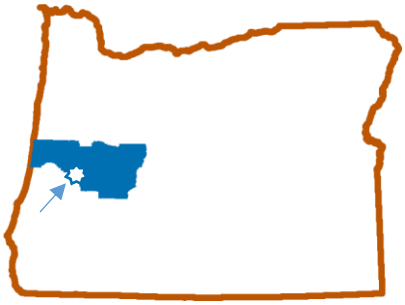
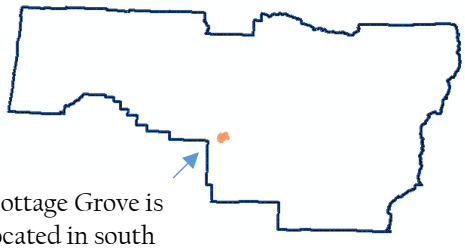




City of Cottage Grove

NATURAL HAZARDS MITIGATION PLAN





Cottage Grove is
located in south
Lane County, OR

FEMA

Effective Month XX, 2023 through Month XX, 2028

The *2023 Cottage Grove Home Natural Hazards Mitigation Plan* (NHMP) is designed to guide the development of resilient infrastructure and city operations in the community of Cottage Grove, in partnership with Lane County, South Lane Fire and Rescue, local organizations, and community members. The benefit of an NHMP that is compliant with the Stafford Act and regulations contained in 44 CFR 201 that require jurisdictions maintain an approved NHMP, is that the city will be qualified to receive federal funds for disaster mitigation grants. These plans are updated every five years and the 2023 Cottage Grove NHMP is the fourth update. The Cottage Grove Hazard Mitigation Advisory Council (HMAC) meets annually to track plan progress and supports an update of the plan every five years.

Comments, suggestions, and corrections are encouraged from all interested parties.

The City of Cottage Grove provides online access to maps that include floodplain maps (City Maps | Cottage Grove Oregon). Additionally, the State Department of Geology and Mineral Industries (DOGAMI) provides the online tool HAZVU, which is available to the general public: Oregon HazVu: Statewide Geohazards Viewer. Detailed mapping resources can be found at Lane County GIS, located at: Home - Lane County.

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***Mission**: To promote sound public policy designed to protect citizens, critical facilities, infrastructure, and property from natural hazards. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the city towards a safer, more sustainable community.*

The City of Cottage Grove developed this Natural Hazards Mitigation Plan (NHMP) through a partnership funded by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation Grant Program (PDM). In 2019, the Department of Land Conservation and Development (DLCD) applied for and received the grant from FEMA through the Oregon Department of Emergency Management (OEM) to assist Cottage Grove. This *2023 Cottage Grove NHMP* is the result of a substantial collaborative effort between DLCD and Cottage Grove, with guidance and public input by the Cottage Grove Hazard Mitigation Advisory Committee (HMAC). The *2023 Cottage Grove NHMP* is structured to address the requirements contained in 44 CFR 201.6 with an emphasis on identifying and describing the unique attributes of the City of Cottage Grove.

Cover photos: (clockwise from top left) Feb. 2019 road closure (E. Mongan); April 2019 Riverstone Mobile Home Park evacuation (Register-Guard); Feb. 2019 snow event building collapse (E. Mongan); April 2019 Row River flooding (South Lane Fire & Rescue); Feb. 2019 snow event branch on park building (E. Mongan); Feb. 2019 Dorena Dam impoundment overtopped by flood waters (C. Johnson).

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Section 1: Introduction

The City of Cottage Grove, Oregon is subject to various hazards that pose threats to public safety and property. Developing a strategy over time best achieves the goal of reducing the impact of hazards that directly and indirectly affect all community members. This Hazard Mitigation plan is a locally specific guide for risk assessment and mitigation strategies and is a necessary component in assessing and mitigating the hazards to which the City of Cottage Grove and its residents are vulnerable.

The geographic boundaries represented by this plan are the areas within the City limits and Urban Growth Boundary of Cottage Grove, hereafter referred to as the 'planning area' or the City.

An approved NHMP is a basic requirement to be eligible for FEMA mitigation project funds per Section 322 of the Stafford Act, 42 U.S.C. 5165. Detailed requirements are outlined in the Code of Federal Regulations (CFR) Title 44, Part 201.6, and Part 206.434. The Disaster Mitigation Act (DMA) of 2000 also established a new requirement for local mitigation plans and authorized up to 7 % of HMGP funds available to a State for development of State, local, and Indian Tribal mitigation plans.

A Natural Hazard Mitigation Plan is distinguished from an emergency operation plan to the extent that it outlines the proactive implementation of mitigation projects and response activities prior to a hazard or disaster occurrence. Mitigation projects (or "Action Items") can be short- or long-term activities that reduce a community's vulnerability to hazard impact through various means including avoidance, protection, and preparedness.

What is Natural Hazard Mitigation?

Natural hazard mitigation is defined as permanent reduction or alleviation of loss of life, property and injuries resulting from natural hazards on the built environment 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 Spanish speaking residents, or the elderly. Mitigation is the responsibility of individuals, private businesses and industries, state and local governments, and the federal government.

Identified as one of the four stages of Emergency Management (Planning and Preparation, Mitigation, Response and Recovery), engaging in mitigation activities provides jurisdictions with a number of benefits, including: reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication with the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

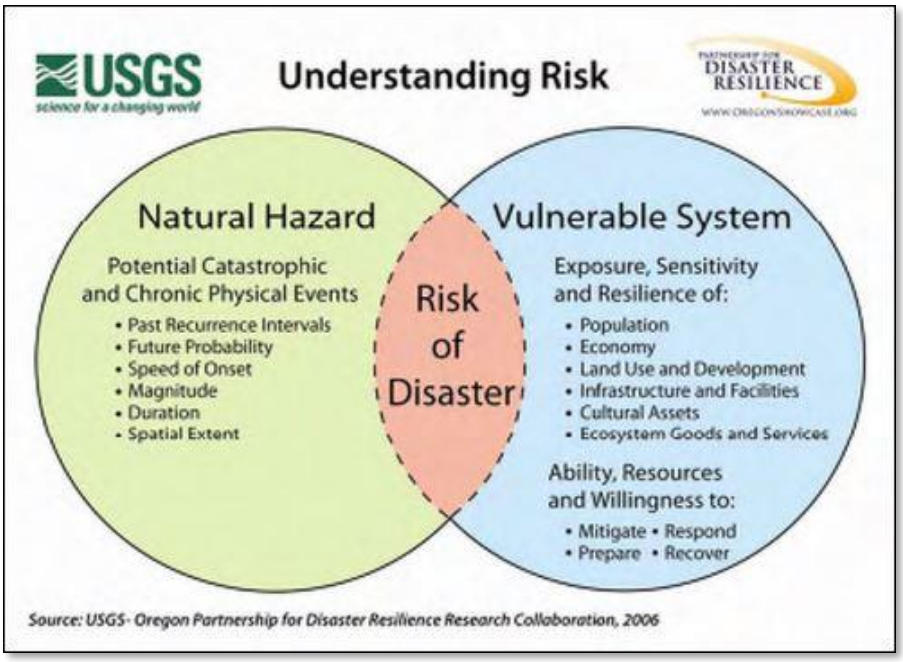
Why Develop a Mitigation Plan?

Cottage Grove developed this Natural Hazard Mitigation Plan in an effort to reduce future loss of life and property resulting from natural disasters. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with deliberate awareness, 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 disasters.

A natural hazard mitigation plan can assist the community in understanding what puts the community at risk. When a community can identify and understand the relationship between the natural hazards it faces, its vulnerable systems, and its existing capabilities, it becomes better equipped to identify and implement actions aimed at reducing the community's overall risk of disasters.

Figure 1: Understanding Hazard Vulnerability and Risk



This plan focuses on the primary natural hazards that could affect Cottage Grove and the Southern Willamette Valley, which include earthquakes, floods, landslides, severe weather, volcanoes, drought, and wildland-urban interface fires. The dramatic increase in the costs associated with natural disasters over past decades has fostered interest in identifying and implementing effective means of reducing vulnerability. This Natural Hazard Mitigation Plan Update is intended to assist Cottage Grove in reducing its risks from natural hazards by identifying resources, information, and strategies for risk reduction.

The plan is strategic and non-regulatory in nature, meaning that it does not set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other municipal plans and programs including the Comprehensive Land Use Plan, Emergency Operations Plan, and Capital Improvement Plan as well as the State of Oregon Natural Hazards Mitigation Plan and Lane County Natural Hazard Mitigation Plan.

Authorities:

Federal Authorities

The Cottage Grove Natural Hazard Mitigation Plan was developed in accordance with the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) which is the primary authority for providing federal disaster recovery and hazard mitigation financial assistance to states and local governments. The Stafford Act was amended in 1996, 2000 (Disaster Mitigation Act), 2007, and 2013. The basic provisions of these acts are implemented as federal rules in CFR Title 44. The program requirements related to hazard mitigation are included in 44 CFR Parts 9, 10, 13, 14, 78, 201 and 206.

Federal administrative authority for hazard mitigation planning in the northwestern United States resides with FEMA's Region X (10) office in Bothell, Washington. This plan was reviewed by Region X staff and found to meet or exceed all requirements outlined in the FEMA publication *Local Mitigation Planning Policy Guide,* FP 206-21-0002*,* effective April 19, 2023.

State Authorities

This document was developed in accordance with ORS Chapter 401 — Emergency Management and Services and subordinate administrative rules. State administrative authority for hazard mitigation planning resides with the Oregon Department of Emergency Management, Mitigation, and Recovery Services based in Salem.

Local Authorities

The City of Cottage Grove Community Development Department is the primary overseer of plan development, implementation, and maintenance. The Community Development Department is responsible for monitoring implementation over time and tracking the status of identified hazard mitigation actions.

Policy Framework for Natural Hazard Mitigation in Oregon

Planning for natural hazards is an integral element of Oregon's Statewide Land Use Planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The 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 hazard areas. Goal 7, along with other Statewide Land Use Planning Goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this plan aligns with the goals of the City of Cottage Grove Comprehensive Plan, and helps Cottage Grove meet the requirements of statewide planning Goal 7.

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

and Mineral Industries (DOGAMI), Oregon Department of Transportation (ODOT), and the Department of Land Conservation and Development (DLCD).

The Disaster Mitigation Act of 2000 (DMA 2000) is a key piece of federal legislation addressing mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts. It reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program 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 communities must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds and Pre-Disaster Mitigation (PDM) grants for projects. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual and their capabilities.

Local Adoption

> ***44 CFR requirement 201.6(c)(5):***
> *The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*

Upon provisional approval of this Plan by the State of Oregon Department of Emergency Management (OEM) and the Federal Emergency Management Agency, the Cottage Grove City Council will formally adopt the document in public session. Copies of local adoption instruments are included in this document in Appendix H.

Planning Process

> ***44 CFR Requirement §201.6(b):*** *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*
>
> *(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
>
> *(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process;*
>
> *(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*
> ***Requirement §201.6(c) (1):*** *[The plan* ***shall*** *document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Update of the Natural Hazard Mitigation Plan for the City of Cottage Grove marks the completion of the fourth full planning cycle undertaken by the city. During the first planning cycle 2005-2010, numerous mitigation projects were identified, many of which were either implemented, or identified for future action. The second adopted plan, in 2012, and the third update completed in 2017 each showed continued progress on identified goals. During the current plan update several more mitigation strategies were accomplished and this update builds upon the current plan format while consolidating mitigation strategy actions to support future updates.

The process to update the Plan followed a four-step outline and guidance found in the FEMA publication, *Local Mitigation Planning Handbook,* May 2023. These steps are as follows:

1) Organize resources and engage the planning team.
2) Assess risks.
3) Develop the mitigation plan.
4) Implement the plan and monitor progress.

