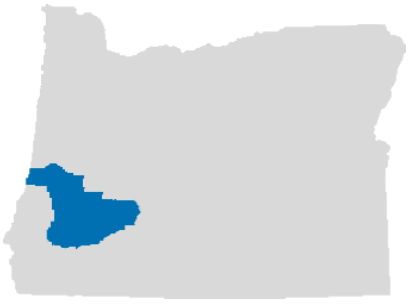
Douglas County

MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

- Douglas County
- Canyonville
- Drain
- Elkton
- Glendale
- Myrtle Creek
- Oakland



- Reedsport
- Riddle
- Roseburg
- Sutherlin
- Winston
- Yoncalla

FEMA

Effective - January XX, 2024 through January XX, 2029

The *2024 Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan* is a living document that will be reviewed and updated periodically. It will be integrated with existing plans, policies, and programs. 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 pre- and post-disaster mitigation grants.

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Douglas County developed this Natural Hazards Mitigation Plan through a partnership funded by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance Grants. In 2022, the Department of Land Conservation and Development (DLCD) received Hazard Mitigation Grant Program (HMGP) for DR-4562-OR from FEMA through the Oregon Department of Emergency Management (OEM) to assist Douglas County with the NHMP.

Cover photo: (from left to right) Douglas County NHMP Steering Committee, 1997; Oregon Department of Transportation, Flickr, 2019; United States Department of Agriculture, 2020

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Douglas County developed this Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) through a regional partnership funded by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP): HMGP-DR-4562-06-P-OR. This updated Natural Hazard Mitigation Plan is a collaboration between Douglas County and the cities of Canyonville, Drain, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, and Yoncalla.

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Volume I

Plan Summary

This updated Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) was designed 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 residents within the community, it is possible to create a resilient community that will benefit from long-term recovery planning efforts.

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." 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 general public, in conjunction with the participation of local, tribal, state, territorial and Federal governmental partners."

Why Develop this Mitigation Plan?

The Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions (counties, cities, special districts, etc.) maintain an approved NHMP to receive FEMA Hazard Mitigation Assistance funds for mitigation projects. To that end, Douglas 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 pre- and post-disaster mitigation project grants and (2) promote local mechanisms to accomplish riskreduction strategies.

What is Mitigation?

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

- U.S. Federal Emergency Management Agency

NHMP Plan Development Participants

The Douglas County NHMP is the result of a collaborative effort between the County, cities, special districts, residents, public agencies, non-profit organizations, the private sector, and regional organizations. The steering committee guided the NHMP development process.

For a list of individual County steering committee participants, refer to the acknowledgements section above. The update process included representatives from the following jurisdictions and agencies:

The Douglas County Planning Director, Joshua Shaklee, convened the planning process and will take the lead in implementing, maintaining, and updating the County NHMP. Each of the participating jurisdictions have also named a local convener who is responsible for implementing, maintaining, and updating their addendum (see addenda, Volume III, for specific names and positions). Douglas 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, including but not limited to: Public and private infrastructure partners, watershed and neighborhood groups, and numerous others. The public is encouraged to provide feedback about the NHMP throughout the implementation and maintenance period.

Risk Reduction through Mitigation Planning

The NHMP is intended to assist Douglas County reduce the risk from 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.

By identifying and understanding the relationship between hazards, vulnerable systems, and existing capacity, Douglas County is better equipped to identify and implement actions aimedat reducing the overall risk to hazards. This approach is used to better understand each sector's unique vulnerabilities, threats, and hazards. The County utilized the information collected to inform specific, targeted actions aimed at reducing risks across each of the four lifeline sectors.

Douglas County's Overall Risk to Hazards

Douglas County reviewed and updated the risk assessment to evaluate the probability of each hazard as well as the vulnerability of the community to that hazard. Table 1 below summarizes hazard probability and vulnerability for all of Douglas County as determined by the County steering committee (Volume I, Chapter 3).

Table 1 Hazard and Vulnerability Assessment Summary

Hazard Probability	Probabilitiy	Vulnerability
Coastal Erosion	**High**	Low
Drought	**High**	Moderate
Earthquake - Cascadia	Moderate	**High**
Earthquake - Crustal	Low	Low
Extreme Heat Event	Moderate	Moderate
Flood	**High**	Moderate
Landslide	**High**	Moderate
Local Tsunami	Moderate	Moderate
Distant Tsunami	**High**	Low
Wildfire (WUI)	**High**	**High**
Windstorm	**High**	Moderate
Winter Storm	**High**	**High**

Source: Douglas County NHMP Steering Committee, 2023

NHMP Implementation

Volume I, Section 4 of this NHMP details the formal process that will ensure that the Douglas County NHMP remains an active and relevant document.

The NHMP will be implemented, maintained, and updated by a designated convener. The Douglas County Planning Director is the designated convener (NHMP Convener) and is responsible for overseeing the review and implementation processes. 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

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 (ODEM). ODEM reviews the NHMP and submits it to the FEMA– Region X for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201.6. Once the NHMP is pre-approved by FEMA, the County and cities formally adopt the NHMP via resolution. The Douglas County NHMP Convener will be responsible for ensuring local adoption of the NHMP and providing the support necessary to ensure NHMP implementation. Once resolutions are executed at the local level and documentation is provided to FEMA, the NHMP will be formally acknowledged by FEMA. The County and participating cities will maintain eligibility for the Hazard Mitigation Grant Program funds, the Building Resilient Infrastructure and Communities Program funds, and the Flood Mitigation Assistance program funds.

The accomplishment of the NHMP goals and actions depends upon regular Steering Committee members and other stakeholder participation and adequate support from County and City leadership. 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 Committee for Douglas County and participating cities 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.

Douglas County adopted the NHMP on [Month Day], 2024. FEMA Region X approved the Douglas County NHMP on [Month Day], 2023. With approval of this NHMP, the entities listed above are now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through [Month Day-1], 2024.

Chapter 1: Introduction

This section provides a general introduction to natural hazard mitigation planning in Douglas 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." Put another way, natural hazard mitigation is a method of 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 (e.g., updated development codes), capital improvement projects (e.g. seismically retrofitting critical facilities such as bridges), and education opportunities to targeted audiences (e.g., non-English speaking community members or the elderly). Hazard mitigation aims to reduce damage to communities and increase community safety, economic stability, and overall resilience. Natural hazard mitigation cannot be accomplished by one entity alone but is rather the responsibility of the "Whole Community": individuals, private businesses and industries, state and local governments and the federal government.

Engaging in mitigation activities benefits jurisdictions (counties, cities, special districts, etc.) in many ways, including increasing community resilience and capacity. Through natural hazard mitigation, the loss of life, property, essential services, and critical facilities due to a natural hazard are decreased, creates cooperation and communication within the community, increases potential for state and federal funding for recovery and reconstruction projects, and reduces a communities recovery timeline and costs in the aftermath of a disaster.

Why Develop a Mitigation Plan?

Douglas County developed this NHMP in an effort 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.

In addition, to establish a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000, as amended by the Disaster Recovery Reform Act (DRRA) of 2018, and the regulations contained in 44 CFR 201 require that jurisdictions (counties, cities, special districts, etc.) maintain an approved NHMP to receive federal funds for mitigation projects. To that end, Douglas 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 pre- and post-disaster mitigation project grants and (2) promote local mechanisms to accomplish riskreduction strategies.

What Federal Requirements Does This Plan Address?

DMA2K reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program (now known as the Building Resilient Infrastructures and Communities program (BRIC) and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). 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 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 the individual and State and local jurisdictions' capabilities.

Title 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.[1] Pursuant of Title 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. 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. Lastly, the NHMP must be submitted to the Oregon Department of Emergency Management (ODEM) for initial review and then sent to FEMA for federal approval. Additionally, the way ODEM administers the Emergency Management Performance Grant (EMPG), which helps fund local emergency management programs, also requires a FEMA-approved NHMP.

What is the History of the Natural Hazard Mitigation Plan in Douglas County?

Douglas County adopted its first NHMP in 2003, which was then approved by FEMA in early 2004. This initial document consisted of appendices for each of the 12 cities within the County. To maintain eligibility with FEMA, the plan must be updated every five years, and in 2009, an update of the original plan was completed, along with the review of a 2008 natural hazard analysis and survey. Unlike the original plan, the 2009 update did not include the cities within the County, except for the City of Reedsport, which was added to the County plan as an addendum to the 2009 document.

During the 2016 NHMP update process, the City of Reedsport obtained separate acknowledgement of the city's NHMP, as they had unique circumstances that set their NHMP update on a separate timeline than this update process. However, the City of Reedsport also participated in this update process through the steering committee and other phases of the multi-jurisdictional planning process. During the 2023 NHMP update process, the City of Reedsport has once again been included in the planning process and will be part of the 2024 updated NHMP approved by FEMA.

This document serves as the fourth edition of the Douglas County NHMP. It includes the cities of Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla. All these communities have participated in the update process. The updated plan focuses on the natural hazards to which Douglas County and the cities listed above are vulnerable and identifies mitigation actions aimed to reduce the risks these natural hazard pose. This is done through

[1] Code of Federal Regulations, Title 44, Part 201, Section 201.6, subsection (a).

community partnerships and cooperation, education and outreach programs, and the implementation of risk-reduction activities such as structural retrofitting. The actions described in this document are intended to be developed and implemented by planning entities via existing plans and programs within Douglas County and participating cities.

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, acknowledged by the State, that are required to comply with the statewide planning goals. The 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 the Oregon Department of Emergency Management (ODEM), 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 Plan Updated and Developed?

Douglas County and the cities of Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla participated on a steering committee was formed for Douglas County to guide and participate in the review of the updated plan. Local professionals with experience in emergency management, community wildfire protection planning, building code administration, national flood insurance program administration, road and transportation issues, and public utility administration also participated through additional outreach, which included interviews, surveys, and reviews of the draft plan.

The Douglas County Steering Committee consisted of the following individuals representing their respective jurisdictions:

- Janelle Evans, City of Canyonville
- Jeni Stevens, City of Drain
- Linda Cereda, City of Elkton
- Noah Miller, City of Elkton
- Dawn Russ, City of Glendale
- Lonnie Rainville, City of Myrtle Creek
- Caroline Shields, City of Oakland

- Courteney Davis, City of Reedsport
- Deanna Schafer, City of Reedsport
- Hailey Sheldon, City of Reedsport
- Matt Smart, City of Reedsport
- Kathy Wilson, City of Riddle
- Andrew Blondell, City of Roseburg
- Caleb Stevens, City of Roseburg
- Kate Bentz, City of Roseburg
- Nik Ramstad, City of Roseburg
- Stuart Cowie, City of Roseburg
- Brendan McGarr, City of Sutherlin
- Kristi Gilbert, City of Sutherlin
- Thomas McIntosh, City of Winston
- Jennifer Bragg, City of Yoncalla
- Emily Ring, Douglas County
- Josh Gibson, Douglas County
- Joshua Shaklee, Douglas County
- Wayne Stinson, Douglas County

Public meetings involving the Steering Committees, Planning Commission, and Board of Commissioners were held as part of the plan development and adoption process. These meetings served multiple purposes but were held to provide the public with an opportunity to comment regarding the process in accordance with 44 CFR 201.6(4)(b) and (c). Comments both verbal and written were provided at multiple PAC meetings in which the NHMP was a specific agenda item. Upon finalizing the document and receiving FEMA approval, the Board of Commissioners will hold a meeting as the decision-making authority to formally adopt the NHMP. See Appendix A for more detailed information about the steering committee and public participation process meetings held as part of this NHMP update.

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. Douglas County provided an accessible project website for the public to provide feedback on the draft NHMP. In addition, Douglas County provided a press release on their website to encourage the public to offer feedback on the NHMP update. The County and city 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.

How is the Plan Organized?

Each chapter of the NHMP provides specific information and resources to assist in understanding the hazard-specific issues facing the community. Combined, these 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.

Chapter 1: Introduction

Chapter 1 reviews natural hazard mitigation planning and explains why it is important, describes federal requirements necessary to address within the plan, and the policy framework for natural hazard planning in Oregon. It discusses the history of the Natural Hazards Mitigation Plan in Douglas County and how the plan was updated, developed, and organized.

Chapter 2: Community Profile

The community profile describes the County and participating cities 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 plan was updated.

Chapter 3: Hazard Identification and Risk Assessment

Chapter 3 provides the factual basis for the mitigation strategies. It 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. Table 2 displays the hazards addressed in this NHMP:

Table 2 Profiled Natural Hazards

Disasters in Douglas County	
Coastal Erosion	Landslide
Drought	Tsunami
Earthquake	Wildfire
Extreme Heat	Winter Storm
Flood	Windstorm

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

Chapter 4: Mitigation Mission, Goals, and Action Items

This chapter documents the NHMP mission, goals, and actions (mitigation strategy) regarding natural hazards that help to guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. Based on the mission and goals, specific action items have been created. Action items are detailed recommendations for activities that local departments, residents, and others could engage in to reduce risk.

Chapter 5: Plan Implementation & Maintenance

This chapter 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.

Appendix A: Action Item Forms

Appendix A contains the detailed action item forms for each of the mitigation strategies identified in this NHMP.

Appendix B: Planning and Public Process

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

Appendix C: Economic Analysis of Natural Hazard Mitigation Projects

Appendix C describes FEMA requirements for benefit/cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

Appendix D: Grant Programs and Resources

Appendix D lists state and federal resources and programs by hazard.

Appendix E: Community Survey

Appendix E compiles results of the Community Survey, which was designed to get a better understanding of the community's understanding and needs relating to prescribed burning and wildfire smoke throughout the County.

A Multi-Jurisdictional Capacity Building Approach

The Douglas County NHMP is organized into a single document which is intended to be co-adopted as the NHMP for Douglas County as well as each of the twelve incorporated cities within Douglas County. While it is a single document representing multiple jurisdictions, it contains the necessary information for each individual city's mitigation planning purposes.

The planning process for the 2024 Multi-jurisdictional NHMP was designed to provide the most efficient and effective coordination and input possible given local fiscal and staffing constraints. Most incorporated cities within Douglas County have limited staff, constrained budgets, and minimal citizen involvement. This restricts their ability to provide a robust steering and planning process for long-range programs, such as the NHMP. However, each community has identified the NHMP as an important factor of their long-range planning program. Therefore, it was important to incorporate each city into a planning process which was not only effective for planning the NHMP multi-jurisdiction update, but also feasible for each jurisdiction based on the limitations. This planning process consisted of a steering committee made up of local representatives from Douglas County and each individual city. This method provided adequate input from the County and each individual city during the process, and it is understood that ultimately each jurisdictions decision making body (City Council/Board of Commissioners) will become the implementers of this document.

- The community profile provides general socio-economic, natural and built environmental data in regard to the County as a whole. However, the data is specific enough to capture and apply to each individual city. Many of the demographic and economic datasets provided within the community profile are broken down by city and the information that is not can generally be assumed that this data will be accurate and applicable to each individual city. The community profile provides an adequate balance of generalizing the profile to represent Douglas County as a

whole, but also characterizing each individual community when generalizing is not sufficient to do so.

- Similarly, the **hazard assessment** is organized into a single chapter with the understanding that many of the hazards that affect the County are generally applicable in similar scope to each individual city (Reedsport is an exception). The assessment provides an updated list of all FEMA major disaster declarations in Douglas County, which is applicable to the County and each individual city. It also provides a hazard probability and vulnerability assessment table for the County and each city. In this case, it made the most sense to organize the hazard profiles by each hazard rather than each jurisdiction to eliminate redundancies that would occur if making a hazard profile for each hazard across each jurisdiction because of the similarities of how each individual city along with the County are affected by each natural hazard. Rather, this document provides general hazard profiles for each type of hazard and provides greater detail when a city has a specific example of how it has been historically affected or is uniquely vulnerable to that hazard.
- To eliminate redundancy for general mitigation goals, in the **mitigation plan goals & action items** chapter, chapter 4 provides a combined approach for the mitigation plan goals that are applicable to each city as well as the County. The chapter organizes each action item contained within the document into the applicable hazard to which it addresses and notes which jurisdictions are including that action item in their mitigation strategy. This portion provides a more specific rationale for each action item, implementation strategies for the action item, the coordinating organizations within each action item, and in many cases the specific improvement projects within each jurisdiction.
- The **plan implementation & maintenance** procedures and process for each jurisdiction are essentially the same. Each jurisdiction identified a similar, and in some cases identical, prioritization process for examining and implementing action items. It is also understood that the implementation of each jurisdiction's action items will ultimately depend upon that jurisdiction's current budget and capacity. Each jurisdiction has also identified the same criteria and factors for a five-year period update of the NHMP. The implementation and maintenance of the 2024 Multi-Jurisdictional NHMP is intended to also be incorporated into the Planning Advisory Committee Meetings, which played an important role in the development of this update. The meetings are held on a quarterly basis and include members from each specific region of the County.

Chapter 2: Community Profile (Douglas County Multi-Jurisdictional)

The following section describes Douglas 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, and political capital. These community capitals can be defined as resources or assets that represent many 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 adequately met.

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). To help define and understand the County's sensitivity and resilience to natural hazards, the following capacities must be examined:

- Natural Environment Profile
- Social/Demographic Profile
- Economic and Employment Profile
- Built Environment Profile
- Transportation Infrastructure Profile
- Policy Capacity Profile

The Community Profile describes the sensitivity and resilience to natural hazards of Douglas County, and its incorporated cities, as they relate to each capacity. It provides a snapshot of the time when the plan was developed and will assist in preparation for a more resilient County.

Natural Environment Profile

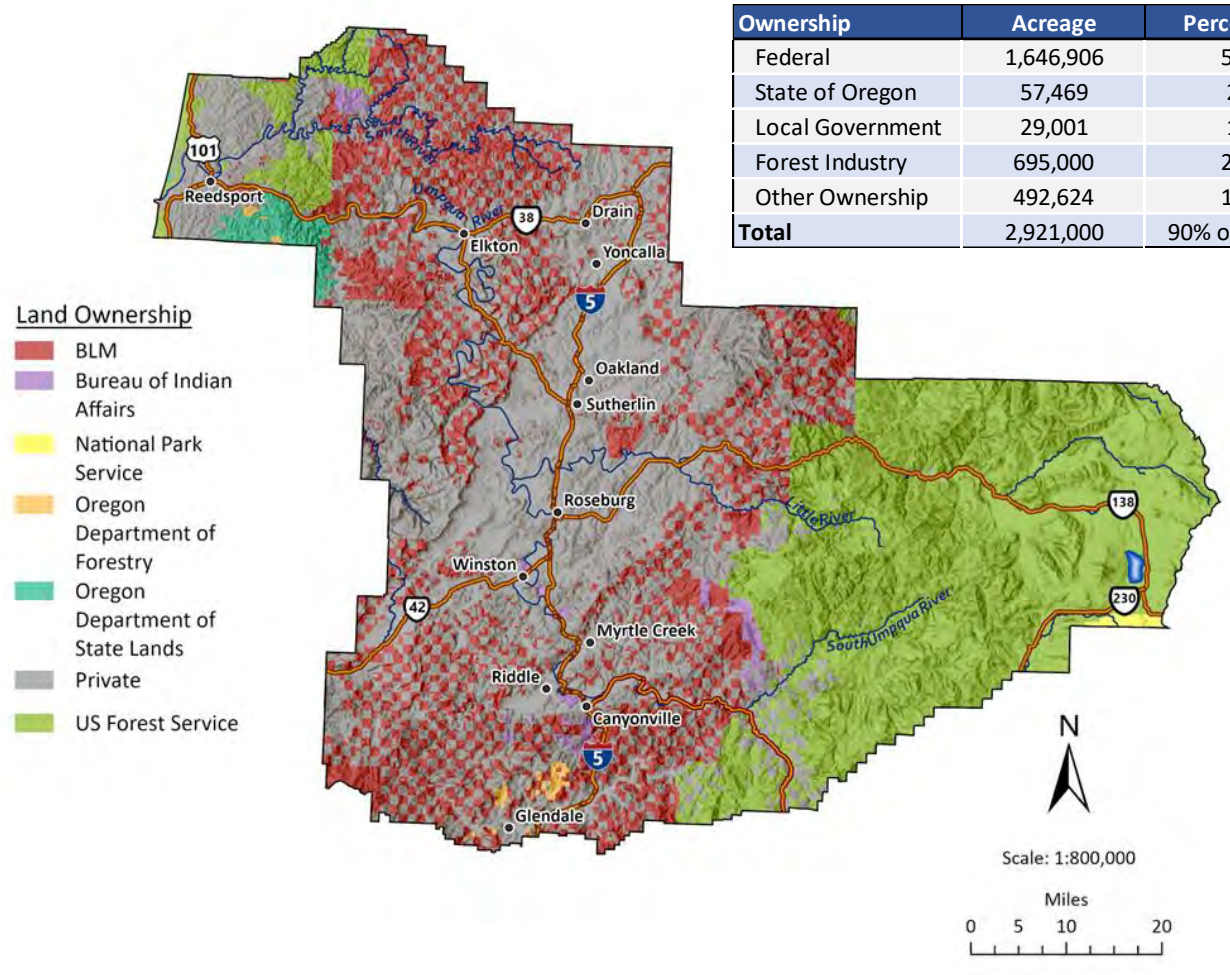
Natural environment capacity is recognized as the geography, climate, and land cover (urban water and forested land) of the area that help maintain clean water, air and a stable climate. Natural resources such as wetlands and forested hill slopes play a significant role in protecting communities and the environment from weather-related hazards, such as flooding and landslides.

Geography

Douglas County is in Southwest Oregon and covers an area of 5,071 square miles. The County extends from sea level at the Pacific Ocean to 9,182-foot Mount Thielsen in the Cascade Range. Douglas County comprises 3,240,360 acres (5,071 square miles) and is the fifth largest County in Oregon by land area. Timberlands, farm forests, and agricultural land comprise 98 percent of the County's land area, of which 50 percent is owned by the federal government. Residential, industrial, or land within urban growth boundaries make up the other 2 percent of land within Douglas County (see Figure 1)**.**

Figure 1 Land Ownership in Douglas County

Ownership	Acreage	Percentage
Federal	1,646,906	51%
State of Oregon	57,469	2%
Local Government	29,001	1%
Forest Industry	695,000	21%
Other Ownership	492,624	15%
Total	2,921,000	90% of County



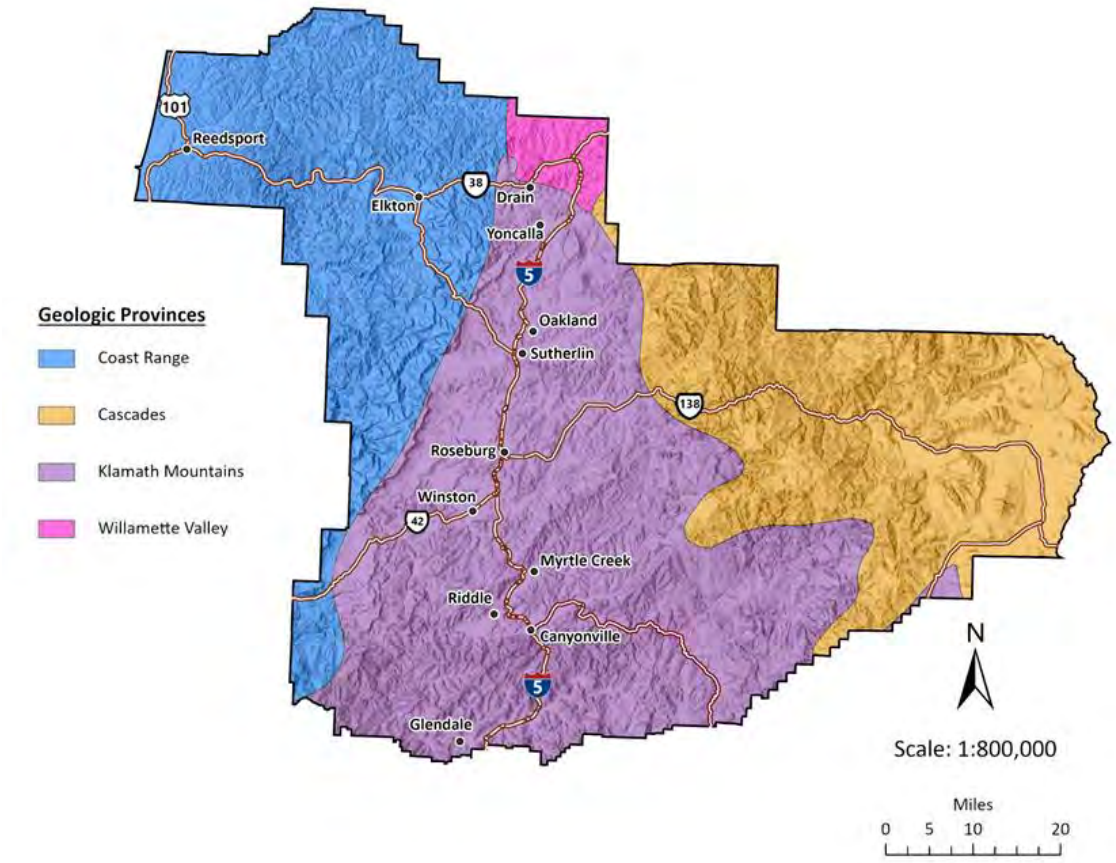
Source: Douglas County GIS, 2023

The County is bordered by Coos County and the Pacific Ocean on the west; by Lane County to the north; by Klamath County to the east; and by Josephine and Jackson Counties to the south. The major city in Douglas County is Roseburg, where 25 percent of the population live. The nearest large urban areas include Eugene, which is seventy miles to the north and Medford, which is ninety miles to the south. Douglas County is unique, in that it is one of only two counties in Oregon that reaches from sea level at the Pacific Ocean to over 9,000 feet at the crest of the Cascades (Mount Thielsen is the County's highest peak at 9,182 feet). The geography, topography, climate, and other natural attributes such as vegetation vary markedly based on the different regions in Douglas County, including the spectrum of climatologic and hydrologic patterns across Douglas County.

Geological Provinces

Douglas County is comprised of four geologic provinces or ecoregions[2] located within its boundaries. These provinces are characterized by complex and rugged topography, unique soils groups, deep and narrow valleys, which impact all activities of residents of the County (see Figure 2). The physical setting of the County plays an important role in the hazard analysis process.

Figure 2 Douglas County Geologic Provinces



Source: Douglas County GIS, 2023

[2] EPA Ecoregions III in Oregon Map. Accessed April 10, 2022.

The Coast Range Province is the second oldest in the County at over 60 million years of age. The topography of this Province features rugged mountains rising from sea level at the coast of the Pacific Ocean to an elevation of 3,000 feet in the Coast Range. The valleys in this Province are fertile, with an elevation of about 300 feet above sea level. Rock formations of the Coast Range province are typically igneous and sandstone.

The Klamath Province is the oldest in the County ranging from 200-400 million years in age. Elevations in this province range from about 250 feet above sea level in the Drain area rising to upwards of 4,000 feet along the southerly County boundary. The topography features a range of steep mountains and canyons to gentle foothills and flat valley bottoms. The Klamath Mountains were not significantly shaped by volcanism and can be better described as a mosaic rather than the layer-cake geology encountered throughout the rest of Oregon.

The Western Cascade Province is the third oldest in the County. Here igneous rocks were made from volcanic activity. Narrow "V" shaped valleys are a common natural feature in this region. Elevations in the Western Cascade region top 6,000 feet.

The high Cascade Province is the youngest in the County. This region was formed by volcanic activity. Rocks are much less weathered in this province. Mount Thielsen (9,182 feet) is the most obvious formation in this province.

Hazard Analysis Zones

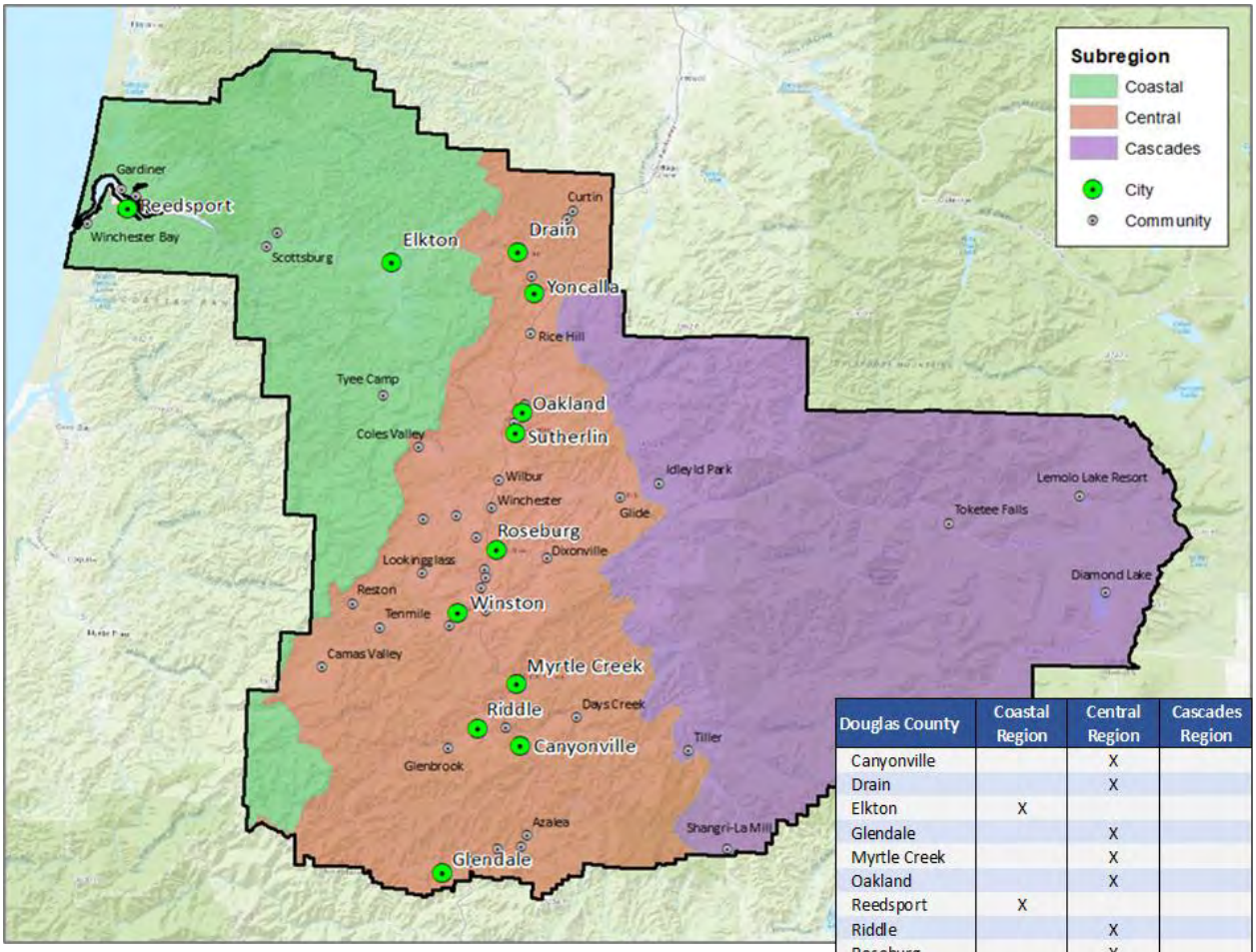
To gain a more in-depth understanding of hazards risk and community vulnerability, Douglas County can be assessed as 3 distinct regions: Coastal, Central, and Cascades. Each region shares distinct ecological characteristics and levels of risk associated with identified hazards **Figure 3** displays each region's borders defining how the County is organized:

- The Coastal region covering most of the western County, coming up to the head of tide line of both the Smith River and the Umpqua River, including the coast of the Pacific Ocean and the Coastal Range of the mountains;
- The Central region includes the central Umpqua valley and most of the population along Interstate 5-corridor; and
- The Cascades region includes the Umpqua National Forest located within Douglas County and portions of the Cascade Mountains.

These three regions were developed by the Oregon Partnership for Disaster Resilience for the purpose of conducting the Douglas County Risk Assessment and determining the County's vulnerability and risk to the various hazards. To further enhance the accuracy of the hazard analysis zones, OPDR has adjusted these regions to better reflect the EPA's Level III Ecoregions.

The Coastal and Central region include all 12 of Douglas County's incorporated cities: Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, and Yoncalla (see Figure 3). All but two of these cities (Reedsport and Elkton) are located in the Central region, where a majority of the County's population resides.

Figure 3 Douglas County Subregions



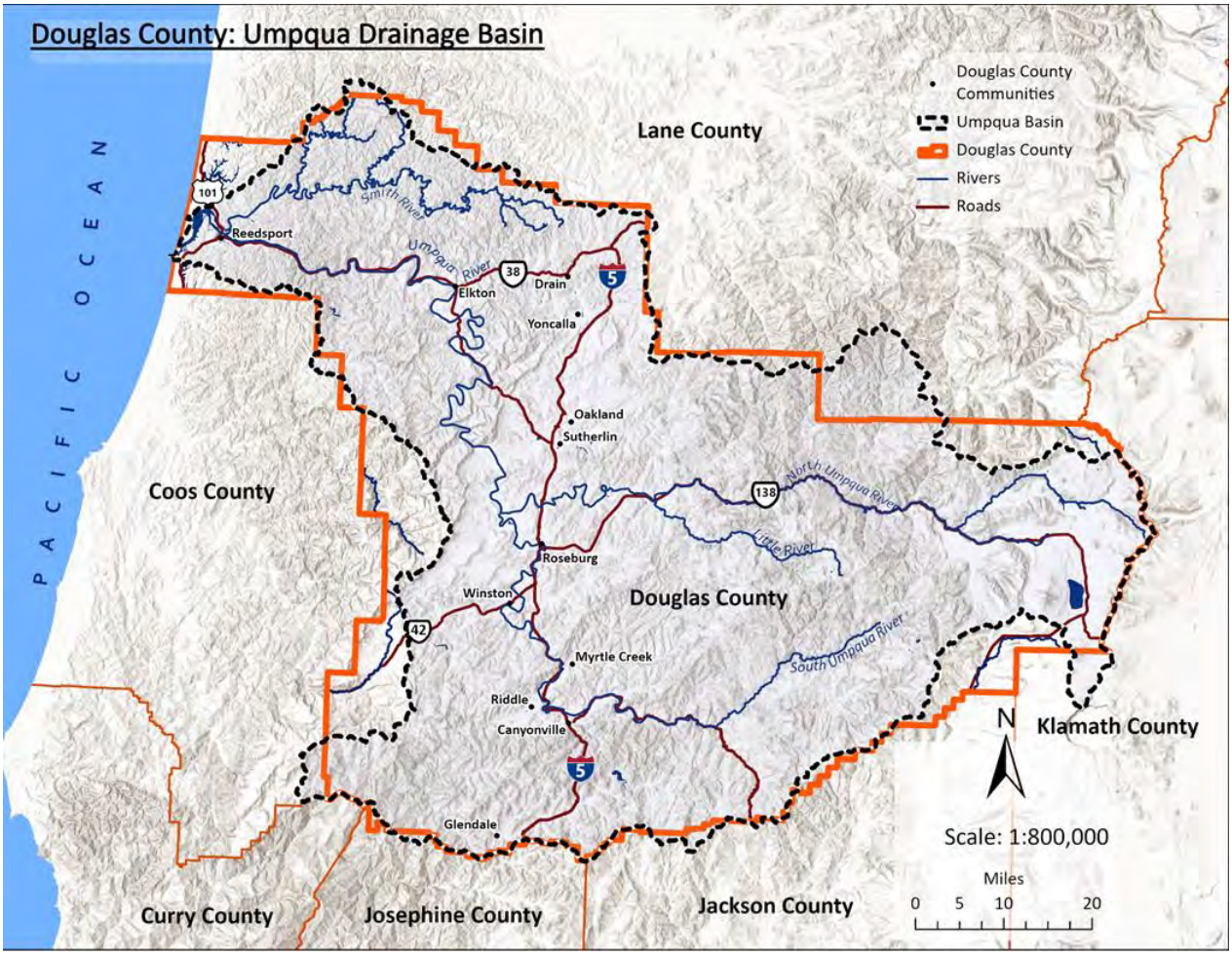
Douglas County	Coastal Region	Central Region	Cascades Region
Canyonville		X	
Drain		X	
Elkton	X		
Glendale		X	
Myrtle Creek		X	
Oakland		X	
Reedsport	X		
Riddle		X	
Roseburg		X	
Sutherlin		X	
Winston		X	
Yoncalla		X	

Source: Institute for Policy Research and Engagement.

Umpqua River Basin

The boundary of Douglas County closely aligns with the drainage basin of the Umpqua River, shown in Figure 4**.** The basin covers an area of approximately 4,560 square miles.

Figure 4 Umpqua River Basin and Watershed



Source: Douglas County GIS, 2023

The Umpqua Basin features ten major streams. All ten flow into the main Umpqua River, which meanders westward and joins the Pacific Ocean near Reedsport. The North Umpqua, from its headwaters at Maidu Lake, flows 106 miles, while the South Umpqua River flows roughly 104 miles from the headwaters of Castle Rock Creek. The other major tributaries include Cow Creek, Elk Creek, Calapooya Creek, Little River, Lookingglass Creek, Deer Creek and Smith River. From the confluence of the North and South Umpqua Rivers near Roseburg, the Umpqua River flows 111 miles.

Stream gradients in the basin vary greatly. The North Umpqua River has an average gradient of 86 feet per mile. The South Umpqua to Cow Creek has a relatively flat average gradient of 6 feet per mile, increasing to an average gradient of 42.5 feet per mile near Castle Rock Creek. On the Mainstem Umpqua, there is a gentle average gradient of 4 to 4.5 feet per mile from the confluence of the North and South Umpqua Rivers to tidewater at Scottsburg.

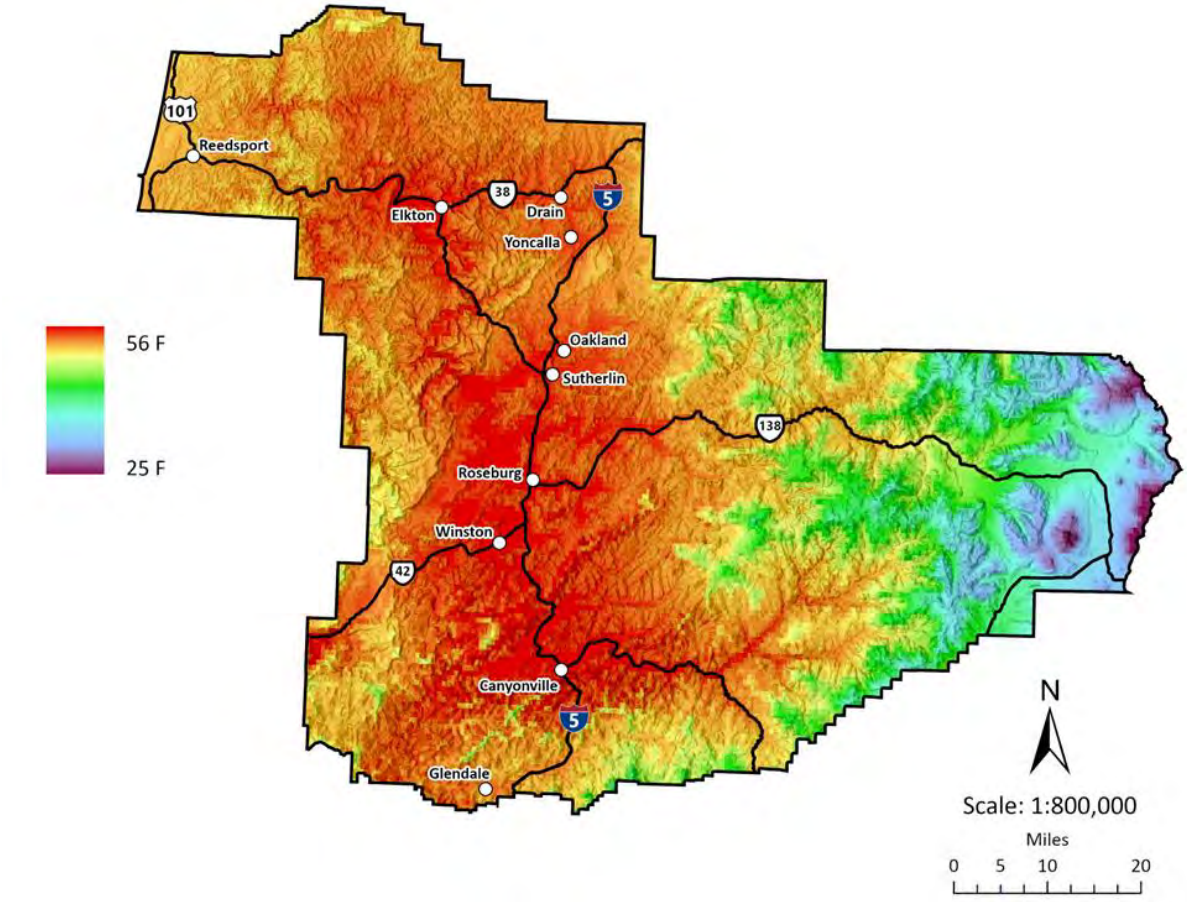
Climate

In the Umpqua Valley, moisture-laden breezes from the Pacific Ocean set the pace for seasonal temperatures and rainfall. These breezes blow over the Coast Range, through the inland valleys, and up to the Cascade Mountains, creating three distinct climatic areas. The coastal areas have the most moderate seasons. The inland valleys are subject to the hottest summer temperatures, while the Cascades see the

most extreme winter conditions. In all three areas, the prevailing westerly winds cool the heat of summer and warm the chill of winter.

In summer, the average Countywide temperature ranges between 52- and 70-degrees Fahrenheit. In winter, the average temperature does not drop below 37 degrees Fahrenheit. This temperature climate is due, in part, to the ocean winds that flow onshore. In Figure 5, mean temperature is lowest in the east, in the Cascades region, with the highest mean temperature being in the Central region, and once again decreasing in mean temperature near the coast.

Figure 5 Countywide Average Annual Temperature Mean (1991-2020)

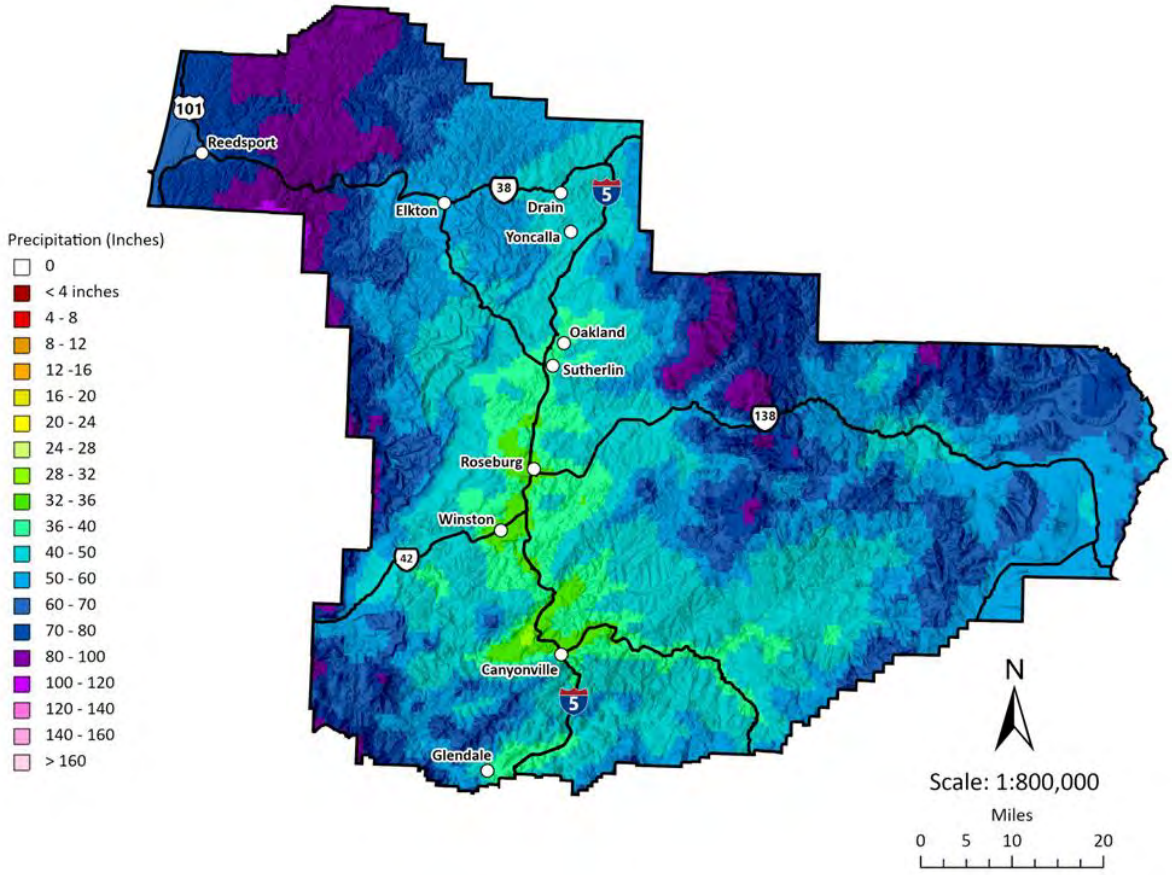


Source: Douglas County GIS, 2023

As ocean winds move inland from the coast, they lose velocity and moisture as they climb the Coast Range and enter the inland valleys. Coastal Douglas County receives the most rainfall, reporting an average of 80 inches per year at Reedsport and over 100 inches per year in the Coast Range. Inland valleys have some of the lowest wind velocities in the United States. Here rainfall averages 35 inches annually. This moderate climate is marked by relatively comfortable winters and temperate summers. The County enjoys over an average of 200 frost-free days annually, resulting in a growing season that generally extends between May and October. The first hard front usually does not arrive until December. Winter temperatures are the most extreme at high elevations, where the mean temperatures fall below 15 degrees in the Cascade Range. Snow is common at elevations above 2,500 feet.

Figure 6 illustrates annual precipitation averages for Douglas County. From the Pacific Ocean at sea level to Mt. Thielsen at 9,182 feet above sea level, precipitation ranges from an average 80 to 100 inches per year on the coast to just an average of 30 inches in the interior valleys, to over an average of 70 inches in the Cascade Mountains. This change in elevation causes a significant increase in precipitation, such as rain and snow.

Figure 6 Annual Average Precipitation for 30 Year Normal (1991-2020)



Source: Douglas County GIS, 2023

Minerals and Soils

The soils present in Douglas County are the acidic and leached products of weathering in a moist temperate climate under coniferous cover. Upland soils in Douglas County are characterized by variable thickness, moderate to rapid runoff, and moderate to extreme erosion hazard. Terrace soils have slow to moderate runoff and slight to high erosion potential depending on the steepness of slope. Lowland soils in the Umpqua Valley are the products of ongoing deposition. These deep alluvial soils are rich in minerals and are great for agriculture.

Potential soil related hazards include landslides and liquefaction. Landslides can occur when areas featuring steep slopes and shallow soils are saturated with water, causing the mass movement of rock, debris, or earth. Liquefaction can occur when loose, water-logged sediment loses its structural integrity because of ground shaking during an earthquake, causing the ground to behave like a liquid. Major structural damage can occur where liquefaction occurs near or beneath buildings or other structures.

Minerals in the Umpqua Valley are abundant and provide ample sources of ore and building materials. The abundance of minerals is due primarily to the convergence and proximity of the four geologic provinces within Douglas County (refer to geography and environment section).

Fault Lines and Seismic Threats

Douglas County, like most of the Pacific Northwest, lies over the Cascadia Subduction Zone (CSZ) where the North American crustal plate overrides the Juan de Fuca plate underneath the earth's crust. Volcanoes are present along this structural sag, and the activity on these mountains is caused by the buoyant melted rock of the Juan de Fuca plate, as it rises to the surface. A CSZ earthquake is anticipated to result in significant damage across the entire County. Data suggests that the Pacific Northwest is overdue for a large magnitude CSZ earthquake.

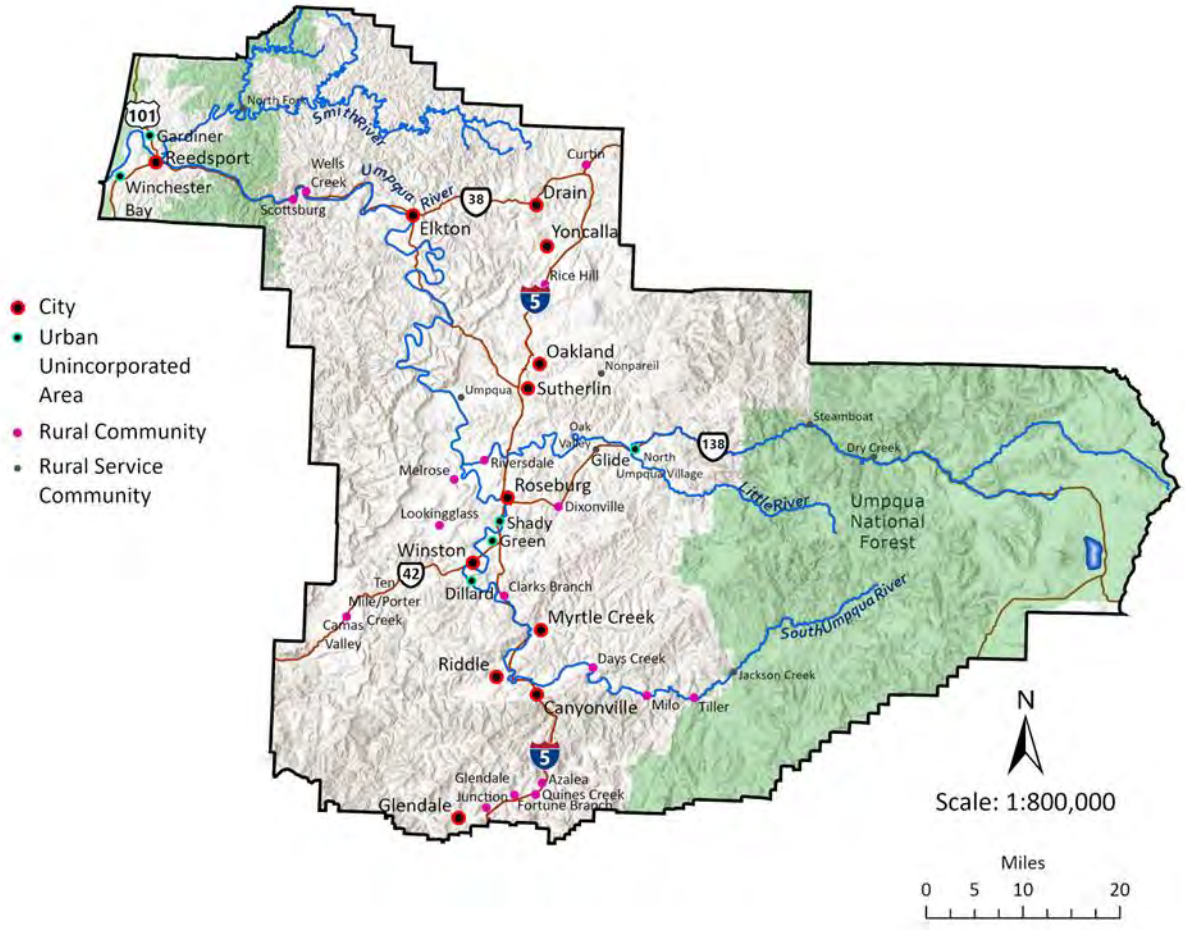
Other local, crustal fault lines lay under Douglas County that can cause significant localized damage to a community. As seen in Figure 7, there are several fault lines under Sutherlin (north of Roseburg along the I-5 Corridor), as well in the far east portion of the County in the Cascades.

Figure 7 Douglas County Fault Lines

Source: Oregon Department of Geology and Mineral Industries

Social/Demographic Profile

Figure 8 Douglas County Communities



Source: Douglas County GIS, 2023

Social/demographic capacity is a significant indicator of community hazard resilience. The characteristics and qualities of a community's population such as age, income, 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.

Douglas County has a variety of residential community types: incorporated cities, unincorporated urban areas, rural communities, and rural service centers, which can be seen in Figure 8.

The incorporated, urban unincorporated, and rural unincorporated communities are listed in Table 3.

Table 3 Douglas County Communities

Douglas County		
Incorporated	**Urban Unincorporated**	**Rural Unincorporated**
Canyonville	Dillard	Azalea
Drain	Gardiner	Camas Valley
Elkton	Glide	Clarks Branch
Glendale	Green	Curtin
Myrtle Creek	Shady	Days Creek
Oakland	Tri City	Dixonville
Reedsport	Winchester Bay	Glendale Junction
Riddle	-	Lookinglass
Roseburg	-	Melrose
Sutherlin	-	Milo
Winston	-	Quines Creek
Yoncalla	-	Rice Hill
-	-	Riversdale
-	-	Scottsburg/Wells Creek
-	-	Tenmile/Porter Creek
-	-	Tiller

Source: Douglas County NHMP Steering Committee

Douglas County Communities

Incorporated Cities

Incorporated cities are given power through the state to govern within their own boundaries. They are required to provide services such as sewer and water. The growth of a city is guided by Urban Growth Boundaries (UGB's). There are 12 incorporated cities within Douglas County

Canyonville	Reedsport
Drain	Riddle
Elkton	Roseburg
Glendale	Sutherlin
Myrtle Creek	Winston
Oakland	Yoncalla

Urban Unincorporated Areas

Urban unincorporated areas (UUAs) are located outside of Urban Growth Boundaries (UGBs) possessing a community identity all their own. These areas, due to their residential densities and the existence of public facilities (including sewer), are urban in nature. These areas have specific issues relative to their development that are not commonly found in the rural portions of Douglas County. UUA boundaries have been established to delineate urban or urbanizable land from rural land. Within UUA boundaries, land is

designated to be developed at relatively dense levels and that development will be served by a full range of public facilities and services. There are seven UUAs within Douglas County:

Dillard	Shady
Gardiner	Tri City
Glide	Winchester Bay
Green	-

Rural Communities

Rural Communities are defined by the statewide planning program's Unincorporated Communities Rule (OAR 660-22-010 (6)) as unincorporated communities which consist primarily of residential uses but also includes at least two other land uses (commercial, industrial, or public uses including but not limited to schools, churches, grange halls, post offices) serving the community, the surrounding rural area, or to persons traveling through the area. There are 16 rural communities in Douglas County:

Azalea	Melrose
Camas Valley	Milo
Clarks Branch	Quines Creek
Curtin	Rice Hill
Days Creek	Riversdale
Dixonville	Scottsburg/Wells Creek
Glendale Junction	Tenmile/Porter Creek
Lookinglass	Tiller

Rural Service Centers

Rural Service Centers (RSCs) are defined by the Unincorporated Communities Rule (OAR 660-22-010 (7)) as unincorporated communities consisting primarily of commercial or industrial uses providing goods and services to the surrounding rural area or to persons traveling through the area, but which may also include some dwellings. There are nine rural service centers in Douglas County:

Dry Creek	North Umpqua Village
Fortune Branch	Oak Valley
Jackson Creek	Steamboat
Nonpariel	Umpqua
North Fork	-

Population

As of 2022, Douglas County has a population of 112,076 in an area of 5,071 square miles. The population of Douglas County has steadily increased in the last 100 years from 19,674 people in 1910 to 111,201 people in 2020. Population growth is projected to continue (as shown in Table 4), according to the

Coordinated Population Forecast 2022 – 2072 for Douglas County produced by the Population Research Center at Portland State University.[3]

Table 4 Projected Douglas County Population

Douglas County Population Projections	2022	2047	2072
	112,076	116,368	119,442

Source: Chen et al., 2022

Most of Douglas County's population resides in Central Douglas County. The largest cities in the County are Roseburg and Sutherlin, with populations of 29,631 and 9,436, respectively. The largest city in the Coastal Region of Douglas County is Reedsport with a population of 4,480.

Table 5 and Figure 9 below shows the forecast average annual growth rate for Douglas County and each of its twelve incorporated cities. Please note, that the population for each city is different than that of the 2010 and 2020 census, since this population data includes the number of people in each of the city's urban growth boundaries as well as the city limits. It is anticipated that each city will experience some level of growth within the next 20 years. Douglas County will experience an average annual growth rate of approximately one percent. Urban and rural growth patterns can impact how agencies, cities and counties prepare for emergencies, because changes in development can increase risk associated with hazards. The table and figure below show population trends in Douglas County.

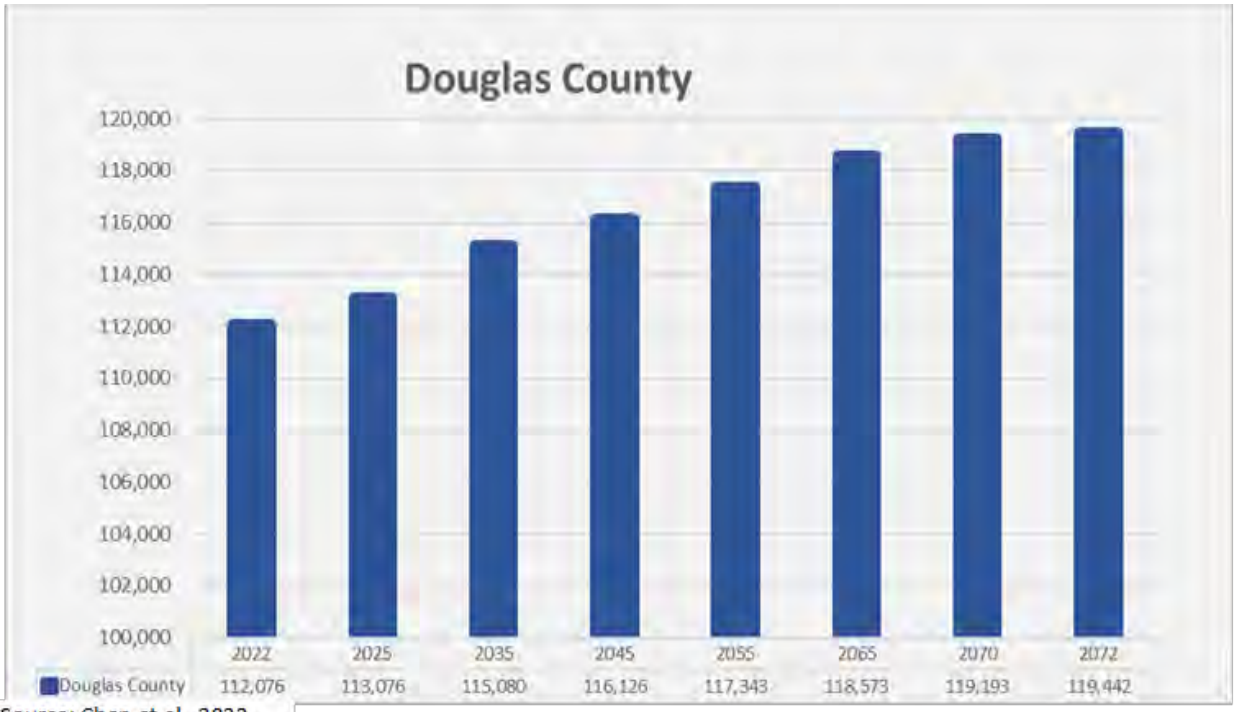
Table 5 Douglas County & Cities – Projected Population and Average Annual Growth Rate (AAGR) (2022 to 2072)

Total Population									
Area / Year	2022	2025	2035	2045	2055	2065	2070	2072	AAGR
Douglas County	112,076	113,076	115,080	116,126	117,343	118,573	119,193	119,442	0.1%
Canyonville	1,775	1,734	1,605	1,494	1,396	1,302	1,257	1,239	-0.7%
Drain	1,315	1,303	1,254	1,139	1,018	909	858	838	-1.1%
Elkton	192	188	176	161	146	133	127	125	-0.9%
Glendale	938	923	871	806	743	684	656	645	-0.8%
Myrtle Creek	7,631	7,612	7,558	7,706	7,994	8,278	8,419	8,475	0.4%
Oakland	1,087	1,079	1,050	1,033	1,030	1,025	1,022	1,020	0.0%
Reedsport	4,480	4,518	4,551	4,470	4,365	4,255	4,198	4,176	-0.3%
Riddle	1,223	1,233	1,263	1,285	1,307	1,327	1,336	1,340	0.2%
Roseburg	29,631	30,503	32,476	33,708	34,766	35,796	36,301	36,500	0.3%
Sutherlin	9,436	9,457	9,546	10,052	10,833	11,652	12,078	12,251	0.7%
Winston	5,984	6,237	6,904	7,500	8,110	8,753	9,087	9,224	0.8%
Yoncalla	1,064	1,046	990	942	899	858	837	829	-0.5%
Outside UGB Area	47,321	47,242	46,837	45,828	44,736	43,601	43,017	42,781	-0.3%

Source: Chen et al., 2022

[3] Portland State University. Population Research Center. 2022 Annual Population Report Tables

Figure 9 Projected Total Population and Average Annual Growth Rate (AAGR) (2022 to 2072)



Source: Chen et al., 2022

The twelve incorporated communities within the County comprise about 57.8percent of the County population. The remaining 42.2 percent of the population resides in unincorporated areas. Table 6 shows the number of people living in unincorporated areas of the county in 2020.

Table 6 Douglas County Urban Unincorporated Areas Population

Area	2020 Population
Dillard	304
Gardiner	539
Glide	1,431
Green	8,014
Shady	Undetermined
Tri City	3,991
Winchester Bay	382

Source: U.S Census Bureau, 2020

On its own, population size is not an indicator of vulnerability. Other characteristics are more indicative of vulnerability, including location, community composition and demographics, socio-economic statuses, community and individual health and well-being, community connectivity, and overall community adaptive capacity. Each of these characteristics can play a significant role in a community's and individuals' ability to prepare for, respond to, and recover from a natural hazard.

The following portion of the Social/Demographic Capacity section of this chapter will further analyze these composition factors in Douglas County to better understand community vulnerability.

Socially Vulnerable Populations[4]

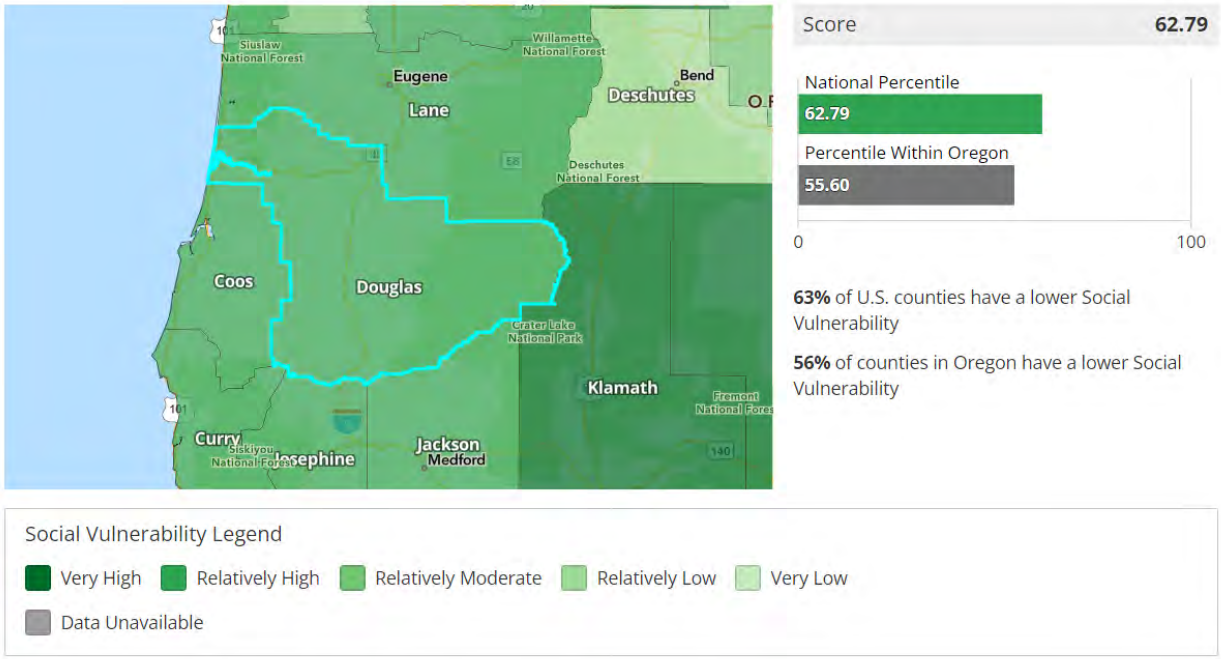
Social vulnerability is the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Natural hazards disproportionately impact socially vulnerable individuals due to a variety of characteristics, such as age, gender, race and ethnicity, disability, language spoken, access to Internet or devices, household size, housing tenure, and household composition. Equally important is recognizing seasonal, outdoor workforces and transient populations affecting the total number of people physically present within the County's political boundaries, including tourists and visitors. People experiencing homelessness also face a disproportionate level of public health and exposure risk to natural hazards.

Socially vulnerable populations experience the impacts of natural hazards and disasters more acutely, requiring mitigation actions that targets the specific needs of vulnerable groups in manners that have the potential to greatly reduce their vulnerability. FEMA's Office of Equal Rights by encouraging agencies and organizations planning for natural hazards to identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

Social vulnerability can be broadly assessed using the FEMA National Risk Index (NRI), an online risk analysis tool that illustrates a community's risk and vulnerability for 18 different natural hazards using various data sources, such as the US Census, federal agencies, state provided data, and more. According to NRI (seen in Figure 10), Douglas County has a Relatively High social vulnerability rating. This rating captures the vulnerability to the adverse impacts of natural hazards when compared to the rest of the U.S. and other Oregon counties. This means that due to certain characteristics, residents of Douglas County may experience the impacts of natural hazards and disasters more accurately, and suffer more deaths, injuries, losses, and disruptions of livelihoods in proportion to the larger population.

[4] Social Vulnerability | National Risk Index (fema.gov)

Figure 10 Social Vulnerability in Douglas County



Source: FEMA National Risk Index, 2023

Federal Assistance Programs

The level of participation in federal assistance programs, such as a community's utilization of monthly food benefit programs, are another indicator of poverty or lack of resource access. Statewide social assistance programs include Supplemental Security Income (SSI), Supplemental Nutritional Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), and Earned Income Tax (EIT), all of which can provide aid to economically vulnerable families and individuals.

In December 2020, Douglas County has 3,649 individuals receiving SSI, with most participants being either blind or disabled. During 2020, Douglas County saw a substantial decrease in TANF cases, with the Roseburg Department of Health Services (DHS) reporting a drop of 757 TANF cases. This may be due to the increased unemployment benefits and stimulus payments made by the state and federal government due to the Covid-19 Pandemic.[5]

During 2020, Douglas County had an average of 24,675 individuals per month using SNAP benefits, which totaled to an average monthly dollar amount of $4.2 million. Additionally, due to the COVID Pandemic, there was a significant increase in SNAP participation, with the DHS reporting paying out an additional $1.7 million per month.[6]

These income support programs provide critical financial assistance to local vulnerable and distressed populations and provide vital assistance to these communities during times of increased financial stress and burden, such as during the COVID Pandemic.

[5] United State Social Security Administration, 2020.

[6] Center of Budget and Policy Priorities, Oregon SNAP Fact Sheet, April 2022

Race and Ethnicity

Studies have shown that racial and ethnic minorities can be more vulnerable to natural disaster events due to historic patterns of inequality associated with race and ethnicity. Minority communities are more likely to live in inferior building stock, with degraded infrastructure, or having less access to public services. Table 7 displays Douglas County's population by race and Hispanic or Latino/a ethnicity.

Table 7 Race and Ethnicity (Hispanic or Latino/a)

	Douglas County		Unincorporated		Incorporated	
	Number	Percent	Number	Percent	Number	Percent
Total Population	110,680	100%	52,754	100%	57,926	100%
White	99,863	90%	47,994	91%	51,869	90%
Black or African American	332	<1%	185	<1%	147	<1%
American Indian and Alaska Native	1,132	1%	424	1%	708	1%
Asian	961	1%	459	1%	502	1%
Native Hawaiian and Other Pacific Islander	69	<1%	0	0%	69	<1%
Some Other Race	1,071	1%	340	1%	731	1%
Two or More Races	7,252	7%	3,352	6%	3,900	7%
Hispanic or Latino/a	6,809	6%	3,398	6%	3,411	6%

Source: U.S Census Bureau, 2021

The overall population in Douglas County is ninety percent (90 percent) racially white with six percent of the County being Hispanic or Latino/a. Within unincorporated areas of the County, ninety-one percent (91 percent) of the population is racially white and six percent (6%) is Hispanic or Latino/a.

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 pre-established trusted sources or providing preparedness handouts and presentations in the languages spoken by the population can significantly contribute overall community resilience.

Age

The age profile of an area has a direct impact on what actions are prioritized for mitigation and how response to hazard incidents is carried out. Older populations often 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.

Douglas County's population is aging, like many areas in Oregon. Table 8 shows that over 25 percent of the population is 65 or older, which increased from 21 percent to 25.5 percent from 2010 to 2022. This growth highlights the increasing risk that natural hazards pose to these vulnerable populations. Further evidence of Douglas County's aging population can be seen by the slight increase of the median age of individuals from 46 in 2010 to 46.6 in 2021.

Table 8 Age Structure of the Population

Area	Younger than 14 years old	Ages 15 to 64 years old	Older than 65 years old
Douglas County	16.0%	58.5%	25.5%
Canyonville	17.7%	48.4%	34.1%
Drain	11.6%	70.4%	18.0%
Elkton	1.4%	32.9%	65.7%
Glendale	20.6%	67.4%	12.2%
Myrtle Creek	20.3%	61.6%	18.0%
Oakland	21.7%	55.5%	23.0%
Reedsport	16.7%	52.7%	30.5%
Riddle	17.5%	70.2%	12.2%
Roseburg	17.7%	62.4%	20.0%
Sutherlin	15.4%	55.3%	29.3%
Winston	23.2%	58.9%	18.1%
Yoncalla	11.4%	58.7%	29.9%
Average	16.2%	57.9%	25.9%

Source: Social Explorer, 2022-

Income

Household income and poverty status are indicators of socio-economic demographic capacity, and the stability and overall resilience of the local economy. Household income can be used to compare economic areas as a whole but does not reflect how the income is divided among the area residents. Based on data provided by the US Census Bureau, through the American Community Survey, the 2022 median household income across Douglas County was estimated at $56,754, which is significantly lower than the State of Oregon median household income for 2022, which is $75,793. Table 9 indicates the median household income for each of the twelve cities within the County during 2022.

Table 10 shows the distribution of household incomes in Douglas County in 2022. Most households in Douglas

Table 9- Median Household Income

Area	Median Household Income
Oregon	$75,793
Douglas County	$56,754
Canyonville	$39,603
Drain	$58,005
Elkton	$41,906
Glendale	$55,424
Myrtle Creek	$61,230
Oakland	$58,779
Reedsport	$45,789
Riddle	$60,120
Roseburg	$51,824
Sutherlin	$47,314
Winston	$53,459
Yoncalla	$49,680

Source: Social Explorer, 2022-

County are making under $100,000 dollars, yet the household income category with the highest percentage is $100,000 - $199,999 (19.8 percent).

Table 10 Household Income

Household Income	Households	Percent
Less than $15,000	3,920	8.6%
$15,000 - $29,999	6,774	14.8%
$30,000 - $44,999	6,957	15.2%
$45,000 - $59,999	6,195	13.6%
$60,000 - $74,999	5,046	11.1%
$75,000 - $99,999	5,923	13.0%
$100,000 - $199,999	9,045	19.8%
$200,000 or more	1,803	3.9%

Source: Social Explorer, 2022

Poverty levels are another indicator of community resilience. People in poverty are generally not able to adequately prepare for and/or respond to natural hazards. Table 11, below identifies the percentage of individuals that were below the poverty level in 2022, based on data provided by the US Census Bureau, through the American Community Survey. It is estimated that 13.8 percent of individuals live below the poverty level across the County. Poverty rates in Douglas County are higher than those of Oregon State. Canyonville and Glendale have rates that are around twice as high as that of Oregon State (24.5 percent and 24.0 percent respectively).

Research suggests that lack of wealth contributes to social vulnerability because individual and community resources are not as readily available. Affluent and white communities are more likely to have both the collective and individual capacity to rebound from a hazard event more quickly, while financially insecure populations and communities of color may not have this capacity –leading to increased vulnerability.

Table 11 Poverty Rate

Area	Number	Percent
Oregon	498,517	12.1%
Douglas County	15,112	13.8%
Canyonville	447	24.5%
Drain	190	16.2%
Elkton	12	8.6%
Glendale	174	24.0%
Myrtle Creek	578	16.7%
Oakland	176	12.9%
Reedsport	867	20.4%
Riddle	157	15.1%
Roseburg	3,953	17.3%
Sutherlin	1,235	14.7%
Winston	756	13.7%
Yoncalla	158	15.1%

Source: U.S. Census Bureau, 2021

Wealth can help those affected by hazard incidents to absorb the impacts of a disaster more easily, which can either help them maintain or even grow their overall wealth. Conversely, poverty, at both an individual and community level, can drastically alter recovery time and quality, often putting them further into poverty, leading to an even greater wealth gap. Research suggests that in the aftermath of disaster, white affluent communities and individuals are more likely to not only recovery quicker, but also might gain wealth as result of more ease of access to and knowledge of post-disaster recovery funds and possess funds saved pre-disaster. In contract, more socio-economically vulnerable communities tend to lose wealth, as they often lack saved funds and do not have the knowledge to navigate and receive post-disaster recovery funds – leading to greater social vulnerability.

Understanding the economic makeup of a community can help assessing community needs regarding their ability and capacity to prepare for and recover from natural disasters, the proportion of the population who will be adversely affected because of natural disasters, and the potential for an increase in poverty rates following a natural disaster. More socially vulnerable communities will likely need greater assistance prior to and in the aftermath of a natural disaster, particularly with preparing for a natural hazard and navigating the process to obtain post-disaster recovery funds.

Health

Individual and community health play an integral role in community resiliency. Indicators such as health insurance, people with disabilities, dependencies, and homelessness paint an overall picture of a community's well-being and resilience. These factors contribute to community risk and vulnerability, and reflect a community's ability to prepare, respond to, and cope with the impacts of a disaster. Community members who have health-related vulnerabilities will likely require additional community support and resources, both prior to and following a natural hazard.

The percentage of the population in Douglas County without health insurance (6.2 percent) is slightly lower than that of the State (6.7 percent). However, five of the 12 cities in Douglas County have higher rates of uninsured individuals than Oregon. (See Table 12). The ability to provide services to the uninsured populations may burden local providers, as well as local health services following a natural disaster. Many Oregonians are enrolled in health care coverage under the Oregon Health Plan, which was established under the Affordable Care Act (ACA) coverage expansion, and the rate of uninsured has significantly decreased over the past decade.

