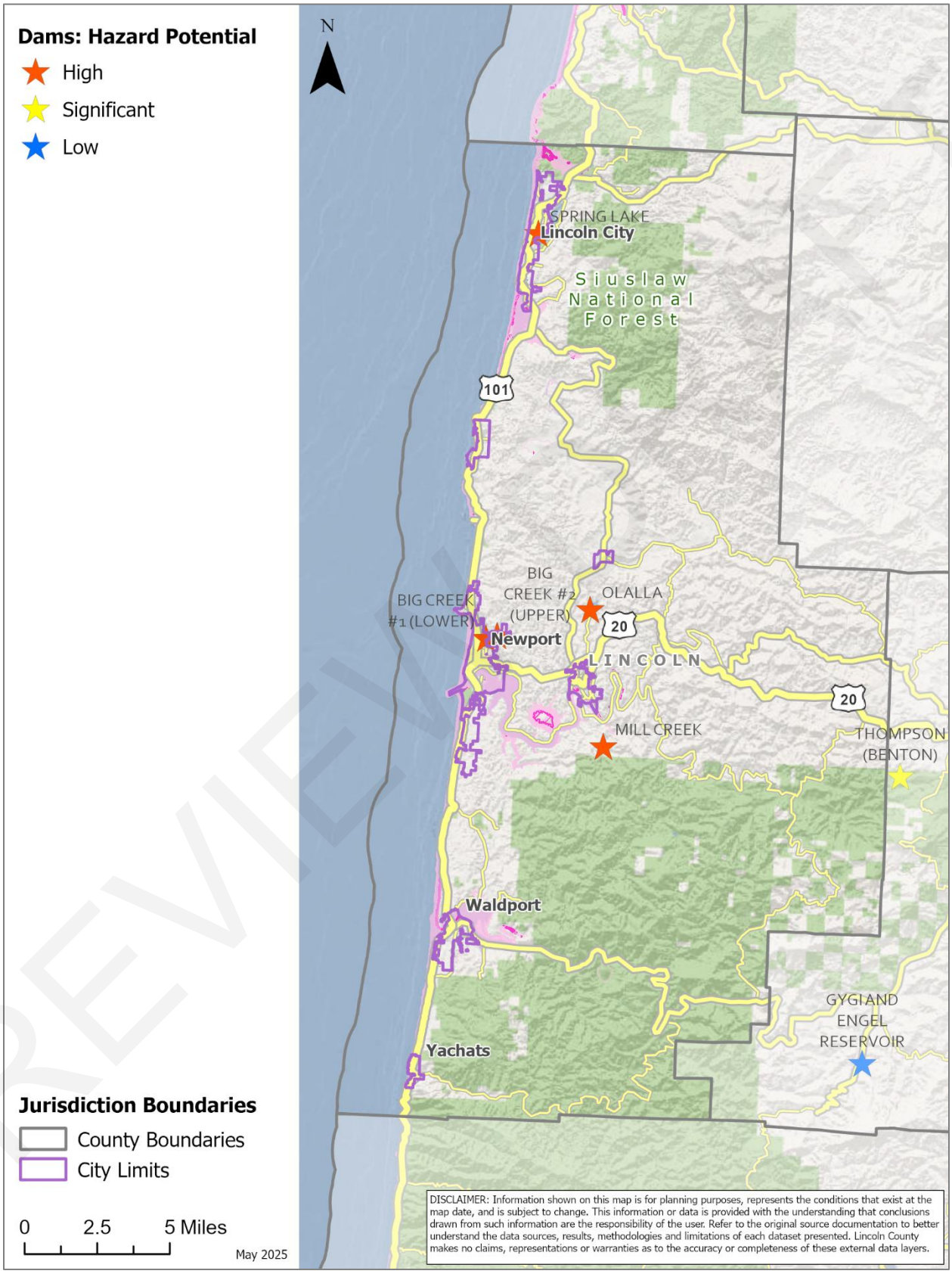
Dams assigned to the significant hazard potential classification are those where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities. Significant hazard potential dams are often located in predominantly rural or agricultural areas. There are no Significant Hazard dams in Lincoln County.

Dams assigned the low hazard potential classification are those where failure or mis- operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the dam owner's property. There are no Low Hazard dams in Lincoln County.

Dam failures can occur at any time in a dam's life; however, failures are most common when water storage for the dam is at or near design capacity. At high water levels, the water force on the dam is higher and several of the most common failure modes are more likely to occur. Correspondingly, for any dam, the probability of failure is much lower when water levels are substantially below the design capacity for the reservoir.

Dam failures can occur rapidly and with little warning. Fortunately, most failures result in minor damage and pose little or no risk to life safety. However, the potential for severe damage still exists.

Map C-3 Dams and Threat Potential



Source: OPDR, data National Inventory of Dams - Link. Note: Text in red indicates HHPD Grant eligible as of 12/2/2024.

Railroads

Railroads are major providers of regional and national cargo trade flows. The Willamette and Pacific Railroad or (WPRR) is a subsidiary rail line of the Portland and Western Railroad, it is designated as non-class 1 railway with approximately 24,327 carloads and a revenue stream of over 13 million dollars in 2011. Most of the line located within Lincoln County runs through the northern extreme border and terminates in Toledo. [116]

Rails are sensitive to icing from winter storms that can occur in the Southeast Oregon region. For industries in the region that utilize rail transport, these disruptions in service can result in economic losses. The potential for rail accidents caused by natural hazards can also have serious implications for the local communities if hazardous materials are involved.

Airports

Lincoln County has four public airports, two private heliports, and one private airport. Of the two private heliports both are operated by the county's hospitals.[117] Samaritan Pacific Communities and Samaritan North Lincoln hospitals both maintain a heliport for emergency airlifting of critically injured patients. Newport operates a municipal airport and the other airports are relatively small facilities operated by The Oregon Department of Aviation. There is no commercial service airport in the County. Access to these facilities could become closed in the event of natural hazards. Another important consideration in identifying area air resources is the type and condition of runway surfaces at these various facilities, as they will impact the ability to utilize the airport.

Newport Municipal Airport **(KONP)**

The Newport airport provides facilities for the US Coast Guard that allow helicopters to respond more quickly to maritime emergencies than if the crews were dispatched from North Bend. The master plan incorporates a FEMA staging area designation. At elevation 157 feet, is located on 700 acres approximately 3 miles south of Newport off Highway 101. Runway 16/34 is 6000 feet in length and 150 feet wide with asphalt pavement and is lighted. Runway 2/20 is 3000' feet long and 75 feet wide, also asphalt and lighted. Aircraft based on the field are 23 single engine airplanes, 2 multi- engine airplanes, 1 jet airplane, 3 helicopters, and 1 military aircraft. Aircraft operations: average 66 per day, including 58 percent transient general aviation, 21 percent local general aviation, 12 percent military, 6 percent commercial, and 3 percent air taxi. Newport Municipal Airport in past years supported commercial commuter shuttle operations, serving Corvallis and Portland.[118]

[116] Oregon. Department of Transportation (2014). DRAFT Oregon State Rail Plan: Freight and Passenger Rail Inventory. Salem, Oregon. Oregon Department of Transportation.

[117] FAA Airport Facilities Data. 2014. http://www.faa.gov/airports/airport_safety/airportdata_5010/menu/ Accessed August 2014.

[118] Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill. http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf

Siletz Bay State Airport (S45)
This is listed as a Category 4 airport. Category 4 airports serve the needs of general and business aviation users and activities within the local area. The Salishan Resort is one-third of a mile away. The airports have the airfield facilities and services necessary to accommodate general aviation users, in light single and multi-engine aircraft weighing 12,500 pounds and less (11,000 pounds single wheel). The Siletz Bay State Airport, at elevation 62 feet, has a 3300-foot-long and 60-foot-wide asphalt runway (17/35) with pilot controlled lighting. Aircraft operations average 57 per week with 61 percent transient general aviation, 32 percent local general aviation, and 7 percent air taxi. There are approximately 17 single engine airplanes, including one ultralight, based at the field, which is unattended.

The Toledo State Airport (5S4)
at elevation 7 feet, is located approximately 1 mile southwest of Toledo. Runway 13/31 is 1695 feet long and 40 feet wide with asphalt pavement. The airport is unattended. Aircraft based on the field are six single engine airplanes, including two ultralights. Aircraft operations average 22 per week, with 96 percent transient general aviation and 4 percent local general aviation.

The Wakonda Beach State Airport (OR04)
At elevation 41 feet, is located approximately 3 miles south of Waldport. Runway 16/34 is 2000 feet long by 50 feet wide with a turf surface. The airport is unattended. Aircraft based on the field are three single engine airplanes, including one ultralight. Aircraft operations average 69 per month, with 90 percent transient general aviation and 10 percent local general aviation

Ports

Deep-water ports are important facilities for the Oregon Coast as they facilitate the transportation of goods and are an integral component of the fishing industry in the area. These ports are important to identify because of the potential threat of considerable damage a result of winter storms or a major tsunami event.

There are three functioning port districts within Lincoln County and one harbor in the City of Depoe Bay. The port facilities include the Port of Newport, the Port of Alsea, and the Port of Toledo. Fish and shellfish make up most of the cargo unloaded at these port facilities, and the Port of Newport has a large commercial fishing fleet. The Port of Newport is a deep channel port that allows ocean-going vessels to dock. The harbor in Depoe Bay is home to a small fishing fleet consisting of both commercial and recreational boats. Separate commissions or city councils govern all four facilities. Local streets connecting to US 101, US 20, and OR 34 provide overland freight connections.[119]

[119] Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill. http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf

Roads

The county's major expressway is Highway 101. It runs North/South through Lincoln County and is one of the main passages for automobiles, buses, and trucks traveling through the Coastal area of the state. Other highways that service Lincoln County include:

- Oregon Route 18: connects Lincoln City to the Willamette Valley
- US Route 20: connects Newport, Toledo, and Siletz to the Willamette Valley
- Oregon Route 34: connects Waldport to the Willamette Valley
- Oregon Route 229: runs north and south between Kernville and Toledo. Provides access to interior communities in Lincoln County.
- Oregon Route 410 (Logsden Road): runs east to west connecting Siletz to Nashville and Benton County.

Daily transportation infrastructure capacity throughout Lincoln County is stressed by maintenance, congestion, and oversized loads. Natural hazards can further disrupt automobile traffic and create gridlock and will make evacuations difficult.

Seismic lifeline

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.[120]

System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

The Coast Geographic Zone is the most seismically vulnerable of all the geographic zones and the most difficult to access due to geographic constraints. While one could argue that the region's critical post-earthquake needs should dictate that all routes be Tier 1, the reality is that the vulnerabilities in the Coast Geographic Zone are so extensive that the majority of the cost to make the entire lifeline system resilient would be incurred for repairs done within this region. Furthermore, because of the high vulnerability of the zone, it is paramount that emergency services and recovery resources can reach this zone from other zones.

The bulleted list below describes the tiered system for the coastal geographic zone of seismic lifelines.

[120] CH2MHILL, Prepared for Oregon Department of Transportation. Oregon Seismic Lifeline Routes Identification Project, *Lifeline Selection Summary Report,* May 15 2012.

The Tier 1 system in the Coast Geographic Zone consists of three access corridors:

- OR 30 from Portland to Astoria
- OR 18 from the Valley to US 101 and north and south on US 101 from Tillamook to Newport
- OR 38 from I-5 to US 101 and north and south on US 101 from Florence to Coos Bay

The Tier 2 system in the Coast Geographic Zone consists of three access corridors:

- US 26 from OR-217 in Portland to US 101 and north and south on US 101 from Seaside to Nehalem
- OR 126 from the Valley to US 101 at Florence
- US 101 from Coos Bay to the California border

The Tier 3 system in the Coast Geographic Zone consists of the following corridors:

- US 101 from Astoria to Seaside
- US 101 from Nehalem to Tillamook
- OR 22 from its junction with OR 18 to the Valley
- OR 20 from Corvallis to Newport
- OR 42 from I-5 to US 101
- US 199 from I-5 to the California border

Bridges

Because of earthquake risk, the seismic vulnerability of the county's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. The county's bridges are part of the state and interstate highway system that is maintained by the Oregon Department of Transportation (ODOT) or that are part of regional and local systems that are maintained by the region's counties and cities.

Table C-28 shows the structural condition of bridges in the region. A distressed bridge is a condition rating used by the Oregon Department of Transportation (ODOT) indicating that a bridge has been identified as having a structural or other deficiency, while a deficient bridge is a federal performance measure used for non-ODOT bridges; the ratings do not imply that a bridge is unsafe.[121] The table shows that overall 24% of the county owned bridges are distressed, compared to 100% of the city owned bridges and 31% of State Owned (ODOT) bridges. There are 9 historic bridges in the County, all owned by the state.

[121] Oregon. Bridge Engineering Section (2012). 2012 Bridge Condition Report. Salem, Oregon: Bridge Section, Oregon Department. of Transportation.

Table C-28 Bridge Inventory

Bridge Owner	Number	Distressed	Percent Distressed	Historic
State	68	21	31%	9
County	85	20	24%	0
City	2	2	100%	N/A
Total	155	43	28%	9

Source: Oregon Department of Transportation, 2014; Oregon Department of Transportation (2013), Oregon's Historic Bridge Field Guide
Note: ODOT bridge classifications overlap and sum-total is not used to calculate percent distressed, calculation for ODOT distressed bridges accounts for this overlap.

The bridges in Lincoln County require ongoing management and maintenance due to the age and types of bridges. Modern bridges, which require minimum maintenance and are designed to withstand earthquakes, consist of pre-stressed reinforced concrete structures set on deep steel piling foundations.

Telephone Communications

Pioneer Telephone Cooperative provides telephone service to southern Lincoln County while Century Telephone provides service to northern Lincoln County. Underground telephone lines are generally located in or near highway right-of-way. Most telephone lines are above ground and suspended between single poles maintained by the cooperative or electric utility. DSL service is available for internet connections from these phone companies via CoastNet.[122]

Critical Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., polices and fire stations, public hospitals, public schools). It is important that these facilities are the most resilient to natural hazards as interruption or destruction of these facilities could restrict response efforts and time needed to assist those in danger.

Law Enforcement

Lincoln County is served by the Lincoln County Sheriff's office, as well as individual city law enforcement teams and Oregon State Patrol. The County Sheriff's office provides services to unincorporated parts of the county. There are 10 structural fire agencies in Lincoln County.[123] Aside from just extinguishing fires, each fire district and department provides essential public services in the communities they serve, including emergency medical services, search and rescue, and fire prevention education.[124]

[122] Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill. http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf

[123] Lincoln County Community Wildfire Protection Plan (2018).