The first step, organizing resources and engaging the planning team , was addressed by assembling the Hazard Mitigation Advisory Committee (HMAC) as coordinated by the Cottage Grove Community Development Department. In keeping with the goal of including multiple stakeholders, Lane County Emergency Management, South Lane County School District, South Lane County Fire and Rescue District, Cottage Grove Museum, Coast Fork Willamette Watershed Council, PeaceHealth Community Medical Center, real estate and insurance company representatives, power company representatives, private timber company representatives, Oregon Department of Forestry and Umpqua National Forest representatives were invited to participate in the planning process through emails and phone calls along with staff and city councilors from the City of Cottage Grove. The final steering committee included some of those invited. The 2022-23 Advisory Committee included the Cottage Grove Public Works Director, Senior Planner, Assistant Planner, Planning Department Administrative Assistant, Assistant to the City Manager, Building Official, Water Production Superintendent, Wastewater Superintendent, City Councilors, City Engineer, South Lane County Fire and Rescue Division Chief, Coordinator of Cottage Grove Museum, South Lane County School District Facility Supervisor, Lane County Emergency Manager, and the Director of the Coast Fork Willamette Watershed Council.

The five meetings of the HMAC between January, 2022 and April 2023 were facilitated by the project manager from the Department of Land Conservation and Development to lead the HMAC through the process of meaningful public engagement in risk assessment while utilizing the best available science to make risk assessments for geologic and wildfire hazards.

The HMAC received two reports that influenced their risk assessment. The Multi-Hazard Risk Report for the City of Cottage Grove, Oregon, Open-File Report O-23-03, authored by Matt C. Williams and Nancy C. Calhoun, Department of Geology and Mineral Industries in 2023 estimates potential losses that involves estimating the damage, injuries, and financial losses likely to be sustained in a geographic area over a given period of time. It is provided as Appendix C. The second report is Future Climate Projections Lane County, Oregon, authored by Meghan Dalton, Erica Fleishman, and Dominiques Bachelet of Oregon Climate Change Research Institute in July 2022 included as Appendix D. The report evaluates regional climate models and provides estimations on the level of risk of different hazards using the projected climate change scenarios. This work provides a “modifier” to existing hazard

projections. Incorporating the risks of climate change is a FEMA requirement and advisable for all local communities.

Appendix G to this NHMP contains agendas and minutes from those meetings. Each of these meetings was publicly noticed and periodically attended by members of the public. In addition, the HMAC developed and launched a survey that provided an opportunity for the public to provide input during the drafting stage of the plan. A survey and the open-ended responses are also included in Appendix F.

Vulnerable and underserved populations were offered the opportunity to participate in the plan development through the work of a city councilor who solicited input through flyers available at the Food Pantry. The South Lane Fire and Rescue District was represented by an active participant in the Steering Committee. The district serves the entire county including all vulnerable individuals.

The second step, assessing risk, was conducted by reviewing the prior risk assessments from the 2005, 2012 and 2016 NHMP Updates. The HMAC considered whether any new hazards have begun to cause people or assets to be at risk. The group was presented with two technical reports to inform their risk assessment for the 2022-23 City of Cottage Grove NHMP update as mentioned above. Existing technical reports provided by Lane County Emergency Management, studies and planning documents and input from members of the Advisory Committee were also utilized in the 2022-23 update. The project manager and conveners also review of Lane County's update to its Hazard Mitigation Action Plan (HMAP) and the City of Eugene's Natural Hazard Mitigation Plan Update.

The third step, developing the mitigation plan, includes input from the HMAC and data sources referred to in Step 2. Mitigation project development and prioritization for the Plan emphasized a review of costs vs. benefits and the social, technical, administrative, political, legal, economic, and environmental considerations of mitigation related projects. Plan update work involved preparing a public review draft and providing a public comment period to solicit input from the public and interested parties. Open houses were held at City Hall and the Library; the plan was made available on the city's website and comments were solicited via social media and print media. Presentations were made at various community groups and local events including an Emergency Preparedness Fair. A survey was developed and launched via the city's website. Comments and recommendations from these sources were incorporated into the final version of the Natural Hazard Mitigation Plan submitted to the State and FEMA and ultimately adopted by the City.

The fourth step, plan implementation and monitoring, will occur on an ongoing and annual basis prior to and following State and FEMA approval. Adoption of the approved plan is the first step toward implementing the plan. Feasibility studies and scoping of mitigation projects are secondary steps, followed by grant writing coordinated through OEM to secure funding and ultimately the implementation of the projects and other mitigation strategies. Other mitigation projects and activities that do not require outside funding will be enacted on an ongoing basis. Monitoring will also occur on an ongoing basis as action items are implemented, following major disaster events, and during annual meetings of the Hazard Mitigation Advisory Committee.

Adjustments to implementation and review processes are made over time. Reviews are conducted on a project-by-project basis which proved to generate more enthusiasm, improved results, and ultimately engaged more people in the process. Additionally, it was recognized that unforeseen incidents and situations will inevitably emerge; therefore, the NHMP is purposely designed to be flexible enough to address new projects and evolving priorities relevant to hazard mitigation.

Section 2: Community Profile

Cottage Grove, known as the Covered Bridge Capital of Oregon, is located approximately 20 miles south of Eugene. The city of Cottage Grove is located near the southern border of Lane County, which is located in the southern portion of the Willamette Valley. The city is bisected by Interstate 5 (I-5), with its downtown situated west of the interstate. Cottage Grove is a friendly, recreation-and-family-oriented town. The city's tree-covered hillsides, river greenways, water courses, natural vegetation, and colorful heritage add variety and give the urban area its distinctive form and livability.

History

In 1853, early Cottage Grove settlers built the first sawmill in the area that is now Dorena Lake. Four years later, Harvey Hazelton built the region's first commercial mill on Silk Creek. The post office, originally located near Creswell, kept moving south until it was established in what became known as Cottage Grove. The Cottage Grove Post Office was so named because it originally operated near Creswell out of a cottage in a grove of trees. The City of Cottage Grove, named after the post office, officially incorporated in 1887.

Early settlers farmed in and around the Cottage Grove area, raising sheep and cattle and growing fruit, vegetables, and grasses. The population of the area began to increase significantly after 1858 when gold was discovered 30 miles east of the present city. While the Civil War briefly put extraction activity on hold, this discovery lured thousands of prospectors to the area. In 1871, the Oregon and California Railroad reached Cottage Grove and expanded the city's access to markets. Originally, the town was on the west side of the river. When the railroad came, it spurred growth down Main Street toward the tracks and the stretch between the river and the railroad tracks became the downtown core. By the end of the nineteenth century, Cottage Grove had begun developing its timber-based economy and its population grew quickly.

Historically, the timber industry supported families in and around the city. Through the years, Cottage Grove diversified and expanded its lumber and wood product industries. Since the mid 1980's, this sector has been in decline. Agricultural activities currently play a minor role in the economy. Recreation and tourism have recently become more of a focus, partly due to the presence of six historic covered bridges in the area. There are superb recreational opportunities available at Dorena and Cottage Grove Lakes.

Geography and Climate

Cottage Grove is located in the southern Willamette Valley, at the confluence of the Coast Fork Willamette River and the Row River, between the Coast Range and the Cascade Mountains. As the confluence of the Row River and Mosby Creek (a large, undammed tributary) is just to the east outside of city limits, the low elevation areas of the City features soils ranging from high value agricultural lands with silty loam and sand deposits to large cobble depositions that were historically mined along these tributaries and throughout the Interstate 5 corridor, resulting in gravel ponds that now serve as flood storage, fishing ponds, and Western pond turtle habitat. The hillsides often have a shallow depth to bedrock which is sometimes reflected in the presence of Oregon white oaks, instead of conifers.

The City lies wholly within the Coast Fork Willamette Watershed Basin. In addition to the Coast Fork and Row Rivers, and Mosby Creek, there are numerous smaller streams in the area, including Bennett and

Silk creeks which flow into the City from the west. Silk Creek has a wide valley that features a range of prairies, wetlands, and ash trees. Bennett Creek has more of a steep, forested condition surrounded by conifer forests with cedars, maple, and alder along the drainages.

To the south is a ridge known as the Calapooya Divide which connects these ranges and provides a wildlife corridor between the coast and the Cascades. It also marks the start of the Umpqua basin to the south. The divide also marks a climatic change as the hotter and drier conditions of southern Oregon begin there.

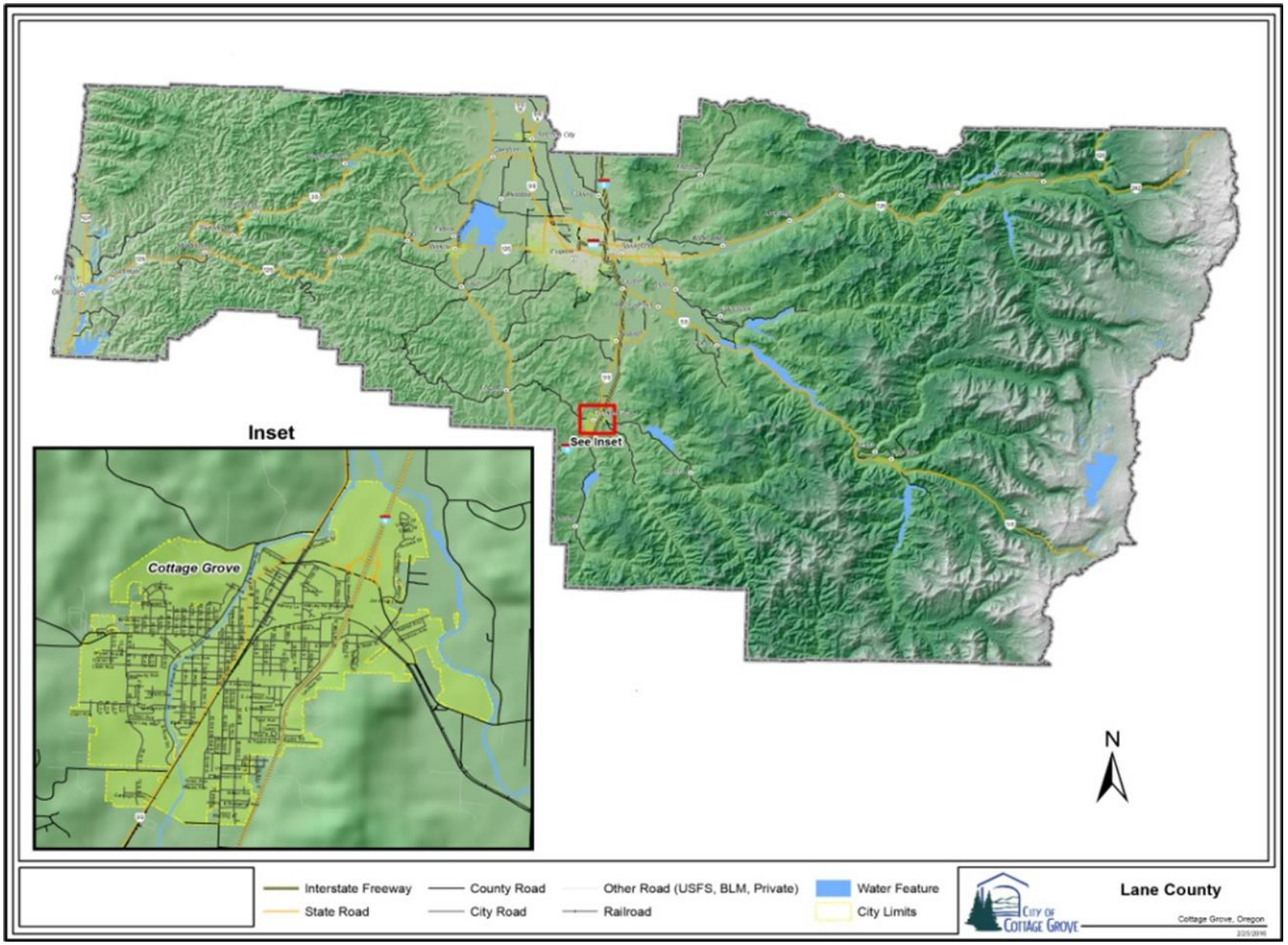
Upstream of city limits to the east, there are two large flood control reservoirs operated by the U.S. Army Corps of Engineers. These earthen structures with cement dam discharge areas were built in the late 1940's and created Dorena and Cottage Grove Lakes. The Cottage Grove and Dorena dams are part of a system that controls 28% of the water flow in the larger Willamette Watershed.

The defining feature of the Willamette Valley is the remarkably broad and level floodplain of the Willamette River. The Willamette Valley begins just south of the City of Cottage Grove and runs northward approximately 110 miles to the urbanized areas and foothills south of Portland. Along its course the valley averages 15-30 miles in width.