Table 12 Health Insurance Coverage

Area	Population	Number of Uninsured	Percentage of Uninsured
Oregon	4,167,351	278,280	6.7%
Douglas County	110,000	6,844	6.2%
Canyonville	1,903	111	5.8%
Drain	1,175	220	18.7%
Elkton	140	4	2.9%
Glendale	724	48	6.6%
Myrtle Creek	3,472	416	12.0%
Oakland	1,360	60	4.4%
Reedsport	4,253	390	9.2%
Riddle	1,072	58	5.4%
Roseburg	23,065	1,703	7.4%
Sutherlin	8,407	237	2.8%
Winston	5,549	65	1.2%
Yoncalla	1,044	119	11.4%

Source: U.S. Census Bureau, 2021

Table 13 below describes the disability status of the population. As of 2022, 20.6 percent of the Douglas County population had one or more disabilities, which is significantly higher than the states percentage (14.4 percent). Three of the 12 cities located within the County have a level of disabled citizens that is twice the amount of the State percentage. Research recognizes that those who are impaired with sensory, mental, or physical disabilities have higher vulnerability to hazards and will likely require additional community support and resources.

Table 13 Total Population with a Disability

Area	Population	Number of Disabled	Percentage of Disabled
Oregon	4,167,351	599,964	14.4%
Douglas County	110,000	22,681	20.6%
Canyonville	1,903	576	30.3%
Drain	1,175	217	18.5%
Elkton	140	52	37.1%
Glendale	724	151	20.9%
Myrtle Creek	3,472	610	17.6%
Oakland	1,360	162	11.9%
Reedsport	4,253	981	23.1%
Riddle	1,072	171	16.0%
Roseburg	23,065	5,003	21.7%
Sutherlin	8,407	2,106	25.1%
Winston	5,549	1,227	22.1%
Yoncalla	1,044	353	33.8%

Source: U.S. Census Bureau, 2021

The Oregon Housing and Community Services (OHCS) provide homelessness counts across the state, which is used to identify the number of homeless, their age and their family type[7]. The OHCS data shows that that as of 2023, 421 individuals and persons in families in Douglas County identify as unhoused. Of these individuals, 189 people (44.9 percent) were sheltered, meaning they were residing in an emergency shelter or transitional or temporary housing, while 232 people (55.1 percent) were unsheltered, meaning they resided in a place not meant for human habitation, such as cars, parks, abandoned buildings, or on the streets.

Additionally, males are disproportionally more likely to experience homelessness as compared to females, as 263 (62.5 percent) individuals identified as male, while 157 (37.3 percent) identified as female, with one individual (0.2 percent) identifying as trans/non-binary. Finally, 66 people (15.7 percent) identified as chronically homeless, meaning they have experienced homelessness for at least a year. Veterans constitute 10.5 percent (44 individuals) of the homeless population. Of the overall homeless population, 59 individuals (14 percent) were children under 18 living with their family.

The unhoused often have limited personal resources to rely on, especially during an emergency. The County, cities, and local non-profit entities provide services such as shelter, food and medical assistance following natural hazard events. Assistance is available through agencies and organizations in the community, such as the American Red Cross and homeless shelters. Additionally, it is necessary to determine the most effective means to communicate with these populations, as traditional means of communication may not be feasible or accessible to them.

[7] County Profiles 2023 - Oregon Housing | Tableau Public

Economic and Employment Profile

Economic capacity refers to the financial resources present, and revenue generated in the community to achieve a higher quality of life through income equality, housing affordability, economic diversification, and diversification of employment and industry opportunities. These indicators can represent strong community economic resilience. 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 items like employment sectors, workforce, resources and infrastructure are interconnected in the existing economic picture. Identifying systematic strengths and vulnerabilities allows public and private entities to address needs and increase the resilience of the local economy.

Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. One tool for measuring economic diversity is the Hachman Index, which uses measures such as gross domestic product (GDP) or employment to measure the mix of industries present in a particular region relative to a (well-diversified) reference region (in this case, all 36 of Oregon's Counties). The Hachman Index scores from 0 to 1.00, with a higher score indicating more similarity with the reference region, while a lower score indicates less similarity. For example, a diversity ranking of one would indicate that an area enjoys the most diverse economic activity compared to other Oregon counties, while a ranking of 36 would signify the least diverse economy.

Table 14 shows that Douglas County has an economic diversity rank of 15 as of 2021, as compared to Lane County which has a diversity rank of one and Coos County which has a diversity rank of 27. The County's ranking has declined from a rank of 11 since 1999, indicating that economic diversity in Douglas County has decreased over the past two decades.

Table 14 Douglas County Economic Diversity (1999 and 2021)

	1999		2021	
	Value	Rank	Value	Rank
Douglas County	0.454	15	0.486	11
Coos County	0.240	27	0.377	23
Jackson County	0.649	6	0.803	4
Josephine County	0.572	9	0.753	6
Klamath County	0.561	10	0.658	8
Lane County	0.859	1	0.848	1

Source: Tauer, 2022

While illustrative, economic diversity is not a guarantor of economic vitality or resilience. Douglas County, as of September 2023, is listed as an economically distressed community as prescribed by ORS 285A.020(5). The economic distress measure is based on indicators of decreasing new jobs, average wages, and income, and is associated with an increase in unemployment.[8]

[8] Business Oregon : Distressed Areas in Oregon : Reports, Publications, and Plans : State of Oregon

Employment

Employment status and salary level may impact the resilience of individuals and families in the face of disasters as well as their ability to mitigate natural hazards. The possibility of additional unemployment following a disaster compounds the number of unemployed people within the community, making post recovery efforts from a disaster an even slower process.

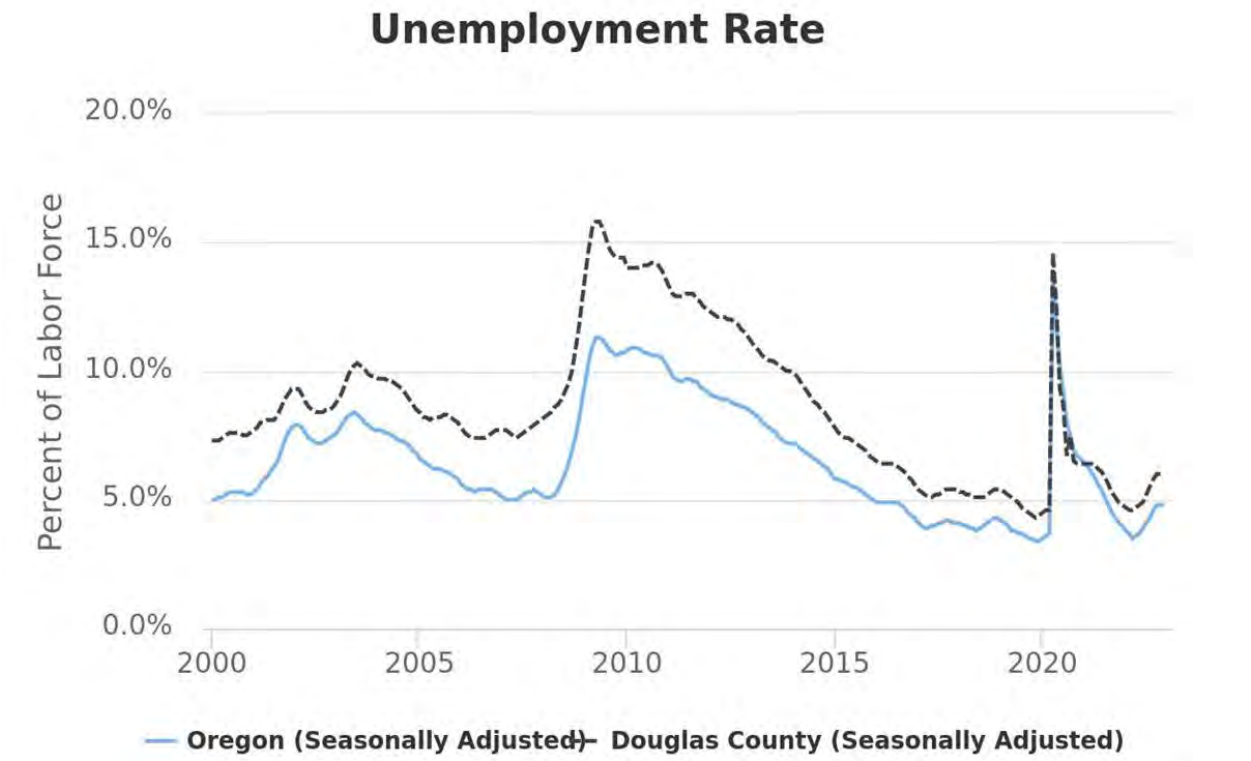
Table 15 and Figure 11 shows that the rate of unemployment in both Oregon and Douglas County has been mostly declining since 2010. However, the rate of unemployment in Douglas County has continually lagged behind the state's average, with an average of 1.8 percent higher unemployment rate between 2000 to 2022. Additionally, unemployment significantly increased across the state in 2020 because of the 2019 Novel Corona Virus (Covid-19) pandemic, from 7.6 percent to 10.7 percent, the highest rate since 2010. Unemployment eventually fell to a two-decade low by 2022 (4.2 percent). For Douglas County, the rates reflected a similar pattern, with unemployment rates reaching 7.8 percent in 2020 (the closest that Douglas County has come to matching the state's rate) and decreasing to 5.3 percent in 2022.

Table 15 Unemployment Rate in Douglas County as compared to State 2000-2022

	2000	2005	2010	2015	2020	2022	Change (2000-2022)
Oregon	5.2%	6.2%	10.7%	5.5%	7.6%	4.2%	-1.0%
Douglas County	7.4%	8.2%	14.1%	7.3%	;7.8	5.3%	-2.1%

Source: Oregon Employment Department, 2022

Figure 11 Unemployment Rate from 2000 to 2022



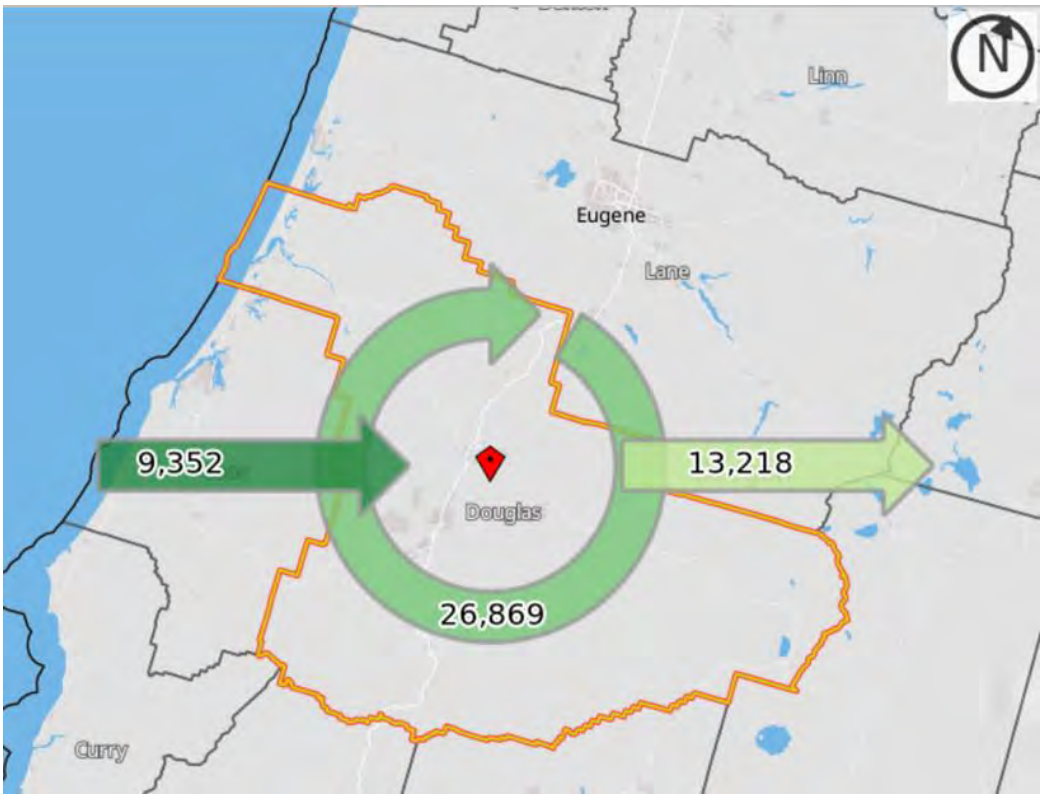
Source: Oregon Employment Department, 2022

Labor and Commute Trends

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 protect 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 following labor shed, and commute shed analysis is intended to document where County residents work and where people who work in Douglas County reside.

The Douglas County economy is a cornerstone of regional economic vitality. Douglas County employers draw in more than 9,300 workers from outside the County. Figure 12 shows the County's laborshed (i.e., the area or region from which an employer draws their commuting workers). The map shows that about 74 percent (26,869) of workers (all jobs) live and work in the County. Roughly 26 percent (9,352) of workers reside outside of the County and work in the County, and about 49 percent (13,213) of residents work outside of the County.

Figure 12 Douglas County Laborshed



Source: U.S Census OnTheMap, 2020

Table 16 shows the areas and regions that residents of Douglas County commute for work (i.e., the commute shed). Of the 36,221 jobs employing Douglas County residents, the vast majority, at approximately three-fourths (74.2 percent), of employed Douglas County residents work in the County. The remainder of the employed residents are employed in various other Oregon counties, including Lane

County (5.6 percent), Coos County (4.1 percent), and Josephine County (3.1 percent). Some residents must commute much further from as far as Multnomah and Washington Counties in northern Oregon.

Table 16 Commute Shed (Where Workers are Employed who Live in Douglas County), 2020

Jurisdiction	Number of Job	Share
All Counties	36,221	100%
Douglas County, OR	26,869	74.2%
Lane County, OR	2,026	5.6%
Coos County, OR	1,478	4.1%
Josephine County, OR	1,124	3.1%
Jackson County, OR	1,081	3.0%
Marion County, OR	315	0.9%
Washington County, OR	295	0.8%
Multnomah County, OR	282	0.8%
Deschutes County, OR	272	0.8%
Linn County, OR	246	0.7%
All Other Locations	2,233	6.2%

Source: U.S Census OnTheMap, 2020

Table 17 shows the areas and regions that residents of Douglas County commute for work (i.e., the commute shed). Of the 36,221 jobs employing Douglas County residents, the vast majority, at approximately three-fourths (74.2 percent), of employed Douglas County residents work in the County. The remainder of the employed residents are employed in various other Oregon counties, including Lane County (5.6 percent), Coos County (4.1 percent), and Josephine County (3.1 percent). Some residents must commute much further from as far as Multnomah and Washington Counties in northern Oregon.

Table 17 Labor Shed (Where Workers Live who are Employed in Douglas County), 2020

Jurisdiction	Number of Job	Share
All Counties	40,087	100%
Douglas County, OR	26,869	67.0%
Lane County, OR	4,069	10.2%
Jackson County, OR	1,976	4.9%
Coos County, OR	1,389	3.5%
Josephine County, OR	1,068	2.7%
Multnomah County, OR	934	2.3%
Marion County, OR	607	1.5%
Washington County, OR	513	1.3%
Clackamas County, OR	358	0.9%
Deschutes County, OR	314	0.8%
All Other Locations	1,990	5.0%

Source: U.S Census OnTheMap, 2020

The degree to which workers are impacted during a disaster can depend upon the means of transportation relied upon to reach their place of employment. Workers reliant on motorized vehicles and public transportation may be delayed or unable to travel if maintained roads, bridges, and other infrastructure are impacted during an event (for example, earthquakes or heavy winter storms). Table 18 shows that 88.6 percent of Douglas County commuters utilize motorized vehicles (cars, trucks, vans, or motorcycles) and less than one percent (0.3 percent) use public transportation. Only around three percent (3.2 percent) of commuters' bike or walk to work or take other means, and almost eight percent work from home, a rising trend since the COVID-19 Pandemic.

Table 18 Means of Transportation to Work

Jurisdiction	Workers (16 and older)	Motorized Vehicle^ (Percent)	Public Transportation (Percent)	Bike/Walked (Percent)	Other (Percent)	Worked from Home (Percent)
Douglas County	42,177	88.6%	0.3%	2.6%	0.6%	7.9%
Incorporated	20,772	89.1%	0.2%	3.5%	0.2%	6.2%
Unincorporated	21,405	88.2%	0.0%	1.7%	0.3%	9.5%

Source: Social Explorer, 2022

Mitigation activities at the business level 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 continues to stay high, there is a continual 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 Douglas County residents and businesses.

Employment by Industry

Key industries include major employers and significant revenue generators in Douglas County. Different industries face distinct vulnerabilities to natural hazards; thus, it is important to identify the key industries in the region that enable the community to target mitigation activities addressing the specific sensitivities of those industries. A natural hazard event can affect one industry and 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.

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 region. Thus, understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

The five major employment sectors in Douglas County are grouped into the following categories: (1) Trade, Transportation, and Utilities; (2) Government; (3) Education and Health Services; (4) Leisure and Hospitality; and (5) Manufacturing. Although employment in wood products manufacturing has declined in recent years, lumber and wood products continue to be one of the largest employment sectors in Douglas County within the manufacturing sector, employing around seven percent of the private sector. Douglas County contains nearly 2.8 million acres in commercial forestland and is the second largest

producer of timber in the state (Oregon Natural Hazards Mitigation Plan). Table 19 shows the distribution of total employment across all sectors.

Table 19 Covered Employment by Industry Sector in Douglas County, 2022

Industry	Employment	Percent	Wages	Annual Average
Total All Employers	38,449	100.0%	$1,930,924,340	$50,220
Total Private Employers	31,275	81.3%	$1,502,707,135	$48,048
Natural Resources & Mining	1,542	4.9%	$83,083,601	$53,880
Construction	1,774	5.7%	$98,121,729	$55,311
Manufacturing	4,675	14.9%	$290,572,968	$62,155
Trade, Transportation & Utilities	7,375	23.6%	$319,874,640	$43,373
Information	283	0.9%	$16,172,793	$57,148
Financial Activities	978	3.1%	$55,636,601	$56,888
Professional & Business Services	3,290	10.5%	$159,284,836	$48,415
Education & Health Services	6,444	20.6%	$355,694,023	$55,198
Leisure & Hospitality	3,601	11.5%	$79,127,271	$21,974
Other Services	1,232	3.9%	$41,212,197	$33,451
Private Non-Classified	80	0.3%	$3,926,476	$49,081
Total All Government	7,174	18.7%	$428,217,205	$59,690
Federal Government	1,444	20.1%	$115,271,989	$79,828
State Government	716	10.0%	$50,838,272	$71,003
Local and Tribal Government	5,014	69.9%	$262,106,944	$52,275

Source: Oregon Employment Department, 2022

Built Environment Profile

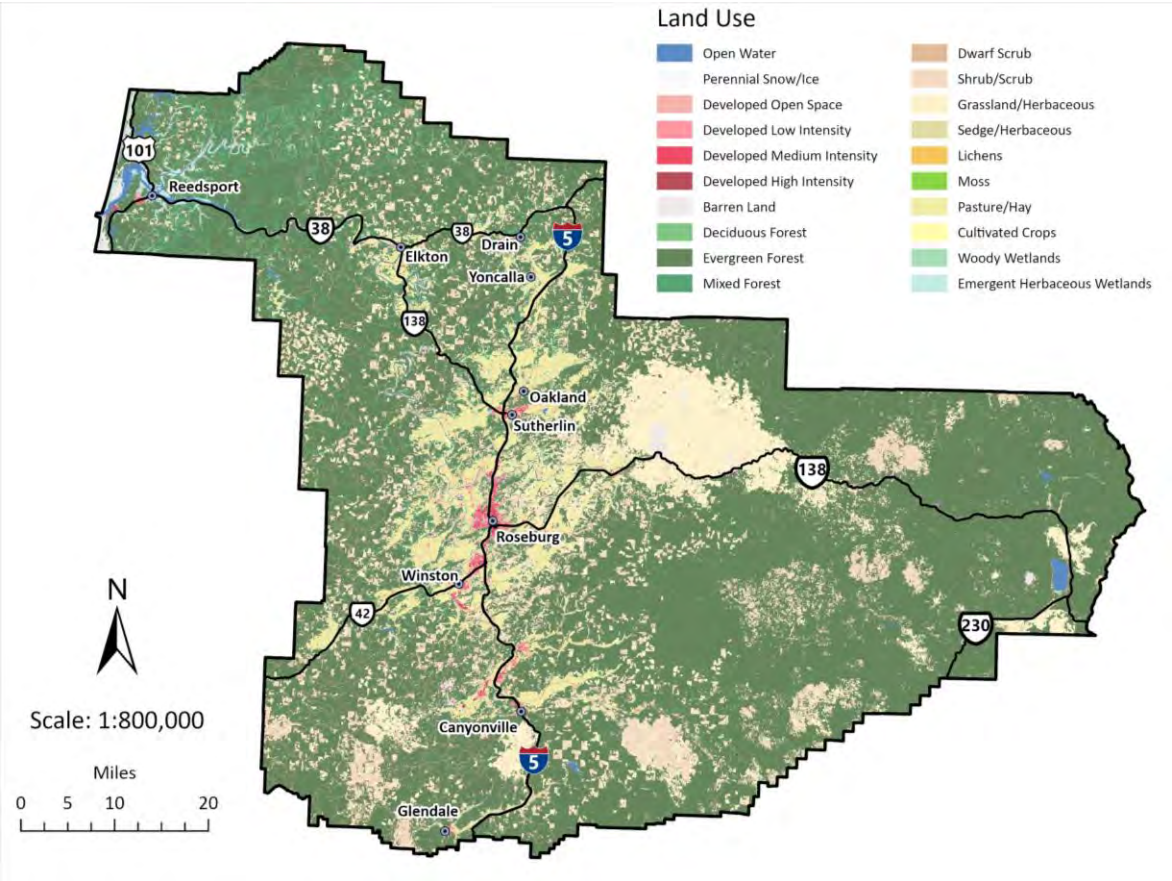
Built Environment capacity refers to the built environment and infrastructure that supports the community. The various forms, quantity, and quality of built capital contribute significantly to community resilience. Physical infrastructure, including utility and transportation lifelines, are critical during a disaster and are essential for proper response. The lack or poor condition of infrastructure can negatively affect a community's ability to cope, respond 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.

Land Use and Development Patterns

period.Throughout its history and to this day, the County's, as well as the state and regional economies are largely based on timber, tourism, and agriculture. This, along with the large portions of the County that are public lands, impacted the land use and development patterns in the County.The majority of Douglas County has a low population density, with the population densest in the central urban areas. In all, the population per square mile is 21 people.[9] Based upon the Douglas County Coordinated Population Forecast for 2022 – 2072 completed by the Population Research Center at Portland State University, 57.8 percent of the population within Douglas County lives inside the UGB associated with one of the 12 cities. Over half the land (54 percent) in Douglas County is publicly owned (51 percent Federal Government, 2 percent State Government, one percent Local Government); the remaining lands (46 percent) are owned privately. As seen in Figure 13**,** a significant portion of the County lacks significant development, with the developed area primarily located in the central region, along with more development along the coast, while the cascades region is primarily rural communities and timber plantations.

[10] Federal Highway Administration National Bridge Inventory

Figure 13 Douglas County Land Use Map



Source: Oregon Explorer

Urban Growth Boundaries

In 1973, the Oregon Legislature adopted Senate Bill 100 (SB 100), which established the statewide land use planning program. SB 100 required the development of Statewide Planning Goals, which took place over subsequent years (the last Goals were adopted in 1976). The 19 Statewide Planning Goals provide Oregon's policies related to land use, including citizen involvement (Goal 1), housing (Goal 10), and natural resources (Goal 5).

Local jurisdictions, including Counties and incorporated cities, were required to prepare and adopt comprehensive plans, zoning regulations, and land use permitting regulations. As part of the 19 Goals, UGBs were established to separate areas planned for urban use as opposed to rural, thus aiming to limit the amount of development in the rural area uses. UGBs may need to be amended periodically to accommodate growth, as they contain enough land to meet estimated 20-year development based on employment and population growth. However, the land use designation can change from resource protection in one of two ways:

- The requested change could qualify as an exception to Statewide Planning Goals, in which case the city must demonstrate to the State that the change meets requirements for an exception. These lands, known as exception lands, are predominantly designated for residential use.
- Resource land can also be converted to non-resource use when it can be demonstrated that the land is no longer suitable for farm or forest production.

Local and state policies currently direct growth away from rural lands and into UGBs, and, to a lesser extent, into rural communities. If development follows historical development trends, urban areas will expand their UGBs, rural unincorporated communities will continue to grow, and overall rural residential density will increase slightly with the bulk of rural lands kept in farm and forest use, or even kept as open space. The existing pattern of development in the rural areas, that of radiating out from the urban areas along rivers and streams is likely to continue. Most of the “easy to develop” land is already developed, particularly in Roseburg, in general leaving more constrained land such as land in the floodplains or on steep slopes to be developed in the future, perhaps increasing the rate at which development occurs in natural hazard areas.

Oregon Statewide Planning Goal and Planning Goal 7

Since 1973, Oregon has maintained a strong statewide program for land use planning. The foundation of that program is a set of 19 statewide planning goals that express the state's policies on land use and on related topics, such as citizen involvement, land use planning, and natural resources.

Most of the goals are accompanied by "guidelines," which are suggestions about how a goal may be applied. Oregon's statewide goals are achieved through local comprehensive planning. State law requires each city to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into effect. The local comprehensive plans must be consistent with the statewide planning goals. Plans are reviewed for such consistency by the state's Land Conservation and Development Commission (LCDC). When LCDC officially approves a local government's plan, the plan is said to be "acknowledged." It then becomes the controlling document for land use in the area covered by that plan.

The Oregon Statewide Planning Goal 7, Areas Subject to Natural Disasters and Hazards, has the overriding purpose to “protect people and property from natural hazards”. Goal 7 requires local governments to adopt comprehensive plans (inventories, policies and implementing measures) to reduce risk to, at a minimum, people and property from natural hazards. Natural hazards identified within Goal 7 include floods, landslides, earthquakes, tsunamis, coastal erosion, and wildfires. However, if other hazards are identified to impact local government, they shall adopt inventories, policies, and implementing measures for each of those hazards.

To comply with Goal 7, local governments are required to respond to new hazard inventory information from federal or state agencies. The local government must evaluate the hazard risk and assess the:

a) frequency, severity, and location of the hazard;
b) effects of the hazard on existing and future development;
c) potential for development in the hazard area to increase the frequency and severity of the hazard; and
d) types and intensities of land uses to be allowed in the hazard area.

Local governments must adopt or amend comprehensive plan policies and implementing measures to avoid development in hazard areas where the risk cannot be mitigated. In addition, the siting of essential facilities, major structures, hazardous facilities and special occupancy structures should be prohibited in hazard areas where the risk to public safety cannot be mitigated. The state recognizes compliance with Goal 7 for coastal and riverine flood hazards by adopting and implementing local floodplain regulations that meet the minimum National Flood Insurance Program (NFIP) requirements.

In adopting plan policies and implementing measures for protection from natural hazards local governments should consider:

a) the benefits of maintaining natural hazard areas as open space, recreation, and other low density uses;
b) the beneficial effects that natural hazards can have on natural resources and the environment; and
c) the effects of development and mitigation measures in identified hazard areas on the management of natural resources.

Local governments should coordinate their land use plans and decisions with emergency preparedness, response, recovery, and mitigation programs. Given the numerous waterways and forested lands throughout Douglas County, special attention should be given to problems associated with riverbank erosion and potential for wild land/urban interface fires.

Goal 7 guides local governments to give special attention to emergency access when considering development in identified hazard areas, including:

a) Consider programs to manage stormwater runoff to address flood and landslide hazards,
b) Consider non-regulatory approaches to help implement the goal,
    - When reviewing development requests in high hazard areas, require site specific reports, appropriate for the level and type of hazards. Site specific reports should evaluate the risk to the site, as well as the risk the proposed development may pose to other properties.
    - Consider measures exceeding the National Flood Insurance Program.

Changes in Development

Table 20 provides a summary of building permits issued between the years 2020 to 2023, with the total valuation of the permitted development. These permits summarize the number development permits issued for buildings, residential single-family housing, manufactured dwellings, and others.

Table 20 Douglas County Issued Permits Summary

Year	Permits	Total Valuation of Development (in millions)
2023	1,143	$176.1
2022	1,199	$158.9
2021	1,289	$189.3
2020	1,160	$145.7

Source: Archive Center - Permits Issued, Douglas County Building Department

Between the years2019 to 2023, approximately 1,315 permits were issued for commercial buildings, which includes new nonresidential structures, additions/alterations to nonresidential structures, and garages/carports/shops.

Additionally, approximately 3,088 permits were issued for residential dwellings, including single family and multi-family dwellings, either new structures or additions/alternations to preexisting structures. For residential dwellings in the County, approximately 385 manufactured dwellings were placed throughout the County. These dwellings are more vulnerable to natural hazards than other structures and homes, including wildfire, flooding, and extreme weather.

The City of Roseburg is proposing to swap residential land with significant development constraints inside the Urban Growth Boundary (UGB) with land immediately outside the UGB that is much easier to develop. Simply put, the city is proposing to swap undeveloped residential land with severe slopes for flat residential land, which will assist in reducing hazard risks to the structures and residents living there. The UGB will move in such a manner as to create no net increase in the number of possible dwelling units currently allowed in the UGB as compared to the new boundaries proposed by the swap. The purpose of the swap is to help facilitate residential growth by providing more easily developable land.

Housing

Throughout Douglas County, most areas have a higher rate of home ownership compared to those renting their residence. One in five people in unincorporated Douglas County is estimated to rent compared to own their homes, as over 80 percent of residents own their home. In incorporated Douglas County, the ratio of owners to renters leans more towards renters, with almost 40 percent of residents living in a rented space. Table 21 provides a summary for basic estimates of the housing demographics in Lane County.

Table 21 Household Occupancy Profile

	Total Households	Total Housing Units	Occupancy Rate	% of Owner	% of Renter
Total Population	45,663	49,693	91.9%	70.7%	29.3%
Incorporated	22,233	23,826	93.3%	60.3%	39.7%
Unincorporated	23,430	25,867	90.6%	80.5%	19.5%

Source: Social Explorer, 2022

Table 22 identifies the types of housing most common throughout the County. Of interest are mobile homes, which account for almost 20 percent of the housing Countywide, posing further significant risk to the vulnerable individuals who reside in these homes.

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.

Table 22 Housing Profile Numbers

	Housing Units	Single Family	Multi-Family	Mobile Homes	Transient
	Total	Percent	Percent	Percent	Percent
Douglas County	49,693	68.5%	11.3%	19.6%	0.6%

Source: US Census Bureau, 2021

Aside from location and type of housing, the age of structures has implications on how they may be affected by certain natural hazards. Seismic building standards were codified in the Oregon building code starting in 1974; more rigorous building code standards were passed in 1993 that accounted for the Cascadia Subduction Zone earthquake. Therefore, in many cases, homes built before 1993 are more vulnerable to damage due to seismic activity.

In 1968, the federal National Flood Insurance Act instituted the National Flood Insurance Program (NFIP) through which FEMA instituted floodplain studies and mapping in order to administer the Flood Disaster Protection Act of 1973. Upon receipt of floodplain studies and maps, communities developed floodplain management ordinances to protect people and property from flood loss and damage. Table 23 illustrates the number and percent of homes built prior to 1970, 1970 to 1989, and from 1990 to the present. Regionally, a little over a third of the housing stock was built prior to 1970, before the implementation of floodplain management ordinances and the codification of general building standards. Approximately 31.1 percent of the County's housing stock was built after 1990, meaning that a large portion of the housing stock within the County is more vulnerable to flooding events.

Table 23 Year Structure Built

	Total Housing Units	Pre 1970		1970-1989		1990-Present	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
OREGON	1,798,864	593,250	33.0%	524,349	29.1%	681,265	37.9%
Douglas County	49,693	17,755	35.8%	16,510	33.2%	15,428	31.1%
Cannyonville	959	396	41.3%	208	21.7%	355	37.1%
Drain	540	250	46.4%	170	31.5%	120	22.3%
Elkton	106	34	32.1%	38	35.8%	34	32.1%
Glendale	361	176	48.8%	125	34.6%	60	16.7%
Myrtle Creek	1,368	631	46.1%	293	21.4%	444	32.4%
Oakland	565	274	48.5%	205	36.3%	86	15.1%
Reedsport	2,034	907	44.7%	876	43.1%	251	12.4%
Riddle	426	234	54.9%	111	26.0%	81	19.0%
Roseburg	10,910	4,983	45.7%	3,012	27.6%	2,915	26.7%
Sutherlin	3,934	699	17.8%	1,586	40.4%	1,649	42.0%
Winston	2,144	750	34.9%	443	20.6%	951	44.4%
Yoncalla	479	198	41.3%	167	34.9%	114	23.8%

Source: US Census Bureau, 2021

Critical Facilities and Infrastructure Profile

Critical facilities and infrastructure support the security, health, and economic vitality of the County, and can include structures, assets, systems, networks, and functions that maintain and provide vital services to cities, states, regions, and the nation. Disruption to these can significantly impact the overall community and accesses to the assets and services, potentially leading to further cascading effects, and result in largescale community suffering, property destruction, economic loss, and damage to public confidence and well-being.

Examples of critical facilities and infrastructure include transportation networks, systems for power transmission, and facilities essential to government response and recovery activities (e.g., hospitals, police, fire and rescue stations, school districts and higher education institutions). Due to the fundamental role that facilities and infrastructure play both pre- and post-disaster, it demands special attention in building more resilient communities.

Critical facilities are defined as those needed to maintain government functions and protect life, health, safety, and welfare of the public within Douglas County. Table 24 displays an inventory of critical facilities within Douglas County.

Table 24 Critical Facilities Inventory

Community	Fire Station	Medical Facility	Police Station	Schools	Airports
Douglas County	***54***	***5***	***12***	***58***	***21***
Canyonville	**1**	0	**1**	**3**	0
Drain	**2**	0	**1**	**2**	0
Elkton	**1**	0	0	**1**	**1**
Glendale	**1**	0	0	**2**	**1**
Myrtle Creek	**4**	0	**1**	**4**	**2**
Oakland	**4**	0	**1**	**3**	**2**
Reedsport	**2**	**1**	**2**	**2**	**1**
Riddle	**1**	0	**1**	**2**	0
Roseburg	**12**	**4**	**3**	**20**	**6**
Sutherlin	**3**	0	**1**	**5**	**3**
Winston	**1**	0	**1**	**3**	0
Yoncalla	**2**	0	0	**2**	0
Unincorporated	**20**	0	**1**	**9**	**5**

Source: Douglas County NHMP Steering Committee; FEMA Resilience Analysis Planning Tool (RAPT), 2023

Critical infrastructure includes infrastructure essential for the safety and functionality of Douglas County and its economy. Table 25 displays an inventory of critical infrastructure within Douglas County.

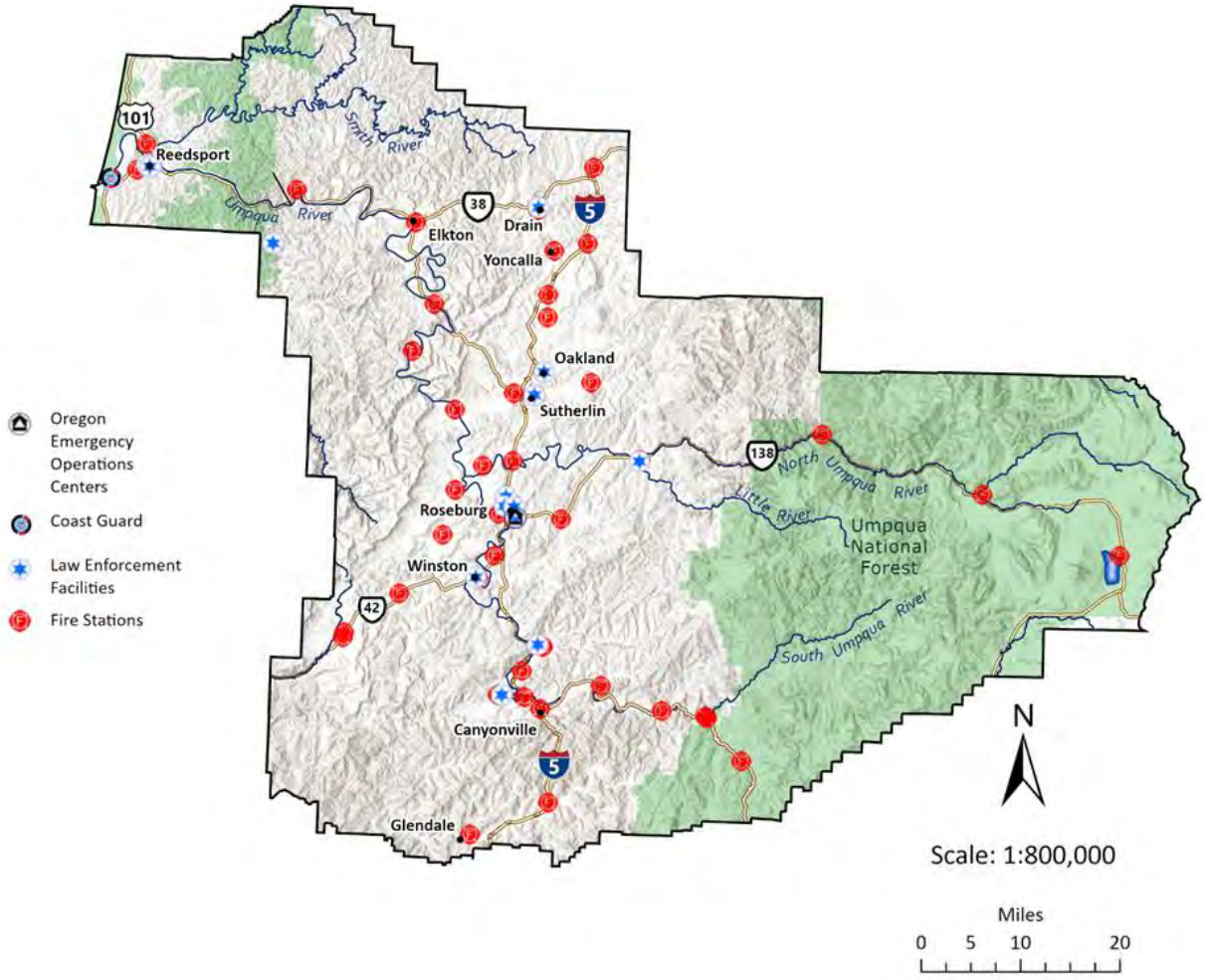
Table 25 Critical Infrastructure Inventory

Community	Communication Towers	Power Plants	Landfill Facilties	Wastewater Treatment Plants
Douglas County	***30***	***11***	***19***	***12***
Canyonville	**2**	0	**1**	**1**
Drain	0	0	0	**1**
Elkton	**2**	0	**1**	0
Glendale	**1**	0	**1**	**1**
Myrtle Creek	**2**	0	**1**	**1**
Oakland	**1**	0	**1**	**1**
Reedsport	**2**	0	**1**	**1**
Riddle	0	0	**3**	**1**
Roseburg	**4**	**2**	**3**	**2**
Sutherlin	**2**	0	0	**1**
Winston	**1**	0	0	0
Yoncalla	**2**	0	**1**	**1**
Unincorporated	**11**	**9**	**6**	**1**

Source: Douglas County NHMP Steering Committee; FEMA Resilience Analysis Planning Tool (RAPT), 2023

Figures 14 through 16 below show the location of County-wide critical infrastructure and service assets, such as facilities, hospitals and nursing homes, public schools, communication sites and dams.

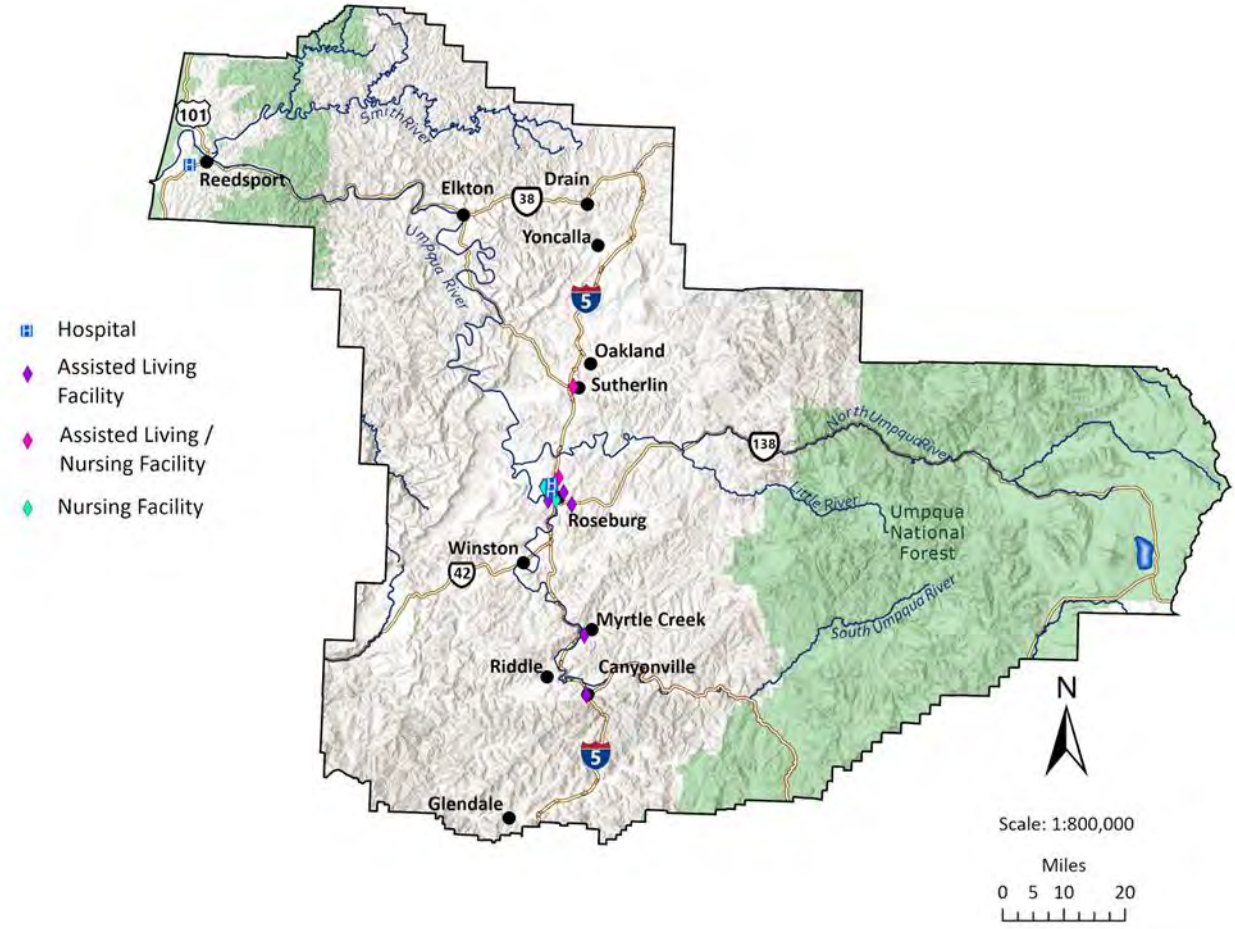
Figure 14 Douglas County Critical Facilities



Source: Douglas County GIS, 2023

Figure 14 indicates the location of critical response facilities. These facilities include the Sheriff, city police and state police law enforcement locations. They also include metro and rural fire stations and hospital locations.

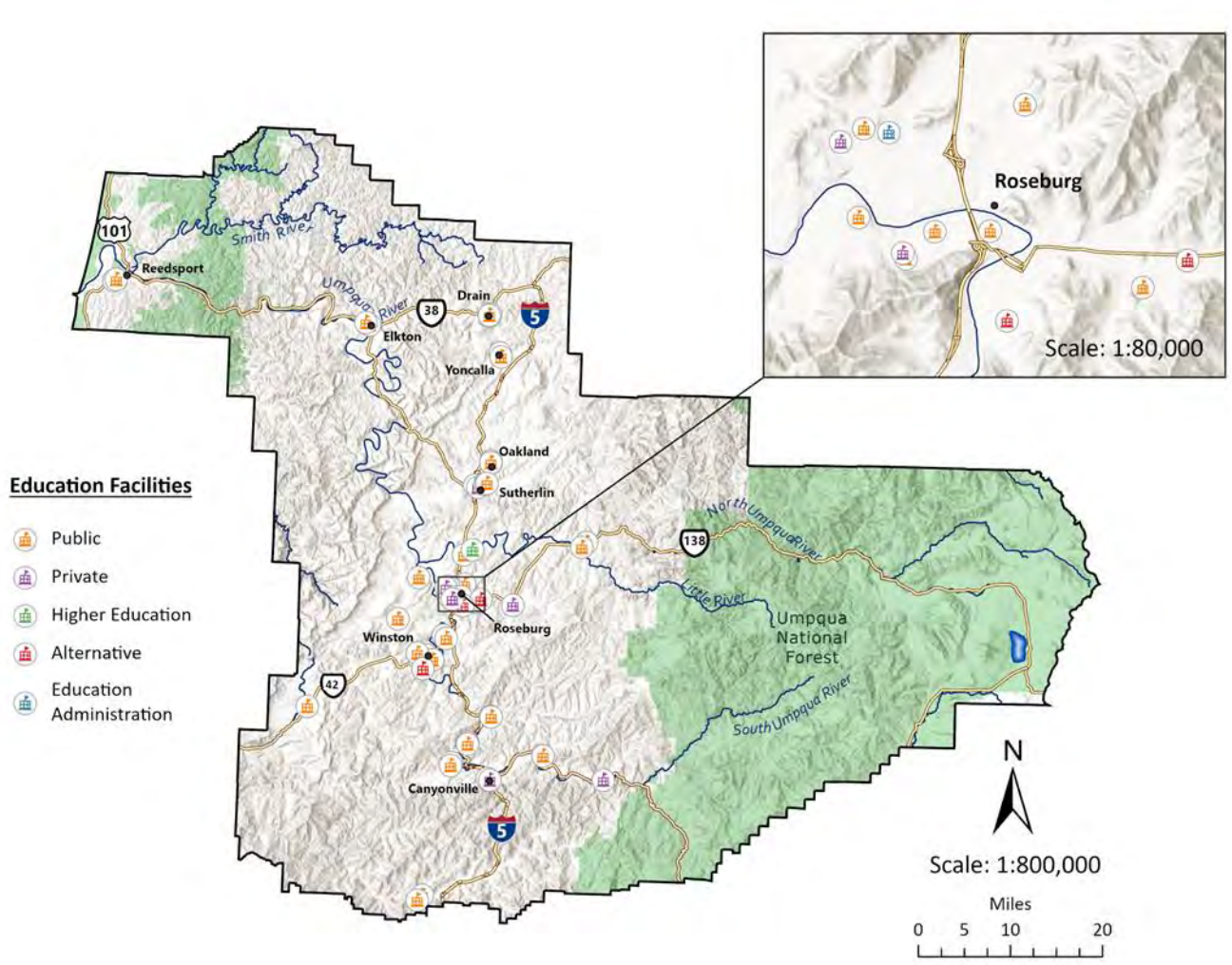
Figure 15 Douglas County Hospitals and Nursing Homes



Source: Douglas County GIS, 2023

Figure 15 shows the location of hospitals and nursing homes within Douglas County. These facilities are vital to the continued delivery of health services and may significantly impact the public's ability to recover from emergencies and disasters. Assisted living centers, nursing homes, residential mental health facilities, and psychiatric hospitals are important to identify within the community because of the dependent nature of the residents on these facilities; as well as these facilities can potentially serve as secondary medical facilities following a natural disaster, as they are equipped with nurses, medical supplies, and beds.

Figure 16 Douglas County Public Schools



Source: Douglas County GIS, 2023

Figure 16 shows the location of each public school within Douglas County. Schools in general are centrally located within a community, with the greatest number of schools located in Roseburg, as seen in the inset in the above figure. Schools are also often designed to act as a shelter in the event of a large-scale disaster. While schools are in session, they house a vulnerable segment of the population that is dependent upon the needs of family members to recover from emergencies and post disaster events.

Dams

Dams are manmade structures built to impound water. They serve 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. Dams may also be multifunctional, serving two or more of these purposes.

The Oregon Water Resources Department is the state authority for dam safety with specific authorizing laws and implementing regulations. Oregon's dam safety laws were rewritten in 2019. This law and new regulations both became operative on July 1, 2020. OWRD coordinates on but does not directly regulate the safety of dams owned by the United States or most dams used to generate hydropower. OWRD is the

Oregon Emergency Response System contact in the event of a major emergency involving a state-regulated dam, or any dam in the State if the regulating agency is unknown. The Dam Safety Program also coordinates with the National Weather Service and the Oregon Department of Emergency Management on severe flood potential that could affect dams and other infrastructure. Oregon's statutory size threshold for dams to be regulated by OWRD is at least 10 feet high and storing at least 3 million gallons.

The National Inventory of Dams (NID) 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 thousands of dams in Douglas County too small to meet NID selection criteria. These small dams are also generally too small to have significant impacts if they fail and thus are generally not considered for purposes of risk assessment or mitigation planning. This NID potential hazard classification is solely a measure of the probable impacts if a dam fails. Thus, a dam classified as High Hazard Potential 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 Hazard Potential 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 the High Hazard Potential classification are those where structural or operational failure will probably result in the loss of human life, structures, and property. 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. Furthermore, where a dam's failure is expected to result in loss of life downstream of the dam (a High Hazard dam), an Emergency Action Plan (EAP) must be developed. The EAP contains a map showing the area that would potentially be inundated by floodwaters from the failed dam. These dams are often monitored so that conditions that pose a potential for dam failure are identified to allow for emergency evacuations. As of 2023, there are 16 High Hazard dams in Douglas County (Table 26).

Table 24 Douglas County High Hazard Dams

Table 26 Douglas County High Hazard Dams

High Hazard Dam Name	Condition	Owner Type	EAP Prepared
Winchester	Poor	State Regulated	Yes
Wageman**	Poor	State Regulated	Yes
Bear Creek 3	Poor	State Regulated	Yes
Hayhurst Road	Poor	State Regulated	Yes
Berry Creek	Fair	State Regulated	Yes
Cooper Creek (Sutherlin)	Fair	State Regulated	Yes
Hayhurst Road	Fair	State Regulated	Yes
Paris	Fair	State Regulated	Yes
Plat I	Satisfactory	State Regulated	Yes

Updegrave	Satisfactory	State Regulated	Yes
Clearwater No 2 Forebay	Not Available	State Regulated	Yes
Creekside Development Dam No. 1	Not Available	Tribe Regulated	No
Creekside Development Dam No. 3	Not Available	Federal	Yes
Galesville	Not Available	Federal	Yes
Lemolo No 1	Not Available	Federal	Yes
Soda Springs	Not Available	Federal	Yes
Toketee	Not Available	Federal	Yes

Hazard Dam Name	Condition	Owner Type	EAP Prepared
ıchester	Poor	State Regulated	Yes
geman**	Poor	State Regulated	Yes
ır Creek 3	Poor	State Regulated	Yes
'hurst Road	Poor	State Regulated	Yes
ry Creek	Fair	State Regulated	Yes
›per Creek (Sutherlin)	Fair	State Regulated	Yes
'hurst Road	Fair	State Regulated	Yes
is	Fair	State Regulated	Yes
: I	Satisfactory	State Regulated	Yes
degrave	Satisfactory	State Regulated	Yes
arwater No 2 Forebay	Not Available	State Regulated	Yes
ekside Development Dam No. 1	Not Available	Federal	No
ekside Development Dam No. 3	Not Available	Federal	Yes
esville	Not Available	Federal	Yes
ıolo No 1	Not Available	Federal	Yes
la Springs	Not Available	Federal	Yes
etee	Not Available	Federal	Yes

Source: Oregon Water Resources Department, 2023

Significant Hazard Potential dams are those where structural or operational failure 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 12 Significant Hazard dams in Douglas County.

Low Hazard Potential dams are those where structural or operational failure 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 26 Low Hazard dams in Douglas County. As seen in Table 27, in total, there are 54 dams, with many located within significant rivers and lakes. While most dams have been designated with Low Hazard Potential, there are still a significant number of dams classified as High Hazard Potential to those lives and properties within the potential inundation zone if the dam were to fail.

Table 27 Douglas County Dams and Threat Potential

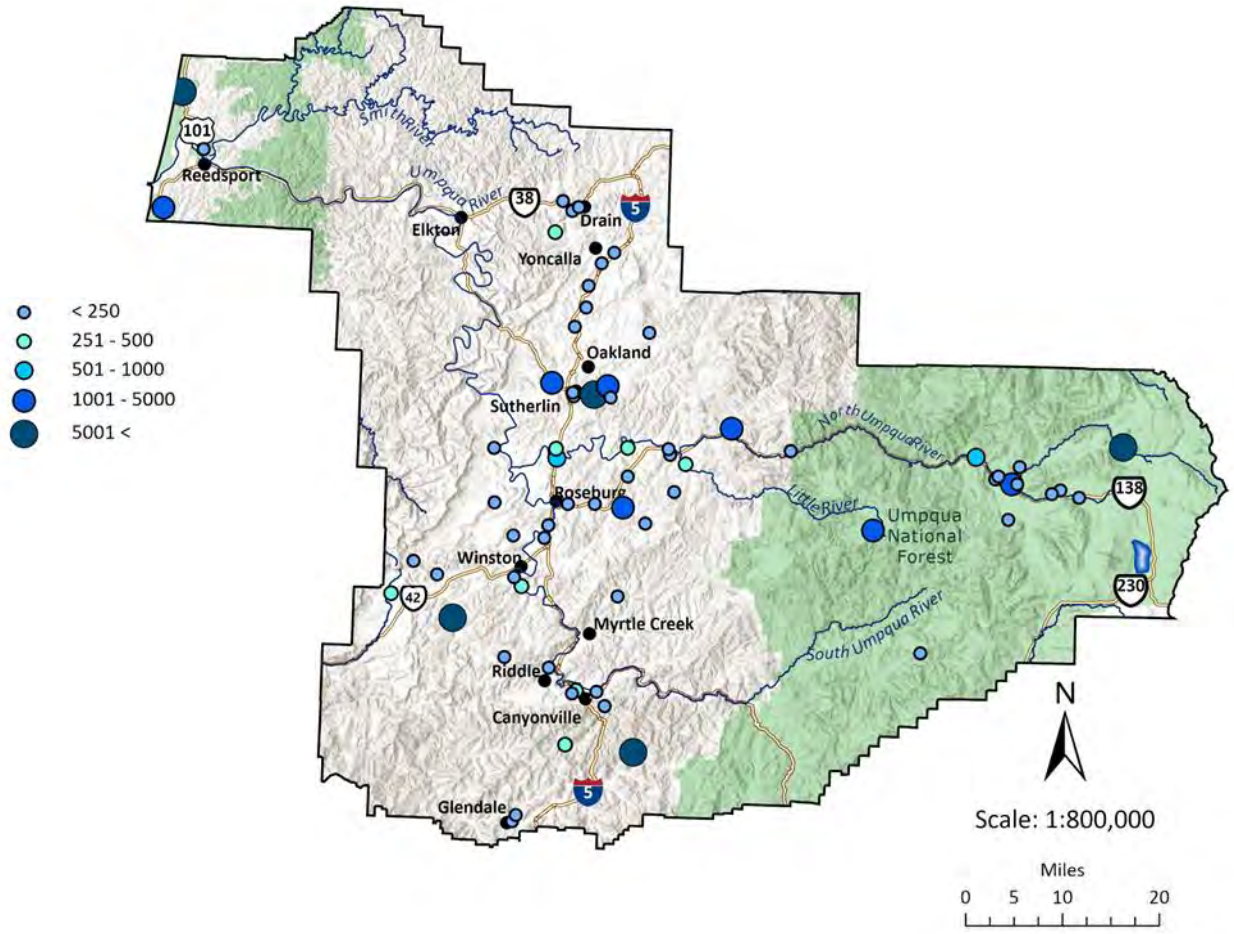
Threat Potential	Number of Dams	Noted Rivers, Creeks, Lakes
High	16	North Umpqua River, Sutherlin Creek, Cooper Creek, Ten Mile Creek, Bear Creek, Berry Creek
Significant	12	West Fork Canyon Creek, North Umpqua, Hubbard Creek, Elk Creek, Livingston Creek, Deer Creek, Middle Fork Coquille River
Low	26	Camas Swale, Judd Creek, West Fork Canyon Creek, Bond Creek, Trib to Clear Lake, Clearwater River, North Umpqua, South Fork Deer Creek, Beaver Creek, Bachelor Creek, Hemlock Creek, Adams Creek, Calapooya Creek, Tahkenitch Creek, Yoncalla Creek
Total	54	-

Source: Oregon Water Resources Department, 2023

Dam failures can occur rapidly and with little warning. Fortunately, most failures result in minor damage and pose little or no risk to life or safety. However, the potential for severe damage still exists.

While dam failures can occur at any time in a dam's life, 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. Were dams with high storage capacity to fail, the most significant damage to the surrounding and downstream communities would result. Figure 17 shows the location of dams throughout Douglas County and the associated storage capacity of each dam.

Figure 17 Douglas County Dams and Storage Capacity



Source: Douglas County GIS, 2023

Transportation Infrastructure Profile

Residents and visitors to Douglas County are reliant on well-maintained and operated transportation infrastructure. Absent a functional transportation system, residents would be unable to commute to work, shipments and other economic operations would be unable to operate, and community capacity to respond and operate would greatly diminish. It is important to document and maintain an inventory of infrastructure throughout Douglas County, as well as identify critical transportation infrastructure vulnerable to natural hazards.

The Douglas County Transportation System Plan identified the transportation infrastructure that is vulnerable to various natural hazards, which is seen in Table 28. Identifying and documenting the locations of infrastructure vulnerabilities will assist in determining potential mitigation projects to address these vulnerabilities.

Table 28 Douglas County Vulnerable Infrastructure

Hazard	Infrastructure Element
Earthquake	Bridges maintained by Douglas County that provide critical connections I-5 bridge south of Canyonville (Canyonville) OR 38 bridge (Drain) US 101 bridges over Scholfield Creek and Umpqua River (Reedsport) South Umpqua River Bridge (Winston)
Flood	Transportation network (Riddle) Mill Street (Myrtle Creek) Areas inside levee (Reedsport)
Landslide	Transportation network (Riddle) North side of OR 38 near western portion of UGB (Elkton) Dole Road (Myrtle Creek) Structures along Crestview Drive Area (Reedsport) Creekside Street (Roseburg) North along Lookingglass Road (Winston)
Tsunami	Evacuation Routes (identified in the Community Wildfire Protection Plan) US 1010
Wildfire	Roseburg Airport (Roseburg) Transportation network within Wildland/Urban Interface
Winter Storm	Roads accessing steep I-5/Canyon Pass (Canyonville) I-5/Stage Pass (Glendale) I-5/Union Gap (Sutherlin)

Source: Douglas County, 2023

Public Highways and Roads

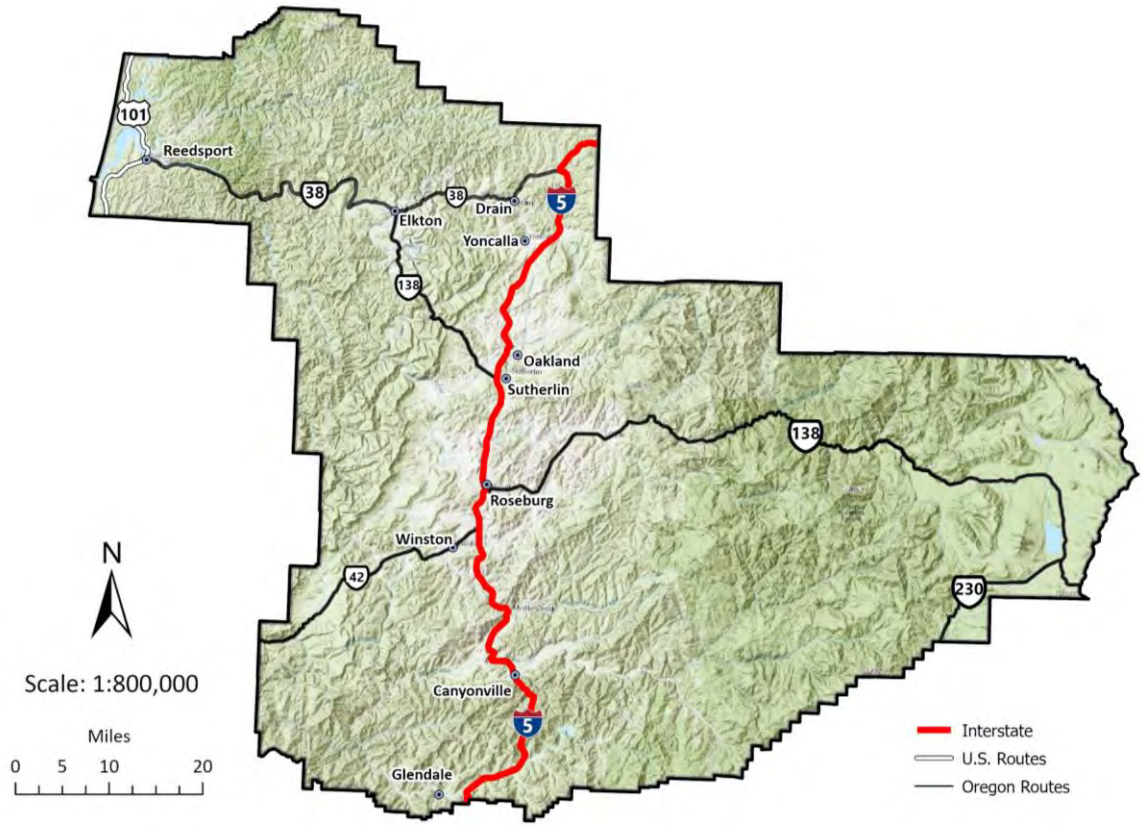
The heaviest traveled routes are the Interstate-5 (I-5) corridor and state highways. I-5, part of the nationwide interstate freeway system runs north and south through interior Douglas County. I-5 is the main route for cars and trucks traveling along the west coast. Population growth in the region has brought more workers and automobiles onto roads. A high percentage of workers drive to work alone. This,

coupled with interstate traffic, creates additional stresses on transportation systems, including added maintenance, congestion, oversized loads, and traffic accidents.

Public transportation infrastructure is maintained by federal, state, and local governments, which can be viewed in Figure 18. State Highways 38 and 138 run from the coast to Douglas County's eastern border in the Cascades. US Highway 101 is oriented north and south along the Pacific Coast, passing through areas of Gardiner, Reedsport, and Winchester Bay. State Highway 42 connects I-5 with the city of Coos Bay to the west, and is oriented east and west through Winston, Tenmile and Camas Valley.

Intersecting I-5 and State Highways are many paved County and city roads. County roads access areas throughout Douglas County and provide access to rural communities.

Figure 18 Public Transportation Infrastructure



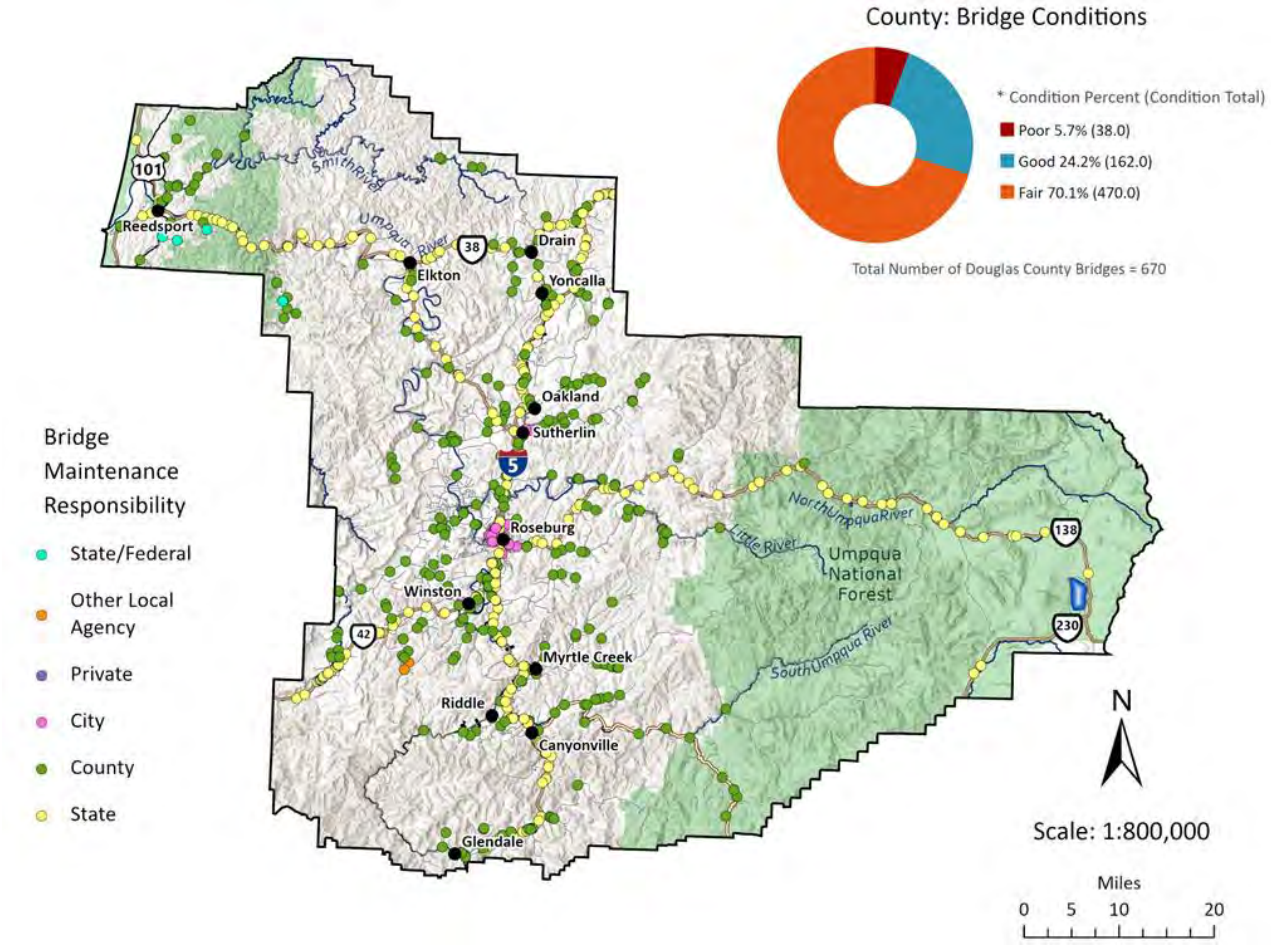
Source: Douglas County GIS

Bridges

Because of earthquake risk, the seismic vulnerability of the County's bridges is an important issue. Non-functional or failed 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, which is maintained by the Oregon Department of Transportation (ODOT), or are part of regional and local systems, maintained by the region's counties and cities.

In Douglas County, there are approximately 670 publicly owned highway bridges longer than twenty feet located on public roads maintained by federal, state, and County government. Of these bridges, 254 are maintained and operated by Douglas County[10]. Of these bridges, the average age is 47 years, and roughly 6 percent are in poor conditions, and the vast majority (70 percent) are in fair conditions, which can be seen in Figure 19.

Figure 19 Douglas County Bridges



Source: Douglas County GIS, 2023

Table 29 shows the structural condition of bridges in the region. A *distressed* bridge is a condition rating used by 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. The table shows that the County has quite a low percentage of bridges that are distressed and/or deficient (4.8 percent). Over 20 percent of the total County and city owned bridges are distressed, compared to 70 percent of ODOT bridges.

[10] Federal Highway Administration National Bridge Inventory

Table 29 Douglas County Bridge Inventory

Threat Potential	ODOT Distressed		Non-ODT Distressed	
	Number	Percent	Number	Percent
State Owned	2	8.7%	176	38.3%
County Owned	16	69.6%	254	55.2%
City Owned	3	13.0%	24	5.2%
Other Owned	2	8.7%	6	1.3%
Total Bridges per Category	23	4.8%	460	95.2%
Total Bridges in Douglas County	483			

Source: Oregon Natural Hazard Mitigation Plan, 2020

The bridges in Douglas 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.

The County's bridge maintenance and engineering divisions work in coordination to inspect and maintain the bridges located on County roads. Bridges within Douglas County are inspected at two-year intervals or more frequently if special conditions exist. Bridges that are found to be in critical condition during an inspection are immediately prioritized for replacement.

Rail Transportation

The Central Oregon Pacific Railroad provides rail service to central Douglas County, while the Coos Bay Rail Link provides service along the coast through Reedsport. The County has no passenger rail service available.

Airports

There are four existing public use airports in Douglas County including the Roseburg Regional, Myrtle Creek, US Forest Service Toketee Airfield and George Felt Airport. According to FAA Airport Facilities Data there are also 17 private airstrips and helipads located throughout the County, which provide service to agricultural, industrial, and residential users.

Water Transport

The Umpqua River is responsible for facilitating the growth of the area's lumber industry. The Port of Umpqua in Reedsport is host to several major employers in the County, including marine construction, boat yard, and a commercial fishing fleet.

The lower 28 miles of the Umpqua River, from its mouth to the head of tidewater near Scottsburg, is declared by Oregon Department of State Lands to be a commercially navigable waterway.[11] The port hosts host to several major employers including marine construction, a boat yard, and a commercial fishing fleet. Channel depths are maintained by the US Army Corps of Engineers.

[11] Oregon Administrative Rule (OAR) 141-081-0050.

Political Capacity Profile

Political capacity is recognized as 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.[12] 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

A three-member Board of Commissioners governs Douglas County. The Commissioners serve as the Executive Branch and perform legislative and quasi-judicial functions of the County. They are also responsible for the administration of all County business.

Commissioners are responsible for the planning, formation, and implementation of the annual budget. In addition, Commissioners serve on other federal, state, and local mandated governmental panels, boards and commissions with fiscal duties and authority over public monies. County

Beyond Emergency Management, all departments within the County governance structure have some degree of responsibility in building overall community resilience. Each plays a role in ensuring that County functions and normal operations resume after an incident and the needs of the population are met.

County departments and divisions that are most involved with natural hazard mitigation include the following:

- **Planning**: The Douglas County Planning Department is responsible for administering state, regional, and local land use, and zoning regulations in unincorporated areas of Douglas County. This department administers both short and long-range plans that determine much of the built, physical community. Through the County Comprehensive Plan and subsequent policies, the Planning department guides decisions about growth, development, and conservation of natural resources. Beyond being the primary convener of the Douglas County NHMP, the Planning Department participates by developing, implementing, and monitoring policies that incorporate hazard mitigation principles such as ensuring homes, businesses, and other buildings are built to current seismic code and adhere to FEMA floodplain regulations.
- **Sheriff's Office**: The mission of the Douglas County Sheriff's Office is to provide "peace and security of the citizens and visitors to our County". The Sheriff's Office interacts with the vulnerable aspects of the community on a day-to-day basis and can help identify areas for focused mitigation. Furthermore, as first responders, they directly interact with community members, both prior to, during, and after disasters, and rely on reliable access to resources and infrastructure to assist the community.
- **Emergency Management**: The Douglas County Emergency Management division is responsible for emergency management planning and operations for the portion of the County outside the limits of the incorporated municipalities of the County. The Douglas County Emergency Operations Plan

[12] Mileti, D. 1999. Disaster by Design: a Reassessment of Natural Hazards in the United States. Washington D.C.: Joseph Henry Press

provides details on the organization and operations of emergency management, as well as preparing for, responding to, and recovering from disasters and large-scale emergencies.

- **Building**: The Building Department focuses on assisting residents with design and construction guidelines, construction, and development requirements, and assisting residents with permitting and building code applications. This department could collaborate to do outreach to the owners of structures that were not built up to modern, resilient code. Professionals from this division could also even be called on to help survey buildings after an incident.
- **Fairgrounds and Speedway**: The Fairgrounds and Speedway serve as entertainment venues but can be considered a staging site for response efforts. Mitigation could include specific actions to ensure the facilities could be used during response, such as providing extra power should it need to be used as a shelter.
- **Land**: The Douglas County Land Department is responsible for the acquisition of properties for County projects, administering County leases, and managing County-owned Forest lands, such as planning, vegetation management, and logging/timber activities. Mitigation on County-owned land and forestland can be led by the Land Department, to include such activities as practicing defensible space or planting native vegetation.
- **Geographic Information Systems**: The Geographic Information Systems division develops and maintains a Geographic Information System (GIS) for Douglas County. The GIS is composed of computer maps and associated databases. In all phases of the disaster cycle, information is key. Building robust data that catalogues not only the County's risk and vulnerability, but also resources and response capability, can ensure that efficient and effective mitigation activities.
- **Information Technology**: The Douglas County Information Technology department (IT) focuses on providing the various other County departments with the information systems and telecommunications technology necessary to conduct daily business. Without this critical component, the County could not effectively serve its residents. Mitigation efforts from IT would not likely involve residents but would go a long way to ensuring uninterrupted services during hazard incidents.
- **Douglas Public Health Network**: Douglas Public Health Network (DPHN) is a 501(c)3 non-profit that provides quality public health services consistent with laws, available resources, and community support, through the prevention of disease, health education and promotion and protection of the community and the environment. As an inherently mitigation-focused department, DPHN can be an ally in preparing the community for natural hazards. DPHN has a distribution network established for information and supplies; these connections to the community can be used to encourage personal preparedness and during incident response.
- **Public Works:** The Douglas County Public Works department consists of six (6) divisions that range from road and bridge design and construction, natural resource management, County Roads, Solid Waste, and operations and maintenance. Due to their extensive responsibility, this department can help in prioritizing projects for mitigation and is a key partner in this project.

Existing Plans and 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 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 are updated regularly and can adapt easily to changing conditions and needs.[59]

The Douglas County NHMP 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 NHMP helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the NHMP's action items through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the County's resources. In addition to the plans listed below the County and incorporated cities also have zoning ordinances (including floodplain development regulations) and building regulations.

Douglas County's current plans and policies include the following:

Document Title	Communities | Year Published	Description	Relation to Natural Hazard Planning
Community Wildfire Protection Plan	Douglas County | 2023	The CWPP assists Douglas County in clarifying and refining priorities for the protection of life, property, and critical infrastructure at the wildland-urban interface on public and private lands.	The CWPP is developed as a means of identifying Douglas County's plans and goals for wildfire and prescribed fire smoke response and includes actions that the County plans to take to mitigate the negative effects of smoke.
Comprehensive Plan	Douglas County | 2017 Canyonville | 1997 Drain | 1997 Elkton | 1997 Glendale | 2000 (To be updated) Myrtle Creek | 2017 Oakland | 1986 Reedsport | 2013 Roseburg | 1993 Sutherlin | 1991 Winston | 2009	As a master plan for the community, the Comprehensive Plan helps to anticipate and plan for future land use within a community in accordance with the Statewide Land Use Planning Program, as well as provide a vision for the future of the community and the steps to achieve that vision.	The plan works in compliance with Oregon Land Use Goal 7 to remain in place through the local planning and building process, along with all local provisions for natural hazard mitigation. The plan outlines the limitations and regulations regarding natural hazards, and provides limitations, restrictions, and guidelines for developing in areas known to be at-risk of natural hazards.