[124] Ibid.

Hospitals and Clinics

Lincoln County has two hospitals, one in Newport (Samaritan Pacific Communities Hospital) and the other in Lincoln City (Samaritan North Lincoln Hospital). In addition, there are several clinics in the County including Samaritan Depoe Bay Clinic (Depoe Bay), Samaritan Coastal Clinic (Lincoln City), Samaritan Women's Health Center (Lincoln City), and Samaritan Toledo Clinic (Toledo).

Schools

The Lincoln County School District has 11 schools in four regions throughout the County. There are an additional three charter schools connected to the school district. See the Lincoln County School District addendum for more information.

Dependent Facilities

Facilities which have patients that are dependent on continued support and care include long term care (skilled, assistive), senior residential facilities, residential mental health facilities, and psychiatric hospitals. In the event of a disaster, these facilities may also act as secondary medical facilities as they are equipped with nurses, medical supplies, and beds.

Correctional Facilities

Correctional facilities are incorporated into physical infrastructure as they play an important role in everyday society by maintaining safe separation from the public. There are two correctional facilities located in Lincoln County. The Lincoln County Jail and the Lincoln County Juvenile Department are both located in Newport. While correctional facilities are built to code to resist structural failure, they typically have backup power to sustain regulation of inmates following the immediate event of an emergency. It is when the impacts of the event continue over a long duration, that logistical planning of these facilities becomes a challenge.

Synthesis

Built capacity refers to the built environment and infrastructure that support a community. The various forms of built capital mentioned above will play significant roles in the event of a disaster. Physical infrastructures, along with utility and transportation lifelines are critical during a disaster and are essential for proper functioning and response. Community resilience is directly affected by the quality and quantity of built capital and lack of, or poor condition of, infrastructure can negatively affect a community's ability to cope, respond, and recover from a natural disaster. Initially following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions will force communities to rely on local and immediate resources, so it is important to identify critical infrastructures throughout the county as they may play crucial roles in the mitigation and recovery stages of a disaster.

It is important for the county to consider these numbers when producing mitigation and educational outreach materials as it is important to reach all populations, especially the ones who face a higher risk of damage. There are five (5) dams throughout the county classified with a high threat potential. There are a variety of critical facilities located throughout county limits that in the event of a disaster can make communication efforts challenging. Several major

highways run throughout the county, giving residents several alternative routes that may provide service access, or serve as evacuation routes, yet if these roads are destroyed it can isolate communities and make rescue efforts more challenging.

Community Connectivity Capacity

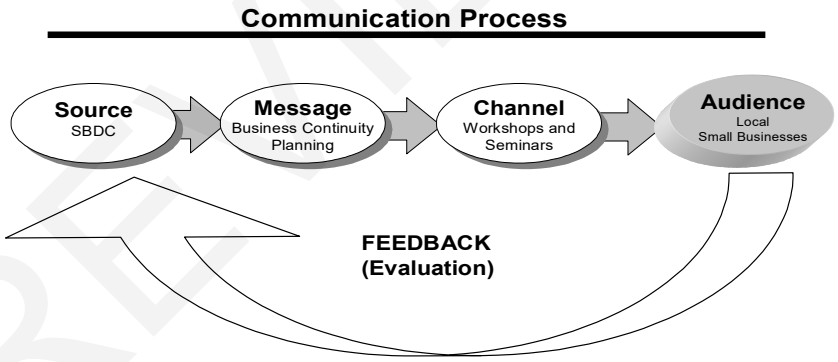
Community connectivity capacity places strong emphasis on social structure, trust, norms, and cultural resources within a community. In terms of community resilience, these emerging elements of social and cultural capital will be drawn upon to stabilize the recovery of the community. Social and cultural capitals are present in all communities; however, it may be dramatically different from one city to the next as these capitals reflect the specific needs and composition of the community residents.

Social Systems and Service Providers

Social systems include community organizations and programs that provide social and community-based services, such as employment, health, senior and disabled services, professional associations, and veterans' affairs for the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income, etc.). The county can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The presence of these services is more predominantly located in urbanized areas of the county, this is synonymous with the general urbanizing trend of residents.

Figure C-8 displays the NHMP's communication process. It is followed by a brief explanation of how the communication process works and how the community's existing social service providers could be used to provide natural hazard related messages to their clients.

Figure C-8 Communication Process



Source: Adapted from the U.S. Environmental Protection Agency Radon Division's outreach program

There are five essential elements for communicating effectively to a target audience:

- The source of the message must be credible,
- The message must be appropriately designed,
- The channel for communicating the message must be carefully selected,

- The audience must be clearly defined, and
- The recommended action must be clearly stated and a feedback channel established for questions, comments and suggestions.

The following list highlights organizations that are active within the community and may be potential partners for implementing mitigation actions. The three involvement methods are defined below.

Education and outreach – organization could partner with the community to educate the public or provide outreach assistance on natural hazard preparedness and mitigation.

Information dissemination – organization could partner with the community to provide hazard-related information to target audiences.

Plan/project implementation – organization may have plans and/or policies that may be used to implement mitigation activities, or the organization could serve as the coordinating or partner organization to implement mitigation actions.

The following organizations are active within the community and may be potential partners for implementing mitigation actions:

- Federal Emergency Management Agency Region X
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Coast Guard
- U.S. Department of Agriculture
- Department of Land Conservation and Development
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of Forestry
- Oregon Department of Geology and Mineral Industries
- Oregon Department of Transportation
- Division of State Lands
- Oregon Department of Parks and Recreation
- Oregon Department of Emergency Management
- Oregon State Building Codes
- Local Fire Districts
- Local Sewer and Water Districts
- Lincoln County Emergency Management
- Lincoln County Public Works Department
- Lincoln County Department of Information Technology
- Lincoln County Department of Planning and Development
- Lincoln County Community Emergency Response Team (CERT)
- Local Utility Providers
- City Governments and Departments
- Chamber of Commerce Office

- Insurance Companies
- Local Hospitals
- Oregon Coast Community College
- Central Oregon Coast Association (Travel Oregon)
- Hatfield Marine Science Center
- City Community/Recreational Centers
- Lincoln County School District
- Lincoln County Community Health Center
- Central Coast Economic Development Alliance
- Confederated Tribes of Siletz Indians

Civic Engagement

Civic engagement and involvement in local, state, and national politics are important indicators of community connectivity. Individuals who are more invested in their communities often demonstrate this through participation in political elections. In the 2024 Presidential General Election, Lincoln County, Oregon, reported a voter turnout of 75%, closely aligning with the statewide turnout of approximately 75.4%. Other indicators such as volunteerism, participation in formal community networks and community charitable contributions are examples of other civic engagement that may increase community connectivity.

Cultural Resources

Libraries and Museums

Libraries and museums develop cultural capacity and community connectivity as they are places of knowledge and recognition, they are common spaces for the community to gather and can serve critical functions in maintaining the sense of community during a disaster. They are recognized as safe places and reflect normalcy in times of distress. There are currently four community libraries in Lincoln County located in Newport, Siletz, Toledo, and Lincoln City. There are two museums in Lincoln County, which have an emphasis on the history of The Oregon Coast and the marine and fishing history of the region.

Cultural Events

Other such institutions that can strengthen community connectivity are the presence of festivals and organizations that engage diverse cultural interests. Examples of events include the Yachats Celtic Music Festival, the Nesika Illahee Pow Wow in Siletz. Examples of organizations include The Pacific Maritime & Heritage Center and Arcoíris Cultural Center. Not only do these events bring revenue into the community, they have potential to improve cultural competence and enhance the sense of place. Cultural connectivity is important to community resilience, as people may be more inclined to remain in the community because they feel part of the community and culture.

Historic Places

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources for tourism revenue. Protecting these resources from the impact of disasters is important because they have an important role in defining and supporting the community. According to the National Register Bulletin, "a contributing resource is a building, site, structure, or object adds to the historic associations, historic architectural qualities, or archeological values for which a property is significant because it was present during the period of significance, related to the documented significance of the property, and possesses historical integrity or is capable of yielding important information about the period; or it independently meets the National Register criteria."[125] If a structure does not meet these criteria, it is considered to be non-contributing.

Table C-29 identifies the number of eligible/significant (ES), eligible/contributing (EC) historical sites, and non-eligible historic sites in Lincoln County. The table also shows how many ES and EC sites are listed on the National Register and are located and in incorporated cities, and how many contributing and non-contributing resources are located at ES and EC sites. Overall, there are a total of 35 historically registered places in Lincoln County.

Table C-29 Lincoln County Historic Places

Eligible Sites	Total Sites	Located in Incorporated Cities
Eligible / Significant	49	37%
Eligible / Contributing	112	73%
Not Eligible / Noncontributing	199	76%
Not Eligible / Out of Period	16	100%
Nationally Registered	36	31%

Source: Oregon Historic Sites Database

Table C-30 displays the nationally registered historic places in Lincoln County. Many of the locations are restricted addresses because of the sensitivity of the sites, additionally some sites do not denote a date of construction because it is a natural feature or the date of the site is not known.

[125] U.S. Department of the Interior, National Park Service, Cultural Resources, National Register Bulletin 16A: "How to Complete the National Register Registration Form".

Table C-30 Lincoln County Nationally Registered Historic Places

Nationally Registered Site	Address	City	Date Constructed
Archeological Site (35-LNC-48)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-54)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-63)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-68)	Address Restricted	Address Restricted	-
Boiler Bay Site (35-LNC-63)	Address Restricted	Address Restricted	-
Cape Creek Site (35-LNC-57)	Address Restricted	Address Restricted	-
Cape Perpetua Shelter & Parapet	Waldport Ranger District	Yachats vcty	1933
Chitwood Bridge	Yaquina River	Toledo vcty	1926
Depoe Bay Bridge	Hwy 101	Depoe Bay	1927
Depoe Bay Ocean Wayside	119 SW Hwy 101	Depoe Bay	1956
Devils Punch Bowl	-	-	-
Dorchester House, The	2701 NW Hwy 101	Lincoln City	1929
Fisher School Bridge	Crab Creek Rd	Fisher	1919
Good Fortune Cove Site (35-LNC-56)	Address Restricted	Address Restricted	-
Good Fortune Point Site (35-LNC-55)	Address Restricted	Address Restricted	-
Government Point Site	Address Restricted	Address Restricted	-
New Cliff House	267 NW Cliff St	Newport	1911
North 804 Midden (35-LNC-72)	Address Restricted	Address Restricted	-
North Fork Of The Yachats Bridge	North Fork Yachats River	Yachats vcty	c.1938
Old Yaquina Bay Lighthouse	Yaquina Bay State Park	Newport	1871
Pacific Spruce Saw Mill Tenant Houses	146-192 NE 6th St	Toledo	1920
Rocky Creek Bridge	Otter Crest Loop Rd	Otter Rock vcty	1927
Rocky Creek Site (35-LNC-43)	Address Restricted	Address Restricted	-
Roper, Charles & Theresa, House	620 SW Alder St	Newport	1913
Seal Rock	-	-	-
Siletz Agency Site		Siletz	c.1856
Smelt Sands Midden (35-LNC-65)	Address Restricted	Address Restricted	-
St John's Episcopal Church	110 NE Alder St	Toledo	1937
Ten Mile Creek Bridge	Hwy 101	Yachats	1931
The Ahnkuti Site (35-LNC-76)	Address Restricted	Address Restricted	-
Tradewinds Kingfisher (Cruiser)	Port Of Depoe Bay Basin; Port of Newport	Depoe Bay	1941
Trail 804 Midden #3 (35-LNC-73)	-	-	-
US Spruce Production Railroad XII, Spur 5	[Linear District]	Yachats vcty	1925
Yachats Trail 804 Midden (35-LNC-66)	Address Restricted	Address Restricted	-
Yaquina Bay Bridge	Hwy 101	Newport	1936
Yaquina Head Lighthouse	Yaquina Head	Newport vcty	1872

Source: Oregon Historic Sites Database

The limited tools and models for heritage resource disaster resilience planning creates hurdles for energizing collaborative efforts between natural hazard mitigation planning and heritage preservation. Limited awareness about the vulnerability of heritage resources to natural and human-caused hazards, insufficient funding, and the limited capacity of local heritage organizations to address hazards can present additional obstacles.

A Disaster Resilience Plan for Heritage Resources (DRHR) is one method that could enhance the community's ability to protect sites vulnerable to natural hazards. The overarching goal of a DRHR is to increase community level knowledge and provide a framework for decision-making about heritage resources in the case of a disaster. For more information on resources that are available visit: https://www.oregon.gov/oprd/OH/Pages/DisasterPrep.aspx.

Community Stability

Community stability is a measure of rootedness in place. It is hypothesized that resilience to a disaster stems in part from familiarity with place, not only for navigating the community during a crisis, but also accessing services and other supports for economic or social challenges.[126]

Residential Geographic Stability

Table C-31 estimates residential stability across the region. It is calculated by the number of people who have lived in the same house and those who have moved within the same county a year ago, compared to the percentage of people who have migrated into the region. Lincoln County overall has a geographic stability rating of about 93% (i.e., 93% of the population lived in the same house or moved within the county). Siletz and Waldport have the highest geographic stability (97%) while Lincoln Beach has the lowest (77%).

Table C-31 Regional Residential Stability

Jurisdiction	Population	Geographic Stability	Same House	Moved Within Same County
Oregon	4,190,769	93%	85%	8%
Lincoln County	49,890	92%	85%	7%
Incorporated	29,349	92%	84%	8%
Unincorporated	6,203	82%	78%	5%
Bayshore CDP	956	95%	94%	1%
Lincoln Beach CDP	2,701	73%	70%	3%
Neotsu CDP	527	72%	72%	0%
Rose Lodge CDP	1,491	95%	85%	10%
San Marine CDP	528	82%	75%	7%
Other Unincorporated	528	94%	89%	5%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table A08001

[126] Cutter, Susan, Christopher Burton, Christopher Emrich. "Disaster Resilience Indicators for Benchmarking Baseline Conditions". Journal of Homeland Security and Emergency Management.

Homeownership

Housing tenure describes whether residents rent or own the housing units they occupy. Homeowners are typically more financially stable but are at risk of greater property loss in a post-disaster situation. People may rent because they choose not to own, they do not have the financial resources for home ownership, or they are transient.