Lane County spans a wide range of climatic and geologic regions from the Pacific coast to the high Cascades. This diversity results in considerable variation in precipitation. The average annual precipitation ranges from less than 40 inches in the Willamette Valley to over 100 inches in the Coast Range and along the west slope of the Cascades. Snowmelt from the Central Cascades provides a continuous water source throughout the year and can contribute significantly to flooding. The city of Cottage Grove features cool, wet winters and warm, dry summers. Average annual precipitation is less than 40 inches. The climate of Cottage Grove is moderate. The average high temperature in January is 46 °F while the average low is 34 °F . In August the average high is about 82 °F with an average low of 51 °F . Each year the area receives about 38 inches of precipitation.

Extreme temperatures in Cottage Grove are rare, historically. Days with a maximum temperature above 90°F degrees occur only 5-15 times per year on average, and days with below zero temperatures occur only about once every 25 years. Although snow falls every few years on the South Willamette Valley floor, typical depth is less than 6 inches, though it is more frequent and deeper at higher elevations in the foothills. Ice storms occasionally occur, and high winds typically occur several times per year in association with major weather systems.

Figure 2. Map of Lane County & City of Cottage Grove



Population and Demographics

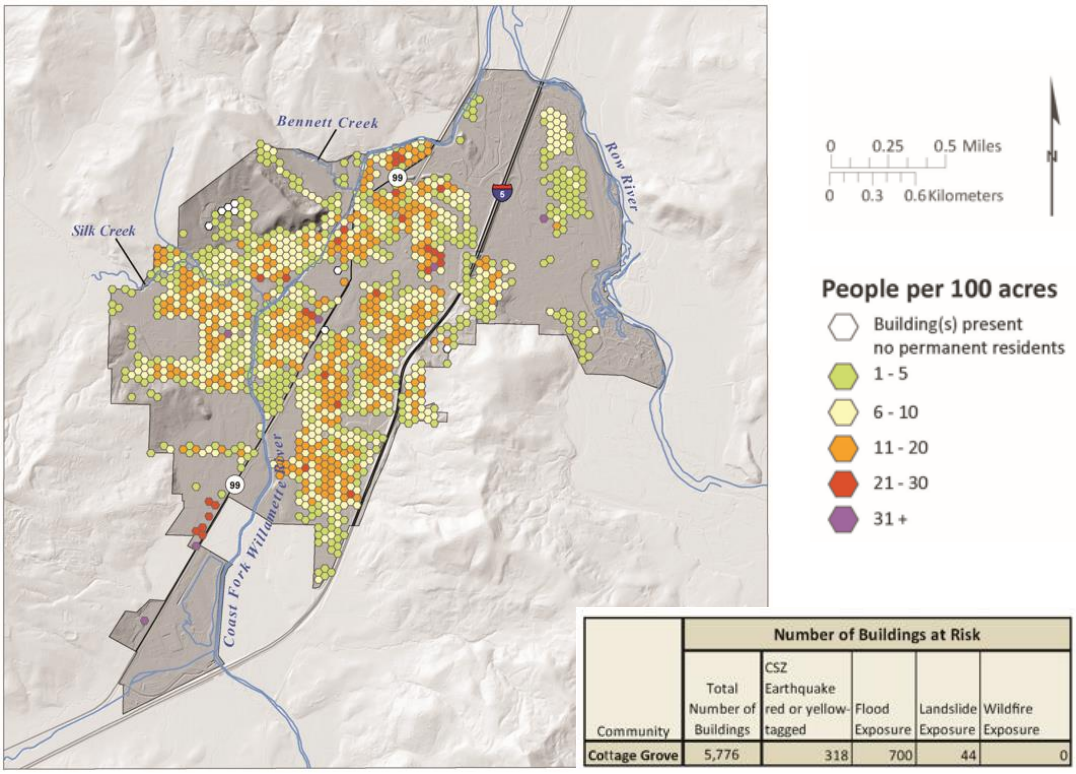
Cottage Grove was home to approximately 10,729 people as of July 1, 2022. While relative to all of Lane County (383,958) this is only 2.8% of the population[1], Cottage Grove is larger than 80% of the communities in Oregon (#49 of 242 counted by PRC in 2021) and serves as a community hub for a large area of both south Lane and north Douglas Counties. The average annual growth rate between 2000 and 2010 was 1.3%, but this is projected to drop to 0.3% from the period 2020-2045, and 0.2% until 2070.

Figure 3. Forecast Population of Cottage Grove

	Population	Share of County
Cottage Grove UGB		
2020	10,645	2.8%
2045	11,604	2.6%
2070	12,278	2.5%

Source: Portland State University Population Research Center, 2021

The Oregon Department of Geology and Mineral Industries (DOGAMI) provided maps of population density and building type in the multi-hazard risk assessment[2] as excerpted in the images below.

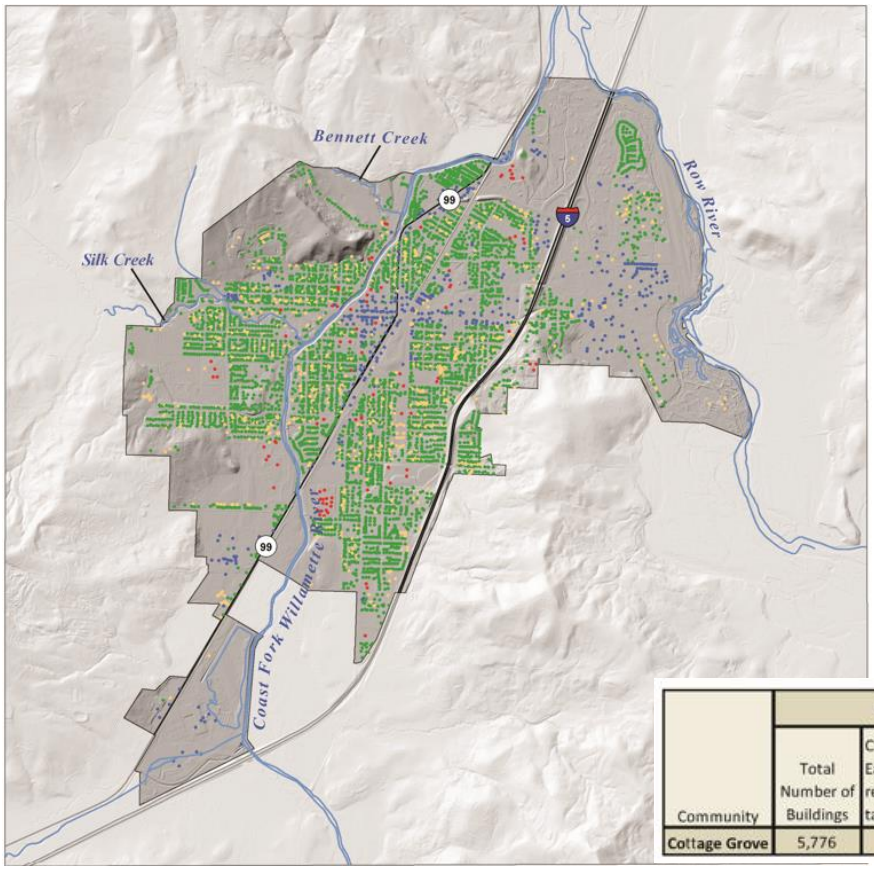


Community	Number of Buildings at Risk: Total Number of Buildings	CSZ Earthquake red or yellow-tagged	Flood Exposure	Landslide Exposure	Wildfire Exposure
Cottage Grove	5,776	318	700	44	0

Source: DOGAMI, 2023

[1] Portland State University, Population Research Center, 2022 Annual Population Estimate Report, April 2023; Population Estimate Reports | Portland State University (pdx.edu)

[2] DOGAMI o-23-03 link



Community	Number of Buildings at Risk				
	Total Number of Buildings	CSZ Earthquake red or yellow-tagged	Flood Exposure	Landslide Exposure	Wildfire Exposure
Cottage Grove	5,776	318	700	44	0

Source: DOGAMI, 2023

The United States Census data used in this community profile of the City of Cottage Grove is the 5-year American Community Survey 2016-2021. This census data describes the population of Cottage Grove as being 51.7% male and 48.3% female. The race and Hispanic origin percentages for the city of Cottage Grove are: 87% white alone, 1.3% Black or African American alone, 0.7% American Indian and Alaska Native alone, 1.2% Asian alone, 0.0% Native Hawaiian or Pacific Islander, 7.4% two or more races, 9.7% Hispanic or Latino, and 80.6% white alone, not Hispanic or Latino.

Disaster impacts in terms of loss and the ability to recover quickly to pre-disaster levels can vary between population groups. Historically 80% of disaster burdens fall onto the shoulders of the public, and disproportionately affects certain populations more than others. The elderly, the very young, the disabled, minorities, non-English-speakers, and low-income persons are often impacted to a greater degree than others. These vulnerable populations will need more assistance during and after a disaster. In Cottage Grove based on the US American Community Survey 5-year estimates for 2021, the most recent year that this data is available for Cottage Grove:

- 4.7% are children under the age of 5.
- 15.6% are elders over the age of 65.
- 16.1% of the civilian non-institutionalized adult population aged 65 or over live with a disability.
- 21.3% of people are living in poverty.
- 7.7% or 633 people are veterans.
- 9.7% of the elderly population have incomes at or below the poverty level.

These groups are likely to have greater needs during and after a disaster, a factor which must be considered when planning for disaster response and recovery operations.

Per the American Community Survey 5-year estimates of population for 2021, 15.6% of Cottage Grove's population is over 65 years old, as compared to 21.5% of Lane County's; 22.0% of Cottage Grove's population is under 18, as compared to 17.3% in the County as a whole. In summary, the city has a larger percentage of children, and but a smaller percentage of retirees than the county as a whole.

Business Oregon lists Lane County as a Distressed County in 2023 due in part to a greater portion of the city's population that is unemployed, and a lower per capita personal income level as compared with the statistics for the State of Oregon.[3]

Critical Facilities and Infrastructure

Figure 4 below maps the location of the following Critical Facilities in Cottage Grove.

Critical Facilities: Those facilities and infrastructure necessary for emergency response efforts.

- City Hall (Emergency Operations Center (EOC) #1
- Police Station, 911 Call Center, Jail
- Cottage Grove Community Hospital
- City of Cottage Grove Public Works Shop (EOC #2)
- Water Treatment Facilities (Row River)
- Water Intake Facility (Row River)
- Water Treatment, Storage, and Distribution Lines
- Wastewater Treatment Plant (WWTP)
- South Lane County Fire and Rescue Station #1
- Cottage Grove State Airport
- Cottage Grove Schools
- Cottage Grove High School
- Our Lady of Perpetual Help Catholic Church (Red Cross Shelter)
- Knox Butte Reservoir
- Downtown Historical District
- Cottage Grove Reservoir Dam
- Dorena Reservoir Dam

Critical Infrastructure: Infrastructure that provides services for the City of Cottage Grove.

- Telephone Lines
- Wastewater Collection System
- Stormwater Collection System
- Cell Phone Towers
- Roads
- NW Natural Gas Lines
- Overhead Power lines
- Transportation Networks
- Bridges

[3] https://www.oregon.gov/biz/reports/Pages/DistressedAreas.aspx

- Central Oregon and Pacific Railroad Lines

Vulnerable Populations: Locations serving populations that have special needs or require special consideration.

- Cottage Grove Community Hospital
- Coast Fork Nursing Home
- Middlefield Oaks Assisted Living/Memory Care Facility
- Magnolia Gardens Assisted Living/Memory Care Facility
- Riverview Terrace Apartments
- South Lane School District Schools
- Coast Fork Learning Center
- Family Relief Nursery

Economic Assets/Population Centers: Economic Centers, are those businesses that employ large numbers of people, and provide an economic resource to the City of Cottage Grove. *Population Centers* usually are aligned with economic centers and will be of particular concern for evacuation/notification during a hazard event.