Economic Opportunity Analysis \ Economic Development Strategies	Canyonville | 1997 Myrtle Creek | 2008 Reedsport | 2009 (Update in progress) Sutherlin | 2014	Economic Opportunity Analyses analyze and forecast growth in commercial, industrial, and other business districts. It uses this analysis to identify and allocate appropriate developable land for future businesses and jobs.	An EOA helps to identify developable land for future businesses and industries that can contribute to increasing community capacity and enhance community resilience. The process of pre-determining suitable developable land, developing on areas that are high-risk may be avoided or minimized. Alternately, mitigation actions can be initiated to reduce businesses and operations' vulnerability to natural hazards. This can enhance community resilience by helping these operations continue to operate as soon as possible in the aftermath of a natural disaster.
Emergency Operations Plan \ Emergency Management Plan	Douglas County | 2023 (Pending update) Elkton | 2020 Glendale | 2022 Myrtle Creek | 2020 Oakland | 2004 Reedsport |2012 (Update in progress) Roseburg | 2014 Sutherlin | 2018	An Emergency Operations Plan is a multi-hazard, adaptable document that addresses a community's planned response and short-term recovery to extraordinary emergency situations related to disasters. It is developed to provide focus and direction on responding to potential large-scale disasters that can create unique and novel situations requiring unusual responses.	An EOP provides a framework for mitigation, response, and recovery activities to prevent and minimize negative impacts and damages. As mitigation takes place before and after an emergency event occurs, it seeks to implement actions that prevent an emergency from occurring, reduce the chances of an emergency happening, or minimize the damaging effects of unavoidable emergencies by working to reduce the overall response and recovery efforts and processes.

Housing Needs Analysis	Canyonville | 2017 Reedsport | 2009 (Update in progress) Roseburg | 2019	A Housing Needs Analysis analyzes and develops estimates of future housing needs and determines the number of housing units necessary to manage projected growth. This includes setting goals, policies, and objectives for housing preservation, improvement, and development.	Housing needs of the state and county are growing, which calls for the development of more housing. Thus, it may be necessary to expand into potential hazard zones, such as historical floodplains or into the Wildland Urban Interface (WUI). Identifying the location of potential housing development, along with assessing the hazard risk of these areas are necessary in order to reduce people and their homes' vulnerability to hazards.
Parks Master Plan	Douglas County | 2016 Drain | 2020 Myrtle Creek | 2006 Reedsport | 2021 Roseburg | 2008 Sutherlin | 2005 Winston | 2014	A Parks Master Plan is a long-range and comprehensive strategy that guides the development, improvement, and maintenance of a community's recreational assets. The plan also identifies, prioritizes, and budgets for future park capital improvement projects.	The plan is intended to preserve and protect natural and scenic areas of importance, which includes preventing or limiting development, but also from natural hazards, such as flooding and wildfire. These at-risk areas are identified, as well as areas in need of restoration, which can contribute to the development of mitigation measures that will facilitate hazard risk reduction and the preservation and protection of the park.

Stormwater Master Plan	Glendale | 2025 (To be developed) Myrtle Creek (Ordinance) | 2006 Oakland | (To be developed) Reedsport | 2002 (Not adopted) Roseburg | 2011 Sutherlin | 2014 Winston | 2016	A Stormwater Master Plan is a strategic planning document that recommends policies, activities, and programs formulated to improve water quality, identify and address current and future flooding and development conflicts, and preserve and enhance natural resources. The purpose of the plan is to guide stormwater management upgrades and long-term planning.	A Stormwater Master Plan identifies potential flooding sites that might conflict with current or potential development sites and proposes strategies, such as mitigation measures, to reduce these risks.
Transportation System Plan	Douglas County | 2022 Canyonville | 1998 Myrtle Creek | 2006 Oakland | 2015 Reedsport | 2006 Roseburg | 2023 Sutherlin | 2020 Winston | 2023	The Transportation System Plan (TSP) addresses anticipated transportation needs. It is prepared to meet state and federal regulations that require urban areas to conduct long-range planning. The long-range planning approach is intended to serve as a guide for a community in managing its existing transportation facilities and developing future transportation facilities.	The Transportation System 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.

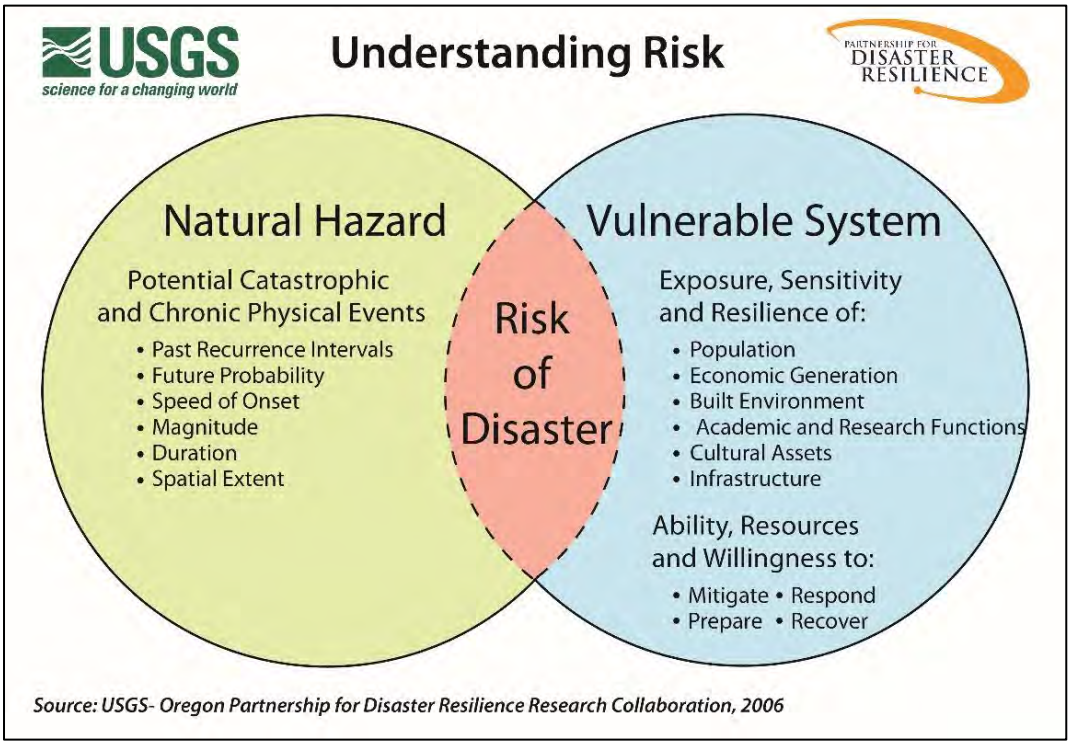
Water Master Plan \ Water System Management Plan \ Water Management Conservation Plan	Canyonville | 2015 Drain | 2001 (To be updated) Elkton | 2019 Glendale | 2018 (To be updated) Myrtle Creek | 2016 Oakland | 1997 (To be updated) Reedsport | 2009 (Not adopted) Riddle | 2021 Roseburg | 2010 Sutherlin | 2017	A Water Master Plan describes the current conditions of the community's water systems and addresses projected future needs. It defines a system-wide strategy for water supply, wastewater, and capital improvement strategies.	Water Master Plans aim to assess a community's water system's current performance and determine future requirements for facilities to provide critical services, such as wastewater treatment, flood prevention, and risk reduction. This may include identifying potential improvements to or retrofitting water service stations and water storage facilities.

Chapter 3: Hazard Risk Assessment

This section serves as the factual basis for Douglas County and its participating jurisdictions address Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. The Risk Assessment applies to Douglas County and participating jurisdictions included in the NHMP. This plan addresses city specific information where relevant.

We use the information presented in this section, along with community characteristics presented in Chapter 2 to inform the risk reduction actions identified in Chapter 4. Figure 20 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 20 Understanding Risk



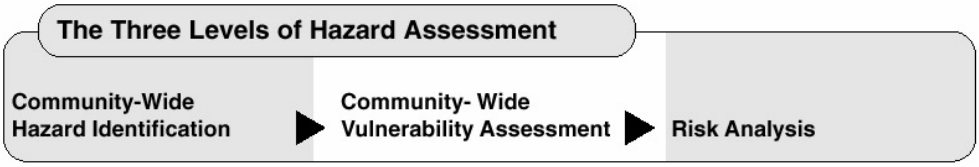
Evaluating Natural Hazard Risk

Evaluating the risk of natural hazards consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the following graphic:

- **Phase 1:** Identify hazards that can impact 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.

Figure 21 Three Phases of a Hazard Assessment



Source: Planning for Natural Hazards: Oregon Technical Resource Guide, 1998

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.

Risk Assessment Components

Hazard Identification

Hazard identification involves the identification of the geographic extent of a hazard, its intensity, and its probability of occurrence. This level of assessment typically involves producing a map. The outputs from this phase can also be used for land use planning, management, and regulation; public awareness; defining areas for further study; and identifying properties or structures appropriate for acquisition or relocation.[13]

A comprehensive overview of each identified hazard is provided, which includes an in-depth discussion of the characteristics and causes of each natural hazard, its previous incidences and impacts on Douglas County, and the extent to which Douglas County and its residents are vulnerable to each individual hazard based on population characteristics, infrastructure, and environment.

In the *2016 Douglas County Multi-Jurisdictional NHMP*, the County identified 8 major hazards that consistently affect this geographic area: drought, earthquake, flood, landslides, tsunami wildfire, windstorm, and winter storm. During the NHMP update process in 2023, the Steering Committee members identified two additional natural hazards, Extreme Heat and Coastal Erosion.

Future Climate Variability

Another change made to the list of natural hazards addressed in the plan was the reconsideration of the impact of climate change. As part of the NHMP update process, FEMA requires that changes in the climate and future climate variability and its impact on climatic natural hazards are examined. The information discussed in these sections have been compiled from studies conducted by the Oregon Climate Change Research Institute (OCCRI), with the primary source being the Future Climate Projections for Douglas County (2023), with additional information from the Oregon Climate Assessment (2023).

Climate change and climate resilience are important parts of this discussion. The climate is changing and the impacts becoming more evident through both quantitative and qualitative research and data. The

[13] Burby, 1998, Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities (Natural Hazards and Disasters).

NHMP Steering Committee agreed that climate change is experienced in the increased severity and frequency of natural hazard events and will be addressed throughout the NHMP. The natural hazards examined through a future climate variability lens are climate-related hazards, which include coastal erosion, drought, extreme heat, flood, landslides, wildfire, windstorm, and winter storm.

Probability and Vulnerability Summary

Table 31 (below Hazard Vulnerability Analysis) presents the probability scores for each of the natural hazards present in Douglas County for which descriptions are provided herein. Probability assesses the likelihood that a hazard event will take place in the future. Vulnerability assesses the extent to which people are susceptible to injury or other impacts resulting from a hazard as well as the exposure of the built environment or other community assets (social, environmental, economic, etc.) to hazards. The exposure of community assets to hazards is critical in the assessment of the degree of risk a community has to each hazard.[14]

The hazard assessment also involves a **vulnerability assessment**, seen in Table 32, which integrates information from the hazard profiles with an inventory of existing property and populations exposed to the hazard. As a matter of priority, special consideration is given to populations with characteristics of social vulnerability (described in Chapter 2) given their disproportionate vulnerability to the effects of these natural hazards. Accordingly, it attempts to estimate how different types of property and population groups will be impacted by the hazard.

[14] Burby, 1998, Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities (Natural Hazards and Disasters).

Table 31 Hazard Probability Summary

Hazard Probability	Douglas County	Coastal Region	Central Region	Cascades Region
Coastal Erosion	High	High	-	-
Drought	High	High	High	High
Earthquake - Cascadia	Moderate	Moderate	Moderate	Moderate
Earthquake - Crustal	Low	Low	Low	Low
Extreme Heat Event	Moderate	Moderate	Moderate	Moderate
Flood	High	High	High	High
Landslide	High	High	High	High
Local Tsunami	Moderate	Moderate	-	-
Distant Tsunami	High	High	-	
Wildfire (WUI)	High	**Moderate**	High	High
Windstorm	High	High	High	High
Winter Storm	High	High	High	High

Table 32 Hazard Vulnerability Summary

Hazard Vulnerability	Douglas County	Coastal Region	Central Region	Cascades Region
Coastal Erosion	Low	Low	-	-
Drought	Moderate	Moderate	Moderate	Moderate
Earthquake - Cascadia	High	High	High	**Moderate**
Earthquake - Crustal	Low	**Moderate**	Low	Low
Extreme Heat Event	Moderate	Moderate	Moderate	**Low**
Flood	Moderate	**High**	**High**	Moderate
Landslide	Moderate	Moderate	Moderate	Moderate
Local Tsunami	Moderate	Moderate	-	-
Distant Tsunami	Low	Low	-	-
Wildfire (WUI)	High	**Moderate**	High	High
Windstorm	Moderate	Moderate	Moderate	Moderate
Winter Storm	High	**Moderate**	High	High

**Bold Texts denote different regional scoring from the county's plan

Risk Assessment and Analysis

The third phase, **risk assessment**, involves estimating the damage, injuries, and costs likely to be incurred in a geographical area due to a natural hazard, either during or immediately after the event, or over a prolonged period. Risk can be determined by assessing two measurable components: (1) the magnitude of the harm that may result due to a natural hazard (which is defined through the vulnerability assessment), and (2) the likelihood or probability of the hazard occurring.

The following risk analysis draws upon five sources: *2024 Douglas County Multi-Jurisdictional NHMP*, Hazard Vulnerability Assessment exercise conducted with Douglas County NHMP Steering Committee, the Oregon Department of Geology and Mineral Industries (DOGAMI) Risk Report of Douglas County, the OPDR Risk Report for Douglas County, and the list of critical facilities and infrastructure as compiled from the individual jurisdictions, as well compiled from various state and federal government data sites.

DOGAMI Douglas County Risk Report

The DOGAMI Risk Report provides information for the risk analysis in the Multi-Hazard Risk Report by utilizing HAZUS-MH analysis and geospatial analysis for Douglas County. This report is conducted by DOGAMI. HAZUS-MH stands for Hazards U.S. – Multi-Hazard and it is a software program that joins current scientific and engineering knowledge with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after a disaster occurs. A limitation of HAZUS-MH is that it only provides analysis of impact and estimates for five (5) hazards of the ten (10) hazards: Earthquake (Cascadia Subduction Zone and Crustal), Tsunami, Flooding, Landslide, and Wildfire.

The geospatial analysis includes both loss estimates (in dollars) to buildings from flood (recurrence intervals) and earthquake scenarios using FEMA Hazus®-MH methodology, and (2) calculated number of buildings, their value, and associated populations exposed to earthquake, and flood scenarios, or susceptible to varying levels of hazard from landslides and wildfire (Williams & Madin, 2023).

NHMP Planning Area

This is a multi-jurisdictional NHMP for Douglas County and its participating jurisdictions – Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, and Yoncalla. While the primary convener of the plan is Douglas County, each of the participating jurisdictions are plan holders -- a partner that is a jurisdiction that signs the IGA with DLCD for the work on the NHMP. All partners are listed in the Special Thanks and Acknowledgements section of the *2024 Multi-Jurisdictional NHMP for Douglas County*.

The participating cities are located in one of three identified regions of Douglas County: Coastal, Central, and Cascades. Only the Cascades region has no incorporated cities

Table 33 Cities by Region

Douglas County	Coastal Region	Central Region	Cascades Region
Canyonville		X	
Drain		X	
Elkton	X		
Glendale		X	
Myrtle Creek		X	
Oakland		X	
Reedsport	X		
Riddle		X	
Roseburg		X	
Sutherlin		X	
Winston		X	
Yoncalla		X	

Source: Douglas County NHMP Steering Committee

located within its boundaries, and most of the cities are located in the Central region. The cities are associated with their respective region in Table 33**.**

Hazards

Douglas County identifies ten natural hazards that could have an impact on the County.-Douglas County and the cities of Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, and Yoncalla have identified the following natural hazards that could have an impact on their respective jurisdiction: coastal erosion, earthquakes, drought, extreme heat, floods, landslides, tsunamis, wildfires, windstorm, and winter storms. Note that only the Coastal Region is subject to tsunami and coastal erosion hazards.

Hazard Vulnerability Assessment

Each of the regions' Hazard Vulnerability Assessments (HVA), and the probability and vulnerability assessment summaries are provided below in Table 31, 32, 33, and 34. These are derived from a commonly employed methodology developed by FEMA in 1983 and have been adjusted by the Oregon Department of Emergency Department (ODEM) for the state of Oregon.

The risk assessment is conducted by first identifying the community's relevant hazards, then scoring each one in four categories: history, probability, vulnerability, and maximum threat. Total scores range from 24 (low) to 240 (high). This method provides local jurisdictions with a sense of hazard priorities, or relative risk. It is also intended to provide comparison of the same hazard between local jurisdictions statewide.

Severity scores assigned to each category are based on the following:

- LOW = assign a score between 1 to 3 points
- MODERATE = assign a score between 4 to 7 points
- HIGH = assign a score between 8 to 10 points

History

History is the record of previous occurrences of identified natural hazards. An assessment of the history of a hazard in a jurisdiction assesses events for which the following types of activities were required: the Emergency Operations Center (EOC) was activated; three or more EOP functions were implemented; extraordinary multi-jurisdictional response was required; and/or local or tribal emergency was declared. Severity scores are assigned based on the follow criteria:

- LOW = 0-1 event past 100 years
- MODERATE = 2-3 events past 100 years
- HIGH = 4 + events past 100 years

Probability

Probability is the likelihood of future occurrences of the natural hazard within a specified period of time. Douglas County evaluated the best available probability data to develop the probability scores presented below. Severity scores are assigned based on the follow criteria:

- LOW = one incident likely within 75 – 100 years,
- MODERATE = one incident likely within 35-75 years,
- HIGH = one incident likely within 10-35 years.

Vulnerability

Vulnerability is the percentage of population and property likely to be affected under an average occurrence of the hazard. Severity scores are assigned based on the follow criteria:

- LOW = < 1% affected, scores between 1 and 3 points
- MODERATE = 1 – 10% affected, scores between 4 and 7 points
- HIGH = > 10% affected, scores between 8 and 10 points

Maximum Threat

Maximum threat is the highest percentage of population and property that could be impacted under a worst-case scenario. Severity scores are assigned based on the follow criteria:

- LOW = < 5% affected
- MODERATE = 5 – 25% affected
- HIGH = > 25% affected

Although this methodology is consistent statewide, the reported raw scores for each county are based on partially subjective rankings for each hazard. Because the rankings are used to describe the relative risk of a hazard within a county, and because each county conducted the analysis with a different team of people using slightly different assumptions, comparisons between local risk assessments must be treated with caution.

Table 34 Douglas County HVA

Douglas County Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Ranking
Coastal Erosion	18	5	10	56	**89**	11
Drought	16	30	80	63	**189**	**5**
Earthquake - Cascadia	4	40	100	49	**193**	**3**
Earthquake - Crustal	4	15	30	21	**70**	12
Extreme Heat Event	8	25	60	42	**135**	8
Flood - Riverine	20	35	60	70	**185**	6
Landslide/Debris Flow	20	25	50	63	**158**	7
Local Tsunami	4	20	50	49	**123**	9
Distant Tsunami	20	10	30	56	**116**	10
Wildfire (WUI)	16	40	80	63	**199**	**1**
Windstorm	18	30	80	63	**191**	**4**
Winter Storm	18	40	70	70	**198**	**2**

Table 35 Coastal Region HVA

Coastal Region Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Ranking
Coastal Erosion	18	5	10	56	**89**	11
Drought	10	25	100	56	**191**	**5**
Earthquake - Cascadia	4	50	100	49	**203**	**3**
Earthquake - Crustal	4	20	30	14	**68**	12
Extreme Heat Event	6	25	70	35	**136**	8
Flood - Riverine	18	40	80	70	**208**	**1**
Landslide/Debris Flow	18	30	60	70	**178**	6
Local Tsunami	4	20	50	49	**123**	9
Distant Tsunami	20	10	30	56	**116**	10
Wildfire (WUI)	8	35	70	49	**162**	7
Windstorm	20	25	80	70	**195**	**4**
Winter Storm	20	35	80	70	**205**	**2**

Table 36 Central Region HVA

Central Region Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Ranking
Drought	18	30	70	63	**181**	**5**
Earthquake - Cascadia	4	50	100	49	**203**	**1**
Earthquake - Crustal	4	15	40	21	**80**	9
Extreme Heat Event	10	35	70	42	**157**	7
Flood - Riverine	20	40	50	70	**180**	6
Landslide/Debris Flow	20	20	30	63	**133**	8
Wildfire (WUI)	20	45	60	70	**195**	**3**
Windstorm	16	30	80	56	**182**	**4**
Winter Storm	18	40	70	70	**198**	**2**

Table 37 Cascades Region HVA

Cascades Region Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Ranking
Drought	18	30	80	63	**191**	**3**
Earthquake - Cascadia	4	25	100	49	**178**	**5**
Earthquake - Crustal	4	15	30	21	**70**	9
Extreme Heat Event	10	15	50	42	**117**	8
Flood - Riverine	20	30	50	63	**163**	6
Landslide/Debris Flow	20	20	50	63	**153**	7
Wildfire (WUI)	20	45	100	70	**235**	**1**
Windstorm	16	30	80	56	**182**	**4**
Winter Storm	18	40	70	63	**191**	**2**

Federal Disaster and Emergency Declarations

Reviewing past events that have occurred in an area can provide a general sense of the hazards that have caused significant damage to the County and the cities. Where trends emerge, disaster declarations can help inform hazard mitigation project priorities.

Federally declared disasters have been approved within every state because of natural hazard related events. As of October 2023, FEMA has approved a total of 40 major disaster declarations, 101 fire management assistance declarations and four (4) emergency declarations in Oregon.[15]

When requesting a presidential declaration for a major disaster or emergency, governors provide detailed information about the amount of value of public and private property damage resulting from the event. FEMA uses these damage assessments to determine if the event meets the disaster declaration threshold. In addition, FEMA uses the information to determine the amount of federal public and private assistance being made available as well as the specific counties being included in the declaration.

Disaster declarations can help inform hazard mitigation project priorities, by demonstrating and documenting which hazards historically have caused the most significant damage to the County. Table 38 below summarizes the major disasters declared for Douglas County by FEMA since 1964. The table shows that there have been 18 major disaster declarations and five (5) fire management assistance declarations on record for the County. The table shows that recent major disaster declarations in Douglas County have been flood, fire and weather related.

[15] Declared Disasters | FEMA.gov. Accessed October 12, 2023

Table 38 FEMA Major Disaster Declarations for Douglas County

Declaration Number	Declaration Date	Incident(s)	Incident(s) Period
DR-184	23735	Flood	24-Dec-64
DR-319	26319	Flood	21-Jan-72
DR-413	27054	Flood	25-Jan-74
DR-1036	34548	El Nino Effects	1-May-1994 to 31-Oct-1994
DR-1099	35104	Severe Storms, Flooding	4-Feb-1996 to 21-Feb-1996
DR-1107	35143	Severe Storms, High Winds	10-Dec-1996 to 12-Dec-1996
DR-1149	35422	Severe Storms, Flooding	17-Nov-1996 to 11-Dec-1996
DR-1160	35453	Severe Winter Storms, Flooding	25-Dec-1996 to 6-Jan-1997
DR-1405	37327	Severe Winter Windstorm w/ High Winds	7-Feb-2002 to 8-Feb-2002
DR-1510	38036	Severe Winter Storms, Flooding	26-Dec-2003 to 14-Jan-2004
FM-2549	38220	Bland Mountain #2 Fire	20-Aug-2004 to 5-Sep-2004
DR-1632	38796	Severe Storms, Flooding, Landslides, Mudslides	18-Dec-2005 to 21-Jan-2006
DR-1956	40591	Severe Winter Storm, Flooding, Landslides, Mudslides, Debris Flow	13-Jan-2011 to 21-Jan-2011
DR-4055	40970	Severe Winter Storm, Flooding, Landslides, Mudslides	17-Jan-2012 to 21-Jan-2012
FM-5037	41483	Douglas Fire Complex	27-Jul-2013 to 19-Aug-2013
FM-5092	42216	Stouts Creek Fire	30-Jul-2015 to 29-Aug-2015
DR-4258	42417	Oregon Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	6-Dec-2015 to 23-Dec-2015
DR-4432	43587	Oregon Severe Winter Storms, Flooding, Landslides, and Mudslides	23-Feb-2019 to 26-Feb-2019
DR-4452	43655	Oregon Severe Winter Storms, Flooding, Landslides, and Mudslides	6-Apr-2019 to 21-Apr-2019
FM-5285	43673	Oregon Mile Post 97 Fire	27-Jul-19
DR-4499	43918	Oregon Covid-19 Pandemic	20-Jan-2020 to 11-May-2023
FM-5365	44083	Oregon Archie Creek Fire	8-Sep-2020 to 15-Oct-2020
DR-4562	44089	Oregon Wildfires and Straight-line winds	7-Sep-2020 to 3-Nov-2020

Source: Source: Federal Emergency Management Agency

Hazard Profiles

The following subsections describe relevant information for each hazard. For additional background on the hazards, vulnerabilities, and general risk assessment information for hazards in Southwest Oregon (Region 4), refer to the State of Oregon NHMP,Region 4, Southwest Oregon Risk Assessment (2020).

The identified natural hazards that will be assessed in these hazard profiles are listed below in Table 40.

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Table 40 Douglas County Profiled Hazard

Identified Natural Disasters in Douglas County	
Coastal Erosion	Landslide
Drought	Tsunami
Earthquake	Wildfire
Extreme Heat	Winter Storm
Flood	Windstorm

Source: Douglas County NHMP Steering Committee

Coastal Erosion

Coastal Erosion Summary	
Hazard Ranking	
11 out of 12	
Probability	**Updates Made**
County: High Coastal: High Central: N/A Cascades: N/A	- New Hazard Added -Data and information from OCCRI Climate Projection Report incorporated
Vulnerability	**Locations**
County: Low Coastal: Low Central: N/A Cascades: N/A	Douglas County, Elkton, Reedsport

Summary 1: Coastal Erosion

The Pacific Northwest (PNW) coast of Oregon is one of the most dynamic coastal landscapes in North America, evident by its long sandy beaches, sheer coastal cliffs, dramatic headlands, and vistas. Ultimately, the power of the Pacific Ocean erodes and changes the shape of the coast. Beaches and coastal bluffs are some of the most dynamic landforms, response to waves changes, nearshore currents, tides, rain, and wind.

The most important natural variables that influence changes to the shape and width of the beach and ultimately its stability is the beach sand budget (balance of sand entering and leaving the system) and the processes (waves, currents, tides, and wind) that drive the changes.

Human influences associated with jetty construction, dredging practices, coastal engineering, and the introduction of non-native dune grasses have all affected the shape and configuration of the beach, including the volume of sand on several of Oregon's beaches, ultimately influencing the stability or instability of these beaches.

Characteristics

Coastal erosion occurs through a complex interaction of many geologic, atmospheric, and oceanic factors. Beaches, sand spits, dunes and bluffs are constantly affected by waves, currents, tides, and storms resulting in chronic erosion, landslides, and flooding. Changes may be gradual over a season or many years. Changes may also be drastic, occurring during a single storm event. Two important natural variables for coastal change are the beach sand budget (balance of sand entering and leaving the system) and processes (waves, currents, tides, and wind) that drive the changes. Erosion becomes a hazard when human development, life, and safety are threatened.

Coastal erosion occurs via the following mechanisms:[16]

[16] Weitzner, 2015, *Coastal Processes and Causes of Shoreline Erosion and Accretion*

- Beach, dune and bluff erosion caused by wind, waves, runoff, and disturbance;
- Mass wasting of sea cliffs in the form of landslides and slumps due to gravity, constant wave and tidal effects, and geologic instability;
- Storm surges, high ocean waves and the flooding of low-lying lands during major storms;
- Sand inundation;
- Erosion due to the occurrence of El Niño's and from rip current embayments; and
- Recession of coastal bluffs due to long-term changes in mean sea level and the magnitude and frequency of storm systems.

Human-Influenced Coastal Erosion

Human activities also influence, and in some cases, intensify the effects of erosion and other coastal hazards. Major actions such as jetty construction and maintenance dredging can have long-term effects on large sections of the coast. This is particularly true along dune-backed and inlet-affected shorelines such as the Umpqua River littoral cell, which are sections of the coast where sediment movement is self-contained. The planting of European bunchgrass since the early 1900s has locked up sand in the form of high dunes along the coast and riverbank. This in turn has contributed to the net loss of beach sand and increased beach erosion. Residential and commercial development can affect shoreline stability over shorter periods of time and in smaller geographic areas. Activities such as grading and excavation, surface and subsurface drainage alterations, vegetation removal, and vegetative as well as structural shoreline stabilization can all reduce shoreline stability.

Location and Extent

The Oregon coast is exposed to one of the most extreme ocean wave climates in the world, due to its long fetches and the strength of the extratropical storms that develop and track across the North Pacific. These storms exhibit a pronounced seasonal cycle producing the highest waves in the winter. Summer months are dominated by considerably smaller waves, enabling beaches to rebuild and gain sand eroded by the preceding winter. When large waves are superimposed on high tides, they can reach much higher elevations at the back of the beach, contributing to significantly higher rates of coastal erosion and flood hazards. It is the combined effect of these processes that leads to the erosion of coastal dunes and bluffs, causing them to retreat landward.[17]

The City of Reedsport and the unincorporated communities of Winchester Bay and Gardiner are located in the Coastal Region of Douglas County and are the only communities in the County susceptible to coastal erosion. The erosion of coastal land is caused by tidal flows, as well as wind, rain, and earthquake events. Some amount of annual coastal erosion is common and expected in certain areas. Extreme coastal erosion, especially from storm surges, tsunamis or shifting weather patterns, becomes a hazard when development such as homes, marinas, jetties, or recreation areas are threatened. Most of Douglas County's coastline is publicly owned and is extremely limited to development as a result. However, communities such as Winchester Bay remain vulnerable to risks that result from coastal erosion.

Additionally, one method for determining coastal erosion hazard zones for dune-backed beaches is by using the foredune erosion model and a probabilistic analysis of storm-inducted total water levels under a wide range of conditions, including buff slope, height, material properties (rock or soil composition), and the historical response of broad classes of bluffs to coastal erosion. This is conducted by incorporating

[17] Kennedy, et al., 2014, *Rock Coast Geomorphology: A Global Synthesis*

worst-case Cascadia earthquake scenario and future sea level increases as projected by the National Research Council.

History

There is minimal impact of coastal erosion affecting the region. Much of Douglas County's shoreline is restricted to development and therefore, the direct impacts of coastal erosion are unlikely to pose risk to any of the region's communities. Observation and monitoring may potentially benefit mitigation strategies for those areas with the closest proximity to the coast, particularly Winchester Bay and Salmon Harbor.

Coastal Erosion Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined **the probability of experiencing coastal erosion is "High",** meaning one incident may occur within the next 10 to 35 years**.** Coastal erosion will continue and may intensify because of changing storm patterns or from a local or distant tsunami.

The erosion of the Oregon coast is exceedingly complex, reflecting processes operating over both short and long-time scales, and over large spatial scales. However, the most significant erosion effects are largely controlled by high-magnitude (relatively infrequent) events that occur over the winter when wave heights and ocean water levels tend to be at their highest.

Vulnerability Assessment

The Steering Committee rated **the County as having a "Low" vulnerability to coastal erosion**, meaning it is expected that less than 1 percent of the County's population or assets would be affected by coastal erosion. While most of the County's shoreline is restricted to development, the community of Winchester Bay may face some vulnerability to the effects of coastal erosion given its position on the coastline.

In the 2020 Oregon NHMP, the following assets and locations were determined to be generally the most vulnerable to coastal erosion (Oregon DLCD, 2020):

- Buildings, parks, and infrastructure along low-lying areas adjacent to bays or the ocean and at higher elevations where buildings and infrastructure have been located on readily erodible materials (e.g., consolidated sand, weakly cemented sandstone, siltstone, etc.).
- Areas subject to flooding with wave action—while few of Oregon's coastal developments are within FEMA-designated Velocity (V) zones, those that are appeared to be constructed according to V- zone standards which fall under the regulatory purview of local jurisdictions compliant with the National Flood Insurance Program (NFIP).
- Coastal highways are strongly impacted by coastal erosion.

Coastal erosion is increasingly affecting people due to development near the beach or coastal bluffs. Structures and infrastructure that serve vacation homes are the primary vulnerability of this hazard. Uninformed people who purchase real estate in areas subject to coastal erosion are the primary individuals at personal risk of this hazard, although first responders and other emergency personnel are likely at greater hazard as they will be required to assist in coastal erosion-related rescues in recreational settings. Typically, shoreline stabilization efforts using riprap are not an effective long-term mitigation (Stimely and

Allan, 2014). Whether it is a gradual process or in the form of landslides, coastal erosion can cause loss of property (Williams et al, 2020).

Future Climate Variability – Coastal Erosion[19]

The OCCRI *Future Climate Projections Douglas County, Oregon* report states the risk of coastal erosion on the Oregon coast will increase due to sea level rise and changing wave dynamics. The National Oceanic and Atmospheric Administration (NOAA) water-level station located in Charleston, Oregon, 58 miles south of Douglas County, has measured sea levels for over 50 years. Due to historical trends, future estimations of local sea level are projected to rise by 1.3 to 6.0 feet by 2100 given intermediate-low (1.6 feet) to high (6.6 feet) global mean sea level scenarios. Due to rising sea levels, coastal erosion is expected to increase, impacting coastal communities, including the safety of human lives, infrastructure, development, and the local economy. OCCRI calculated that due to rising sea levels, coastal erosion, and subsequent flooding from a four-foot inundation zone scenario in the Umpqua River estuary, will impact 19 miles of highways, roads, and railways, two critical facilities, one potential contaminant source, and 635 buildings.

[19] OCCRI, Future Climate Projections Douglas County, 2023

Drought

Drought Summary	
Hazard Ranking	
5 out of 12	
Probability	**Updates Made**
<u>County: High</u> Coastal: High Central: High Cascades: High	- Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorporated - Severe drought conditions experienced 2018, 2020, 2021, 2022, and 2023
Vulnerability	**Locations**
<u>County: Moderate</u> Coastal: Moderate Central: Moderate Cascades: Moderate	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 2 Drought Profile

Characteristics

A drought is a period of drier than normal conditions. As a temporary condition, it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate. Furthermore, drought is frequently an "incremental" hazard, meaning the onset and end is often difficult to determine, and its effects may accumulate slowly over a considerable period of time and may linger for years after the termination of the event. As such, potential impacts vary among communities.

The growing occurrence and severity of other climate-related hazards are exacerbating the severity and probability of drought. Such hazards as extreme heat and wildfires can increase the probability for Douglas County to experience more severe and chronic droughts in the future. Additionally, the diminishing annual snowpack in the Cascades, which is relied upon to replenish water tables throughout the entire County, is also exacerbating the occurrence of drought. Even in a year where precipitation exists within average historical levels, snowpack can still be lower than historical averages due to increases in global temperatures and climate trends, producing what is called a “snow drought”.

Another climate-event that can increase the frequency and severity of drought is El Niño Southern Oscillation (ENSO) weather patterns, which El Niño is the warm phase of the ENSO and El Niña is the cooling phase. During their respective time, El Niño conditions lead to wetter, snowier conditions, and cooler maximum temperatures during the winter. La Niña conditions lead to drier and warmer temperatures overall, with notable extreme cold spells. During stronger El Niño or La Niña episodes, these trends are even more pronounced.[20]

[20] Information about the El Nino and La Nina cycles (weather.gov)

Location and Extent

Drought occurs in virtually every climatic zone, impacting communities and regions, but its characteristics, extent, and impact can vary significantly from one region to another. As a result, different regions of Douglas County can experience the effects of drought differently. The Coastal Region is susceptible to risks resulting from severe and chronic drought, due to offshore winds originating from the Pacific Ocean. These winds produce cooling effects that reduce the regions susceptibility to extended periods of high temperatures. The Central and Cascades Region, by contrast, are very susceptible to severe drought due to higher average temperatures and reduced snowpacks in the Cascade mountains, resulting in higher probability of wildfires. Additionally, the Central Region includes the most populated areas in Douglas County and thus the highest proportion of wells, agricultural and ranching activities, and most susceptible to declining water table levels. as well as water rationing in rural and urban locations and decreases in tourism-related activities.

Also, droughts can affect more than one county, and in Douglas County regions that are more dependent on rainfall for operation and vitality (e.g., agriculture, hydroelectric generation, recreation, etc.), such as the Central and Cascades regions, droughts can impact local commerce, agriculture, fisheries, and overall quality of life.

History

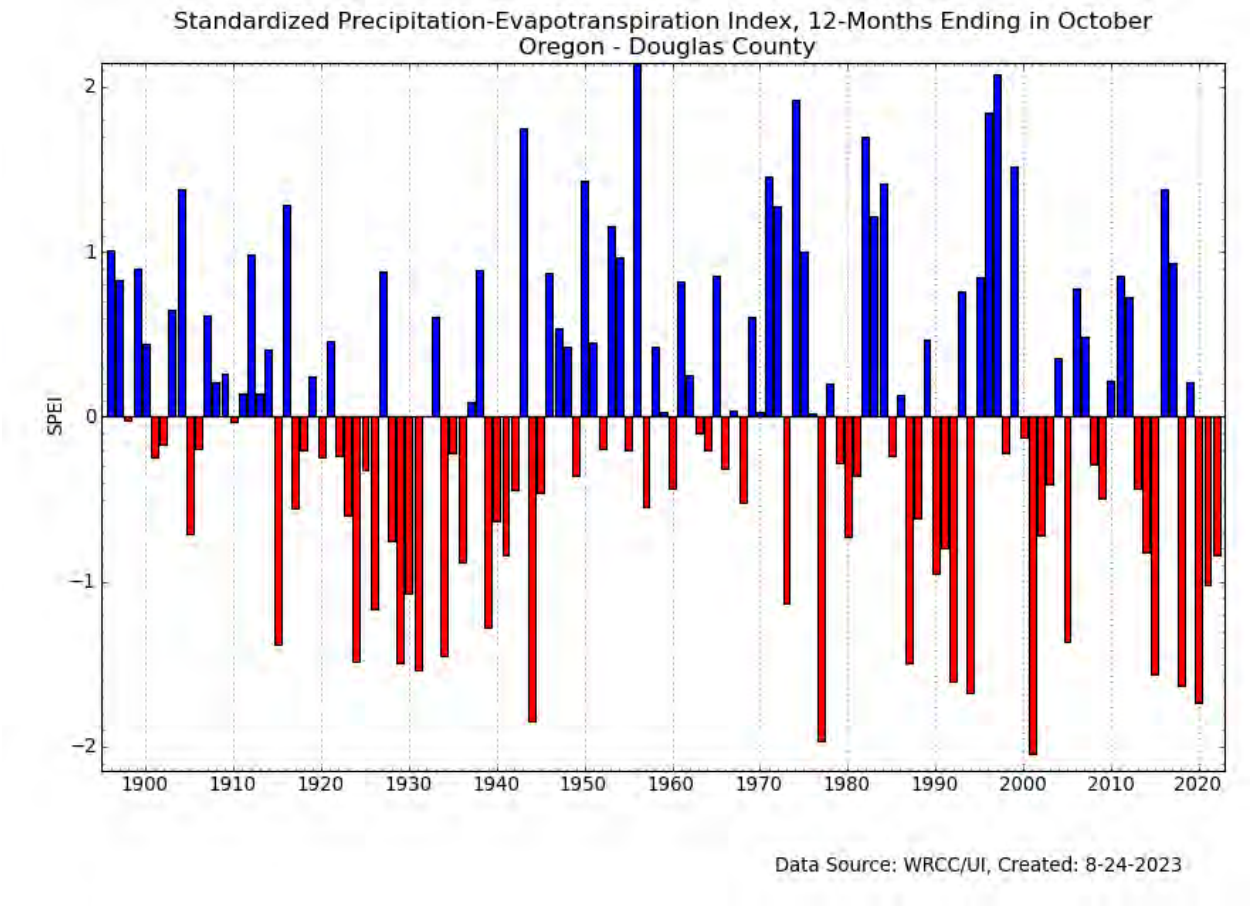
Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. Most federal agencies use the Palmer Method which incorporates precipitation, runoff, evaporation, and soil moisture. However, the Palmer 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.

Instead, the Standardized Precipitation-Evapotranspiration Index (SPEI) is used, which provides 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, moderate drought occurs between -1.5 and -1.0, and mild drought occurs between -1.0 and 0.

Figure 22 shows the water year (October 1 – September 30) history of SPEI from 1895 to 2022 for Douglas County. The SPEI record indicates that the County has experienced only one period of extreme drought (water years 2001) and seven years of severe drought (water 1944, 1977, 1992, 1993. 2015, 2018, and 2020). In addition, there are 11 years of moderate drought and 45 years of mild drought. Douglas County experienced severe drought conditions in 1992, 1994, 2001, 2002, 2010, 2014, 2015, 2018, 2020, 2021, 2022, and most recently in 2023. In each of these years except for 2014, Douglas County was declared to be under drought emergency by the Governor.7F21

[21] Oregon Water Resources Department Public Declaration Status Report

Figure 22 Standardized Precipitation-Evapotranspiration Index, 12-Months Ending in September, Douglas County, OR (1896-2022)



Drought Hazard Risk Assessment

Probability Assessment

Based on the available data and research the NHMP Steering Committee assessed **the probability of experiencing a locally severe drought as "High,"** meaning one incident is likely within the next 10 to 35 years, and this rating remains the same across the regions. *This rating has increased since the previous NHMP.*

Droughts are not uncommon in the State of Oregon, nor do they solely occur east of the Cascades, as 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, which is seen in Figure 22 above**.**

Vulnerability Assessment

The Steering Committee rated **the County as having a "Moderate" vulnerability to drought hazards**, meaning it is expected that between 1-10 percent of the County's population or assets would be affected by a major drought emergency or disaster. While the rating is the same across the regions, the Central and Cascades regions are slightly more vulnerable to drought conditions compared to the Coastal region. *This rating has increased since the previous NHMP.*

The environmental and economic consequences of droughts can be significant, contributing to the increased risk of wildfire, a significant concern of Douglas County. Also, domestic water-users may be subject to stringent conservation measures (e.g., rationing) as per the County's water management plan in times of severe drought. Potential impacts to County water supplies the agriculture industry are the greatest threats, as well as pose threat to forest conditions, which can set the stage for potentially destructive wildfires.

Future Climate Variability – Drought[23]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects that drought conditions, represented by low summer soil moisture, low spring snowpack, low summer runoff, and low summer precipitation, is projected to become more frequent in Douglas County by the 2050s. It is estimated that by the year 2100, annual mean precipitation in Oregon will increase by 5-10 percent, however, summers will become increasingly drier and warmer, while winters will become warmer. As a result of warmer winters, snowpack across Oregon is projected to decline an estimated 25 percent by 2050, contributing to reduced summer soil moisture in the mountains and subsequent reduction in summer streamflow. As mountain snowpack declines, seasonal drought will become less predictable and snow droughts will increase the likelihood of hydrological and agricultural drought during the following spring and summer.

The incidence of related negative physical and mental health outcomes is likely to increase in response, especially among low income, tribal, rural, and agricultural communities.[24] Other issues that can be exacerbated due to drought include increased food scarcity and increased incidences of infectious, chronic, and vector-borne diseases.

[23] OCCRI, Future Climate Projections Douglas County, 2023
[24] York et al., 2020; Ho et al., 2021

Earthquake

Earthquake - Cascadia Summary	
Hazard Ranking	
3 out of 12	
Probability	**Updates Made**
<u>County: Moderate</u> Coastal: Moderate Central: Moderate Cascades: Moderate	- Earthquake Scoring split into two categories: Cascadia and Crustal - Reorganized for clarity and consistency - DOGAMI Risk Report data and findings incorporated
Vulnerability	**Locations**
<u>County: High</u> Coastal: High Central: High Cascades: Moderate***	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 3 CSZ Earthquake Profile

Earthquake - Crustal Summary	
Hazard Ranking	
12 out of 12	
Probability	**Updates Made**
<u>County: Low</u> Coastal: Low Central: Low Cascades: Low	- Earthquake Scoring split into two categories: Cascadia and Crustal - Reorganized for clarity and consistency - DOGAMI Risk Report data and findings incorporated
Vulnerability	**Locations**
<u>County: Low</u> Coastal: Moderate*** Central: Low Cascades: Low	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 4 Crustal Earthquake Profile

Characteristics

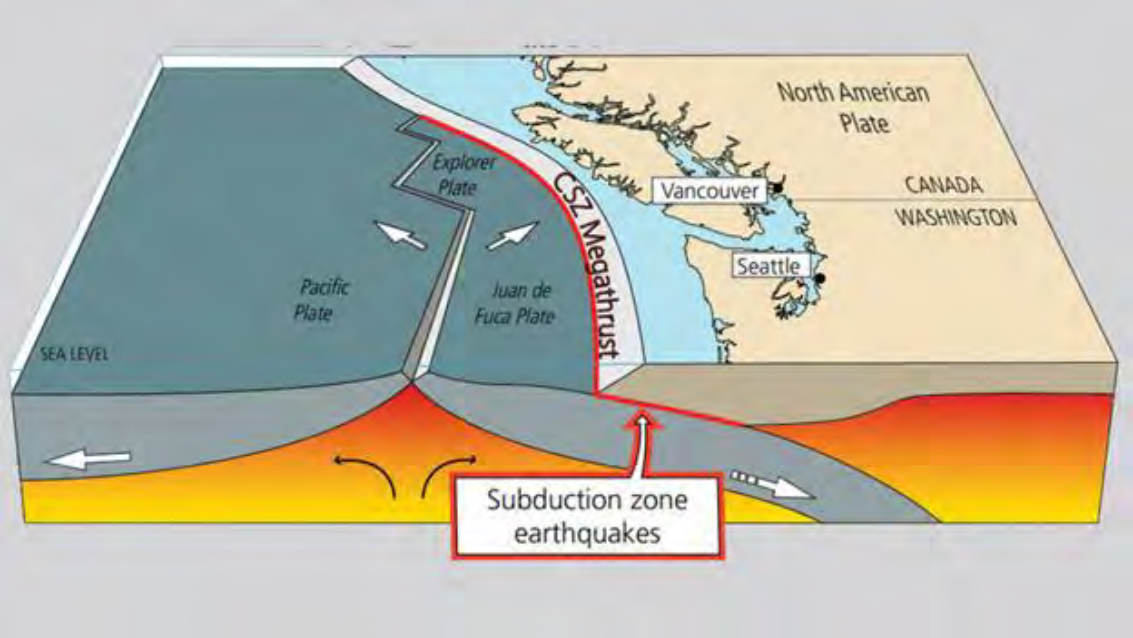
An earthquake is a shaking of the earth's surface by energy waves emitted by movement under the earth's surface, such as the slipping tectonic plates suddenly overcoming friction with one another underneath the earth's surface or from the rupture of fault lines.

Due to the geographic position of Douglas County and Oregon, it is susceptible to earthquakes from four primary sources: (a) the off-shore Cascadia Subduction Zone (CSZ), (b) deep intra-plate events within the subducting Juan de Fuca plate, (c) shallow crustal events within the North America Plate, and (d) earthquakes associated with renewed volcanic activity.

Cascadia Subduction Earthquake

In Douglas County the greatest risk from earthquakes would be from an offshore CSZ earthquake. The Pacific Northwest is located at a convergent plate boundary, where the Juan De Fuca and North American tectonic plates meet, creating what is known as the CSZ, which extends from British Columbia to northern California. As the Juan de Fuca plate moves, it is shoved underneath the North American plate, as can be seen in Figure 23**.** As the two plates converge, currently at a rate of about 1 – 2 inches per year, pressure is built up, and once fault's frictional strength is exceeded, the plates slip past each other along the fault in a "megathrust" earthquake, which causes a CSZ earthquake. Subduction zones like the CSZ have produced earthquakes with magnitudes of 8 or larger. Historic subduction zone earthquakes include the 1960 Chile (magnitude 9.5), the 1964 southern Alaska (magnitude 9.2), and the 2011 Japan (magnitude 9.0) earthquakes.[25]

Figure 23 Cascadia Subduction Zone Diagram

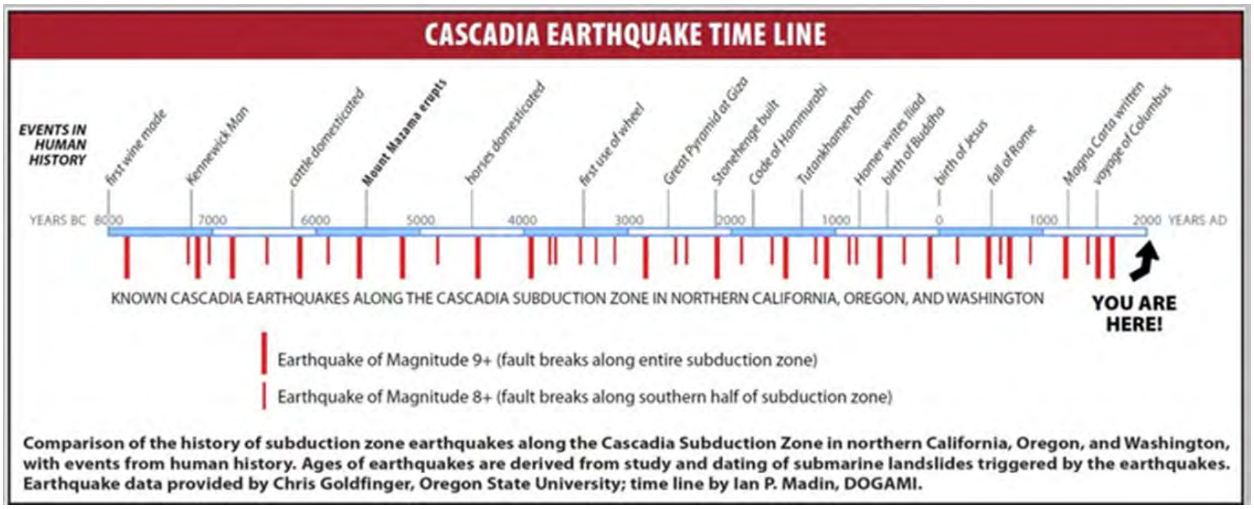


Source: Oregon State University, 2021

Geologic evidence shows that the CSZ has generated significant earthquakes, most recently about 300 years ago. It is generally accepted to have been a magnitude 9 or greater. The average recurrence interval of a CSZ event is approximately 500 years, with gaps between events as small as 200 years and as large as 1,000 years, which can be seen in Figure 24**.** Such earthquakes cause significant damage to the coastal area of Oregon as well as inland areas in western Oregon. Shaking from a large CSZ earthquake could last up to five minutes.

[25] Cascadia Subduction Zone | Pacific Northwest Seismic Network (pnsn.org)

Figure 24 Cascadia Earthquake Occurrence Time Line



Source: Yu et al., 2014

A CSZ earthquake is the most likely to occur, and also most likely to be the most damaging across all of Douglas County of the four types of earthquakes possible within our area, even though more shallow and highly localized crustal earthquake could still devastate the targeted community.

Deep Intraplate Earthquake

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. 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. In 1965, a magnitude 6.5 intraplate earthquake centered south of Seattle-Tacoma International Airport caused seven deaths.[26]

Crustal Fault Earthquake

Crustal fault earthquakes occur at relatively shallow depths of 6 – 12 miles below the surface. 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. DOGAMI's HazVu: Statewide Geohazards Viewer shows three small active faults in the vicinity of Yoncalla, Oakland, and Rice Hill, as well as four small active faults in the far east portion of the County near Diamon Lake (see Figure 6).[27]

Volcanic Activity Earthquake

Some earthquakes are related to volcanoes. Most such earthquakes occur along the edges of tectonic plates, where volcanoes also occur. Volcanic activity earthquakes are caused by the movement of magma.

Magma exerts pressure on the rocks until it cracks the rock, then squirts into the crack, and starts building pressure again. Every time the rock cracks, it makes a small earthquake. These earthquakes are usually too weak to be felt but can be detected and recorded by instrumentation.[28]

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[26] Deep Earthquakes | Pacific Northwest Seismic Network (pnsn.org)
[27] Crustal Faults | Pacific Northwest Seismic Network (pnsn.org)
[28] Volcanic Earthquakes | Pacific Northwest Seismic Network (pnsn.org)

Location and Extent

Earthquake damage is largely controlled by the strength of shaking at a given site. The strength of shaking at any point is a complex function of many factors, but magnitude of the earthquake (which defines the amount of energy released) and distance from the epicenter or fault rupture, are the most important. The ripples in a pond that form around a dropped pebble spread out and get smaller as they move away from the source. Earthquake shaking behaves in the same way: you can experience the same strength of shaking 10 miles from a magnitude 6 earthquake as you would feel 100 miles from a magnitude 9 earthquake.

Two measurement scales are used to describe the magnitude and intensity of earthquakes. To measure the magnitude, the "moment magnitude" (Mw, or M) scale uses the Arabic numbering scale. It provides clues to the physical size of an earthquake (http://www.actforlibraries.org/understanding-the-richter-scale-and-moment-magnitude-scale/) and is more accurate than the previously used Richter scale for larger earthquakes. The second scale, the "modified Mercalli," measures shaking intensity and is based on felt observations; it is therefore more subjective than the mathematically derived moment magnitude. It uses Roman numerals to indicate the severity of shaking. It is important to understand the relationship between the intensity of shaking and the amount of damage expected from a given earthquake scenario.

Richter Magnitude	Earthquake effects
0-2	Not felt by people
2-3	Felt little by people
3-4	Ceiling lights swing
4-5	Walls crack
5-6	Furniture moves
6-7	Some buildings collapse
7-8	Many buildings destroyed
8-Up	Total destruction of buildings, bridges and roads

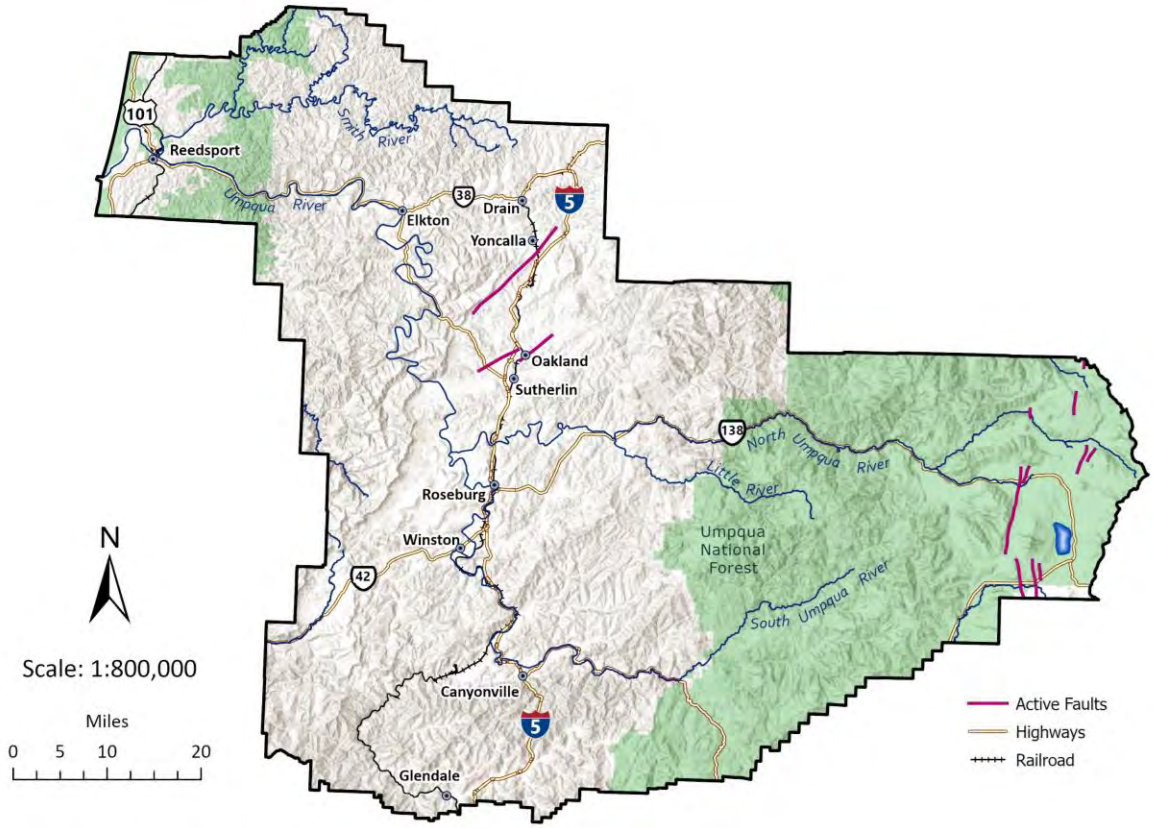
The other important factor in controlling earthquake damage is the contribution of local geology, which can lead to several specific hazards related to earthquakes occur. These include ground shaking, landslides, liquefaction, and amplification. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Figure 25 shows a generalized geologic map of Douglas County and includes the location of active faultlines in Douglas County, which are primarily in the northern central part of the County.

Figure 26 shows the areas for potential low, moderate, and high liquefaction due to a seismic event. These areas of liquefiable soft soils are throughout the County, but high potential of liquefaction is concentrated along the coast, through the central region, and in the far east forested portion of the County.

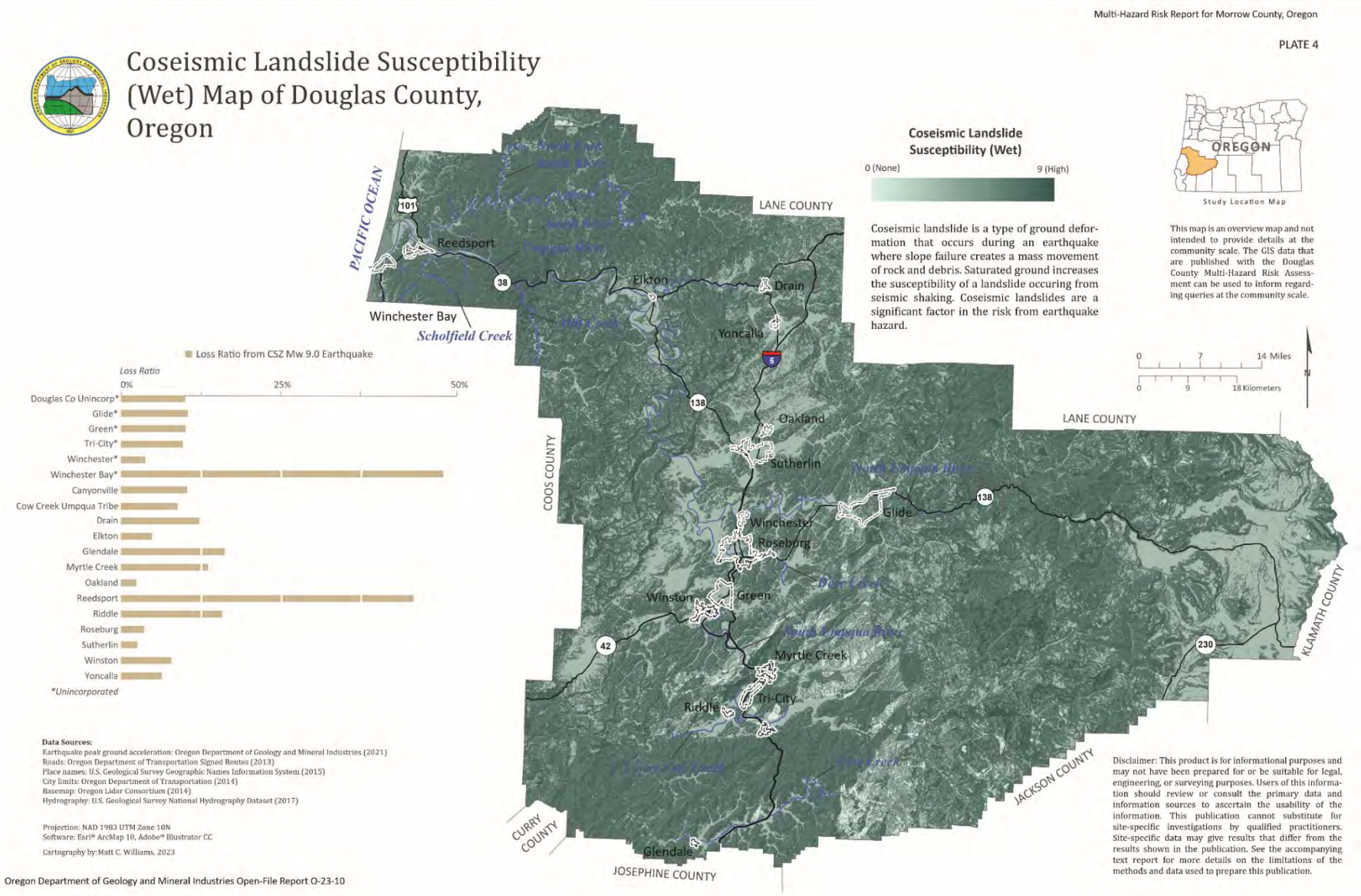
Most of the earthquakes shown in the figure below are low-impact events slightly above or below M 3.0, although one mapped event is shown with M 5-7. The larger events may have been slightly felt but little to no structural/property damage resulted. Thus, the seismic hazard for Douglas County arises predominantly from major earthquakes in the CSZ. Smaller, crustal earthquakes in or near Douglas County could be locally damaging but would not be likely to result in widespread or major damage.

Figure 25 Active Faultlines



Source: Douglas County GIS

Figure 26 Coseismic Landslide Susceptibility



Below is a list of earthquake related hazards that occur either during or in the aftermath of an earthquake event.[29]

- **Ground Shaking**: When an earthquake occurs, motion is generated on the earth's surface that is caused by seismic waves. It is the primary cause of earthquake damage, and depends on the strength of the earthquake magnitude, type of fault, and distance to epicenter.
- **Earthquake-Induced Landslides**: Landslides that occur due to ground shaking from earthquakes. Many communities, especially those with steep slopes, face this risk.
- **Liquefaction**: When the ground shakes, wet granular soils are changed from a solid state to a liquid state, resulting in the loss of soil strength and its ability to support weight.
- **Amplification**: Soil and soft sedimentary rocks on and near the earth's surface can increase the magnitude of a seismic wave generated by an earthquake due to the ground shaking. As such, structures developed on soft and unconsolidated soil face greater risk. This is particularly dangerous for areas that include deep sediment filled basins and on top of ridges.
- **Tsunami**: When tectonic plates located along the ocean floor and along the coast slip and release their built-up pressure, a tsunami can be generated. Damage because of a tsunami is discussed more thoroughly later within this chapter, under the Tsunami Section (Page 3-68).

History

Douglas County has no historical evidence of earthquakes centered immediately within the County. However, crustal, intraplate, and prehistoric subduction zone earthquakes centered outside Douglas County may have affected the area. Table 41 list records significant historical earthquakes with an epicenter near Douglas County area which may have had an impact on the County:[30]

Table 41 Historical Earthquakes in the Douglas County (Southwestern Oregon) Region

Date	Location	Magnitude	Remarks
Jan. 1700	Offshore	~ 9.0	Generated a tsunami that struck Oregon,
Nov. 1873	Brookings area	7.3	Origin probably Gorda block of the Juan de Fuca plate; intraplate event
Apr. 1920	Fort Klamath	5	Origin probably in the vicinity of Crater Lake
Mar. 1993	Scotts Mills	5.6	$28 million in damage, damage to homes, schools, building, state buildings; crustal event
Sep. 1993	Klamath Falls	5.9 to 6.0	2 earthquakes causing 2 deaths and extensive damage; $7.5 million in damage to homes, commercial, and governmental buildings; crustal event

Source: Wong and Bott, 1995

Earthquake Hazard Assessment

In previous Douglas County NHMPs, earthquakes were scored and rated as a single hazard, rather than separated into Cascadia Subduction Zone earthquake and crustal earthquake. As the probability and

[29] Earthquake Hazards Overview | Pacific Northwest Seismic Network (pnsn.org)

[30] "A Look Back at Oregon's Earthquake History, 1841-1994", Oregon Geology, pp. 125-139.

vulnerability for each of these earthquake types differ, it was decided to separate them into separate hazards under the scoring and ranking process for better accuracy.

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 previous NHMP rating for earthquake probability remained the same.*

The Steering Committee determined **the probability of experiencing a crustal earthquake is "low",** meaning one incident may occur within the next 75 to 100 years. The probability of crustal earthquakes is lowest in the Coastal region. The probability of a CSZ earthquake is moderate to high for all regions within the County. *The previous NHMP rating for earthquake probability was decreased.*

Douglas County is susceptible to deep intraplate events within the 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 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 323 years ago in January of 1700. The probability of a 9.0+ CSZ event occurring in the next 50 years ranges from 7 – 12 percent. 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 percent.

However, according to a U.S. Geological Survey paper, "Failure analysis suggests that by the year 2060, Cascadia will have exceeded ~27% of Holocene recurrence intervals for the northern margin and 85% of recurrence intervals for the southern margin." (Goldfinger et al., 2012).

Establishing a probability for crustal earthquakes is difficult given the small number of historic events in the region. For more information, see the DOGAMI reports cited previously.

Vulnerability Assessment

Based on the available data and research the Steering Committee determined **the vulnerability of experiencing a Cascadia Subduction Zone (CSZ) is "high",** meaning more that 10 percent of the population will be affected. *From the previous NHMP rating earthquake* vulnerability *remained the same*.

The Steering Committee determined **the vulnerability of experiencing a crustal earthquake is "low",** meaning less than one percent of the population will be affected, though the Coastal region has a slightly higher rating of vulnerability compared to the Central and Cascades regions**.** *From the previous NHMP rating for* earthquake *vulnerability was decreased.*

The effects of earthquakes span a large geographic area, and an earthquake occurring in or affecting Douglas County would probably be felt throughout the County. However, the degree to which the earthquakes are felt, and the damages associated with them may vary.

Assets and infrastructure vulnerable to damage from earthquakes include large stocks of old buildings and bridges, hazardous materials facilities, extensive sewer, water, and natural gas pipelines, dams, a petroleum pipeline, and other critical facilities and private property located in the County. The areas that are particularly vulnerable to potential earthquakes in the County have been identified as the Coastal Region of the County, as reflected in the increased seismic zone rating of the areas west of Range 10W.

The relative or secondary earthquake hazards, such as liquefaction, ground shaking, amplification, and earthquake-induced landslides can be just as devastating as the earthquake.

DOGAMI Risk Report Earthquake Results

The *Multi-Hazard Risk Report for Douglas County* (DOGAMI, 2023) provides an earthquake hazard analysis summary table for a loss estimate analysis for two scenarios, and an inventory of structures seismic design level based on benchmark years. The loss estimate analysis approximates the loss (in dollars) to buildings from a CSZ Mw-9.0 earthquake and a local crustal fault Mw-6.8 earthquake.

According to the Risk Report, portions of the Douglas County residents 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.*

A summary of results is provided below, as well as the estimated losses for each of the earthquake scenarios. An inventory of buildings' seismic code status is also presented and discussed. The name and location of potentially impacted critical facilities are listed based on which earthquake scenario they are vulnerable to, as well as a list of identified areas of vulnerabilities throughout the County.

Report Summary

Table 42 shows the summarized results from the *DOGAMI Risk Report for Douglas County* which projects that a CSZ Mw-9.0 earthquake would incur losses of approximately $2 billion and cause damage to roughly 8.4 percent of total structures throughout the County. DOGAMI also projected that a crustal Mw-6.8 earthquake would incur losses upwards of $1.8 billion and cause damage to roughly 7.5 percent of total structures throughout the County (see Table 43) Both results are strongly influence by ground deformations from liquefaction, as well as other earthquake-related hazards.

Table 42 CSZ Earthquake Result Summary

	Countywide CSZ Mw 9.0 Earthquake Results (not including buildings or populations within the medium-sized tsunami					
	Number of Red-Tagged Buildings	Number of Yellow-Tagged Buildings	Loss Estimate	Loss Ratio	Non-Functioning Critical Facilities	Potential Displaced Population
Douglas County	2,585	7,862	$2 billion	8.4%	25 of 88	3,500

Source: DOGAMI Douglas County Risk Report, 2023

Table 43 Crustal Earthquake Result Summary

	Countywide Crustal Scenario Mw 6.8 Earthquake Results					
	Number of Red-Tagged Buildings	Number of Yellow-Tagged Buildings	Loss Estimate	Loss Ratio	Non-Functioning Critical Facilities	Potential Displaced Population
Douglas County	2,298	6,439	$1.76 billion	7.5%	18 of 88	2,340

Source: DOGAMI Douglas County Risk Report, 2023

Loss Estimate:

Table 44 presents the effects of iterative advancements in seismic building codes on structural losses due to earthquakes by providing an earthquake loss estimate for Douglas County for 9.0 magnitude CSZ and a 6.0 magnitude crustal earthquake scenario. During a CSZ earthquake, it is estimated that almost a third of structures are projected to be damaged in Riddle (31.1 percent), Reedsport (30.3 percent), and Glendale

(28.8 percent). In a crustal earthquake scenario, upwards of a third of buildings will be damaged in both Myrtle Creek (33.5 percent) and Riddle (32.9 percent). In both scenarios, the city of Riddle is projected to experience the greatest proportion of structural damage as compared to the rest of the jurisdictions.

Table 44 CSZ and Crustal Earthquake Loss Estimate

	Total Number of Buildings	Total Estimated Building Value ($)	Buildings Damaged			
			CSZ M9.0 Earthquake		Crustal M6.5 Earthquake	
			Damaged Buildings	Percent Damaged	Damaged Buildings	Percent Damaged
Total Unincorporated County	49,213	14,764,964	7,920	16.1%	7,236	14.7%
Canyonville	898	274,677	151	16.8%	165	18.4%
Drain	589	226,400	121	20.5%	100	17.0%
Elkton	142	48,153	8	5.6%	0	0.0%
Glendale	423	127,625	122	28.8%	71	16.8%
Myrtle Creek	1688	531,074	397	23.5%	566	33.5%
Oakland	512	179,224	4	0.8%	7	1.4%
Reedsport	2626	667,084	796	30.3%	3	0.1%
Riddle	569	174,784	177	31.1%	187	32.9%
Roseburg	9678	4,226,793	331	3.4%	202	2.1%
Sutherlin	3,915	1,332,097	107	2.7%	61	1.6%
Winston	2406	749,929	247	10.3%	95	3.9%
Yoncalla	635	184,859	58	9.1%	44	6.9%
Total Douglas County	73,294	23,487,663	10,439	14.2%	8,749	11.9%

Source: DOGAMI Douglas County Risk Report, 2023

Seismic Building Codes

The years that seismic building codes are enforced within a community, called “benchmark” years, have a great effect on the results produced from the Hazus-MH earthquake model. Oregon initially adopted seismic building codes in the mid-1970s. The established benchmark years of code enforcement are used in determining a “design level” for individual buildings. The design level attributes (pre-code, low-code, moderate-code, and high-code) are used in the Hazus earthquake model to determine what damage functions are applied to a given building. The year built or the year of the most recent seismic retrofit are the main considerations for an individual design level attribute. Seismic retrofitting information for structures would be ideal for this analysis but was not available for Douglas County. The information in Table 45 outlines the various benchmark years that apply to buildings within Douglas County.

Table 45 Douglas County Seismic Design Level Benchmark Years

Building Type	Year Built	Design Level	Basis
Single-Family Dwelling (includes Duplexes)	Prior to 1976 1976–1991 1992–2003 2004–2016	Pre Code Low Code Moderate Code High Code	- Interpretation of Judson (Judson, 2012)
Manufactured Housing	Prior to 2003 2003–2010 2011–2016	Pre Code Low Code Moderate Code	- Interpretation of OR BCD 2002 Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002) - Interpretation of OR BCD 2010 Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
All other buildings	Prior to 1976 1976–1990 1991–2016	Pre Code Low Code Moderate Code	- Business Oregon 2022 Oregon Benefit-Cost Analysis Tool, p. 24 (Business Oregon, 2022)

Source: DOGAMI Douglas County Risk Report, 2023

Table 46 illustrates the current state of seismic building codes for the County. Across the entire County, 40 percent of structures were constructed prior to code development and implementation, which can pose a significant risk of damage and loss to many community structures were an earthquake were to occur.

Table 46 Douglas County Structural Seismic Design Level Inventory

	Total Number of Buildings	Pre-Code		Low-Code		Moderate-Code		High-Code	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Unincorporated County	49,213	16,267	33.0%	6,982	14.2%	23,363	47.0%	2,601	5.3%
Canyonville	898	425	47.0%	102	11.4%	336	37.0%	35	3.9%
Drain	589	350	59.0%	67	11.4%	146	25.0%	26	4.4%
Elkton	142	67	47.0%	17	12.0%	36	25.0%	22	15.5%
Glendale	423	194	46.0%	42	9.9%	151	36.0%	36	8.5%
Myrtle Creek	1688	920	55.0%	221	13.1%	436	26.0%	111	6.6%
Oakland	512	261	51.0%	71	13.9%	150	29.0%	30	5.9%
Reedsport	2626	1915	73.0%	401	15.3%	166	6.0%	144	5.5%
Riddle	569	348	61.0%	79	13.9%	120	21.0%	22	3.9%
Roseburg	9678	5723	59.0%	1235	12.8%	2288	24.0%	432	4.5%
Sutherlin	3,915	1,690	43.0%	480	12.3%	1527	39.0%	218	5.6%
Winston	2406	977	41.0%	376	15.6%	846	35.0%	207	8.6%
Yoncalla	635	329	52.0%	70	11.0%	196	31.0%	40	6.3%
Total Douglas County	73,294	29,466	40.2%	10,143	13.8%	29,761	40.6%	3,924	5.4%

Source: DOGAMI Douglas County Risk Report, 2023

Critical Facility Vulnerability – CSZ Mw-9.0 Earthquake

Table 46 provides an inventory of vulnerable critical facilities that were determined to be susceptible to moderate to complete damage due to a CSZ Mw 9.0 Earthquake. Seismically retrofitting these structures would reduce the potential damage sustained from an earthquake.