Collectively, about 42% of the occupied housing units in Lincoln County are owner-occupied; about 24% are renter occupied (Table C-32). Siletz (62%), Rose Lodge CDP (57%), and "other" unincorporated areas (54%) have the highest rate of owner-occupied units. Seasonal or recreational housing accounts for a large amount of housing units in Lincoln County. Approximately 27% of the county's housing stock is considered "seasonal" housing, these are homes that are either occupied by the owner part of the year or are used as vacation rentals.[127] Lincoln Beach CDP (58%), Yachats (51%), Lincoln City (35%), and Depoe Bay (33%) have the highest seasonal housing percentages. The incorporated areas have a higher rate of renter-occupied households. Toledo (12%) and Rose Lodge (15%) have the highest vacancy rates within the county.

Table C-32 Housing Tenure and Vacancy

Jurisdiction	Housing Units	Owner-occupied		Renter-occupied		Seasonal^		Vacant^^	
		Estimate	Percent	Estimate	Percent	Estimate	Percent	Estimate	Percent
Oregon	1,818,599	1,062,522	58%	618,278	34%	56,489	3%	137,799	8%
Lincoln County	32,094	15,896	50%	6,587	21%	7,390	23%	9,611	30%
Incorporated	18,368	8,214	45%	5,087	28%	95	1%	5,067	28%
Unincorporated	5,223	2,447	47%	373	7%	1,861	36%	2,403	46%
Bayshore CDP	979	430	44%	39	4%	426	44%	510	52%
Lincoln Beach CDP	2,683	1,130	42%	228	8%	1,151	43%	1,325	49%
Neotsu CDP	433	229	53%	28	6%	49	11%	176	41%
Rose Lodge CDP	737	441	60%	61	8%	140	19%	235	32%
San Marine CDP	391	217	55%	17	4%	95	24%	157	40%
Other Unincorporated	8,503	5,235	62%	1,127	13%	95	1%	2,141	25%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Tables B25002, B25003, B25004

Notes: ^ = Seasonal, recreational, or occasional housing units. ^^ = Functional vacant units, computed after removing seasonal, recreational, or occasional housing units from vacant housing units.

According to Cutter, wealth increases resiliency and recovery from disasters. Renters often do not have personal financial resources or insurance to assist them post-disaster. On the other hand, renters tend to be more mobile, and have fewer assets at risk of natural hazards.[128] In the most extreme cases, renters lack enough shelter options when lodging becomes uninhabitable or unaffordable post-disaster.

Table C-33 shows the number of occupied households with more people than rooms. If there is more than one person living in a room, that is considered a crowding situation. Crowding can be linked to poverty rates and is another metric that can be used to determine how vulnerable people are to natural disasters.

[127] U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table B25004.

[128] Cutter, S. L. (2003). Social Vulnerability to Environmental Hazards. *Social Science Quarterly*.

Table C-33 Housing Tenure by Occupants per Room

Jurisdiction	Occupied Rooms	Crowding*			
		Owner-Occupied		Renter-Occupied	
		Total	Percent	Total	Percent
Oregon	1,680,800	20,092	1%	34,532	2%
Lincoln County	22,483	329	1%	91	< 1%
Incorporated	13,301	86	1%	81	1%
Unincorporated	2,820	69	2%	0	0%
Bayshore CDP	469	0	0%	0	0%
Lincoln Beach CDP	1,358	35	3%	0	0%
Neotsu CDP	257	0	0%	0	0%
Rose Lodge CDP	502	34	7%	0	0%
San Marine CDP	234	0	0%	0	0%
Other Unincorporate	6,362	174	3%	10	< 1%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table B25014
Notes: * = Crowing is defined by more than 1 person living in the same room

Table C-34 describes the county's population that are living in group quarters. Defined by people living together but not in a housing unit, people living in group quarters may find advocating for themselves more difficult, making them more vulnerable to natural disasters. There are two types of group quarters. Institutional, which includes correctional facilities, nursing homes, and mental hospitals, and non-institutional, which includes college dormitories, military barracks, missions, and shelters.

Table C-34 Group Quarters Population

Jurisdiction	Total Population	Living in Group Quarters	
		Total	Percent
Oregon	4,229,374	96,575	2%
Lincoln County	50,334	650	1%
Incorporated	29,580	463	2%
Unincorporated	6,301	179	3%
Bayshore CDP	956	0	0%
Lincoln Beach CDP	2,779	13	< 1%
Neotsu CDP	547	0	0%
Rose Lodge CDP	1,491	0	0%
San Marine CDP	528	166	31%
Other Unincorporated	14,453	8	< 1%

Source: Social Explorer, U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates, Table A19001

Synthesis

Lincoln County has distinct social and cultural resources that work in favor of increasing community connectivity and resilience. Sustaining social and cultural resources, such as social services and cultural events, may be essential to preserving community cohesion and a sense of place. The presence of larger communities makes additional resources and services available for the public. However, it is important to consider that these amenities may not be equally distributed to the rural portions of the county and may produce implications for recovery in the event of a disaster.

In the long-term, it may be of specific interest to the county to evaluate community stability. A community experiencing instability and low homeownership may hinder the effectiveness of social and cultural resources, distressing community coping and response mechanisms.

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research & Engagement. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon Department of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how an economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, law enforcement, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

Mitigation Strategy Economic Analyses Approaches

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the state Oregon Department of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but

still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process."

Social: Community development staff, local non-profit organizations, or a local planning board can answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff and building department staff can answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city/county administrator can answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county board of commissioners, city or county administrator, and local planning commissions to answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)

- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can answer these questions.

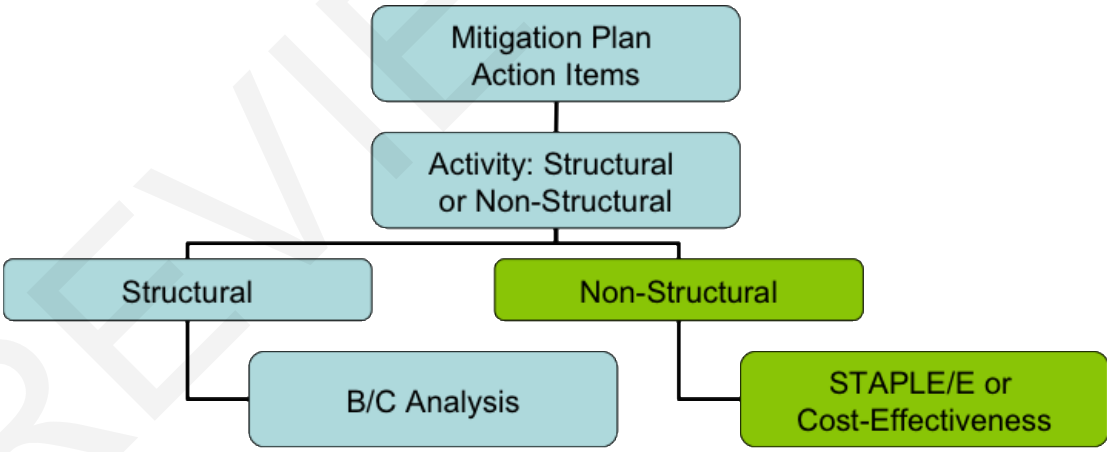
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. Figure D-1 serves as a guideline for when to use the various approaches.

Figure D-1 Economic Analysis Flowchart



Source: Oregon Partnership for Disaster Resilience. 2005.

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- ***Determine the project cost.*** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ***Estimate the benefits.*** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- ***Consider costs and benefits to society and the environment.*** These are not easily measured but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- ***Determine the correct discount rate.*** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- Net present value. Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- Internal rate of return. Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or landowners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values

- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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Appendix E: Grant Programs and Resources

Introduction

There are numerous local, state, federal, and foundation funding sources available to support natural hazard mitigation projects and planning. The following section includes an abbreviated list of the most common funding sources that can be utilized by local jurisdictions in Oregon. Because grant programs often change, it is important to periodically review available funding sources for current guidelines and program descriptions.

This appendix is organized into five sections by type of funding source: local, state, federal (including both hazard mitigation and hazard mapping/technical support), and foundation.

Local

Local funding depends on the funding mechanisms a jurisdiction has authority to use. A few common types of funding for hazard mitigation projects include:

Capital Improvement Project

Many jurisdictions put together a set of their big-ticket items into a budget package called a Capital Improvement Project (CIP) budget or 'Capital Projects' budget. These projects usually have been on the organizational 'to do' list for some time or have gained priority status through another mechanism such as a planning, design, or strategic planning process. Once a project moves into this status, an array of budget tools can be deployed.

Deferred and Lifetime Maintenance Funding

Other considerations about how to use lines of funding essentially amount to either a future line of funding or a deficit (such as an unfunded mandate or deferred maintenance). Lifetime Maintenance funding is a component of a project that can be included in a CIP or other project budget. This includes the expected operations and maintenance (O&M) costs of the project, and it rolls those costs into the upfront costs so there is a budget available for them. The alternative to this is a piece of equipment or other asset that does not receive the maintenance it needs due to budget cuts, which then has a shorter life and thus a higher annual cost to the jurisdiction and its customers.

General Obligation Bond

A general obligation bond (GO bond) is a municipal bond backed solely by the credit and taxing power of the issuing jurisdiction rather than the revenue from a given project. General obligation bonds are issued with the belief that a municipality will be able to repay its debt obligation through taxation or revenue from projects. No assets are used as collateral. In Oregon Revised Statutes, the rules for issuing GO bonds are regulated by type of entity. For example, sanitary and water districts have a discrete set of rules specific to their authorities in 2020 ORS, Vol. 12, Ch. 450.

Road Fund

A "county road fund" means a separate fund in the county treasury designated to receive deposit of revenues that are dedicated to roads or road improvements. The county road fund must be used in establishing, laying out, opening, surveying, altering, improving, constructing, maintaining and repairing county roads and bridges on county roads (with exceptions). See 2020 ORS, Vol. 10, Ch.238, Section 238.705.

Special Tax District

Some special districts, like Ports, may have the authority to create special tax levies, such as a "bond sinking fund", that is "a special tax upon all taxable real and personal property situated within the port. Such annual levy shall not exceed one-tenth of one percent." See 2020 ORS, Vol. 19, Ch. 777, Section 777.520.

Soil and water districts, drainage districts, levee districts, or diking districts can petition for bonds or tax local residents to pay for maintenance of culverts, dikes, or levees (see 2026 ORS, Vol. 15, Ch. 547-553 and Vol. 15, Ch. 568). Communities may also be able to pass local bond measures or a wastewater tax (see 2026 ORS, Vol. 12, Ch. 450, Section 450.170) to build up a fund for larger mitigation projects on local waterways and water management infrastructure.

State

Coastal Grants, DLCD

https://www.oregon.gov/lcd/OCMP/Pages/Grants.aspx

The Oregon Coastal Management Program (OCMP) at the Oregon Department of Land Conservation and Development (DLCD) announced a new National Oceanic and Atmospheric Administration (NOAA) funding opportunity in 2022 designed to build a Climate Ready Nation under the 2021 Bipartisan Infrastructure Law and available only through coastal management programs. The objective of this initiative is to increase resilience through landscape-scale habitat restoration and conservation in coastal ecosystems nationwide and promote coastal resilience in underserved coastal communities as well as those most vulnerable to climate impacts.

Community Grants, DLCD

https://www.oregon.gov/lcd/cpu/pages/community-grants.aspx

The DLCD Community Services Division offers grants to empower local and tribal governments to improve planning. The grants can pay to update comprehensive plans, modernize land use ordinances, or augment other planning activities. The general fund grant program, administered by the community services division, is funded by the Oregon legislature. Changes to the grant program can arise based on changes in state priorities, the economy, and other factors. In general, the funding follows the state's two-year budget cycle and is part of DLCD's budget.

Community Risk Reduction Grants, OSFM

https://www.oregon.gov/osfm/wildfire/pages/investments-for-oregon.aspx

Oregon State Fire Marshall (OSFM) grant programs provide the following funding sources:

Wildfire Season Staffing Grant

This grant program funds local fire agencies to hire additional firefighters for the fire season. This additional capacity allows fire agencies to respond to other calls, improving response times, and ultimately saving lives. This grant is usually offered annually.

Community Wildfire Risk Reduction Grant

This grant program is open to local governments, special districts, structural fire service agencies, and non-governmental organizations. The grant funds wildfire risk reduction projects, equipment, and staff. These projects will help protect people, property, and communities, preparing communities for wildfire impacts and creating a more fire-adapted Oregon.

This grant program is open to local governments, special districts, structural fire service agencies, and non-governmental organizations. This grant funds wildfire risk reduction projects, equipment, and staff.

2023 Oregon Fire Service Capacity Program

This grant program is for small- to medium-sized agencies that need more permanent firefighters and fire prevention staff. This grant is available to Oregon's local fire districts and departments for funds to support up to two firefighters and two fire prevention personnel.

This funding increases local on-duty capacity throughout the next three years; allows agencies to quickly mobilize to fight fires at the local, regional, and state (conflagration) levels; and better prepares communities to survive wildfires. More on-duty firefighters keep fires small before they can impact communities.

Emergency Shelter Grants and Supports, ODHS

https://www.oregon.gov/odhs/emergency-management/Pages/emergency-shelter.aspx

The Oregon Department of Human Services (ODHS) provides assistance for local governments, Tribal Nations, public education providers, non-profits, and faith-based organizations to address shelter needs for cleaner air shelters during wildfire smoke and other poor air quality events as well as both cooling and warming shelters.

Landscape Resiliency Program, ODF

https://www.oregon.gov/odf/pages/landscape-resiliency-program.aspx

This grant program was established through Senate Bill 762, Section 18 (2021) and funds landscape-scale projects that reduce wildfire risk on public and private forestlands and rangelands, and in communities near homes and critical infrastructure through restoration of landscape resiliency and reduction of hazardous fuels. Oregon Department of Forestry (ODF), with input from the Landscape Resiliency Project work group and the public, awarded $20 million for nine projects during the 2021–23 biennium.

Local Work Groups, USDA-NRCS

https://www.nrcs.usda.gov/state-offices/oregon/oregon-local-work-groups

The Natural Resources Conservation Service (NCRS) offers solutions for agricultural producers to protect natural resources. This agency of the U.S. Department of Agriculture (USDA) works directly with local farmers to meet their unique conservation and business goals. Each NRCS field office throughout the state hosts an annual Local Work Group Meeting to gather input from local landowners and partners about natural resource needs in the county. This locally-led process helps inform Oregon's conservation priorities and strategy across the state, and contributes to NRCS's conservation planning strategies. Find more information about these meetings at NRCS Oregon Local Work Groups.