- South Lane School District office and schools
- Cottage Grove Community Hospital
- Lane Community College
- Cottage Grove Industrial Park
- Safeway
- Wal-Mart
- Starfire Lumber
- Weyerhaeuser
- Downtown Cottage Grove Historic District

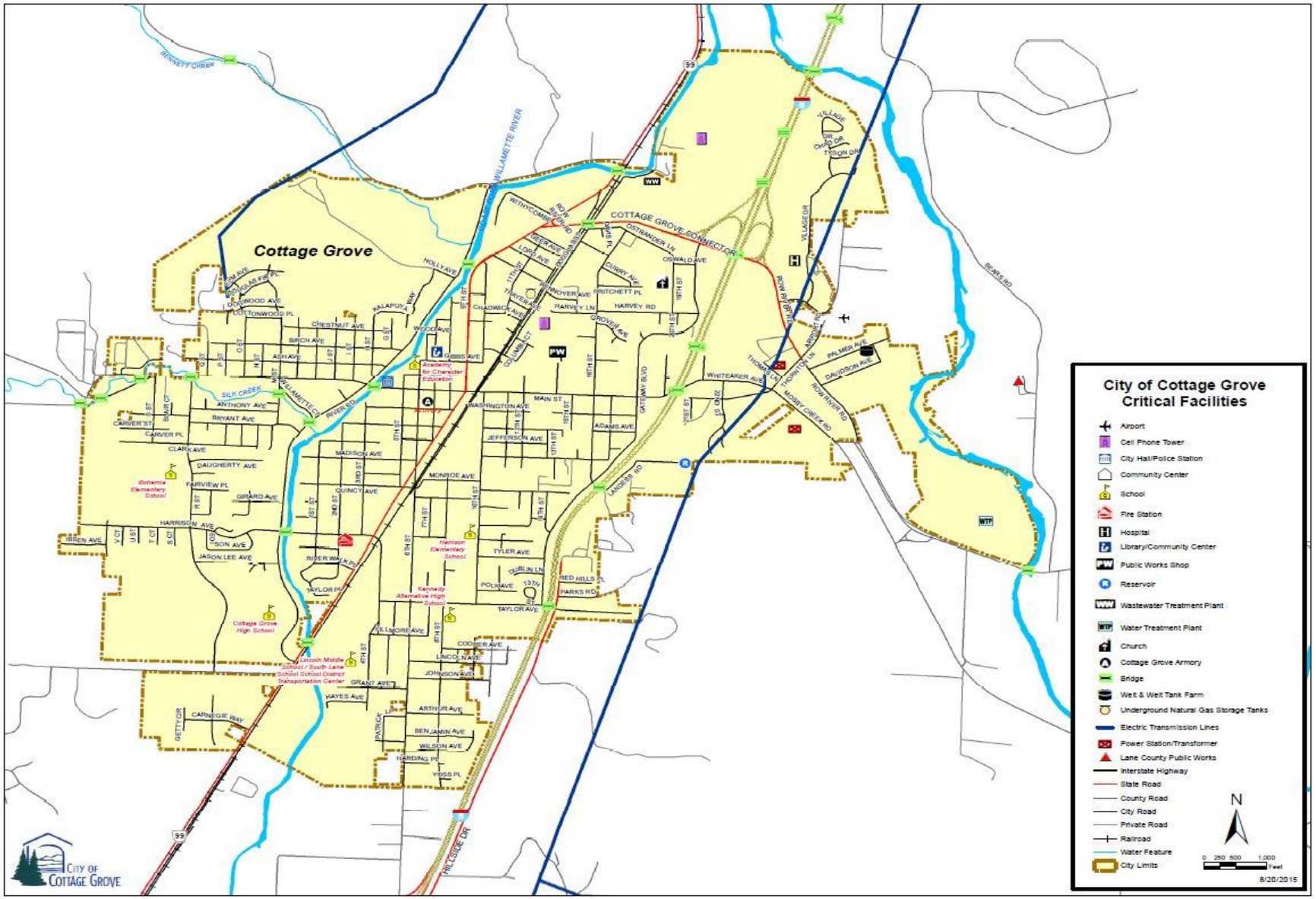
Environmental Assets: Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic and functional service for the community.

- North Regional Park
- Row River Nature Park
- Coiner Park
- Bohemia Park
- Willamette River Greenway
- Coast Fork of the Willamette River
- Row River
- Silk Creek
- Wetlands – Speedway, Row River Nature Park, High School, Industrial Park,
- Mt. David
- Row River Trail
- Cottage Grove & Dorena Reservoirs
- Willamette National Forest and Umpqua National Forest

Hazardous Materials: Those sites that store, manufacture, or use potentially hazardous materials.

- Welt & Welt
- Kimwood Corp
- City of Cottage Grove

Figure 4. Cottage Grove Critical Facilities



Economy

Due to the City's location at the outer end of a comfortable commute to the Eugene-Springfield metro area, Cottage Grove has the feeling of a relatively self-contained, independent community. Despite its size and relative independence, the City has struggled in recent years to sustain its economy, and Cottage Grove residents depend heavily on the metro area for employment.

In 2017, Cottage Grove had 301 employer establishments provided a total of 3,200 jobs. In 2006, the City had 4,423 jobs. In the 2009 Economic Opportunities Analysis, ECONorthwest projected that employment in Cottage Grove will increase at an average of 1.4% per year—to 6.075 employees in 2029. This means 1,652 new jobs—a 37% increase during this 20-year planning period. Cottage Grove currently has a jobs-to-population ratio of 1:2.1, or one job for every 2.1 people. This is low compared with Springfield (1:1.7) and the state as a whole (1:1.6).

Major economic generators within the City include Weyerhaeuser, Kimwood, Cottage Grove Community Medical Center, South Lane School District, and the City of Cottage Grove.

Economic Future

Cottage Grove faces some challenges over the next 50 years to stimulate its economy. The city's pleasant, attractive neighborhoods and well-established infrastructure give it a good foundation upon which to build. The Downtown Historic District has long been recognized as an economic center in the city and is a key resource in the continued economic success of the community.

Concerted efforts are underway to diversify and strengthen the economy in order to provide more opportunities for employment and to continue improving city services. The City recognized a need for additional industrial land in order to diversify its industrial and manufacturing sector, a key to rebuilding and sustaining the local economy, and expanded its Urban Growth Boundary in 2011 to incorporate 240 additional acres. Planned improvements in the water, stormwater, and wastewater systems are integral to continued development and renewal of Cottage Grove's commercial and industrial sectors.

Cottage Grove has the potential to draw visitors from US Interstate 5, directing them to the downtown core, to the lakes, and around the community. The Economic Development Committee, Economic/Business Improvement District, the Cottage Grove Area Chamber of Commerce, the City of Cottage Grove, and other groups of citizens have worked to make Cottage Grove more attractive to tourists, to draw more dollars to the community while keeping intact the City's small-town charm.

As the economy rejuvenates, Cottage Grove's vision is to emerge as a vibrant, independent, leading community in the Southern Willamette Valley region.

Land Use

Residential uses occupy the largest share of development land within the urban growth boundary (UGB), comprising 26 % of the total land area. Single family and duplex residential development has been occurring slowly on infill lots throughout the community and in several large subdivisions under development (River Walk and Sunrise Ridge). Industrial development has continued in the Cottage Grove Industrial Park. In the last five years, the City has seen its park land inventory expand to include the 14-acre Bohemia Park, the .62-acre Chambers Bridge Park, the All-America Square, and expanded acreage at Coiner Park and the Row River Trailhead Park. In 2011, the City's Urban Growth Boundary

was expanded to include 240 acres of industrial and commercial property along Hwy 99 S and S. 6th Street. With this expansion, Weyerhaeuser was included within the City's UGB.

Future Land Use

The City of Cottage Grove Community Development Department enforces building and development codes to promote public safety and preserve the quality of life in Cottage Grove. The Cottage Grove Comprehensive Plan's development-related goals for future land use are:

- *To preserve our prime agricultural and forest lands considering their potential for both short- and long-term productivity.*
- *To encourage rural non-farm forest uses to locate on marginal lands where environmental and development constraints are limited.*
- *To protect our natural and cultural features from inappropriate and hazardous development*
- *To assure wise and efficient use of our urbanized lands.*

The UGB contains a total of 3,294 acres. The comprehensive plan designates 63% of Cottage Grove's UGB for residential use, and about 19% for commercial uses.

Housing

According to the Population Research Center (Portland State University) Coordinated Population Forecast (2015-2065) Housing Data, there are 4,353 housing units in Cottage Grove, less than 7% of which are unoccupied. The minimum lot size is 6,000 square feet in Low Density Residential districts, and 5,500 in Medium Density Residential districts. New housing is built on lots ranging from 5,500 to 9,000 square feet.

Transportation

In 2010, approximately 50% of workers living in Cottage Grove commuted to Eugene-Springfield, along Highway 99 and I-5.

Over the years, the city's streets have developed primarily in a grid pattern. More recently, the City has begun to develop a beltway arterial along the outer edges of the city to facilitate ease of movement.

The Oregon Department of Transportation (ODOT) maintains bridges on I-5 and Highway 99, and the Cottage Grove Connector, all of which are within City limits. There are 23 bridges and overpasses in the City, three of which are maintained by Lane County; the remaining 20 are maintained by the Oregon Department of Transportation (ODOT).

Bicycle and pedestrian travel in Cottage Grove has been emphasized in local transportation planning for many years. A bike path system provides links to two natural resource parks within the city and to regional multi-use trails. The 16.3-mile Row River Trail "Rails-to-Trails" project is a popular recreational amenity for residents and visitors alike. This trail, a former short line railroad right-of-way, runs from downtown Cottage Grove, along Dorena Lake, to Culp Creek. These improvements have helped make the City more welcoming to pedestrians and bicyclists.

Public transit bus service is provided to commuters by Lane Transit District, and South Lane Wheels provides local fixed route and on-demand service within Cottage Grove. A taxi service also provides local service in and around the city. The Central Oregon and Pacific Railroad provides daily freight service.

Cottage Grove State Airport is located at 78803 Airport Road, east of downtown along the Row River with a 3,188-foot runway. The airport does not have a control tower; however, it is attended Monday through Saturday 10am to 7pm. The State Aviation Division owns the airport.

The Central Oregon & Pacific Railroad has three to five scheduled freight trains running through the City during weekdays travelling on the Union Pacific Railroad rail line. The rail line parallels Highway 99, N. Douglas Ave., and N. Lane St. within the City limits.

Public Facilities and Services

Cottage Grove owns and operates its own water supply system. Since the late 1970's, the City has planned major improvements to its water production and storage facilities to ensure a continued water supply for the future. Construction was completed on a new water intake and treatment facility at the Row River Nature Park in 2007, and continued improvements include covering the reservoir to improve water quality and developing new drying ponds at the water treatment plant.

The City owns and operates its own wastewater treatment system, which was upgraded in 2005 to accommodate growth and increase the quality of the effluent. Effluent discharge is treated through irrigation of the Middlefield Golf Course and other properties owned by the city. This system has numerous limitations and stormwater is contributing to inflow and infiltration problems.

Electricity is provided by Pacific Power and Emerald People's Utility District. Bonneville Power Administration is the primary regional electricity distributor, much of which is produced at hydroelectric dams such as those on the Columbia River However, nearby Dorena Dam located east of Cottage Grove by approximately 5 miles was retrofitted with hydroelectric capability in 2015.

Natural Gas is provided by Northwest Natural Gas. Qwest is the local telephone service provider. Cottage Grove is a member of the Fibersouth Consortium, a cooperative effort among local governments to provide modern fiber optic services to their communities. There are two fiber optic lines installed along the railroad tracks running through town: the main north-south West Coast fiber optic backbone and a new Fibersouth Consortium line. Both of these lines run just outside the Cottage Grove Industrial Park. Over 80% of the city is covered by Wi-Fi, which is provided as a public utility by the City of Cottage Grove. Cellular phone service is available from several national companies that provide regional coverage.

The South Lane School District provides educational services to Cottage Grove students. The district operates two K -5, one middle school, one 9-12 comprehensive high school, and one K-12 charter school in Cottage Grove. There are several other district schools outside the city limits. The elementary schools serve about 450 students each. Lincoln Middle School serves grades 6-8 and has a student body of approximately 450. Cottage Grove High School serves grades 9-12 with a population of approximately 650 students.

Cottage Grove maintains its own police force, which operates out of City Hall. The South Lane County Fire & Rescue District provides fire protection, emergency medical response, and other specific rescue services for the City of Cottage Grove and surrounding rural areas. Fire Station #1 is located within city limits at Hwy 99 S and Harrison Avenue.