Table 47 CSZ Earthquake Exposed Critical Facilities Inventory

Exposed Critical Facilities - CSZ Mw-9.0 Earthquake				
Community	**School**	**Hospital**	**Fire Responders**	**Government Buildings**
Unincorporated County	1	-	2	-
Drain	-	-	1	-
Elkton	-	-	1	-
Myrtle Creek	1	-	-	-
Reedsport	2	2	1	1
Roseburg	1	-	1	-
Winston	3	-	-	-
Total Douglas County	**8**	**2**	**6**	**1**

Source: DOGAMI Douglas County Risk Report, 2023

Critical Facility Vulnerability – Local Crustal Mw-6.8 Earthquake

Table 48 provides an inventory of vulnerable critical facilities that were determined to be susceptible to moderate to complete damage due to a local crustal Mw-6.8 earthquake. Seismically retrofitting these structures would reduce the potential damage sustained from an earthquake.

Table 48 Crustal Earthquake Exposed Critical Facilities Inventory

Exposed Critical Facilities - Crustal Fault Mw-6.8 Earthquake				
Community	**School**	**Hospital**	**Fire Responders**	**Government Buildings**
Unincorporated County	7	-	1	-
Canyonville	1	-	-	-
Myrtle Creek	2	-	1	-
Riddle	2	-	-	-
Total Douglas County	**12**	**0**	**2**	**0**

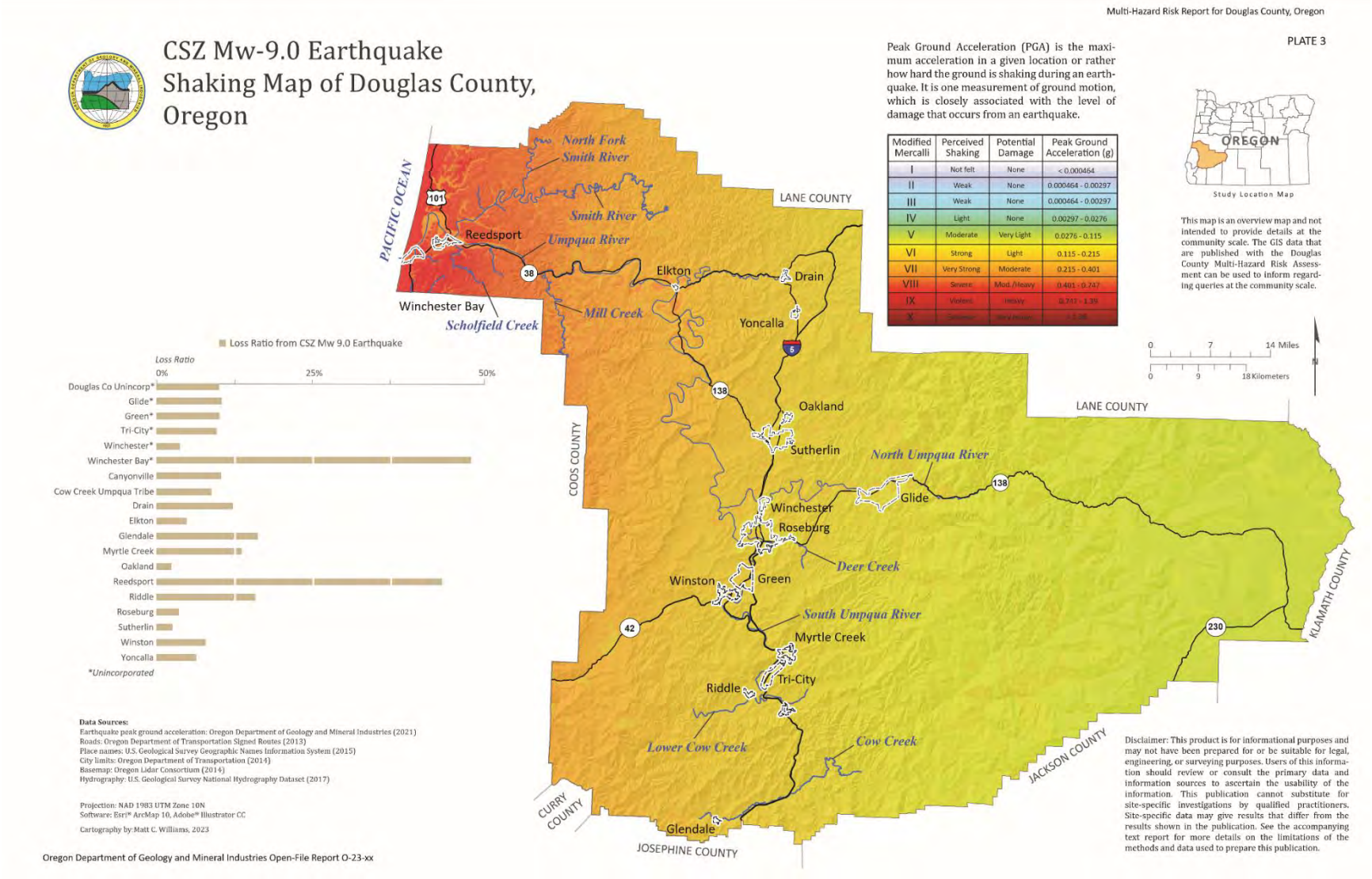
Source: DOGAMI Douglas County Risk Report, 2023

Areas of Significant Vulnerability

Proposed shaking of Douglas County from a projected CSZ Mw-9.0 earthquake is shown in Figure 27. Areas of high risk and vulnerability within the study area due to both a CSZ earthquake and a crustal earthquake include:

- Buildings in high liquefaction susceptible areas near the coast and along the Umpqua River (includes Winchester Bay and Reedsport) are at higher risk to damage from coseismic liquefaction induced ground deformation. The ground shaking intensity will be far greater in this area compared to other parts of Douglas County.
- Areas near the epicenter of a hypothetical fault earthquake scenario and with large areas of liquefaction soils are likely to incur a significant amount of damage. The communities of Riddle, Glide, Myrtle Creek, and Tri-City have higher estimated loss ratios compared to other communities in the study due to the level of shaking and ground deformation likely to occur.

Figure 27 CSZ Mw-9.0 Earthquake Shaking Map



2007 Rapid Visual Survey

In 2007, DOGAMI completed a rapid visual screening (RVS) of educational and emergency facilities in communities across Oregon, as directed by the Oregon Legislature in Senate Bill 2 (2005). RVS is a technique used by the Federal Emergency Management Agency (FEMA), known as FEMA 154, to identify, inventory and rank buildings that are potentially vulnerable to seismic events. DOGAMI ranked each building surveyed with a 'low,' 'moderate,' 'high,' or 'very high' potential for collapse in the event of an earthquake. It is important to note that these rankings represent a probability of collapse based on limited observed and analytical data and are therefore approximate rankings. To fully assess a building's potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

As noted in the community profile, approximately 69 percent of residential buildings were built prior to 1990, which increases the County's vulnerability to earthquake hazard. In total, almost 40 buildings in Douglas County and its cities were rated as having a 'high' or 'very high' potential for collapse, with more than half of them being schools. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007.

In addition to building damage, utility (electric power, water, wastewater, natural gas) and transportation systems (bridges, pipelines) are also likely to experience significant damage. In addition, there is a low probability that a major earthquake will result in failure of upstream dams.

Utility systems will be significantly damaged, including damaged buildings and damage to utility infrastructure, including water and wastewater treatment plants and equipment at high voltage substations (especially 230 kV or higher which are more vulnerable than lower voltage substations). Buried pipe systems will suffer extensive damage with approximately one break per mile in soft soil areas. There would be a much lower rate of pipe breaks in other areas. Restoration of utility services will require substantial mutual aid from utilities outside of the affected area.

For more information, see: Open-File-Report: O-2007-02 - Statewide seismic needs assessment: Implementation of Oregon 2005 Senate Bill 2 relating to public safety, earthquakes and seismic rehabilitation of public buildings, 2007; and

DOGAMI Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS)

Extreme Heat

Extreme Heat Summary	
Hazard Ranking	
8 out of 12	
Probability	**Updates Made**
County: Moderate Coastal: Moderate Central: Moderate Cascades: Moderate	- New Hazard Added -Data and information from OCCRI Climate Projection Report incorporated - Heatwaves from 2017-2022 documented
Vulnerability	**Locations**
County: Moderate Coastal: Moderate Central: Moderate Cascades: Low***	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 5 Extreme Heat Profile

As the climate continues to warm, extreme heat events will be an emerging hazard with implications for public health as well as infrastructure. Extreme heat events are expected to increase in frequency, duration, and intensity in Oregon due to continued warming temperatures. Due to the growing occurrence and threat of extreme heat waves, Douglas County has decided to include Extreme Heat as a new natural hazard in their Natural Hazard Mitigation Plan. The 2020 Oregon Natural Hazard Mitigation Plan identifies Douglas County as being likely affected by extreme heat hazards.

An increasing number of extreme heat events have occurred in Douglas County in 2017, 2019, 2020, 2021, and 2022 all. Though extreme heat events are not as prevalent in Douglas County compared to other Oregon counties, statewide extreme heat occurs more often throughout the summer and varies in how extreme the temperature rises during a given event.

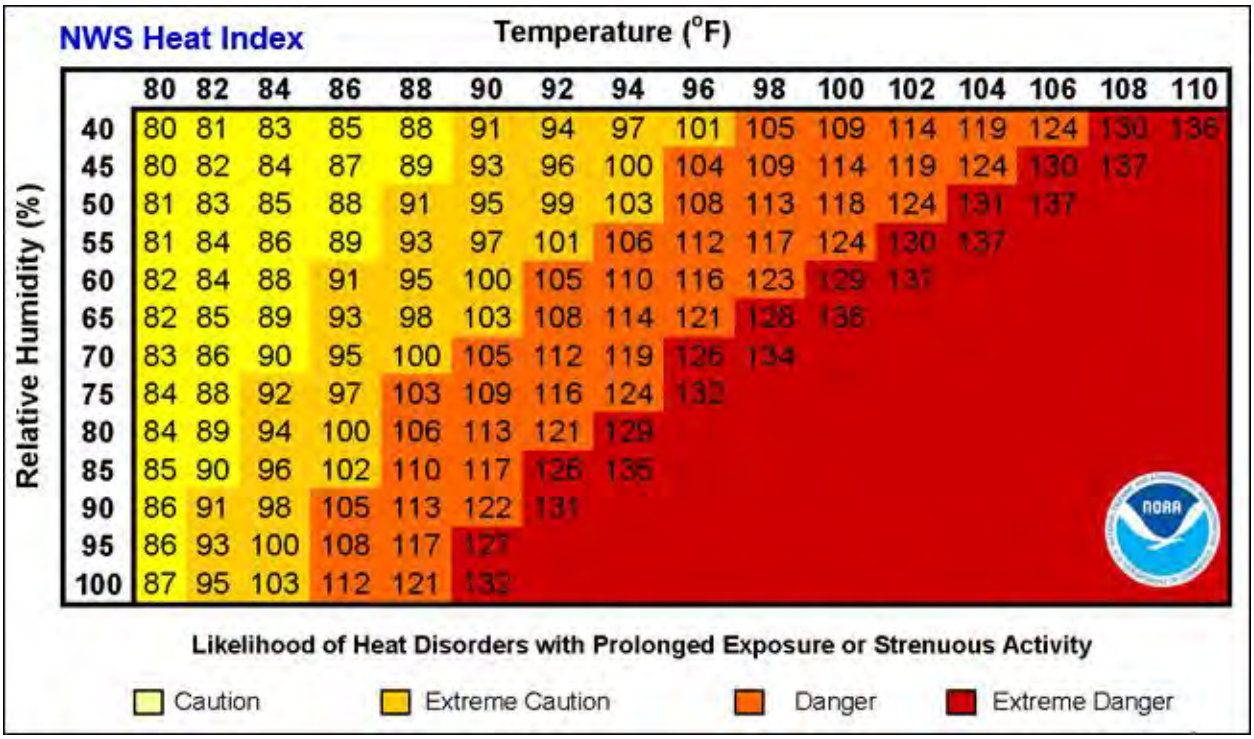
Characteristics

Extreme Heat is a period of abnormally, uncomfortably hot, and unusually humid weather typically lasting two or more days with temperatures outside the historical averages for a given area, as well as the numbers of days with temperatures above 90°F. Extreme heat can pose risk to communities in several ways, whether in isolation or in combination with each form extreme heat takes. The hazard may represent an increase in daily temperatures exceeding a threshold of safety for human beings, both for dehydration and potential for skin burns. Extreme heat events may exist as heat waves, a streak of consecutive days in which the daily high temperature is above the historical average and/or exceeds a threshold of safety. It is estimated that between 1999 and 2022, heat waves killed at least 19,021 Americans, according to the Centers for Disease Control and Prevention. That's more than any other single hazard-related deaths,

including hurricanes, lightning, tornadoes, floods, and earthquakes. And it's largely an urban problem—the bulk of those deaths occur in cities.[32]

The National Weather Service issues heat warnings when the heat index exceeds given local thresholds. The heat index is a measure of how hot it feels combining both temperature and relative humidity. As relative humidity increases, a given temperature can feel even hotter. Figure 28 displays NOAA's National Weather Service rubric for temperature and relative humidity according to the danger of heat-related illnesses.

Figure 28 NOAA National Weather Service Heat Index



Source: National Weather Service

Location and Extent

The extent and location of extreme heat can occur region-wide and can affect all segments of a jurisdiction. Urban places, such as cities, are more vulnerable to heat waves because that's where more people are concentrated but also because there is less vegetation to permit evaporation, cars and factories give off heat, and the proximity of asphalt roads and buildings store and radiate heat. On a hot summer day, urban areas can be 5°F to 18°F hotter than surrounding rural areas which is enough to turn a heat wave into a serious health crisis.

Figure 29 shows the average number of days with temperatures over 90°F compared to currently to 30 years in the future. As shown, the days increase significantly from 7 days to 15 days, particularly on the coast and the central cascades area. Overall, all of Douglas County will expect to see more days of high heat than previously experienced historically. These high heat days will be even more exacerbated in urban areas due to the urban heat island effect. Heat islands occur in areas of concentrated, urban development, where

[32] Climate Change Indicators: Heat-Related Deaths | US EPA

buildings, roads, and other infrastructure absorb, rather than reflect, the sun's energy, resulting in higher temperatures in these environments versus less developed areas characterized by forests and water.

Figure 29 Historical and Future Number of Hot Days in Douglas County

Source: First Street Foundation

There are several mitigation actions that aim to reduce the urban heat island effect, including:

- Providing shaded areas throughout the County, including vegetation options such as planning appropriate trees to provide shade and passive cooling of buildings and to provide local cooling though evaporation. Non vegetation options are also available, such as latticed shade awnings above paved areas and exposed lots where trees are not viable options. These options will assist in reducing the heat island effect and provide shaded relief for people.
- Improving the reflective surfaces of urban roof tops to bounce light (heat) rather than absorbing it. Ideally, solar panel arrays could absorb sunlight and shade the roof tops from storing heat, while also providing a source of energy for the internal powering of fans, or air conditioning and diminish the draw on local and regional power demands at peak use periods.

History

A severe heat episode or "heat wave" occurs about every two to three years and typically lasts two to three days but can last as many as five days. A severe heat episode can be defined as consecutive days of temperatures in the upper 90s to around 100 degrees Fahrenheit. On average, the region experiences 8.9 days with temperatures above 90-degrees Fahrenheit each year, and an average historical baseline for the hottest day of the year at 93.7°F.

As global temperatures increase on average and changing climatic patterns, Oregon and Douglas County have experienced abnormally high temperatures and more frequent periods of heat. Douglas County has experienced higher 90s and triple digit temperatures in the past, but the likelihood of extended periods of excessive heat (i.e., 3 days or longer) remained around 40 percent for the past 30 years.[33] However, this number has increased to just below 70% for 2023 and will increase to above 90 percent over the next 30 years. During the recent 2021 "heat dome" that blanketed the Pacific Northwest, and many communities across Oregon, as well as Douglas County, reached new record high temperatures. During this extreme heat event, a total of 123 heat related deaths in the Pacific Northwest were reported resulting from limited

[33] Risk Factor. n.d. Heat Risk Overview: Douglas County.

access to air-conditioning and an increase in the number of drownings when residents sought relief in bodies of water. Widespread business closures and event postponements occurred.[34]

Extreme heat exists as a recent threat to people in Douglas County and many instances include recent heat waves that coincide with the uptick in wildfires.

Each region of Douglas County has experienced heat waves, but to varying degrees and intensity. The following identify how the different regions have experienced heatwaves within the past few years.

Coastal Region

Communities located near the ocean, such as Reedsport and Winchester Bay rarely experience temperatures greater than 70 degrees. However, temperatures can suddenly rise above 90 degrees, which occurred as recently as September 2022 and is expected to rise with future changes in the global temperatures.[35]

Central Region

The Central region is most likely to experience the highest temperatures when heat waves occur in Douglas County. In recent years, temperatures exceeded 100 degrees on several occasions along with the extended periods of 90-degree heat. Several heat advisories have been issued during these events throughout the central valley. Most significant is the 2021 "heat dome" event where Roseburg set a record high at 114 degrees.

Cascades Region

The Cascades region is less susceptible to experiencing the same high temperatures as other regions, especially at higher elevations, but high temperatures can reach the 90s and at times exceed 100 degrees when hot air affects the entire region. While heat waves may be less frequent at higher elevations, prolonged average temperatures higher in the Cascades can contribute to increasing risk of wildfires as forests remain drier for longer periods.

Table 49 lists out the most recent heatwaves that Douglas County has experienced.

[34] 2021 Northwest Heat Dome: Causes, Impacts and Future Outlook | USDA Climate Hubs

[35] Weather Underground Historical Temperature Data, Southwest Oregon Regional Airport Station.

Table 49 Douglas County Heatwaves 2017-2022

Date	Description
August 1–4, 2017	Strong high pressure brought record breaking heat to many parts of southwest and south central Oregon. Reported high temperatures during this interval ranged from 82 to 110 degrees. Reported low temperatures during this interval ranged from 41 to 65 degrees.
June 11–12, 2019	Strong high pressure and a very dry air mass made for hot conditions over southwest Oregon during this interval. Reported low temperatures ranged from 52 to 63 degrees. Reported high temperatures ranged from 89 to 101 degrees.
August 14-16, 2020	High pressure and a dry air mass supported very hot temperatures over inland areas during this interval. Minimum temperatures were quite warm as well. The heat was occasionally tempered by high clouds streaming over the area. High temperatures in this zone ranged from 85 to 110 degrees. Low temperatures in this zone ranged from 46 to 66 degrees.
June 26-29, 2021	A historic heat wave affected the Pacific Northwest during this interval. It was caused by a strong upper level ridge that created dry and stable conditions over the area with strong subsidence. Many daily, monthly, and all-time high temperature records were set over southwest and south central Oregon. Low temperature ranged between 54 to 75 degrees and the high temperature ranged anywhere between 80 to 115 degrees. ***On 6/27/21, Roseburg set an all-time high temperature record of 114 degrees, the old record was 109 degrees set on 8/15/2020.
July 29-30, 2021	Strong high pressure brought another heat wave to southern Oregon. Low temperatures ranged from 55 to 67 degrees and the high temperatures ranged from 92 to 105 degrees.
August 10-14, 2021	A strong ridge supported a heat wave over inland areas of southwest and south central Oregon during this interval. The low temperatures ranged from 52 to 70 degrees and the high temperatures ranged from 80 to 106 degrees.
July 25-31, 2022	Strong persistent ridging over the Pacific Northwest supported a prolonged heat wave over inland portions of southwest and south central Oregon. Low temperatures ranged from 52 to 63 degrees and high temperatures ranged from 83 to 102 degrees.

Source: National Oceanic and Atmospheric Administration (NOAA), 2023

Extreme Heat Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee assessed the probability of experiencing a locally extreme heat event as **"Moderate,"** meaning one incident is likely within the next 35 to 75 years. *This is a new hazard, thus the rating is new since the last NHMP.*

This rating exists for all regions in the County, though communities and areas in the westernmost part of the Coastal region have a slightly less probability of experiencing extreme heat events.

While extreme heat events can affect all three regions in Douglas County, the severity and occurrence of these hazards differ between the regions.

- **Coastal Region:** Extreme heat events are less likely to affect Douglas County's Coastal region. The cool air that moves off the Pacific Ocean over the landscape is buffered by the Coast Range to the east, which provides a cooling effect for most of the areas and communities located on the coast. Nevertheless, as drought persists in some areas coupled with changing climate conditions, higher temperatures may result periodically as part of broader heat waves affecting the County and state.
- **Central Region:** Extreme heat is most likely to affect the Central region of Douglas County. Although the conditions created by the valley environment between the Coast and Cascade Ranges does somewhat mitigate the trapping of hot air, strong heat waves that affect multiple parts of the state and County can produce higher than average temperatures in areas of more urban development, such as along the I-5 corridor.
- **Cascades Region:** Given the higher elevations and lack of development, extreme heat is less likely to affect the Cascades region. Like the Coastal region, the area's natural features such as forested landscapes and raised elevations contribute to conditions that lower the average temperatures frequently experienced by the County. However, as with the coast, with ongoing drought conditions and the elevated risk of wildfires in the Cascades, potential for extreme heat events to occur does exist and can affect activities that occur in the Cascades, especially recreational and resource management activities.

Vulnerability Assessment

The Steering Committee rated the County as having **a "Moderate" vulnerability to extreme heat hazards**, meaning it is expected that between 1-10 percent of the unincorporated County's population or assets would be affected by a major drought emergency or disaster. *This is a new hazard; thus, the rating is new since the last NHMP.*

Vulnerability to extreme heat events is highest in the Central region compared to the Coastal and Cascades regions moderate vulnerability. Most of the County 's population lives in the Central region, increasing the risk for heat related illnesses affecting the population and consumption of energy straining electrical grids' operating capacity. However, extreme daily high temperatures can present sudden risks to communities in the Coastal region during abnormal events like the "heat dome" in 2021, particularly between the months of April and October.

There are many different populations groups that are more vulnerable to extreme heat. 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.

Furthermore, a significant percentage of the population does not have air conditioning, so once temperatures get into the 90s, it is quite uncomfortable. If a hot weather pattern persists for a few days, the situation gets worse because of the number of days in sequence. Studies show that heat-health related problems greatly increase once there are multiple days of extreme heat in a row. Oregon Public Health officials remind people to take precautions to avoid getting sick from extreme heat and be careful when swimming in Oregon's lakes, streams, and the ocean.

Future Climate Variability – Extreme Heat[36]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects that the number, duration, and intensity of extreme heat events will increase as temperatures continue to warm. As seen in Table 50**,** in Douglas County, the number of extremely hot days (where temperature is 90°F or higher) and the temperature on the hottest day of the year are projected to increase by the 2020s and 2050s. Compared to the 1971-2000 historical baselines, the number of days per year with temperatures 90°F or higher is projected to increase an average of 22 (range 8–34) by the 2050s. The temperature on the hottest day of the year is projected to increase by an average of about 6°F (range 2–8°F) by the 2050s.

Table 50 Projected Number of High Heat Events per Year

	Average Historical Baseline	2020s		2050s	
		Lower	Higher	Lower	Higher
Hot Days	8.9 days	6.4 days (2 - 11.8)	8.2 days (3 - 11.4)	14.6 days (6.1 - 21.7)	22.2 days (7.6 - 34.2)
Warm Nights	0.5 days	0.5 days (0 - 1.4)	0.8 days (0 - 1.9)	2 days (0.4 - 4.8)	4.3 days (1 - 11.2)
Hottest Day	93.7°F	2.2°F (0.9 - 3.3)	3°F (1.5 - 4.3)	4.7°F (2.4 - 6.7)	6.2°F (2.3 - 8.3)
Warmest Night	61.8°F	1.9°F (-0.1 - 3.6)	2.5°F (0.8 - 3.8)	4°F (1.8 - 7)	5.6°F (1.2 - 3.7)
Daytime Heat Waves	1.4 events	0.9 events (0.3 - 1.8)	1.2 events (0.4 - 1.9)	2 events (1 - 3.1)	2.7 events (1.2 - 3.7)
Nightime Heat Wave	0 events	0.1 events (0 - 0.3)	0.1 events (0 - 0.3)	0.3 events (0 - 0.7)	0.6 events (0 - 1.4)

Source: Oregon Climate Change Research Institute, 2023

Heatwaves are extremely dangerous and are the leading cause of weather-related deaths in the United States. As extreme heat events have been historically rare in Oregon, many residents do not have air conditioning in their homes, leaving them more vulnerable to heat-related illnesses and possible death. More vulnerable populations include children, the elderly, economically disadvantaged communities, those working outdoors, such as in agriculture or forestry, and people with preexisting conditions. Projected demographic changes, such as an increase in the proportion of older adults, will increase the number of people in some of the populations that are most vulnerable to extreme heat.

[36] OCCRI, Future Climate Projections Douglas County, 2023

Flood

Flood Summary	
Hazard Ranking	
6 out of 12	
Probability	**Updates Made**
County: High Coastal: High Central: High Cascades: High	- Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorproated - DOGAMI Risk Report data and findings incorporated - High Hazard Potential Dams Identified - NFIP data updated
Vulnerability	**Locations**
County: Moderate Coastal: High*** Central: High*** Cascades: Moderate	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 6 Flood Profile

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 can bring intense rainfall.

Floods occur in Douglas County during periods of heavy rainfall, with low-lying areas at particular risk of flooding. The flooding of developed areas may also occur when the amount of water generated from rainfall and runoff exceeds a storm water system's (ditch or sewer) capacity.

Two types of flooding primarily affect Douglas County: riverine flooding and urban flooding. They are described in the following, along with a third possible, though less likely type of flooding – dam-failure flooding.[37]

Riverine Flooding

Riverine flooding is the overbank flooding of rivers and streams and is a natural process that adds sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers.

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated by the 100-year flood (floods with a 1 percent chance of occurring in one year) with flood depths of only one to three feet. These areas are generally flooded by low velocity sheet flows of water.

[37] Severe Weather 101: Flood Types (noaa.gov)

Urban Flooding

As land is developed and converted from fields or woodlands to roads, parking lots, and structures, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin, leading rainfall to collect and flow faster on impervious concrete and asphalt surfaces. This renders these systems unable to absorb rainfall properly back into the ground. Adding these elements to the hydrological systems can result in floodwaters that rise very rapidly and peak with violent force.

The majority of Douglas County is rural in nature, with a low percentage of urbanized land. However, much of the population lives within cities or urban unincorporated areas that have high concentrations of impermeable surfaces that either collect water or concentrate the flow of water. During periods of urban flooding, streets carry water to culverts, leading to culverts and storm drains sometimes backing up with vegetative debris and causing localized flooding.

Dam Failure Flooding

Loss of life and damage to structures, roads, utilities, and crops may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects could possibly accompany the failure of one of the major dams in Douglas County. Six major water impoundment dams have been developed in Douglas County to serve flood control and water needs. Because dam failure can have severe consequences, FEMA requires applicable dam owners to develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions (see Chapter 2, Built Environment Profile for further information). County officials may participate in the development of the EAP, however, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner. Eight dams were identified as having high hazard potential to the community if they were to fail, either mechanically or structurally.

Additionally, a new program was added under the FEMA National Dam Safety Program – Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program. This grant is geared towards dams that are identified as High Hazard Potential, which is a classification standard for any dam whose failure or mis-operation will cause loss of human life and significant property destruction[38]. Douglas County has three (3) eligible high-hazard dams, which are noted in Table 47**.**

For more detailed information regarding dam failure flooding, and potential flood inundation zones for a particular dam in the County, please refer to Chapter 2: Community Profile, Section Built Environment Section, or the Douglas County Emergency Action Plan, only available through Oregon Water Resources Department (OWRD) or through the relevant city, county, or tribal emergency managers, for first responders.

[38] Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program | FEMA.gov

Table 47 High Hazard Potential Dams in Douglas County

High Hazard Dam Name	Condition	Owner Type	EAP Prepared
Winchester	Poor	State Regulated	Yes
Wageman**	Poor	State Regulated	Yes
Bear Creek 3	Poor	State Regulated	No
Hayhurst Road	Poor	State Regulated	Yes
Berry Creek	Fair	State Regulated	No
Cooper Creek (Sutherlin)	Fair	State Regulated	No
Paris	Fair	State Regulated	No
Plat I	Satisfactory	State Regulated	No
Updegrave	Satisfactory	State Regulated	No
Clearwater No 2 Forebay	Not Available	State Regulated	No
Creekside Development Dam No. 1	Not Available	Federal	No
Creekside Development Dam No. 3	Not Available	Federal	No
Galesville	Not Available	Federal	No
Lemolo No 1	Not Available	Federal	No
Soda Springs	Not Available	Federal	No
Toketee	Not Available	Federal	No

Source: Oregon Water Resources Department, 2023

Location and Extent

As Douglas County spans a wide range of climatic and geologic regions, there is considerable variation in precipitation, with elevation being the largest factor in precipitation totals. In Douglas County, which is almost entirely within the Umpqua River basin, there are over 320 miles of river or major streams that flow through Douglas County, with an estimated 24,396 acres of land in the 100-year floodplain. The surface materials susceptible to flooding include poorly drained, unconsolidated, fine-grained deposits of silt, sand, and gravel. Torrential flood events can introduce large deposits of sand and gravel that assist in the drainage of the otherwise poorly drained soils.

Furthermore, floods can be of extreme magnitudes in confined locations, such as canyons, or a costly nuisance, as in broad river valleys. The topography and geology of the Umpqua River Basin are conducive to runoff, and peak flows on many of the tributaries occur within hours of the passage of weather fronts. Historically, the highest flows usually occur during the period from November through March because of the heavy rains augmented by snow melts.

Flooding extent is also determined by the amount of precipitation within an area. As Douglas County spans from the Pacific Ocean to Mt. Thielsen in the Cascade Range, there is considerable variation in precipitation, with elevation being the largest factor in precipitation totals.

During the rainy season, monthly rainfall totals average far higher than other months of the year (as shown in Table 51). This results in high water, particularly in December and January. High water is usually 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.

Table 51 Average Monthly Mean Rainfall for Sites in Douglas County, Oregon (Inches)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Drain	7.2	6.13	5.28	3.81	2.52	1.3	0.46	0.87	1.38	3.25	7.79	7.87	47.86
Elkton	8.09	6.97	6.05	3.92	2.42	1.1	0.35	0.68	1.45	3.29	8.89	9.29	52.5
Glendale	8.5	4.48	3.63	2.39	2.14	1.15	0.34	0.36	1.03	3.12	5.82	7.53	36.09
Idleyld Park	9.01	7.51	6.99	5.29	3.52	1.88	0.74	1.08	2.03	4.58	10.41	10.32	63.36
Oakland	5.66	4.97	3.92	3.37	2.39	1.25	0.6	0.7	1.29	2.97	6.46	6.48	40.2
Myrtle Creek	5.16	4.51	3.98	3.41	2.62	1.35	0.57	0.59	1.09	2.82	6.57	6.36	37.01
Riddle	4.7	3.86	3.51	2.42	1.56	0.86	0.38	0.62	1.01	2.15	5.2	5.28	31.55
Roseburg	4.97	4.1	3.81	2.75	1.82	0.92	0.44	0.67	1.07	2.27	5.42	5.42	33.66
Toketee Falls	6.61	5.55	5.44	4.26	3.07	1.75	0.8	1.13	1.63	3.55	7.65	7.41	48.85
Winchester	5.14	4.47	3.97	2.94	1.93	0.98	0.4	0.65	1.14	2.41	5.89	5.81	35.73

Source: Oregon Climate Service

Douglas County enjoys a mild winter, with average temperatures not falling below 37 degrees Fahrenheit. The higher elevations (>2,500 feet) in Eastern Douglas County have snow for most of the winter months. Snowmelt in the Cascades and North Umpqua Basin provide a continuous water source throughout the year and can be a major contributor to high waters.

History

Douglas County has several small tributaries in both unincorporated and incorporated areas that are susceptible to flooding. Major floods have affected the residents of the County throughout the centuries, with the earliest documented records detailing the occurrence of the "Great Flood" of 1861-1862 that washed away lower Scottsburg. Table 52 illustrates major flood events in Douglas County. Although the 1996 floods were devastating to the entire region, the floods of 1890, and 1964 were larger. Table 53 shows documented flood crests throughout the County for major flooding events since 1955.

Table 52 Major Flood Events in Douglas County since 1861

Years with Established Flood Records:
1861, 1890, 1893, 1907, 1909, 1927, 1931, 1932, 1942, 1945, 1948, 1950, 1953, 1955, 1956, 1958, 1961, 1964, 1971, 1974, 1981, 1983, 1996 The floods which occurred in 1945, 1955, 1961, 1964, 1971, 1974, 1974, 1981, 1983, and 1996 represent when the North, South and Main Umpqua, Cow Creek, Deer Creek, Elk Creek and Calapooya Creek were at or above established flood levels, representing moderate to major flooding.

Source: Floodplain Management Information Guide-Douglas County

Table 53 Flood Crest Comparisons

Station Name	Flood Stage	1950	1955	1961	1964	1971	1974	1981	1983	1996	1998	2005
South Umpqua River at Tiller	18.0'	22.35'	20.85'	16.53'	25.72'	18.46'	18.36'	18.37'	16.80'	17.08'	15.87'	18.40'
South Umpqua River near Riddle	19.0'	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20.09'	15.18'	20.38'
South Umpqua River at Winston	26.0'	32.4'	31.55'	25.50'	34.28'	30.62'	32.64'	28.74'	30.32'	28.46'	18.18'	26.63'
South Umpqua River at Roseburg	22.0	N/A	29.20'	N/A	34.05'	27.83'	30.50'	24.90'	27.70'	26.29'	17.54'	23.80'
Deer Creek near Roseburg	10.0'	13.38'	13.67'	12.45'	11.88'	13.43'	12.73'	15.39'	14.29'	13.96'	12.76'	13.68' 13.44'
Cow Creek Below McCullough Creek	12.0'	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14.56'	7.39'	12.85'
Cow Creek near Azalea	10.0'	14.37'	12.76'	9.13'	15.63'	11.80'	16.40'	14.94'	14.78'	N/A	N/A	N/A
Cow Creek near Riddle	22.0'	28.50'	27.35'	17.57'	27.67'	25.01'	28.17'	24.42'	26.79'	22.45'	12.90'	20.42'
Steamboat Creek	10.0'	N/A	17.96'	14.61'	25.60'	16.66'	12.23'	16.74'	12.27'	11.78'	14.28'	17.76'
North Umpqua below Steamboat	20.0'	N/A	N/A	N/A	N/A	N/A	16.92'	24.30'	18.06'	17.91'	20.85'	25.65'
North Umpqua near Winchester	26.0'	N/A	29.14'	24.70'	34.20'	26.39'	23.36'	25.25'	20.89'	20.61'	20.18'	23.25'
North Umpqua at Winchester Dam	18.0'	N/A	19.80'	N/A	24.20'	18.20'	15.70'	18.70'	16.30'	16.20'	17.05'	N/A
Calapooya Creek near Oakland	14.0'	N/A	20.47'	21.55'	20.72'	18.60'	18.72'	20.83'	19.16'	18.42'	N/A	19.06'
Umpqua River near Elkton	33.0'	44.20'	46.00'	40.10'	51.95'	43.63'	44.20'	39.18'	37.53'	39.42'	31.29'	39.59'
Elk Creek near Drain	16.0'	N/A	19.06'	20.26'	19.48'	14.24'	18.76'	21.97'	17.50'	15.40'	11.71'	17.46'
Lookingglass Creek	18.0'	N/A	24.93'	19.51'	25.28'	17.59'	14.28'	17.71'	17.93'	15.72'	N/A	N/A

Source: Floodplain Management Information Guide-Douglas County

Flood Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a flood is "high",** meaning one incident is likely within the next 10 to 35-year period This rating exists for all regions in the County, with the Cascades region having only a slightly lower probability rating compared to the Central and Coastal regions*. This rating has not changed since the previous NHMP.*

FEMA's Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs) are the most widely used indicators of the probability of flooding. FIRMs depict the inundation area of a flood with a 1% chance of occurring in any year (also known as "base flood" or "100-year flood") as well as inundation area of a flood with a 0.2% chance ("500-year flood), areas where the probability of flooding is unknown, and base flood elevations (BFEs) where they have been calculated. BFE is the projected depth of floodwater at the peak of a base flood, generally measured as feet above sea level. It is important to recognize that floods occur more frequently near the flooding source. Information regarding the probability of flooding at a given location in the regulated flood zones is provided by Flood Insurance Studies (FIS) for large watersheds. FEMA does not provide information about floods emanating from small watersheds (less than one square mile), or for floods caused by local drainage issues. Probability for these types of flood is, as a result, difficult to obtain.)

Flood Hazard Map of Douglas County is located below, under the DOGAMI Risk Report for Flooding.

Vulnerability Assessment

The Steering Committee rated the County as having a **"moderate" vulnerability to flood hazards**, meaning that between 1-10 percent of the unincorporated County's population or assets would be affected. However, across the different regions, the vulnerability is rated as **moderate** to **high**. Vulnerability to flooding is highest in the Coastal region while it is lowest in the Cascades region. Most of the County's population lives in the Central region where several sources of potential riverine flooding exist. The Central region has a high vulnerability rating for floods. *This rating has not changed since the previous NHMP.*

The vulnerability assessment is conducted by combining 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. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, 500-year events) are not readily available, calculating a community's vulnerability to flood events is not straightforward. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

When structures or fill are placed in the floodway or floodplain, water is displaced and can exacerbate flooding. Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. When structures or materials are added to the floodway or floodplain and no fill is removed to compensate, serious problems can arise. Floodwaters may be forced away from historic floodplain areas, and as a result, other existing floodplain areas may experience floodwaters that rise above historic levels.

Over half of Douglas County's population lives in rural areas outside of cities, often close to or adjacent to a river. The portion of the population that lives in urban areas also often live close to a river. This leads to large amounts of development, both residential development and the utilities and infrastructure that supports these residents, alongside these rivers, which are also often within floodplain areas. The residential areas and needed infrastructure are the two most likely components of the community to be impacted by flooding. In the event of a flood, people would be displaced from their homes, and needed infrastructure, water and sewer services, would be damaged.

Additionally, flooding is a public health concern. According to the Centers for Disease Control and Prevention, floodwater poses a variety of potential health risks, including the spreading and exposure to infectious diseases, chemical and electrical hazards, and injuries. Standing water from flooding can also increase insect populations, creating additional risk for insect-borne diseases. If clean-up efforts are delayed in the aftermath of a flood, water-damaged buildings can collect mold or experience sewage leakage, which poses a health risk to building occupants. To minimize these potential risks, it is important to expedite the clean-up and repair of the community impacted by the flood, including repairing water-damaged buildings and other clean-up efforts.

Local governments must require engineer certification to ensure that proposed developments would not adversely affect the flood carrying capacity of the Special Flood Hazard Area (SFHA) when development is occurring within the floodway portion of the floodplain. Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other critical and essential facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand regional flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the

development and implementation of storm water management systems to ensure that these runoff waters are dealt with effectively.

Future Climate Variability – Flood[39]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects the intensity and occurrence of extreme precipitation will increase as the atmosphere warms and holds more water vapor. In Douglas County, the number of days per year with at least 0.75 inches of precipitation is not projected to change substantially. Nevertheless, by the 2050s, the amount of precipitation on the wettest day and wettest consecutive five days per year is projected to increase by an average of 13 percent (range 0–29 percent) and 10 percent (range -3–24 percent), respectively.

Furthermore, winter flood risk at mid- to low elevations in Douglas County, where temperatures are near freezing during winter and precipitation is a mix of rain and snow, is projected to increase as winter temperatures increase. The temperature increase will lead to a rise in the percentage of precipitation falling as rain rather than snow. Regarding vulnerable people and structures within Douglas County, it is estimated that 5 percent of houses in the County are within the 100-year floodplain, and another 7 percent are within the 500-year floodplain.

DOGAMI Risk Report Flood Results

The *Multi-Hazard Risk Report for Douglas County* (DOGAMI, 2023) provides flood hazard analysis summary tables for a loss estimate analysis and an exposure analysis. The loss estimate analysis approximates the loss (in dollars) to buildings from floods, and the exposure analysis calculates the number of buildings, their value, and associated populations exposed to the various flood scenarios.

The loss estimation analysis compares loss across four (4 different) flood scenarios that the community is vulnerable to. These scenarios determine flood risk by identifying the annual probability and potential extent of impact from the flood. The flood scenarios are:

- 10 year (10% annual probability of occurrence)
- 50 year (2% annual probability of occurrence)
- 100 year (1% annual probability of occurrence)
- 500 year (0.2% annual probability of occurrence)

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.

A summary of results is provided below, as well as a breakdown of the estimated losses and projected exposed buildings and residents for the 100-year flood scenario. The name and location of potentially vulnerable critical facilities are listed, as well as a list of identified areas of vulnerabilities throughout the County.

[39] OCCRI, Future Climate Projections Douglas County, 2023

Report Summary

Table 54 shows the results from the *DOGAMI Risk Report for Douglas County* which projects that 100-year flood (1 percent chance) would incur losses of approximately $218 million and cause damage to roughly 0.9 percent of total structures throughout the County. The 100-year flood has traditionally been used as a reference level for flooding and is the standard probability that FEMA uses for regulatory purposes.

Table 54 Countywide 100-Year Flood Result Summary

	Countywide 100-Year Flood Loss				
	Number of Buildings Damaged	Loss Estimate	Loss Ratio	Damaged Critical Facilities	Potential Displaced Population
Douglas County	4,096	$218 million	0.9%	7 of 88	7,252

Source: DOGAMI Douglas County Risk Report, 2023

Exposure Analysis Results

Table 55 provides the estimated exposure of residents and buildings that would be vulnerable to a 100-year flood. Throughout Douglas County, it is estimated that roughly 6.5 percent of residents could be displaced from their homes due to a 100-year flood. 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” Douglas County has the most population at risk (3,116), although the population is dispersed throughout the County.

Additionally, roughly 6.5 percent of the County’s structures, such as homes and businesses, are exposed to flooding. However, around 15 percent of these exposed buildings are not expected to incur damage due to flooding. This can be in part due to structural elevation, or the materials used in the structure’s construction.

Table 55 Flood Exposure Analysis

	Total Number of Buildings	Total Estimated Building Value ($)	1% (100 year) Flood Scenario			
			Potentially Displaced Residents		Exposed Buildings	
			Number	Percent	Number	Percent
Unincorp County (Rural)	39,950	12,117,248	3,116	7.0%	2,500	6.3%
Glide	1,253	404,529	33	2.0%	24	1.9%
Green	3,943	1,170,115	408	6.6%	272	6.9%
Tri-City	2,216	613,037	147	4.9%	102	4.6%
Winchester	1,407	387,530	107	4.2%	52	3.7%
Winchester Bay	444	72,506	9	3.1%	33	7.4%
Total Unincorporated	49,213	14,764,964	3,819	6.6%	2,983	6.1%
Canyonville	898	274,677	24	1.4%	20	2.2%
Drain	589	226,400	441	37.6%	231	39.2%
Elkton	142	48,153	33	17.5%	20	14.1%
Glendale	423	127,625	12	1.4%	4	0.9%
Myrtle Creek	1,688	531,074	177	5.0%	120	7.1%
Oakland	512	179,224	0	0.0%	0	0.0%
Reedsport	2,626	667,084	1,064	25.0%	760	28.9%
Riddle	569	174,784	0	0.0%	6	1.1%
Roseburg	9,678	4,226,793	1,569	6.5%	617	6.4%
Sutherlin	3,915	1,332,097	0	0.0%	0	0.0%
Winston	2,406	749,929	107	1.9%	66	2.7%
Yoncalla	635	184,859	0	0.0%	0	0.0%
Total Douglas County	73,294	23,487,663	7,246	6.5%	4,827	6.6%

Source: DOGAMI Douglas County Risk Report, 2023

Loss Estimation

Most buildings exposed to flood throughout the County are expected to be subject to flood damage, regardless of flood type and probability of flood. Table 56 illustrates the projected flood losses due to a 100-year flood scenario, which projects that more than 5.6 percent of the County's buildings would potentially sustain damages, which accounts for almost 1 percent of the total estimated building value in the County. The percentage of exposed buildings is greatest in Drain (28.9 percent) and Reedsport (27.2 percent). The value of losses is greatest in Reedsport ($36.7 million and 5.5 percent loss ratio) and Elkton (4.4 million and 2.8 percent loss ratio).

Table 56 Flood Loss Estimate Analysis

	Total Number of Buildings	Total Estimated Building Value ($)	1% (100 year) Flood Scenario				
			Buildings Loss		Loss Value		Potentially Displaced Residents
			Number	Percent	Value (in thousands of $)	Loss Ratio	Number of Residents
Total Unincorporated	49,213	14,764,964	2,621	5.3%	150,741	1.0%	150,741
Canyonville	898	274,677	14	1.6%	177	0.1%	177
Drain	589	226,400	170	28.9%	4,362	1.9%	4,362
Elkton	142	48,153	20	14.1%	1,369	2.8%	1,369
Glendale	423	127,625	1	0.2%	7	0.0%	7
Myrtle Creek	1688	531,074	109	6.5%	6,980	1.3%	6,980
Oakland	512	179,224	0	0.0%	0	0.0%	0
Reedsport	2626	667,084	713	27.2%	36,691	5.5%	36,691
Riddle	569	174,784	6	1.1%	18	0.0%	18
Roseburg	9678	4,226,793	398	4.1%	15,891	0.4%	15,891
Sutherlin	3915	1,332,097	0	0.0%	0	0.0%	0
Winston	2406	749,929	44	1.8%	1,706	0.2%	1,706
Yoncalla	635	184,859	0	0.0%	0	0.0%	0
Total Douglas County	73,294	23,487,663	4,096	5.6%	217,942	0.9%	217,942

Source: DOGAMI Douglas County Risk Report, 2023

Critical Facility Vulnerability

Table 57 provides an inventory of vulnerable critical facilities that were determined to be within the 1 percent flood zone. Elevating these exposed structures would reduce the potential damage sustained from flooding.

Table 57 Flood Exposed Critical Facilities Inventory

Exposed Critical Facilities - 100 Year Flood - 1% Annual Chance				
Community	**School**	**Hospital**	**Fire Responders**	**Government Buildings**
Drain	-	-	1	-
Myrtle Creek	-	-	1	-
Reedsport	-	-	1	1
Roseburg	1	-	1	-
Total Douglas County	**1**	**0**	**4**	**1**

Source: DOGAMI Douglas County Risk Report, 2023

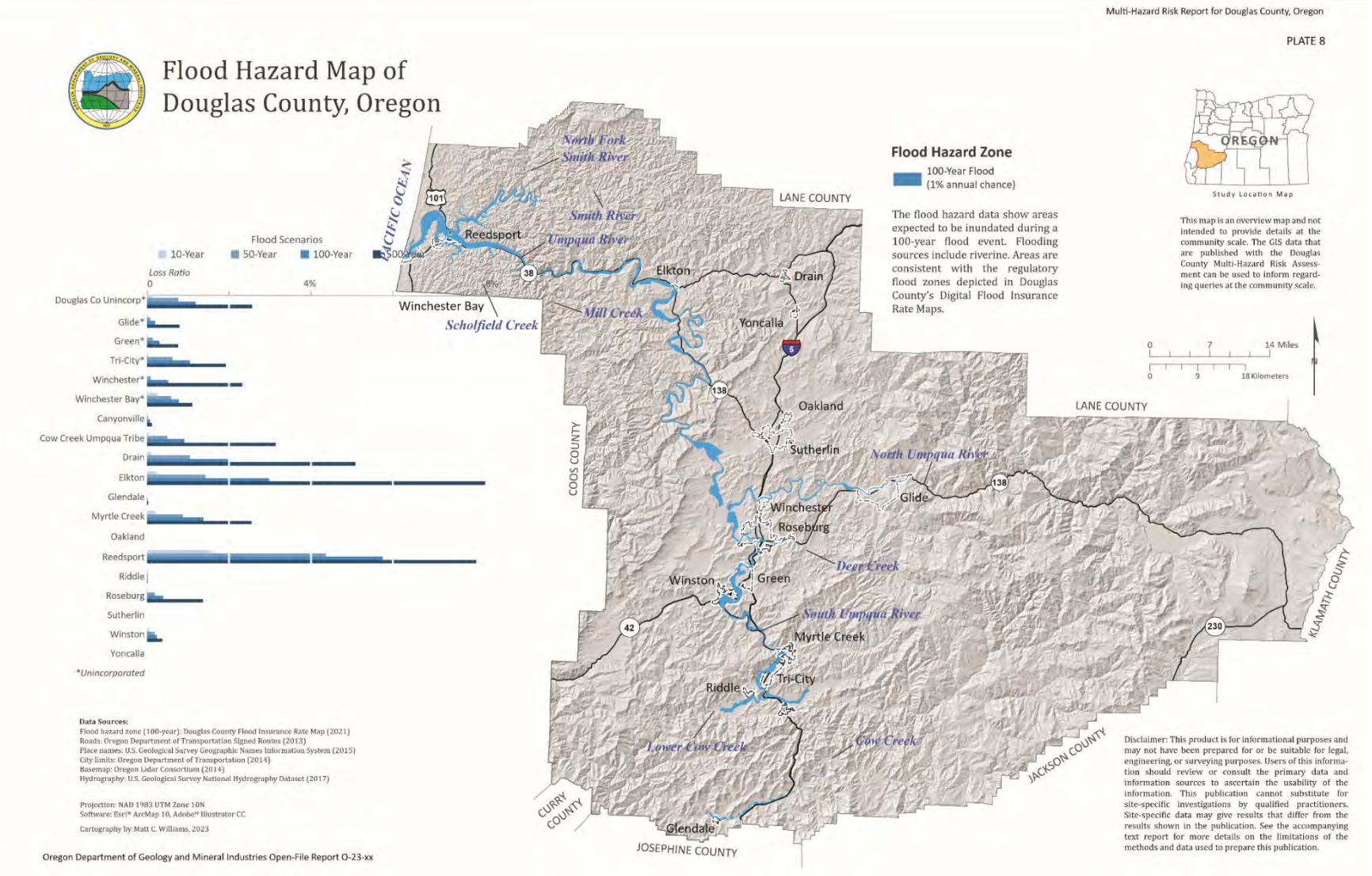
Areas of Significant Vulnerability

Flood hazard (1% annual change) in Douglas County is seen in Figure 30 Flood Hazard Map of Douglas County, and the locations within the study area that are comparatively at greater risk to flood hazard are discussed below:

- Many residential structures along the South Umpqua River in the community of Tri-city are at risk from flooding, as are residential structures in the area where the North and South Myrtle Creek confluence meet.

- All along the South Umpqua River, in the unincorporated county, many farm and residential structures are exposed to flood hazard. This is especially true for the concentration of buildings south of Winston.
- A large area of shallow flooding between South Umpqua River and Roberts Creek in the community of Green is exposed to flood hazard.
- Many areas of shallow flooding along the Umpqua River in Roseburg and one concentrated area of damaging flood area at the Newton Creek confluence.
- The community of Elkton is at risk from flooding along the Umpqua River and Elk Creek confluence.
- A large portion of Reedsport is behind a levee that is undetermined to prevent widespread 100-year flooding within the community. Flood exposure to 760 buildings and over $37 million in potential losses from a 100-year flood is estimated to be within the leveed areas in Reedsport.

Figure 30 Flood Hazard Map of Douglas County



National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) was established in 1968 as a means of providing affordable flood insurance to the nation's flood-prone communities. The NFIP also seeks to reduce flood losses through regulations that focus on building codes and "sound floodplain management." Douglas County joined the NFIP on December 15, 1978. The County's role as an NFIP community requires that the County implement and enforce the NFIP's minimum floodplain management standards. The County has also participated in the Community Rating System (CRS) program historically, which offers discounts to flood insurance premiums for community members for activities beyond the minimum standards that provide additional protection to lives and properties. The County's participation in the CRS has been suspended pending the conclusion of the ongoing Community Assistance Visit (CAV) to which the County is currently subject.

Identification of Flood-Prone Areas - NFIP

Flood maps and Flood Insurance Studies (FIS) are often used to identify flood-prone areas. Douglas County joined the NFIP on December 15, 1978. Douglas County's current FIRM index date is February 17, 2010 for properties inland and March 23, 2021 for coastal communities. NFIP regulations (44 Code of Federal Regulations [CFR] Chapter 1, Section 60.3) require that all new construction in floodplains must be elevated at or above base flood level. The Oregon Building Code requires new construction to be elevated to one foot above the base flood elevation. Communities participating in the NFIP may adopt regulations that are more stringent than those contained in 44 CFR 60.3, but not less stringent.[40]

Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS)

Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A Flood Insurance Rate Map (FIRM) is the official map produced by FEMA, which delineates Special Flood Hazard Areas (SFHA) in communities where NFIP regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

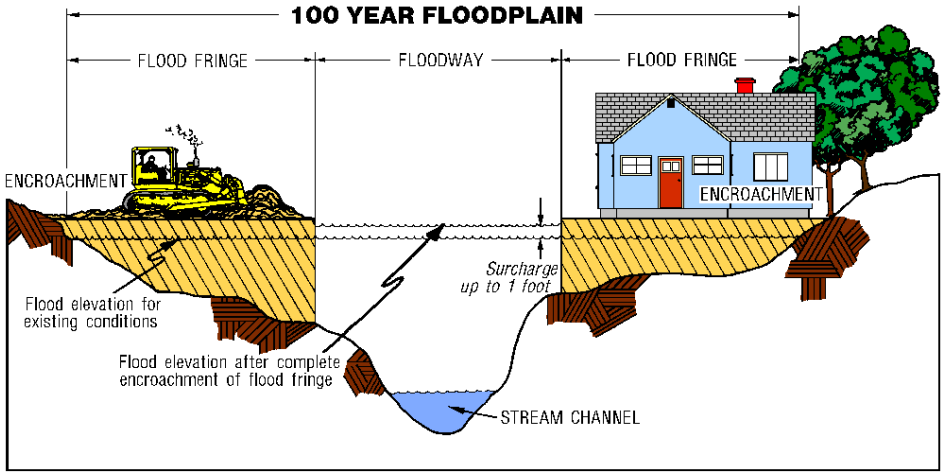
Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases, they also include base flood elevations (BFEs) and areas located within the 500-year floodplain.

Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA.

Communities participating in the NFIP are required to regulate development in Areas of Special Flood Hazard (1% chance), also known as the 100-year flood zone. The FIRMs are also used to rate required flood insurance policies on homes and businesses with federally backed mortgages.

[40] The National Flood Insurance Program (floodsmart.gov)

Figure 31 Floodplain Schematic



Source: US Army Corps of Engineers

NFIP Risk Assessment – Repetitive Loss Properties

FEMA modernized the coastal portion of Douglas County Flood Insurance Rate Maps (FIRMs) in March 2021. The table below shows that as of August 2023, Douglas County (including NFIP participating incorporated cities) has 986 National Flood Insurance Program (NFIP) policies in force. The last Community Assistance Visit (CAV) for Douglas County was in October of 2013. A more recent CAV was made to Winston in 2020. Also, only the cities have had Community Assistance Contacts (CAC), in which Canyonville had the most recent CAC in June 2020. The dates of FIRM maps, CACs, and CAVs can be seen in Table 58.

Table 58 NFIP CAV, CAC, and FIRM Dates

Community	CAC Date	CAV Date	FIRM Date
Douglas County*	-	10/28/2013	3/23/2021
Canyonville	6/24/2020	7/10/1997	2/17/2010
Drain	-	10/23/2013	2/17/2010
Elkton	2/10/2020	4/1/1992	2/17/2010
Glendale	2/10/2020	10/30/2013	2/17/2010
Myrtle Creek*	-	10/29/2013	2/17/2010
Oakland	2/10/2020	4/1/1985	2/17/2010
Reedsport	5/31/2020	9/7/2000	3/23/2021
Riddle	3/5/2020	-	2/17/2010
Roseburg*	5/26/2020	10/28/2013	2/17/2010
Sutherlin	-	-	2/17/2010
Winston	3/11/2020	3/27/1993	2/17/2010
Yoncalla	3/12/2020	-	2/17/2010

Source: Federal Emergency Management Agency, National Flood Insurance Program

The County and the cities of Myrtle Creek and Roseburg are members of the Community Rating System (CRS); the County and Myrtle Creek have Class 10 ratings while Roseburg has a Class 7 rating. Notably, Myrtle Creek is the only city to have repetitive loss properties, with a total of 14 listed repetitive flood-loss properties. The city and County are aware of these properties and have included an action item to seek out funding opportunities to elevate or purchase those properties, pending property owners' interest. flood victims.

Table 59 shows the number of flood insurance properties in Douglas County and the cities, which is a total of 986 policies, including the number of repetitive lost properties. It also lists out the total amount of financial coverage that is provided, which is over $225 million, including the total number of claims made since Douglas County joined the NFIP and the total amount paid out towards these claims. All properties are residential in nature.

Table 59 Flood Insurance Detail

Community	Number of Policies	Number of Repetive Loss Properties	Total Coverage	Total Claims since 1978	Total Paid Since 1978
Douglas County	685	14	$153,415,000	150	$928,739
Canyonville	3	0	$251,000	2	$6,973
Drain	36	0	$6,205,000	39	$472,043
Elkton	2	0	$401,000	1	$8,232
Glendale	4	0	$814,000	0	$0
Myrtle Creek	21	14	$3,676,000	29	$144,557
Oakland	1	0	$350,000	0	$0
Reedsport	45	0	$12,878,000	3	$151,400
Riddle	1	0	$228,000	0	$0
Roseburg	165	4	$42,296,000	30	$100,855
Sutherlin	8	0	$2,229,000	0	$0
Winston	15	0	$3,041,000	3	$1,671
Yoncalla	0	0	$0	1	$21,066
Total	986	32	$225,784,000	258	$1,835,536

Source: Federal Emergency Management Agency, National Flood Insurance Program

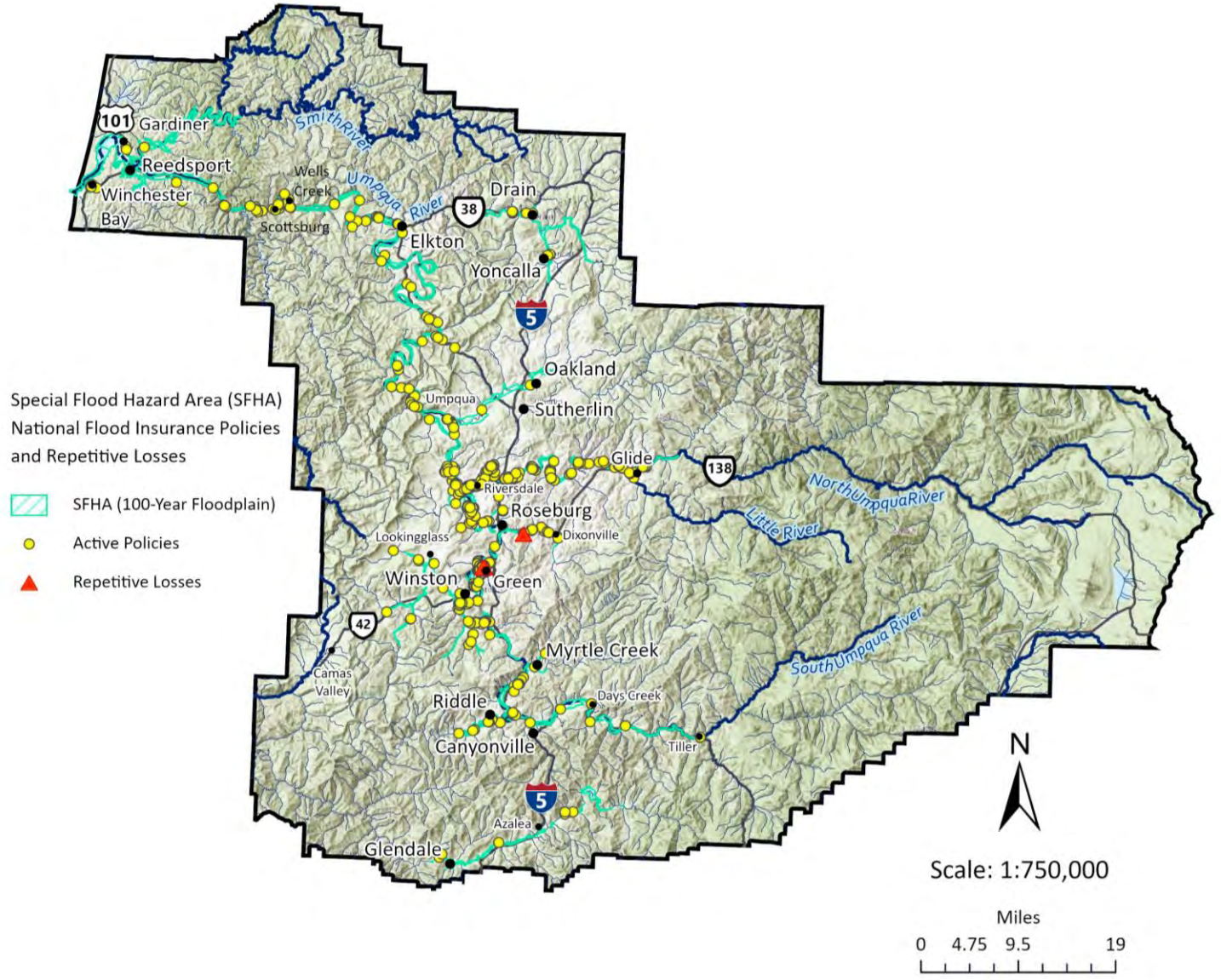
Since 1978, there have been a total of 258 paid claims in the County totaling just over $1.8 million. As noted above, there are 32 Repetitive Loss (RL) Properties[41] located in Douglas County – 14 in unincorporated Douglas County, 14 in Myrtle Creek, and 4 in Roseburg. There are no Severe Repetitive Loss Properties in Douglas County[42].

Figure 31 shows the SFHA throughout Douglas County, including the general locations of the active flood insurance policies and general location of repetitive loss properties.

[41] 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.

[42] 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.

Figure 31 Douglas County SFHA, NFIP Policies, and Repetitive Loss Properties



Source: Douglas County GIS, 2023

compliant NFIP Douglas CountyPlanning Departmenta staffis awho is

The County's Floodplain Administrator also manages these programs for many of the Cities, including ____.

Roseburg administers this program through their Community Development Director, Stuart Cowie. The city of Drain contracts the City of Cottage Grove to provide planning and administration services.

Mitigation Successes

Douglas County has worked with FEMA and property owners to successfully mitigate four repetitive loss (RL) properties to qualify them to be removed from the RL list. Repetitive Loss Update Worksheets (AW-501) were completed for all 4 structures. The fourth and final RL structure was updated in December of 2015. As of 2023, all but the most recent (2015) RL is considered mitigated by FEMA. Since 2015, no other repetitive loss structures exist within unincorporated Douglas County.

Future Opportunities for Flood Mitigation

Future flood mitigation strategies and projects can focus on several areas, including:

- Purchasing properties within known floodplains.
- Encourage the purchase of flood insurance.
- Craft and enforce development codes that support flood resilient structural development.
- Ensure that essential bridges are resilient to flood by potential replacing or updating them.
- Remove development in floodplains and keep space as open green spaces that can act as floodwater storage and drainage.

Douglas County

Landslide

Landslide Summary	
Hazard Ranking	
7 out of 12	
Probability	**Updates Made**
<u>County: High</u> Coastal: High Central: High Cascades: High	- Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorproated - DOGAMI Risk Report data and findings incorporated - DOGAMI Landslide Susceptibility Exposure Report data and findings incorporated
Vulnerability	**Locations**
<u>County: Moderate</u> Coastal: Moderate Central: Moderate Cascades: Moderate	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 7 Landslide Profile

One of the most common and devastating geologic hazards in Oregon is landslides. Average annual repair costs for landslides in Oregon exceed $10 million and individual severe winter storm losses can exceed $100 million.[43] As population growth continues to expand and development into landslide susceptible terrain occurs, greater losses are likely to result.

Characteristics

Landslides are downhill movements of rock, debris, or soil mass. The size and severity of a landslide usually depends on the geology of the area, as does the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil, the length, width, and depth of the area affected, frequency of occurrence, and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials.

Different types of landslides occur depending on the type of origin, failure and their composition and characteristics. However, they are typically broken down into two categories: (1) rapidly moving, and (2) slow moving. Rapidly moving landslides present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides are at increased risk of serious injury.

The velocity of landslides varies from imperceptible to over 35 miles per hour. Some volcanic induced landslides have been known to travel between 50 to 150 miles per hour. Debris flows typically start on steep hillsides as shallow landslides, enter a channel, then liquefy and accelerate. Canyon bottoms, stream

[43] DOGAMI, "Landslide Loss Estimation Pilot Project in Oregon", 2002

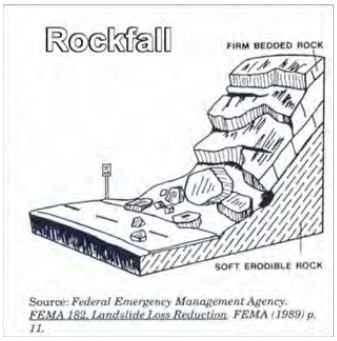
channels, and outlets of canyons can be particularly hazardous. Landslides can move long distances, sometimes as much as several miles.

Slow moving landslides that move downhill slowly are said to “creep”, as its movements are often slow and shallow enough to anticipate its arrival and manage it with adequate effort. Slow moving landslides can occur on relatively gentle slopes and can cause significant property damage but are far less likely to result in serious injuries than rapidly moving landslides.

Rapidly moving landslides are those that can happen rapidly and result in all the soil and rocks on a hillside to be stripped off and filling up the area at the bottom of the slope. Washouts caused by erosion can occur in Douglas County and occur when ditches or culverts beneath hillside roads become blocked with debris. If the ditches are blocked, run-off from slopes is inhibited during periods of precipitation. This causes the run-off water to collect in soil, and in some cases, cause a slide.

There are several different types of landslides, both slow and rapid (see Table 60):

Table 60 Description of Types of Landslides

Landslide Type	Description	Visual
Slides / Rotational	These landslides move in contact with the underlying surface. These movements include rotational slides (see figure ____) where sliding material moves along a curved surface, and translational slides where movement occurs along a flat surface. These slides are generally slow moving and can be deep. Slumps are small rotational slides that are generally shallow	 Source: *Federal Emergency Management Agency. FEMA 182, Landslide Loss Reduction, FEMA (1989) p. 12.*
Rockfall	These occur when blocks of material come loose on steep slopes. Weathering, erosion, or excavations, such as those along highways, can cause falls where the road has been cut through bedrock. They are fast moving with the materials free detached from a steep slope or cliff. The volume of material involved is generally small, but large boulders or blocks of rock can cause significant damage. A motorist was killed from a rock fall in 1993. The 1993 rock fall occurred near Klamath Falls during the 1993 Earthquakes.	 Source: *Federal Emergency Management Agency. FEMA 182, Landslide Loss Reduction, FEMA (1989) p. 11.*
Earthflow	These are liquid movements of landmass (e.g. soil and rock), which breaks up and flows during movement. Earthquakes are often the mechanism which trigger flows. Debris flows normally occur when a landslide moves downslope as a semi-fluid mass scouring, or partially scouring soils from the slope along its path. Flows are typically rapidly moving and also tend to increase in volume as they scour out the channel. Flows often occur during heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances. One example of a flow in Oregon is the Dodson debris flow that occurred in 1996. This debris flow started high on the Columbia Gorge cliffs, and traveled far down steep canyons to form debris fans at Dodson.	 Source: *Federal Emergency Management Agency. FEMA 182, Landslide Loss Reduction, FEMA (1989) p. 15.*

Source: Federal Emergency Management Agency; Oregon Department of Geology and Mineral Industries

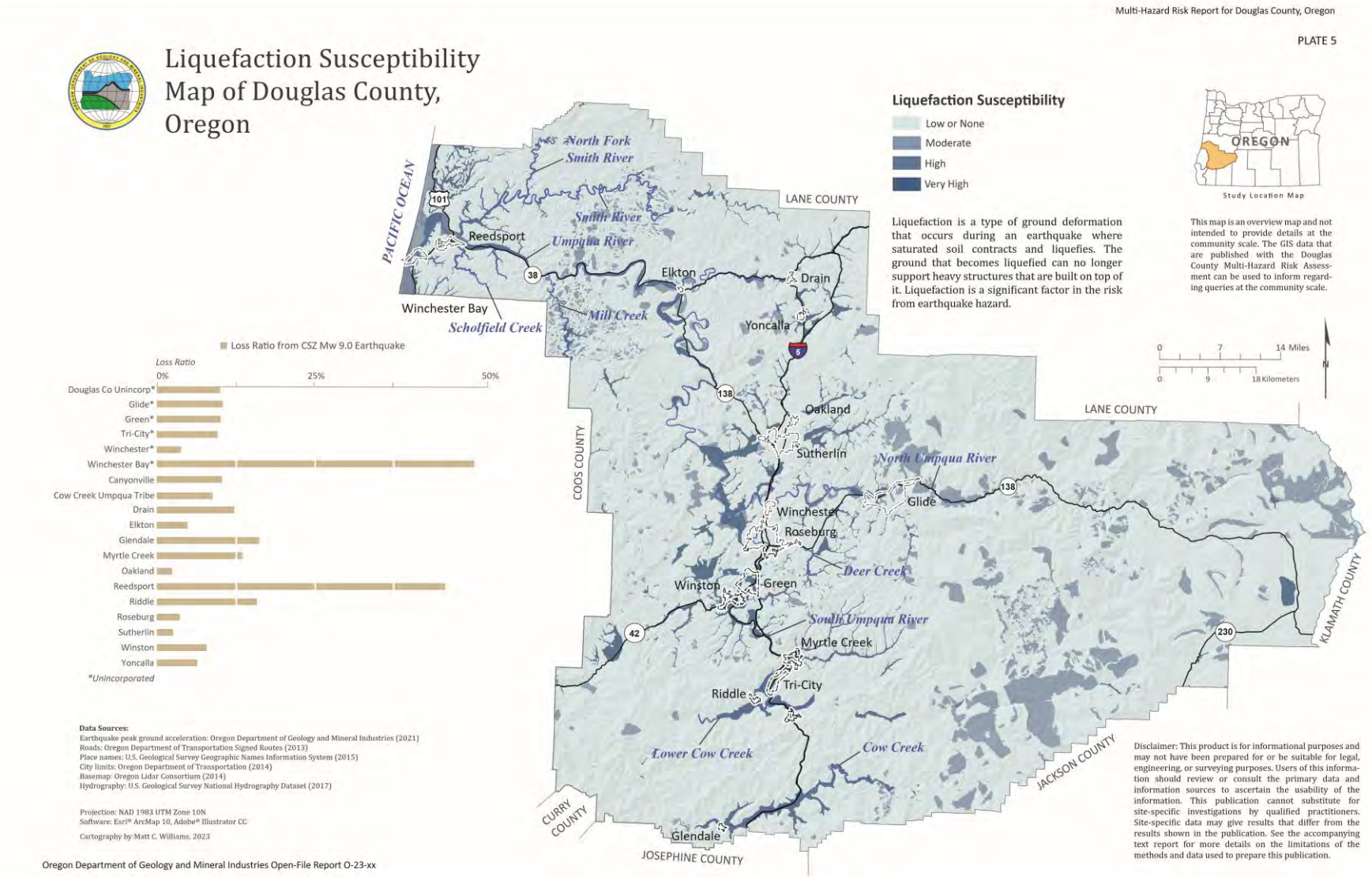
Location and Extent

Landslides are typically triggered by periods of heavy rainfall or rapid snowmelt, as well as earthquakes, volcanic activity, and excavations. Certain geologic formations are more susceptible to landslides than others, and landslides on steep slopes are more dangerous because their movement can be rapid. Although landslides are a natural geologic process, the incidence of landslides and their impacts on people can be exacerbated by human activities. Grading for road construction and development can increase slope steepness and decrease the stability of a hill slope by adding weight to the top of the slope, as well as removing support at the base of the slope, and increasing water content. Other human activities affecting landslides include excavation, drainage and groundwater alterations, changes in vegetation, as well as burn scares left from wildfires.

be less than 10 years. Slope alterations can greatly affect recurrence intervals for all types of landslides, and also cause landslides in areas otherwise not susceptible. Most slopes in Western Oregon steeper than 30 degrees (about 60%) have a risk of rapidly moving landslide activity regardless of geologic unit. Areas directly below these slopes in the paths of potential landslides are at risk as well.

For Douglas County, many potential areas for a landslide are in hilly-forested areas (Figure 32). Landslides in these areas may damage or destroy some timber and impact logging roads. Many of the major highways in Douglas County are at risk of landslides at one or more locations with a high potential for road closures and damage to utility lines. Especially in the easter portions of the County, with a limited redundancy of road network, such road closures may isolate communities.

Figure 32 Douglas County Landslide Susceptibility



The Oregon Department of Geology and Mineral Industries (DOGAMI) has been active in developing maps and collecting data on hazard risk. The final products might be useful for local geologists, engineers, planners, and policy makers interested in addressing landslide hazards. One of these products is the Statewide Landslide Information Database for Oregon (SLIDO). SLIDO is a compilation of landslides in Oregon that have been identified on published maps which allow users to view information on location, type, and other attributes related to identified landslides in the area.

Landslides can affect utility services, transportation systems, and critical facilities. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs, and the loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes may also be at risk of breakage from landslide movements as small as a few inches. These disruptions of infrastructure, roads, and critical facilities can have a long-term effect on the economy of the local community, as well as its ability to return to normal operation.

Table 61 show landslide susceptibility exposure for Douglas County and its incorporated cities. Approximately 67 percent of the County land has high or very high landslide susceptibility exposure. Douglas County cities have wide range of percentages of high and very high landslide exposure susceptibility (the highest in Canyonville with 28.3 percent to the lowest in Yoncalla with 1.6 percent).

Table 61 Landslide Susceptibility Exposure of Oregon and Douglas County

	Sq Ft	Landslide Susceptibility Exposure, ft^2				Landslide Susceptibility Exposure, %			
		Low	Moderate	High	Very High	Low	Moderate	High	Very High
Douglas County	141,317,397,747	12,133,858,652	34,455,769,154	86,836,593,291	7,891,176,650	8.6%	24.4%	61.4%	5.6%
Canyonville	26,805,376	11,220,310	7,987,898	7,597,168	-	41.9%	29.8%	28.3%	-
Drain	17,288,670	8,406,291	6,081,609	2,800,769	-	48.6%	35.2%	16.2%	-
Elkton	5,644,785	-4,115	5,373,344	275,556	-	-0.1%	95.2%	4.9%	-
Glendale	10,965,472	5,556,607	3,793,202	1,615,663	-	50.7%	34.6%	14.7%	-
Myrtle Creek	68,324,272	28,436,449	25,831,232	13,122,283	934,307	41.6%	37.8%	19.2%	1.4%
Oakland	20,565,744	11,379,823	7,687,585	1,498,336	-	55.3%	37.4%	7.3%	-
Reedsport	63,755,190	30,629,256	17,448,299	15,677,636	-	48.0%	27.4%	24.6%	-
Riddle	17,157,224	9,676,307	5,325,983	2,154,935	-	56.4%	31.0%	12.6%	-
Roseburg	296,511,002	183,883,902	74,873,761	35,088,195	2,665,144	62.0%	25.3%	11.8%	0.9%
Sutherlin	176,078,361	88,751,832	59,725,710	27,600,819	-	50.4%	33.9%	15.7%	-
Winston	72,606,099	30,059,591	10,319,361	32,227,148	-	41.4%	14.2%	44.4%	-
Yoncalla	18,183,525	15,602,339	2,289,484	291,702	-	85.8%	12.6%	1.6%	-

Source: Oregon Department of Geology and Mineral Industries, 2016

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.