Oregon State Weed Board Grant Program, ODA/OWEB

https://www.oregon.gov/ODA/programs/Weeds/Pages/GrantProgram.aspx

The Oregon Department of Agriculture (ODA) and the Oregon Watershed Enhancement Board (OWEB) work together to administer the ODA Noxious Weed Grant Program Lottery funded grant program. The implementation of a comprehensive watershed approach to integrated control of noxious weeds is the most effective strategy to minimize impacts and protect natural resources in Oregon from invasive noxious weeds. It is a priority of the Oregon State Weed Board (OSWB) to fund projects that restore and enhance fish and wildlife habitat, watershed functions, and native salmonid populations.

Oregon Watershed Enhancement Board Grant Programs

http://www.oregon.gov/OWEB/Pages/index.aspx

The Oregon Watershed Enhancement Board (OWEB)'s primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide. However, grant projects can sometimes also benefit efforts to reduce flood and landslide hazards or recover from major wildfires. OWEB awards approximately $20 million in funding annually, with funding coming from the general fund, state lottery, timber tax revenues, license plate revenues, and angling license fees.

Resilience Hubs and Networks Grant, ODHS

https://www.oregon.gov/odhs/emergency-management/Pages/resilience-grants.aspx#faq

The Oregon Department of Human Services (ODHS)'s Office of Resilience and Emergency Management (OREM) developed a program to provide grants, support, and technical assistance for the planning and establishment of resilience hubs and networks in Oregon, as guided by HB 3409 (2023). Additional funding may be offered for resilience work in the future.

Seismic Rehabilitation Grant Program, Business Oregon

https://www.oregon.gov/biz/programs/SRGP/Pages/default.aspx

The Seismic Rehabilitation Grant Program (SRGP) is a competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

Small Forestland Grant Program, ODF

https://www.oregon.gov/odf/pages/small-forestland-grant-program.aspx

The Small Forestland Grant Program (SFGP) provides competitively awarded grants to support small forestland owners' properties by reducing wildfire risk and creating resiliency on the landscape. The project must reduce the risk of high severity wildfire by treating hazardous fuels, in addition to other eligibility requirements. This annual grant program was established under SB 762 (2021) with additional funding provided via HB 5020 (2023).

Special Districts Association of Oregon Grant Directory

https://www.sdao.com/grant-resources

The Special Districts Association of Oregon (SDAO) provides a directory of funding resources available to special districts. Some of the programs relate only to specific types of districts, while others are broad in their scope.

Special Public Works Fund, Business Oregon

https://www.oregon.gov/biz/programs/SPWF/Pages/default.aspx

The Special Public Works Fund (SPWF) provides low-cost financing to eligible municipalities for planning, design, and construction of utilities and facilities essential to industrial growth, commercial enterprise, and job creation, including emergency projects needed due to a disaster.

State Preparedness and Incident Response Equipment, OEM

https://spire-geo.hub.arcgis.com/

Oregon HB 2687 (2017) established State Preparedness and Incident Response Equipment (SPIRE), a grant program to distribute emergency preparedness equipment to local governments and other recipients to decrease risk of life and property due to an emergency. Items purchased must qualify as capital assets, meaning individual items must cost at least $5,000. A total of $5 million is available to procure emergency preparedness equipment to help Oregon communities prepare, respond, and recover from emergencies. HB 2426 (2021) added Urban Search and Rescue (USAR) equipment to the list and required that USAR equipment receive the highest priority. For more information on the SPIRE program, contact OEM.SPIRE@oem.oregon.gov.

Volunteer Fire Capacity Grants, ODF

https://www.oregon.gov/ODF/AboutODF/Pages/GrantsIncentives.aspx

The Volunteer Fire Capacity (VFC) grant program is administered by the Oregon Department of Forestry (ODF) and funded through the US Forest Service (USFS). The objective of the VFC program is to improve the capacity and capability of rural and volunteer fire protection districts. These districts protect rural communities and play a substantial cooperative role in the suppression of wildland fires within or near federally managed lands. The VFC award is administered as a reimbursement award and offered annually.

Federal: Hazard Mitigation

Action, Implementation, and Mitigation Grant Program, USFS/COCO

https://co-co.org/get-involved/grants/aim-grant/

Coalitions and Collaboratives Inc. (COCO), a Colorado-based nonprofit co-sponsored by the US Forest Service (USFS) and the National Association of State Foresters, started the Action, Implementation, and Mitigation (AIM) Program to accelerate fire adaptation concepts and reduce the risk from wildfire across the U.S. by increasing capacity and on-the-ground work. COCO hopes to increase community resilience, restore fire-adapted ecosystems and create safer

conditions for residents and firefighters. This grant is available to organizations across the country for a wide variety of capacity-building activities, including personnel, planning efforts, and wildfire risk reduction work on non-federal lands. Grants are usually offered twice annually.

Assistance to Firefighters Grants, FEMA

https://www.fema.gov/grants/preparedness/firefighters/assistance-grants

The primary goal of the Assistance to Firefighters Grant (AFG) is to meet the firefighting and emergency response needs of fire departments and non-affiliated emergency medical service organizations. AFG has helped firefighters and other first responders obtain critically needed equipment, protective gear, emergency vehicles, training and other resources necessary for protecting the public and emergency personnel from fire and related hazards.

Staffing for Adequate Fire and Emergency Response (SAFER)

https://www.fema.gov/grants/preparedness/firefighters/safer

The Staffing for Adequate Fire and Emergency Response (SAFER) grant program is part of AFG and was created to provide funding directly to fire departments and volunteer firefighter interest organizations to help them increase or maintain the number of trained, "front line" firefighters available in their communities.

Fire Prevention and Safety (FP&S)

https://www.fema.gov/grants/preparedness/firefighters/safety-awards

The Fire Prevention and Safety (FP&S) grant program is part of AFG and supports projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to reduce injury and prevent death among high-risk populations.

Community Development Block Grant Program, HUD

https://www.hud.gov/program_offices/comm_planning/cdbg-dr

The Community Development Block Development Grant Program (CDBG) from the U.S. Department of Housing and Urban Development (HUD) promotes viable communities by providing decent housing; quality living environments; and economic opportunities, especially for low- and moderate-income persons. Eligible activities most relevant to natural hazards mitigation include ongoing, long-term recovery efforts like the acquisition of property for public purposes, construction/reconstruction of public infrastructure, and community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs in the last 18 months which pose immediate threats to health and welfare.

Business Oregon

https://www.oregon.gov/biz/programs/CDBG/Pages/default.aspx.

In Oregon, non-metropolitan cities and counties in rural Oregon apply for and receive CDBG grants through Business Oregon. However, tribes, urban cities (Albany, Ashland, Beaverton, Bend, Corvallis, Eugene, Grants Pass, Gresham, Hillsboro, Medford, Portland, Redmond, Salem, and Springfield), and large counties (Clackamas, Multnomah, Washington, Marion) may receive funds directly from HUD.

Community Development Block Grant Mitigation Program

https://www.hud.gov/program_offices/comm_planning/cdbg-dr/cdbg-mit

Community Development Block Grant Mitigation Program (CDBG-MIT) funds pose a unique opportunity for eligible grantees to use this assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses. CDBG-MIT defines mitigation as activities that increase resilience to disasters and reduce or 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. CDBG-MIT activities should align with other federal programs that address hazard mitigation to create a more cohesive effort at the federal, state, and local level.

Community Energy Programs, DOE

https://www.energy.gov/scep/community-energy-programs

Community Energy Programs (CEP) from the U.S. Department of Energy (DOE) provides support and resources to local and tribal governments, public schools, nonprofit organizations, workforce development groups, and other community-serving entities. The CEP includes a wide array of grant programs, several of which apply to hazard mitigation:

- Building Training and Assessment Centers: implementing modern building technologies.
- Energy Future Grants: providing support for local, state, and tribal government-led partnerships that advance clean energy.
- Revolving Loan Fund Grant Program: increasing energy efficiency and improving buildings.
- Technical Assistance for the Adoption of Building Energy Codes: updating building energy codes.
- Energy Efficiency and Conservation Block Grant Program: providing assistance to states, local governments, and tribes to further strategies for improving energy efficiency.
- Local Government Energy Program: supporting local governments and Tribes in implementing transformative clean energy projects and programs.
- Renew America's Schools: conducting energy efficiency improvements at public schools.
- Workforce Development and Business Owner Training Programs: helping to prepare workers to decarbonize buildings.

Community Wildfire Defense Grant, USFS

https://www.fs.usda.gov/managing-land/fire/grants/cwdg

The Community Wildfire Defense Grant Program (CWDG) is a grant program from the U.S. Forest Service (USFS) intended to help at-risk local communities and Tribes plan for and reduce wildfire risk. The 2021 Bipartisan Infrastructure Law authorized the $1 billion, five-year CWDG Program, which prioritizes at-risk communities in an area identified as having high or very high wildfire hazard potential; that are low-income; or have been impacted by a severe disaster that affects the risk of wildfire.

The program provides funding to communities to either develop and revise Community Wildfire Protection Plans (CWPPs) or implement projects described in a CWPP that is less than ten years old. The CWDG Program also helps communities in the wildland urban interface implement the three goals of the National Cohesive Wildland Fire Management Strategy:

- Restore and Maintain Landscapes: Landscapes across all jurisdictions are resilient to fire-related disturbances, in accordance with management objectives.
- Create Fire Adapted Communities: Human populations and infrastructure can better withstand a wildfire without loss of life and property.
- Improve Wildfire Response: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

The CWDG Dashboard provides a nationally consistent data dashboard to help communities complete grant applications and for reviewers to score applications: https://wildfirerisk.org/cwdg-tool. In Oregon, the Oregon Department of Forestry manages the application process: https://www.oregon.gov/ODF/AboutODF/Pages/GrantsIncentives.aspx.

Dam Emergencies Collaborative Technical Assistance Program, FEMA

https://www.fema.gov/emergency-managers/risk-management/dam-safety/technical-assistance

The FEMA Planning for Dam Emergencies Collaborative Technical Assistance (CTA) Program aims to enhance the emergency preparedness of communities with dams through a variety of targeted sessions and resources. Continuous program evaluation is crucial for ensuring greater reach, engagement and impact on the dam safety community.

Disaster Loan Assistance, SBA

http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/disaster-loans

There are four types of loans available from the U.S. Small Business Administration (SBA): home and personal property loans; business physical disaster loans; economic injury loans; and military reservist injury loans. When physical disaster loans are made to homeowners and businesses

following disaster declarations by the SBA, up to one-fifth (20%) of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.

Disaster Recovery Unit, DOE

https://www.ed.gov/disasterrelief

The Disaster Recovery Unit (DRU) coordinates disaster recovery work across the U.S. Department of Education (DOE). The DRU supports K-12 and higher education school communities to restore learning following a Federally declared natural disaster. Additionally, the DRU manages work with other U.S. government agencies to ensure effective and efficient use of DOE's natural disaster recovery resources.

Flood Mitigation Assistance Program, FEMA

http://www.fema.gov/flood-mitigation-assistance-program.

The goal of the Flood Mitigation Assistance (FMA) Program from the Federal Emergency Management Agency (FEMA) is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This includes:

- Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
- Encouraging long-term, comprehensive hazard mitigation planning;
- Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
- Complementing other federal and state mitigation programs with similar, long-term mitigation goals.

Applicants need a user profile approved by the State Hazard Mitigation Officer, which should be garnered well before the application period opens annually by contacting shmo@mil.state.or.us.

For Oregon Department of Emergency Management (OEM) grant guidance on Federal Hazard Mitigation Assistance from FEMA, visit:
https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx.

Emergency Management Performance Grant, FEMA

https://www.fema.gov/grants/preparedness/emergency-management-performance

The Emergency Management Performance Grant (EMPG) provides state, local, tribal and territorial emergency management agencies with the resources required for implementation of the National Preparedness System and works toward the National Preparedness Goal of a secure and resilient nation. The EMPG's allowable costs support efforts to build and sustain core capabilities across the prevention, protection, mitigation, response and recovery mission areas.

Hazardous Fuels Transportation Assistance Grants, USFS

https://www.fs.usda.gov/managing-land/forest-management/products/hazardous-fuels-transport-assist-grants

Hazardous Fuels Transportation Assistance (HFTA) grants from the U.S. Forest Service (USFS) support projects that remove hazardous fuels from national forests and grasslands to a location where the materials may be used for various wood products and services. This program contributes to the USFS's Wildfire Crisis Strategy implementation by removing hazardous fuels from forests and supports local forest product facilities and rural economies.

HFTA grants are open to any entity engaged in the transportation of hazardous fuels from forests in or adjacent to national forests.

Hazard Mitigation Grant Program, FEMA

https://www.fema.gov/grants/mitigation

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP involves a paper application which is first offered to the counties with declared disasters within the past year, then becomes available statewide if funding is still available.

National Dam Safety Program State Assistance Grant Program, FEMA

https://www.fema.gov/emergency-managers/risk-management/dam-safety/grants

The primary purpose of the National Dam Safety Program (NDSP) State Assistance Grant Program is to provide financial assistance to the states for strengthening their dam safety programs. States use NDSP funds for the following types of activities:

- Dam safety training for state personnel
- Increase in the number of dam inspections
- Increase in the submittal and testing of Emergency Action Plans
- More timely review and issuance of permits
- Improved coordination with state emergency preparedness officials
- Identification of dams to be repaired or removed
- Conduct dam safety awareness workshops and creation of dam safety videos and other outreach materials

Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation Discretionary Grant Program, DOT-FHWA

https://www.fhwa.dot.gov/environment/protect/discretionary/

The vision of the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Grant Program is to fund projects that address the climate crisis by improving the resilience of the surface transportation system, including highways, public transportation, ports, and intercity passenger rail. This grant program is administered by the Federal Highway Administration (FHWA) within the U.S. Department of Transportation (DOT).