Cottage Grove Community Medical Center is located at 1515 Village Drive and maintains landing and support facilities for Life Flight Air-Ambulance service.

Natural Resources and Open Space

Cottage Grove includes part of the floodplain of the Coast Fork of the Willamette River that flows north to the Willamette River and is situated just upstream of the confluence of the Coast Fork and Row Rivers. The surrounding hillsides and waterways contribute to the attractiveness of the area. Cottage Grove area residents and visitors can choose from a variety of water-oriented and urban parks, ranging from pocket parks to regional parks and the Willamette River Greenway. The hillside surrounding Cottage Grove provides an aesthetic environment for the community. The hillsides also present a specific set of development challenges and limitations. The complex system of slopes, soils, vegetation, and hydrology require sensitive, responsible development. In recognition of the importance of the hillsides to the city, Cottage Grove developed a major report on hillside development and included it as a specific focus of the Cottage Grove Comprehensive Plan.

Waterways are also significant features in Cottage Grove. Land in the city drains into the Coast Fork of the Willamette River, Row River, and Silk Creek. The section of the Coast Fork running through town is part of the Willamette River Greenway.

The most important wildlife habitat areas in and around Cottage Grove center on the Coast Fork of the Willamette River, the Row River, and the backwater slough areas at the confluence of these two rivers. There is significant fish spawning area in the Coast Fork, about one mile upstream of the UGB. Fishing for native cutthroat trout, steelhead, and Chinook salmon is a primary recreation activity.

Section 3: Risk Assessment

Methods & Data Sources

Methods and data sources that inform the risk assessment include:

Community Profile

One component of risk is vulnerability, this includes specifically vulnerable populations, critical facilities, assets, and other buildings and infrastructure, or natural or cultural resources that could be damaged or destroyed. Disaster occurs when action is not taken to reduce risk. The Community Profile includes information about these vulnerabilities and precedes this section in Section 2.

Natural Hazard Sections

Characterizing a hazard that poses a risk to a community is done by defining the geographic extent and intensity of the hazard, the probability of its occurrence, identifying previous events including disaster declarations, and by using the best available data, modeling, and maps to estimate the risk of damage due to the hazard. This section is informed by the sources below.

1. Multi-Hazard Risk Report for the City of Cottage Grove, Oregon, Open-File Report O-23-03, authored by Matt C. Williams and Nancy C. Calhoun, Department of Geology and Mineral Industries, 2023. pubs.oregon.gov/dogami/ofr/O-23-03/p-O-23-03.htm

   The report estimating potential losses involves estimating the damage, injuries, and financial losses likely to be sustained in a geographic area over a given period of time. This analysis was conducted for the 2023 Cottage Grove NHMP update by the Department of Geology and Mineral Industries (DOGAMI) that serves as the primary technical risk assessment data source for this NHMP update.

   The two major types of risk analysis conducted in this study are (a) a loss estimation using Hazus-MH to calculate the probability and magnitude of an event such as a flood or earthquake and (b) a loss estimate to describe the community's vulnerability in terms of dollar losses. These studies have been conducted using these methods for counties and cities and Tribes across Oregon which provides the community and the state with a common framework in which to measure the effects of hazards on assets.

2. Future Climate Projections Lane County, Oregon, authored by Meghan Dalton, Erica Fleishman, and Dominiques Bachelet of Oregon Climate Change Research Institute, July 2022, Lane.pdf | Powered by Box The report evaluates regional climate models and provide estimations on the level of risk of different hazards using the projected climate change scenarios. This work provides a "modifier" to existing hazard projections. Incorporating the risks of climate change are a FEMA requirement and advisable for all local communities.

   Managing variabilities such as extreme temperatures or greatly increased fire risk can burden a community by coming on suddenly and posing grave or widespread health risks or destruction. Resilience is the ability to withstand change and climate change poses a great opportunity to

evaluate the adaptability of a community in regard to its water supply, wildland-urban interface, and floodplains.

This NHMP update for the City of Cottage Grove also makes use of Lane County & Oregon NHMPs– These documents are unique sources as they summarize the city's service territory, but at a larger scale. Both provide an additional factual basis as well as rankings of hazard risk and mitigation actions.

Hazard Vulnerability Assessment and Survey

The Hazard Mitigation Assessment Committee completed a risk assessment exercise to identify and then rank hazards that impact the City of Cottage Grove and its residents using a methodology developed by FEMA and OEM. This small group exercise was supplemented by a survey that was promoted on the City's website and its Friday Update.

Hazard Identification

During previous plan updates, the City of Cottage Grove identified six major hazards that threaten the community. These hazards were floods, landslides, wildfires, earthquakes, winter storms, volcano, and drought.

For the 2023 plan update, the HMAC indicated concern about risk posed by Dam Failure and to the related risk from Wildfire that is caused by Wildfire Smoke. Other hazards that were raised during HMAC meetings during the risk assessment phase of the update included debris flows, as well as new hazards of extreme heat, air quality, and water quality. It was decided to add both Dam Failure and Wildfire Smoke to the assessment of risk although they are considered hazards related to Flood and Wildfire respectively.

There are no High Hazard Potential dams located within the City of Cottage Grove, although the city could be impacted by breaches of several upstream dams. This topic is more fully considered in the subsequent section on the Natural Hazard Characteristics, History, Vulnerability and Risk.

Hazard Vulnerability Assessment and Survey

Hazard Vulnerability Assessment

The Hazard Vulnerability Analysis is a hazard risk scoring system created by Oregon Department of Emergency Management (OEM) that is used statewide in order to compare hazard risk. A Hazard Vulnerability Assessment (HVA) is a subjective, but local, ranking of a community's hazard risk, usually conducted from the perspective of local infrastructure managers. This scoring method is used to assist with prioritizing hazards and understanding risk.

The following description of the methodology is provided by OEM in the description of the methodology.

In this analysis, severity ratings are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario), and probability based as follows:

LOW = choose the most appropriate number between 1 to 3 points
MEDIUM = choose the most appropriate number between 4 to 7 points

HIGH = choose the most appropriate number between 8 to 10 points

Weight factors also apply to each of the four categories as shown below.

***HISTORY** (weight factor for category = 2)*
History is the record of previous occurrences. Events to include in assessing history of a hazard in your jurisdiction are events for which the following types of activities were required:

- *The EOC or alternate EOC was activated;*
- *Three or more EOP functions were implemented, e.g., alert & warning, evacuation, shelter, etc.;*
- *An extraordinary multi-jurisdictional response was required; and/or*
- *A Local or Tribal Emergency was declared.*

LOW – score at 1 to 3 points based on…	*0 - 1 event past 100 years*
MEDIUM – score at 4 to 7 points based on…	*2 -3 events past 100 years*
HIGH – score at 8 to 10 points based on…	*4 + events past100 years*

***VULNERABILITY** (weight factor for category = 5)*
Vulnerability is the percentage of population and property likely to be affected under an "average" occurrence of the hazard.

LOW – score at 1 to 3 points based on…	*< 1% affected*
MEDIUM – score at 4 to 7 points based on…	*1 - 10% affected*
HIGH – score at 8 to 10 points based on…	*> 10% affected*

***MAXIMUM THREAT** (weight factor for category = 10)*
Maximum threat is the highest percentage of population and property that could be impacted under a worst-case scenario.

LOW – score at 1 to 3 points based on…	*< 5% affected*
MEDIUM – score at 4 to 7 points based on…	*5 - 25% affected*
HIGH – score at 8 to 10 points based on…	*> 25% affected*

***PROBABILITY** (weight factor for category = 7)*
Probability is the likelihood of future occurrence within a specified period of time.

LOW – score at 1 to 3 points based on…	*one incident likely within 75 to 100*
years MEDIUM – score at 4 to 7 points based on…	*one incident likely within 35 to 75 years*
HIGH – score at 8 to 10 points based on…	*one incident likely within 10 to 35 years*

By multiplying the weight factors associated with the categories by the severity ratings, we can arrive at a subscore for history, vulnerability, maximum threat, and probability for each hazard. Adding the subscores will produce a total score for each hazard.

This section outlines the relative risk scores provided by the City of Cottage Grove's HMAC committee at their 4th meeting on October 5, 2022. These scores were made by using local knowledge and best available data, including the DOGAMI Risk Report as guidance. These scores are based on the resources, facilities, and infrastructure that, if damaged by a particular hazard event, could significantly impact public safety, economic conditions, and environmental integrity of the City of Cottage Grove.

Table 1. City of Cottage Grove Hazard Vulnerability Analysis

Hazard Vulnerability Analysis Score Sheet: CITY OF COTTAGE GROVE															
Hazard	**History**			**Probability**			**Vulnerability**			**Maximum Threat**			**Total**	**H-M-L**	**Rank**
	Severity	Weight	Subtotal	Severity	Weight	Subtotal	Severity	Weight	Subtotal	Severity	Weight	Subtotal			
Wildfire Smoke	10	2	**20**	10	7	**70**	10	5	**50**	10	10	**100**	**240**	H	1
Wildfire (WUI)	1	2	**2**	10	7	**70**	10	5	**50**	10	10	**100**	**222**	H	2
Winter Storm	5	2	**10**	10	7	**70**	10	5	**50**	8	10	**80**	**210**	H	3
Drought	1	2	**2**	1	7	**7**	10	5	**50**	10	10	**100**	**159**	M	4
Flood	4	2	**8**	5	7	**35**	5	5	**25**	5	10	**50**	**118**	M	5
Earthquake	1	2	**2**	5	7	**35**	1	5	**5**	5	10	**50**	**92**	M	6
Landslide	1	2	**2**	5	7	**35**	1	5	**5**	4	10	**40**	**82**	M	7
Volcanic Eruption	1	2	**2**	1	7	**7**	1	5	**5**	4	10	**40**	**54**	L	8
Dam Failure	1	2	**2**	1	7	**7**	1	5	**5**	1	10	**10**	**24**	L	9
Cyberterrorism	1	2	**2**	10	7	**70**	5	5	**25**	10	10	**100**	**197**	H	1
Hazmat Release - Transportation	10	2	**20**	8	7	**56**	8	5	**40**	8	10	**80**	**196**	H	2
Hazmat Release - Fixed Facility	1	2	**2**	10	7	**70**	5	5	**25**	5	10	**50**	**147**	M	3

Source: City of Cottage Grove staff, 09/08/22 and 09/15/22 and HMAC meeting #4 on 10/4/2022.

Table 2. Hazard Ranking Rationale

Notes by Hazard: Specific hazard impacts and/or logic used for ranking each hazard.	
Hazard	**Hazard Ranking Rationale**
Wildfire Smoke	Severe smoke events have impacted City - 2020 AQI of 925 was worst in the state. 2022 Ashfall and AQI of 600 from Cedar Creek Fire.
Wildfire (WUI)	Wildfire risk is primarily from the urban fringe, during east wind/extremely low moisture events. As such, coordination with SLCF&R and lane County is a priority.
Winter Storm	A winter storm poses a high risk to the City if power outages extend for many days or weeks due to the average age of the population.
Drought	Drought conditions are predicted to increase with climate variability leading to increased fire and other risks.
Flood	1996 is the only 100-year flood, other than pre-dam. The low ranking is due to the city exercising its authority on this hazard to the extent of their ability to maintain their class 6 CRS rating.
Earthquake	DOGAMI report indicates that only 7% of structures are at risk from a CSZ event.
Landslide	A pump station near Bennett Creek is a critical facility at risk of landslide (differs from DOGAMI report).
Volcanic Eruption	Ashfall is sole risk but it depends on rare east winds blowing ash from Mt St. Helens.
Dam Failure	There are three "high hazard potential" dams upstream of CG, but all are at a very low risk of failure.
Cyberterrorism	This is an ongoing risk to all levels of government.
Hazmat Transpo	Hazmat materials are transported on I5 daily and spills are highly likely. Risk is to downstream drinking water.
Hazmat Facility	A risk of an accidental chlorine or ammonia release is unlikely but possible.

Survey

The online survey developed and launched by the HMAC supported the conclusions drawn by the group during the Hazard Vulnerability Assessment. A copy of the survey is provided in the appendices of this plan. The primary purpose was to evaluate the relative importance of the range of natural hazards addressed in this plan.