History

Landslides may happen at any time of the year. Debris flows and landslides are a very common occurrence in hilly areas of Oregon, including portions of Douglas County. Many landslides occur in undeveloped areas and thus may go unnoticed or unreported. For example, DOGAMI conducted a statewide survey of landslides from four winter storms in 1996 and 1997 and found 9,582 documented landslides, with the actual number of landslides estimated to be many times the documented number. For the most part, landslides become a problem only when they impact developed areas and have the potential to damage buildings, roads, or utilities.

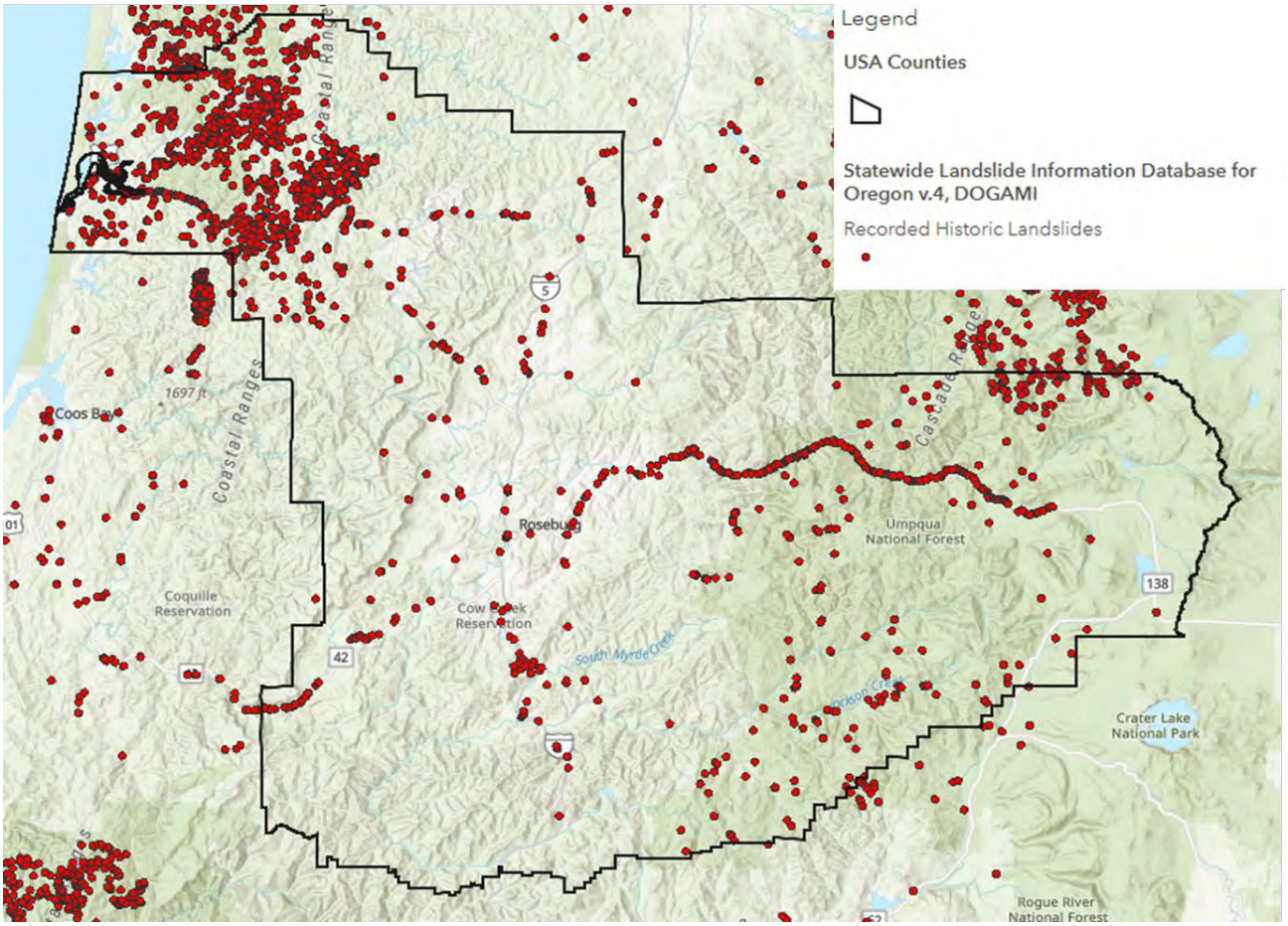
Figure 33 2016 Tyee Rd. Rockslide

Douglas County has had a history of significant landslides occurring in the area, seen in Figure 34**.** In 1974, nine men were killed by a rapidly moving landslide near Canyonville. The men were attempting to repair the main telephone cable between Portland and Sacramento along the I-5 Freeway. In the five days before the slide, the area had experienced 11 inches of rain.

In 1996 severe winter storms impacted Douglas County creating widespread flooding. A rapidly moving landslide debris flow killed four people in Scottsburg where a home was picked up and moved from its foundation.

More recently in December of 2015 a massive landslide closed Hwy 42 near the Coos County - Douglas County line for several weeks. Shortly thereafter, in February of 2016 a large rockslide covered the Tyee Rd. blocking access from Tyee to Umpqua.

Figure 34 Douglas County Landslide Inventory



Source: Oregon HazVu: Statewide Geohazards Viewers

Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying bedrock as it, along with climate, dictates hazardous terrain.

Landslide Hazard Assessment

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 10 to 35-year period. This rating exists for all regions in the County and is partially attributable to expected increases in heavy precipitation storms as well as damage to soil integrity resulting from drought, extreme heat, and wildfires. *This rating has increased since the previous NHMP*.

Landslides are a common hazard in and around Oregon. In fact, a prominent theme of the 1996 flood disaster was that a significant amount of building damage affected structures outside of identified flood hazard areas.

The probability of rapidly moving landslide occurring depends on a number of 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.

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

Vulnerability Assessment

The Steering Committee rated the County as having a **"moderate" vulnerability to landslide hazards**, meaning that between 1-10 percent of the unincorporated County's population or assets would be affected by a major disaster. Vulnerability is highest in the Coastal region compared to low to moderate vulnerability in the Central and Cascades regions*. This rating has increased since the previous NHMP*.

As vulnerability assessments assist in predicting how different types of property and population groups will be affected by a hazard, particularly by analyzing at the city or County level by using parcel-specific assessment data on land use and structures, data that includes specific landslide-prone and debris flow locations in the County can be used to assess the population and total value of property at risk from future landslide occurrences.

Landslides can occur on their own or in conjunction with other hazards, such as flash flooding. Depending upon the type, location, severity, and area affected, severe property damage, injuries and loss of life can be caused by landslide hazards. Landslides can damage or temporarily disrupt utility services, block off or damage roads, critical lifeline services such as police, fire, medical, utility and communication systems, and emergency response.

Communities may suffer immediate damage and loss of service. Disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes may also be at risk of breakage from landslide movements as small as an inch or two.

Roads and bridges are subject to closure during landslide events. Because many Douglas County residents, particularly those who are living in rural areas, are dependent on roads and bridges for travel to work or for services only available in urban areas, delays and detours are likely to have an economic impact on county residents and businesses. To evaluate landslide mitigation for roads, the community can assess the number of vehicle trips per day, detour time around a road closure, and road use for commercial traffic or emergency access.

Lifelines and critical facilities should remain accessible if possible, during a natural hazard event. The impact of closed transportation arteries may be increased if the closed road or bridge is a critical lifeline to hospitals or other emergency facilities. Therefore, inspection and repair of critical transportation facilities and routes is essential and should receive high priority. Losses of power and phone service are also potential consequences of landslide events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause landslides, which can have serious impacts on gas lines.

Future Climate Variability – Landslide[44]

The OCCRI *Future Climate Projections Douglas County, Oregon* report states that as the occurrence and intensity of extreme and heavy precipitation increases, the risk of landslides increases. Landslides are often triggered when heavy rainfall saturates soil, they can also be exacerbated by logging activity, road construction, and the damage resulting from previous wildfire events.

DOGAMI Risk Report Landslide Results

The *Multi-Hazard Risk* Report *for Douglas County* (DOGAMI, 2023) provides a landslide exposure analysis. The exposure analysis calculates the number of buildings, their value, and associated populations exposed to the various landslide susceptibility scenarios.

Determining landslide susceptibility, or the likelihood that a landslide would occur in an area, depends on the slope, surficial geology, soil type, and the presence of pre-existing landslides. **Additionally, changing climate, precipitation patterns, land use, wildfire events, and land and forest management strategies may increase or decrease the susceptibility to landslides**. DOGAMI analyzed areas of landslide susceptible to the following scenarios: medium, high, and very high.

The landslide susceptibility scenarios are defined as the following:

- Medium: The area has a combination of factors that may have a moderately adverse influence on slope stability;
- High: The area has a combination of factors that may have a high adverse influence on slope stability;
- Very High: The area has a combination of factors that may have a severe adverse influence on slope stability, including a history of landslide occurrences in the area.

A summary of results is provided below, as well as a breakdown of the projected exposed buildings and residents to a medium landslide susceptibility scenario. The name and location of potentially vulnerable critical facilities are listed, as well as a list of identified areas of vulnerabilities throughout the County.

Report Summary

Table 62 shows the summarized projections from the DOGAMI Risk Report for Douglas County for landslide potential based on the combination of high and very high landslide susceptibility. High and very high susceptibility zones were chosen as the primary scenario to provide a general sense of community risk for planning purposes. These susceptibility zones represent areas most susceptible to landslides with the highest impact to the community.

The DOGAMI report states that a landslide between high and very high landslide susceptibility would incur losses of approximately $2.3 billion and cause damage to roughly 12 percent of total structures throughout the County, which would incur financial losses of approximately 10 percent of the total building value.

[44] OCCRI, Future Climate Projections Douglas County, 2023

Table 62 Landslide Susceptibility Result Summary

	Countywide Landslide Exposure (High and Very High susceptibility)				
	Number of Buildings Exposed	Exposure Value	Percentage of Exposure Value	Critical Facilities Exposed	Potential Displaced Population
Douglas County	8,839	$2.3 billion	9.9%	4 of 88	12,287

Source: DOGAMI Douglas County Risk Report, 2023

Landslide Exposure Analysis

All the communities in Douglas County are exposed to some level of landslide risk, as seen in Table 63. Those with development in areas of moderate to steep slopes or at the base of steep slopes are at greater risk. Countywide, over 12 percent of buildings are in areas that are subject to high or very high susceptible to landslides. Almost half of all buildings in Winston and over one third of buildings in Tri-City are in areas of very high susceptibility to landslides. The value of these exposed buildings in both of these communities' total over $500 million.

Table 63 Landslide Exposure Analysis

	Total Number of Buildings	Total Estimated Building Value ($)	Landslide Susceptibility			
			Exposed Buildings		Value of Loss	
			Number	Percent	Value (in thousands of $)	Loss Ratio
Unincorp County (Rural)	39,950	12,117,248	5,365	13.4%	1,318,221	10.9%
Glide	1,253	404,529	189	15.1%	50,153	12.4%
Green	3,943	1,170,115	542	13.7%	158,649	13.6%
Tri-City	2,216	613,037	769	34.7%	214,817	35.0%
Winchester	1,407	387,530	24	1.7%	8,824	2.3%
Winchester Bay	444	72,506	54	12.2%	6,187	8.5%
Total Unincorporated	49,213	14,764,964	6,943	14.1%	1,756,851	11.9%
Canyonville	898	274,677	40	4.5%	10,753	3.9%
Drain	589	226,400	24	4.1%	6,237	2.8%
Elkton	142	48,153	3	2.1%	769	1.6%
Glendale	423	127,625	21	5.0%	4,945	3.9%
Myrtle Creek	1,688	531,074	27	1.6%	8,666	1.6%
Oakland	512	179,224	7	1.4%	1,976	1.1%
Reedsport	2,626	667,084	138	5.3%	25,268	3.8%
Riddle	569	174,784	2	0.4%	551	0.3%
Roseburg	9,678	4,226,793	382	3.9%	124,802	3.0%
Sutherlin	3,915	1,332,097	93	2.4%	30,251	2.3%
Winston	2,406	749,929	1,153	47.9%	357,217	47.6%
Yoncalla	635	184,859	6	0.9%	1,536	0.8%
Total Douglas County	73,294	23,487,663	8,839	12.1%	2,329,822	9.9%

Source: DOGAMI Douglas County Risk Report, 2023

Critical Facility Vulnerability

Table 64 provides an inventory of vulnerable critical facilities that were determined to be exposed to the high and very high landslide susceptibility scenario.

Table 64 Landslide Exposed Critical Facilities Inventory

Exposed Critical Facilities - High and Very High Landslide Susceptibility				
Community	**School**	**Hospital**	**Fire Responders**	**Government Buildings**
Winston	3	-	-	-
Total Douglas County	**3**	**0**	**0**	**0**

Source: DOGAMI Douglas County Risk Report, 2023

Areas of Significant Vulnerability

These locations within the study area are comparatively at greater risk to landslide hazard:

- Many residential buildings in the southern part of the community of Tri-City are located on an existing landslide (as is currently mapped) and is at very high risk from landslide hazard.
- There is significant exposure to landslide hazard for the eastern half of the community of Winston.
- Some communities in Douglas County may be at higher or lower risk than what the data show, lidar-based landslide mapping would provide a better understanding of the risk.

Tsunami

Local Tsunami Summary	
Hazard Ranking	
9 out of 12	
Probability	**Updates Made**
<u>County: Moderate</u> Coastal: Moderate Central: N/A Cascades: N/A	- Tsunami Scoring split into two categories: Distant and Local - Reorganized for clarity and consistency - DOGAMI Risk Report data and findings incorporated - Projected inundation zone maps added for coastal communities for a large CSZ Tsunami
Vulnerability	**Locations**
<u>County: Moderate</u> Coastal: Moderate Central: N/A Cascades: N/A	Douglas County, Elkton, Reedsport

Summary 8 Local Tsunami Profile

Distant Tsunami Summary	
Hazard Ranking	
10 out of 12	
Probability	**Updates Made**
<u>County: High</u> Coastal: High Central: N/A Cascades: N/A	- Tsunami Scoring split into two categories: Distant and Local - Reorganized for clarity and consistency - DOGAMI Risk Report data and findings incorporated
Vulnerability	**Locations**
<u>County: Low</u> Coastal: Low Central: N/A Cascades: N/A	Douglas County, Elkton, Reedsport

Summary 9 Distant Tsunami Profile

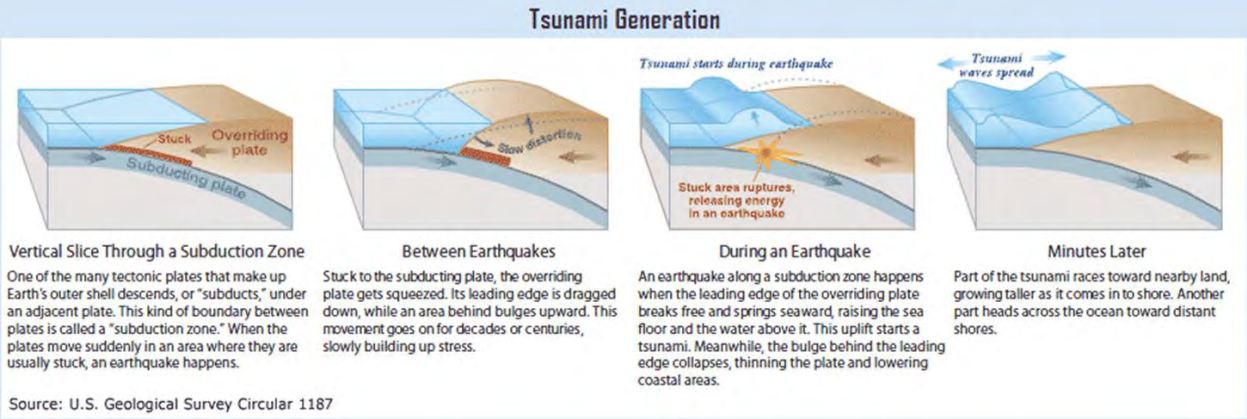
Characteristics

Tsunamis are a low frequency natural hazard in Oregon and are restricted almost exclusively to coastal areas. A tsunami is a series of sea waves usually caused by a rapid vertical movement along a break in the

Earth's crust (i.e., their origin is tectonic). It is generated when a large mass of earth on the bottom of the ocean drops or rises, thereby displacing the column of water directly above it. Tsunamis may also be caused by landslides, including earthquake-induced landslides.

A tsunami can also be caused by a subduction zone earthquake, such as the Cascadia Subduction Zone (CSZ) earthquake. As can be seen in Figure 35**,** the "snapping" of the tectonic plates under the ocean causes the seafloor to rise quickly and the uplift which then causes a tsunami to occur.

Figure 35 How Tectonic Plate Movement Generates Tsunamis



Tsunamis can reach heights exceeding 100 feet. As the waves approach shallow coastal waters, they appear normal and the speed decreases. If the initial disturbance occurs close to the coastline, tsunamis can demolish coastal communities within minutes and large disturbances can cause inundation and destruction thousands of miles away from its epicenter.

Location and Extent

Coastal Douglas County could experience the impacts of either a "local" or "distant" tsunami. A distant tsunami is caused by a distant earthquake, in which the tsunami will not reach the coast for several hours, and there is time to issue a warning. A recent example of a distant tsunami along the Oregon Coast was the 2011 Japan Tsunami, which caused waves above 6.5 feet to crash along the west coast shore.

A local tsunami is generated from a nearby source, typically in which there is less than 1 hour between its origin and when it reaches the shore. In the case of a local tsunami, feeling an earthquake could be the only warning. A tsunami generated by a local offshore earthquake can arrive at the shoreline within 10 to 25 minutes whereas a distant tsunami can take several hours to reach the coast. General evacuation protocol in coastal areas is to follow instructions, signage, and messaging and immediately proceed to high ground. The public is highly encouraged to continually make themselves aware of tsunami warning protocols, establish an evacuation plan, and participate in officially sponsored drills and educational workshops about tsunami risk and evacuations in their communities.

While small-scale tsunamis can result in minimal to no damage, the destructive potential of tsunamis is significant, especially for large tsunamis. In addition to property damage and fatalities, tsunamis can result in the spread of disease and environmental damage. Areas near the coast get flooded with sea water, damaging infrastructure, such as drinking water supplies and water treatment plants. These effects result in water contamination that can cause the spread of diseases, such as malaria. Tsunamis can also affect natural resources, animals, plants, and landscapes. They kill land and sea animals, uproot trees, and

damage onshore habitats. Human waste mixes with toxic substances and hazardous materials, contaminating soil and water.

In the event of a large-scale tsunami, areas directly along the Umpqua River in Winchester Bay, Gardiner, and Reedsport are most at risk of inundation from a-tsunami wave (see Figure 36**)** and could reach even each further into Douglas County along tributaries of the Umpqua River.

Figure 36 Inundation Map of Large Tsunami for Coastal Douglas County

Source: Douglas County Planning

Note: A more detailed and thorough Tsunami inundation and evacuation map is available from DOGAMI, NOAA, and ODEM as part of a local tsunamic evacuation analysis.[45] Using the proposed XXL tsunami inundation zone, this study determined the minimum walking times to safety (defined as ~20 ft beyond the inundation limit) for a moderate walking speed of 4 fps (feet per second, 22 minutes/mile) using the most straightforward path. Four feet per second is the standard speed for pedestrians to cross at signalized intersections.[46] Evacuation paths were limited to roads, trails, and pedestrian pathways designated by local government reviewers as the most likely routes.[47]

[45] DOGAMI tsunami evacuation brochure - Reedsport, Gardiner, Winchester Bay (oregon.gov)

[46] U.S. Department of Transportation, 2012

[47] DOGAMI Open-File Report O-18-05, Tsunami evacuation analysis of Florence and Reedsport, Lane and Douglas Counties, Oregon

History

Since the beginning of the 19th century, tsunamis have been responsible for over 700 fatalities and billions of dollars in damage in the United States and its territories[48]. On the West Coast alone, tsunamis (both local and distant) have resulted in over 25 deaths and almost $250 million dollars in damage[49].

Recent research suggests that tsunamis have struck the Oregon coast on a regular basis historically. They can occur any time of day or night. Typical wave heights from tsunamis occurring in the Pacific Ocean over the last 500 years have ranged between 20 – 65 feet at the shoreline. However, a few waves may have been much higher, as high as 100 feet, due to local conditions along the shoreline.

The most recent event of significance which impacted the state was the 2011 Japan Tsunami resulting from the Tohoku earthquake. This magnitude 9 earthquake generated a tsunami that reached the coast of Oregon in a matter of hours. Minor damage to boats, docks, and harbors was reported along the coast because of this distant tsunami. Significant damage was reported in Brookings-Harbor. While Winchester Bay, Gardiner, and Reedsport saw no major effects of the tsunami, a local tsunami could potentially have greater impact to the community, due to its proximity and strength of the localized wave. Although located upriver from the immediate coastline, these communities are still susceptible to local and distant tsunamis.

Tsunami Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a local tsunami on the Coastal region is "moderate",** meaning at least one incident is likely DOGAMI within the next 35 to 75 years, and determined **the probability of experiencing a distant tsunami on the Coastal region as" high**", meaning at least one incident is likely within the next 10 to 35-year period.

It is difficult to predict the probability of when the next tsunami will occur, but it is estimated that all CSZ generated tsunamis would cause extensive damage, and the last Cascadia Subduction Zone event occurred a little over 320 years ago. Geologists predict a 10-14 percent chance that a CSZ tsunami will be triggered by a shallow, undersea earthquake offshore of Oregon in the next 50 years. The forecast comes from evidence of large but infrequent earthquakes and tsunamis that have occurred at the Oregon coast every 500 years, on average. Other deep ocean earthquakes along the Ring of Fire region (also known at the Pacific rim) may also produce distant tsunamis that impact the Oregon coast. These events also have extended the number of years between events.

Douglas County currently uses tsunami hazard maps that were produced to help implement Senate Bill 379, which 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 inundation zones. The focus of the maps is therefore on implementation of this public safety bill and has minor impacts on land use or emergency planning.

The Department of Geology and Mineral Industries released updated Tsunami Inundation Maps in 2013, which is believed to be a better representation of the tsunami impacts on the community.

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[48] NTHMP - U.S. Tsunami Hazard (weather.gov)

[49] Imid

To help mitigate possible impacts to a tsunami event, Douglas County has adopted a Tsunami Inundation Overlay as part of their Land Use and Development Ordinance (LUDO). The purpose of the Tsunami Inundation Overlay is to implement state legislation and agency rules adopted by the Governing Board of the DOGAMI. The TIO Overlay is intended to reduce the risk of loss of life in the event of a Tsunami inundation. Inundation risks can be reduced by the provision of information and assistance from DOGAMI to developers, and by limiting where essential facilities or special occupancy structures may be located. This overlay also requires that, after land use approval, developers subject to overlay requirements shall submit building plans or proposals to DOGAMI for their review and response prior to receiving a development permit. The Overlay applies to the Tsunami Inundation Zone, as defined in the County LUDO and as depicted in the Comprehensive Plan.

Vulnerability Assessment

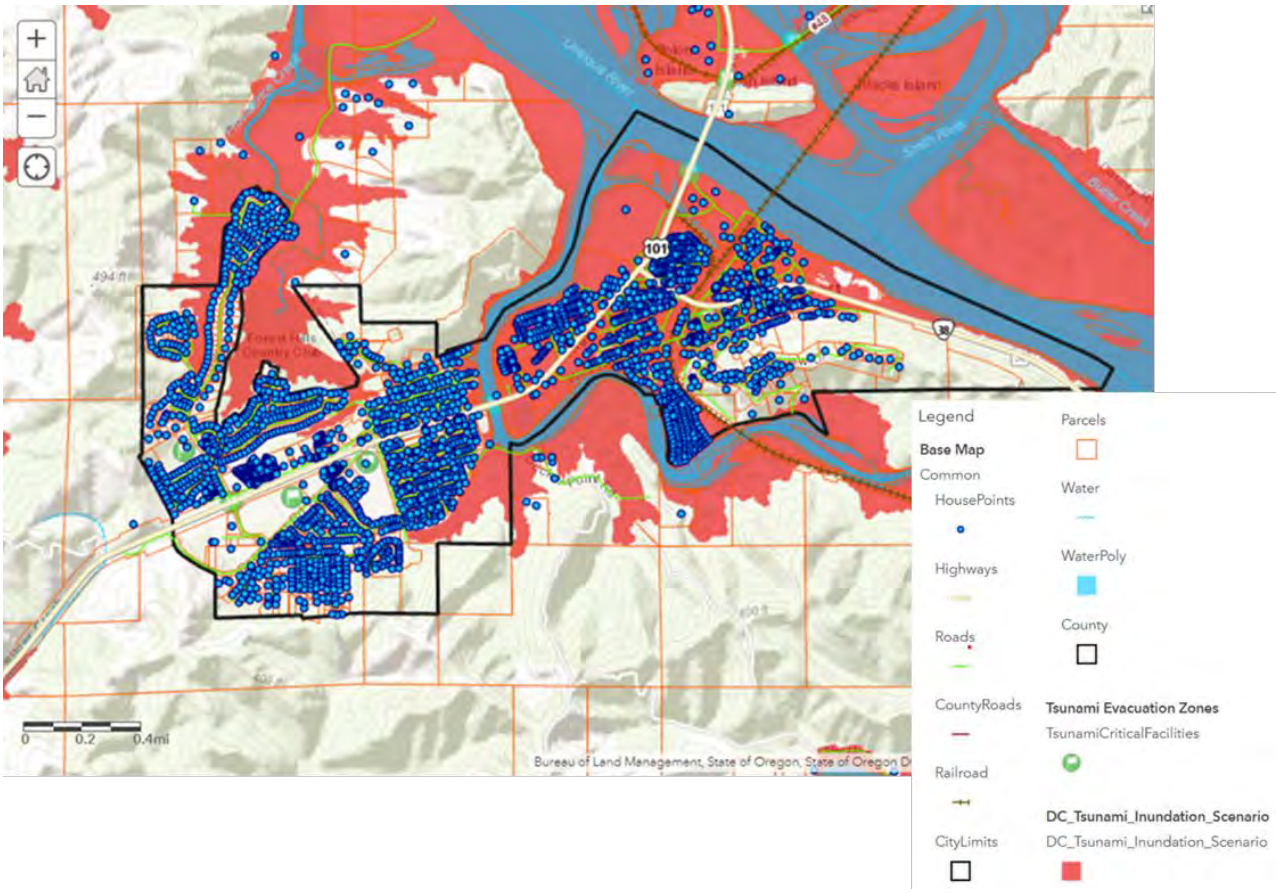
Coastal Douglas County is vulnerable to the threat of tsunamis. Based on the available data and research the Steering Committee determined the **vulnerability of communities to a local tsunami on the Coastal region is "moderate",** meaning at least 1-10 percent of the population will be affected, and determined the **vulnerability of communities to a distant tsunami on the Coastal region is" low",** meaning less than 1 percent of the population will be affected.

Because tsunamis in Oregon typically occur because of earthquakes, the unknown time and magnitude of such events adds to the difficulty in adequately preparing for such disasters. If a major earthquake occurs along the CSZ, a local tsunami could follow within 5 to 30 minutes. Although tsunami evacuation routes have been posted all along the Oregon Coast, damage to bridges and roadways from an earthquake could make evacuation quite difficult even if a tsunami warning were given. In addition, if a major earthquake and tsunami occur during the "tourist season," causalities and fatalities from these disasters would be far greater than if the same events occurred during the winter months.

Much of coastal Douglas County is undeveloped, however populated areas in Winchester Bay, Gardiner, Reedsport and other rural locations along the Umpqua and Smith Rivers and their tributaries could experience the impacts of either a "local" or "distant" tsunami. Distant tsunamis, except for the most extreme events, will not affect significant numbers of residents, since they principally flood beaches and immediate waterfront areas (see the orange zone in Figure 38**).** Loss of life from distant tsunamis will also be far less than for local tsunamis because there will be at least four hours to evacuate prior to wave arrival rather than 15–20 minutes.

For the City of Reedsport, the greatest threat regarding tsunamis is from a local tsunami, such as from a CSZ earthquake generating tsunami. Were such as tsunami to occur the main area most vulnerable to a large tsunami would be the residences and some businesses in proximity to the projected inundation zone (see Figure 37 and Figure 38) In the event of a tsunami, a majority of homes and structures in Reedsport are vulnerable to tsunami induced damage, as well as a number of critical transportation infrastructure, such as bridges, and critical facilities, though there are several critical facilities just out of the inundation zone in the southwest part of the city. An important aspect of tsunami risk in Reedsport is the inundation areas tend to be areas frequented by city residents and visitors.

Figure 37 Reedsport Inundation Zone from Large Tsunami



Source: Douglas County Planning

Figure 38 Tsunami Inundation and Evacuation Map

Source: Department of Geology and Mineral Industries

DOGAMI Risk Report Tsunami Results

The *Multi-Hazard Risk Report for Douglas County* (DOGAMI, 2023) provides a tsunami hazard analysis summary table for a loss estimate analysis based on various locally based tsunami scenarios. The exposure analysis calculates and compares the number of buildings, their value, and associated populations exposed across- four (4) different tsunami scenarios that the coast is vulnerable to. Each tsunami scenario is based on the time interval in which pressure from a subduction zone accumulates (creating a "slip deficit) and the specific amount of seismic slip needed to generate a tsunami, due to the subduction zone megathrust rupture.

The slip deficit time intervals for each local source tsunami scenario are as follows (Priest and others, 2013):

- XX Large: 1,200 years
- X Large: 1,050–1,200 years
- Large: 650–800 years
- Medium: 425–525 years
- Small: 300 years

A summary of results is provided below, as well as a breakdown of the projected exposed buildings and residents to a medium tsunami scenario.

Report Summary

Table 65 shows the summarized projections for a locally generated, medium scenario tsunami. A "Medium" tsunami scenario was chosen for the summary as it best describes the level of risk to communities[51]. A medium scenario tsunami is the most likely to occur triggered by a CSZ event, and would incur both building damages and losses estimated at just over $200 million, not including costs incurred from the accompanying earthquake.

Table 65 DOGAMI Tsunami Summary

	Countywide CSZ Mw-9.0 Tsunami Inundation (Medium tsunami scenario)				
	Number of Buildings Exposed	Exposure Value	Percentage of Exposure Value	Critical Facilities Exposed	Potential Displaced Population
Douglas County	861	$205 million	0.9%	4 of 88	854

Source: DOGAMI Douglas County Risk Report, 2023

Exposure Analysis

Table 66 shows that a medium tsunami will impact almost 2 percent of the buildings in Coastal Douglas County and Coastal Communities (Winchester Bay and Reedsport), with almost half of the buildings in Winchester Bay being impacted. All buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The US Coast Guard - Umpqua River Station (the only critical facility exposed to tsunami risk) is located within the tsunami inundation zone and is expected to be exposed to potential damage.

It is also estimated that almost 1,000 residents will be displaced in the event of a medium tsunami scenario, which accounts for almost 2 percent of the county. The community of Winchester Bay will have almost half of its residents displaced, and the city of Reedsport will have around 15 percent of its residents displaced.

Table 66 Tsunami Exposure Analysis

	Total Number of Buildings	Community Population	Medium Tsunami Scenario			
			Exposed Buildings		Potentially Displaced Residents	
			Number	Percent	Number	Percent
Unincorp County (Rural)	39,950	44,535	152	0.4%	99	0.2%
Winchester Bay	444	276	219	49.3%	128	46.4%
Reedsport	2,626	4,252	490	18.7%	626	14.7%
Total Douglas County	43,020	49,063	861	2.0%	853	1.7%

Source: DOGAMI Douglas County Risk Report, 2023

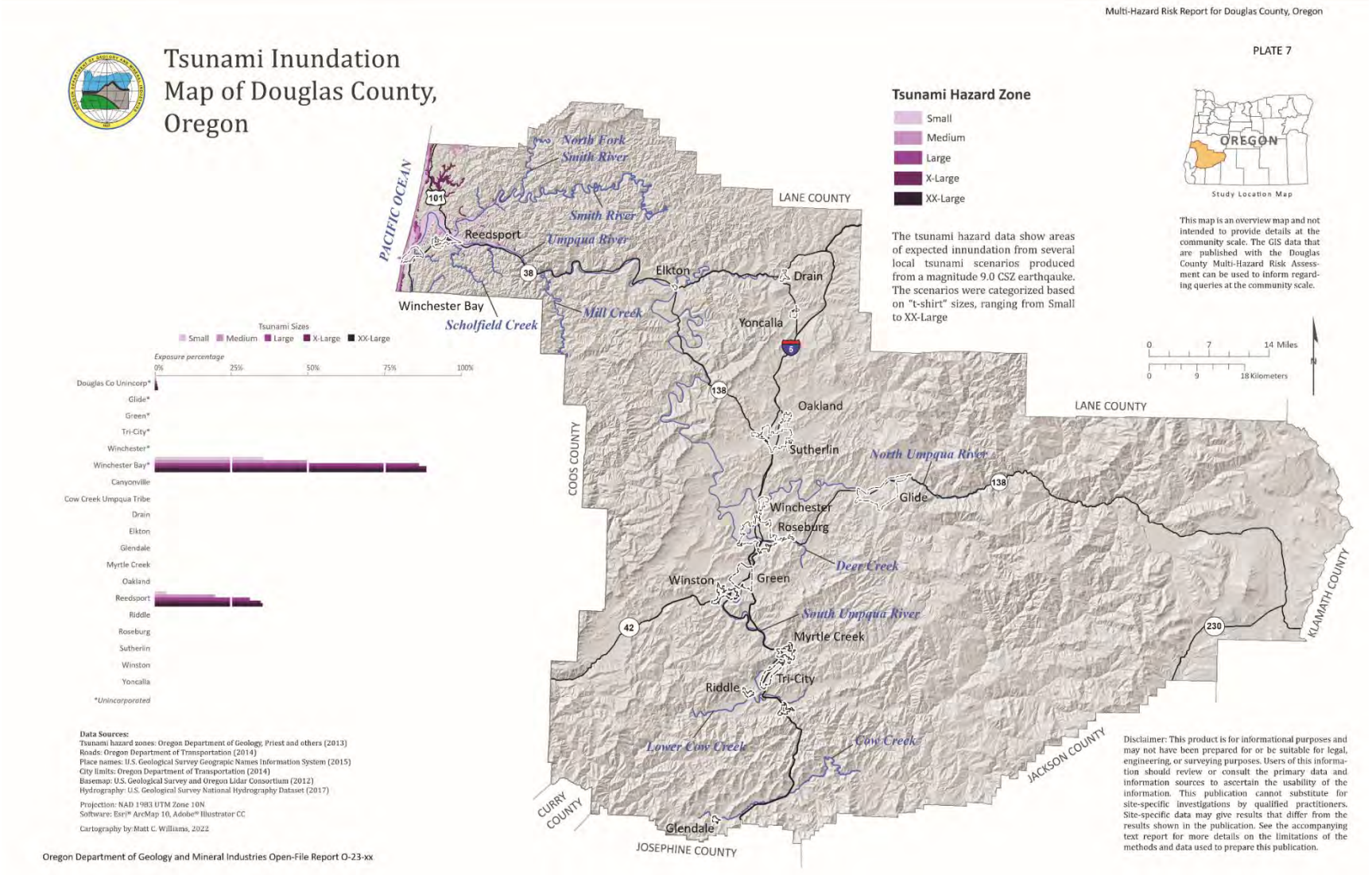
Areas of Significant Vulnerability

The projected tsunami inundation zone for coastal Douglas County is shown in Figure 39, shows areas that are more vulnerable or at greater risk from CSZ Mw-9.0 tsunami hazard are detailed below:

- Nearly every building in the community of Winchester Bay is at risk from tsunami hazard.
- Buildings along the Umpqua River and Schofield Creek in Reedsport are at risk from tsunami hazard.
- The unincorporated community of Gardiner along the Umpqua River are at risk from tsunami.

[51] Tsunami Animations, Time Histories, and Digital Point Data for Flow Depth, Elevation, and Velocity for the Clatsop Project Area, Clatsop County, Oregon, 2023

Figure 39 Tsunami Inundation Map



Wildfire

Wildfire Summary	
Hazard Ranking	
1 out of 12	
Probability	**Updates Made**
<u>County: High</u> Coastal: Moderate*** Central: High Cascades: High	- Recent Wildfire Added (Archie Creek Wildfire '20, Tygee Ridge Complex Wildfire '23) - Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorproated - DOGAMI Risk Report data and findings incorporated - Wildfire maps added - Information on SB 762, 80, 644 added - Information from Douglas County 2023 Community Wildfire Protection Plan added
Vulnerability	**Locations**
<u>County: High</u> Coastal: Moderate*** Central: High Cascades: High	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 10 Wildfire Profile

Fires are a natural part of the ecosystem in Oregon. However, wildfires can present a substantial hazard to life and property in growing communities, especially those expanding into previously wildland areas, which is known as the wildland urban interface (WUI). There is potential for severe losses due to development in the WUI areas in Douglas County. Forestland comprises approximately 75 percent of Douglas County, and the forests play an important role in the economy of the County, as well as surrounding homes and businesses. Wildfire is a serious threat to the well-being and quality of life in Douglas County.

Characteristics

Wildfires occur in areas with large amounts of flammable vegetation or structures 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. The increase in residential development in interface areas has resulted in greater wildfire risk. Fire is a natural process that significantly contributes to ecological health. However, due to decades of fire suppression and exclusion policies and practices across a wide range of ecological systems, including forests and non-treed environments such as grass fields and sage brush steppes, have become overgrown with vegetation, creating ample fuel conducive for potential catastrophic wildfires to occur.

In the heavily forested Cascades region, the forests present a continuous fuel supply both vertically, in small, thin trees and dead branches (ladder fuels), and horizontally, in an abundance of dead and downed material on the forest floor. When a fire ignites in such a forest, the dead branches, sticks, twigs, and other material increase fire intensity and, with ladder fuels present, provide great opportunity for the fire to reach the forest canopy, resulting in a stand-killing crown fire. These conditions also affect the means in which prescribed fire and fuels treatment are applied to the landscape.

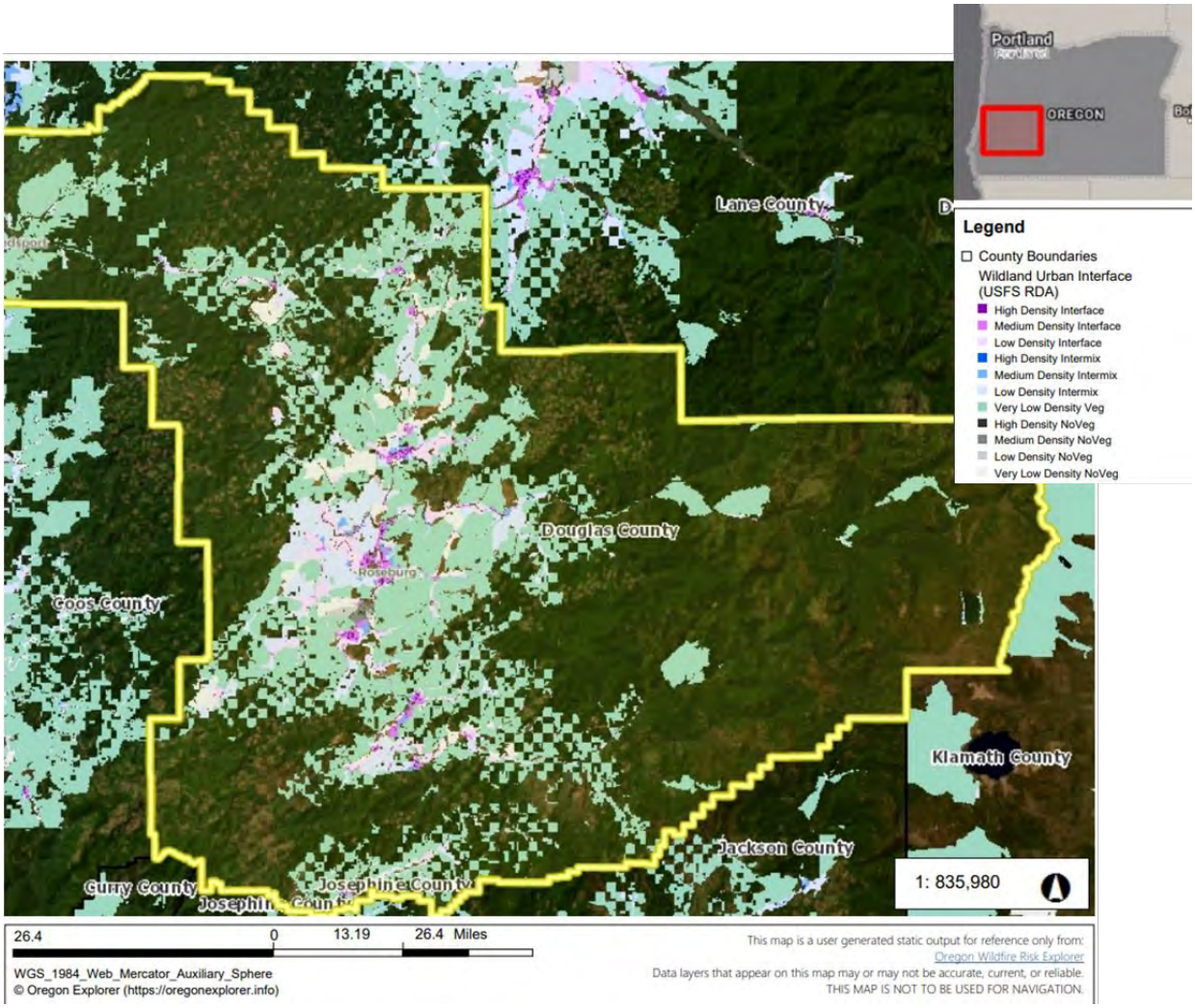
Current climate conditions, especially in drought years, influence the frequency, intensity, duration, and extent of fire. Summers are dry and lightning prone because a Pacific coast high-pressure system typically blocks precipitation for much of the season. In the upper elevations, where temperatures are low and rainfall is high, fires are less frequent than in the valleys. Larger climatic factors such as long-term global variations related to El Niño or to sunspot cycles also influence fire regimes, but this influence is confounded by local climatic variations, recent land management activities, and burns.

The following factors contribute significantly to wildfire behavior and increased wildfire risk.

The Wildland Urban Interface (WUI)

One challenge Douglas County faces regarding the wildfire hazard is from the increasing number of homes built on the urban/rural fringe compared to thirty years ago. Since the 1970s, Oregon's growing population has expanded further and further into wildland and previously undeveloped resource lands including forestlands, minimizing the space between developed areas and vegetation (see Figure 40). The "interface" between urban and suburban areas and the resource lands created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Furthermore, human activities increase the incidence of fire ignition and potential damage.

Figure 40 Wildland Urban Interface Zones in Douglas County



Source: Oregon Department of Forestry and the United States Forest Service, Oregon Wildfire Risk Explorer

Certain conditions increase the risk of significant interface fires. The most common conditions include 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 the presence of a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel, topography, weather, drought, and development.

Fuel

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading," or the amount of available vegetative fuel. Oregon, a western state with prevalent conifer, brush, and rangeland fuel types, is subject to more frequent wildfires than other regions of the nation. An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures, and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread. The accumulation of fuels around residential homes

enables high intensity fires to flare and spread rapidly. Because of the many different possible "fuels" found in the interface landscape, firefighters have a difficult time predicting how fires will react or spread.

Figure 41 Fire Behavior in High Fuel Loading Area

Fire behavior in a small area that was Thinned Fire burns low and on the ground.	Fire behavior in unthinned forests: Fires burn at high temperatures and reaches tops of trees.

Source: Healthy Forests Initiatives

Topography

Topography influences the movement of air, thereby impacting a fire's course. For example, wildfire moves faster uphill due to the direction of ambient winds. If the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensifies fire behavior and causes the fire to spread faster. Solar heating of dry, south-facing slopes produces upslope drafts that can complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

Weather

Weather patterns combined with certain geographic locations can create a conducive climate for wildfire activity. Areas where annual precipitation is less than 30 inches per year are extremely fire susceptible. High-risk areas in Oregon share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. Predominant wind directions may guide a fire's path.

Drought

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions, and leave reservoirs and water tables lower. Drought leads to problems with irrigation, and may contribute to additional fires, or additional difficulties in fighting fires.

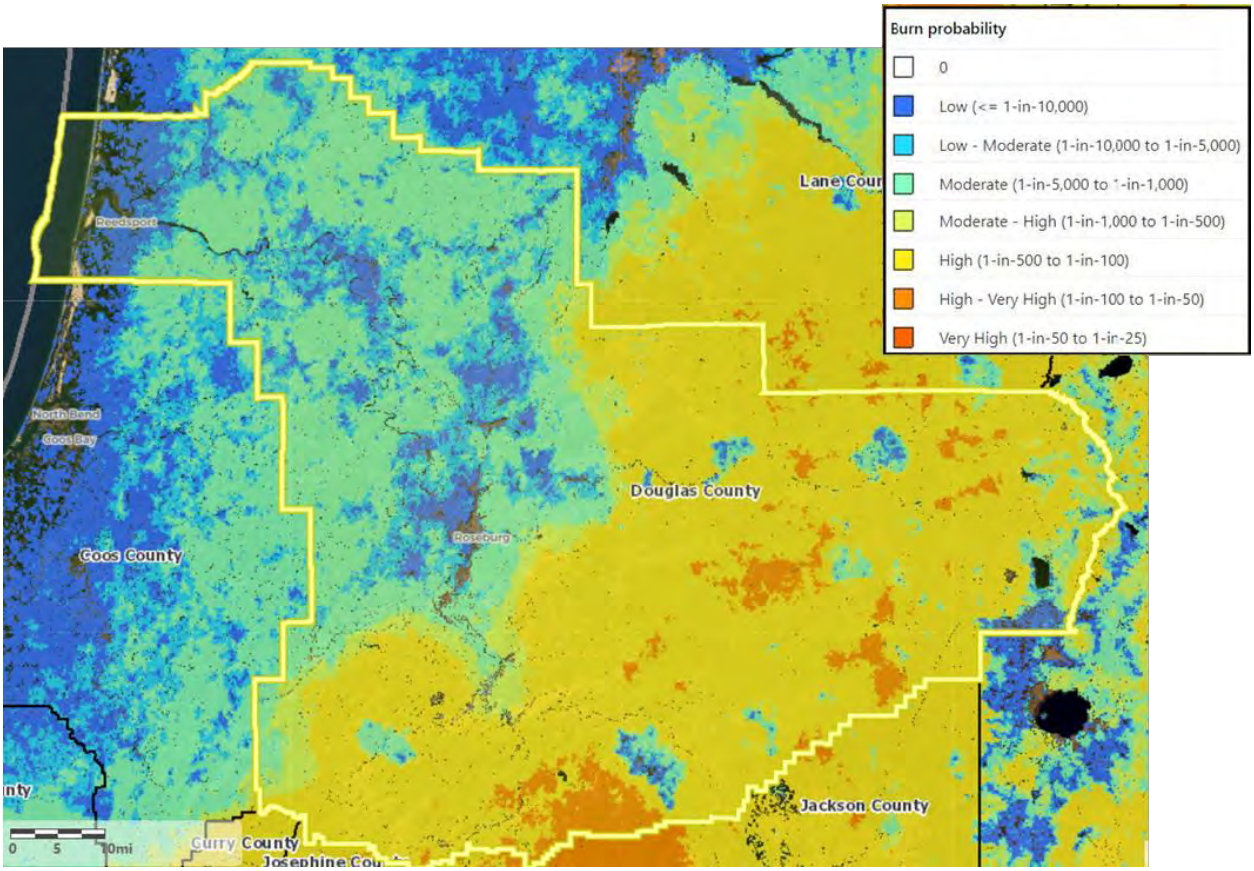
Human-Caused

Human-caused wildfire is a growing concern, as the number of human-caused wildfires has grown significantly. Oregon has seen hundreds of fires started due to arson, debris burning, equipment use, recreational activities, and smoking. As more people are interacting with the wildland in some way and there is a growing interest in outdoor activities, the risk of human-caused wildfire grows.

Location and Extent

As WUI areas are developed, wildfire risk continues to pose a growing threat to the lives and property, requiring a greater need to continuously monitor these threats. One challenge Douglas County faces is from the increasing number of homes being developed within the WUI, as responding to fires in the expanding WUI area may tax existing fire protection systems beyond original design or current capability.

Figure 42 Wildfire Burn Probability and Risk in Douglas County



Source: Oregon Department of Forestry and the United States Forest Service, Oregon Wildfire Risk Explorer

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 human causes of wildfires include arson and negligence from various human activities.

According to the most recent wildfire risk maps available from the State of Oregon, the extent of wildfire is greatest along the County's mountainous eastern and southern boundaries (see Figure 42). As WUI areas are developed, wildfire risk continues to pose a growing threat to the lives and property, requiring a greater need to continuously monitor these threats. One challenge Douglas County faces is from the increasing number of homes being developed within the WUI, as responding to fires in the expanding WUI area may tax existing fire protection systems beyond original design or current capability. In these areas, there is a high burn probability with expected flame lengths greater than 8-feet under normal weather conditions. Most of the developed portions of the County (about 55 percent) have less severe (low to

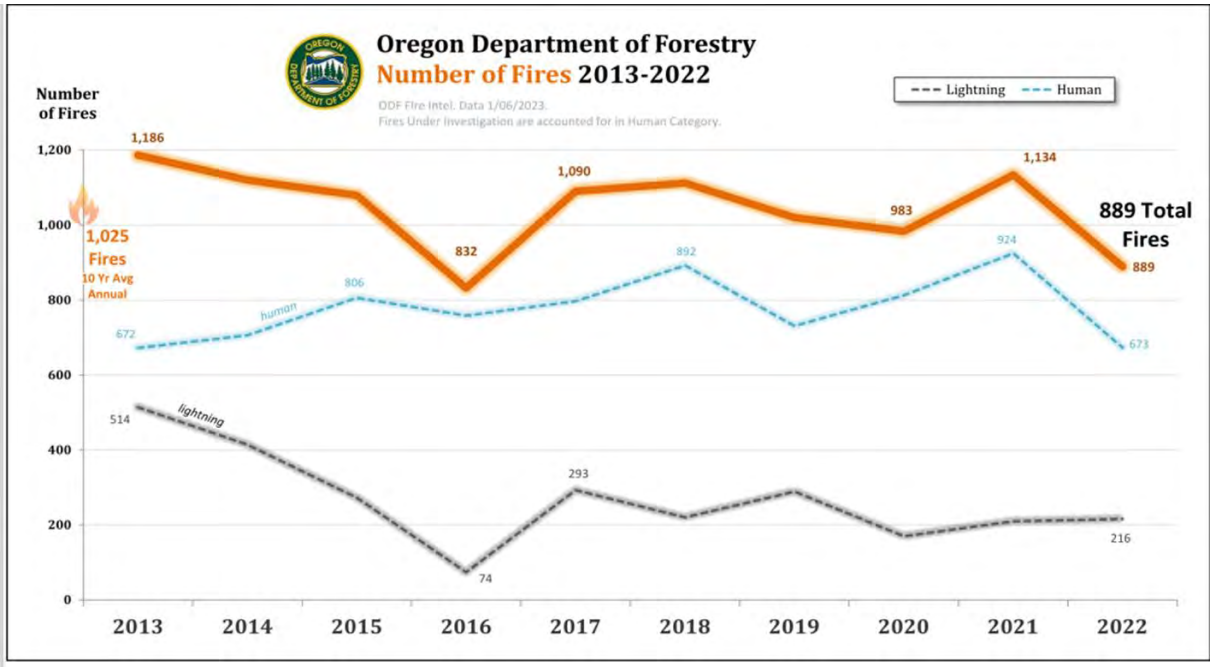
moderate) wildfire burn probability that include expected flame lengths less than 8-feet under normal weather conditions. However, conditions vary widely and with local topography, fuels, and local weather (including wind) conditions. Under warm, dry, windy, and drought conditions expect higher likelihood of fire starts, higher intensity, more ember activity, and more difficult to control wildfires that will include more fire effects and impacts.

However, the extent of wildfire risk goes beyond the wildfire itself. There are many secondary hazards related to wildfires, including poor air quality, impacted water quality, increased risk of landslides and erosion, and greater exposure to pollutants in the atmosphere. These secondary hazards can significantly impact the health and well-being of human lives, particularly those who have respiratory health-related concerns.

History

Hundreds of wildfires have occurred in Oregon in just the past 10 years, with the ignition source of many of these fires due to human activity, while others were caused by natural processes. In general, human caused wildfires typically occur within and around populated areas, recreational areas, and near transportation corridors, while lightning caused wildfires are often in more remote locations. Figure 43 shows the total number of wildfires in Oregon, and a breakdown of how many were started from either natural origins and human origins between 2012-2022.

Figure 43 Number of Wildfires Across Oregon from 2012-2022



Source: Oregon Department of Forestry, 2022

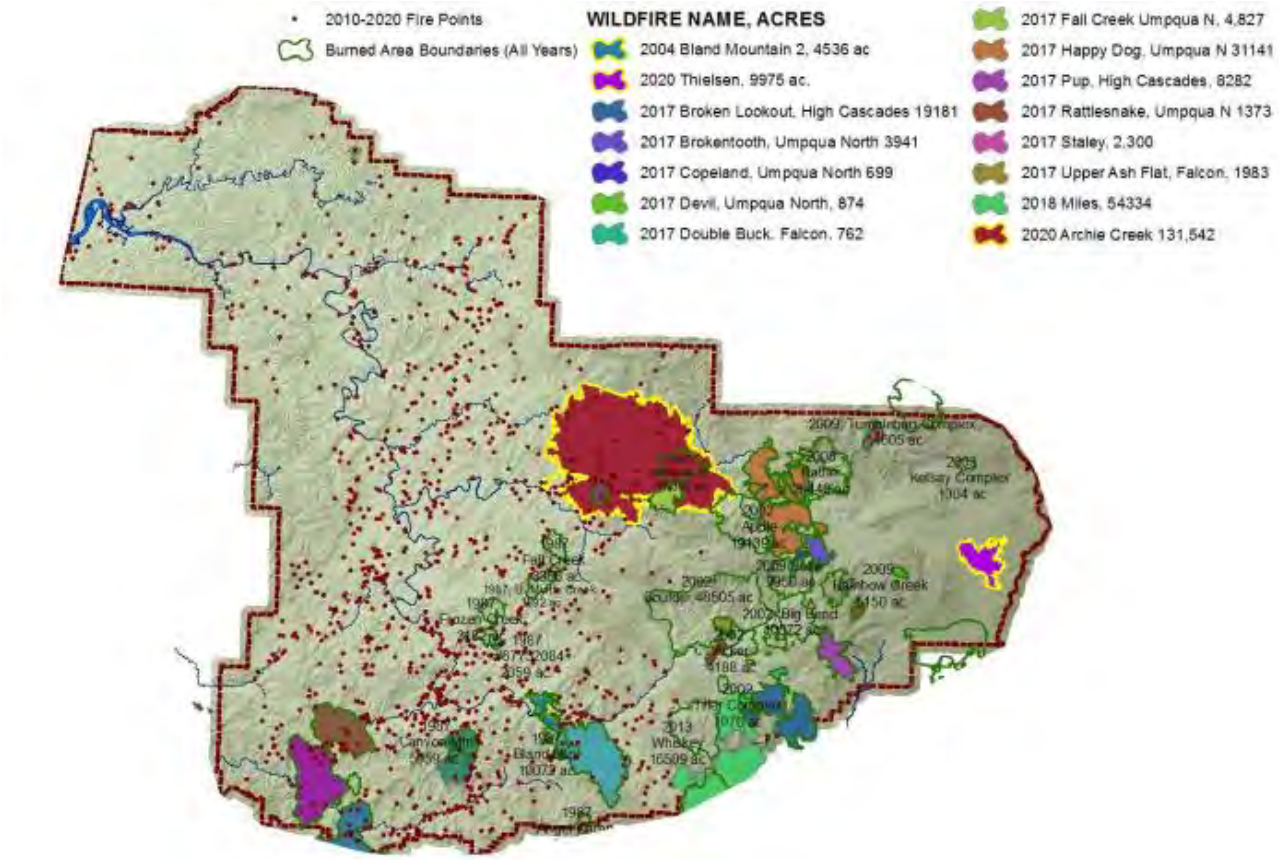
Thousands of wildfires have occurred in Oregon over the centuries, with some of the most catastrophic fire events in recent documented history taking place in Douglas County. Doulgas County wildfire history is more detailed in the 2023 Douglas County Community Wildfire Protection Plan. The most significant and catastrophic wildfires in the decades are documented in Table 67 and Figure 44**.**

Table 67 Significant Wildfires in Douglas County 2012-2023

Wildfire Name	Description	Acreage Burned	Suppression Costs
Douglas Complex	The Douglas Complex consisted of several fires located north of the City of Glendale. All of the fires started July 26, 2013 by lightning following a thunderstorm that moved through southern Oregon.	48,679	$54 million
Cable Crossing	The Cable Crossing fire started July 28, 2015 near Hwy.138, 6 miles east of Glide. The fire started on the north side of the North Umpqua River and then crossed the river to the south side of the North Umpqua	1,857	$7.5 million
Stouts Creek	The Stouts Creek fire was reported July 30, 2015, burning approximately 11 miles east of Canyonville near the community of Milo.	26,452	$44.4 million
North Umpqua Complex	The North Umpqua Complex fires consisted of several fires located in the northern part of the Umpqua National Forest. The fires began between August 8th and 9th by dry lightning outbreaks, as well as a fire started by a human source.	41,000	$13.5 million
Miles Post 97	The Mile Post 97 fire started on July 24, 2019 near Interstate 5 milepost 97, in an old fire scar from 1987, about a mile southeast of Canyonville.	13,119	$21.4 million
Archie Creek	The Archie Creek fire began on September 8, 2020, and was one of the many catastrophic 2020 Labor Day Fires. The fire was first detected east of Glide, in the North Umpqua River drainage during a strong east wind event that passed through the area.	131,596	$40 million
Tyee Ridge Complex	The Tyee Ridge Complex fire started on August 24, 2023, and the fires started at about 9 p.m. due to several lightning strikes. It grew, as a collection of fires merged, beginning when the Rattlesnake Ridge fire merged with Cougar Creek #1. Later, the Lighthouse #2 and Lighthouse #4 merged with Lighthouse #3.	7,945	$40.6 million

Source: Federal Emergency Management Agency; Douglas County Community Wildfire Protection Plan, 2023

Figure 44 Location and Extent of Significant Wildfires in Douglas County



Source: Federal Emergency Management Agency; Douglas County Community Wildfire Protection Plan, 2023

Wildfire Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a wildfire is "high",** meaning one incident is likely within the next 10 to 35-year period. This rating exists for all regions in the County. *This rating has not changed since the previous NHMP.*

The Oregon NHMP notes that during a typical year, more than 2,500 wildland fires of any size are started on forest lands in Oregon. ODF and USFS estimate 66 percent of these fires are caused by human activity (1,650); the remainder result from lightning (850).

Historically, a much lower number of human-caused fires have occurred in the northwest, less than 2,000 per year on average, and an even smaller number of human-caused fires have occurred in Douglas County. However, changing conditions and the growing occurrences and severity of related hazards such as drought and extreme heat may contribute to a higher likelihood of ignitions from both sources but especially human activity. As many conditions that influence wildfire behavior and occurrence are demonstrated across large areas within Douglas County, this is continually creating a significant collective wildfire risk.

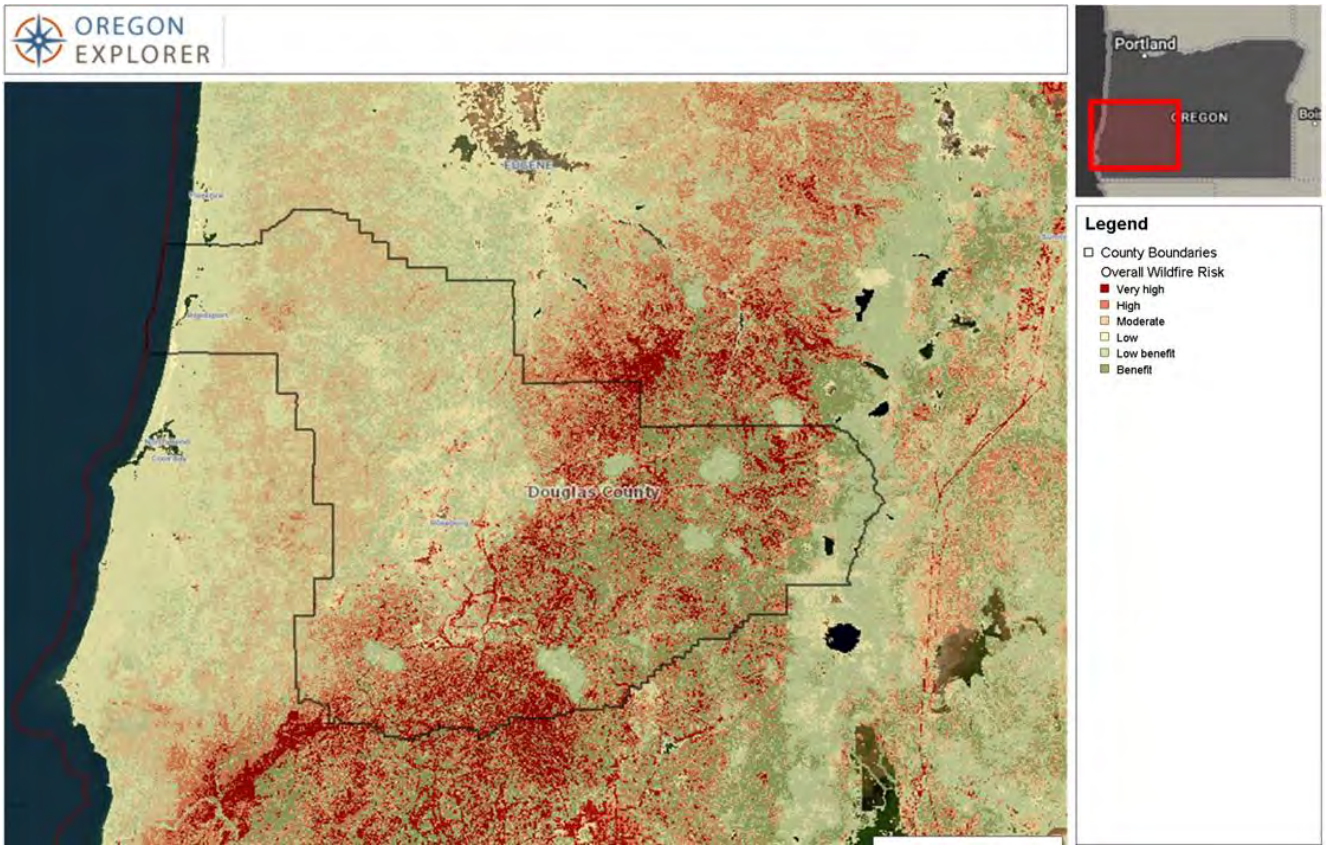
Vulnerability Assessment

The Steering Committee rated the County as having a **"high" vulnerability to wildfire hazards**, meaning that more than 10 percent of the County's population or assets would be affected by a major disaster. Vulnerability is highest in the Central and Cascades regions, although the Coastal region still rates has possessing high vulnerability to wildfires. *This rating has not changed since the previous NHMP*.

Each year a significant number of people build homes within or on the edge of the forest (urban/wildland interface), thereby increasing wildfire hazards. Many Oregon communities are within, or abut, areas subject to serious wildfire hazards, complicating firefighting efforts and significantly increasing the cost of fire suppression.

Potential impact to structure from wildfire is shown in Figure 45, darker areas have higher risk to structures if fire ignites nearby. The areas of greater risk are generally located in more rural parts of the County, that are hillier, and more heavily vegetated and forested. The County has many acres that are susceptible to wildland fires. The total number of acres comprises an estimated 90 percent of the County.

Figure 45 Wildfire Risk to Potential Structures



Source: Oregon Explorer, 2018v

's primary the North Umpqua RiverFuture Climate Variability -Wildfire[52]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects that wildfire frequency, intensity, and extent will continue to increase across the Northwest. In part, the increased incidence of wildfire is due to

[52] OCCRI, Future Climate Projections Douglas County, 2023

growing drought conditions, increased number of extreme heat events, anthropogenic emissions and development in the WUI. Wildfire risk is expressed as the average number of days per year where fire danger is very high. Wildfire risk is projected to increase by 12 days (range -6–27) by the 2050s. Extreme fire weather during late summer and autumn increased by about 40 percent over the western United States and about 50 percent over western Oregon. This late season increase in wildfires is largely due to drier vegetation and warmer temperatures during dry wind events. Increased severity of wildfire events and the subsequent increase in wildfire smoke will impact the health of all demographics and vulnerable populations.

DOGAMI Risk Report Wildfire Results

The *Multi-Hazard Risk Report for Douglas County* 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 wildfire hazard. The exposure analysis calculates and compares the number of buildings, their value, and associated populations exposed across three (3) different wildfire hazard scenarios that the community is vulnerable to.

Wildfire hazard was developed as a combination of burn probability and the presence of infrastructure and assets, and were categorized into the following:

- Low wildfire hazard
- Moderate wildfire hazard
- High 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 more than 10 percent of community structures exposed to at least moderate wildfire hazard.

Report Summary

Table 68 shows the summarized projections from the DOGAMI Risk Report for Douglas County for wildfire potential based on the combination of moderate and high wildfire hazard. Moderate and High wildfire hazard were chosen as the primary scenarios to provide a general sense of community risk for planning purposes. These hazard zones represent areas most at risk of wildfire with the highest impact to the community.

The DOGAMI report projects that the combination of Moderate and High wildfire hazard would incur losses of approximately $10.2 billion and cause damage to roughly percent of total structures throughout the County, which would incur financial losses of approximately 44 percent of the total building value.

Table 68 Wildfire Result Summary

	Countywide Wildfire Exposure (High or Moderate Risk)				
	Number of Buildings Exposed	Exposure Value	Percentage of Exposure Value	Critical Facilities Exposed	Potential Displaced Population
Douglas County	37,252	$10.2 billion	44%	11 of 88	44,737

Source: DOGAMI Douglas County Risk Report, 2023

Wildfire Exposure Analysis

The WUI for nearly every community in Douglas County has exposure to wildfire hazard, as seen in Table 69. Properties that are most vulnerable to wildfire hazard are those developments that has occurred in

the high hazard zone. Approximately 70 percent (34,424 buildings) of unincorporated Douglas County buildings are exposed to Medium and High Hazard wildfire. The percentage of exposed buildings is greatest in Glide (71.3 percent); however, the dispersed "rural" Douglas County has the most exposed buildings (32,225). Primarily, high risk of wildfire exists for the unincorporated communities located within the heavily forested eastern parts of the unincorporated County.

Table 69 Wildfire Exposure

	Total Number of Buildings	Community Population	Moderate and High Wildfire Hazard			
			Exsposed Structures		Displaced Residents	
			Number	Percent	Number	Percent
Unincorp County (Rural)	39,950	44,535	32,225	80.7%	34,785	78.1%
Glide	1,253	1,625	893	71.3%	1,224	75.3%
Green	3,943	6,201	405	10.3%	659	10.6%
Tri-City	2,216	3,012	708	31.9%	925	30.7%
Winchester	1,407	2,555	193	13.7%	435	17.0%
Winchester Bay	444	276	0	0.0%	0	0.0%
Total Unincorporated	49,213	58,204	34,424	69.9%	38,028	65.3%
Canyonville	898	1,663	212	23.6%	358	21.5%
Drain	589	1,174	62	10.5%	146	12.4%
Elkton	142	189	30	21.1%	42	22.2%
Glendale	423	857	116	27.4%	205	23.9%
Myrtle Creek	1,688	3,507	396	23.5%	839	23.9%
Oakland	512	937	165	32.2%	322	34.4%
Reedsport	2,626	4,252	20	0.8%	40	0.9%
Riddle	569	1,226	30	5.3%	63	5.1%
Roseburg	9,678	23,955	614	6.3%	1,766	7.4%
Sutherlin	3,915	8,962	732	18.7%	1,816	20.3%
Winston	2,406	5,682	396	16.5%	985	17.3%
Yoncalla	635	1,032	55	8.7%	75	7.3%
Total Douglas County	73,294	111,640	37,252	50.8%	44,685	40.0%

Source: DOGAMI Douglas County Risk Report, 2023

Approximately 65 percent of unincorporated Douglas County's population (38,028 people) may be displaced by wildfires within Douglas County. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire. Populations with potential impacts from smoke and traffic disruptions 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" Douglas County has the most population at risk (34,785), although the population is dispersed throughout the County. Over 75 percent of Glide residents are exposed, as well as roughly a third of Tri-City and Oakland residents are vulnerable to displacement due to wildfire.

Critical Facility Vulnerability

Table 70 provides an inventory of vulnerable critical facilities with potential exposure to the Moderate or High wildfire hazard zone.

Table 70 Wildfire Exposed Critical Facilities Inventory

Exposed Critical Facilities - High or Moderate Wildfire Hazard				
Community	**School**	**Hospital**	**Fire Responders**	**Government Buildings**
Unincorporated County	-	-	1	1
Winston	2	-	-	-
Total Douglas County	**2**	**0**	**1**	**1**

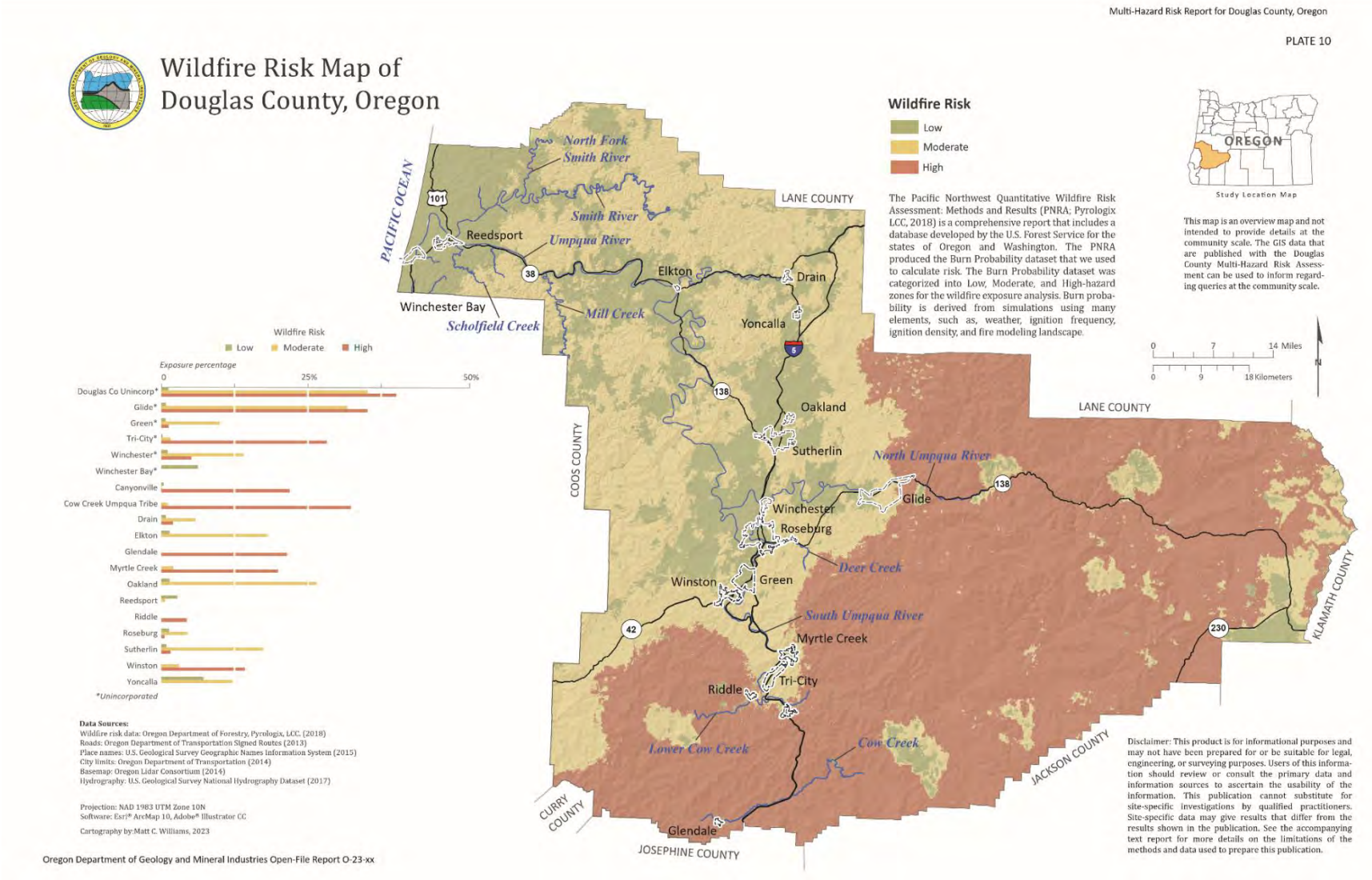
Source: DOGAMI Douglas County Risk Report, 2023

Areas of Significant Vulnerability

Wildfire risk of Douglas County is seen in the map, Figure 46,and these locations within the study area are comparatively at greater risk to wildfire hazard:

- All communities and unincorporated areas in the forested, mountainous portion of the county (southern and western) are at high risk from wildfire. The risk from wildfire is greatest in the wildland urban interface zones in the communities of Douglas County.
- While the Archie Creek wildfire that occurred in the fall of 2020 caused widespread and devastating damage to areas along the North Umpqua River, those wildfires were not specifically examined in this report. However, the areas that burned will be at risk of indirect hazards such as post-wildfire debris flows, rock falls, and flash flooding. The data used in this risk assessment, both asset and hazard information, originated prior to the date of these fires.

Figure 46 Wildfire Risk



Community Wildfire Susceptibility Issues

Growth and Development in the Interface

Development of homes and other structures encroaching upon forest wildland and natural areas expands the WUI. These interface areas are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation, and natural fuels.