Projects selected under this program should be grounded in the best available scientific understanding of climate change risks, impacts, and vulnerabilities. They should support the continued operation or rapid recovery of crucial local, regional, or national surface transportation facilities. Furthermore, selected projects should utilize innovative and collaborative approaches to risk reduction, including the use of natural infrastructure, which is explicitly eligible under the program. Also called nature-based solutions, these strategies include conservation, restoration, or construction of riparian and streambed treatments, marshes, wetlands, native vegetation, stormwater bioswales, breakwaters, reefs, dunes, and shade trees. They reduce flood risks, erosion, wave damage, and heat impacts while also creating habitat, filtering pollutants, and providing recreational benefits. Projects in the PROTECT Discretionary Grant Program have the potential to demonstrate innovation and best practices that State and local governments in other parts of the country can consider replicating.

Post-Disaster Recovery Programs, USDA-NCRS

The U.S. Department of Agriculture (USDA)'s Natural Resources Conservation Service (NRCS) offers solutions for agricultural producers to protect natural resources. The NRCS Oregon office offers many programs to perform voluntary resource conservation on private lands. Some programs are only available to individuals who reach out after a disaster. USDA has a Disaster Assistance Discovery Tool to help assess what programs can help individuals.

Funding and technical assistance for natural disaster recovery is available in several ways:

Emergency Watershed Protection (EWP) Program

https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection

This program offers technical and financial assistance to reduce immediate threats to life and property after a flood, fire, windstorm, or other natural disaster that affects a watershed. The Emergency Watershed Protection (EWP) Program does not require a federal or state disaster declaration. Eligible local sponsors reach out to NRCS, sign an agreement, and then start EWP projects, which can include:

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded streambanks
- Correct damaged or destroyed drainage facilities
- Establish vegetative cover on critically eroding lands
- Repair levees and structures
- EWP property buyouts

2018 Farm Bill

Farmers, ranchers, and forest managers can access funding programs to mitigate risk, conserve resources, and recover from natural disasters under the 2018 Farm Bill. Natural disaster recovery-specific programs include:

- Emergency Assistance for Livestock, Honeybees, and Farm-raised Fish program (ELAP)
- Emergency Conservation Program (ECP)
- Emergency Forest Restoration Program (EFRP)
- Emergency loans
- Livestock Forage Disaster Program (LFP) – *drought and fire only*
- Livestock Indemnity Program (LIP)
- Tree Assistance Program (TAP)

Public Assistance Grant Program, FEMA

https://www.fema.gov/assistance/public

FEMA's Public Assistance Grant Program provides supplemental grants to state, tribal, territorial, and local governments, and certain types of private non-profits so communities can quickly respond to and recover from major disasters or emergencies. FEMA also encourages protecting these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

Regional Catastrophic Preparedness Grant, FEMA

https://www.fema.gov/grants/preparedness/regional-catastrophic

The Regional Catastrophic Preparedness Grant Program (RCPGP) plays an important role in the implementation of the National Preparedness System. RCPGP supports the building of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation by providing resources to close known capability gaps in Housing and Logistics and Supply Chain Management, encouraging innovative regional solutions to issues related to catastrophic incidents, and building on existing regional efforts.

Wildfire Smoke Preparedness in Community Buildings Grant Program, EPA

https://www.epa.gov/indoor-air-quality-iaq/wildfire-smoke-preparedness-community-buildings-grant-program

Wildfire Smoke Preparedness in Community Buildings is a federal grant program from the U.S. Environmental Protection Agency (EPA) to enhance community wildfire smoke preparedness. The program can provide grants to States, federally recognized Tribes, public pre-schools, local educational agencies, and non-profit organizations for the assessment, prevention, control, and/or abatement of wildfire smoke hazards in community buildings and related activities.

Federal: Hazard Mapping/Technical Support

Cooperating Technical Partners Program, FEMA

https://www.fema.gov/flood-maps/cooperating-technical-partners

FEMA's Cooperating Technical Partners (CTP) program develops partners and partnerships to update flood maps across the nation. CTPs help ensure better overall flood risk identification and community protection through the development of reliable and up-to-date flood maps and community outreach. Communities can connect with a current CTP organization to request a mapping and data analysis project that supports hazard identification and mitigation. In Oregon, some examples of current FEMA CTPs are the Oregon Department of Geology and Mineral Industries (DOGAMI) and the City of Portland.

Decision, Risk and Management Science Program, NSF

https://new.nsf.gov/funding/opportunities/decision-risk-management-sciences-drms

The Decision, Risk and Management Sciences Program (DRMS) from the U.S. National Science Foundation (NSF) supports scientific research directed at increasing understanding and effectiveness of decision making by individuals, groups, organizations and society. DRMS supports research with solid foundations in theories and methods of the social and behavioral sciences. This social and behavioral science research should advance knowledge, address fundamental scientific and societal issues and have strong, broader impacts.

Emergency Community Water Assistance Grants, USDA-NRCS

https://www.rd.usda.gov/programs-services/water-environmental-programs/emergency-community-water-assistance-grants

The USDA Emergency Community Water Assistance Grants (ECWAG) program provides critical funding to help rural communities prepare for or recover from emergencies that threaten access to safe, reliable drinking water. Counties, cities, and special districts are eligible to apply if they are public entities located in rural areas with populations of 10,000 or fewer and have a median household income below the state's non-metropolitan median.

Eligible emergencies include natural disasters such as droughts, floods, earthquakes, and hurricanes, as well as chemical spills or disease outbreaks. The program offers:

- Up to $150,000 for emergency repairs to water transmission lines and related infrastructure.
- Up to $1,000,000 for developing new water sources, including wells, reservoirs, and treatment facilities.

Applications are accepted year-round, and a federal disaster declaration is not required to qualify

Environmental Quality Incentives Program, USDA-NRCS

https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives

The Environmental Quality Incentives Program (EQIP) is the U.S. Department of Agriculture (USDA)'s Natural Resources Conservation Service (NRCS) flagship conservation program that helps farmers, ranchers and forest landowners integrate conservation into working lands. EQIP provides technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns, such as:

- Improved water and air quality;
- Conserved ground and surface water;
- Increased soil health;
- Reduced soil erosion and sedimentation;
- Improved or created wildlife habitat; and
- Mitigation against drought and increasing weather volatility.

Local Infrastructure Hub

https://localinfrastructure.org/

The Local Infrastructure Hub is a national program designed to connect cities and towns with the resources and expert advice they need to access federal infrastructure funding to drive local progress, improve communities, and deliver results for residents. The program is run by a wide

array of public organizations, most notable the National League of Cities and the U.S. Conference of Mayors.

National Coastal Zone Management Program, NOAA

https://coast.noaa.gov/czm/about/

The National Coastal Zone Management Program is administered by the National Oceanic and Atmospheric Administration (NOAA) and provides grants for the planning and implementation of coastal management programs that enhance and protect coastal resources and communities.

National Earthquake Hazard Reduction Program

https://www.nehrp.gov/

The National Earthquake Hazard Reduction Program (NEHRP) is the federal government's coordinated long-term nationwide program to reduce risks to life and property that result from earthquakes. There are four member agencies of NEHRP: the National Institute of Standards and Technology (NIST) – which is the lead agency for NEHRP – the Federal Emergency Management Agency (FEMA), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS). NEHRP has four basic goals:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation.
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems.
- Improve earthquake hazards identification and risk assessment methods, and their use.
- Improve the understanding of earthquakes and their effects.

National Flood Insurance Program, FEMA

https://www.fema.gov/flood-insurance

The National Flood Insurance Program (NFIP) provides flood insurance to property owners, renters and businesses, and having this coverage helps them recover faster when floodwaters recede. The NFIP works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects.

Flood insurance is available to anyone living in one of the almost 23,000 participating NFIP communities. Homes and businesses in high-risk flood areas with mortgages from government-backed lenders are required to have flood insurance.

NFIP Flood Maps

https://www.fema.gov/flood-maps

The NFIP also provides Flood Insurance Rate Maps (FIRMs) and floodplain management maps for all NFIP communities. An NFIP community is any place with at least a 1% chance of experiencing a flood each year. Maps are updated through the Risk Mapping, Assessment, and Planning (MAP)

program. Oregon Risk MAP projects can include community resilience meetings, mapping and data updates, flood modeling, and other natural hazard data collection and review.

National Landslide Hazards Reduction Program, USGS

https://www.usgs.gov/programs/landslide-hazards/science/national-landslide-preparedness-act

The National Landslide Preparedness Act (P.L. 116-323, 2021) authorized a national landslide hazards reduction program and a 3D elevation program within the U.S. Geological Survey (USGS). This broadened the already existing Landslide Hazards Program under the Natural Hazards Mission Area, and the 3D Elevation Program under the National Geospatial Program and required additional coordination with other federal agencies. The Act authorizes the National Landslide Hazards Reduction Program (NLHRP) to identify and understand landslide hazards and risks; reduce landslide losses; protect communities at risk; and help improve communication, emergency preparedness by coordinating with communities and entities responsible for infrastructure at risk.

National Tsunami Hazard Mitigation Program, NWS

https://www.weather.gov/nthmp/

The National Tsunami Hazard Mitigation Program (NTHMP), a part of the National Weather Service (NWS)'s Tsunami Program, is a coordinated U.S. national effort to mitigate the impact of tsunamis through public education, community response planning, hazard assessment, and warning coordination. NTHMP partner states are provided with financial assistance via grants that are the primary funding source for projects that further the efforts of the NTHMP and NOAA's TsunamiReady program. With this assistance, NTHMP partner states have substantially improved the products and services they provide to coastal communities in a cost-effective way.

Natural Hazards Mission Area, USGS

https://www.usgs.gov/mission-areas/natural-hazards

The U.S. Geological Survey (USGS) works with many partners to monitor, assess, and conduct targeted research on a wide range of natural hazards so that policymakers and the public have the understanding they need to enhance preparedness, response, and resilience. The USGS provides alerts and warning of geologic hazards as well as interactive maps and planning data.

North American Wetland Conservation, DOI-FWS

https://www.fws.gov/program/north-american-wetlands-conservation

The North American Wetland Conservation (NAWC) Fund provides cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats in the United States, Canada, and Mexico. These grant programs are funded by the U.S. Fish and Wildlife Service (FWS) within the U.S. Department of the Interior (DOI).

Readiness and Environmental Protection Integration, DOD

https://www.repi.mil/

The Department of Defense's (DOD) Readiness and Environmental Protection Integration (REPI) program benefits the environment by conserving land near military installations and ranges. REPI engages in partnerships that often work across boundaries and protect working lands (e.g., farms, forests, ranches), wildlife habitat, water resources, natural spaces for recreational opportunities, and threatened and endangered species. REPI is involved in nature-based solutions that help installations prevent, prepare for, and recover from anticipated or unanticipated changes in environmental conditions.

Partners for Fish and Wildlife, DOI-FWS

https://www.fws.gov/program/partners-fish-and-wildlife

The Partners for Fish and Wildfire (PFW) program provides free technical and financial assistance to landowners, managers, tribes, corporations, schools and nonprofits interested in improving wildlife habitat on their land. The PFW program employs 220 biologists across all 50 states and territories who consult with landowners to help them conserve and improve wildfire habitats.

Planning Assistance to States, USACE

https://www.poa.usace.army.mil/Missions/Civil-Works-and-Planning/Planning-Assistance-to-States/

The Planning Assistance to States (PAS) program is offered through the U.S. Army Corp of Engineers (USACE. The PAS has two types of planning assistance: Technical Assistance and Comprehensive Plans. Any state, group of states, federally recognized tribe, or regional coalition of governmental entities may partner with USACE under the PAS program to prepare a Comprehensive Plan or receive other forms of technical assistance. Examples of past studies and activities completed under PAS include watershed planning, flood risk management, surface and groundwater quality, environmental conservation and restoration, water supply and demand, wetland delineations, stream assessments, and GIS mapping.

Rural Development Assistance, USDA

https://www.rd.usda.gov/programs-services/all-programs

The U.S. Department of Agriculture (USDA)'s Rural Development Assistance grant programs offer a wide variety of grants for rural communities, including for to supplement disaster relief and recovery as well as housing construction, infrastructure maintenance, economic development, health services, and energy needs.

Secure Rural Schools Program, USFS

https://www.fs.usda.gov/working-with-us/secure-rural-schools

The Secure Rural Schools program provides funding for schools, roads, and other municipal services to more than 700 counties across the U.S. and Puerto Rico. The program is funded by the U.S. Forest Service (USFS), with a portion of USFS funds generated through multi-use activities – such as grazing and timber production – being distributed to eligible counties to help maintain local roads and schools. Funds have been used for improvements to public schools and roads, infrastructure maintenance, and improving the health of watersheds and ecosystems.

Silver Jackets, USACE

https://www.iwr.usace.army.mil/Silver-Jackets/State-Teams/Oregon/

The Oregon Silver Jackets Team is a subcommittee to the State Interagency Hazard Mitigation Team (IHMT). Managed by the U.S. Army Corps of Engineers (USACE) through their Flood Risk Management Program, this interagency team of state and federal agencies can offer technical mapping, modeling, and planning assistance for flood-specific risk identification and mitigation projects.

Soil Survey, USDA-NRCS

https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-science

The U.S. Department of Agriculture (USDA)'s Natural Resources Conservation Service (NRCS) delivers science-based soil information to help farmers, ranchers, foresters, and other land managers effectively manage, conserve, and appraise their most valuable investment — the soil. The NRCS maintains soil surveys for counties and other areas that can assist with mitigation.

Wetlands Reserve Easements, USDA-NCRS

https://www.nrcs.usda.gov/programs-initiatives/wre-wetland-reserve-easements

The Wetlands Reserve Easements (WRE) program from the U.S. Department of Agriculture (USDA)'s Natural Resources Conservation Service (NRCS) protects and restores wetlands through easements and restoration agreements with private landowners.

Foundation

Center for Disaster Philanthropy

https://disasterphilanthropy.org/cdp-funds/our-grantmaking-process/

The Center for Disaster Philanthropy (CDP) grants support medium- and long-term recovery and resilience efforts in communities affected by natural and human-made hazards, including conflicts and humanitarian crises. With a focus on historically marginalized and at-risk populations, CDP prioritizes investments in local organizations to support a range of programs critical for individuals' and communities' recovery.

Oregon Community Foundation

https://oregoncf.org

The Oregon Community Foundation (OCF) provides grants and scholarships across Oregon. As a statewide community foundation, they work alongside donors, stewarding their priorities into strategic giving to support diverse communities across Oregon, creating lasting, transformative change. OCF has five offices and professional advisors to assist donors in setting up advised funds to serve seven areas of impact: Arts and Culture; Economic and Community Vitality; Community Engagement; Education; Health and Well-being; Housing Stability; and Land and Nature.