Of the eighteen respondents to the survey gathered between July 15-16, 2022, the natural hazard of greatest concern was winter storms. Sixteen of the respondents indicated that they were concerned about this hazard. The second highest number of respondents (12) indicated wildfire concerned them followed by respondents that drought was the most concerning natural hazard with ten positive responses. Earthquake and flooding were of concern to less than half the respondents with 7 and 6 positive responses for each respectively. Concern about landslides and volcanic activity were of concern to only two or three respondents.

Although climate change is not addressed as a natural hazard in and of itself, the survey asked respondents whether they were concerned about its effect on natural hazards. Ten of 18 responded that it was. The impact of climate change on each of the relevant natural hazards is addressed in this plan based on the research conducted by the Oregon Climate Change Research Institute for Lane County.

Natural Hazard Characteristics, History, Vulnerabilities and Risk

Flood

Characteristics of Flood

In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Floods are a commonly occurring natural hazard in Cottage Grove and have the potential to create public health hazards and public safety concerns, close and damage major highways, destroy railways, damage structures, and cause major economic disruption (Williams & Calhoun, 2022).

Flooding occurs when climate, geology, and hydrology combine to create conditions where river and stream waters flow outside of their usual course and "overspill" beyond their banks. In Lane County, the combination of these factors, augmented by ongoing development, create chronic seasonal flooding conditions. Flooding is most common from October through April, when storms from the Pacific Ocean bring intense rainfall to the area. Larger floods result from heavy rains that continue over the course of several days, augmented by snowmelt at time when the soil is near saturation from previous rains. It should be noted that flood issues like flash flooding, ice jams, post-wildfire floods, and dam safety were not examined in the DOGAMI risk report.

Riverine Flooding

The City of Cottage Grove is located south of the confluence of the Row River and the Coast Fork of the Willamette River. The City is subject to riverine flooding from these two rivers as well as Silk, Mosby, and Bennett Creeks. The city itself is located wholly within the Coast Fork Willamette Watershed Basin.

The Coast Fork of the Willamette River runs north then northeast through the center of the city along a fairly narrow, channelized corridor that has seen development since the founding of the community in the 1860's. The original channel has been heavily modified. Some slight movement of the Coast Fork Willamette channel has been seen in its more northern reaches within City limits. The Row River forms the City's eastern boundary. Its channel remains fairly natural, with multiple meanders and a wide, vegetated floodplain. Much of the Row River floodplain in the City is under City of Cottage Grove ownership as a measure of floodwater control. The Row River joins the Coast Fork of the Willamette River immediately to the north of the City's urban growth boundary. Silk Creek enters the city from the west from the foothills of the Coast Range. This creek flows through the back yards of several residential neighborhoods before crossing under River Road via a culvert to join the Coast Fork. Mosby Creek joins the Row River east of the City, west of Dorena Lake. Most riverine flooding in Cottage Grove occurs along and is driven by tributaries and rivers with no flood control devices, such as Silk Creek and Mosby Creek.

Cottage Grove has actively pursued several flood hazard mitigation activities in an effort to reduce vulnerability to damage and disruption from flooding events. Efforts include:

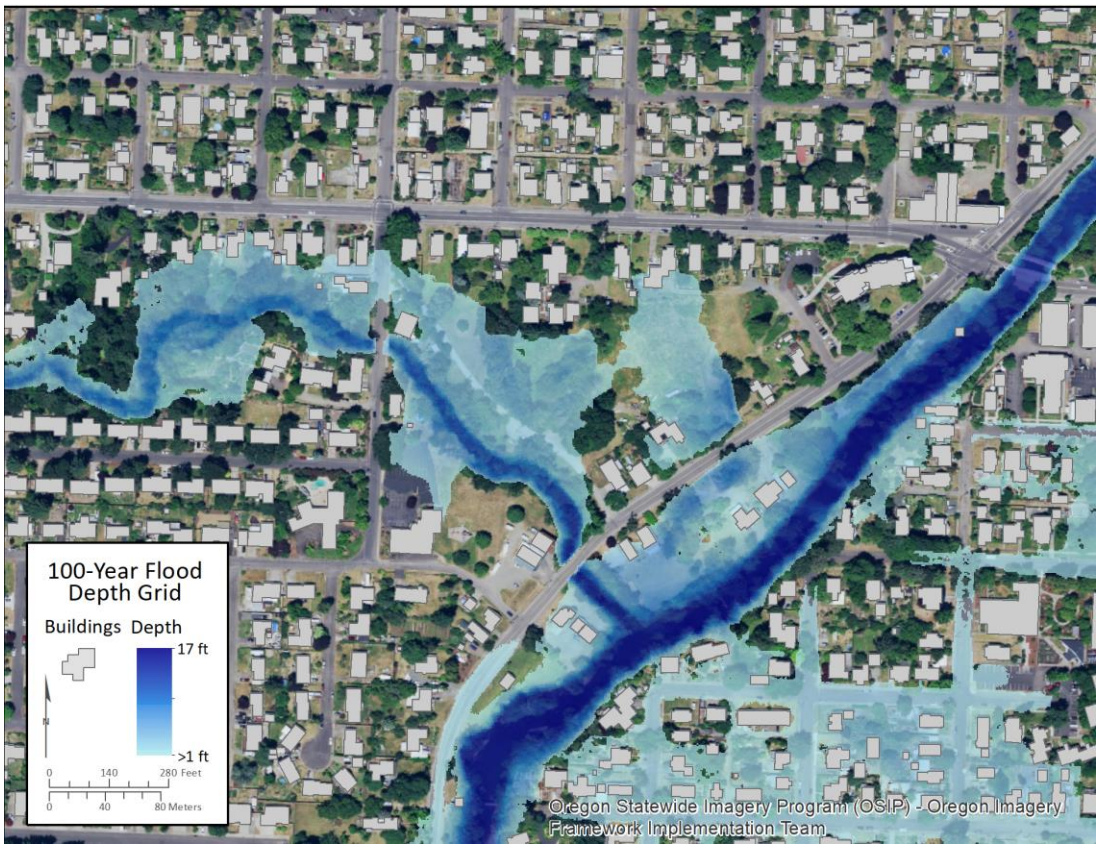
- Cottage Grove participates in the National Flood Insurance Program, which enables property and business owners to qualify for federally underwritten flood insurance and in the Community Rating System as well which helps lower the flood insurance rates for residents.

- In 2008, the City replaced the Row River Water Treatment Facility intake structure with a flood-proof intake structure.
- The City has been working with the Coast Fork Willamette Watershed Council to pursue funding to re-connect the Row River Nature Park wetlands to the Row River to encourage riparian meandering and lessen flood hazard.
- The City has begun replacing and hardening stormwater outfalls into the Coast Fork to ensure that flood waters continue to drain into the river during high-water events.
- The City has participated in dam failure scenarios with the Lane County Emergency Preparedness Coalition, South Lane County Fire & Rescue, USACE and the Cottage Grove Community Hospital.
- The City has participated in dam failure scenarios with the Lane County Emergency Preparedness Coalition, South Lane County Fire & Rescue, USACE and the Cottage Grove Community Hospital.
- The City has adopted a Stormwater Management Plan. The goal of this plan is to protect citizens and property from urban flooding through planning for and building adequate green and gray stormwater systems.

Flooding potential is most common from October through April when storms from the Pacific Ocean bring steady and occasionally intense rainfall, and soil saturation remains high. Flooding can be aggravated when streams are altered by human activity, such as through channelization of streams or loss of wetlands. Many types of flood hazards exist in Oregon, including riverine floods, flash floods (resulting from locally intense thunderstorms, ice jams, and dam failures), coastal floods, shallow area and urban flooding, and playa flooding.

Riverine flooding is affected by the intensity and distribution of rainfall, soil moisture, seasonal variation in vegetation, and water-resistance of the surface areas caused by urbanization. Flash flooding is a localized flood that results from a short duration of intense rainfall across a limited geographic area. During extended periods of intense rainfall, stormwater conveyance systems can be overwhelmed, and flooding of surrounding neighborhoods can result. It should be noted that stormwater is not treated in the City wastewater system. There exist remnants within the city of older piping that combines stormwater into the sewer system, increasing unnecessary costs in waste water treatment. These remnants are addressed and removed on a case-by-case basis when found and as funding is available.

Figure 5. Depth Grid of the Silk Creek & the Coast Fork



Source: Williams & Calhoun, 2022. FEMA 2022 draft flood data

Ponding/ Shallow Flooding

Finally, it is also possible that the City is subject to shallow AO flooding known as ponding. However, shallow flooding is normally precipitation driven. The City has identified areas within the City featured on the preliminary FEMA flood maps (scheduled to become effective in 2024) as being subject to flooding from drainage canals such as those along the Union Pacific rail corridor. As such, refining the profile of the City's flood risk by further study and characterization of possible indirect flood sources is being added as a new action item.

Potential for Dam Failure

The City is also subject to flooding from dam failure. The U.S. Army Corps of Engineers operates 13 multi-purpose flood control projects (dams) in the Willamette Valley Project, nine of which are located in Lane County, and were constructed between 1941 and 1968. A primary purpose of the Willamette Valley Project is flood control, although the reservoirs only control flooding on 50% of the tributaries in the Willamette Basin. Reservoirs are maintained at full pool from May to September for recreation and drained in the fall for the wet season to provide storage capacity for winter storms.

The Dorena Dam was built on the Row River upstream of Cottage Grove in 1942. The Cottage Grove Dam was built on the Coast Fork Willamette River upstream of Cottage Grove in 1943. These federally

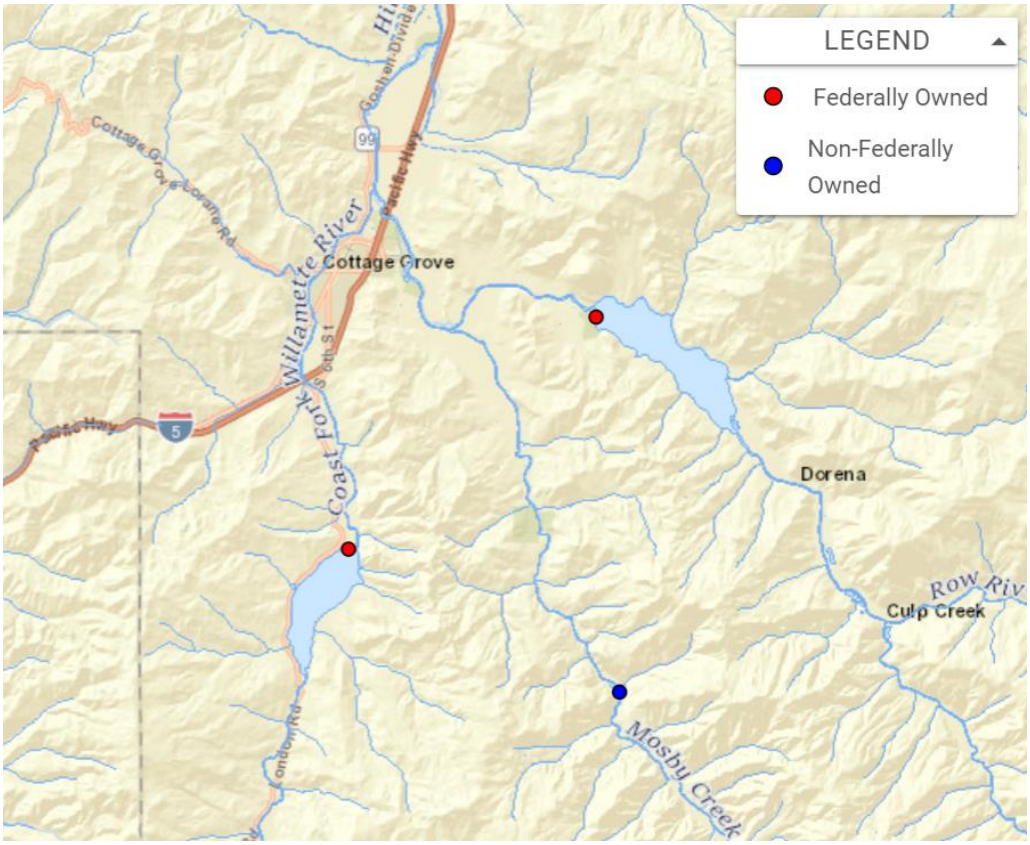
owned dams are operated and maintained by the U.S. Army Corps of Engineers, as a part of the Willamette Valley Project.