In the event of a wildfire, vegetation, structures, and other flammable materials can merge into unpredictable events. Factors relevant to the fighting of wildfires within the interface include access, firebreaks, proximity of water sources, distance from a fire station, and availability of firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons:

- Combustible roofing material;
- Wood construction;
- Structures with no defensible space;
- Poor road access to structures limiting firefighting apparatus;
- Structures located on steep slopes covered with flammable vegetation;
- Limited water supply;
- Storage of firewood and combustibles beneath or around structures.

Road Access

Road access is a major issue for all emergency service providers. Insufficient space for emergency vehicles causes a challenging situation for emergency workers as they have limited or no access to structures. Due to the size of emergency vehicles, emergency personnel are challenged by narrow roads and limited access. When there is doubt concerning the stability of a residential bridge, or adequate turnaround space, emergency personnel may only work to remove the occupants, with limited to no ability to save structures.

Water Supply

Firefighters in remote and rural areas are faced with limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained firefighting flows. Some rural fire districts are adapting to these conditions by developing secondary water sources.

Rural Services

People moving from more urban areas frequently have high expectations for fire protection services. Often, new residents do not realize that they are living outside of a fire protection district, or that the services provided are not the same as in an urban area. The diversity and amount of equipment and the number of personnel can be substantially limited in rural areas. Fire protection may rely more on the landowner's personal initiative to protect their own property. Therefore, public education and awareness plays a greater role in rural or interface areas. Growth and development in rural areas of Douglas County influence the WUI. While historical losses from wildfires in Douglas County have been relatively low, additional development, and an increase in fuel loads, expands the public need for natural hazards mitigation planning in the County.

Wildfire Mitigation Capabilities

Due to the serious threat of wildfire in Douglas County, the County adopts and utilizes various policies, programs, and tools. This section outlines some of the most important and impactful capabilities that contribute towards wildfire resiliency and mitigation across Douglas County.

Plans

- **Community Wildfire Protection Plan (CWPP):** A CWPP is a plan developed collaboratively between Douglas County, community stakeholders that identify wildland fire hazards, prioritizes measures to reduce those hazards and recommends ways for homeowners and communities to reduce ignitability of County structures. This Collaboration between agency partners helps address the specific needs of our community, inform decision-makers, and guide interventions that protect life, property and infrastructure from wildfire. The Douglas County CWPP was updated and adopted in October 2023.

Policies and Ordinances

- Douglas County Land Use and Development Ordinance
- Douglas County Comprehensive Plan
- Douglas Forest Protective Association – Douglas District Fire Operations Plan (2017)
- Cow Creek Band of Umpqua Tribe of Indians –Tribal Natural Hazard Mitigation Plan (2012)
- Oregon State Fire Marshall – Oregon Fire Service Mobilization Plan
- Oregon Statewide Planning Goals and Guidelines – Goal 7: Areas Subject to Natural Hazards
- US Department of the Interior – Pacific Northwest Operating Plan (2014)

2021 Oregon Wildfire Programs Summary (Senate Bill 762):

- In 2021, the Oregon legislature passed Senate Bill 762, Oregon's first comprehensive wildfire preparedness and resiliency bill. This legislation created Wildfire Programs with a goal to advance fire protection in Oregon by mitigating the catastrophic impacts of wildfire on lives and property through three key strategies: creating fire-adapted communities, developing safe and effective responses, and increasing the resiliency of Oregon's landscapes. The Wildfire Programs established wildfire-related programmatic responsibilities, ranging from wildfire hazard mapping, defensible space, building codes, and land use to forest management, electric utilities, air quality, and public health. Investments totaled $195 million during Oregon's 2021-2023 budget.

2023 Oregon Wildfire Programs Summary (Senate Bills 80, 82, and 644):

- In 2023, the legislature continued the Wildfire Programs with a variety of adjustments, expanding some program areas and reducing others. The legislature passed two primary wildfire bills during the 2023 session to advance fire protection in Oregon: Senate Bill (SB) 80 and SB 82. In addition, SB 644 addresses wildfire mitigation as it relates to Accessory Dwelling Units.
- **SB 80:** A variety of improvements were made to the Wildfire Programs including: wildfire hazard mapping updates, expanding philanthropy pathways to the community risk reduction fund, creating the landscape resiliency fund, expanding clean air space authorities to non-profits, administrative updates to the advisory council, and advanced prescribed fire through a liability program.
- **SB 82:** Partnering with Oregon's insurance industry, transparency in rating and underwriting decisions by insurers is ensured, as it relates to wildfire threats. The bill also allows consumers to

see how wildfire risk reduction efforts – such as establishing defensible space, hardening homes, and participation in wildfire community preparedness programs – may influence their insurance rating and the availability of insurance.

- **SB 644:** This bill amends requirements relating to wildfire hazard mitigation for development of accessory dwelling units (ADU) on lands zoned for rural residential use. The bill allows, but does not require, counties to permit ADUs in rural residential zones if the ADU complies with the construction provisions of section R327 of the Oregon Residential Specialty Code (wildfire hazard mitigation, also known as home hardening) regardless of location in the absence of the statewide wildfire hazard map.

Programs and Projects

- **Douglas Forest Protective Association (DFPA):** is responsible for protection from fire to approximately 1.6 million acres of forestland, covering most of Douglas County. The district provides protection to private, state, County, and federal lands.
- **Coos Forest Protective Association (CFPA):** is divided into two subunits, with the northern Reedsport unit covering the Douglas County Coastal area.
- **Wester Lane Forest Protective Association:** provides fire protection to **750,650** acres of private and public forestland in western Lane County and parts of northern Douglas County.
- **Eastern Lane Forest Protective Association:** provides fire protection to approximately **3,500** acres of private and public forestland in western Lane County and parts of northern Douglas County.
- Oregon Department of Forestry (ODF)
- Federal Emergency Management Agency (FEMA) Programs
- Fire Management Assistance Grant Program
- Prescribed Burning
- Firewise
- FireFree Program

Windstorms

Windstorm Summary	
Hazard Ranking	
4 out of 12	
Probability	**Updates Made**
<u>County: High</u> Coastal: High Central: High Cascades: High	- Straight-line winds recorded that exacerbated the 2020 wildfires - Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorproated
Vulnerability	**Locations**
<u>County: Moderate</u> Coastal: Moderate Central: Moderate Cascades: Moderate	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 11 Windstorm Profile

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 Douglas County, they are especially dangerous near developed areas with large trees or tree stands, which can impact the surrounding exposed properties, as well as major infrastructure and above ground utility lines. The lower wind speeds typical in central Douglas County are still high enough to knock down trees and powerlines and cause other property damage. Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals and/or streetlights. Roads blocked by fallen trees during a windstorm may have severe consequences for access to emergency services. Emergency response operations can have difficulty accessing the community when roads are blocked or when power supplies are interrupted. Windstorms at different speeds can have varying effects and extent of damage, which can be seen in the wind speed effect breakdown in Table 71**.**

While windstorms are a concern to communities across Douglas County, they are especially a concern in coastal areas, which are subject to more severe weather moving immediately across the Pacific Ocean. Winds speeds from 40-60 mph are common in the winter months, more specifically between October to March. After a more severe windstorm, it can take communities days, weeks, or longer to return to normal activities.

Table 71 The Effect of Wind Speed

Wind Speed (mph)	Wind Effects
25-31	Large branches will be in motion.
32-38	Whole trees in motion; inconvenience felt walking against the wind.
39-54	Twigs and small branches may break off of trees; wind generally impedes progress when walking; high profile vehicles such as trucks and motor homes may be difficult to control.
55-74	Potential damage to TV antennas; may push over shallow rooted trees especially if the soil is saturated.
75-95	Potential for minimal structural damage, particularly to unanchored mobile homes; power lines, signs, and tree branches may be blown down.
96-110	Moderate structural damage to walls, roofs and windows; large signs and tree branches blown down; moving vehicles pushed off roads.
111-130	Extensive structural damage to walls, roofs, and windows; trees blown down; mobile homes may be destroyed.
131-155	Extreme damage to structures and roofs; trees uprooted or snapped.
Greater than 155	Catastrophic damage; structures destroyed.

Source: Washington County Office of Consolidated Emergency Management

Location and Extent

The most frequent surface winds in Oregon are from the southwest. These widespread winds are associated with storms moving onto the coast from the Pacific Ocean. Winds coming from the south are the most destructive. The Columbus Day Storm of 1962 was an example of this type of windstorm. West winds generate from the Pacific Ocean and are strong along the coast, but slow down inland due to the obstruction of the Coastal and Cascade Mountain range. Prevailing winds in Oregon vary with the seasons. In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east.

Typically, mountainous terrain slows down wind movement, which is why Oregon's sheltered valley areas have the slowest wind speed in the state. However, in the foothills, wind speeds may increase due to down-sloping winds from the mountains.

Predicting weather patterns is difficult at best; however, the 1997-98 El Niño event marked the first time in history that climate scientists were able to predict abnormal flooding and drought months in advance for various locations around the United States. The methodology consists of monitoring water temperatures, air temperatures, and relative humidity plus measuring sea-surface elevations. Once an El Niño or La Niña pattern is established, climatologists can project regional climatic behavior. Although the scientific community is optimistic about its recent forecasting achievements, not all droughts are associated with El Niño or La Niña events.

History

Douglas County has experienced several high wind events that have required disaster declarations to be made. The most recent, and very significant windstorm was the unusually strong east wind event of 2020, which greatly exacerbated the 2020 wildfires throughout Oregon.

Table 72 presents significant windstorm events in Douglas County that led to an official disaster declaration.

Table 72 Significant Windstorms in Douglas County

Date	Declaration Number	Details
Oct. 1962	DR-136-OR	Severe Storms
Dec. 1995	DR-1107-OR	Severe Storms, High Winds
Dec.1996-Jan. 1997	DR-1160-OR	Severe Winter Storms, Flooding
Feb. 2002	DR-14050-OR	Severe Winter Windstorm with High Winds
Dec. 2015	DR-4258-OR	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides
Sep. - Nov. 2020	DR-4562-OR	Wildfires and Straight-line Winds

Source: Federal Emergency Management Agency

Windstorm Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a windstorm is "high",** meaning one severe incident is likely within the next 10 to 35-year period. This rating exists for all regions in the County. *This rating has increased since the previous NHMP.*

Changing weather patterns and a steady increase in the strength of storms within the past several years suggests that windstorms will frequently occur over the next decade. Table 73 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 4, which includes Douglas County, can expect to be exposed to 60 mph winds in a 25-year recurrence interval (4 percent annual probability).

Table 73 Wind Speed Probability Intervals

	25-Year Event (4% annual probability)	50-Year Event (2% annual probability)	100-Year Event (1% annual probability)
Region 4 Southwest Oregon	60 mph	70 mph	80 mph

Source: Oregon Natural Hazard Mitigation Plan, 2020

High winds are especially common in the coastal region and mountainous Coast Range between October and March. From unofficial but reliable observations, it is reasonable to assume that gusts well above 100 mph occur several times each year across the higher ridges of the Coast and Cascades Ranges. At the most exposed Coast Range ridges, it is estimated that wind gusts of up to 150 mph and sustained speeds of 110 mph will occur every 5 to 10 years.

Vulnerability Assessment

The Steering Committee rated the County as having a **"moderate" vulnerability to windstorm hazards**, meaning that between 1-10 percent of the County's population or assets would be affected by a major disaster. Vulnerability is similar throughout the different regions in the County. *This rating has not changed since the previous NHMP*.

Windstorms can cause damage over 100 miles from the center of storm activity. Isolated wind phenomena in the mountainous regions have more localized effects. Wind impacting walls, doors, windows, and roofs, may cause structural components to fail. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact the building's protective envelope (doors, windows, and walls), the result can be roof or building component failures and considerable structural damage. Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls of buildings. When severe windstorms strike a community, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

One of the most common problems associated with windstorms is power outages. High winds commonly occur during winter storms, and can cause trees to bend, sag, or fail (tree limbs or entire trees), encountering nearby distribution power lines. Fallen trees can cause short-circuiting and conductor overloading. Wind-induced damage to the power system causes power outages to customers, incurs cost to make repairs, and in some cases can lead to ignitions that start wildland fires.

The basic strategy adopted by power companies to avoid wind-induced damage is to maintain adequate separation between its transmission circuits and trees, by limiting overgrowth and conducting ongoing tree trimming.

Future Climate Variability – Windstorm[53]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects that while mean wind speeds and frequency of strong easterly winds during peak wildfire season will decrease, extreme winter

[53] OCCRI, Future Climate Projections Douglas County, 2023

wind speeds may increase. These changes in wind patterns will affect natural disturbances, the provision of electricity, transportation safety, and contribute to the spread of wildfires and pollutants.

Winter Storms

Winter Storm Summary	
Hazard Ranking	
2 out of 12	
Probability	**Updates Made**
County: High Coastal: High Central: High Cascade: High	- Severe 2019 winter storm recorded - Reorganized for clarity and consistency - Future Climate Variability section included and OCCRI Climate Projection Report incorproated - DOGAMI Risk Report data and findings incorporated
Vulnerability	**Locations**
County: High Coastal: Moderate*** Central: High Cascade: High	Douglas County, Azalea, Canyonville, Drain, Elkton, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla

Summary 12 Winter Storm Profile

Winter storms are among nature's most impressive spectacles. Their combination of heavy snow, ice accumulation, and extreme cold can totally disrupt modern civilization, closing roads and airports, creating power outages, and downing telephone lines.

For the most part, the wind aspects related to winter storms are addressed with windstorm hazard analysis preceding this section. Heavy precipitation aspects associated with winter storms in some parts of the state, which sometimes lead to flooding, are covered with floods. This section generally addresses snow and ice hazards and extreme cold.

Characteristics

Severe winter storms can produce rain, freezing rain, ice, snow, cold temperatures, and wind, and are generally brief, lasting no more than a few days. While ice buildup due to icestorms generally range from a trace to one inch, these ice storms are often accompanied by high winds, which can increase the destructive impacts, especially to trees, power lines, highway safety and utility services. Accumulations between ¼ and ½ inch can cause small tree branches and faulty limbs to break, while accumulations of ½ to one inch can cause more significant breakage. Severe freeze, where daily high temperatures remain below freezing for five or more days, occur every three to five years in Douglas County. Severe or prolonged snow events occur less frequently and are very geographic in nature. The eastern part of Douglas County is affected the most severely, having widespread impacts on people and property in the County.

The following are some primary characteristics of winter storms in Douglas County.[54]

[54] Winter Weather Safety, 2023

Weather Patterns

Severe winter storms affecting Oregon typically originate in the Gulf of Alaska and in the central Pacific Ocean. Oregon's latitude, topography, and nearness to the Pacific Ocean give the state diverse climates. Douglas County's climate generally consists of wet winters and dry summers. For Douglas County, winter storms are most common between the months of October through March.

Very cold air rarely moves west of the Cascades Range, as the Cascades act as a natural barrier, damming cold air east of the range. If the cold air east of the Cascades is deep, it will spill through the gaps of the Cascades and flow into the western valleys via the many river drainage areas along the western slope. If a storm from the Pacific moves near or over the cold air, freezing rain, sleet, and/or snow will be produced. Nearly every year, minor snowfalls of up to six inches occur in the western interior valleys. However, due to these weather patterns, it is a rare occurrence for snowfalls of over a foot in accumulations.

Snow

Douglas County receives an average of only five days per year of measurable snow with snowfall accumulations rarely measuring more than two inches in the lower elevation regions of the County, with higher elevations in the Cascades receiving more. For example, high elevation's locations like Diamond Lake reports an average of 6-8 feet of snow per year, while in the lower elevations of the Umpqua Valley snow is relatively rare, though snowfall events do occur. An example of a snowstorm event occurred in January 1969, when 43.7 inches of snow fell over an 8-day period in Roseburg.

Figure 47 Downed Trees from the "Snowmageddon" Winter Storm Event

Source: Oregon Department of Emergency Management

Severe snowfall events can result in loss of life, property, power, gas, and/or other service disruptions. The variable character of this hazard is determined by a variety of meteorological factors including snowfall, snowpack, rainfall, temperature, and wind.

Ice

Like snow, ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation, including freezing rain, sleet, and hail. While sleet and hail can create hazards for motorists when it accumulates, freezing rain can be the most damaging of ice formations. Ice buildup can bring down trees, communication towers, and wires creating hazards for property owners, motorists, and pedestrians.

Extreme Cold Weather

Extreme cold weather stretches are rare throughout Douglas County apart from very high-altitude locations like the Cascades. Extreme cold hazards include infrastructure damage to pipes, power lines and

roadways. Prolonged low temperatures when combined with power outages could be a hazard to vulnerable populations like the elderly.

Additionally, anytime a winter storm involves snow or ice, extreme cold is a concurrent risk. “Extreme” is a relative term, primarily defined as where temperatures are typically moderate and very rarely dip below freezing, any temperature near or below freezing (32°F) is considered extreme. “Wind chill” describes how cold the air feels to human skin and is measured by factoring the temperature with the wind speed. Wind chill can be cooler or much colder than the air temperature and can exacerbate risks associated with cold weather.

Location and Extent

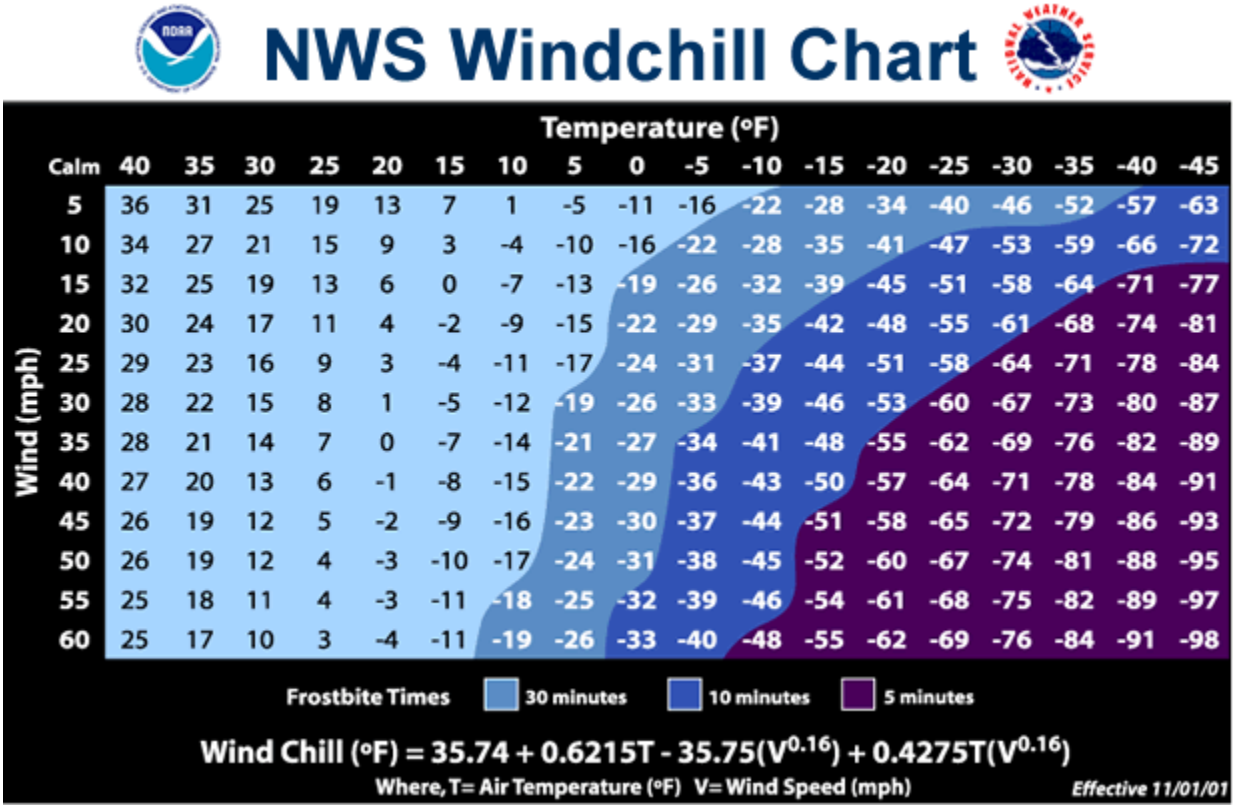
Winter storms affect all parts of Douglas County, and the entire County is susceptible to damaging severe weather. Winter storms that bring snow and ice can impact all aspects of the community, including infrastructure (including powerlines and roads), the economy (including local businesses) and community members. Those resources and individuals that reside 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.

According to the National Weather Service:

> *Most snowstorms need two ingredients: cold air and moisture. Rarely do the two ingredients occur at the same time over western Oregon, except in the higher elevations of the Coast Range and especially in the Cascades. But snowstorms do occur over eastern Oregon regularly during December through February. Cold arctic air sinks south along the Columbia River Basin, filling the valleys with cold air. Storms moving across the area drop precipitation, and if conditions are right, snow will occur.*
>
> *However, it is not that easy of a recipe for western Oregon. Cold air rarely moves west of the Cascade Range. The Cascades act as a natural barrier, damming cold air east of the range. The only spigot is the Columbia River Gorge, which funnels the cold air into the Portland area. Cold air then begins deepening in the Columbia River valley, eventually becoming deep enough to sink southward into the Willamette valley. If the cold air east of the Cascades is deep, it will spill through the gaps of the Cascades and flow into the western valleys via the many river drainage areas along the western slope. The cold air in western Oregon is now in place. The trick is to get a storm to move near or over the cold air, which will use the cold air and produce freezing rain, sleet, and/or snow. Sometimes, copious amounts of snow are produced. Nearly every year, minor snowfalls of up to six inches occur in the western interior valleys. However, it is a rare occurrence for snowfalls of over a foot in accumulations [sic].*

Furthermore, the combination of wind and low temperature in winter can be deadly. The wind chill index (see Figure 48) helps you determine when dangerous conditions develop that could lead to frostbite or hypothermia. It takes into account heat loss from the human body to its surroundings during cold and windy weather. The calculation utilizes wind speed in miles per hour and temperature in degrees Fahrenheit.

Figure 48 Wind Chill Chart

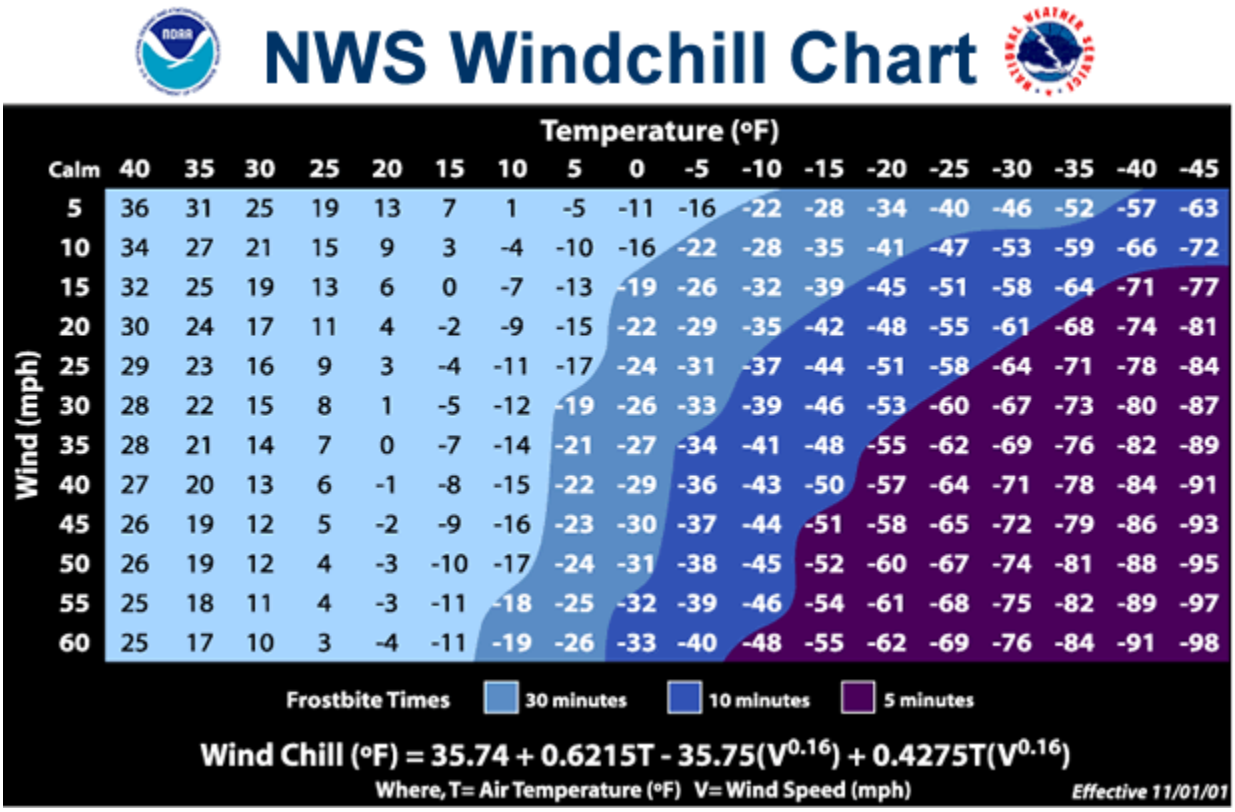


Source: https://www.weather.gov/bou/windchill

According to the National Weather Service:

> *Most snowstorms need two ingredients: cold air and moisture. Rarely do the two ingredients occur at the same time over western Oregon, except in the higher elevations of the Coast Range and especially in the Cascades. But snowstorms do occur over eastern Oregon regularly during December through February. Cold arctic air sinks south along the Columbia River Basin, filling the valleys with cold air. Storms moving across the area drop precipitation, and if conditions are right, snow will occur.*
>
> *However, it is not that easy of a recipe for western Oregon. Cold air rarely moves west of the Cascade Range. The Cascades act as a natural barrier, damming cold air east of the range. The only spigot is the Columbia River Gorge, which funnels the cold air into the Portland area. Cold air then begins deepening in the Columbia River valley, eventually becoming deep enough to sink southward into the Willamette valley. If the cold air east of the Cascades is deep, it will spill through the gaps of the Cascades and flow into the western valleys via the many river drainage areas along the western slope. The cold air in western Oregon is now in place. The trick is to get a storm to move near or over the cold air, which will use the cold air and produce freezing rain, sleet, and/or snow. Sometimes, copious amounts of snow are produced. Nearly every year, minor snowfalls of up to six inches occur in the western interior valleys. However, it is a rare occurrence for snowfalls of over a foot in accumulations [sic].*

Furthermore, the combination of wind and low temperature in winter can be deadly. The wind chill index (see Table ___) helps you determine when dangerous conditions develop that could lead to frostbite or hypothermia. It takes into account heat loss from the human body to its surroundings during cold and windy weather. The calculation utilizes wind speed in miles per hour and temperature in degrees Fahrenheit.



The regions across Douglas County can experience winter storms differently, due to their geographical and climatic differences, and are explained in the following:

Coastal Region

Though snow and ice are rarer on the coast, winter storms are more likely to occur with colder temperatures and stronger winds, due to the direct proximity to the Pacific Ocean, and lack mountains acting as a natural barrier. Due to the stronger winds and colder temperatures, there is a higher risk of damage to transmission lines and trees, which can contribute to greater instances of landslides and damage to structures.

Central Region

Winter storms often form within the Umpqua Valley, leading to colder temperatures spread throughout the valley, resulting in snow, ice, and strong windstorms. Additionally, with the higher concentration of development within the Central Region, there is a greater risk and vulnerability to residents and infrastructure.

Cascades Region

Due to the higher elevations, winter storms can produce more snow in this region compared to the other regions. Though development is much less in this region, as much of the region is included in the Umpqua National Forest, winter storms pose the risk of road blockages by downed trees, cutting off access between remote communities. Additionally, these remote communities can lose power to their homes, causing them to be unable to properly heat their residences and lose access to adjacent communities or utilize communication infrastructure.

History

Douglas County has experienced some notable and significant storms, even within the past decade, including the 2019 winter storm that was coined as "Snowmageddon". All of the snow events occurred between November and April. Each of these events caused disruption to the community in some way, either through infrastructure damage or power outages. The following discusses some of the most significant snowstorm events in Douglas County.

- **December 24, 1889 to February 13, 1890:** The big snow of '90 started the day before Christmas. Snow fell continually for 52 days, leaving between 5 ½ and 7 ½ feet, in the town of Glendale and more in the surrounding mountains. The weather then turned warm, and the snow began to melt so fast, the ground became soggy and there was high water and flooding. A severe landslide covered the railroad tracks and dammed up Cow Creek near West Fork below Glendale for many days. Reportedly several Chinese workers perished in the slide and that area of the mountain became known as the Chinaman's slide. Nothing could get through except people on foot, by climbing on the canyon wall high above the slide and mud area.
- **December 1919:** The December 1919 snowstorm was recorded as the third heaviest snowfall-producing storm in Oregon.
- **January 1950:** A total of 28.0 inches of snow fell in Roseburg between January 9th and 15th. Riddle was hit even harder with 42.9 inches of snow. There were three severe storms in January 1950, with little time separating each event resulting in a nearly continuous storm. The storm had severe effects on infrastructure, residents, and businesses across the state. Deep snowdrifts closed all highways west of the Cascades. Sleet that turned to freezing rain caused unsafe conditions on highways and damaged trees and powerlines.
- **Winter 1969:** January 21 to February 6, 1969 when strong storms, accompanied by snow, ice, wind, and freezing rain hit Oregon statewide. In the Roseburg area alone, 43.7 inches of snow fell over an 8-day period, including 25.5 inches between January 26th and 27th.
- **Winter 2019:** From February 23 to February 26, 2019, a snowstorm dubbed "Snowmageddon" occurred, resulting in heavy rain and wet, heavy snow to fall across the region and that state. Over 2 feet of snow came down in less than 24 hours, with over another foot of snow coming down over the next few days. The event severely impacted the County's infrastructure, including leaving thousands of Douglas County residents

Table 74 Snowmageddon Response and Recovery Costs

Repair Category	Cost
Debris Removal	$4,934,072
Emergency Protective Measures	$601,360
Roads and Bridges	$719,137
Public Buildings	$474,365
Utilities	$23,124,453
Parks/Others	$175,556
Total	**$30,028,943**

Source: Oregon Department of Emergency Management

without power, with some having no power for weeks after the event. Overall, the estimated cost of damages from this disaster was over $30 million, a breakdown of which can be seen in Table 74**.**

- Ice storms (sleet and freezing rain) are typically a short-lasting event in Douglas County. In the winter of 1978, freezing rain covered the Umpqua Valley. The build-up of ice caused power failures, brought down trees, and created serious hazards for motorists.

Winter Storm Hazard Assessment

Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a winter storm is "high",** meaning one incident is likely within the next 10 to 35-year period. This rating exists for all regions in the County. While winter storms of some degree of severity occur every year in Douglas County, the recurrence interval for significantly severe winter storms occur around every four years, as determined by the 2020 Oregon NHMP. *This rating has increased since the previous NHMP*.

Vulnerability Assessment

The Steering Committee rated the County as having a **"high" vulnerability to winter storm hazards**, meaning that more than 10 percent of the County's population or assets would be affected by a major disaster. Vulnerability is similar throughout the different regions in the County. *This rating has increased since the previous NHMP.*

Severe winter storms can cause power outages, transportation, and economic disruptions, posing a high risk of injuries and loss of life, especially for more vulnerable populations and those residing in more rural areas. Figure 49 highlights these vulnerabilities when a powerline was downed during the 2019 Snowmageddon Winter Storm.

Figure 49 Downed Powerline due to Snowmageddon

Source: Douglas County NHMP Steering Committee

Winter storms which bring snow, ice, and high winds can cause significant impacts on life and property, including downed trees and limbs, downed powerlines, and blocked roads. Many severe winter storm deaths occur because of traffic accidents on icy roads, heart attacks occurring 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.

The most likely impact of snow and ice events on Douglas County are road closures limiting access to and from impacted areas, especially roads to higher elevations. Closed roads due to debris and damage to

infrastructure can become a major obstacle to providing critical emergency response, police, fire, and other disaster recovery services. Winter storms with heavy wet snow or high winds and ice storms may result in power outages from downed transmission lines and/or poles.

Future Climate Variability – Winter Storm[55]

The OCCRI *Future Climate Projections Douglas County, Oregon* report projects cold extreme to become less frequent and intense as the climate warms. However, the frequency of cold extremes decreases at a slower rate than the increase of heat extremes. Cold extremes will diminish as winter temperatures warm and become less variable. It is estimated that the number of cold days (maximum temperature 32°F or lower) per year in Douglas County will decrease by an average of 2.4 (range 1.3–3.4) by the 2050s, while the temperature on the coldest night of the year is projected to increase by an average of 5°F (range 2–10°F). The number of County residents vulnerable to extreme cold is likely to grow, although the decrease in incidence of cold extremes may offset a percentage of residents affected.

[55] OCCRI, Future Climate Projections Douglas County, 2023

Chapter 4: Mitigation Plan Goals & Action Items

This section outlines Douglas 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 reviewed and updated the mission, goals and action items documented in this NHMP. Additional planning process documentation is in Volume II, Appendix B.

Mitigation Goals

Mitigation plan goals are more specific statements of direction that Douglas County residents, 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 action items. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

The plan goals help guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals serve as checkpoints as agencies and organizations begin implementing mitigation action items. The following goals were updated for the 2024 Douglas County NHMP with the help of the NHMP Steering Committee. The goals reflect the mitigation priorities of both Douglas County and the cities of Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston and Yoncalla. Each jurisdiction will adopt the following goals:

NOTE: The 2016 goals were reduced from 35 to five goals, as previously goals were categorized under each hazard type. The Douglas County Steering Committee agreed to condense these goals to address each hazard instead broadly under the same five goals.

Mitigation Goals

- GOAL A: Develop and implement mitigation activities to protect human life, property, and the natural environment.
- GOAL B: Protect existing buildings and infrastructure from the impacts of natural hazards.
- GOAL C: Build resilience to the impacts of natural hazards on the local economy.
- GOAL D: Educate the public and raise awareness of the impacts of natural hazards.
- GOAL E: Increase preparedness of communities and agencies.

The local adoption of the NHMP is used as a supporting document of the Comprehensive Plan. Communities in Oregon depend upon a Local Comprehensive Plan to organize and prioritize goals and policies for the community. These goals and policies assist with the implementation of planning, capital improvement, budgeting and other various decisions made to achieve the County and each city's goals. This multi-jurisdictional NHMP, once acknowledged by FEMA will subsequently be adopted by each jurisdiction as a support document for each local comprehensive plan. Action strategies and mitigation planning goals are thereby incorporated in the local jurisdictions plan for the purpose of implementation in the local decision-making process.

Action Items Development Process

Development of action items included a multi-step, iterative process that involved brainstorming, discussion, review, and revisions. Action items are developed through various sources, including community identified issues, study and report findings, steering committee discussion, and more. Example of how hazard related issues are illustrated below in Figure 50.

Figure 50 Development of Action Items

Many of the action items were created during the previous NHMP planning processes and were updated as necessary. During these processes, steering committees 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 Department of Land Conservation and Development (DLCD) provided guidance in the development of action items by presenting and discussing actions that were used in other communities. DLCD 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.

Action Item Framework

Many of the NHMP's recommendations are consistent with the goals and objectives of each jurisdiction's (County, cities, special districts) existing plans and policies. Where possible, each jurisdiction 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.

Action Item Development and Prioritization

The action items were developed through a two-stage process. In stage one, DLCD facilitated a work session with the steering committee to discuss vulnerabilities, risk profile, and to identify potential issues. In the second stage, DLCD, working with the steering committee, developed potential actions based on the hazards and the issues identified.

During the 2023 update process, the steering committee re-evaluated hazard mitigation strategies (Action Items), noting what accomplishments had been made, and determining whether the actions were still relevant. Any new action items were identified at this time (see Volume II, Appendix B).

Each steering committee identified the top three (3) action items priorities that currently reflect their community's current conditions, needs, and capacity. The Jurisdictions will focus their attention and resource availability upon these achievable, high leverage activities over the next five years, though the top priority actions may shift due to changes in community risk, capacity, and funding.

Although this methodology provides a guide for the jurisdictions in terms of implementation, each jurisdiction has the option to implement any of the action items at any time. This option to consider all action items for implementation allows jurisdictions to consider mitigation strategies as new opportunities arise, such as capitalizing on funding opportunities. Mitigation actions that were not prioritized will be considered for prioritization during maintenance meetings.

See Volume I, Chapter 4 for the action items for each participating jurisdiction.

Action Item Matrix

The action item matrix (Table 75) documents the title of each action along with the jurisdictions adopting the action, which jurisdictions are prioritizing the action, the projected timeline, and projected cost.

Table 75 Action Items: Douglas County

Natural Hazard Action ID	Action Item	Participating Jurisdictions	Priority Project for Community	Cost	Timeline
MH-1	Establish and promote warming/cooling/air quality centers in strategic, accessible locations to serve populations affected by extreme heat, cool winter temperatures and poor air quality due to wildfire smoke. Could include utilization of public facilities such as schools, community centers, and government buildings	Douglas County, Elkton, Reedsport, Riddle, Sutherlin		High	Ongoing
MH-2	Replace the water line bridge crossing from the city's water treatment plant (WTP) to connect across town.	Elkton	Elkton	High	Long-Term
MH-3	Elevate levee to the 200 year Base Flood Elevation plus 2 feet of freeboard standard ("200 + 2").	Reedsport		High	Short-Term
MH-4	Identify potential evacuation/supply routes, as well as enhance evacuation route capacity and accessibility in the event of highway and bridge closures due to a disaster, such as flood, tsunami, earthquake, or wildfire.	Douglas County, Reedsport, Riddle, Sutherlin	Douglas County, Reedsport, Riddle	High	Ongoing
MH-5	Replace the Scholfield Bridge and assess the adjoining water pipe for consideration as a potential retrofit.	Reedsport	Reedsport	High	Long-Term
MH-6	Provide an area for long-term food storage for community consumption and another for consumption by emergency responders.	Reedsport		Medium	Short-Term
MH-7	Install unmanned rapid deployment levee gates.	Reedsport		High	Short-Term
MH-8	Expand the Turner Fire Station to house a multi-jurisdictional operations center.	Reedsport		High	Long-Term
MH-9	Expand the existing communications systems between local and County agencies, such as acquiring satellite phones for emergency responders and maintenance crews.	Reedsport, Sutherlin		High	Short-Term

MH-10	Identify a fuel storage location south of the Scholfield Bridge to aid in emergency response services	Reedsport		Medium	Short-Term
MH-11	Utilize new hazard data and information (including tsunami, landslide, and other data developed by DOGAMI and other sources) to update the Natural Hazards (Goal 7) Section of the Reedsport Comprehensive Plan.	Reedsport		Low	Ongoing
MH-12	Identify and enhance/replace water pumps, storm water pumps, sewer, electric, gas and other utilities to enhance their resilience to a severe seismic event, in addition to preventing flooding caused by severe winter events exacerbated by climate change, such as winter storms or coastal erosion.	Reedsport, Riddle, Sutherlin	Riddle	High	Long-Term
MH-13	Encourage harvesting of potentially dangerous trees and wind-downed trees along utility and road corridors, preventing/minimizing potential winter and windstorm damage and risk to lives, property, and infrastructure	Douglas County, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Yoncalla	Drain, Elkton	Medium	Ongoing
MH-14	Work with local providers to have 3 portable generators available to provide emergency power.	Elkton	Elkton	High	Ongoing
D-1	Continue implementing the objectives of the “Water Resource Element” of the Douglas County Comprehensive Plan.	Douglas County		Medium	Ongoing
D-2	Develop Municipal Water Conservation plan that outlines trigger points for the city to institute water restrictions. Educate the community on water conservation methods they can implement to reduce the impact of droughts.	Canyonville, Myrtle Creek	Canyonville, Myrtle Creek	Medium	Short-Term

EQ-1	Further assess and fix the seismic deficiencies of critical facilities rated with a medium and high potential of collapse by DOGAMI's rapid visual screening assessment.	Douglas County, Canyonville, Drain, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		High	Ongoing
EQ-2	Further assess and fix the seismic needs of additional structures not included in DOGAMI's rapid visual screening assessment but identified by the County or individual cities (public structures) as being vulnerable during an earthquake event.	Riddle, Sutherlin		High	Ongoing
EQ-3	Further assess and fix the seismic needs of bridges identified as being seismically vulnerable during an earthquake event.	Douglas County, Roseburg, Sutherlin	Douglas County	High	Ongoing
EQ-4	Encourage earthquake safety promotion and drills to schoolchildren and community groups.	Douglas County, Canyonville, Drain, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Low	Ongoing
EQ-5	Assist the Sutherlin Water Control District in updating the Emergency Action Plan for Plat I and Cooper Creek Dams.	Douglas County, Sutherlin		Low	Short-Term
EQ-6	Install Master Heights water storage tank and associated seismically resistive water lines to hospital and fire station for water resilience during an emergency.	Reedsport		High	Long-Term
FL-1	Identify opportunities to upgrade the Federal Insurance Rate Map (FIRM).	Douglas County, Canyonville, Drain, Glendale, Myrtle Creek, Oakland, Riddle, Sutherlin		Medium	Ongoing

FL-2	Identify opportunities to upgrade Douglas County Planning Department's GIS system for floodplain mapping.	Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Riddle, Sutherlin, Winston, Yoncalla		Medium	Long-Term
FL-3	Distribute information regarding flooding to the public efficiently.	Douglas County, Canyonville, Drain, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Winston, Yoncalla	Drain, Roseburg	Low	Ongoing
FL-4	Explore funding for repetitive loss property mitigation projects.	Douglas County, Canyonville, Drain, Glendale, Myrtle Creek, Oakland, Riddle, Winston, Yoncalla		High	Ongoing
FL-5	Further assess and fix the scouring impacts to bridge foundation elements identified and determined to be unstable due to observed and evaluated scour conditions by implementing commonly accepted scour countermeasure projects.	Douglas County, Canyonville, Myrtle Creek, Oakland, Sutherlin	Canyonville, Myrtle Creek	High	Ongoing
FL-6	Identify surface water drainage obstructions, including seeking funding for culvert mitigation projects, fixing, and repairing culverts identified in "very poor" condition.	Douglas County, Riddle, Sutherlin		High	Ongoing
FL-7	Assess the possibility of secondary water source for the City of Oakland.	Oakland		High	Long-Term
FL-8	Ensure continued compliance with the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.	Canyonville, Reedsport, Riddle, Roseburg	Canyonville	Medium	Ongoing
FL-9	Seek certification for the city's levee system to ensure safety and functionality.	Reedsport	Reedsport	High	Short-Term

FL-10	Upgrade and expand the interior storm water collection system to accommodate the yearly amounts of water and potential flooding and to resist seismic activity.	Reedsport, Riddle, Sutherlin	Riddle	High	Long-Term
LS-1	Identify areas within a jurisdiction that are subject to possible geologic hazards. Amend the zoning ordinance to include a geologic hazard overlay which provides mitigating standards required for development within those areas subject to possible geologic hazards.	Douglas County, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Medium	Ongoing
LS-2	Encourage construction, site location, and design that can be applied to steep slopes to reduce the potential threat of landslides.	Douglas County, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Winston, Yoncalla	Roseburg	Medium	Ongoing
LS-3	Mitigate development and activities in identified potential and historical landslide areas through public outreach.	Douglas County, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Low	Ongoing
LS-4	Increase coordination between local jurisdictions, emergency responders, homeowners, and landslide warning systems.	Douglas County, Sutherlin		Medium	Ongoing
T-1	Investigate the possibility of adopting more accurate tsunami inundation maps created by DOGAMI in 2013 as compared to the existing regulatory map created in 1995.	Douglas County		High	Long-Term
T-2	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools, and businesses in promoting tsunami awareness and evacuation.	Douglas County		Low	Ongoing

T-3	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of tsunami dangers.	Douglas County		High	Ongoing
WF-1	Seek funding and labor opportunities to staff fuel-reduction projects throughout wildfire hazard prone areas in Douglas County.	Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Low	Ongoing
WF-2	Increase communication, coordination, and collaboration between wildland/urban interface property owners, city and County planners, and fire prevention crews and officials to address risks, existing mitigation measures, and federal assistance programs.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla	Douglas County	Medium	Ongoing
WF-3	Maintain and further develop interagency and private industry relationships for continuing strong fire response in rural Douglas County.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Low	Ongoing
WF-4	Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to wildfire.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla	Drain	Low	Ongoing

WF-5	Create incentives and assist landowners in reducing fuel loads on private property.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		High	Ongoing
WF-6	Look for solutions to protect structures located outside of fire districts through partnerships, grant funding or expansion of fire district services.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		High	Ongoing
WF-7	Seek improved information gathering, and distribution and technology for enhancing fire identification, initial response, and evacuation if necessary.	Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		Medium	Ongoing
WD-1	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.	Douglas County, Myrtle Creek	Myrtle Creek	Medium	Ongoing
WD-2	Map locations around the County that have the highest incidence of extreme windstorms.	Douglas County		Medium	Long-Term
WD-3	Encourage critical facilities to secure backup emergency power.	Douglas County, Canyonville, Riddle, Roseburg, Sutherlin, Winston	Douglas County, Roseburg	Medium	Ongoing

WT-1	Assure a sufficient supply of sand and anti-icing agent to use on priority and secondary transportation routes for a minimum of one major winter storm event each year.	Douglas Canyon, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, Yoncalla		High	Ongoing

Chapter 5: Plan Implementation & Maintenance

This section details the formal process employed to ensure that the NHMP remains an active andrelevant document. The plan implementation and maintenance process include a schedule for monitoring and evaluating the NHMP semi-annually, as well as updating the plan every five years. Finally, this section describes how the County will integrate public participation throughout the NHMP maintenance and implementation process.

Implementing the NHMP

The success of the NHMP depends on how well the outlined action items are implemented. Proper implementation and maintenance of the plan ensures that this plan will maximize County and/or city's efforts to reduce the risks posed by natural hazards. The respective County and/or city Planning Department will act as the agency responsible for implementing this process.

In an effort to ensure that the activities identified are implemented, the following steps will be taken: 1) the NHMP will be formally adopted, 2) a Steering Committee will be assigned, 3) a convener shall be designated, 4) semi-annual meetings will be held, 5) the identified activities will be prioritized and evaluated, and 6) the NHMP will be implemented through existing plans, programs and policies.

NHMP Adoption

The Douglas County NHMP was developed and will be implemented through a collaborative process. After the NHMP is locally reviewed and deemed complete, the Douglas County Emergency Manager, or their designee, shall submit it to the State Hazard Mitigation Officer (SHMO) at the Oregon Department of Emergency Management (ODEM). ODEM submits the NHMP to 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 cities will adopt the NHMP via resolution. At that point, the County will gain eligibility for the Hazard Mitigation Grant Program, the Building Resilient Infrastructure and Communities program funds, and Flood Mitigation Assistance program funds. Following adoption by the County, the participating jurisdictions should convene local decision makers and adopt the Douglas County Multijurisdictional NHMP.

Convener

The Douglas County Planning Department will serve as the convener for the NHMP and will take responsibility for the implementation of the NHMP and facilitate the Steering Committee meetings. Each individual city will be responsible for convening their own meeting with their respective quasi-steering committee concerning implementation and maintenance involving action items in their specific jurisdiction. (See the table below for a list of conveners and bodies for each specific city). NHMP implementation and evaluation will be a shared responsibility among all the assigned Steering Committee Members.

Given the capacity constraints for most of the local jurisdictions included in this multi-jurisdictional plan most of the jurisdictions involved utilize existing Planning Commissions and City Councils as the reviewing body for maintenance of the NHMP.

The Convener's responsibilities include:

- Coordinate Steering Committee meeting dates, times, locations, agendas and member notification;
- Facilitate and document the discussions and outcomes of committee meetings;
- Serve as a communication conduit between the Steering Committee and the public/stakeholders;
- Review status of mitigation actions and identify needs that can be addressed through new action items;
- Identify emergency management-related funding sources for natural hazardmitigation projects; and
- Utilize the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.

Steering Committee

The Douglas County Convener will maintain a Natural Hazard Steering Committee for updating and implementing the NHMP. The Steering Committee roles and responsibilities include:

- Attend future maintenance and NHMP update meetings (or designating a representative to serve in your place);
- Serve as the local evaluation committee for funding programs such as the Hazard Mitigation Grant Program funds, the Building Resilient Infrastructure and Communities program funds, and Flood Mitigation Assistance program funds;
- Prioritize and recommend funding for natural hazard risk reduction projects;
- Document the successes and lessons learned, and evaluate how these can be incorporated into future mitigation work;
- Evaluate and update the Natural Hazards Mitigation Plan following a disaster to address for new needs, vulnerabilities, and risks;
- Evaluate and update the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule; and
- Develop and coordinate ad hoc and/or standing subcommittees as needed.
- Coordinate public involvement activities

Members

To make the coordination and review of the NHMP as broad and useful as possible, the steering committee will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. The stakeholder's engaged as part of the ongoing implementation and maintenance of the NHMP includes but is not limited to:

- City representatives
- Special district Representatives
- Watershed Districts
- Economic Development Agencies
- Local Utility Representatives
- Fire & Police Departments

- State and Federal Agencies
- Soil and Water Conservation Groups
- Other Nongovernmental Organizations
- Port Agencies

In addition, the Douglas County Planning Department will utilize the Committee for Citizen Involvement (CCI) to evaluate public input concerning implementation and maintenance of the plan. CCI review will provide the opportunity for countywide citizen involvement in the land use planning process. The primary function of the CCI is to evaluate local and countywide planning issues and submit recommendations concerning land use actions to the appropriate decision-making body. It is intended that CCI recommendations reflect the needs and concerns of County residents. The CCI meets quarterly to review Planning Department related issues including ongoing maintenance and proposed updates to the local NHMP; such recommendations are summarized and forwarded on to the Planning Commission for review and action. See Appendix A for a roster sheet of the CCI.

Implementing 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 NHMP, FEMA requires the identification of existing programs that might be used to implement these action items. Douglas County and the participating cities 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, Douglas County and participating cities will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the recommendations contained in the NHMP are consistent with the goals and objectives of the participating cities and the County's existing plans and policies. Where possible, Douglas County and participating cities should implement the recommended actions contained in the NHMP 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 action items contained in the NHMP through suchplans and policies increases their likelihood of being supported and implemented.

Examples of plans, programs or agencies that may be used to implement mitigation activitiesinclude:

- City and County Budgets
- Community Wildfire Protection Plans
- Comprehensive Land Use Plans
- Economic Development Action Plans
- Zoning Ordinances and Building Codes

For additional examples of plans, programs or agencies that may be used to implementmitigation activities refer to list of plans in Volume I, Section 2.

NHMP Maintenance

NHMP maintenance is a critical component of the NHMP. Proper maintenance of the NHMP ensures that it will maximize the County and participating Cities' efforts to reduce the risks posed by natural hazards. This section includes a process to ensure that a regular review and update of the NHMP occurs. The Steering Committee and local staff are responsible for implementing this process, in addition to maintaining and updating the NHMP through a series of meetings outlined in the maintenance schedule below.

Meetings

The Steering Committee will meet on a semi-annual basis to complete the following tasks. During the first meeting the Steering Committee will:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the NHMP and mitigation in general;
- Identify issues that may not have been identified when the NHMP was developed;and
- Prioritize potential mitigation projects using the methodology described below.

During the second meeting, the Steering Committee 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 theCounty on progress that has been made towards their components of the NHMP.

The convener will be responsible for documenting the outcome of the semi-annual meetingsin **Volume II, Appendix B.** The process the Steering Committee will use to prioritize mitigation projects is detailed in the section below. The NHMP's format allows the County and participating Cities 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.

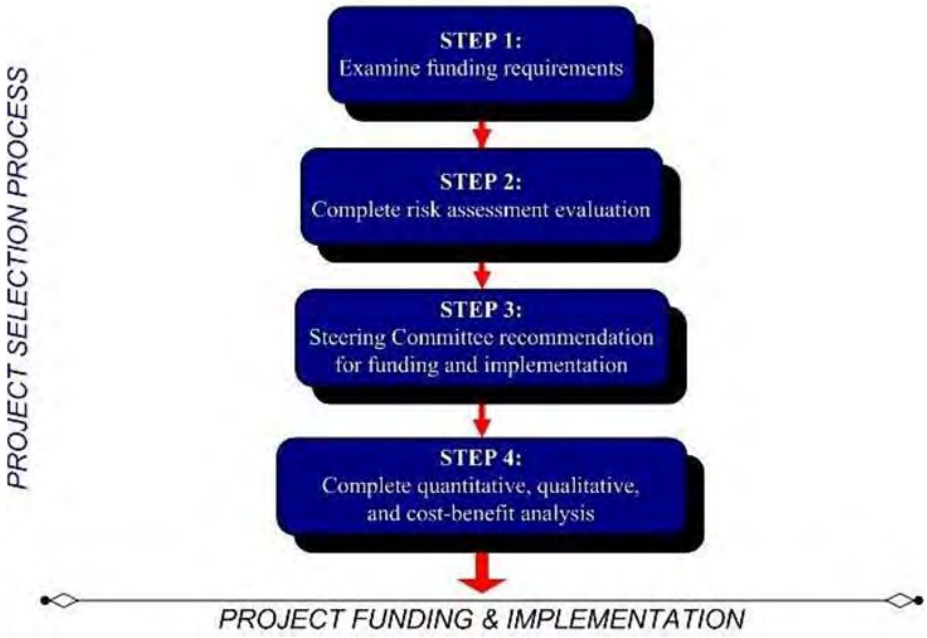
Project Prioritization Process

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. The following four steps illustrate the project development and prioritization process, as well as seen in Figure 51**.**

- **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/city's proposed mitigation projects. Examples of mitigation funding sources include but are not limited to FEMA's Building Resilient Infrastructure and Communities (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. Because grant programs open and close on differing schedules, the County and/or city will need to examine upcoming funding streams' requirements to determine which mitigation activities would be eligible. The steering committee may consult with the funding entity, ODEM, or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the steering committee semi-annual NHMP maintenance meetings.

Figure 51 Action Item and Project Review Process

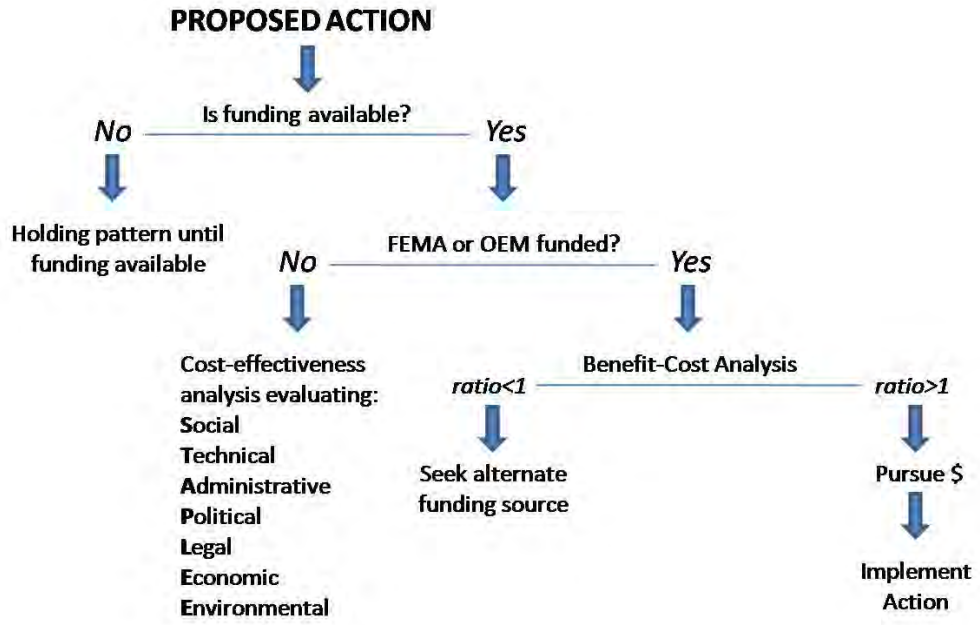


Source: Oregon Partnership for Disaster Resilience, 2008

- **Step 2 - Complete risk assessment evaluation:** The second step in prioritizing the NHMP'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 steering committee will determine whether the NHMP'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 committee 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 - Coordinating Body Recommendation:** Based on the steps above, the committee will recommend which mitigation activities should be moved forward. If the committee decides to move forward with an action, a coordinating organization will be designated to take further actions and, if applicable, documenting success upon project completion. The committee 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, 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 52 shows decision criteria for selecting the appropriate method of analysis.

Figure 52 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 FEMA-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one 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. OPDR 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 Douglas County NHMP. To ensure that these opportunities willcontinue, the County and participating jurisdictions will:

- Post copies of their plan on corresponding websites;
- Place articles in the local newspaper directing the public where to view and providefeedback; and

- Use existing newsletters such as schools and utility bills to inform the public where toview and provide feedback.

In addition to the involvement activities listed above, Douglas County, cities, and special districts will ensure continued public involvement by posting a link to the Douglas County NHMP on their websites.

Five-Year Review of Plan

This NHMP will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. The Douglas County NHMP is due to be updated by [month day], 2029. The Convener will be responsible for organizing the Steering Committee to address NHMP update needs. The Steering Committee will be responsible for updating any deficiencies found in the NHMP and for ultimately meeting the Disaster Mitigation Act of 2000 NHMP update requirements.

During plan updates, the following questions will be asked to determine what actions are necessary to update the plan. Douglas County and/or the appropriate city will be responsible for convening the committee to address the questions outlined below.

- Are the plan's goals still applicable?
- Have new issues or problems related to hazards been identified in the community?
- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Do existing actions need to be reprioritized for implementation?
- Are the actions still appropriate, given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Are there new studies or data available that would enhance risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

The questions above will help the committee determine what components of the mitigation plan need updating. The committee will be responsible for updating any deficiencies found in the plan based on the questions above.

Volume II

Appendix A: Action Item Forms

Action Items

Multi-Hazard Action Items

- Multi-Hazard #1
- Multi-Hazard #2
- Multi-Hazard #3
- Multi-Hazard #4
- Multi-Hazard #5
- Multi-Hazard #6
- Multi-Hazard #7
- Multi-Hazard #8
- Multi-Hazard #9
- Multi-Hazard #10
- Multi-Hazard #11
- Multi-Hazard #12
- Multi-Hazard #13
- Multi-Hazard #14

Drought Action Items

- Drought #1
- Drought #2

Earthquake Action Items

- Earthquake #1
- Earthquake #2
- Earthquake ##
- Earthquake #4
- Earthquake #5
- Earthquake #6

Flood Action Items

- Flood #1
- Flood #2
- Flood #3
- Flood #4
- Flood #5

- Flood #6
- Flood #7
- Flood #8
- Flood #9
- Flood #10

Landslide Action Items

- Landslide #1
- Landslide #2
- Landslide #3
- Landslide #4

Tsunami Action Items

- Tsunami #1
- Tsunami #2
- Tsunami #3

Wildfire Action Items

- Wildfire #1
- Wildfire #2
- Wildfire #3
- Wildfire #4
- Wildfire #5
- Wildfire #6
- Wildfire #7

Windstorm Action Items

- Windstorm #1
- Windstorm #2
- Windstorm #3

Winter Storm Action Items

- Winter Storm #1

Action Items

Action items are followed and developed by rationale for the proposed action item, coordinating organizations, and ideas for implementation. Action items are categorized by each specific hazard; however, it should be noted that some action items are driven by the possibility of several different hazards occurring at separate times or during one multi-hazard event and are thus categorized as 'Multi-Hazard'. Be aware that although an action item may be listed under one hazard, does not mean it could not qualify for implementation under another possible event. Some action items are specific to an individual city and will be identified as such, though many cities share similar mitigation goals.

The action items listed within this chapter are first categorized as follows:

- Action Items are organized into the following tables based on the action item's relativity to each jurisdiction within this plan. The action items which are listed in alphabetical order and described in greater detail within the latter portion of this chapter are listed and identified by unique I.D. which corresponds to the natural hazard in which the action item is categorized. The number within the alphanumeric I.D. corresponds to the action items number in which it is listed within the natural hazard. The I.D.'s are as follows:
    - **MH -** Multi-Hazard
    - **D -** Drought
    - **EQ -** Earthquake
    - **FL -** Flood
    - **LS -** Landslide
    - **T -** Tsunami
    - **WF -** Wildfire
    - **WD -** Windstorm
    - **WT -** Winter Storm

- After the tables the action items are then categorized by each specific type of hazard, at which time they are discussed in further detail. Analysis involving each action item includes review of the following items:
    - **Priority Action for Identified Community:** Lists which communities have identified the action as a high priority mitigation action.
    - **Description of Action Item:** Provides any relevant background information, rational for implementation, and potential implementation ideas and sites.
    - **Coordinating Organizations:** Provides listing proposed primary lead, secondary leads, and other community organizations that will participate.
    - **Estimated Cost:** Provides a broad and general estimate of how much it would cost to plan, develop, and implement the action.
    - **Timeline:** Provides a projection of how long a project would take from start to finish, though many action items can be applied to multiple iterations of the project, which would call for an ongoing process.
    - **Notes:** Compromises of any necessary information not documented in the form, including jurisdiction specific information or previous/successful applications of the action item.

Douglas County Mitigation Successes

Douglas County has several examples of hazard mitigation including the following projects funded through FEMA Hazard Mitigation Assistance and the Oregon Infrastructure Finance Authority's Seismic Rehabilitation Grant Program.[56]

- Douglas County:
    - Upgraded Douglas County GIS system for floodplain mapping.
    - Transmission line relocation (between Elkton & Scottsburg) – Douglas Electric
    - Flood control for Cow Creek – Galesville Dam
- City of Canyonville
    - Repairing Hamlin Bridge (2022024).
- City of Drain
    - Seismic structural upgrade of North Douglas Elementary School (2023).
    - Relocation of water line washed out during 1996/97 storm event
    - House elevation program after 1996/97 storm event
- City of Glendale
    - Seismic structural upgrades of Glendale High School and Glendale Elementary School.
- City of Myrtle Creek
    - Buy out of trailer park along the South Umpqua River (Conv. to park)
    - House Elevation Program
- City of Oakland
    - Limiting activities and development on steep slopes (Ordinance No. 567 and 582).
    - Installed emergency generators at Water Treatment Plan.
    - New water intake was relocated due to winter storm damage (2021)
- City of Reedsport
    - Developed code language and regulated a tsunami overlay zone.
    - Levee update
    - Stream gage installation for flood forecasting
- City of Roseburg
    - Seismic structural upgrades of Fire Station #2 (2019) and Fire Station #3 (2018).
    - Seismic upgrades of seven (7) water transmission mains updates between 2012-2024.
    - Improved storm water storage capacity along Newton Creek (2017).
    - 30-inch transmission main constructed (2021)
    - Backup power generation completed at city water treatment (2023)

[56] The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools, and emergency services facilities.

Multi-Hazard Action Items

Multi-Hazard #1			
Proposed Action Item	Identify, establish, and promote suitable locations for temporary warming/cooling/air quality centers or temporary housing in strategic, accessible locations. These will serve populations affected by either extreme heat, cool winter temperatures and poor air quality due to wildfire smoke, or who have lost access to their residences due to earthquake damage, wildfire evacuation, lost power due to winter storms. These could include utilization of public facilities such as schools, community centers, and government buildings.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☒Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	Wildfire, floods, earthquake, and/or tsunami events, could result in a major loss (demolition) of buildings within hazard zones. Furthermore, extreme heat or cold events, as well as poor air quality due to wildfire smoke can significantly impact the health and well-being of residents if their living situations are not adequately equipped to mitigate the impacts from these hazardous events. Given the potential for these types of outcomes and impacts, temporary shelter and potential housing situations will be vital for the future, especially as these events increase in their probability of occurrence. Given that time would be restricted in an emergency, seeking to utilize existing structures for shelters and temporary housing options will be ideal, rather than constructing new structures to meet these needs. Immediate shelter and housing solutions could mean tent camps or partnering with property owners outside of high-hazard zones and/or that are structurally resilient to hazards. This could also include local churches and schools with HVAC systems, have space for sleeping, and have shower and restroom facilities. Furthermore, these could potentially develop into community resilience hubs, which are community-serving facilities augmented to support community members, as well as coordinate resource and service management and distribution before, during, and after a natural hazard event.		
Potential Funding Sources	BRIC, HMGP, HB 2990: Community Resilience Hubs Grant		

Coordinating Organization	Planning department, Emergency Management, Public Works Department
Estimated Cost	**Timeline**
High	Ongoing
Notes	**This action addresses the following hazards: Extreme weather events, wildfire, poor air quality, earthquake, flooding, and tsunami. Reedsport: Immediate shelter and housing solutions could mean partnering with property owners south of the Scholfield Bridge whose homes are undamaged and large enough to take in community members

Multi-Hazard #2			
Proposed Action Item	Replace the water line bridge crossing from the city's water treatment plant (WTP) to connect across town.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☒Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The objective is to create a redundant treated water line crossing Elk Creek from the WTP to City reservoir. Currently there is only one line delivering water from the WTP to the City set in concrete under Elk Creek which is vulnerable to earthquake and potentially flood damage. The City currently only has one route for treated water to get from the treatment plant across Elk Creek to the majority of the population and the reservoirs. There are also aging water lines extending down Hwy 38. These lines are vulnerable to earthquake damage. The current creek crossing is also potentially vulnerable to flood damage. The City is in the process of applying for BIL funding through Business Oregon to replace the water line from the WTP across the Hwy 38 bridge at Elk Creek and continuing down Hwy 38 to the High School, continuing through the HS property and connecting with the 8-inch line on River Road.		
Potential Funding Sources	BIL, BRIC, CDBG, USDA Rural Utilities Service (RUS), WaterSMART, EPA CWSRF, General Funds		
Coordinating Organization	City of Elkton, Business Oregon, Civil West Engineering		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes	**This action addresses the following hazards: Drought, earthquake, flood. LOI approved and qualified, 10% water rate increase applied (necessary for loan)		

Multi-Hazard #3			
Proposed Action Item	Elevate levee to the 200 year Base Flood Elevation plus 2 feet of freeboard standard ("200 + 2").		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	As described under Action Item "Seek certification of the city's levee system": The City has received grant funding from FEMA and other agencies to design and construct the improvements necessary for the Corps to certify the levee. As of the date of this Plan, the City is currently nearing completion of the permitting phase of the levee improvement project. The levee improvement design calls for the levee to be elevated to the predicted height of the "200 year" flood, plus two feet of freeboard. The City's levee protects the community from both flood and varying degrees of tsunami. By increasing the height of the levee, it will provide a higher level of protection from these events and account for potential subsidence during an earthquake. Even if the levee is eventually overtopped by a tsunami, the added height will provide additional time to evacuate as tsunamis usually take time to build and the first wave is usually considerably smaller than the second or third. This will allow residents and first responders additional time to secure food fuel sources, evacuate the injured and get to high ground. This project includes the replacement of the sheet pile wall at Champion Park with a larger more secure structure that can withstand higher hydraulic loading and seismic activity.		
Potential Funding Sources	FMA, BRIC, HMGP, General Funds		
Coordinating Organization	City of Reedsport Public Works Department; City of Reedsport Police & Fire Departments; FEMA, USAGE, State of Oregon		
Estimated Cost	**Timeline**		
High	Short-Term		
Notes	**This action addresses the following hazards: Flood, tsunami, earthquake		

Multi-Hazard #4			
Proposed Action Item	Identify potential evacuation/supply routes, as well as enhance evacuation route capacity and accessibility in the event of highway and bridge closures due to a disaster, such as flood, tsunami, earthquake, or wildfire.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	A natural disaster, such as a tsunami, wildfire, or earthquake, can devastate a community by causing extensive damage to critical transportation infrastructure, and thus potentially impairing community members' ability to evacuate their communities. Alternative routes are vital to evacuations and provide essential services to the community during a catastrophic event. Identifying potential evacuation and supply routes will reduce the city's vulnerability to a future disaster, as well as evaluating the effectiveness of existing evacuation routes and signage to determine the feasibility of these routes and to determine if road conditions are adequate. Doing so can help improve evacuation route road conditions and expand the use and visibility of Evacuation resources and signs around hazard areas. The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(il)]. While identifying evacuation routes will not necessarily reduce the effects of a hazard, they will improve the safety of the community's residents should a natural disaster occur.		
Potential Funding Sources	BRIC, General funds, HMGP, FMA		
Coordinating Organization	Planning Department, Police and Fire Departments, Private Logging Companies, US Forest Services, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes	**This action addresses the following hazards: Extreme weather events, flood, landslide, tsunami, earthquake, wildfire. Reedsport: The Scholfield Bridge is a vital link between the west and east sides of Reedsport. The Umpqua River Bridge provides an essential crossing over the Umpqua River. Damage to these		

	bridges could divide the two halves of the community, with no other accessible, connecting roads.

Multi-Hazard #5			
Proposed Action Item	Replace the Scholfield Bridge and assess the adjoining water pipe for consideration as a potential retrofit.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The Scholfield bridge is a critical transportation link between downtown Reedsport and the southwest side of the city. The bridge was constructed in 1928 and was upgraded in 1952. These upgrades, however, did not include the original pilings, which have begun to deteriorate making the bridge vulnerable to flood, tsunami and/or earthquake. Failure or collapse of the bridge would eliminate the major evacuation route for downtown and mid-town residents and isolate residents from the only Hospital in the city. In addition, connected to the bridge is a critical water pipe that connects the southwest side of the city to the northeast side. If the bridge and water pipe are disabled due to earthquake, flood, or tsunami, then areas of Reedsport would be isolated, and residents would be at risk of contaminated water. The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(11)]. Replacing the Scholfield Bridge and water pipe will reduce the risk of damage to two critical pieces of infrastructure and prevent contamination of the local water resources.		
Potential Funding Sources	BRIC, USDA RUS, STORM, WaterSMART, CDBG, EPA CWSRF, General fund		
Coordinating Organization	City of Reedsport Public Works Department, City of Reedsport Planning & Finance Departments, Oregon Department of Transportation, FEMA, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes	**This action addresses the following hazards: Earthquake, tsunami, flood		

Multi-Hazard #6			
Proposed Action Item	Provide an area for long-term food storage for community consumption and another for consumption by emergency responders.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	In the event of a major hazard, such as earthquake, tsunami, or severe flooding, many residents of the downtown and/or those living in older homes that are unable to withstand an earthquake event, would likely be displaced. This would mean those individuals and families would be without not only shelter, but food, as well. Compounding the effects of those individuals and families' limited access to food, both of Reedsport's grocery stores were constructed prior to the 1960's and located in the downtown area. This means the existing food stock could become contaminated or may no longer be accessible following a natural disaster. Even if access were possible, the supply on hand would likely be limited to not more than one week. With road access cut off, it is unknown how quickly, if at all, food can be delivered to the community by vehicles. Consideration should be given to a mutual agreement with an agency from Roseburg or another region that may be unaffected by the natural hazard, in order to have food flown in. Furthermore, education on the storage of non-perishable foods, such as canned goods, vacuum sealed foods, and water for individual preparation is highly important. Groups such as CERT could lead trainings and mock scenarios to help individuals and families understand how to store food and bottled water that will help them survive a few days to a week until they are reached by emergency responders, in the case of a major natural disaster. If the downtown is unavailable, then it will be necessary to identify an area or areas uptown for food storage and temporary "grocery store" uses, where food is rationed rather than purchased. The Project Blessing Food Pantry is located in the uptown area and is designed as a mini grocery store. The local food supply storage could be rationed and distributed through the pantry. The pantry may not be large enough to store food, so another location for storage may need to be identified.		
Potential Funding Sources	BRIC, HMGP, FNS, SPIRE, General Funds		

Coordinating Organization	City of Reedsport Public Works Department, City of Reedsport Police and Fire Departments, Local churches, Reedsport School District, Project Blessing and AARP Food Pantries, Oregon Emergency Management, Douglas County Emergency Management, CERT
Estimated Cost	**Timeline**
Medium	Short-Term
Notes	**This action addresses the following hazards: All extreme weather events, flood, earthquake, landslide, tsunami, wildfire,

Multi-Hazard #7			
Proposed Action Item	Install unmanned rapid deployment levee gates.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The City of Reedsport's levee system was constructed in the 1960's in order to prevent flooding the downtown; however, the levee system has many openings to allow for vehicular and pedestrian traffic. These existing openings through the levee allow for vehicular and pedestrian travel from protected to unprotected areas during normal and non-flooding conditions. Currently, the openings can be closed using drop boards that require manual assembly. This can be time and labor consuming. The labor time necessary to erect the gates in case of a tsunami or severe flood would be too slow and dangerous for our emergency staff. It takes approximately 20 minutes and five people to manually close one gate. In order to protect the lives of residents and property of Reedsport's downtown core, new traffic rated automatic flood gates should be installed to act as levee closure devices. These automated gates will activate during flood conditions thus reducing the labor and response time for gate closure. Currently, the City of Reedsport levee system has 7 closure structures. The gate at Winchester Avenue will need to be raised with the installation of a new sheet pile wall structure. These improvements are planned as part of the Reedsport levee improvement project description under the Action Item "Seek certification of the city's levee system:"		
Potential Funding Sources	FMA, BRIC, HMGP, General Funds		
Coordinating Organization	City of Reedsport Public Works Departments, City of Reedsport Finance, Police, & Fire Departments, Oregon Department of Emergency Management, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Short-Term		
Notes	**This action addresses the following hazards: Tsunami, flood		

Multi-Hazard #8			
Proposed Action Item	Expand the Turner Fire Station in order to house a multi-jurisdictional operations center.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	In the case of a major hazard event, such as an earthquake, tsunami, or major flood, more room is needed for an emergency operations center at Turner Fire Station. The facility would need to expand in order to incorporate: • Showers for decontamination, • A kitchen for preparing meals for emergency shifts and mutual aid calls, • A classroom for training, • Two additional bays for tender or ladder trucks; • Additional space to set up the Douglas County Emergency operation center, • A radio room for the ham radio, dispatch, and other communications. • Onsite potable water storage in case the City's water infrastructure is damaged and not able to provide uncontaminated water. The water could then be used by the emergency responders and/or rationed to the public, depending on the severity of the event.		
Potential Funding Sources	BRIC, HMGP, SPIRE, EMPG, General Funds		
Coordinating Organization	City of Reedsport Public Works Departments and Police & Fire Departments, Red Cross, Oregon Department of Emergency Management, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes	**This action addresses the following hazards: All extreme weather events, earthquake, flooding, tsunami, wildfire In 2023, the City completed a seismic retrofit of the Turner Fire Station; at that time, the City commissioned a preliminary design of an addition to the station, which would house the multi-jurisdictional operations center, and confirmed its feasibility on the site.		