Meyer Memorial Trust

https://mmt.org/

Since 1982, Meyer Memorial Trust has awarded grants and program-related investments totaling more than $814 million to more than 3,380 organizations around the Pacific Northwest. Today, the Meyer Memorial Trust focuses on work in Oregon in four areas Oregonians have identified as crucial to making the state better for all its residents: housing, education, the environment, and building stronger communities.

The Collins Foundation

https://www.collinsfoundation.org/grants

The Collins Foundation invests in Oregon nonprofits, both rural and urban, that are dedicated to improving quality of life and well-being for the people in their communities. As a funder and partner, The Collins Foundation is committed to the pursuit of equity, both in how resources are allocated across Oregon's diverse communities and how internal structures are shaped.

The Ford Family Foundation

https://www.tfff.org/grants/funding/

Grants aligned with the Ford Family Foundation Community impact area support conditions that help children and families thrive in rural communities. This includes focusing on local economies, social capital, community visioning and planning capacity, and public gathering spaces. Current grant funding examples related to hazard mitigation include community building and engagement efforts, community centers and convening spaces, rural health centers, disaster resiliency planning, and fire halls.

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Appendix F: Survey

Purpose

To gather input from the Lincoln County community, the Oregon Partnership for Disaster Resilience (OPDR) and Lincoln County Emergency Management designed a survey to measure community perspectives on hazard awareness, preparedness, and mitigation.

The survey was developed on Qualtrics and was available online in both English and Spanish for approximately three months from May to July 2024. Members of the NHMP Steering Committee helped distribute this survey to County residents, County visitors, and those who work in the County via email, newsletters, and social media posts. An optional raffle prize of two emergency go-bags was offered to survey respondents who provided their emails.

A total of 73 responses were received as part of this survey. Since not all questions were answered by all respondents, and some respondents were flagged as potential bots, not every figure adds up to the full number of potential responses. All analysis was conducted by OPDR.

Key Takeaways

The following takeaways informed the development of the hazard analysis matrix in Volume I, Section 3 as well as the Mitigation Strategy in Volume I, Section 4:

Community Concerns About Natural Hazards
The survey revealed that Lincoln County residents are most concerned about earthquakes, wildfires, coastal erosion, and tsunamis. These concerns align with the region's known vulnerabilities and the risk assessments conducted by local emergency management. In contrast, volcanic events and extreme heat were seen as less threatening, though this may reflect a lack of awareness rather than actual risk.

Preparedness and Perceived Readiness
While many residents reported taking basic preparedness steps—like trimming trees, securing heavy items, and clearing storm drains—fewer had made significant financial investments such as purchasing insurance or retrofitting homes. The community feels most prepared for winter storms and windstorms, but far less so for floods, landslides, and volcanic events. This disparity highlights the need for targeted outreach and support for under-addressed hazards.

Evacuation Awareness and Challenges
Most respondents indicated they would evacuate during a disaster and had a general idea of where to go, especially in the event of a tsunami. However, 28% expressed concern about traffic congestion during evacuations, and some were unsure about evacuation procedures when away

from home. These insights point to the need for a more robust, countywide evacuation strategy that includes education for multiple daily contexts—home, work, and travel.

Barriers to Emergency Preparedness
Financial constraints were the most cited barrier to preparedness, with nearly half of respondents indicating that cost prevents them from taking necessary actions. Other barriers included lack of knowledge, feeling overwhelmed, and time constraints. These findings suggest that public education campaigns should focus on low-cost, high-impact actions and provide clear, accessible guidance.

Communication Preferences and Gaps
Residents overwhelmingly prefer to receive emergency alerts through digital channels, especially text messages, emails, and online news. However, several respondents noted the lack of reliable communication during power outages, emphasizing the need for backup systems like local radio stations with emergency power. This gap in infrastructure could significantly hinder emergency response and public safety during disasters.

Infrastructure and Environmental Vulnerabilities
Respondents identified numerous vulnerabilities in local infrastructure, including aging water systems, lack of backup power, and seismic risks to bridges and public buildings. Concerns about flooding, erosion, and landslides were also prevalent, particularly in areas like Highway 101 and 20. Wildfire risks were exacerbated by dry conditions and inadequate fire suppression infrastructure. These insights underscore the urgency of investing in resilient infrastructure and community-wide mitigation strategies.

Demographic and Geographic Insights
The survey was dominated by long-term residents, with 82% having lived in the county for over five years and 61% for more than a decade. Most respondents were older adults, particularly those aged 65 and above. Otter Rock and Newport were the most represented communities, while several rural areas had little to no participation. This demographic and geographic skew suggests that future outreach should focus on engaging younger residents and underrepresented communities.

Socioeconomic Challenges
Many respondents reported difficulty affording homeownership, healthcare, and insurance. A significant portion identified as low-income or faced food and transportation insecurity. These socioeconomic pressures directly impact residents' ability to prepare for disasters and highlight the importance of integrating social services with emergency preparedness efforts.

Community Feedback and Suggestions
Respondents expressed a strong desire for improved public education, more visible outreach efforts, and better emergency communication systems. Some shared personal stories of disaster impacts, while others offered gratitude for the county's preparedness initiatives. These comments reflect a community that is engaged, concerned, and eager to be part of the solution.

Survey Methods and Results

The survey began with a brief introduction summarizing the goals of the project, supporting the development of Lincoln County's Natural Hazard Mitigation Plan (NHMP), and provided respondents the option to switch the survey language from English to Spanish. No respondents chose to complete the survey in Spanish. The survey was administered via Qualtrics during April and May 2025 and was distributed to the community through Lincoln Alerts and Lincoln County's official social media channels. Additionally, cities and special districts helped promote the survey by making it available to their respective communities.

The remainder of this section provides the results of the community survey, organized into the five categories used to divide up the survey:

- Natural Hazard Information: Questions focused on the perceptions of natural hazards present in the community.
- Individual/Community Preparedness: Questions focused on the perception of individual and community preparedness for disaster events.
- Household Preparedness: Questions focused on the preparedness of respondents' households for disaster events.
- Demographics: Questions helped identify key information about respondents. This section was optional but completed by nearly all respondents.

Each table or figure summarizing results includes the number of respondents for that given question (represented by the notation "n=X", where X is equal to the number of respondents). Where relevant or where results may be unclear, a brief narrative is included highlighting key components of the question on which to focus.

Unless otherwise noted, "Earthquake" when referenced in question includes both a Crustal Earthquake and a Cascadia Subduction Zone (CSZ) event.

Natural Hazard Information

Q: Please indicate your level of concern about the following natural hazards:

The survey asked respondents how concerned they were about hazards affecting the area where they live and/or work. To best represent concerns about each of the 12 hazards profiled in the NHMP, responses are broken down by hazard and arranged by hazards of highest concern.

The top four hazards of concern from respondents are Earthquake, Wildfire, Coastal Erosion, and Tsunami. Respondents were least concerned about Volcanic Event and Extreme Heat.

Table F-1 Natural Hazard Concerns (n=62)

	Not Concerned	Slightly Concerned	Somewhat Concerned	Moderately Concerned	Very Concerned
Earthquake	2%	10%	21%	21%	46%
Wildfire	0%	11%	22%	22%	43%
Coastal Erosion	2%	13%	29%	24%	32%
Tsunami	2%	16%	24%	29%	27%
Windstorm	6%	8%	24%	41%	19%
Drought	22%	13%	21%	25%	17%
Landslide	5%	22%	22%	33%	13%
Air Quality (Smoke)	22%	29%	14%	21%	11%
Winter Storm (Snow/Ice)	10%	14%	29%	33%	11%
Flood	19%	32%	30%	8%	6%
Extreme Heat	33%	29%	19%	11%	5%
Volcanic Event	46%	27%	21%	2%	2%
Other:	3%	0%	5%	2%	3%

Source: Lincoln County NHMP Community Survey

The question also included an "Other" option, to which seven (7) people responded. The other options identified by respondents included: Tornadoes

- Use of pea gravel on roads in winter instead of sand or rock salt.
- community water system
- power outages
- River Erosion
- algae bloom, other water toxin
- Pollution

Q: Has your home been damaged by a hazard event (for example, flood waters entering home or wildfire damage)?

Nine respondents reported that their homes were affected by various natural hazards, including windstorms, ice storms, and wildfires. Respondents reported that windstorms caused significant tree damage, with some trees falling on fences, outbuildings, and even houses, leading to roof and siding damage. Ice storms also brought down large trees, damaging homes. One respondent experienced severe impacts from the 2020 Echo Mountain Complex Fire, losing structures and suffering smoke damage that led to asthma.

Individual/Community Preparedness

Q. There are several activities that can reduce your community's risk from natural hazards. These activities can be for government, businesses, or individuals. Please check the box that best represents your opinion on which activities will reduce the risk of natural hazards in Lincoln County. - Regulatory approach to reducing risk

The survey asked respondents to identify which activities they believe are most important for reducing community risk from natural hazards. While there was general agreement that all listed activities have value, respondents prioritized making homes more disaster-resilient, disclosing natural hazard risks during real estate transactions, and protecting utilities to minimize damage. In contrast, using local tax dollars to reduce risks and losses, adopting a regulatory approach, and pursuing non-regulatory strategies were ranked as the least important options.

Table F-2 Importance of activities that will reduce community risk (n=60)

	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Making your home more disaster-resilient	75%	14%	8%	2%	2%
Disclosing natural hazard risks during real estate transactions	72%	15%	10%	3%	0%
Protecting and reducing damage to utilities	70%	20%	5%	3%	2%
Enhancing the function of natural features (e.g. streams, wetlands)	52%	25%	22%	2%	0%
Policies that prohibit development in areas subject to natural hazards	51%	36%	12%	2%	0%
Combination of regulatory and non-regulatory approaches to reducing risk	50%	27%	18%	5%	0%
Use of local tax dollars to reduce risks and losses from natural hazards	32%	38%	27%	2%	2%
Regulatory approach to reducing risk	28%	38%	27%	7%	0%
Non-regulatory approach to reducing risk	27%	33%	30%	7%	3%

Source: Lincoln County NHMP Community Survey

Next respondents were asked to identify any natural hazard natural hazard problem areas that they are aware of in their community (flood-prone areas, important buildings that lack backup power, etc.). Residents across Lincoln County shared a wide range of concerns about natural hazards and infrastructure vulnerabilities in their communities. Their responses reflect a deep

awareness of the region's exposure to earthquakes, tsunamis, storms, and climate-related events, as well as the urgent need for improved preparedness and resilience.

Earthquake and Tsunami Preparedness
Respondents expressed deep concern about the seismic vulnerability of critical infrastructure, including water towers, bridges like the Yaquina Bay Bridge, and older buildings such as the Otter Rock firehall. Many noted the lack of backup power for essential services, including water systems, communication towers, and emergency shelters. There is also widespread worry about limited evacuation routes, particularly in tsunami zones and areas prone to landslides or road collapse, which could leave communities isolated after a major disaster.

Power and Communication Outages
Frequent and prolonged power outages during storms and ice events were a major issue, with many communities lacking adequate backup generators. This has led to disruptions in water supply and communication, especially in remote or coastal areas. Respondents emphasized the need for improved emergency communication systems, particularly for vulnerable populations such as the elderly and those living alone.

Water System Vulnerabilities
Aging and deteriorating water infrastructure was a recurring theme, especially in Otter Rock and Depoe Bay. Residents reported structural weaknesses in water tanks, failing main lines, and contamination risks during outages. Many communities rely on gravity-fed systems or natural springs, which are highly susceptible to damage from landslides or seismic activity, raising concerns about long-term water access.

Flooding, Erosion, and Landslides
Flood-prone areas were identified in several towns, including Waldport and Newport, with additional concerns about coastal erosion threatening homes and infrastructure. Respondents noted that erosion from paved surfaces and cliffside instability is worsening, and that landslides frequently impact key transportation routes like Highway 101 and Highway 20, further complicating emergency response and evacuation.

Fire Hazards
Wildfire risk is increasing due to drought conditions, dry landscaping practices, and accumulation of debris. Several respondents pointed out the lack of adequate fire suppression infrastructure, such as low water pressure and inoperable hydrants, which could hinder firefighting efforts during a major event.

Climate-Related Concerns
Communities are experiencing more frequent extreme weather events, including windstorms, ice storms, droughts, and heatwaves. Infrastructure is often not equipped to handle these changes, and residents are uncertain whether current preparations are sufficient to withstand future climate-related disasters.

Community-Specific Issues

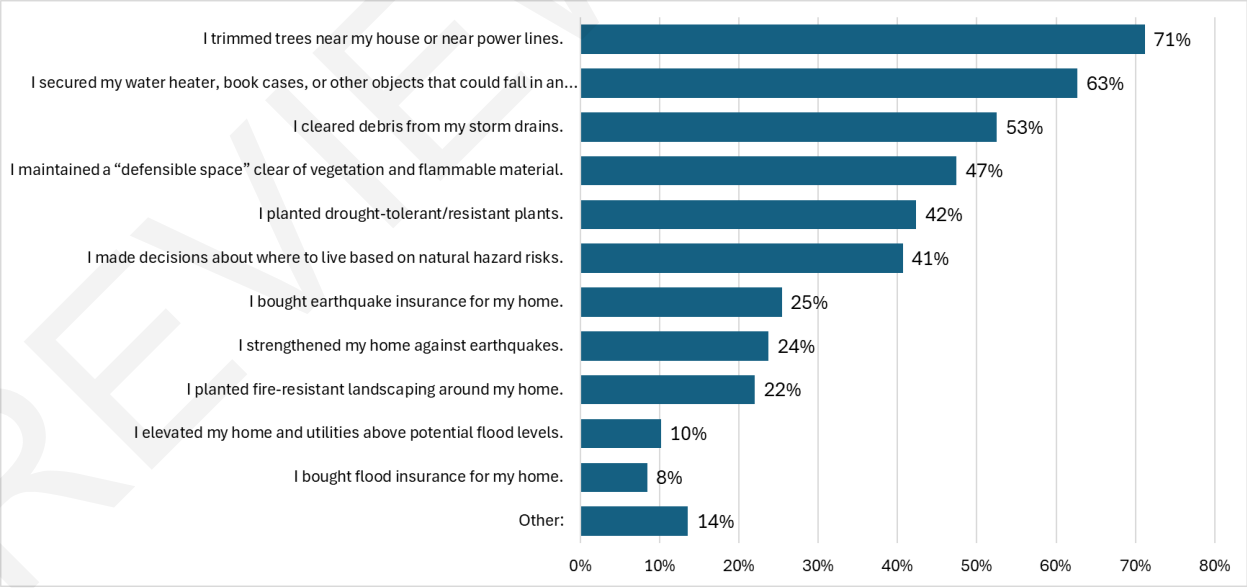
In Otter Rock, residents highlighted the degradation of the water system, highway slippage, and the risk of isolation due to road failures. In Depoe Bay, Lincoln Beach, and Gleneden Beach, concerns centered on the lack of backup power and seismic resilience. Newport residents pointed to vulnerabilities in the Big Creek Dam and courthouse, as well as the community's reliance on a single reservoir. Across the county, there is a shared sense of urgency to address these vulnerabilities before a major disaster strikes.