Table 3. Dams in Lane County Upstream of Cottage Grove (NID)

Name	Hazard Potential	Structural Height (Ft)	Max Storage (Acre-Ft)	Owner	Purpose/Notes
Cottage Grove Dam	High	103’	50,000	USACE	Flood Risk Reduction; earthen dam
Dorena Dam	High	154’	131,000	USACE	Flood Risk Reduction, Hydroelectric, Other
Booth Kelly Lumber Pond	Low	12’	144	Weyerhaeuser	Firefighting/ Built in 1953; aka Mosby Creek Log Pond

Source: US Army Corps of Engineers (2022). National Inventory of Dams. https://nid.usace.army.mil/#/ Note: Hazard potential indicates the downstream risk resulting from failure or mis-operation of the dam or facilities. The hazard potential does not speak to the condition of the dam or the risk of the dam failing.

Figure 6. Map of Dams Upstream of Cottage Grove (NID)



Source: USACE (2020). National Inventory of Dams. https://nid.usace.army.mil/#/

Flooding and Inundation Map updates

FEMA Map Update – Regulatory Framework

As of September 12, 2022, Central Lane County's Flood Insurance Rate Maps (also known as FIRMs) have been updated and became available for review. FEMA created a story map about this update project at: https://storymaps.arcgis.com/stories/4b7f576f061e41a8923801723c19f431 There will be two public meetings in October 2022 and the formal appeal period will open in December 2022 or January 2023 for 90 days.

These flood insurance rate maps are regulatory tools that are based on best available science. However, the process to develop the most recent update has been quite long, so these maps were made using just a one-dimensional model. The federal regulations have restrictions on the way the model used for the map is created which can affect accuracy and the perception of accuracy on the ground. In the case of Cottage Grove, the railroad that runs north/south through town would prevent flow across the tracks. But because the railroad is not an officially certified levee, it cannot be factored into the model. City staff feel that this is causing an inaccurate presentation of shallow flooding in the Middlefield community and other areas.

The new flood insurance rates will not go into effect until these maps become “effective” in 2024. However, the preliminary maps will now show that over 800 structures in the city are subject to a 1% annual flood risk. All federally backed loans will trigger the mortgage companies carrying these loans to require that homeowners purchase flood insurance. This will be a significant and new financial burden for city residents on fixed incomes. However, if the amount of flooding indicated is less than one foot, there are opportunities to adjust mandatory purchase requirements (W. Shaw, personal communication 9/20/22).

USACE Inundation Map – Hydraulic Framework

There is an inundation map flood study underway by the US Army Corps of Engineers (USACE) using a two-dimensional model (a raster or grid overlay) for the entire Willamette Valley to understand flows at many different elevations in order to better manage flows from the 13 USACE dams. This effort relies upon stream gauge data and control points throughout the system that correlate streamflow data to records of discharge. This effort is in conjunction with the USACE “Silver Jackets”—a team of technical experts who support community-based reduction of flood risk and risk communication.

While more technical information being presented locally may not simplify things, it should convey two important things to the community:

1) The City of Cottage Grove is at risk of more flooding than has occurred in anyone’s lifetime due to the fact that the city is at the confluence of two rivers;
2) Two federal agencies are working to provide maps using best available data.

Stream Gauge and Discharge Information

Table-4. USGS Stream Gauges near Cottage Grove

Flooding Source	Gauge ID #	Location	Drainage Area (sqmi.)
Coast Fork Willamette River*	14152500	Coast Fork Willamette River at community of London	72
Coast Fork Willamette River*	14153500	Coast Fork Willamette River below Cottage Grove Dam	104
Row River	14154500	Row River above Pitcher Cr, near Dorena, OR	211
Row River	14155500	Row River near City of CG	270
Mosby Creek	14156000	Mosby Creek near CG	85
Mosby Creek	14156500	Mosby Creek at mouth near CG	95
Coast Fork Willamette River	14157000	Coast Fork Willamette River at community of Saginaw	529

Source: FEMA, Lane County FIS, volume I page 53. USGS, WaterWatch. https://waterwatch.usgs.gov/?m=real&r=or Note: *This is the southernmost tributary sometimes known as the "upper" Coast Fork Willamette River.

Table-5. Stream Discharges

Table 9: Summary of Discharges *(continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Coast Fork Willamette River *(continued)*	At Camus Swale Creek	578	18,400	*	30,000	42,500	56,600
	At USGS Gage No. 14157000, at Saginaw, OR	529	16,000	*	26,100	37,000	49,300
	At Row River	154	5,300	*	7,600	12,200	18,100
	At Silk Creek	133	4,600	*	6,600	10,600	15,700
	At USGS Gage No. 14153500, below Cottage Grove Dam, OR	104	3,700	*	5,300	8,500	12,600

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Row River	Above confluence with Coast Fork Willamette River	375	12,900	*	17,400	25,600	42,500
	At USGS Gage No. 14155500 (Dorena Reservoir out) near Cottage Grove, OR	270	9,600	*	12,900	18,900	41,800

Lane County FIS, volume I page 46, 49.

Flood History

Cottage Grove has a long history of flood events. The most heavily flooded areas are the low lands along the Row and Willamette Rivers, and the properties adjacent to Silk Creek. The following historical recount of flooding was developed from the Cottage Grove Development Timeline created by community members using data from local historical resources, such as the Cottage Grove Museum.

- 1861 Floods hit the area
- 1881 Floods in the town
- 1926 People rode rowboats into the Bartell Hotel
- 1933 Flood in the town
- 1946 January heavy rains (4.32 inches)caused flooding
- 1961 February Floods-4.74 inches in 24 hours
- 1963 High water at Christmas
- 1964 High water again
- 1985 Flooding in the area with heavy rains
- 1996 100 inches of rain, flooding along Silk Creek, Mosby Creek
- February 1997 flooding on Silk Creek and the Row River
- January 2011 dam floodgates opened after heavy rain
- April 2019 level 3 evacuation for Row River floodplain
- June 11-14, 2022 both Dorena and Cottage Grove dams overtopped for more than one day (Water cascades over Cottage Grove Dam spillway for first time since December 1964 | KMTR (nbc16.com)

Since the construction of Cottage Grove and Dorena Dams in the 1940s, flooding has been less severe along the Row River and Coast Fork of the Willamette. These dams have reduced the expected 100-year stream discharges (volume of water flowing in the rivers). Hence expected flood elevations and overall flood potential for major flood events along these rivers have been substantially reduced. The flood hazard areas shown on the current Flood Insurance Rate Maps (FIRM) for Cottage Grove assume that the dams are operating properly. Dam failure hazards are not addressed by the FIRM.

Despite the reduction in flood potential from construction of the dams, the Cottage Grove area continues to face flood risks from the Coast Fork Willamette and Row Rivers as well as smaller creeks like Silk Creek, Mosby Creek, and Bennett Creek. Flood risk on these smaller streams has not been reduced by the dams. A major flood disaster on the Row River may have greater impacts to the eastern third of the city, particularly the Cottage Grove Airport, the Cottage Grove Community Hospital, Welt & Welt, and Wal-Mart. A major flood disaster on the Upper Coast Fork Willamette River would inundate over one half of the city, including all of the historic core and Hwy 99.

A major flood event occurred in February 1997. Unusually heavy rains over the four-day period from February 5th to February 8th resulted in significant flooding on numerous rivers and streams throughout western Oregon. The 1997 flood may have been about a 250-year event. During this flood event, Silk Creek flooded adjacent properties, and the Row River raised high enough to damage the city's current water treatment intake facility. Damage to Lane County businesses, residences and infrastructure was estimated to be roughly $19 million dollars for this February 1997 storm.

In January 2011, several days of heavy rain caused isolated flooding throughout the County, although little or no flooding occurred within Cottage Grove. Saturated soils caused the loss of the Coast Fork Willamette River bank in a few locations, and overloaded storm drains caused isolated street flooding in the community. These locations were documented by city maintenance staff for future maintenance. At the end of the event, the U.S. Army Corps of Engineers opened the floodgates on the Cottage Grove and Dorena Dams, rapidly raising the levels of the Coast Fork and Row Rivers. The prolonged high waters weakened many riparian trees along the Coast Fork. Although Lane County activated its EOC during this event, Cottage Grove had no need to do so.

In early April 2019 (8th-9th) A particularly strong atmospheric river resulted in anywhere from 2.5 to 5 inches of rain over a 48 hour period. Heavy rain combined with snow melt from all the snow from a few weeks prior in this same area caused flooding. A level 3 evacuation was ordered for the 100-year flood plain along the Row River near Cottage Grove. The release of water from the Dorena Reservoir was higher than recorded in the 1996 flood.

Vulnerabilities

Critical Facilities

Critical facilities located in the 100-year floodplain include the Row River Water Treatment Facility, the Wastewater Treatment Facility, and a pump station near Bennett Creek that serves to pump water into a reservoir and over a hill. The critical facilities that face flood hazards in the 100-year floodplain are major facilities that if incapacitated would cause tremendous problems for the City as well as citizens.

Bridges

Bridges may also be impacted by flood and can be found in Figure 5: “Flood Zones City of Cottage Grove.” Bridges are vulnerable to flooding because debris can choke bridges and cause them to collapse under the increased pressure. The City of Cottage Grove relies on bridges for transportation, as the Coast Fork of the Willamette River divides the city with all critical facilities located on the east portion of the city. A collapse of all bridges would leave the west portion of the city isolated from emergency services.

Other Community Assets in the 100-year floodplain include the Middlefield Golf Course, North Regional Park, Row River Nature Park, Willamette River Greenway Trail, and the Row River Trail.

Based on potential impacts, high long-term probability, and presence of development and infrastructure in riparian areas, a Moderate Vulnerability classification is assigned for flood. Using the Hazard Vulnerability Assessment exercise, the Steering Committee ranked riverine flooding as a moderate threat in Cottage Grove.

Climate-Related Risk

According to the Lane County Future Projections Report, the risk of flooding is likely to be influenced by climate change in the following manner:

- “Winter flood risk at mid- to low elevations in Lane County is projected to increase as winter temperatures increase. The temperature increase will lead to an increase in the percentage of precipitation falling as rain rather than snow.”
- “Streams in the Northwest are projected to shift toward higher winter runoff, lower summer and fall runoff, and earlier peak runoff, particularly in snow-dominated regions (Raymondi et al.,

2013; Naz et al., 2016). These changes are expected to result from increases in the intensity of heavy precipitation; warmer temperatures that cause more precipitation to fall as rain and less as snow, in turn causing snow to melt earlier in spring; and increasing winter precipitation and decreasing summer precipitation (Dalton et al., 2017; Mote et al., 2019; Dalton and Fleishman, 2021)."[4]

- "Warming temperatures and increasing winter precipitation are expected to increase flood risk in many basins in the Northwest, particularly mid- to low-elevation mixed rain-and snow basins in which winter temperatures are near freezing (Tohver et al., 2014)."
- "Recent regional hydroclimate models project increases in extreme high flows throughout most of the Northwest, especially west of the Cascade crest (Salathé et al., 2014; Najafi and Moradkhani, 2015; Naz et al., 2016). One study, which used a single climate model, projected an increase in flood risk in fall due to earlier, more extreme storms, including atmospheric rivers; and an increase in the proportion of precipitation falling as rain rather than snow (Salathé et al., 2014). Rainfall-driven floods are more sensitive to increases in precipitation than snowmelt-driven floods. Therefore, the projected increases in total precipitation, and in rain relative to snow, likely will increase flood magnitudes in the region (Chegwidden et al., 2020)."
- "Winter streamflow is projected to increase due to increased winter precipitation and the snowpack will melt earlier as temperatures increase and a greater percentage of precipitation falls as rain rather than snow." (Dalton et al, 2022)

National Flood Insurance Program

FEMA last produced Flood Insurance Rate Maps (FIRM) for Cottage Grove that detail the flood hazard areas in 1999. These 100-year floodplain and floodway maps have been digitized and reproduced for the City of Cottage Grove by Lane County and can be seen in Figure 7: "Flood Hazard Areas City of Cottage Grove". As of March, 2016, 206 parcels have been identified as either being wholly or partially within the Special Flood Hazard Area.150 properties have natural or artificial wetlands on part or all of the property.