Multi-Hazard #9			
Proposed Action Item	Expand the existing communications systems between local and County agencies, such as acquiring satellite phones for emergency responders and maintenance crews.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	To minimize the effects of a natural disaster, such as earthquake, major flood, or tsunami, it is imperative for there to be reliable means of communication between local and County agencies, and emergency responders and maintenance crews. Given that cell phones and landlines rely on infrastructure (e.g., towners, power lines) to operate, these methods of communication will likely not withstand a major disaster event. One such method that does not rely on communication and cell towers, or cables or phone lines to work is satellite phone services, which are reliable means of communication when other services have failed. Limited agencies have access to such communication methods, such as Reedsport's Lower Umpqua Hospital, who rely on the satellite phone services to ensure reliable medical services, quick response to fires, maintenance of roadways, etc. in the event of a disaster. Other agencies, such as first responders, government entities, health care services, and other critical facilities should have access to a satellite phone in the event of an emergency so that communications systems remain active and accessible.		
Potential Funding Sources	BRIC, HMGP, USDA RUS, CDBG, General Funds		
Coordinating Organization	Police Department, Fire Department, Public Works Department, Finance Departments, Red Cross, Oregon Department of Emergency Management, Douglas County Emergency Management & Sherriff's Office, Lower Umpqua Hospital		
Estimated Cost	**Timeline**		
Medium	Short-Term		
Notes	**This action addresses the following hazards: All extreme weather events, earthquake, flooding, tsunami, wildfire Reedsport: Plans to ensure that satellite phone services are available to be utilized in the emergency operations center at Turner Fire Station and multiple phones to be used among the Police & Fire Department, Douglas County Sherriff's Office, Public		

	Works Department, and other agencies that may arrive to help mitigate the disaster

Multi-Hazard #10			
Proposed Action Item	Identify a fuel storage location south of the Scholfield Bridge to aid in emergency response services		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Presently, there are no fuel storage facilities or service stations located south of the Scholfield Bridge. All of the operating gas stations are located north of the Scholfield Bridge, in the mid-town and downtown areas. This is of concern to the Police & Fire Departments, as well as the Lower Umpqua Hospital. In the event of an earthquake, significant enough to damage the bridge, an adequate supply of fuel will need to be available in the uptown area to serve emergency responders and so that the Hospital and other critical facilities can operate generators in the likelihood that the power lines are damaged. Should a major flooding event occur, while the bridge may be unaffected, the fuel supply in the downtown area would be unattainable and could be contaminated by the time flood waters recede. In order to address this concern, it will be necessary to identify safe locations in the uptown area for the proper storage of fuel tanks. While the hospital and fire departments currently each have limited supplies of fuel available, it is not enough to operate for more than a couple of days. A major event could leave these facilities and agencies stranded for weeks. An adequate supply shall be determined, as well as locations with enough room to properly store and secure the tanks.		
Potential Funding Sources	BRIC, ODEM Fuel Storage Facility Compatibility Fund Grant, USDA RUS		
Coordinating Organization	City of Reedsport Police & Fire Departments, City of Reedsport Finance & Public Works Departments, Lower Umpqua Hospital		
Estimated Cost	**Timeline**		
Medium	Short-Term		
Notes	**This action addresses the following hazards: All extreme weather events, earthquake, flooding, tsunami, wildfire		

Multi-Hazard #11			
Proposed Action Item	Utilize new hazard data and information (including tsunami, landslide, and other data developed by DOGAMI and other sources) to update the Natural Hazards (Goal 7) Section of the Reedsport Comprehensive Plan.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Incorporating the new hazard data and information developed through the NHMP into the city's updated Comprehensive Plan will aid the city in following the goals set by the State's Comprehensive Plan Goal 7, which is designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards. This will encourage the development of partnerships that will further encourage the implementation of identified mitigation actions, and other hazard risk-reduction and response actions.		
Potential Funding Sources	BRIC, DLCD Community Grants, General fund		
Coordinating Organization	City of Reedsport Finance & Public Works Departments		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes	**This action addresses the following hazards: All extreme weather events, earthquake, flooding, tsunami, wildfire, coastal erosion		

Multi-Hazard #12			
Proposed Action Item	Identify and enhance/replace water pumps, storm water pumps, sewer, electric, gas and other utilities to enhance their resilience to a severe seismic event, in addition to preventing flooding caused by severe winter events exacerbated by climate change, such as winter storms or coastal erosion.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	Each city, as well as other utility providers, commonly express concern regarding aging infrastructure involving water, sewer, electric and gas distribution and in this case its vulnerability to seismic events, and climate-related hazards, such as flooding. Currently, all of the communities are at risk of flooding from severe winter storms, riverine flooding, and coastal flooding. Specifically, low-income housing, food distribution hubs, freight transit facilities, and government offices face a high risk of flooding. One way to minimize these risks is for the new pump stations and other utilities to have the following components: earthquake resistant concrete structures, larger redundant pumps and piping, pumps set at elevation above flood levels, modern electrical systems with offsite notification and backup power by diesel generators. The utilities can also be set on piles and concrete foundations rated for seismic activity. Pumps and generators will be housed in split face concrete masonry unit buildings constructed to modern fire and seismic building codes. Pump sizing will be increased to handle the stormwater of the 100-year rainfall event. Electrical for the pump stations will be new equipment and wiring to include service and meter base, main breaker, automatic transfer switch and duplex pump control panel. In addition, Supervisory Control and Data Acquisition (SCADA), would be provided to allow for remote access and monitoring of the pump station water levels, pump operation, and alarm conditions. Backup power by diesel generators would be provided at each pump station. The generators will provide a minimum of 24 hours of backup power in an outage. Each of the pump stations would be provided access routes which would allow the generator to be filled even if the landside area is completely flooded.		

Potential Funding Sources	BRIC, HMGP, FMA, CDBG, USDA RUS, WaterSMART, EPA CWSRF
Coordinating Organization	Public Works Department, Planning Department, Finance Department, Oregon Department of Emergency Management, Douglas County Emergency Management
Estimated Cost	**Timeline**
High	Long-Term
Notes	**This action addresses the following hazards: Earthquake, tsunami, extreme weather events, wildfire, coastal erosion **Reedsport**: The City has been working to upgrade its stormwater pumps in the following way: • Between 2016 and 2023, Reedsport replaced stormwater pump stations: in the 7th Street, 12th Street and Elm Avenue basins. • The 16th Street basin pump station is planned for replacement; it is (like the other recently replaced pump stations) is undersized and contains electrical, backflow and backup power issues that contribute to stormwater accumulation during rain or high-water events. • The pump stations have / will be set at an elevation equivalent to the top of the levee (the 500-year flood event with 3 feet of freeboard) and use the levee as the access roadway. With these improvements should the landside area become inundated by tsunamis or other large event the pump stations would still be able to remove the water from the downtown area. **Oakland**: Much of its underground infrastructure varies in age and is susceptible to earth movement. In order to mitigate against the concern, the City of Oakland would like to develop a plan to upgrade all water and sewer lines with the ultimate goal of replacing 90% of its underground infrastructure **Riddle**: The city is concerned about the structural condition of the Twin Oaks Water Storage Reservoir, a .25-million-gallon welded steel tank, within the City of Riddle's water distribution system. The concern is based on prior underwater inspections and apparent leakage reported by city staff. The tank is necessary for storage of potable water for the City of Riddle. **Roseburg**: The City of Roseburg has expressed concerns that during the course of a major earthquake event the hard connections between water transmission mains and the reservoirs will fail. This will take the reservoirs out of service for an indefinite amount of time. Seismically rated connections could be used to replace these rigid connections. If a seismic analysis

	were to be completed, possible consideration concerning these seismically rated connections could be determined. In the event of a major earthquake and the water plant is still operational, the City of Roseburg's water plant discharges approximately 8,300 gallons of water per minute, but unfortunately cannot reduce flow significantly enough to allow residents to fill up their own smaller water containers. As a result, a portable treatment system would be one way to continue to provide potable water during a disaster. **Winston**: The City of Winston has identified two sewage pump stations that need to be brought up to current seismic standards. The pump stations play a significant role in the city's sewage distribution system. They are identified as the Snow Ave. and Lookingglass Creek Pump Stations. No preliminary engineering has been done to determine the scope of work for this project

Multi-Hazard #13			
Proposed Action Item	Encourage harvesting of potentially dangerous trees and wind-downed trees along utility and road corridors, preventing/ minimizing potential winter and windstorm damage and risk to lives, property, and infrastructure.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	High winds and heavy snow can topple trees and break limbs which in turn can result in power outages, disrupt telephone, computer, and TV and radio service, or cause damage to property or lives. Initiating and maintaining existing programs that reduce or eliminate tree hazards to all critical utilities in Douglas County can prevent future damage to power lines and structures from wind and winter events. Douglas County Agencies, State Agencies, Federal Agencies and Utility Operators shall encourage the harvesting of potentially dangerous or already felled trees along utility corridors and roads.		
Potential Funding Sources	HMGP, USFS Urban and Community Forestry Grant, ODF Landscape Resiliency Program, General Funds		
Coordinating Organization	Douglas County and City Public Works Departments, Utility Providers, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes	**This action addresses the following hazards: All extreme weather events, earthquake, drought		

Multi-Hazard #14			
Proposed Action Item	Work with local providers to have 3 portable generators available to provide emergency power.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☒Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The city cannot provide drinking water or treat wastewater when the power is out. Thus, it is essential to provide appropriately sized and actively available generators needed to operate the raw water pumps, water treatment plant, and wastewater treatment plant. This would involve creating an emergency plan and developing partnerships with a local rental company to have the generators available in the event of a long-term power outage.		
Potential Funding Sources	BRIC, HMGP, USDA RUS, CDBG		
Coordinating Organization	City of Elkton, Public Works		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Drought Action Items

Drought #1			
Proposed Action Item	Continue implementing the objectives of the "Water Resource Element" of the Douglas County Comprehensive Plan.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The Water Resource Element assesses both surface and subsurface water sources to evaluate how an ample supply of high-quality water can be obtained for present needs and future growth. The WRE will be continually monitored, reviewed, and updated in order to continue addressing its four specific items: (1) The important issues affecting the Umpqua River Basin; (2) A detailed description of the six major sub-basins with findings addressing surface water, groundwater, lakes, current and future water use, and alternatives to meet future demand; (3) Land and water use policies directed toward specific water resource issues and concerns; and (4) Maps describing the various sub-basins as well as potential and existing water impoundment sites.		
Potential Funding Sources	USDA RUS, WaterSMART, EPA CWSRF, General Fund, Oregon Water Resources Department Planning Grant		
Coordinating Organization	Douglas County Planning Department, Oregon Water Resources Department, Local Soil and Water Conservation Districts, Watershed Councils, Irrigation Districts.		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Drought #2			
Proposed Action Item	Develop Municipal Water Conservation plan that outlines trigger points for the city to institute water restrictions. Educate the community on water conservation methods they can implement to reduce the impact of droughts.		
Applied Jurisdictions			
☐Douglas County	☒Canyonville	☐Drain	☐Elkton
☐Glendale	☒Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Develop Municipal Water Conservation plan that outlines trigger points for the city to institute water restrictions. Educate the community on water conservation methods they can implement to reduce the impact of droughts. Establish effective methods of water curtailment within the city that typically have high water use. Collaborate with other local water districts to obtain example plans the city can review to develop its own plan. Work with the Water Master to develop water levels and drought conditions to guide the city on when to implement water restrictions. Develop communications plan to inform the public of water conservation and water restriction measures.		
Potential Funding Sources	USDA RUS, WaterSMART, EPA CWSRF, Oregon Water Resources Department Grant, General Funds		
Coordinating Organization	Public Works Department, Douglas County Water Master, Oregon Water Resources, Local Soil and Water Conservation Districts, Watershed Councils		
Estimated Cost	**Timeline**		
Medium	Short-Term		
Notes			

Earthquake Action Items

Earthquake #1			
Proposed Action Item	Further assess and fix the seismic deficiencies of critical facilities rated with a medium and high potential of collapse by DOGAMI's rapid visual screening assessment.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☐Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Under the direction of Oregon Senate Bill 2 (2005), DOGAMI completed a statewide seismic needs assessment that surveyed critical facilities through a rapid visual screenings (RVS) process. Continue utilizing the results of this study by addressing the remaining buildings given a "very high" or "high" level of potential collapse. This can be done by conducting seismic structural studies for each building, seeking fundings for seismic retrofitting, and retrofit, rebuild, or relocate high risk buildings.		
Potential Funding Sources	BRIC, Seismic Rehabilitation Grant Program (SRGP), Readiness and Emergency Management for Schools (REMS), General Funds		
Coordinating Organization	County and City Planning and Public Works Departments, School Districts, Law Enforcement Agencies, Fire Departments, Oregon Emergency Management, DOGAMI, FEMA		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes	Many of these buildings identified as seismically vulnerable in the 2007 study have been seismically retrofitted, including: **Drain**; • North Douglas Elementary School (100 N School St. Drain) **Reedsport**: • Highland Elementary School & Reedsport Junior/High School • Fire Station 1 (Downtown Fire Hall) • Reedsport Police Department **Roseburg** • Douglas Co. received a grant for Roseburg High School Gym in 20114 for $1.5 million		

- Roseburg School District: Green Elementary in 2015-17 for $1,497,500

More discussion on the RVS study is discussed in **Chapter 3: Risk Assessment – Earthquakes.**
More details, as well as the list of identified buildings in Douglas County can be found at the following link.

"Very High" (100%) level of collapse -
Douglas County

- Glide High School (18990 N Umpqua Hwy. Glide)
- Green Elementary School (4498 SW Carnes Rd. Roseburg) (funding approved and project initiated)
- Lookingglass Elementary School (7421 Lookingglass Rd. Roseburg)
- Education Skills Building – UCC (1140 Umpqua College Rd. Roseburg)
- Whipple Fine Arts Building – UCC (1140 Umpqua College Rd. Roseburg)

Canyonville

- Canyonville School (124 N Main St. Canyonville)

Drain

- North Douglas Elementary School (100 N School St. Drain)

Myrtle Creek

- Coffenberry Middle School (591 NE Rice St. Myrtle Creek)

Riddle

- Riddle High School (127 Main St. Riddle)

"High" (>10%) level of collapse –
Douglas County

- Camas Valley School (197 Main Camas Rd. Camas Valley)
- Gardiner RFPD (208 Marsh St. Gardiner)
- South Umpqua High School (501 NW Chadwick Ln. Myrtle Creek)
- Tri City Elementary School (546 SW Chadwick Ln. Myrtle Creek)
- Tri City RFPD (136 N Old Pacific Hwy. Myrtle Creek)
- Melrose Elementary School (2960 Melrose Rd. Roseburg)
- Rose Elementary School (948 SE Roberts Ave. Roseburg)
- Sunnyslope Elementary School (2230 Cannon Rd. Roseburg)
- Winchester Elementary (217 Pioneer Way. Winchester)

Drain

	• North Douglas County Fire & EMS (531 S. Cedar St. Drain) **Glendale** • Glendale Elementary School (100 Pacific Ave. Glendale) **Myrtle Creek** • Myrtle Creek Elementary School (651 NE Division St. Myrtle Creek) **Oakland** • Oakland RFD (117 SE 3rd St. Oakland) **Reedsport** • Highland Elementary School (2605 Longwood Dr. Reedsport) • Reedsport Junior/Senior High School (2260 Longwood Dr. Reedsport) • Lower Umpqua Hospital (600 Ranch Rd. Reedsport) • Reedsport FD Station 1 (124 N 4th St. Reedsport) • Reedsport Police Dept. (146 N 4th St. Reedsport) • Douglas County Sheriff's Office (680 Fir Ave. Reedsport) **Riddle** • Riddle Elementary School (463 Park St. Riddle) **Roseburg** • Roseburg FD (801 NW Garden Valley Blvd. Roseburg) • Roseburg FD (2177 W Harvard Ave. Roseburg) • Douglas County Sheriff's Office & ERC -911 (1036 SE Douglas St. Roseburg) **Winston** • Douglas High School (1381 NW Douglas Blvd. Winston) • McGovern Elementary School (600 NW Elwood St. Winston) • Winston Middle School (330 SE Thompson Ave. Winston) **Yoncalla** • Yoncalla Elementary School (401 1st St. Yoncalla)

Earthquake #2			
Proposed Action Item	Further assess and fix the seismic needs of additional structures not included in DOGAMI's rapid visual screening assessment, but identified by the County or individual cities (public structures) as being vulnerable during an earthquake event.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	During consultation with the City of Roseburg, the city indicated that the Public Works shop (Fulton) is constructed of unreinforced concrete and will most likely not withstand an earthquake. The Fulton Shop is where the entire city's street and water maintenance equipment is stored including back hoes, excavators, pickup trucks, sweepers, flusher and vacuum trucks. Public Works maintenance crews are essentially first responders along with Police and Fire in the event of a natural disaster. The equipment will need to be used to respond for rescue and debris removal purposes. It is essential to keep this equipment available and operational when an earthquake event occurs. • Conduct a seismic structural study for the Fulton Shop buildings. • Research and seek funding for seismic retrofitting of the buildings. • Retrofit or rebuild the buildings based upon the findings determined within the seismic structural study.		
Potential Funding Sources	SRGP, Local Bonds; Capital Improvements Program.		
Coordinating Organization	City of Roseburg Planning and Public Works Departments, Oregon Emergency Management, DOGAMI, FEMA		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Earthquake #3			
Proposed Action Item	Further assess and fix the seismic needs of bridges identified as being seismically vulnerable during an earthquake event.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☒Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	The Douglas County Public Works Department has identified multiple bridges that are vulnerable to failure during large seismic events. These bridges are on sole-access routes (routes with no viable detours) and are among the most seismically vulnerable bridges under County jurisdiction due to the presence of unstable bearings, resulting in catastrophic lateral displacement of superstructure members during a large-magnitude earthquake. The seismically vulnerable bridges can be addressed by conducting additional seismic structural studies, if necessary, as well as retrofitting the bridges based upon findings determined within the seismic structural study. The required retrofits would include the installation of lateral restraints, anchorage, and other seismic mitigation features.		
Potential Funding Source	BRIC, SRGP, CDBG, General Funds		
Coordinating Organization	Douglas County Public Works, ODOT, DOGAMI, FEMA		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes	**The City of Canyonville** has two bridges, one at the South end of Main Street and one on Hamlin Drive. Both bridges have scouring issues according to the Oregon Department of Transportation 2022 Bridge inspection. Scouring was ranked as 3 for the S Main Street Bridge and 2 for Hamlin Bridge. The City received a grant for repair to Hamlin Bridge. The project should be completed in 2024.		

The following table identifies the Douglas County bridge seismic retrofit projects:

BRIDGE #	ROAD #	MILE POST	BRIDGE NAME	VUNERABILITY (V)	COST ESTIMATE
19C501	48	1.01	RAILROAD X-ING	11.9	$648,000

19C509	195	0.01	SMITH RIVER	10.7	$1,400,000
19C231	6	14.54	UMPQUA	8.1	$1,310,000
19C500	48	0.17	EAST GARDINER	7.3	$1,380,000
19C480	1	34.8	ELK CREEK	6.2	$320,000

Earthquake #4			
Proposed Action Item	Encourage earthquake safety promotion and drills to schoolchildren and community groups.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Provide educational opportunities to inform community members about how they can better prepare for earthquakes and post-earthquake events. Encourage Douglas County Schools to promote earthquake safety education and action. This can include conducting safety seminars and practice drills with community groups to describe earthquake dangers and steps that can be taken to reduce their impact.		
Potential Funding Sources	General fund, Emergency Management Performance Grant, Homeland Security Grant Program, Meyer Memorial Trust		
Coordinating Organization	Douglas County Emergency Management, Oregon Emergency Management, Douglas County Schools, Community Organizations, DOGAMI		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Earthquake #5			
Proposed Action Item	Assist the Sutherlin Water Control District in updating the Emergency Action Plan for Plat I and Cooper Creek Dams.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	The Emergency Action Plan was last updated in 2007, utilizing inundation mapping data from the 1992 plan. The Sutherlin Water Control District has more recent inundation mapping for the area utilizing LIDAR data. This new mapping has yet to be referenced or included in the Emergency Action Plan. An update to the plan would rectify this situation. Steps would include evaluating the cost to complete an update to the EAP, acquiring appropriate finding to pay for update, and hire/work with consultant to update the plan		
Potential Funding Sources	General fund, Homeland Security Grant Program, EPA Water Infrastructure and Resiliency Finance Center, FEMA Rehabilitation of High Hazard Potential Dams Grant Program		
Coordinating Organization	Sutherlin Water Control District, City of Sutherlin, Douglas County Emergency Management, Oregon Emergency Management		
Estimated Cost	**Timeline**		
Low	Short-Term		
Notes			

Earthquake #6			
Proposed Action Item	Install Master Heights water storage tank and associated seismically resistive water lines to hospital and fire station for water resilience during an emergency situation.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	To reliably supply the Lower Umpqua Hospital with water, via a gravity system, the City plans to install a water tank atop a hill near the Master Heights subdivision (at the north end of 22nd Street), and associated gravity water line leading to the hospital. In 2022, the City acquired the property and access to the tank site. The City now plans to fund construction of the tank and associated gravity water line. The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(il)]. Upgrading the water system and installation of a seismically resistive storage and distribution system will reduce the vulnerability of loss of life and prevent damage to buildings and infrastructure in Reedsport due to a natural disaster. The failure of the existing Reedsport water system would result in most of the population, persons at the hospital and emergency services to be without water, another disaster to the community with regard to loss of life and property damage. This project is identified in the City of Reedsport's 2016/2020 Capital Improvement Program. Work with Oregon Emergency Management to seek funding for upgrading the water system. Develop and or revise the Reedsport water system plan to further refine the need for upgrading the existing water system.		
Potential Funding Sources	BRIC, CDBG, USDA RUS, WaterSMART, EPA CWSRF, SRGP, General Funds		
Coordinating Organization	City of Reedsport Public Works Department, Planning, Finance, and Fire Department, FEMA, Oregon Department of Emergency Management, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes			

Flood Action Items

Flood #1			
Proposed Action Item	Identify opportunities to upgrade the Federal Insurance Rate Map (FIRM).		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	The FIRMs are the official map used by cities and counties that are participants in the National Flood Insurance Program (NFIP). The NFIP provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. The more accurate the FIRMs are, the easier it is to administer the floodplain program and thus ensure quality participation in the NFIP. Douglas County should continue coordination with DOGAMI, FEMA, and Reedsport involving the Coastal Floodplain Mapping Update Project.		
Potential Funding Sources	FEMA RiskMAP Program, FMA, HMA, General Funds		
Coordinating Organization	County and City Planning Departments, DOGAMI, FEMA		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Flood #2			
Proposed Action Item	Identify opportunities to upgrade Douglas County Planning Department's GIS system for floodplain mapping.		
Applied Jurisdictions			
☐Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Although FIRMs are the official maps used to determine the location of the regulatory floodplain, the GIS floodplain mapping overlay is the actual day-to-day tool used to determine the location of the floodplain in relationship to development. The effectiveness of the GIS floodplain overlay directly correlates to the effectiveness of planning staff making correct interpretations regarding development within the floodplain. Douglas County should continue coordination with DOGAMI, FEMA, and Reedsport involving the Coastal Floodplain Mapping Update Project. Research and seek funding opportunities to update GIS software and data and have the FIRMs reevaluated. Douglas County can coordinate with FEMA regarding this process.		
Potential Funding Sources	FEMA RiskMAP Program, FMA, HMA, General Funds		
Coordinating Organization	County and City Planning Departments, DOGAMI, FEMA		
Estimated Cost	**Timeline**		
Medium	Long-Term		
Notes	Douglas County: Completed - GIS systems have been upgraded to include numerous layers, including an accurate display of FEMA FIRM data.		

Flood #3			
Proposed Action Item	Distribute information regarding flooding to the general public efficiently.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Provide educational opportunities to inform citizens about how they can better prepare for flooding and post-flood events. Encourage Douglas County Emergency Management and other city emergency managers to promote flooding safety education. This can include conducting floodplain seminars to educate the public about floodplain development standards. Also, conduct safety seminars with community groups to describe flood dangers and steps that can be taken to reduce their impact.		
Potential Funding Sources	General fund, Emergency Management Performance Grant, BRIC, HMGP		
Coordinating Organization	County and City Planning Departments, Douglas County Emergency Management, Oregon Emergency Management, Community Organizations, FEMA		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Flood #4			
Proposed Action Item	Explore funding for repetitive loss property mitigation projects.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☐Roseburg	☐Sutherlin	☒Winston
☒Yoncalla			
Description	Douglas County and different cities have obtained funding to assist in retrofitting and elevating past repetitive loss properties. Continued funding should be explored for those repetitive loss properties throughout the County that have yet to be addressed through mitigation actions to avoid similar flooding issues in the future. Actions can include structure elevation, install French drains, install flood damage-resistant material, or participate in a property buyout.		
Potential Funding Sources	General fund, Pre-Disaster Mitigation Grant, Hazard Mitigation Grant Program, Flood Mitigation Assistance		
Coordinating Organization	Douglas County and City Planning Departments, Douglas County Emergency Management, Oregon Emergency Management, FEMA		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes	Douglas County has 32 identified repetitive loss properties – 14 in unincorporated Douglas County, 14 in the city of Myrtle Creek, and 4 in the city of Roseburg.		

Flood #5			
Proposed Action Item	Further assess and fix the scouring impacts to bridge foundation elements identified and determined to be unstable due to observed and evaluated scour conditions by implementing commonly accepted scour countermeasure projects.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☐Drain	☐Elkton
☐Glendale	☒Myrtle Creek	☒Oakland	☐Reedsport
☐Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	Scour critical bridges are bridges with foundation elements that have been determined to be unstable for the observed or evaluated scour condition. Bridge scours are rapidly accelerated during flood events, when high flows cause advanced degradation of streambed materials. The scour critical determination is made by ODOT, who maintains the state bridge inventory and is responsible for the inspection and evaluation of all National Bridge Inventory (NBI) bridges (highway bridges that span 20 ft. or more) in Oregon. Fix bridge foundation elements affected by scouring by constructing scouring countermeasures such as riprap placement, concrete repairs, sheet pile installation, or other work.		
Potential Funding Sources	BRIC, USDA RUS, Local Bonds, Capital Improvements Program		
Coordinating Organization	Douglas County and City Public Works Departments, ODOT, FEMA		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes	In addition to the bridges identified by the Douglas County Public Works Department, the City of Myrtle Creek has identified the Johnson Street Bridge as being compromised by substantial scouring and abrasion that has occurred to the supports of the bridge. Canyonville has been awarded a grant that has approved them to upgrade the Hamlin Bridge and construction will be completed in 2024.		

The following table identifies the Douglas County bridge scour countermeasure projects:

BRIDGE #	ROAD #	MILE POST	BRIDGE NAME	SCOUR CODE (NBI #113)
19C085	103	1.46	BILGER CREEK	2
19C203	100	0.44	KENT CREEK	2
19C149	148	0.01	DEER CREEK	3
19C457	389	0.09	ELK CREEK	3
19C056	54	5.81	ELK CREEK	U
19C060	7	4.05	ADAMS CREEK	U
19C066	50	1.30	BACHELLOR CREEK	U
19C071	22	5.05	OLDHAM CREEK	U
19C109	63	0.14	YONCALLA CREEK	U
19C111	74	2.66	WILLIAMS CREEK	U
19C192	146	0.80	LOOKINGGLASS CREEK	U
19C209	43	4.93	RICE CREEK	U
19C317	240	0.17	LITTLE MILL CREEK	U
19C366	94	2.40	BEALS CREEK	U

Flood #6

Proposed Action Item	Identify surface water drainage obstructions, including seeking funding for culvert mitigation projects, fixing, and repairing culverts identified in "very poor" condition.

Applied Jurisdictions

☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			

Description	Douglas County Public Works Department routinely inspects culverts to determine condition and hydraulic functionality. Inspected culverts are assigned a condition of Very Good, Good, Fair, Poor, and Very Poor. "Very Poor" culverts include culverts with extensive deterioration, making them susceptible to scouring during high flow events. Some culverts identified as "Very Poor" are large in diameter (36" or greater) and require repair, lining, or replacement. If necessary, further assess surface water drainage obstructions and the impacts they have on surrounding property.
Potential Funding Sources	BRIC, USDA RUS, Local Bonds, Capital Improvements Program
Coordinating Organization	Douglas County and City Public Works Departments
Estimated Cost	**Timeline**
High	Ongoing

Notes:

The following table identifies Douglas County culvert projects:

Road	Milepost	Length (ft.)	Cover Depth (ft.)	Shape Type	Material Type	Rise Height (in.)	Span/ Width (in.)
009 - FORT MCKAY RD	3.61	60	4	C - Circular	CS - Corrugated Steel	36	36
010E - AZALEA DR	0.49	50	4	C - Circular	CS - Corrugated Steel	36	36
012 - AZALEA-GLEN RD	2.46	42	3	C - Circular	CS - Corrugated Steel	42	42
015 - NORTH MYRTLE RD	14.69	22	0	C - Circular	CS - Corrugated Steel	36	36
015 - NORTH MYRTLE RD	15.01	29	1	C - Circular	CS - Corrugated Steel	36	36
017 - BUCKHORN RD	16.78	64	6	C - Circular	CS - Corrugated Steel	36	36
021 - CANYONVLLE-RIDDLE RD	0.34	110	3	P - Pipe Arch	CS - Corrugated Steel	44	72
027 - REUBEN RD	1.42	60	9	C - Circular	CS - Corrugated Steel	36	36
037 - UPPER SMITH RIVER RD	1.35	52	7	C - Circular	CS - Corrugated Steel	36	36
037 - UPPER SMITH RIVER RD	17.52	64	6	C - Circular	CS - Corrugated Steel	36	36

042 - DAYS CREEK CUTOFF RD	6.59	28	4	C - Circular	CS - Corrugated Steel	36	36
043 - RICE CREEK RD/WILLIS CREEK RD	2.65	60	3	C - Circular	CS - Corrugated Steel	36	36
046 - SOUTH UMPQUA RD	1.15	65	4	P - Pipe Arch	CS - Corrugated Steel	36	58
048 - LOWER SMITH RIVER RD	9.88	78	12	C - Circular	CS - Corrugated Steel	36	36
052 - COLONIAL RD	3.69	74	9	P - Pipe Arch	CS - Corrugated Steel	44	72
062 - BEAR CREEK RD	0.91	110	8	C - Circular	CS - Corrugated Steel	36	36
067 - JOE HOOKER/HENDERER RD	3.72	100	20	C - Circular	CS - Corrugated Steel	36	36
088A - WILLIS CREEK RD	1.68	55	3	C - Circular	CS - Corrugated Steel	36	36
092 - WOODS CREEK RD	0.39	50	1	P - Pipe Arch	PS - Structural Plate Steel	78	120
105 - CLARKS BRANCH RD	2.19	75	4	C - Circular	CS - Corrugated Steel	36	36
128 - UPPER CAMAS RD	6.15	30	4	C - Circular	CS - Corrugated Steel	36	36
131S - BURMA RD/SOUTH CAMAS RD	0.07	61	2	C - Circular	CS - Corrugated Steel	36	36
164 - DOE CREEK RD	1.63	40	2	C - Circular	CS - Corrugated Steel	36	36
295H - SUSAN ST	0.09	90	1	P - Pipe Arch	CS - Corrugated Steel	36	58
387 - OLD HWY 99 SOUTH	2.77	60	4	C - Circular	CS - Corrugated Steel	36	36
388 - OLD HWY 99 NORTH	2.77	72	5	C - Circular	CS - Corrugated Steel	36	36
389 - EAGLE VALLEY ROAD	5.53	48	3	C - Circular	CS - Corrugated Steel	36	36

Flood #7			
Proposed Action Item	Assess the possibility of secondary water source for the City of Oakland.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☒Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	In the next 20 years+ the City of Oakland would like to have an additional, secondary water intake source due to the low summer water flow of the Calapooya Creek. An intertie with another water district or drilling water wells is a future goal that expands upon this action. This idea is a future goal and is something our Council will address once we get our WTP running prior to the Archie Creek Fire event. The Archie Creek Fire obliterated the City's watershed which has caused extreme problems with organics growing bacterial organisms on the City's instruments. Currently the city is working with FEMA and OEM in rectifying this issue. The wildfires on the North Umpqua Watershed will in all probability be our new norm.		
Potential Funding Sources	HMGP, BRIC, Oregon Drinking Water Source Water Protection Fund		
Coordinating Organization	City of Oakland, Public Works		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes	The new water intake source will assist in: *1. Addressing or controlling the water temperature of the source water within process parameters 28 F to 120 F* *2. Addressing or controlling the turbidity of the water source within process parameters under 0.3 ntu at maximum water production of 500 gpm. (the current design maximum flow)* *3. Addressing or controlling the pH of the water source within process parameters between pH of 6.5 to 7.5* *4. Addressing or controlling and meeting all water quality parameters required by Oregon Health Authority and Oregon EPA to remain in compliance.* *5. Completely preventing, monitoring, reporting and addressing or controlling /limiting algal and biological growth or prevent pass through of biological organisms into the distribution system.* *6. Completely preventing the buildup and pass-through of bacteria or substances that contribute to the formation of*		

	black slime on all instrumentation, sensors, optics, surfaces, or pipes resulting from ash, manganese, or iron or algal or biological growth. *7. Completely preventing the buildup and pass-through of bacteria or virus or biological organisms on the surfaces of the mixed media filters, chlorine tanks, clear wells, or reservoirs within the distribution system.* *8. Completely preventing, addressing or controlling the excess sludge from organics removed from the process, provide a method to handle the process sludge and decanted water and completely prevent, address or control all backwash water separately from the Wastewater Treatment Plant Process or Collection System or* *9. Addressing, controlling and removing all ash sludge, debris or sedimentation/slime from all tanks and reservoirs throughout the Raw Water Intake System, the Water Treatment System, and the Distribution System.* *10. Providing the means to remove all wildfire-generated sediment that needs to be removed from the entire system in addition to the 'sludge' and biofilms.* *11. Providing the means to prove removal of all wildfire-generated sediment that needs to be removed or is removed from the entire system in addition to the 'sludge' and biofilms.*

Flood #8			
Proposed Action Item	Ensure continued compliance with the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.		
Applied Jurisdictions			
☐Douglas County	☒Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☒Riddle	☒Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The National Flood Insurance Program (NFIP) provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance. Reedsport has been a participant in the National Flood Insurance Program since 1974, with the last map update occurring in 2019. As a participating community of the National Flood Insurance Program (NFIP), anyone can buy flood insurance and currently there are 66 policies in effect. Given that recent status of the levee certification, if the City is unable to bring the levee into compliance those structures inside the levee, which are currently considered to be "levee protected" on the FIRMS, would be mapped into the floodplain and required to obtain flood insurance, if there is a mortgage on the property. The fiscal impacts of having to obtain flood insurance for residents in the downtown area (because rates are based on elevation above/below the 100-year flood level) would be significant and could potentially lead to vacancy and abandonment. This would, in turn, affect property tax collection which helps support the City's general fund. The ripple effect from such an impact would be ongoing for years. The need to recertify the levee and remain in the NFIP is necessary to prevent such devastation to the community. The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will diminish flood damage to new and existing buildings in communities while providing homeowners, renters, and business owners additional flood insurance protection.		

	Conduct an assessment of Reedsport floodplain ordinances to ensure they reflect current flood hazards. Complete levee certification and accreditation to maintain eligibility in the NFIP. Continue to participate in the National Flood Insurance Program (NFIP). Educate residents in Reedsport about flood insurance regulations, flood issues, and actions they can implement to mitigate the flood risk.
Potential Funding Sources	FMA, General Funds, BRIC
Coordinating Organization	City of Reedsport Planning Department, City of Reedsport Finance and Public Works Department, Oregon Department of Land Conservation and Development, FMEA, Oregon Department of Emergency Management, Douglas County Emergency Management
Estimated Cost	**Timeline**
Medium	Ongoing
Notes	

Flood #9	
Proposed Action Item	Seek certification for the city's levee system to ensure safety and functionality.
Applied Jurisdictions	
☐Douglas County ☐Canyonville ☐Drain ☐Elkton ☐Glendale ☐Myrtle Creek ☐Oakland ☒Reedsport ☐Riddle ☐Roseburg ☐Sutherlin ☐Winston ☐Yoncalla	
Description	A major flood event occurred in Reedsport in December 1964 that was equal to a 100-year flood event. This flood inundated a major portion of the downtown area. Water was 4 feet deep in most areas and led to the construction of the levee system around the downtown Reedsport. Since the construction of the levees, Reedsport has experienced severe winter storm events and high water but has been protected from major flooding events from riverward flooding sources. However, due to the age of the levee and subsequent storm drain systems installed in the late 1960's there are essential systems (i.e., culverts, tide gates, gravity drains, stop valves, etc.) constructed as a part of and within the levee which are failing and in need of repair or replacement. It is not unusual during yearly high-water events, that the discharge lines, culverts, and tide gates are all below the water level and do not function correctly. The potential failure of the levee system along the Scholfield Creek and Umpqua rivers would result in flooding beyond the FEMA FIRM levels. The City has received grant funding from FEMA and other agencies to design and construct the upgrades necessary for the Corps to certify the levee. As of the date of this Plan, the City is currently nearing completion of the permitting phase of the re-certification project. Section 65.10 of the NFIP regulations describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the flood that has a 1- percent chance of being equaled or exceeded in any given year (base flood). This information must be supplied to FEMA by the community or other party seeking recognition of a levee system at the time a study or restudy is conducted, when a map revision under the provisions of Part 65 of the NFIP regulations is sought based on a levee system, and upon request by the Administrator during review of previously recognized structures.
Potential Funding Sources	FMA, General fund, HMGP
Coordinating Organization	City of Reedsport Planning Department, City of Reedsport Public

	Works Department, U.S. Forest Service, Department of Land Conservation & Development, FEMA, Oregon Department of Emergency Management, Douglas County Emergency Management
Estimated Cost	**Timeline**
High	Short-Term
Notes	

Flood #10			
Proposed Action Item	Upgrade and expand the interior storm water collection system to accommodate the yearly amounts of water and potential flooding and to resist seismic activity.		
Applied Jurisdictions			
☐Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☒Reedsport
☒Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	Due to the location of these cities, especially Reedsport, the downtown areas are frequently affected by heavy rains and subsequent river flooding and runoff due to yearly and regular winter storms. The cities' storm water infrastructure is limited by the location, undersized/sometimes faulty piping, and outdated infrastructure. Subsequently, the current system has difficulty managing the seasonal amount of water, causing backups and the potential for flooding every year.		
Potential Funding Sources	FMA, BRIC, HMGP, CDBG, USDA RUS, WaterSMART, EPA CWSRF, General Funds		
Coordinating Organization	Public Works Departments, Planning and Finance Departments, FEMA, USAGE, Oregon Department of Emergency Management, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes	Reedsport has identified several areas affected by a lack of storm water infrastructure: • Downtown streets and alleys are experiencing flooding. These areas include but are not limited to Holly Knowles, the 9th Street area, and 14th & Hawthorne. • The downtown stormwater pipes and manholes must be replaced as certain lines have settled and degraded and no longer allow for proper gravity flow into the related pump stations. • River Ben Manufactured Home Park is at risk from water system backup and Scholfield Slough high water level rise. The residential area consists of mostly seniors, a vulnerable population during floods. The Park is privately owned as well as its internal utility infrastructure. It is also outside the levee system.		

Landslide Action Items

Landslide #1			
Proposed Action Item	Identify areas within a jurisdiction that are subject to possible geologic hazards. Amend the zoning ordinance to include a geologic hazard overlay which provides mitigating standards required for development within those areas subject to possible geologic hazards.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☐Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	The purpose of a geologic hazards overlay district is to protect the public health, safety, and welfare by assuring that development in hazardous or potentially hazardous areas is appropriately planned to mitigate the threat to life and property. This can be begun by investigating and analyzing study areas subject to possible geologic hazards, investigating other jurisdictions geological hazard overlay zoning ordinances, and developing a geological hazard overlay ordinance for the affected jurisdiction.		
Potential Funding Sources	BRIC, HMGP, STORM, General Fund		
Coordinating Organization	County and City Planning Departments, Building Department, DOGAMI		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Landslide #2			
Proposed Action Item	Encourage construction, site location, and design that can be applied to steep slopes to reduce the potential threat of landslides.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☐Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Encouraging landslide-stable development can help protect public welfare by assuring that development in potentially hazardous areas is appropriately planned to mitigate the threat to life and property. This can be done through developing a "How-To" development and construction guide for homeowners in potential landslide hazard areas. Also, develop a public information to emphasize economic risk when building on potential or historical landslide areas		
Potential Funding Source	BRIC, HMGP, General Funds		
Coordinating Organization	County and City Planning Departments and Public Works Departments		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Landslide #3			
Proposed Action Item	Mitigate development and activities in identified potential and historical landslide areas through public outreach.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☐Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Utilizing public outreach will help protect public welfare by spreading awareness to minimize development in hazardous and potentially hazardous areas in order to mitigate the threat to life and property. Outreach can be conducted by partnering with existing mechanisms, such as SWCD, NRCS, watershed councils, etc. Landslide educational materials can be distributed to the public during other outreach and community engagement opportunities.		
Potential Funding Sources	BRIC, HMGP, General Funds		
Coordinating Organization	County and City Planning Departments, Douglas County Emergency Management, DOGAMI		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Landslide #4			
Proposed Action Item	Increase coordination between local jurisdictions, emergency responders, homeowners and landslide warning systems.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☒Sutherlin	☐Winston
☐Yoncalla			
Description	To help protect public welfare, coordination and cooperation between local governments and community members can grow in order to work on improving landslide warning systems. This can include education at-risk home sites regarding climatic and soil conditions that are conducive to landslides. Additionally, education community members on how to implement mitigation activities to minimize landslide risks, as well as spread evacuation information and procedures for at-risk home sites.		
Potential Funding Sources	BRIC, HMGP, EMPG, Preparedness Grants, Oregon Watershed Enhancement Board, General Funds		
Coordinating Organization	Douglas County Emergency Management, DOGAM		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Tsunami Action Items

Tsunami #1			
Proposed Action Item	Investigate the possibility of adopting more accurate tsunami inundation maps created by DOGAMI in 2013 as compared to the existing regulatory map created in 1995.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Douglas County currently uses tsunami hazard maps that were produced to help implement Senate Bill 379, which 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. The Department of Geology and Mineral Industries released updated Tsunami Inundation Maps in 2013, which is believed to be a better representation of the tsunami impacts on the community. These maps have not been officially adopted by the City of Reedsport or Douglas County. As these maps are roughly a decade old, it may be in the best interest of the County to investigate updating the DOGAMI tsunami inundation maps to better represent the tsunami impacts on the coastal communities. This will include connecting with the appropriate coordinating agencies by discussing issues involving updating the older maps, as well as adopting the new tsunami inundation maps. It is the ultimate intention to officially adopt these new maps.		
Potential Funding Sources	BRIC, HMGP, STORM, NOAA/NWS Tsunami Activities Grant, General Funds		
Coordinating Organization	City of Reedsport and Douglas County Planning Department, Douglas County Building Department, DOGAMI, DLCD		
Estimated Cost	**Timeline**		
High	Long-Term		
Notes			

Tsunami #2			
Proposed Action Item	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools, and businesses in promoting tsunami awareness and evacuation.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The purpose of promoting tsunami awareness is to reduce the risk of life and property in the event of a tsunami event. This can be done by distributing relevant tsunami information that description the dangers and presents the evacuation routes for visitors at the coast, as well as provide educational outreach for local residents and business owners.		
Potential Funding Sources	BRIC, HMGP, EMPG, REMS, NOAA/NWS Tsunami Activities Grant, General Funds		
Coordinating Organization	City of Reedsport and Douglas County Planning Department, Douglas County Emergency Management, DOGAMI		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Tsunami #3			
Proposed Action Item	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of tsunami dangers.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	The purpose of promoting tsunami awareness is to reduce the risk of life and property in the event of a tsunami event. This can be better accomplished by utilizing and improving local and regional tsunami information, expanding the capacity of utilization of the most up-to-date technology that assists in determining evacuation needs and concerns. This technology will assist in providing the most accurate and detailed project map of the hazard areas, which can be used for educational and awareness purposes. This technology can also serve to expanding disaster warnings to community members.		
Potential Funding Sources	BRIC, HMGP, USDA RUS, STORM, NOAA/NWS Tsunami Activities Grant, General Funds		
Coordinating Organization	City of Reedsport and Douglas County Planning Departments, Douglas County Emergency Management, DOGAMI		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Wildfire Action Items

Wildfire #1			
Proposed Action Item	Seek funding and labor opportunities to staff fuel-reduction projects throughout wildfire hazard prone areas in Douglas County.		
Applied Jurisdictions			
☐Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Fuel reduction projects and vegetation treatments have been proven as a means of mitigating wildfire hazards, to lessen catastrophic fire and its threat to public and firefighter safety, and damage to property. The objective is to remove enough fuel so that when a wildfire burns, it is less severe and can be more easily suppressed. This can be accomplished by • Working on Wildfire Hazard mapping of Douglas County to identify areas and homes that would most benefit from fuel reduction projects. • Promoting opportunities for landowners to utilize fuel reduction projects. • Enabling communities and agencies to quickly transform grant opportunities to on-the-ground projects. • Investigating potential funding opportunities for individual mitigation projects.		
Potential Funding Sources	Fire Management Assistance Grants (FMAG), Staffing for Adequate Fire and Emergency Response (SAFER), Assistance to Firefighters Grant (AFG), ODF Fuels Reduction Program, ODF Landscape Resiliency Program, OSFM Community Risk Reduction Grants, Community Wildfire Defense Grant (CWDG)		
Coordinating Organization	Douglas County Planning Department, Douglas County Building Department, Douglas Forest Protective Association; Coos Forest Protective Association, Douglas County Emergency Management, City/Rural Fire Departments		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Wildfire #2			
Proposed Action Item	Increase communication, coordination, and collaboration between wildland/urban interface property owners, city and County planners, and fire prevention crews and officials to address risks, existing mitigation measures, and federal assistance programs.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Through communication, coordination, and collaboration, risks can be addressed through some of the following methods: • Encourage single-family residences in wildfire hazard areas to have fire plans and promote homeowner wildfire hazard mitigation in accordance with Planning Department development standards and current fire prevention practices. • Encourage Planning and Building Departments to educate landowners and/or developers who choose to build in the wildland/urban interface to identify and mitigate conditions that aggravate wildland/urban interface wildfire hazards		
Potential Funding Sources	BRIC, HMGP, EMPG, FMAG, CWDG, OSFM Community Risk Reduction Grants, FireWise, General Funds		
Coordinating Organization	Douglas County Planning Department, Douglas County Building Department, Douglas Forest Protective Association; Coos Forest Protective Association, Douglas County Emergency Management, City/Rural Fire Departments		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Wildfire #3			
Proposed Action Item	Maintain and further develop interagency and private industry relationships for continuing strong fire response in rural Douglas County.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Fuel reduction projects and vegetation treatments have been proven as a means of mitigating wildfire hazards, to lessen catastrophic fire and its threat to public and firefighter safety, and damage to property. The objective is to remove enough fuel so that when a wildfire burns, it is less severe and can be more easily suppressed. This can be accomplished by maintaining and enhancing protocol for fire jurisdictions, private industry cooperators and landowners to avoid problems during wildfire chaos. Also, promoting and advocating the reduction of "red tape" to enable faster private industry assistance (use of vehicles, manpower, etc.) in a wildfire situation.		
Potential Funding Sources	BRIC, HMGP, EMPG, FMAG, CWDG, OSFM Community Risk Reduction Grants, FireWise, General Funds		
Coordinating Organization	Douglas County Emergency Management, City/Rural Fire Departments, Douglas and Coos Forest Protective Associations		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Wildfire #4			
Proposed Action Item	Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to wildfire.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Rationale for Proposed Action Item	Wildfire prevention and risk reduction is a cost-effective way to proactively address wildfire concerns and issues. Public acceptance or rejection of mitigation actions can make or break even the best wildfire risk reduction program. Outreach and education programs are designed to raise awareness and improve audience knowledge of wildfire risk reduction needs and practices. In addition, outreach and education programs can build skills, develop capacity, and create social capital. In the best cases, education and outreach programs will influence attitudes and opinions and result in effective action. • Visit urban interface and rural areas and conduct education and outreach activities; • Conduct specific community-based demonstration projects for fire prevention and mitigation in the urban interface; • Perform public outreach and information activities in Douglas County by creating "Wildfire Awareness Week" activities. Fire stations can hold open houses and allow the public to visit, see the equipment, and discuss wildfire mitigation with the station crews.		
Potential Funding Sources	BRIC, FMAG, AFG, CWDG, OSFM Community Risk Reduction Grants, General Funds		
Coordinating Organization	Douglas County Emergency Management, City/Rural Fire Departments, Douglas and Coos Forest Protective Associations		
Estimated Cost	**Timeline**		
Low	Ongoing		
Notes			

Wildfire #5			
Proposed Action Item	Create incentives and assist landowners in reducing fuel loads on private property.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	An incentive is a reward for performing the desired behavior and tends to be more successful than disincentives that penalize individuals for negative actions. Before creating an incentive program, consider that discontinuing it later could result in losing the desired behavior. Begin by developing an incentive-based program by visiting urban interface neighborhoods and other high-risk communities to assess what incentives they would be motivated by and the actions to which they would adhere. The incentive program can be spread by conducting specific community-based demonstration projects for fire prevention and mitigation in the urban interface. Also, performing public outreach and information activities in Douglas County by creating "Wildfire Awareness Week" activities. Fire stations can hold open houses and allow the public to visit, see the equipment, and discuss wildfire mitigation with the station crews.		
Potential Funding Sources	FireWise, FMAG, CWDG, ODF Landscape Resiliency Program, OSFM Community Risk Reduction Grants, General Funds		
Coordinating Organization	Douglas County Emergency Management, City/Rural Fire Departments, Douglas and Coos Forest Protective Associations		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Wildfire #6			
Proposed Action Item	Look for solutions to protect structures located outside of fire districts through partnerships, grant funding or expansion of fire district services.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Help to reinforce on-site fire siting standards for residential structures located in forest zones. Promote collaboration with other community groups who could help to combat fire in areas outside a rural fire protection district. Form community partnerships that are equipped and trained by fire district personnel to combat fires in those areas		
Potential Funding Sources	FMAG, CWDG, ODF Landscape Resiliency Program, OSFM Community Risk Reduction Grants, General Funds		
Coordinating Organization	Douglas County Emergency Management, City/Rural Fire Departments, Douglas and Coos Forest Protective Associations		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Wildfire #7			
Proposed Action Item	Seek improved information gathering, and distribution and technology for enhancing fire identification, initial response, and evacuation if necessary.		
Applied Jurisdictions			
☐Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Improved information gathering and distribution will help to promote mitigation opportunities and faster response and evacuation time. This can be accomplished through: • Updating wildland/urban interface hazard maps. • Conducting risk analysis and creating hazard maps using GIS technology to identify risk sites and further assist in prioritizing mitigation activities. • Encouraging development and use of new data and systems to identify hazard areas and better inform firefighters, communities, and landowners of wildfire status once a fire occurs.		
Potential Funding Sources	FMAG, CWDG, OSFM Community Risk Reduction Grants, General Funds		
Coordinating Organization	Douglas County and City Planning Departments, Douglas County Emergency Management, City/Rural Fire Departments, Douglas and Coos Forest Protective Associations		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Windstorm Action Items

Windstorm #1			
Proposed Action Item	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☒Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Falling vegetation is the primary source of wind-related damage. Much of the property damage that occurs during windstorms results from tree limbs breaking or entire trees uprooting. The Oregon Department of Forestry's Urban and Community Forestry Program provides assistance to communities to help them deal with hazard tree issues. The program provides technical, financial, and educational assistance on a wide range of urban forestry topics. This can be conducted by partnering with responsible agencies (ODF) and organizations to design and disseminate educational information to property owners to reduce risk from tree failure to life, property, and utility systems. Additionally, enhanced partnerships between utility providers and County and local public works agencies and landowners to document known hazard areas. Lastly, identifying and find solutions to potentially hazardous trees in urban areas, near utility corridors, and near vital infrastructure.		
Potential Funding Sources	BRIC, HMGP, Preparedness Grants, General fund		
Coordinating Organization	Douglas County and City Public Works Departments, Utility Providers		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes			

Windstorm #2			
Proposed Action Item	Map locations around the County that have the highest incidence of extreme windstorms.		
Applied Jurisdictions			
☒Douglas County	☐Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☐Oakland	☐Reedsport
☐Riddle	☐Roseburg	☐Sutherlin	☐Winston
☐Yoncalla			
Description	Enhance mapping and tracking of severe windstorms and vulnerable homes, infrastructure and utilities, and identify public infrastructure and facilities subject to damage or closure during windstorm events. Mapping and tracking should include windstorm data for localities throughout the County, maps of the locations within the County that are most vulnerable to high winds, and estimating injury and property damages based on location.		
Potential Funding Sources	BRIC, HMGP, NOAA Climate Resilience Regional Challenge, STORM, General Funds		
Coordinating Organization	Douglas County and City Public Works Departments, Utility Providers, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
Medium	Long-Term		
Notes			

Windstorm #3			
Proposed Action Item	Encourage critical facilities to secure backup emergency power.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☐Drain	☐Elkton
☐Glendale	☐Myrtle Creek	☒Oakland	☐Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☐Yoncalla			
Hazard Type:			
☐Multi-Hazard	☐Coastal Erosion	☐Drought	
☐Earthquake	☐Extreme Heat	☐Flood	
☐Landslide	☐Tsunami	☐Wildfire	
☒Windstorm	☐Winter Storm		
Description	Severe windstorms often produce property damage resulting from fallen vegetation including tree limbs or entire trees uprooting. When the storms hit, trees fall over roadways, often pulling power lines down with them. When power is lost, without backup emergency power critical facilities are unable to provide essential services. Some cities have provided specific details concerning the need for backup emergency services, which are provided below.		
Potential Funding Sources	BRIC, HMGP, USDA RUS, General Fund		
Coordinating Organization	Douglas County and City Planning and Public Works Departments, Utility Providers, Douglas County Emergency Management		
Estimated Cost	**Timeline**		
Medium	Ongoing		
Notes	**Oakland** • Water Treatment Plant Power outages affect the City of Oakland's ability to provide essential services such as drinking water to homes and businesses as well as wastewater removal. The City needs to obtain a backup emergency power generation system in order to continue to provide service in the event power is lost during a windstorm event. This project is 75% complete. An emergency generator was purchased through a grant and should be completely installed by October 1, 2023. **Roseburg**		

	• The City of Roseburg has identified five critical facilities that are in need of backup emergency power in order to provide critical service in the event of a windstorm event: 1. Water Treatment Plant The City of Roseburg Water Treatment Plant does not have backup emergency power generation. During a power outage, the City's water treatment plant goes off-line and is unable to produce water. Currently there is an estimated one day's water storage available in the system. 2. Fire Station #3 – 801 NW Garden Valley Blvd Fire Station #3 is the backup Emergency Operations Center to the City's Public Safety Center and currently does not have backup emergency power. 3. Radio Tower/Radio System Backup emergency power is not available for radio communications equipment located at Reservoir Hill. The City uses Reservoir Hill as a central high point location within the City for radio antennas to relay all communications for Police, Fire, and Public Works. During a power outage, there is no backup generation to stay functional during an emergency. 4. Fire Station #2 – 2177 W Harvard Ave Fire Station #2 currently does not have backup emergency power. 5. City Maintenance Facility The City of Roseburg maintenance facility on Fulton Street does not have backup emergency power generation. The facility is headquarters for the Street Division and Water Division maintenance crews. It is also the City's fuel storage depot for all City vehicles, including Police and Fire. All personnel and equipment who would respond to a Public Works related emergency operate out of this location. Sutherlin • Backup emergency power is not available at Sutherlin City Hall or the Sutherlin Police Department. An alternate power source will need to be evaluated in order to keep these facilities functional in the event of a significant power outage. Winston • Backup emergency power is not available for the Snow Ave. or Lookingglass Creek pump stations. In the event of a power outage the City of Winston will need an alternate power source to operate the pump stations and the water treatment plant.

Winter Storm Action Items

Winter Storm #1			
Proposed Action Item	Assure a sufficient supply of sand and anti-icing agent to use on priority and secondary transportation routes for a minimum of one major winter storm event each year.		
Applied Jurisdictions			
☒Douglas County	☒Canyonville	☒Drain	☒Elkton
☒Glendale	☒Myrtle Creek	☒Oakland	☒Reedsport
☒Riddle	☒Roseburg	☒Sutherlin	☒Winston
☒Yoncalla			
Description	Destructive winter storms that produce heavy snow, ice, rain and freezing rain, high winds have a long history in Oregon. Assuring a sufficient supply of sand and de-icing agent will maintain safe transportation corridors and ensure the delivery of services to residents.		
Potential Funding Sources	General fund		
Coordinating Organization	Douglas County and City Planning and Public Works Departments, ODOT		
Estimated Cost	**Timeline**		
High	Ongoing		
Notes			

Appendix B: Planning and Public Process

This appendix describes the changes made to the 2016 Douglas County Natural Hazard Mitigation Plan (NHMP) during the 2024 NHMP update process.

Project Background

Douglas County and the cities of Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport, Riddle, Roseburg, Sutherlin, Winston, and Yoncalla partnered with the Oregon Department of Land Conservation and Development (DLCD) to update the multi-jurisdictional 2017 Douglas County NHMP. The Disaster Mitigation Act of 2000 requires communities to update their mitigation plans every five years to remain eligible funding from the Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities Grant Program, and Flood Mitigation Assistance Program. A Federal Emergency Management Hazard Mitigation grant funded the plan update with non-federal match provided by the Oregon Legislature.

DLCD and the committees made several changes to update and consolidate the previous NHMP. Major changes are documented and summarized in this memo.

2024 NHMP Update Changes

The sections below discuss only *major* changes made to the NHMPs during the 2024 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 city and special district 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 2016 Douglas County NHMP section names and the corresponding 2024 section names, as updated (major Volumes are highlighted). This memo will use the 2024 NHMP update section names to reference any changes, additions, or deletions within the NHMP.

As the table indicates the structure of the NHMP has changed slightly including the addition of several additional addenda. Content and changes are described below.

Front Pages

- The NHMP's cover has been updated.
- Acknowledgements have been updated to include the 2024 project partners and planning participants.
- The FEMA approval letter, review tool, and County, city, and special districtdocuments of adoption are included.

Volume I: Basic Plan

Volume I provides the overall NHMP framework for the 2024 Multi-jurisdictional NHMP update. Volume I includes the following sections:

Plan Summary

The 2024 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.

Chapter 1: Introduction

Chapter 1 introduces the concept of Natural Hazard Mitigation planning and answers the question, "Why develop a mitigation plan?" Additionally, Chapter 1 summarizes the 2024 NHMP update process, and provides an overview of how the NHMP is organized and will be implemented into the jurisdiction.

Chapter 2: Community Profile

The community profile has incorporated updated data, including from the census and employment records. New profiles were added, including profiles on transportation infrastructure and political capacity, which included a table on Douglas County and its jurisdiction's current plans and policies, and how they related to natural hazard planning.

Chapter 3: Hazard Identification and Risk Assessment

This section consists of three phases: hazard identification, vulnerability assessment, and risk analysis. Hazard identification involves the identification of hazard characteristics, geographic extent, its intensity, history of occurrences in the area, 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:

- New hazards were included as they were identified by the NHMP Steering Committee to be of growing risk to the community and thus important to assess and address through mitigation actions. These include Coastal Erosion 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.
- 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.
- Findings from the DOGAMI Risk Report for Douglas County were incorporated into the relevant hazards: Earthquake, Flood, Landslide, Tsunami, and Wildfire.
- Future climate variability and impacts were discussed for each climatic hazard. Information was primarily sourced from the OCCRI Future Climate Projection Report for Douglas County.

Chapter 4: Mitigation Plan Goals and Action Items

This chapter provides the basis and justification for the mission, goals, and mitigation actions identified in the NHMP. Major changes to Chapter 4 include the following:

- The 2016 goals were reduced from 35 to five goals, as previously goals were categorized under each hazard type. The Douglas County Steering Committee agreed to condense these goals to address each hazard instead broadly under the same five goals.
- During the reviewing and updating of Action Items, the NHMP Steering Committee decided to create a new category of Action Items, Multi-Hazard. This category allows for multiple hazards to be addressed through a single action.
- The NHMP Steering Committee decided to alter the prioritization process of Action Items to instead to have each jurisdiction identify their top three (3) mitigation actions that they plan to implement. These prioritized mitigation actions are what the jurisdiction believe to currently their community's current conditions, needs, and capacity, though these might shift throughout the implementation and maintenance phase, and thus prioritized mitigation actions might also shift.
- Action items were reviewed, revised, and prioritized. Major changes are indicated below and any actions from the 2017 NHMP remained the same are still in process:
    - New
        - All Multi-Hazards were either newly developed, renamed, or combined;
        - **D-2:** Canyonville and Myrtle Creek added this action;
        - **EQ-6:** Reedsport added this action;
        - **FL-10:** Reedsport, Riddle, and Sutherlin added this action.
    - Combined 2016 Mitigation Actions for 2024 Actions
        - **MH-4**: T-4, F-3, and new action were combined;
        - **MH-12**: E-4 and new action were combined;
        - **MH-13**: WT-2, WT-3, and WD05 were combined
    - Completed 2016 Mitigation Actions
        - E-1:
            - Completed by Glendale with the seismic rehab of the Glendale High School and Glendale Elementary School
            - Completed by Drain with the seismic fix of the North Douglas Elementary School
        - **F-2:** Douglas County completed by upgrading the GIS system;
        - **F-5:** Canyonville received a grant to repair the Hamlin Bridge;
        - **F-8:** Oakland received a grant and relocated a new water intake;
        - **F-9:** Projected completed by Roseburg in 2017
        - **L-1:** Oakland completed this through Ordinance No. 567 and 582;
        - **L-2:** Oakland completed this through Ordinance No. 567;
        - **L-3:** Oakland completed this through Ordinance No. 567;
        - **L-5:** Completed by Roseburg
    - Deleted 2016 Mitigation Actions
        - **D-1:** This isn't a role that the County performs

- **F-7**: Roseburg decided to delete this as it was mitigated in 1965 and was included by error;
- **WF-1:** The County deleted this as an action as it isn't a role that the County performs;
- **WF-7:** The County deleted this as an action as it isn't a role that the County performs.

Chapter 5: Plan Implementation and Maintenance

Douglas County Planning Department and Douglas County Emergency Management will continue to convene and coordinate the County Steering Committee during the Implementation and Maintenance phase (documentation for the city and special district Steering Committees is contained within Chapter 5). The County is exploring convening the Local Emergency Planning Committee to serve as the Steering Committee going forward. If this is not feasible, in the short or long term, the County will convene a separate Steering Committee for the purpose of reviewing and maintaining the 2024 NHMP.

Volume II: Appendices

Below is a summary of the appendices included in the 2024 NHMP:

Appendix A: Action Items Forms

This Action Items Forms appendix was developed to present each Action item in-depth, including noting which communities have identified the Action Item as one they plan to follow and implement.

Appendix B: Planning and Public Process

This planning and public process appendix reflects changes made to the Douglas County NHMP and documents the 2024 planning and public process.

Appendix C: Economic Analysis of Natural Hazard Mitigation Projects

Updates are provided for the economic analysis of natural hazard mitigation projects.

Appendix D: Grant Programs and Resources

Updates were made to grant programs and resources, including adding in the FEMA Mitigation Grant Programs table that notes which mitigation program covers which type of mitigation strategy or project.

Appendix E: Community Survey

This survey was administered during the development of the NHMP to determine the community's concerns regarding which hazards pose the greatest risk to the community. It was used to identify the community assets that community members consider are most valuable to the community. 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.

Public Participation Process

Douglas County is dedicated to directly involving the public in the review and update of the natural hazard mitigation plan. Although members of the steering committee represent the public to some extent, the residents of Douglas County, Canyonville, Drain, Elkton, Glendale, Myrtle Creek, Oakland, Reedsport,

Riddle, Roseburg, Sutherlin, Winston, and Yoncalla were provided the opportunity to provide feedback about the NHMP. The NHMP will undergo review by the County NHMP steering committee on a semiannual basis and by the city and special district steering committees on an annual basis.

Douglas County made the NHMP available via their website throughout the update process and the updated NHMP was made available for public review and comment through the FEMA review period. The participating cities and special districts were included within the press release that was provided (see following page).

Public Involvement Summary

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 informtheir risk assessment and mitigation strategies.

A draft of the Risk Assessment was provided to the public as an opportunity to provide feedback or comments on the document. During the public review period there were zero (0) responses.

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

Press Release

The public was made aware of the Community Survey and the opportunity to provide comments on the Hazard Risk Assessment through press releases. The Douglas County Lead Public Information Officer distributed announcements for both opportunities on various community engagement sites, and which were also shared by the cities on their own sites.

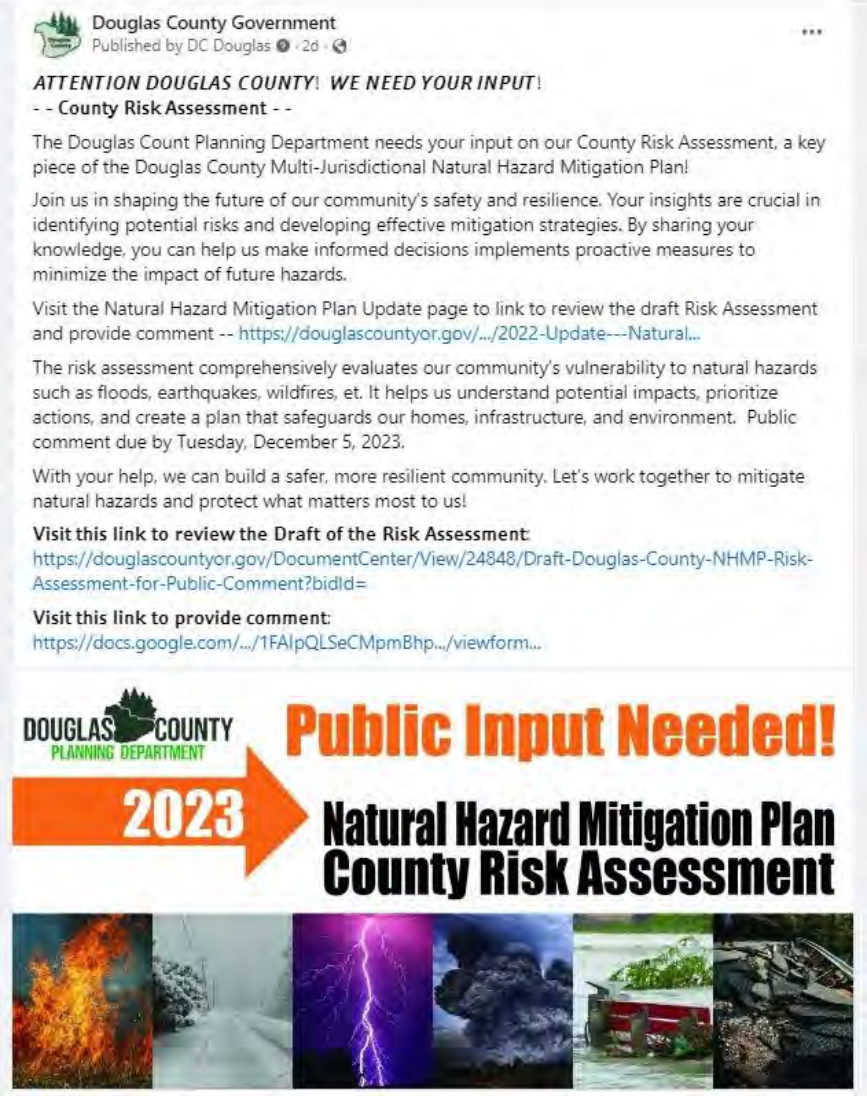
Figure 53**Error! Reference source not found.** is the visual used to announce the open period for public comments for the NHMP.

Figure 53 Community Announcement for NHMP Public Comment

Source: Douglas County Public Affairs Office, 2023

Visuals were posted on social media sites, such as a Facebook (see Figure 54**Error! Reference source not found.**), to announce the comment period to their followers.

Figure 54 Facebook Announcement for NHMP Public Comment



Source: Douglas County Public Affairs Office, 2023

Douglas County Steering Committee

Steering Committee members possessed familiarity with the Douglas County community and how it is affected by natural hazard events. The Steering Committee guided the update process through several steps including goal confirmation and prioritization, action item review and development and information sharing to update the NHMP and to make the NHMP as comprehensive as possible. The Steering Committee met formally on the following dates:

Meeting #1: Kickoff, March 2, 2022

During this meeting, the Steering Committee reviewed the NHMP process, including scope of work, timeline, Steering Committee commitments, and public engagement strategies. They also reviewed the hazard assessment process, as well as lessons learned from recent natural disaster events, jurisdictions' hazard priorities, and new steps.

Meeting #2: June 21, 2022

During this meeting, the Steering Committee was presented the Scope of Work and projected timeline of the project. Hazard assessment was discussed, including which hazards would be profiled. The Hazard Vulnerability Assessment scores were discussed, including how the process would be conducted and its application.

Meeting #3: October 19, 2022

During this meeting, the Steering Committee was presented the Scope of Work and projected timeline of the project. Again, the hazard assessment was discussed, including which hazards would be profiled. The Hazard Vulnerability Assessment scores were discussed, including how the process would be conducted and its application. Information was requested from the Steering Committee for the hazard assessment.

Meeting #4: March 22, 2023

During this meeting, the Steering Committee was presented the Scope of Work and projected timeline of the project. Erica Fleishman from OSU OCCRI discussed the upcoming Future Climate Projections Report for Douglas County, including project scope, standard extent of findings, and potential application of the findings into the updated NHMP. A discussion on this future report also included topics regarding concerns in changes to precipitation and temperature, and concerns about specific local issues and potential data needs.

Meeting #5: June 20, 2023

During this meeting, the Steering Committee was presented with the status of the report, as well as being encouraged to provide relevant community profile information and to notify them of upcoming public engagement opportunities. The risk assessment was discussed, including the results and inclusion of the OPDR Hazard Analysis conducted for Douglas County. Steps were made towards developing and finalizing the mitigation goals, and mitigation actions were discussed.

Meeting #6: August 15, 2023

During this meeting, the Steering Committee reviewed the public engagement process, including the Community Survey that was being dispersed across the County. Ericia Fleishman from OCCRI presented

the findings from the Future Projections Report for Douglas County. Mitigation goals were discussed and finalized by the Steering Committee, and next steps on the mitigation actions were discussed.

Meeting #7 October 10, 2023

During this meeting, the Steering Committee reviewed the status of the NHMP, as well as the findings from the Community Survey were presented and discussed. The finalization process of the mitigation actions was discussed, and communities agreed to provide their final list of actions by the end of the month. The inclusion and utilization of policies and ordinances and list of critical infrastructure and facilities were discussed, and indicated how these would be used to inform natural hazard mitigation planning.

Meeting #8: November 14, 2023

During this meeting, the Steering Committee reviewed the status of the NHMP, as well as presented preliminary findings from the DOGAMI Risk Report from Matt Williams. The previous NHMP's implementation and maintenance program was reviewed and any changes that were necessary were made. Action Item prioritization was discussed, and updates were made on how that process would be updated for this current review process.