Q: What steps do you take to improve the safety of yourself in the event of a disaster?

Survey respondents reported taking a variety of proactive steps to improve their personal safety in the event of a disaster. The most common actions included trimming trees near homes or power lines (71%) and securing items that could fall during an earthquake, such as water heaters and bookcases (63%). Over half of respondents also cleared debris from storm drains (53%), while nearly half maintained defensible space around their homes to reduce fire risk (47%) and planted drought-tolerant vegetation (42%).

Fewer respondents reported making more structural or financial investments: 25% purchased earthquake insurance, 24% strengthened their homes against earthquakes, and only 10% elevated their homes or utilities above flood levels. The least common actions were buying flood insurance (8%) and planting fire-resistant landscaping (22%). These results suggest that while many residents are taking practical, lower-cost steps to reduce risk, fewer are investing in more intensive or costly mitigation measures.

Figure F-1 Hazard Preparedness Measures (n=59)



Source: Lincoln County NHMP Community Survey

Survey responses revealed a mix of preparedness levels and barriers to taking safety measures before a disaster. Some individuals reported being well-prepared, citing actions such as stocking

backup supplies, water, and generators. Others mentioned having a backup generator specifically for power outages or emphasized the importance of connecting with neighbors as part of their preparedness strategy.

However, several respondents indicated they had not taken any preparedness steps, with one explicitly stating they hadn't done any of the listed actions. Others noted limitations, such as not owning their home, which prevented them from making structural or landscaping changes. One respondent highlighted community-level concerns, including unsafe burning practices and the risks posed by ivy-covered trees, suggesting a need for better enforcement of fire regulations in small communities like Otter Rock.

Q: How prepared are you to respond to natural hazard events?

Overall, the responses reflect a range of individual readiness levels, from proactive planning to significant constraints, and underscore the importance of both personal and community-wide approaches to disaster preparedness.

Table F-3 shows that respondents feel most prepared for winter storms, with nearly three-quarters reporting at least a moderate level of preparedness. Windstorms and earthquakes also show relatively high levels of awareness and action. In contrast, volcanic events, floods, and landslides have the highest percentages of respondents who feel unprepared or only slightly prepared.

Wildfire and tsunami preparedness levels are mixed, with many respondents reporting moderate or somewhat prepared but few feeling very prepared. Notably, coastal erosion and drought show a wide spread across all preparedness levels, indicating varying perceptions of risk and readiness.

Table F-3 Level of Preparedness (n=60)

	Not Prepared	Slightly Prepared	Somewhat Prepared	Moderately Prepared	Very Prepared
Winter Storm (Snow/Ice)	5%	24%	32%	24%	15%
Wildfire	17%	15%	32%	33%	3%
Tsunami	17%	22%	25%	29%	7%
Windstorm	7%	15%	44%	25%	8%
Drought	19%	17%	32%	27%	5%
Earthquake	15%	17%	36%	27%	5%
Coastal Erosion	25%	12%	36%	20%	7%
Flood	22%	29%	31%	15%	3%
Volcanic Event	47%	17%	19%	15%	2%
Landslide	23%	35%	28%	13%	0%
Other:	100%	0%	0%	0%	0%

Source: Lincoln County NHMP Community Survey

In a follow-up question, 95% of survey respondents indicated that they know where to evacuate during a tsunami. This high level of awareness suggests strong community engagement with tsunami preparedness efforts. However, the remaining 5% of respondents expressed uncertainty, highlighting important gaps in situational awareness.

Among those who were unsure, one respondent simply asked, "Where safe places are located," indicating a lack of basic information about designated evacuation zones. Another respondent shared a more nuanced concern: while they felt confident about evacuation procedures at home in Waldport, they were unsure what to do if a tsunami occurred while they were at work in Newport or commuting between the two locations. This suggests that while many residents may be familiar with evacuation routes near their homes, they may not be equally informed about safe zones in other parts of the county where they spend significant time.

These comments underscore the need for broader public education that includes evacuation planning for multiple locations—home, work, and travel routes—to ensure comprehensive preparedness across all daily contexts.

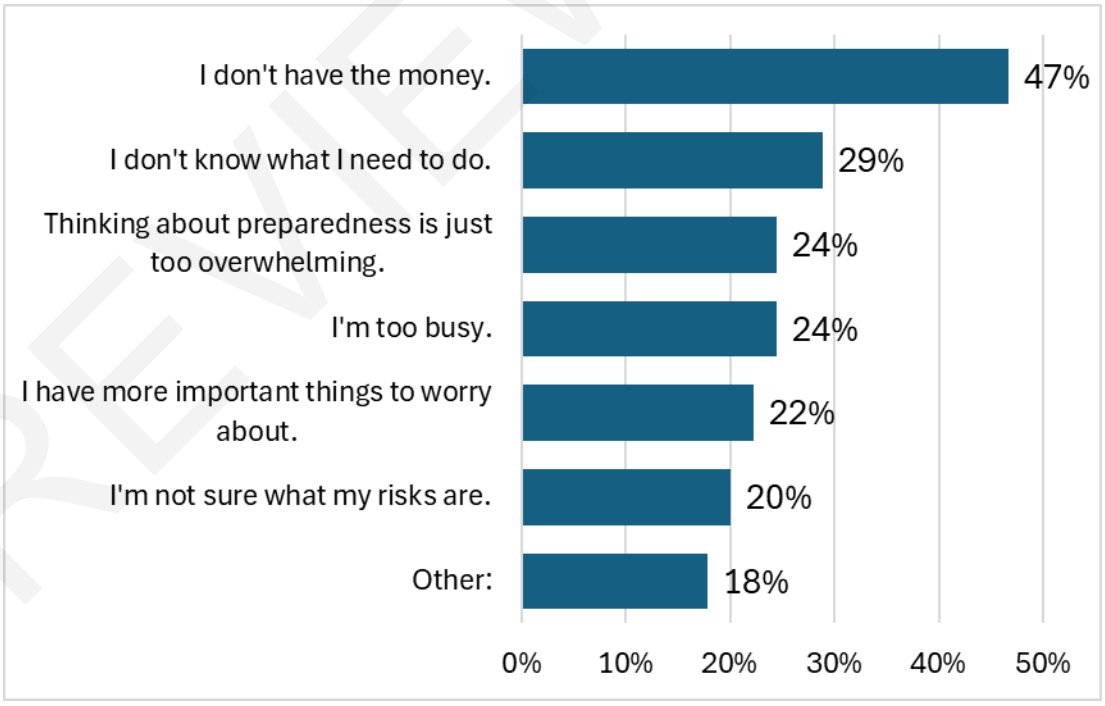
Q: Do any of these things make it hard for you to prepare for emergencies?

The most frequently cited barrier was lack of money, selected by 47% of respondents. This suggests that financial constraints are a significant obstacle to taking preparedness actions such as purchasing supplies, retrofitting homes, or investing in insurance.

Other notable barriers include not knowing what to do, feeling overwhelmed, and being too busy (11). These responses point to a need for clearer, more accessible guidance and support to help residents take manageable steps toward preparedness.

A smaller number of respondents indicated that they have more important things to worry about or are unsure of their risks, highlighting the importance of risk communication and prioritization in public outreach efforts.

Figure F-2 Barriers to Emergency Preparedness (n=45)



Source: Lincoln County NHMP Community Survey

The "Other" category, selected by eight (8) respondents, revealed a range of unique challenges and perspectives. Some noted physical or logistical barriers, such as needing help to prepare, limited evacuation routes, or the large amount of storage space required for supplies. Others pointed to systemic or environmental issues, including state permitting obstacles, unsafe road conditions, and hazards caused by unmanaged camping and speeding traffic in areas like Otter Rock. A few respondents expressed confidence in their current level of preparedness, stating they were already prepared or not stressed about disasters. One respondent emphasized the emotional and practical impact of losing a home to fire, especially when caused by unsafe burning practices.

Household Preparedness

Q: Do you rent or own a residence in Lincoln County? How long have you lived in Lincoln County?

Among survey respondents, 90% reported owning their home. When asked how long they have lived in Lincoln County, the responses showed a wide range of residency durations. About 26% have lived in the county for 1 to 5 years, while 15% have been residents for 6 to 10 years. Another 18% have lived there for 11 to 20 years, and the largest group, 32%, have lived in Lincoln County for more than 20 years.

This distribution suggests that while there is a significant number of newer residents, the majority have long-standing ties to the community, which may influence their familiarity with local hazards and their investment in preparedness efforts.

Q: Is your residence at risk to any of the following natural hazards?

Respondents expressed varying levels of concern about the risk of natural hazards to their residences. The most widely recognized threats were earthquakes, windstorms, and wildfires, with over 90% of respondents indicating that their homes are at risk from these events. Winter storms also ranked high, with 86% acknowledging potential exposure.

Moderate concern was shown for hazards such as drought (58%) and air quality issues from smoke (59%), reflecting growing awareness of climate-related impacts. Perceptions of risk were more divided for landslides and tsunamis, with around 40% of respondents identifying them as threats, while a significant portion remained unsure.

In contrast, hazards like flooding, coastal erosion, and extreme heat were generally seen as lower risks, with most respondents indicating their homes were not affected. Volcanic events and the "Other" category exhibited the highest levels of uncertainty, indicating a lack of clarity or awareness regarding these specific threats, particularly in relation to the magnitude of the tsunami event.

Overall, the data reveals strong awareness of seismic and storm-related hazards, while also highlighting opportunities for improved public education around less universally recognized risks such as volcanic activity, flooding, and localized erosion.

Table F-4 Perceived Risk to Residence from Natural Hazards (n=60)

	Yes	No	Not Sure
Windstorm	97%	2%	2%
Earthquake	95%	5%	0%
Wildfire	92%	3%	5%
Winter Storm (Snow/Ice)	86%	7%	7%
Air Quality (Smoke)	59%	32%	8%
Drought	58%	29%	14%
Landslide	44%	44%	12%
Tsunami	39%	49%	12%
Extreme Heat	36%	54%	10%
Coastal Erosion	22%	66%	12%
Volcanic Event	19%	51%	31%
Flood	14%	75%	12%
Other:	33%	0%	67%

Source: Lincoln County NHMP Community Survey

Most respondents (80%, n=54)) reported that they do not have flood insurance. Only 11% indicated that they do have flood insurance, while 9% were unsure. This suggests a significant gap in flood insurance coverage among the surveyed group, which could reflect a lack of perceived risk, awareness, or accessibility of such insurance.

In contrast, the responses to this question show a higher rate of coverage. A total of 67 percent of respondents (n=6) stated that they do have renters insurance, while 33 percent said they do not. Although the sample size for this question is smaller, it indicates a relatively stronger uptake of renters insurance compared to flood insurance.

Is there anything else you would like to tell us? (n=73)

Respondents shared a range of insights, concerns, and suggestions related to disaster preparedness and community resilience.

A prominent theme was the need for reliable communication systems during emergencies. Several individuals expressed frustration with the lack of access to information when power, internet, and phone services are down, particularly during severe weather events like ice storms. The absence of a dependable local radio station with backup power was noted as a critical gap in emergency communication infrastructure.

Another recurring topic was the importance of public education and outreach. Respondents called for more visible and proactive efforts to inform the public, such as billboards, community events, and other awareness campaigns. One person appreciated the recent wildfire prevention billboard, recognizing it as a positive step toward early education.

Insurance accessibility also emerged as a concern. One respondent shared that they had to drop earthquake insurance due to rising costs, highlighting the financial barriers that can prevent individuals from adequately preparing for disasters.

Environmental and infrastructure vulnerabilities were also discussed. Some respondents pointed out that their water supply is at risk from both drought and earthquakes, and that their communities could become isolated following a major seismic event. Others raised concerns about wildfire risks, especially when neighboring properties contain unmanaged forested land close to homes. Additionally, there was a shared belief that evacuation routes may not be viable during large-scale disasters, posing a serious challenge to both personal and community safety.

Despite these concerns, a few respondents expressed confidence in their personal and neighborhood preparedness. They described having emergency supplies, first aid kits, and contingency plans in place, and noted efforts to encourage neighbors to do the same.

The responses also included expressions of gratitude for the work being done to prepare the community and involve the public in planning efforts. Some offered brief but heartfelt thanks, while others acknowledged the emotional reality of facing natural disasters with a mix of readiness and resolve.

Finally, a few miscellaneous comments were shared, including a humorous remark about the power of nature and a note about inconsistencies in the survey's scoring format.