NHMP Steering Committee Meeting 1

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan
2022 Update Kickoff Meeting
AGENDA

Wednesday March 2, 2022
10:30 AM– 12:00 PM
Online via Zoom
https://us02web.zoom.us/j/85654695357?pwd=bVQvYTZBNVh5czhQSlMyVnVPV2xKUT09

Welcome/Introductions	**10:30 am**
• Please share your name, title, and jurisdiction.	Joshua Shaklee, Planning Director
NHMP Project Overview	**10:40 am**
• IGA/ Scope of Work • Timeline • Public Engagement	Pamela Reber, DLCD Joshua Shaklee, Planning Director
Hazard Assessment	**11:05 am**
• Scope of Work • Timeline	Mike Howard, UO IPRE Wayne Stinson, Emergency Manager
Committee Discussion	**11:30 am**
• Lessons learned from wildfire response/recovery. • Jurisdiction priorities/ needs for long term resilience. • Discuss public engagement strategies.	All Joshua Shaklee, Planning Director Wayne Stinson, Emergency Manager
Public Comment	**11:45 am**
• Please raise your hand and state your name and address for the record (3 min. each).	Joshua Shaklee, Planning Director
Next Steps	**11:50 am**
• UO IPRE will begin work on Hazard Assessment. • Cities take IGA to Councils for approval. • Plan update will begin upon FEMA approval.	All

Update Kickoff Meeting March 2, 2022		
Name	**Jurisdiction**	**Job Title**
Alexandra Corvello	University of Oregon – Oregon Partnership for Disaster Resilience	Hazard Assessment Presenter/ Researcher
Hailey Sheldon	City of Reedsport	Planner
Joe Blanchard	Umpqua National Forest	BAER Program
Joshua Shaklee	Douglas County	Planning Director, Project Convener
Kristi Gilbert	City of Sutherlin	Community Development Director
Lonnie Rainville	City of Myrtle Creek	City Administrator
Matt Smart	City of Reedsport	Police Chief
Michael Howard	University of Oregon – Oregon Partnership for Disaster Resilience	Director/ Hazard Assessment Project Manager
Noah Miller	City of Elkton	-
Pamela Reber	DLCD	Natural Hazard Planner, Project Manager
Stu Cowie	City of Roseburg	Community Development Director
Thomas McIntosh	City of Winston	Assistant City Manager
Wayne Stinson	Douglas County	Emergency Manager

NHMP Steering Committee Meeting 2

Douglas County
Multi-Jurisdictional
Natural Hazard Mitigation Plan

2022 Update Kickoff Meeting AGENDA

Tuesday June 21, 2022
3:00 PM– 5:00 PM
Online via

Welcome/Introductions	**3:00 pm**
• Please share your name, title, and jurisdiction.	Joshua Shaklee, Planning Director
NHMP Project Updates	**3:10 pm**
• IGA/ Scope of Work/Timeline • Memo	Pamela Reber, DLCD Joshua Shaklee, Planning Director
Hazard Assessment	**3:20 pm**
• Hazards overview • HVA scores?	Mike Howard, UO IPRE Wayne Stinson, Emergency Manager
Committee Discussion	**4:00 pm**
• Hazard Assessment • Memo/ Timeline	All Joshua Shaklee, Planning Director Wayne Stinson, Emergency Manager
Public Comment (3 min. each)	**4:30 pm**
• Please state your name and address for the record	Joshua Shaklee, Planning Director
Next Steps	**4:40 pm**
• Info requests • Cost share	All

Update Kickoff Meeting June 21, 2022		
Name	**Jurisdiction**	**Job Title**
Kate Bentz	City of Roseburg	
Caleb Stevens	City of Roseburg	Community Development Department
Thomas McIntosh,	City of Winston	Assistant City Manager
Courteney Davis	City of Reedsport	Planner
Kristi Gilbert	City of Sutherlin	Community Development Director
Brendan McGarr	City of Sutherlin	
Lonnie Rainville	City of Myrtle Creek	City Administrator
Janelle Evans	City of Canyonville	City Administrator
Joshua Shaklee	Douglas County	Planning Director, Project Convener
Wayne Stinson	Douglas County	Emergency Manager
Mark Moffett	Douglas County	Senior Planner
Mike Howard	UO OPRD	Director/ Hazard Assessment Project Manager
Alexandra Corvello	UO OPRD	Hazard Assessment Presenter/ Researcher
Anna Murphy	UO-IPRE	Student Researcher
Matthew Bromley	UO-IPRE	Researcher

NHMP Steering Committee Meeting 3

Douglas County
Multi-Jurisdictional
Natural Hazard Mitigation Plan

2022 Update Kickoff Meeting AGENDA

Wednesday October 19, 2022
3:30 PM– 5:00 PM

https://us02web.zoom.us/j/88286491170?pwd=NVl5OUthM2RPY29qMnFxcmhndkRNQT09

Welcome/Introductions	**3:30 pm**
• Please share your name, title, and jurisdiction.	Joshua Shaklee, Planning Director
NHMP Project Updates/Business	**3:40 pm**
• IGA/ Scope of Work/Timeline • Notes from June meeting (review & approve)	Pamela Reber, DLCD Joshua Shaklee, Planning Director
Hazard Assessment	**3:50 pm**
• Hazards overview • HVA scores?	Mike Howard, UO IPRE Wayne Stinson, Emergency Manager
Committee Discussion	**4:20 pm**
• Hazard Assessment • Info requests	All Joshua Shaklee, Planning Director Pam Reber, DLCD
Public Comment (3 min. each)	**4:50 pm**
• Please state your name and address for the record	Joshua Shaklee, Planning Director
Next Steps	**4:55 pm**
• Info requests • Cost share	All

Natural Hazard Mitigation Plan Update & Hazard Assessment Joint Kickoff Meeting October 19, 2022		
Name	**Jurisdiction**	**Job Title**
Stuart Cowie	City of Roseburg	Community Development Director
Thomas McIntosh	City of Winston	Development Director
Janelle Evans	City of Canyonville	Planner (former City Administrator)
Lonnie Rainville	City of Myrtle Creek	City Administrator
Kathy Wilson	City of Riddle	City Manager
Dawn Russ	City of Glendale	City Recorder/Manager/ Planner
Courteney Davis	City of Reedsport	Planner
Jeni Stevens, City of Drain	City of Drain	
Deanna Wright	DLCD	NFIP Coordinator
Joshua Shaklee	Douglas County	Planning Director, Project Convener
Mark Moffett	Douglas County	Planning
Wayne Stinson	Douglas County	Emergency Manager
Pam Reber	DLCD	Natural Hazard Planner/ Project Manager
Mike Howard,	UO OPRD	Director/ Hazard Assessment Project Manager

NHMP Steering Committee Meeting 4

Douglas County
Multi-Jurisdictional
Natural Hazard Mitigation Plan
2023 Update Kickoff Meeting
AGENDA
March 22, 2023
2:00 PM– 3:30 PM

Online via Zoom:
https://us06web.zoom.us/j/88461604293?pwd=cjVJZ005L3BHdDB6d002U2pnaHA0QT09
Passcode: 783160 | Webinar ID: 884 6160 4293

Welcome/Introductions	**2:00 pm**
• Please share your name, title, and jurisdiction.	Joshua Shaklee, Planning Director
NHMP Project Updates/Business	**2:10 pm**
• IGA/ Scope of Work/Timeline • Notes from October meeting (review & approve)	Joshua Shaklee, Planning Director
Public Comment (3 min. each)	**2:20 pm**
• Please state your name and address for the record	Joshua Shaklee, Planning Director
OCCRI Future Conditions Report	**2:30 pm**
• Project overview	Erica Fleishman, OSU OCCRI
Committee Discussion	**2:50 pm**
• What are concerns that you have about changes to precipitation and temperature? • Concerns about locally specific data needs?	All Erica Fleishman, OSU OCCRI
Next Steps	**3:00 pm**
• Info requests • Cost share	All

Steering Committee Meeting #4 March 22, 2023		
Name	**Jurisdiction**	**Job Title**
Brandan McGarr	City of Sutherlin	Emergency Manager
Courteney Davis	City of Reedsport	Planner
Jeni Stevens	City of Drain	City Administrator
Josh Gibson	Douglas County	Planning
Kathy Wilson	City of Riddle	City Manager
Kristi Gilbert	City of Sutherlin	Community Development Supervisor
Linda Cereda	City of Elkton	Billing Clerk, Utility Worker
Lonnie Rainville	City of Myrtle Creek	City Administrator
Nik Ramstad	City of Roseburg	Planning Assistant (RARE)
Joshua Shaklee	Douglas County	Planning Director, Project Convener
Cynthia Smidt	DLCD	Natural Hazard Planner/ Project Manager
Erica Fleishman	OSU OCCRI	Director
Ricky Hoffman	Oregon Department of Emergency Management	Regional Mitigation & Recovery Coordinator

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan

Steering Committee Meeting #5

AGENDA

Tuesday, June 20, 2023

Time: 2:00 p.m. – 4:00 p.m.

Webinar ID: 881 1744 1442 | Passcode: 316053

https://us06web.zoom.us/j/88117441442?pwd=MFZ6dW44SHBKcVI5U1N6RGFXcXVpUT09

Welcome & Announcements	**3 min**
• Introductions	Joshua Shaklee, Planning Director
Project Updates	**5 min**
• Meeting Notes • Report Status • Community Profile Information • Public Engagement	Joshua Shaklee, Planning Director Cynthia Smidt, DLCD
Risk Assessment	**30 min**
• OPDR Hazard Analysis • Volcano?	Cynthia Smidt, DLCD
Mitigation Strategy	**30 min**
• Mission, Goals • Actions	Joshua Shaklee, Planning Director Cynthia Smidt, DLCD
Next Steps	**3 min**
• August 15, 2023, 9:00-11:00 AM • Individual City Meetings	

Steering Committee Meeting #5 June 20, 2023		
Name	**Jurisdiction**	**Job Title**
Carolyn Shields	City of Oakland	City Recorder
Emily Ring	Douglas County	Emergency Manager
Janelle Evans	City of Canyonville	Planner
Jeni Stevens	City of Drain	City Administrator
Josh Gibson	Douglas County	Senior Planner
Kathy Wilson	City of Riddle	City Manager/Recorder
Kristi Gilbert	City of Sutherlin	Community Development Director
Lonnie Rainville	City of Myrtle Creek	City Administrator
Joshua Shaklee	Douglas County	Planning Director, Project Convener
Wayne Stinson	Douglas County	Emergency Manager

NHMP Steering Committee Meeting 6

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan

Steering Committee Meeting #6

AGENDA

Tuesday, August 15, 2023
Time: 9:00 a.m. – 11:00 a.m.

Webinar ID: 836 7799 6020 | Passcode: 061350
https://us06web.zoom.us/j/83677996020?pwd=MHAyZHpxOXhzc3c3RENidDhzcmxidz09

Welcome & Announcements	**5 min**
• Introductions • DLCD's Gianna Alessi	Josh Gibson, Senior Planner Cynthia Smidt, DLCD
Project Updates	**5 min**
• Meeting Notes • Public Engagement	Cynthia Smidt Josh Gibson
Presentation	**30 min**
• OCCRI Future Projections Report for Douglas County • Discussion	Erica Fleishman, OSU All
Mitigation Strategy	**40 min**
• Goals • Actions	Josh Gibson & Cynthia Smidt All
Next Steps	**3 min**
• October 10, 2023, 1:30-3:30 PM • Individual City Meetings, continued • Public Engagement, continued	Cynthia Smidt

Mitigation Goals

GOAL A: Develop and implement mitigation activities to protect human life, property, and the natural environment.

GOAL B: Protect existing buildings and infrastructure from the impacts of natural hazards.

GOAL C: Build resilience to the impacts of natural hazards on the local economy.

GOAL D: Educate public and raise awareness of the impacts of natural hazards.

GOAL E: Increase preparedness of communities and agencies.

Steering Committee Meeting #6 August 15, 2023		
Name	**Jurisdiction**	**Job Title**
Andy Blondell	City of Roseburg	Planning Technician III
Carolyn Shields	City of Oakland	City Recorder
Emily Ring	Douglas County	Emergency Manager
Hailey Sheldon	City of Reedsport	Planner
Janelle Evans	City of Canyonville	Planner
Jennifer Bragg	City of Yoncalla	City Administrator
Josh Gibson	Douglas County	Planning Division
Kathy Wilson	City of Riddle	City Manager/Recorder
Kristi Gilbert	City of Sutherlin	Community Development Director
Linda Cereda	City of Elkton	Billing Clerk
Thomas McIntosh	City of Winston	Assistant City Manager
Wayne Stinson	Douglas County	Emergency Manager

NHMP Steering Committee Workgroup 1

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan

Steering Committee Action Item Work Session

Tuesday, September 12, 2023

Time: 1:00 pm – 3:00 pm

Steering Committee Action Item Work Session September 12, 2023		
Andy Blondell	City of Roseburg	Planning Technician III
Carolyn Shields	City of Oakland	City Recorder
Emily Ring	Douglas County	Emergency Manager
Hailey Sheldon	City of Reedsport	Planner
Janelle Evans	City of Canyonville	Planner
Jennifer Bragg	City of Yoncalla	City Administrator
Josh Gibson	Douglas County	Planning Division
Kathy Wilson	City of Riddle	City Manager/Recorder
Kristi Gilbert	City of Sutherlin	Community Development Director
Brandi Medeiros	City of Sutherlin	Community Development Assistant
Linda Cereda	City of Elkton	Billing Clerk
Joshua Shaklee	Douglas County	Planning Director, Project Convener

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan

Steering Committee Meeting #7

AGENDA

Tuesday, October 10, 2023

Time: 1:30 pm – 3:30 p.m.

Webinar ID: 878 5473 4123| Passcode: 609910

https://us06web.zoom.us/j/87854734123?pwd=Z3lrZm5vMko2Wlo0YTdKMlFJN3dydz09

Welcome & Announcements	5 min
• Introduction	Joshua Shaklee
Project Updates	5 min
• Meeting Notes • NHMP Status	Gianna Alessi Gianna Alessi, Joshua Shaklee
Survey	20 min
• Community Survey Findings	Gianna Alessi, Joshua Shaklee
Mitigation Strategy	15 min
• Action Item Work Group • Action Item Excel Form	Gianna Alessi, Joshua Shaklee Gianna Alessi
Capability Assessment	20 min
• Policies and Ordinances • Critical Infrastructure List	Gianna Alessi, Joshua Shaklee Gianna Alessi
Next Steps	10 min
• Set Next Meeting • Review and Update Action Items • Review and Update Critical Infrastructure List • Review and Update Policies and Ordinances List • Individual City Meetings, continued • Public Engagement, continued	Gianna Alessi

Steering Committee Meeting #6 October 10, 2023		
Name	**Jurisdiction**	**Job Title**
Andy Blondell	City of Roseburg	Associate Planner
Brandi Medeiros	City of Sutherlin	Community Development Assistant
Emily Ring	Douglas County	Emergency Manager
Hailey Sheldon	City of Reedsport	Planner
Josh Gibson	Douglas County	Planning Division
Joshua Shaklee	Douglas County	Planning Division
Kathy Wilson	City of Riddle	City Manager/Recorder
Kristi Gilbert	City of Sutherlin	Community Development Director
Linda Cereda	City of Elkton	Billing Clerk
Lonnie Rainville	City of Elkton	City Administrator
Ricky Hoffman	State of Oregon	Oregon Department of Emergency Management

Douglas County Multi-Jurisdictional Natural Hazard Mitigation Plan

Steering Committee Meeting #8

AGENDA

Tuesday, November 14, 2023

Time: 2:00 pm – 4:00 p.m.

Webinar ID: 814 2127 2869| Passcode: 067494 | Meeting: Link

Welcome & Announcements	5 min
• Introduction	Joshua Shaklee
Project Updates	5 min
• Meeting Notes • NHMP Status	Gianna Alessi Gianna Alessi, Joshua Shaklee
DOGAMI Presentation	20 min
• Community Survey Findings	Matt William
Plan Implementation	15 min
• Implementation and Maintenance	Gianna Alessi, Joshua Shaklee
Mitigation Strategy (Tentative)	20 min
• Action Prioritization	Gianna Alessi, Joshua Shaklee Cynthia Smidt
Next Steps	10 min
• Public Engagement, continued • Wrap-up	Gianna Alessi Gianna Alessi, Joshua Shaklee, Cynthia Smidt

Steering Committee Meeting #8 November 14, 2023		
Name	**Jurisdiction**	**Job Title**
Andy Blondell	City of Roseburg	Associate Planner
Carolyn Shields	City of Oakland	City Recorder
Emily Ring	Douglas County	Emergency Manager
Hailey Sheldon	City of Reedsport	Planner
Joshua Shaklee	Douglas County	Planning Division
Kathy Wilson	City of Riddle	City Manager/Recorder
Kristi Gilbert	City of Sutherlin	Community Development Director
Linda Cereda	City of Elkton	Billing Clerk
Lonnie Rainville	City of Elkton	City Administrator
Ricky Hoffman	State of Oregon	Oregon Department of Emergency Management
Hui Rodomsky	State of Oregon	Oregon Department of Land Conservation and Development
Matt Williams	State of Oregon	Oregon Department of Geology and Mineral Industries

Appendix C: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Institute of Policy Research and 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 manyvariables. 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 9288, 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 damage, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of 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 interms of dollars. Determining the economic feasibility of mitigating natural hazards can also beorganized 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 estimatingall of the economic benefits and costs regardless of who realizes them, and potentially to a largenumber 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 bemandated by a regulation or standard, or it may be economically justified on its own merits. Abuilding or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigationcompliance requirement; or
- 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 thosemethods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees ina synthetic fashion. This set of criteria requires the committee to assess the mitigation activitiesbased on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in yourcommunity. 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 eachaspect 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 boardcan help 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 cCounty public works staff and building department staff can help 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 or County administrator can help 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 city board of commissioners, city or County administrator, and local planning commissions to help 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 help 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 help answer these questions.

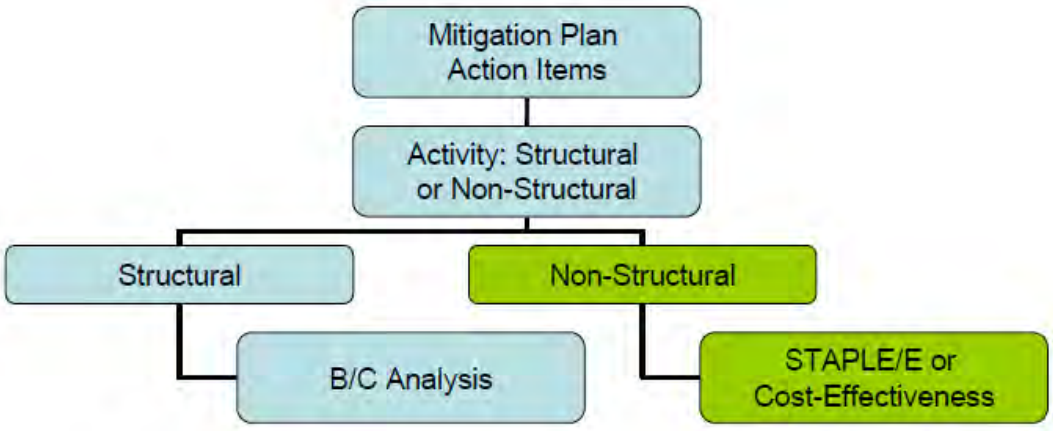
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projectsthat 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 55 is to serve as a guideline for when to use the various approaches.

Figure 55 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 ofprioritized 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 on 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 mitigationshould 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; and
- 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; or
- 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 the 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, opportunities rise 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.

Appendix D: Grant Programs and Resources

Introduction

There are numerous local, state, and federal funding sources available to support natural hazard mitigation projects and planning. The following section includes an abbreviated list of the most common funding sources 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.

State Programs

AmeriCorps/Resource Assistance for Rural Environments (RARE), University of Oregon

The mission of the RARE AmeriCorps Program is to increase the capacity of rural communities to improve their economic, social, and environmental conditions, through the assistance of trained graduate-level members who live and work in communities for 11 months. Members assist communities and agencies in the development and implementation of plans for achieving a sustainable natural resource base and improving rural economic conditions while gaining community building and leadership skills.

https://rare.uoregon.edu/

Coastal Grants, DLCD

The Oregon Coastal Management Program (OCMP) at Oregon Department of Land Conservation and Development (DLCD) is pleased to announce a new National Oceanic and Atmospheric Administration (NOAA) funding opportunity designed to build a Climate Ready Nation under the 2021 Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act (IIJA)) 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.

https://www.oregon.gov/lcd/OCMP/Pages/Grants.aspx

Community Risk Reduction Grants, OSFM

The Oregon State Fire Marshall (OSFM) grant programs provides the following funding sources.

- ***Community Wildfire Risk Reduction Grant:*** 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.
- ***Oregon Fire Service Capacity Program:*** The Fire Service Capacity Program is for small- to medium-sized agencies that need more permanent positions for 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.

- ***Engine Program:*** This $25-million program is purchasing and strategically placing new firefighting equipment across Oregon. The OSFM is purchasing type 3, type 6, and tactical tenders to assist local host agencies in keeping fires small and away from communities.
- ***Community Wildfire Protection Plan (CWPP) Investments:*** In February 2023, the OSFM made a strategic one-time $2.7 million investment at the local and county levels through CWPP. Projects will happen in 25 CWPP planning areas located in Baker, Benton, Clackamas, Coos, Crook, Curry, Deschutes, Douglas, Gilliam, Hood River, Jackson, Jefferson, Josephine, Lake, Lane, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Wallowa, Wheeler, and Yamhill counties. Projects include promoting wildfire-specific community risk reduction efforts, community education, defensible space projects, home assessments, media campaigns, signage, fuel mitigation programs, and grant funds.

https://www.oregon.gov/osp/programs/sfm/Pages/OSFM-Grants.aspx

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 agency budget.

Grants and Supports for Emergency Shelter, ODHS

Oregon Department of Human Services (ODHS) proves assistance for local governments, Tribal Nations and public education providers to address shelter needs for:

- Cleaner air shelters during wildfire smoke and other poor air quality events
- Cooling and warming shelters

Oregon Senate Bill 80 (SB 762 fixes) proposes to extend eligibility to non-profits and faith-based organizations.

https://www.oregon.gov/dhs/EmergencyManagement/Pages/emergency-shelter.aspx

Landscape Resiliency Program, ODF

This grant program funded 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, has awarded $20 million for nine projects during the 2021–23 biennium.

https://www.oregon.gov/odf/pages/landscape-resiliency-program.aspx

Oregon Watershed Enhancement Board

While OWEB's primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshopsfor landowners, watershed

councils, educators, and others, and conducts a biennial conference highlighting watershed effort statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately $20 million in funding annually. More information at:

http://www.oregon.gov/OWEB/Pages/index.aspx

Resilience Hubs and Networks Grant, ODHS

Oregon Department of Human Services (ODHS), Office of Resilience and Emergency Management, is developing a new program to provide grants, support and technical assistance to communities for planning and establishing resilience hubs and networks in Oregon, per HB 3409 (2023), effective date July 27, 2023. ODHS staff anticipate having the program established winter 2023-2024.

https://www.oregon.gov/odhs/emergency-management/Pages/about.aspx

Seismic Rehabilitation Grant Program

The Seismic Rehabilitation Grant Program (SRGP) provides state funds to strengthen public schools and emergency services buildings so they will be less damaged during an earthquake. Reducing property damage, injuries, and casualties caused by earthquakes is the goal of the SRGP.

http://www.orinfrastructure.org/Infrastructure-Programs/Seismic-Rehab/

Small Forestland Grant Program (SFGP), ODF

The SSFGP offered the following two funding opportunities: the Small Forestland Grant and the Firewise Community Grant. Both opportunities require grant dollars are spent reducing the risk of high severity wildfire through the reduction of hazardous fuel on small forestland owner properties. Both opportunities were scored prioritizing high-risk watersheds, but lower risk watersheds were not excluded from applying. All invoices from both program components must be submitted by successful recipients no later than June 15, 2023.

https://www.oregon.gov/odf/pages/small-forestland-grant-program.aspx

Smoke Management-Community Response Plan Grant, DEQ

Communities throughout Oregon are at various stages of planning and preparing for the potential impacts from prescribed fire and wildfire smoke. To create a successful community response plan for smoke, communities need to partner with local stakeholders and apply the best practices and resources to meet the needs of their residents. In 2022, DEQ awarded grants to 20 local and tribal governments to develop comprehensive community response plans for smoke management and to three local entities and businesses to pilot projects promoting alternatives to open burning. Once the grant period is completed, DEQ will share community response plans and best practices from the grant awardees.

https://www.oregon.gov/deq/aq/Pages/Smoke-Resources.aspx

Special Public Works Fund

The Special Public Works Fund (SPWF) provides funds for publicly owned facilities that supporteconomic and community development in Oregon. Funds are available to public entities for: planning, designing, purchasing, improving and constructing publicly owned facilities, replacing publicly owned essential community facilities, and emergency projects as a result of a disaster. Public agencies that are eligible to

apply include: cities, counties, County service districts, (organized under ORS Chapter 451), tribal councils, ports, districts as defined in ORS 198.010, and airport districts (ORS 838). Facilities and infrastructure projects that are eligible for funding are: airport facilities, buildings and associated equipment, levee accreditation, certification, and repair, restoration of environmental conditions on publicly-owned industrial lands, port facilities,wharves, and docks, the purchase of land, rights of way and easements necessary for a public facility, telecommunications facilities, railroads, roadways and bridges, solid waste disposal sites, storm drainage systems, wastewater systems, and water systems.

https://www.orinfrastructure.org/Infrastructure-Programs/SPWF/

State Interagency Hazard Mitigation Team (IHMT)

Find IHMT meeting dates and locations, agendas, minutes and meeting materials. The State IHMT is made up of about 18 state agencies involved with natural hazards. The State IHMT meets quarterly to understand losses arising from natural hazards, coordinate recommended strategies to mitigate loss of life, property, and natural resources, and maintain the Oregon Natural Hazards Mitigation Plan.

http://www.oregon.gov/oem/Councils-and-Committees/Pages/IHMT.aspx

State Preparedness and Incident Response Equipment (SPIRE), OEM

Oregon House Bill 2687 became effective in August 2017. It established a grant program to distribute emergency preparedness equipment to local governments and other recipients to be used to decrease risk of life and property resulting from an emergency. Items purchased must qualify as capital assets, meaning individual items must cost at least $5,000. A total of $5,000,000 is available to procure emergency preparedness equipment to help Oregon communities prepare, respond, and recover from emergencies. During the 2021 Legislative Session, HB 2426 added Urban Search and Rescue (USAR) equipment to the list and required that USAR equipment receive the highest priority. The contact for the SPIRE program is Carole Sebens, Grants Coordinator, Carole.L.Sebens@oem.oregon.gov/

https://www.oregon.gov/oem/emresources/Grants/Pages/Spire.aspx

Urban and Community Forestry Inflation Reduction Act, ODF

The Inflation Reduction Act (IRA) is a federal law that makes historic investments in clean energy and climate action. The IRA advances the Justice40 Initiative, which commits to providing 40 percent of climate, clean energy, and infrastructure investment benefits to overburdened and underserved communities. The IRA provides up to $1.5 billion to the United States Forest Service (USFS) for urban and community forestry investments to foster 1) increased and equitable access to urban tree canopy, 2) broadened community engagement in local urban forest planning, tree planting, and management activities, and 3) improved community and urban forest resilience. The Oregon Department of Forestry's (ODF's) Urban and Community Forestry (UCF) Program received $26.6 million in IRA grant funding from the USFS to support two grant programs.

https://www.fs.usda.gov/managing-land/urban-forests/ucf/2023-grant-funding

FEMA – Pre-/Post-Disaster Mitigation Programs

Hazard Mitigation Grant Program, FEMA

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.

http://www.fema.gov/hazard-mitigation-grant-program

Building Resilient Infrastructure and Communities Grant Program

The Building Resilient Infrastructure and Communities (BRIC) program provides funds to states,territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding theseplans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. BRIC grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. The BRIC grant program is offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer, which should be garnered well before the application period opens.

https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

Flood Mitigation Assistance Program

The overall goal of the Flood Mitigation Assistance (FMA) Program 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 specifically 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.

http://www.fema.gov/flood-mitigation-assistance-program

Detailed program and application information for federal post-disaster and non-disaster programs can be found in the FY15 Hazard Mitigation Assistance Unified Guidance, available at: https://www.fema.gov/media-library/assets/documents/103279. Note that guidance regularly changes. Verify that you have the most recent edition. Flood mitigation assistance is usually offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer, which should be garnered well before the application periodopens.

For Oregon Department of Emergency Management (OEM) grant guidance on Federal HazardMitigation Assistance, visit: https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx

Contact: shmo@mil.state.or.us

Hazard Mitigation Assistance (HMA), FEMA

Detailed program and application information for federal disaster and non-disaster programs can be found in the Hazard Mitigation Assistance Program and Policy Guide, dated March 23, 2023, note that guidance regularly changes. Verify that you have the most recent edition. Flood mitigation assistance is usually offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer (SHMO), which should be garnered well before the application period opens.

For Oregon Department of Emergency Management (OEM) grant guidance on Federal Hazard Mitigation Assistance, visit: https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx

Contact: Anna Feigum, State Hazard Mitigation Officer (SHMO), anna.r.feigum@oem.oregon.gov

https://www.fema.gov/grants/mitigation

Hazard Mitigation Grant Program (HMGP), FEMA

The 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 presidentially declared disasters within the past year, then becomes available statewide if funding is still available. FEMA administers the grant.

As of January 2024, FEMA will fund net-zero energy projects, including solar, heat pumps and efficient appliances, through the Public Assistance program (discussed below), but also funding net-zero energy projects for the HMGP to encourage more communities to use net-zero projects that increase community resilience.

https://www.fema.gov/grants/mitigation/hazard-mitigation

Rehabilitation of High Hazard Potential Dam (RHHPD) Grant Program, FEMA

The RHHPD awards provide technical, planning, design and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. A state or territory with an enacted dam safety program, the State Administrative Agency, or an equivalent state agency, is eligible for the grant.

https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams

Eligible Activities for FEMA Mitigation Grants

While project eligibility must meet all requirements set in the FEMA Hazard Mitigation Assistance Guide, Table 73 summarizes eligible activities that may be funded by the HMA programs. Eligible projects are categorized into three categories – Capability- and Capacity-Building, Mitigation projects, and Management costs.

The table is not comprehensive, and applicants and sub applicants can submit new and innovative activities that may not be specifically outlined below.

Table 76 Eligible Mitigation Activities by FEMA Program

Eligible Projects	HMGP	HMGP Post-Fire	BRIC	FMA
1. Capability- and Capacity-Building				
New Plan Creation and Updates	Yes	Yes	Yes	Yes*
Planning-Related Activities	Yes	Yes	Yes	No
Project Scoping/Advance Assistance	Yes	Yes	Yes	Yes
Financial Technical Assistance	No	No	No	Yes
Direct Non-financial Technical Assistance	No	No	Yes	No
Partnerships	No	No	Yes	Yes
Codes and Standards	Yes	Yes	Yes	No
Innovative Capability- and Capacity- Building†	Yes	Yes	Yes	Yes
2. Mitigation Projects				
Property Acquisition	Yes	Yes	Yes	Yes
Structure Elevation	Yes	Yes	Yes	Yes
Mitigation Reconstruction	Yes	Yes	Yes	Yes
Localized Flood Risk Reduction	Yes	Yes	Yes	Yes
Non-Localized Flood Risk Reduction	Yes	Yes	Yes	Yes**
Stabilization	Yes	Yes	Yes	Yes
Dry Floodproofing Non-Residential Building	Yes	Yes	Yes	Yes
Tsunami Vertical Evacuation	Yes	Yes	Yes	No
Safe Room	Yes	Yes	Yes	No
Wildfire Mitigation	Yes	Yes	Yes	No
Retrofit	Yes	Yes	Yes	Yes†
Secondary Power Source	Yes	Yes	Yes	No
Warning System (excluding earthquake early warning system)	Yes	Yes	Yes	No
Earthquake Early Warning System	Yes	Yes	Yes	No

Eligible Projects	HMGP	HMGP Post-Fire	BRIC	FMA
Aquifer Recharge, Storage and Recovery	Yes	Yes	Yes	Yes***
Innovative Mitigation Project††	Yes	Yes	Yes	Yes
3. Management Costs				
Management Costs	Yes	Yes	Yes	Yes

Source: FEMA, Hazard Mitigation Assistance Program and Policy Guide, 2023

Federal – Pre-/Post-Disaster Programs

Climate Resilience Regional Challenge, NOAA

Approximately $575 million will be available for projects that build the resilience of coastal communities to extreme weather (e.g., hurricanes and storm surge) and other impacts of climate change (e.g., sea level rise, drought). Funding is made possible by the Inflation Reduction Act, a historic, federal government-wide investment that is advancing NOAA's efforts to build Climate-Ready Coasts. This new, competitive grant program provides the opportunity to collaboratively implement transformational regional projects that build immediate and long-term resilience in coastal areas

https://coast.noaa.gov/funding/ira/resilience-challenge/

Community Development Block Grant Program

The Community Development Block Grant Program (CDBG), administered by 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 acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs arising in the last 18 months which pose immediate threats to health and welfare. Grants are awarded based on specific projects as they are identified.

https://www.hud.gov/program_offices/comm_planning/cdbg-dr

Community Development Block Grant Mitigation Program, HUD

The CDBG-MIT Program 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. The 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.

https://www.hud.gov/program_offices/comm_planning/cdbg-dr/cdbg-mit

Community Energy Programs (CEP), U.S. Department of Energy

Community Energy Programs (CEP) provides federal support and resources to local and tribal governments, public schools, nonprofit organizations, workforce development groups, and other community-serving entities. The CEP includes the following: Energy Efficiency and Conservation Block Grant (EECBG) Program, Renew America's Nonprofits Program, Renew America's Schools Program, Communities Local Energy Action Program (Communities LEAP), and Workforce Development and Business Owner Training Program.

https://www.energy.gov/scep/community-energy-programs

Dam Emergencies Collaborative Technical Assistance (CTA) Program, FEMA

FEMA is offering a Collaborative Technical Assistance (CTA) series to help communities at risk of dam-related flooding to better understand their risk landscape and the potential consequences of dam-related emergencies. The CTA will include planning for emergencies related to operational discharges or dam-related infrastructure failure.

https://www.fema.gov/emergency-managers/risk-management/dam-safety/technical-assistance

Disaster Assistance Program, HUD

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 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.

https://www.sba.gov/funding-programs/disaster-assistance

Disaster Recovery Unit (DRU), U.S. Department of Education

The DRU coordinates disaster recovery work across the U.S. department of education. 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 the department's natural disaster recovery resources.

https://www.ed.gov/disasterrelief

Disaster Resources, HUD

The U.S. Department of Housing and Urban Development (HUD) provides a variety of disaster resources listed below. We also partner with Federal and state agencies to help implement disaster recovery assistance. Under the National Response Framework, FEMA and the Small Business Administration (SBA) offer initial recovery assistance.

https://www.hud.gov/disaster_resources

Emergency Management Performance Grants (EMPG), FEMA

Emergency Management Performance Grant program helps state and local governments to sustain and enhance their all-hazards emergency management programs.

https://www.fema.gov/grants/preparedness/emergency-management-performance

Food and Nutrition Service (FNS) Disaster Resources, USDA

The FNS coordinates with state, local, and voluntary organizations to provide nutrition assistance to those most affected by a disaster or emergency. USDA Foods are currently stored in every state and U.S. territory and may be used by state agencies or local disaster relief organizations to provide food to shelters or people who are sheltering in place. If retail food stores are operating in the impacted area, state agencies may request to operate a Disaster Supplemental Nutrition Assistance Program (D-SNAP).

https://www.fns.usda.gov/disaster/disaster-assistance

Grid Resilience and Innovation Partnerships (GRIP) Program, U.S. Department of Energy

The U.S. Department of Energy's Grid Deployment Office is administering a $10.5 billion GRIP Program to enhance grid flexibility and improve the resilience of the power system against growing threats of extreme weather and climate change. The programs will help accelerate the deployment of transformative projects that will ensure the reliability of the power sector's infrastructure, so all American communities have access to affordable, reliable, clean electricity anytime, anywhere. The program includes three funding mechanisms: Grid Resilience Utility and Industry Grants, Smart Grid Grants, and Grid Innovation Program.

https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program

HOME Investments Partnerships Program (IPP), HUD

The HOME IPP provides grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons.

https://www.hud.gov/program_offices/comm_planning/home

National Dam Safety Program (NDSP) State Assistance Grant Program, FEMA

The primary purpose of the NDSP State Assistance Grant Program is to provide financial assistance to the states for strengthening their dam safety programs. The 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

https://www.fema.gov/emergency-managers/risk-management/dam-safety/grants

National Estuary Program (NEP) Watersheds Grant, Restore America's Estuaries

Restore America's Estuaries, in close coordination with and financial support from EPA, administers the NEP Watersheds Grants. This grant program funds projects within one or more of the NEP boundary areas and supports the following Congressionally set priorities:

- Loss of key habitats resulting in significant impacts on fisheries and water quality such as seagrass, mangroves, tidal and freshwater wetlands, forested wetlands, kelp beds, shellfish beds, and coral reefs;
- Coastal resilience and extreme weather events including flooding and coastal erosion related to sea level rise, changing precipitation, warmer waters, or salt marsh, seagrass, or wetland degradation or loss and accelerated land loss;
- Impacts of nutrients and warmer water temperatures on aquatic life and ecosystems, including low dissolved oxygen conditions in estuarine waters;
- Stormwater runoff which not only can erode stream banks but can carry nutrients, sediment, and trash into rivers and streams that flow into estuaries;
- Recurring harmful algae blooms;
- Unusual or unexplained marine mammal mortalities; and
- Proliferation or invasion of species that limit recreational uses, threaten wastewater systems, or cause other ecosystem damage.

https://www.epa.gov/nep

Neighborhood Stabilization Program (NSP), HUD

The NSP was established for the purpose of providing emergency assistance to stabilize communities with high rates of abandoned and foreclosed homes, and to assist households whose annual incomes are up to 120% of the area median income.

https://www.hud.gov/program_offices/comm_planning/nsp

Preparedness Grants, FEMA

FEMA's Preparedness grants support citizens and first responders to ensure we work together as a nation to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate terrorism and other high-consequence disasters and emergencies.

https://www.fema.gov/grants/preparedness

Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT), FHWA

Administered by the Federal Highway Administration (FHWA), housed in the U.S. Department of Transportation, the vision of the 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. Projects selected under this program should be grounded in the best available scientific understanding of climate change risks, impacts, and vulnerabilities.

https://www.fhwa.dot.gov/environment/protect/discretionary/

Public Assistance (PA) Grant Program, FEMA

The objective of the PA Grant Program is to aid State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

In January 2024, FEMA expanded funding to tackle the climate crisis, improve resilience, and cut energy costs through net-zero projects. It will fund net-zero energy projects, including solar, heat pumps and efficient appliances, through the PA program, which covers the rebuilding of schools, hospitals, fire stations and other community infrastructure investments post-disasters.

http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit

Readiness and Emergency Management for Schools (REMS)

REMS supports education agencies, with their community partners, manage safety, security, and emergency management programs. The REMS Technical Assistance (TA) Center helps to build the preparedness capacity (including prevention, protection, mitigation, response, and recovery efforts) of schools, school districts, institutions of higher education (IHEs), and their community partners at the local, state, and Federal levels. REMS TA Center also serves as the primary source of information dissemination for schools, school districts, and IHEs for emergencies.

http://rems.ed.gov/

Regional Catastrophic Preparedness Grant Program (RCPGP), FEMA

The 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.

Housing was added as a strategic priority for this grant program in 2023 to accompany equity, climate resilience, and readiness. Priority will also be given to projects that address the needs of disadvantaged communities that might be at special risk because of current and/or future hazards, including those associated with climate change.

https://www.fema.gov/grants/preparedness/regional-catastrophic

Rural Development Assistance – Utilities, USDA

USDA's Rural Utilities Service (RUS) provides needed infrastructure or infrastructure improvements to rural communities. These include water and waste treatment, electric power and telecommunications services. All these services help to expand economic opportunities and improve the quality of life for rural residents.

https://www.rd.usda.gov/about-rd/agencies/rural-utilities-service

Rural Development Assistance – Housing, USDA

USDA's Rural Housing Service (RHS) offers a variety of programs to build or improve housing and essential community facilities in rural areas. We offer loans, grants and loan guarantees for single- and multifamily housing, childcare centers, fire and police stations, hospitals, libraries, nursing homes, schools, first

responder vehicles and equipment, housing for farm laborers and much more. The RHS also provide technical assistance loans and grants in partnership with non-profit organizations, Indian tribes, state and federal government agencies, and local communities.

https://www.rd.usda.gov/about-rd/agencies/rural-housing-service

Safeguarding Tomorrow Revolving Loan Fund Program, FEMA

The Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act became law on January 1, 2021, and authorizes FEMA to provide capitalization grants to states, eligible federally recognized tribes, territories and the District of Columbia to establish revolving loan funds that provide hazard mitigation assistance for local governments to reduce risks from natural hazards and disasters. These low interest loans will allow jurisdictions to reduce vulnerability to natural disasters, foster greater community resilience and reduce disaster suffering.

https://www.fema.gov/grants/mitigation/storm-rlf

Water Research Grants, EPA

The EPA funds water research grants to develop and support the science and tools necessary to develop sustainable solutions to current water resource problems, ensuring water quality and availability in order to protect human and ecosystem health.

https://www.epa.gov/research-grants/water-research-grants

Water Resources Projects for Small or Disadvantaged Communities, USACE

The U.S. Army Corps of Engineers (USACE) is launching a pilot program to fully fund small water resources projects for economically disadvantaged communities. A more detailed description of the requirements for a project proposal can be found in the WRDA 2020 Section 165 policy guidance issued on June 12, 2023.

https://www.usace.army.mil/Missions/Civil-Works/Project-Planning/Legislative-Links/wrda_2020/

WaterSMART Grants, USBR

Through WaterSMART Grants, the U.S. Bureau of Reclamation (USBR) provides financial assistance to water managers for projects that seek to conserve and use water more efficiently, implement renewable energy, investigate and develop water marketing strategies, mitigate conflict risk in areas at a high risk of future water conflict, and accomplish other benefits that contribute to sustainability in the western United States. Cost-shared projects that can be completed within two or three years are selected annually through a competitive process. Three categories of WaterSMART Grants are offered through separate funding opportunities: Water and Energy Efficiency Grants; Small-Scale Water Efficiency Projects; and Water Marketing Strategy Grants.

https://www.usbr.gov/watersmart/

Federal: Fire Resources

Assistance to Firefighters Grant (AFG) Program Resources, FEMA

https://www.fema.gov/grants/preparedness/firefighters/assistance-grants

FEMA's Assistance to Firefighters Grant Program provides a variety of resources listed below. The purpose of the grant is to provide equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards. The funds are available to fire departments, non-affiliated emergency medical services organizations, and state fire training academies. The funds enhance operations efficiencies, foster interoperability, and support community resilience.

Community Wildfire Defense Grant (CWDG) Program, USDA-FS

https://www.fs.usda.gov/managing-land/fire/grants

The CWDG is intended to help at-risk local communities and Tribes; plan for and reduce the risk of wildfire. The program, which was authorized by the Bipartisan Infrastructure Law, prioritizes at-risk communities in an area identified as having high or very high wildfire hazard potential, are low-income, or have been impacted by a severe disaster that affects the risk of wildfire. The program provides funding to communities for two primary purposes:

- Develop and revise Community Wildfire Protection Plans (CWPP).
- Implement projects described in a Community Wildfire Protection Plan that is less than ten years old.

The CWDG also helps communities in the wildland urban interface (WUI) implement the three goals of the National Cohesive Wildland Fire Management Strategy.

Fire Management Assistance Grant (FMAG) Program, FEMA

The FMAG Program is available to states, local and tribal governments, for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.

https://www.fema.gov/assistance/public/fire-management-assistance

Fire Prevention and Safety (FP&S), FEMA

The FP&S grant property is part of the AFG program noted above 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.

https://www.fema.gov/grants/preparedness/firefighters/safety-awards

National Fire Plan (NFP), USDA/USDOI

The NFP provides technical, financial, and resource guidance and support for wildland fire management across the United States. This plan addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

http://www.forestsandrangelands.gov/

Staffing For Adequate Fire and Emergency Response (SAFER)

The SAFER program 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.

https://www.fema.gov/grants/preparedness/firefighters/safer

Wildfire Smoke Preparedness in Community Buildings Grant Program, EPA

Wildfire Smoke Preparedness in Community Buildings is a new federal grant program to support enhancing community wildfire smoke preparedness. It provides grants and cooperative agreements 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.

https://www.epa.gov/indoor-air-quality-iaq/wildfire-smoke-preparedness-community-buildings-grant-program?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=#Eligible

Federal Mitigation: Research, Hazard Mapping and Technical Assistance

Decision, Risk, and Management Science Program, NSF

Administered through the National Science Foundation (NSF), scientific research is funded that is directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areasof judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature.

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423

Clean Water State Revolving Fund (CWSRF), EPA

The EPA administers this fund. The purpose is to fund water quality projects, including all types of nonpoint source projects, watershed protection or restoration projects, estuary management projects, and more traditional municipal wastewater treatment projects. Grant awards are based on specific projects as they are identified.

https://www.epa.gov/cwsrf

Community Action for a Renewed Environment (CARE), EPA

The administrator of the CARE funding source is the EPA. The purpose is to fund the removal or reduction of toxic pollution. The grant award is based on specific projects as they are identified.

https://www.epa.gov/international-cooperation/community-action-renewed-environment-care-roadmap-10-step-plan-improve

Community Change Equitable Resilience Technical Assistance, EPA

The Community Change Grant Equitable Resilience technical assistance will provide free design and project development assistance, community engagement, and partnership development workshops that support climate resilience and environmental justice activities in disaster-prone areas.

https://www.epa.gov/inflation-reduction-act/community-change-equitable-resilience-technical-assistance

Community Change Grants Technical Assistance, EPA

Office of Environmental Justice and External Civil Rights at EPA is committed to providing robust technical assistance and resources to eligible entities. This assistance is in direct response to feedback from communities and environmental justice leaders who have long called for technical assistance and capacity building support for communities and their partners as they work to access critical federal resources. There are two programs dedicated for the Community Change Grants, which include Community Change Technical Assistance (CCTA) and Community Change Equitable Resilience Technical Assistance (CCER TA).

https://www.epa.gov/inflation-reduction-act/community-change-grants-technical-assistance

Cooperating Technical Partners (CTP), FEMA

The CTP mission is to strengthen the effectiveness of the NFIP and support FEMA's mitigation objectives. The CTP Program leverages partnerships to deliver high-quality hazard identification and risk assessment products, provide outreach support and empower communities to take action to reduce risk based on informed, multi hazard-based data and resources.

https://www.fema.gov/flood-maps/guidance-partners/cooperating-technical-partners

Earthquake Resilience Guide for Water and Wastewater Utilities

There are three steps in this guide: Step 1 – Understand the Earthquake Threat. Step 2 – Identify Vulnerable Assets and Determine Consequences. Step 3 – Pursue Mitigation and Funding Options.

Emergency Response for Drinking Water and Wastewater Utilities, EPA

The Environmental Protection Agency (EPA) has a variety of tools and guidance to support drinking water and wastewater utility preparedness and response. Resources include:

https://www.epa.gov/waterutilityresponse

Emergency Watershed Protection (EWP) Program, USDA-NRCS

The EWP Program provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.

https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection

Federal Funding for Water and Wastewater Utilities in National Disasters, EPA

The Federal Funding for Water and Wastewater Utilities in National Disasters (Fed FUNDS website gives utilities information about federal disaster funding programs. Although Fed FUNDS focuses on major disasters, you can use the information for any incident that disrupts water or wastewater services or damages critical infrastructure.

https://www.epa.gov/fedfunds

Federal Land Transfer / Federal Land to Parks Program, USDOI-NPS

The National Park Service Identifies, assesses, and transfers available federal real property for acquisition for state and local parks and recreation, such as open space.

http://www.nps.gov/ncrc/programs/flp/index.htm

National Coastal Zone Management (CZM) Program, NOAA

The National CZM Program comprehensively addresses the nation's coastal issues through a voluntary partnership between the federal government and coastal and Great Lakes states and territories. Authorized by the Coastal Zone Management Act of 1972, the program provides the basis for protecting, restoring, and responsibly developing our nation's diverse coastal communities and resources. The CZM Program provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration.

https://coast.noaa.gov/czm/

National Earthquake Hazard Reduction Program (NEHRP), NSF

Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery.

http://www.nehrp.gov/

National Flood Insurance Program (NFIP), FEMA

The NFIP provides insurance to help reduce the socio-economic impact of floods. The NFIP insurance is made available to residents of communities that adopt and enforce minimum floodplain management requirements.

https://www.fema.gov/flood-insurance

NFIP Flood Maps, FEMA

Floods occur naturally and can happen anywhere. They may not even be near a body of water, although rivers and coastal flooding are two of the most common types. Heavy rains, poor drainage, and even nearby construction projects can put the community at risk for flood damage. Flood maps (referred to as Flood Insurance Rate Maps or "FIRM") are one tool that communities use to know which areas have the highest risk of flooding. FEMA maintains and updates data through flood maps and risk assessments.

https://www.fema.gov/flood-maps

North American Wetland Conservation (NAWC), USDOI-FWS

NAWC fund provides cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. The grant funds projects for wetlands conservation in the United States, Canada, and Mexico.

https://www.fws.gov/program/north-american-wetlands-conservation

Partners for Fish and Wildlife (PFW), USDOI-FWS

The PFW program provides financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.

https://www.fws.gov/program/partners-fish-and-wildlife

Secure Rural Schools and Community Self-Determination Act of 2000, USDA-FS

Reauthorized for the fiscal year 2022, it was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies.

https://www.fs.usda.gov/working-with-us/secure-rural-schools

USGS Natural Hazards

The USGS Natural Hazards Mission Area includes six science programs including Coastal & Marine Geology, Earthquake Hazards, Geomagnetism, Global Seismographic Network, Landslide Hazards, and Volcano Hazards. Through these programs, the USGS provides alerts and warnings of geologic hazards and interactive maps and data.

https://www.usgs.gov/mission-areas/natural-hazards

Wetlands Reserve Easements (WRE), USDA-NCRS

The WRE program assists protect and restore wetlands through easements and restoration agreements.

https://www.nrcs.usda.gov/programs-initiatives/wre-wetland-reserve-easements

National Map: Orthoimagery, DOI – USGS

Develops topographic quadrangles for use in mapping of flood and other hazards.

https://nationalmap.gov/ortho.html

Mapping Standards Support, DOI-USGS

Expertise in mapping and digital data standards to support the National Flood InsuranceProgram.

http://ncgmp.usgs.gov/standards.html

Soil Survey, USDA-NRCSSurvey, USDA-NRCS

Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigationor related purposes.

http://soils.usda.gov/survey/printed_surveys/

https://coast.noaa.gov/czm/

Community Development Block Grant Entitlement Communities Program, HUD

Provides grants to entitled cities and urban counties to develop viable communities (e.g., decenthousing, a suitable living environment, expanded economic opportunities), principally for low- and moderate-income persons.

https://www.hudexchange.info/programs/cdbg-entitlement/

Disaster Recovery Initiative, HUD

The DRI provides grants to fund gaps in available recovery assistance after disasters (including mitigation).

http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/dri

Wetlands Reserve Program, USDA-NCRS

The WR program provides financial and technical assistance to protect and restore wetlandsthrough easements and restoration agreements.

http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands

Appendix E: Douglas County NHMP Public Survey Results

Purpose

For the purpose of seeking input from the Douglas County community, the Douglas County Planning Department designed a survey to assess community concern about natural hazards, document the experiences of community members who have experienced natural hazards in Douglas County, and identify the critical and essential community assets that the community regards to be more vulnerable to natural hazards. The survey was conducted to gain a better understanding of the community's understanding and perspective regarding natural hazards risk and community vulnerability within the County.

This appendix provides a description of the survey methodology, a summary analysis of the survey findings, and the complete survey questions and data collected.

Methodology

The Douglas County Planning Department and DLCD administered the survey online using the Google Forms digital survey platform, as well as physical copies. The survey was open for responses for eight (8) weeks, from August 3, 2023, to September 30, 2023. The Steering Committee, including the DLCD, Douglas County Planning Committee, and participating cities promoted the survey through press releases, email list serves, and notifications through utilities bills.

The survey questions were developed with the goal to learn more from residents of Douglas County about their risk perceptions and concerns regarding the natural hazards to which Douglas County is susceptible. Responses will be used to help understand community concerns and vulnerabilities and identify opportunities and needs for mitigation action that can be implemented throughout the County.

The survey consisted of nine (9) questions and was distributed to residents throughout Douglas County, including urban and rural areas, incorporated and unincorporated communities. In total, the survey received 223 responses.

Analysis was conducted on each of the questions to gain insight into the results, identify key findings, and use the findings to inform and support the development and implementation of mitigation strategies. Analysis was conducted on each of the questions to gain insight into the results, identify key findings, and use the findings to inform and support the development and implementation of mitigation strategies.

Summary of the Douglas County Survey Results

Question 1 and 2 Analysis

Survey respondents were predominantly from the Central Region of Douglas County, resulting in over 50 percent of responses coming from this region alone (54.1 percent). The remaining responses were distributed more evenly throughout the other regions of the County, with the least number of responses coming from Douglas County's cascades/east region (6.3 percent). Those living in more urban areas within

city limits and urban growth boundaries accounted for the majority of respondents. Conversely, those living in rural or unincorporated areas submitted fewer responses. Because most Douglas County residents reside in the central region and are primarily located in urban areas, differences in representation between urban and rural respondents are consistent with the actual geographical distribution of the population of the community. As a result, responses from each region were proportional and representative of the actual distribution of residents throughout the County.

Even though roughly 45 percent of respondents reside outside Central Douglas County, almost 90 percent reported being familiar with the region. While the survey did not elicit information regarding the ways in which respondents are familiar with the region, it can be inferred that familiarity with the region is due in part to it being an urban center. It should be noted that in urban centers, there is often more access to essential amenities and services, as well as a greater variety of goods and resources available, as well as more access to health care, education options, and public safety resources. Therefore, rural residents may be more dependent on the resources and services available in urban centers, as they are more limited in their access within their direct community, and thus have greater familiarity with urban areas than urban residents may have with more rural communities.

Question 3 Analysis

Respondents were asked to rate their level of concern regarding the eleven (11) natural hazards that affect the respondent, their family, and property on a scale of "1" Not Concerned to "5" Very Concerned.

Based on 132 respondents, approximately 60 percent of respondents, the natural hazard that most concerns them is wildfire and how it would affect the safety of their family, property, and homes. As many of these Douglas County residents who responded likely resided in the County during the 2020 Archie Creek Wildfire, which burned over 130,000 acres of land (which constitutes about four percent of Douglas County's total area), and the recency of this wildfire is still fresh in their minds, as well as visible on the landscape. Respondents who had experienced the Archie Creek Wildfire firsthand reported having to evacuate their homes due to the proximity of the fire to their property, as well as the excessive amount of smoke in the air causing health issues.

Even though wildfires were the top natural hazard that respondents expressed concern about, respondents were also highly concerned about other natural hazards in Douglas County. Approximately one third of respondents reported being very concerned about drought, earthquakes, and windstorms, while about a quarter reported being very concerned about extreme heat and winter storms.

According to approximately half of the respondents, the only hazards that did not pose a significant concern to respondents were tsunamis and volcanoes, while about a fifth of respondents indicated they were not very concerned about landslides.

The minimal concern regarding tsunamis and volcanoes can be in part due to the fact that each of these hazards, were they to occur, would directly affect only a small portion of Douglas County. However, coastal communities, such as Reedsport, would be significantly affected by a tsunami, with much of the projected tsunami inundation zone extending into developed portions of Reedsport, as well as other developed communities along the Douglas County coast. While a tsunami is not a major concern to much of Douglas County, based on the survey results, it remains critical to address community concerns and mitigate the vulnerability of coastal communities were a tsunami to occur.

Question 4, 5, and 6 Analysis

As mentioned previously, many of these respondents have been directly affected by natural hazards, including the 2020 Archie Creek wildfire and the 2019 “Snowmageddon”. When specifically asked if they, their families, and their property had ever been directly affected by a natural disaster event in Douglas County, over sixty (60) percent of respondents indicated they had been directly affected, with many providing examples of their experience.

Many respondents cited having been adversely impacted by the 2019 winter storm, aptly coined “Snowmageddon”. Many of these respondents reported significant impacts as a result of this hazard, including losing power for days on end, and in some cases for weeks. Other respondents said that there were many downed trees that damaged buildings and infrastructure, as well as iced-over roads that prevented evacuations and emergency response efforts.

Several respondents reported having been directly affected by wildfire while living in Douglas County, with many naming the 2020 Archie Creek Wildfire as the most severe natural disaster they have experienced in Douglas County. According to respondents, they were on high alert during this wildfire, with some packing and preparing for evacuation, while others having to actively evacuate. Numerous residents expressed concern about the possibility of losing their homes and experiencing substantial property damage. Respondents from rural areas reported that they had difficulty attempting to evacuate due to blocked or closed roads due to the wildfire.

While the 2019 winter storm and 2020 Archie Creek Wildfire were the two disasters in recent years that respondents discussed the most, others mentioned how they had been affected by other disasters while living in Douglas County. Such examples included having their home flooded by the 1964 flooding of the Umpqua River, lost power due to severe windstorms, health related issues due to the recent extreme heat events and from wildfire smoke, and irrigation water shortages due to drought and extreme heat.

Question 7, 8, and 9 Analysis

Respondents were then asked to share their concerns about the vulnerability of community assets, grouped into the following categories: Industries and Economic Drivers, Infrastructure and Facilities, and Natural Resources. Although respondents expressed concern about the vulnerability of all assets included in each category, respondents expressed the most concern for the vulnerability of community assets grouped under Infrastructure and Facilities. Each category type is discussed in further detail below.

When asked about which Industries and Economic Drivers are most vulnerable to natural hazards in Douglas County, almost half of respondents indicated that Forestry and Timber Products were the most vulnerable. They also expressed concern about the effects of natural hazards on agriculture and small businesses. According to the Oregon Employment Department (see Chapter 2, Community Profile), these industries are significant economic drivers in Douglas County, and they constitute a significant portion of the employment base within the County. In the event these industries were adversely affected by a natural hazard, whereby their operations would slow down or cease, it could have a considerable impact on residents' livelihoods and financial security. Due to this, it is critical that these industries and community assets continue to operate following a disaster, which can be better achieved by implementing appropriate mitigation strategies and actions.

Next, respondents expressed significant concern regarding the vulnerability of various types of community Infrastructure and Facilities. More than half of respondents reported that they believed that the Infrastructure and Facilities most vulnerable to natural hazards in Douglas County are Utilities, such as power lines, gas lines, sewer, and drinking water. Furthermore, respondents expressed concern about the vulnerability of Communication Facilities and Energy Facilities. These assets were among the most severely disrupted during the 2019 winter storm, " Snowmageddon ", which caused many Douglas County residents to lose power and communication services for as long as a few weeks. During this period, the residents experienced difficulty navigating daily life in the absence of these utilities and services, possibly contributing to their significant concerns regarding these assets' vulnerability and ability to continue operating during and after natural disasters.

Lastly, over half of respondents expressed their concern that forest lands were the most vulnerable Natural Resources asset in Douglas County to natural hazards. Additionally, they indicated that they were very concerned about wildlife habitats, farmlands, and waterways. Similarly, to the Industries and Economic Drivers assets, many of these natural resource assets contribute to the employment base in Douglas County, as well as to the economy through tourism and industrial operations, and support the overall health and well-being of the natural environment. Keeping these natural resources healthy and functional prior to and after natural disasters is beneficial to the economy, the health of the environment, as well as the local workforce.

Each of these critical facilities, services, and infrastructure are essential to enabling the continuous operation of government and business functions, and are essential to human health and safety, community economic security, and environmental health. Ensuring these community assets remain operable and functioning following a natural hazard event is crucial. If they are disrupted or damaged, restoring their operational status must be prioritized. As community members have identified which of these critical community assets, they believe are most vulnerable to natural hazards, it is essential that these assets are prioritized when it comes to the implementation of mitigation measures that will reduce their vulnerability and ensure that they are quickly stabilized and functional after disruption.

Concluding Analysis

This survey has provided insight into the concerns and perspectives of Douglas County residents regarding natural hazards, as well as captured their experiences and perspectives of these natural hazards while residing in Douglas County, and their perceptions of the vulnerability of community assets. This information can support the development and implementation of mitigation actions that address these concerns, as well as reduce community vulnerability and risk.

Considering the significant concerns expressed by respondents and based on the results of the risk and hazard assessment of the risks that wildfires, winter storms, flooding, and earthquakes pose to the safety of their families and properties, priority should be placed on implementing mitigation measures that minimize the risk of these particular natural hazards. Additionally, implementing mitigation actions that minimize the vulnerability of community assets that the community most rely upon for economic drivers and daily life, such as utilities, forest land and industries, and wildland, are essential.

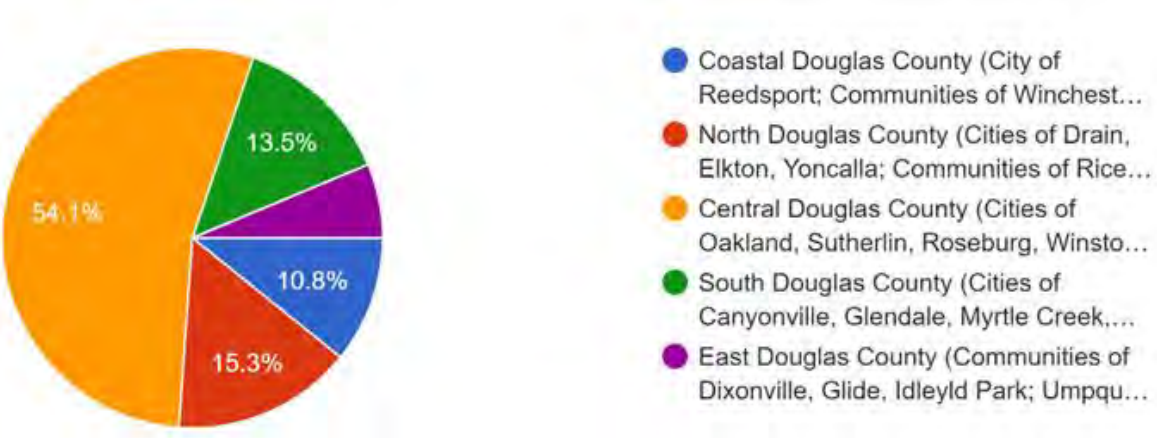
It is important to note that recency and exposure bias could play a role in how the public perceive risk and their level of concern. Recent natural disaster events, such as the 2019 winter storm and the 2020 Archie Creek Wildfire, as well as the extensive media attention and education available to the public associated with

certain hazards, such as earthquakes and wildfires, have a significant influence on an individual's perception of the risk associated with certain hazards. While the most recent science and data, as well as vulnerability and probability analyses support these concerns to some extent, these memory biases can still potentially cause people to overestimate or underestimate the actual risk that a hazard poses to a community.

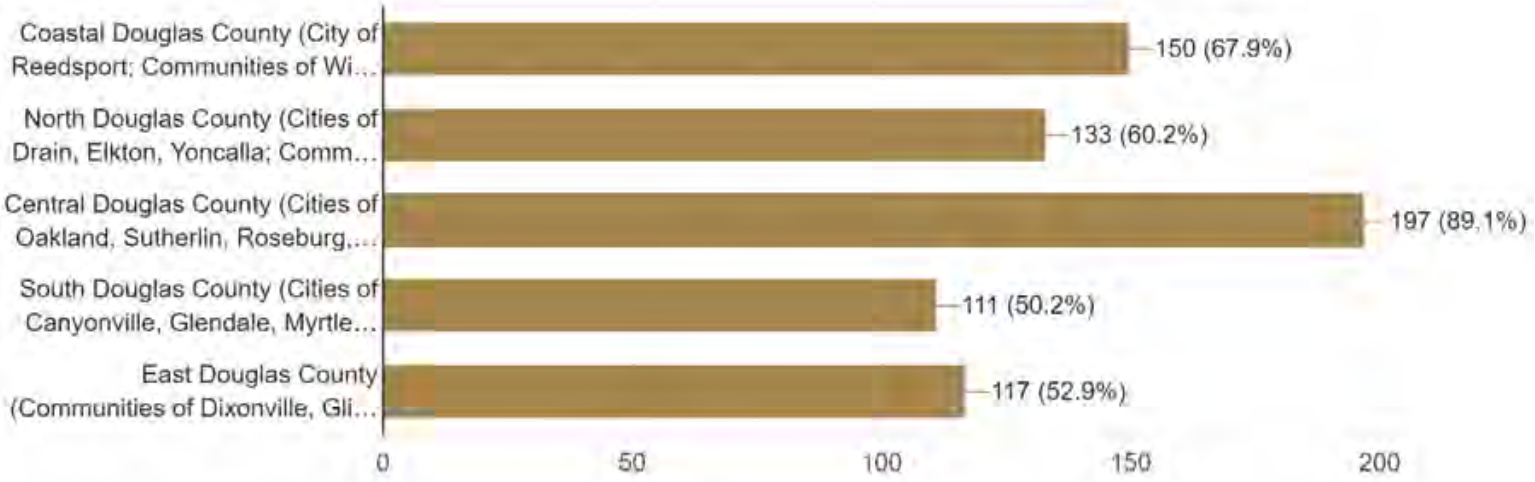
As an example, despite the fact that a tsunami may only directly affect coastal communities, it can still have a significant impact on vital community functions, such as industry operations, the flow of goods and services, and tourism activities. However, because tsunami education and awareness are primarily limited to the coastal region, this limited exposure may contribute to a decreased level of community concern and perception of risk. Therefore, it is important to ensure that education grounded in scientific research and data accurately reflects the actual risks these hazards pose to the community as a whole, and that this education reaches beyond a localized area. Mitigation strategies can be utilized to fill in this knowledge and awareness gap, thereby providing the community with accurate and scientifically based information regarding risks and hazard related concerns in relation to how each natural hazard will affect the community as a whole. Moreover, this can be accomplished while educating individuals on how they can minimize their own risk to the natural hazards that directly affect them.

Survey

1. Which area of Douglas County do you Reside?
    - Coastal Douglas County (City of Reedsport; Communities of Winchester Bay, Scottsburg, Gardiner)
    - North Douglas County (Cities of Drain, Elkton, Yoncalla; Communities of Rice Hill, Curtin)
    - Central Douglas County (Cities of Oakland, Sutherlin, Roseburg, Winston; Communities of Green, Winchester)
    - South Douglas County (Cities of Canyonville, Glendale, Myrtle Creek, Riddle; Communities of Tri-Cities)
    - East Douglas County (Communities of Dixonville, Glide, Idleyld Park; Umpqua National Forest, Diamond Lake area)

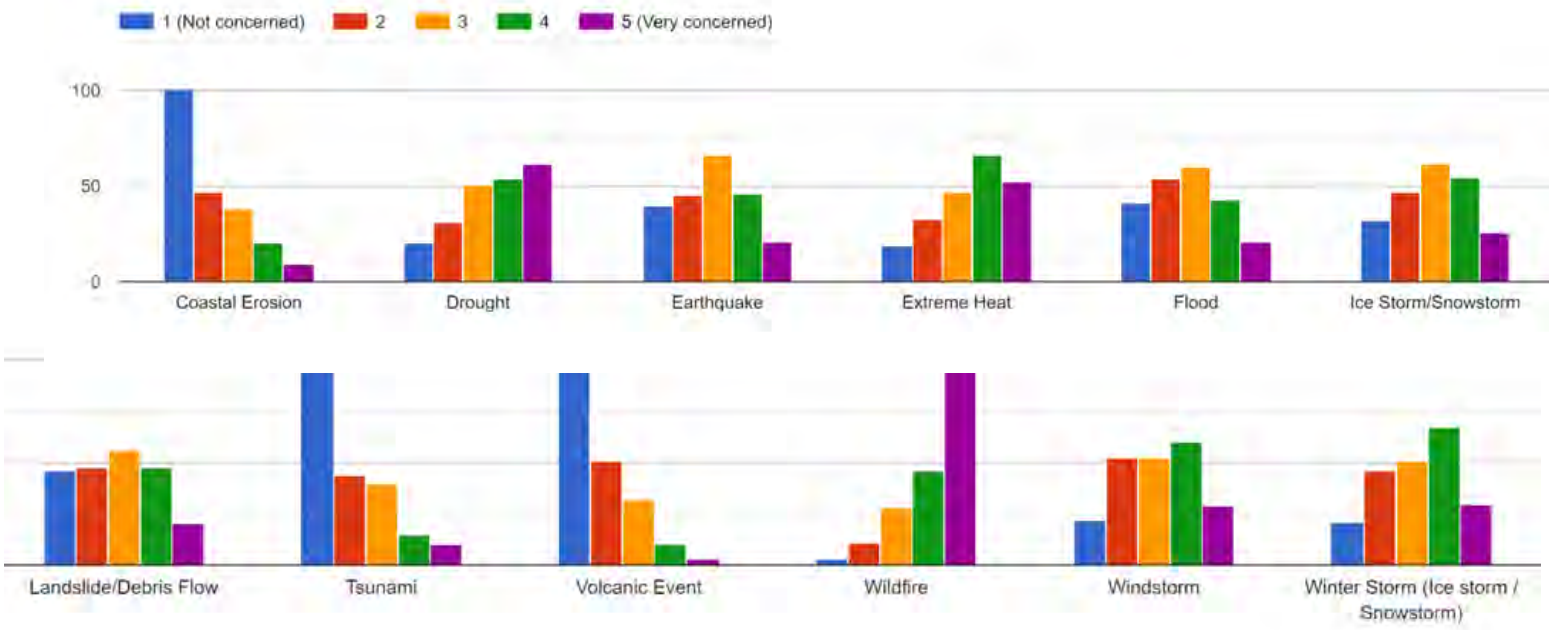


2. Which areas of Douglas County are you FAMILIAR? (Select all that apply)
    - Coastal Douglas County (City of Reedsport; Communities of Winchester Bay, Scottsburg, Gardiner)
    - North Douglas County (Cities of Drain, Elkton, Yoncalla; Communities of Rice Hill, Curtin)
    - Central Douglas County (Cities of Oakland, Sutherlin, Roseburg, Winston; Communities of Green, Winchester)
    - South Douglas County (Cities of Canyonville, Glendale, Myrtle Creek, Riddle; Communities of Tri-Cities)
    - East Douglas County (Communities of Dixonville, Glide, Idleyld Park; Umpqua National Forest, Diamond Lake area)

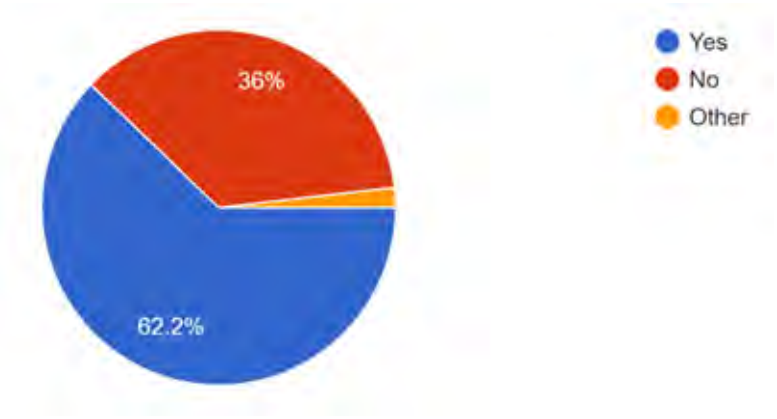


3. Please indicate your LEVEL OF CONCERN regarding the following natural hazards affecting you, your family, and/or your property?

Please assign a number to your concern, with "1" meaning "Not concerned," and "5" meaning "Very concerned."



4. Have you, your family, or your property ever been DIRECTLY AFFECTED by a natural hazard event in Douglas County?
    - **Yes**
    - **No**
    - **Other**

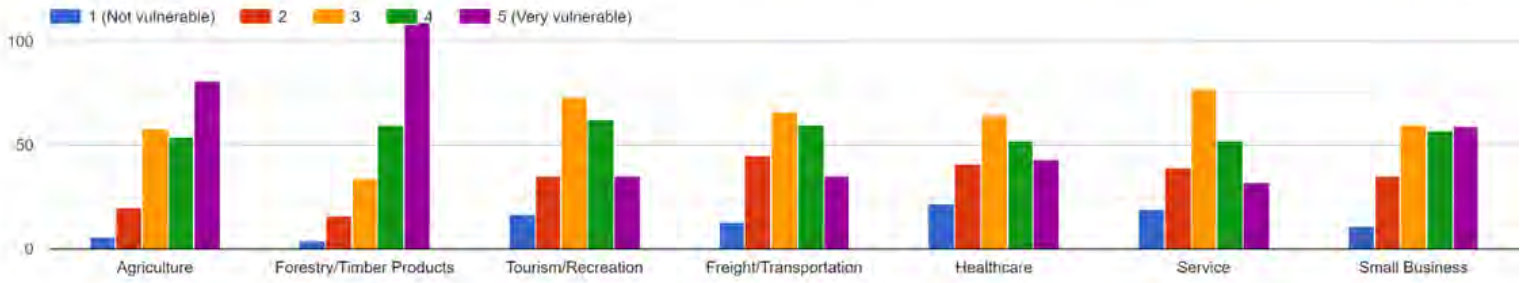


5. If yes, please describe HOW you, your family, or your property were affected by the natural hazard event.

6. Please describe the WORST NATURAL HAZARD EVENT that you remember in Douglas County.

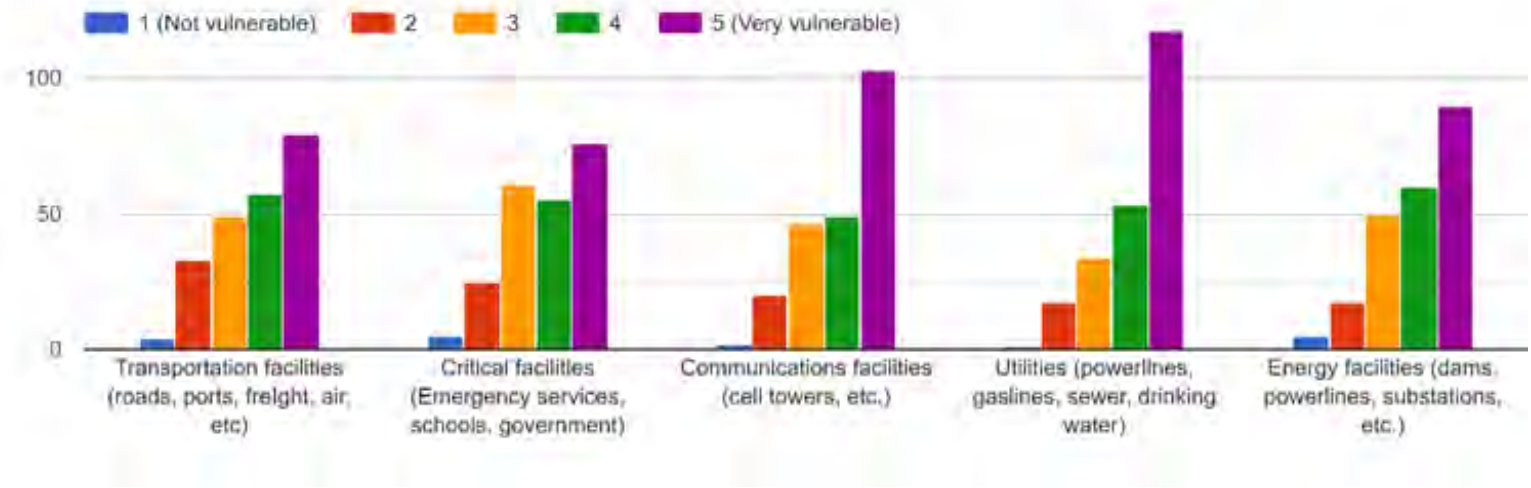
7. How vulnerable do you feel the following INDUSTRIES/ECONOMIC DRIVERS are to natural **hazard events in Douglas County?**

Please assign a number to your assessment, with "1" meaning "Not vulnerable," and "5" meaning "Very vulnerable."



8. How vulnerable do you feel the following INFRASTRUCTURE/FACILITIES are to natural hazard events in Douglas County?

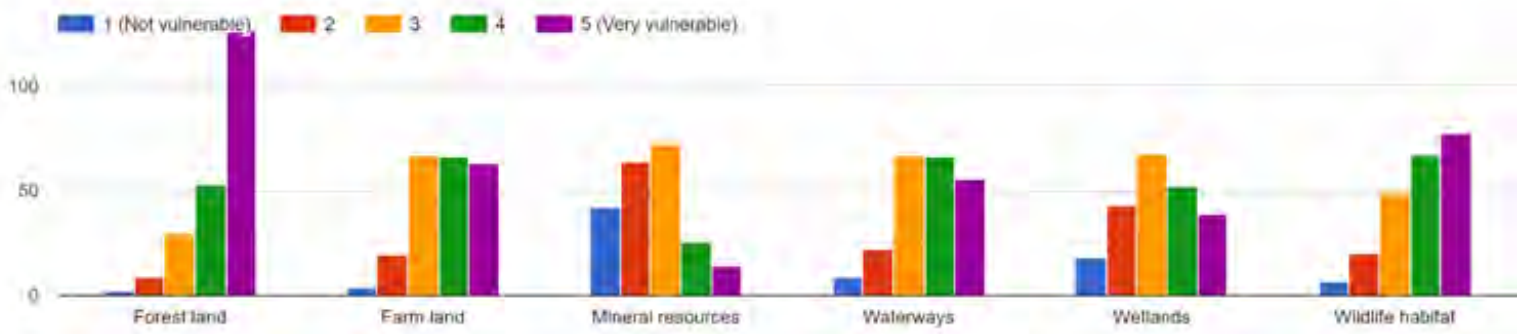
Please assign a number to your assessment, with "1" meaning "Not vulnerable," and "5" meaning



"Very vulnerable."

9. How vulnerable do you feel the following NATURAL RESOURCES are to natural hazard events in Douglas County?

Please assign a number to your assessment, with "1" meaning "Not vulnerable," and "5" meaning "Very vulnerable."


1 (Not vulnerable)
2
3
4
5 (Very vulnerable)
100
50
0
Forest land
Farm land
Mineral resources
Waterways
Wetlands
Wildlife habitat