Demographics

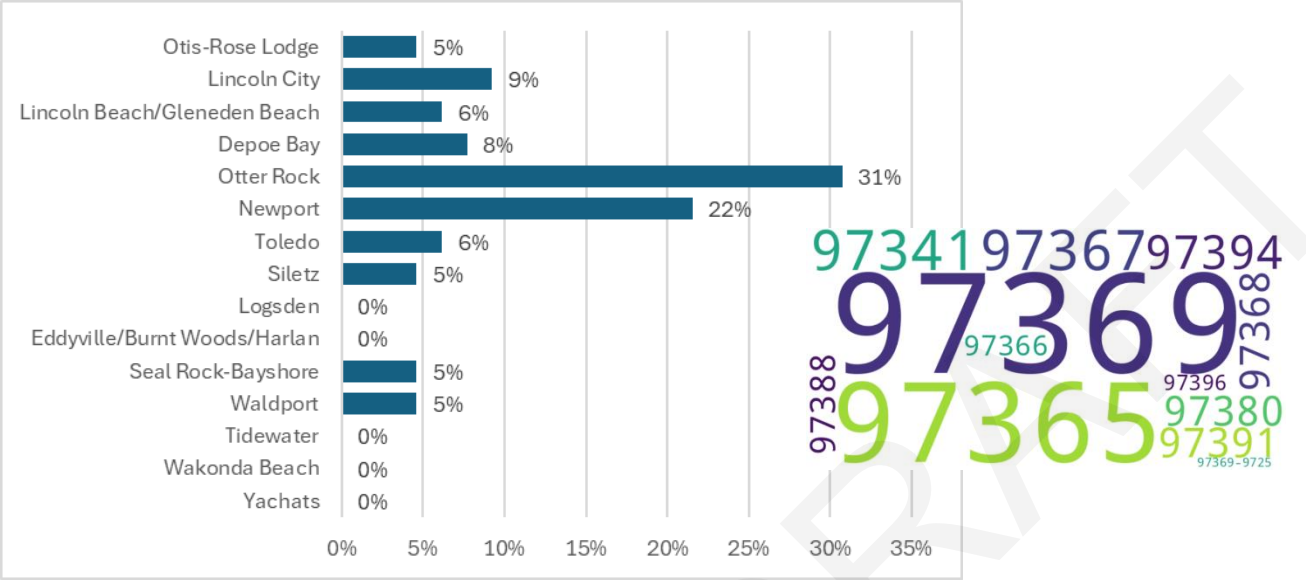
Otter Rock emerged as the most represented community in the survey, accounting for 31% of responses. This strong showing is reinforced by the ZIP code analysis, where ZIP code 97369 (associated with Otter Rock) had the highest number of entries. Newport followed closely behind, contributing 22% of the community responses and ranking second in ZIP code frequency with ZIP code 97365. These two areas clearly stood out as the most engaged in the survey.

Other communities with notable participation included Lincoln City (9%) and Depoe Bay (8%), both of which also appeared frequently in the ZIP code data, suggesting consistent engagement across both data sources. Lincoln Beach/Gleneden Beach and Toledo each accounted for 6% of the responses, while Otis-Rose Lodge, Siletz, and Seal Rock-Bayshore each contributed 5%. These communities were also reflected in the ZIP code analysis, though with slightly lower frequencies.

In contrast, several communities such as Logsden, Eddyville/Burnt Woods/Harlan, Tidewater, Wakonda Beach, and Yachats had little to no representation in the community response data. This was mirrored in the ZIP code analysis, where these areas appeared infrequently or not at all. The limited participation from these communities may be due to lower population density, limited survey reach, or other barriers to engagement.

Overall, the combined data from community names and ZIP codes paints a consistent picture: participation was relatively broad but concentrated in a few key areas, particularly Otter Rock and Newport. This insight can help guide future outreach and preparedness efforts, ensuring that underrepresented communities receive more focused attention.

Location of Residence (n=65)

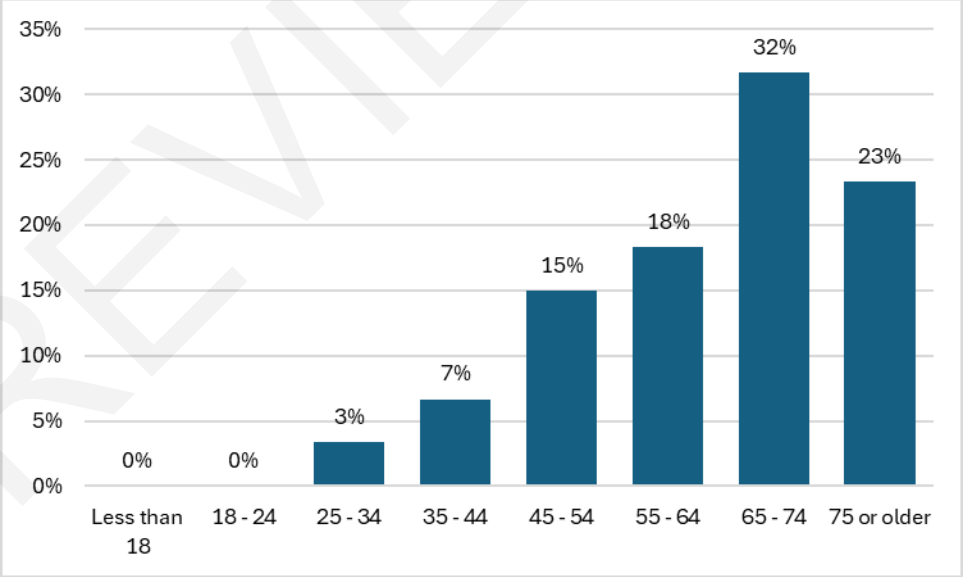


Source: Lincoln County NHMP Community Survey

The survey responses show a clear trend toward older age groups being more heavily represented. No respondents were under the age of 25, with both the "Less than 18" and "18–24" categories reporting 0%.

Survey participation begins modestly in the younger age groups, with only 3% of respondents aged 25–34 and 7% aged 35–44, increasing to 15% in the 45–54 group. Most respondents are older adults, with 32% aged 65–74 and 23% aged 75 or older, indicating a strong representation from senior age groups.

Figure F-3 Age of Respondent (n=60)

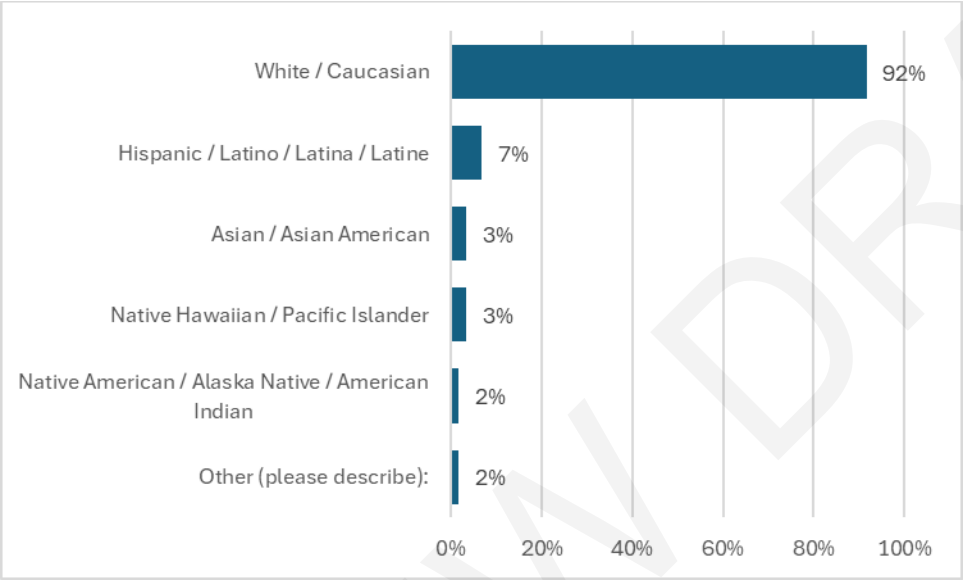


Source: Lincoln County NHMP Community Survey

The overwhelming majority of survey respondents (92%) identified as White or Caucasian, indicating a predominantly homogenous racial demographic among participants. The next largest group, at 7%, identified as Hispanic, Latino, Latina, or Latine.

Smaller percentages of respondents identified as Asian or Asian American and Native Hawaiian or Pacific Islander, each making up 3% of the total. Additionally, 2% of respondents identified as Native American, Alaska Native, or American Indian, and another 2% selected Other, providing their own descriptions.

Figure F-4 Race/Ethnic Background of Respondent (n=60)



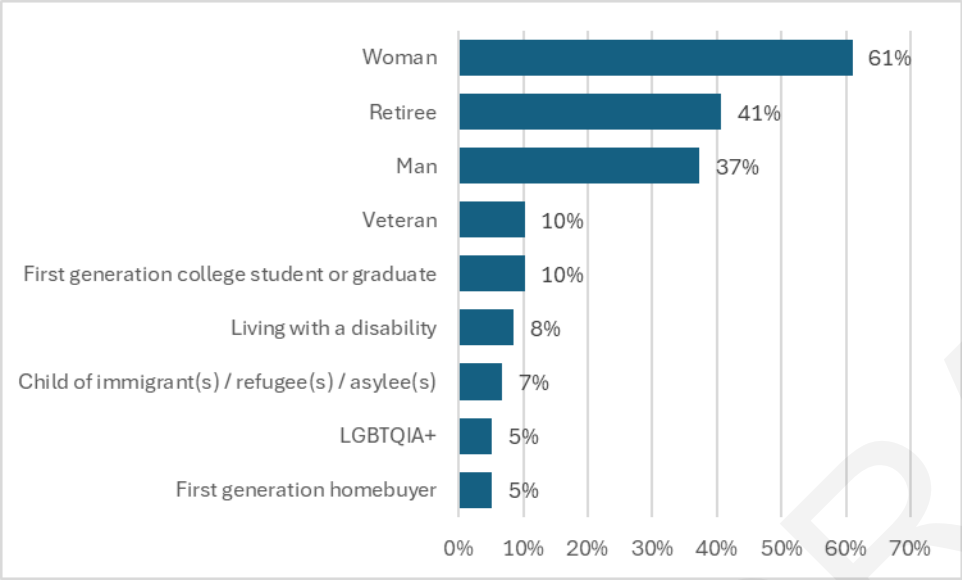
Source: Lincoln County NHMP Community Survey
Note: this question was set as "select all that apply"

The most selected identity among respondents was "Woman," with 61% identifying as such. This was followed by "Retiree" at 41% and "Man" at 37%, indicating a strong representation of older adults and a gender-diverse sample.

Smaller but notable portions of respondents identified with other characteristics: 10% were veterans, and another 10% were first-generation college students or graduates. 8% reported living with a disability, while 7% identified as children of immigrants, refugees, or asylees. 5% identified as LGBTQIA+, and another 5% as first-generation homebuyers. Only 2% chose not to disclose any of these identities.

This data reflects a varied demographic profile, with a majority identifying as women and retirees, and a meaningful presence of individuals from historically underrepresented or marginalized groups.

Figure F-5 Demographic Characteristics of Respondent (n=59)



Source: Lincoln County NHMP Community Survey
Note: this question was set as "select all that apply"

Survey respondents reported a range of challenges affecting their daily lives and well-being. The most cited issues were difficulty affording home ownership and "Other" challenges, each selected by 28% of participants. Close behind, 24% of respondents indicated they have difficulty accessing or affording healthcare, while 16% identified as low-income, qualifying for assistance programs like SNAP, WIC, or the Oregon Health Plan.

Housing-related concerns were also reflected in the 12% who reported difficulty affording rental housing. Additionally, 8% of respondents noted food insecurity, such as skipping meals due to financial or logistical constraints, and another 8% reported transportation challenges.

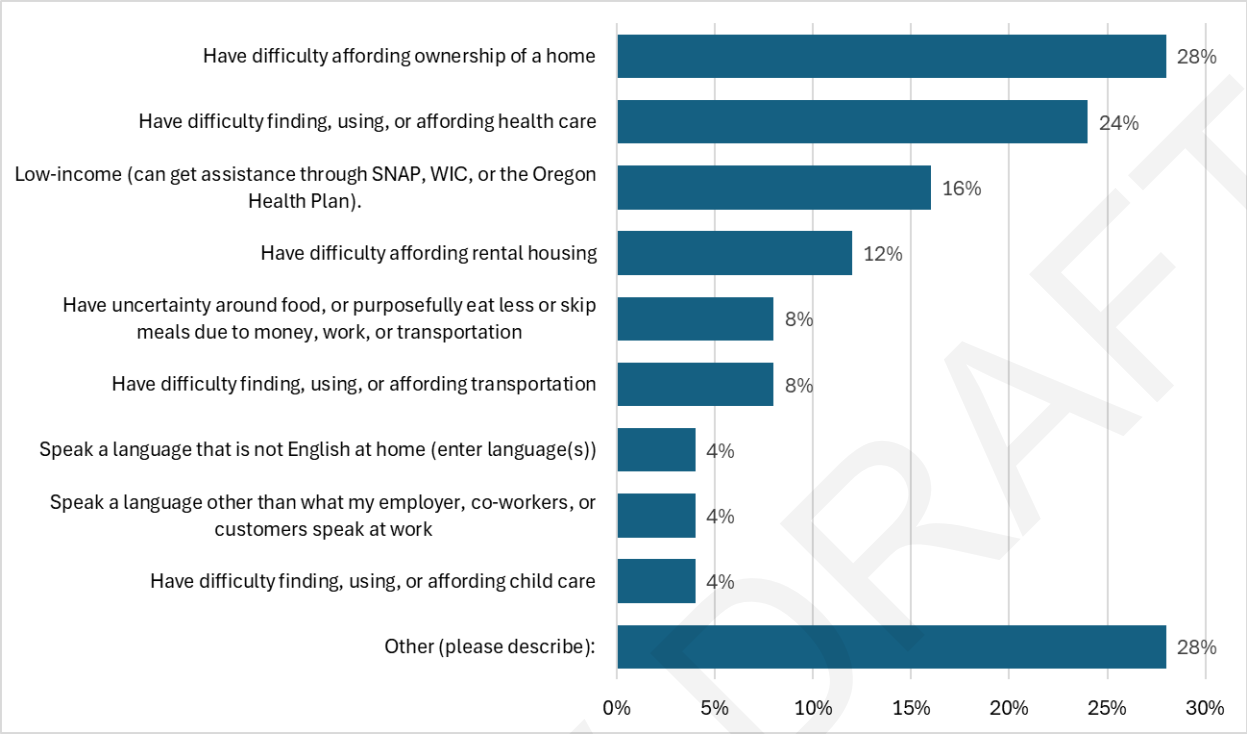
Smaller percentages of respondents identified language barriers, 4% speak a language other than English at home, and another 4% face language mismatches in the workplace. 4% also reported difficulty accessing childcare.

This data highlights a broad spectrum of socioeconomic pressures, with housing, healthcare, and income-related issues being the most prevalent.

In addition to the predefined categories of socioeconomic challenges, several respondents provided open-ended responses under "Other." These comments reveal a mix of personal circumstances and broader concerns that may not be captured by standard survey options.

Some respondents expressed feelings of isolation or vulnerability, such as one who noted, "nobody would know if I was OK." Others highlighted financial constraints, including being retired on a limited income or struggling to afford multiple types of insurance, home, auto, and medical. One respondent mentioned a shortage of potable water, pointing to a critical infrastructure or environmental concern.

Figure F-6 Vulnerability Characteristics of Respondents (n=25)



Source: Lincoln County NHMP Community Survey
Note: this question was set as "select all that apply"

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Jurisdictional Addenda

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