As of May 31, 2015, the City of Cottage Grove had 67 NFIP policies in force with $15,842,400 in coverage in effect.

Based on historical occurrence, Lane County and by extension, Cottage Grove, can expect a significant flood event every 15 – 20 years.

Table 6. National Flood Insurance Program (NFIP) Dates

Jurisdiction	Effective FIRM and FIS	Initial FIRM Date	Last Community Assistance Visit
Cottage Grove	6/2/1999	02/22/1974	4/28/2020

Source: FEMA Community Information System, 09/07/2022

[4] Complete citations are available in the Future Climate Projections report available in the appendices of this plan.

Table 7. National Flood Insurance Program (NFIP) Insurance Information

Jurisdiction	Insurance in Force	Total Paid Claims	Pre-FIRM Claims Paid	Substantial Damage Claims	Total Paid Amount
Cottage Grove	$15,842,400	4	3	-	$4,809

Source: FEMA Community Information System, 04/07/2021, Mitch Paine, FEMA Region 10

Table-8. NFIP Repetitive Loss & Severe Repetitive Loss Properties and CRS

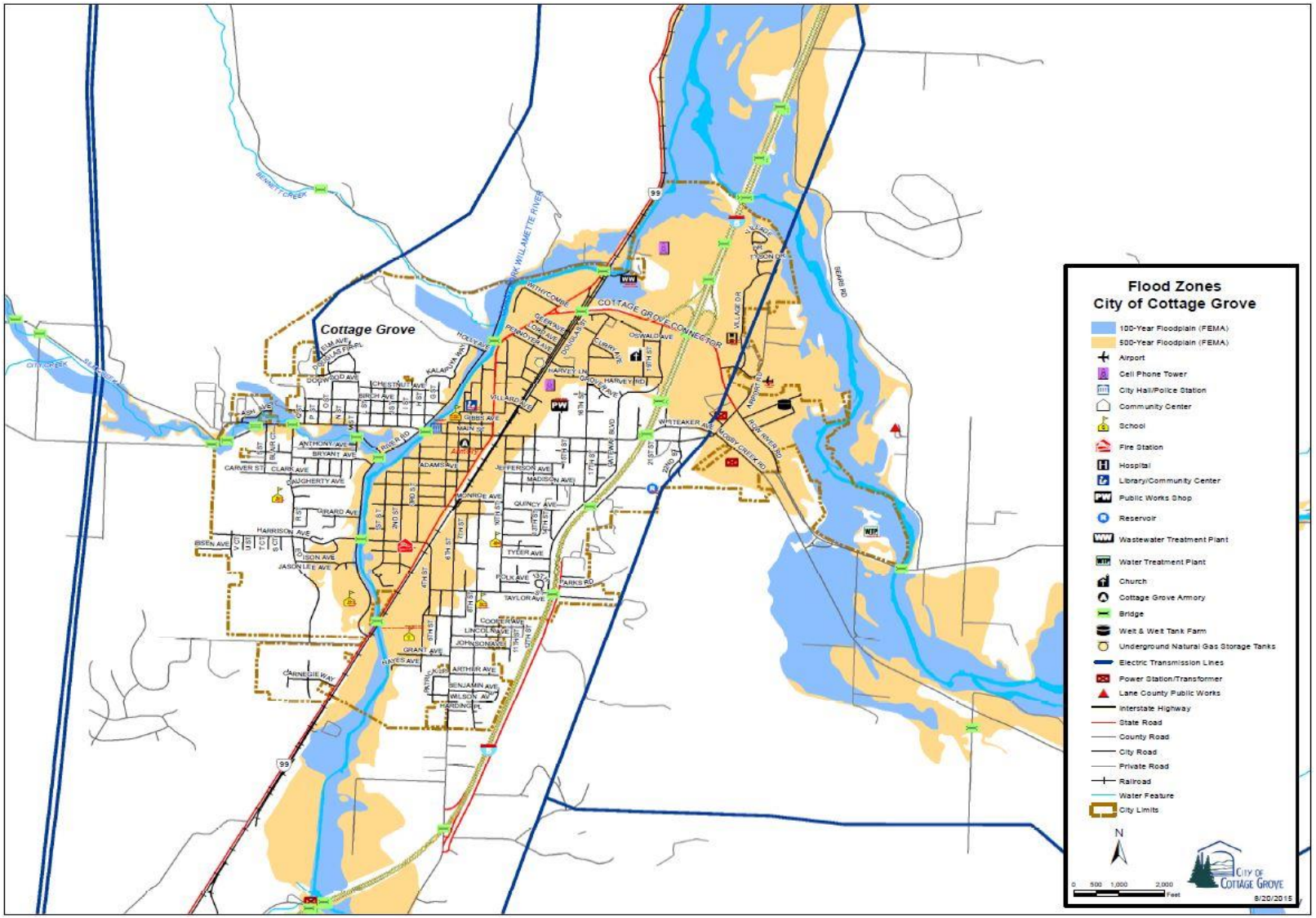
Jurisdiction	Repetitive Loss Structures	Severe Repetitive Loss Structures	CRS Class Rating
Cottage Grove	0	0	6

Source: FEMA Community Information System, 09/07/2022

Repetitive Flood Loss

The City of Cottage Grove works to mitigate problems regarding flood issues when they arise. Throughout history, some areas in the city have proven more susceptible to flooding issues and may have incurred repetitive losses, meaning they have more than two National Flood Insurance Program (NFIP) claims in a ten-year period. There have been 10 claims to NFIP in Cottage Grove since its inception in 1978. Of those claims only 4 were closed for a total of $4,809 in payouts. According to the most current data from the Oregon National Flood Insurance Program Coordinator there are no properties in Cottage Grove that meet the criteria for repetitive loss at this time.

Figure 7. Flood Hazard Areas City of Cottage Grove



Flood Risk Summary

Cottage Grove 100-year flood loss (FEMA 2022 draft data):

- Number of buildings damaged: 451
- Loss estimate: $6,851,000
- Loss ratio: 0.4%
- Non-functioning critical facilities: 0
- Potentially displaced population: 1,188

Source: Williams & Calhoun, 2022.

- The biggest cause of displacement to population is flood hazard. DOGAMI estimates that 11% of the population in the city could be displaced due to a flood.
- Cottage Grove is at significant risk from flooding—Most of the buildings in Cottage Grove are built along the Coast Fork Willamette River in areas that are prone to flooding. Flood mapping was recently revised and represents the best available data to estimate risk. At first glance, Hazus-MH flood loss estimates may give a false impression of lower risk because they show lower damages for a community relative to other hazards we examined. This is due to the difference between loss estimation and exposure results, as well as the limited area impacted by flooding. Another consideration is that flood is one of the most frequently occurring natural hazards. The areas that are most vulnerable to flood hazard are along both banks of the Coast Fork Willamette River over to Highway 99 through commercial and residential portions of Cottage Grove.
- Elevating structures in the flood zone reduces vulnerability—Flood exposure analysis was used in addition to Hazus-MH loss estimation to identify buildings that were not damaged but that were within the area expected to experience a 100-year flood. By using both analyses in this way, the number of elevated structures within the flood zone could be quantified. This showed possible mitigation needs in flood loss prevention and the effectiveness of past activities. The flood depth maps show that floods would occur over a wide area but would be relatively shallow, so that, many buildings exposed to flood hazard would be above the flood elevation. A large number (249) of buildings in the flood hazard area are higher than the base flood elevation (BFE). Based on the number of buildings exposed to flooding throughout the city, many would benefit from elevating above the level of flooding.

DOGAMI Multi-Hazard Risk Report for Cottage Grove Findings: Flood loss estimates for Cottage Grove were modeled for four different flood event sizes. The 10%, 2%, 1% (100 yr. flood), and 0.2% (500 yr. flood) flood scenarios are summarized in the table below.

Table 9. Flood loss estimates

(all dollar amounts in thousands)											
10% (10-yr)			**2% (50-yr)**			**1% (100-yr)**			**0.2% (500-yr)**		
Number of Buildings	**Loss Estimate ($)**	**Loss Ratio**	**Number of Buildings**	**Loss Estimate ($)**	**Loss Ratio**	**Number of Buildings**	**Loss Estimate ($)**	**Loss Ratio**	**Number of Buildings**	**Loss Estimate ($)**	**Loss Ratio**
3	3	0.0%	20	66	0.0%	700	6,851	0.4%	1,871	43,664	2.8%

Source: Williams & Calhoun, 2022.

Completed Flood Risk Reduction Actions

Cottage Grove has actively pursued several flood hazard mitigation activities in an effort to reduce vulnerability to damage and disruption from flooding events.

Between 2016 and 2023 the City of Cottage Grove has realized several mitigation action successes.

- The floodplain regulations were amended to require 2’ of freeboard above the base flood elevation.
- Revisions to Section 14.37.200 of the Cottage Grove Municipal Code (CGMC) limits development in floodplain areas.
- Stormwater management standards have been incorporated into the CGMC in Section 14.35.200.
- Requirements of floodplain management that support the city’s CRS rating of 6 are completed and ongoing to retain this ranking.

In the 2016 plan the following actions were highlighted:

- In 2008, the City replaced the Row River Water Treatment Facility intake structure with a flood-proof intake structure.
- The City has been working with the Coast Fork Willamette Watershed Council to pursue funding to re-connect the Row River Nature Park wetlands to the Row River to encourage riparian meandering and lessen flood hazard.
- The City has begun replacing and hardening stormwater outfalls into the Coast Fork to ensure that flood waters continue to drain into the river during high-water events.
- The City has adopted a Stormwater Management Plan. The goal of this plan is to protect citizens and property from urban flooding through planning for and building adequate green and gray stormwater systems.
- The City has participated in dam failure scenarios with the Lane County Emergency Preparedness Coalition, South Lane County Fire & Rescue, USACE and the Cottage Grove Community Hospital.

Table 10. Flood Warning Types

Riverine Flooding
Flood Potential Outlook (FPO): Announcement to alert the public of potentially heavy rainfall that could send rivers and streams into flood or aggravate an existing flood.
Flood Watch: Announcement to inform the public that current or developing conditions indicate a threat of flooding, but occurrence is neither certain nor imminent.
Flood Warning: An announcement by the NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage forecasts.
Flood Statement: A statement issued by the NWS to inform the public of flooding along major streams in which there is not a serious threat to life or property. It may also follow a flood warning to give later information.

Flash Floods
Flash Flood Watch: Announcement that current or developing conditions indicate potential flash flooding in the watch area
Flash Flood Warning: Issued to inform the public that flash flooding is in progress, imminent, or highly likely.
Flash Flood Statement: A statement by the NWS which provides follow-up information on flash flood watches

Recommended Risk Reduction Actions

The 2022 DOGAMI Multi-Hazard Risk Report for Cottage Grove recommends:

- Map areas of potential flood water storage.
- Identify structures that have repeatedly flooded in the past and would be eligible for FEMA's "buyout" program.
- Create channel migration zone maps.

Landslide

"Landslides are mass downhill movements of rock, debris, or soil. There are many different types of landslides in Oregon. In area around Cottage Grove the most common are debris flows and shallow- and deep-seated landslides. Landslides can occur in many sizes, at different depths, and with varying rates of movement. Generally, they are large, deep, and slow moving or small, shallow, and rapid. Some factors that influence landslide type are hillside slope, water content, and geology. Many triggers can cause a landslide: intense rainfall, earthquakes, or human-induced factors like excavation along a landslide toe or loading at the top. Landslides can cause severe damage to buildings and infrastructure. Fast-moving landslides may pose life safety risks and can occur throughout Oregon (Burns and others, 2016)." (Williams & Calhoun, 2022)

Landslide Events

The historical timeline for the city suggests that no major landslide events have occurred within the City of Cottage Grove in recent history. Evidence along on the escarpment of Mt. David reveal prior landslides occurred in this area approximately 500 years ago. Small slope movements have occurred along the northern side of Mt. David along the edge of Holly Avenue since 2003, when the hillside was logged.

Vulnerabilities

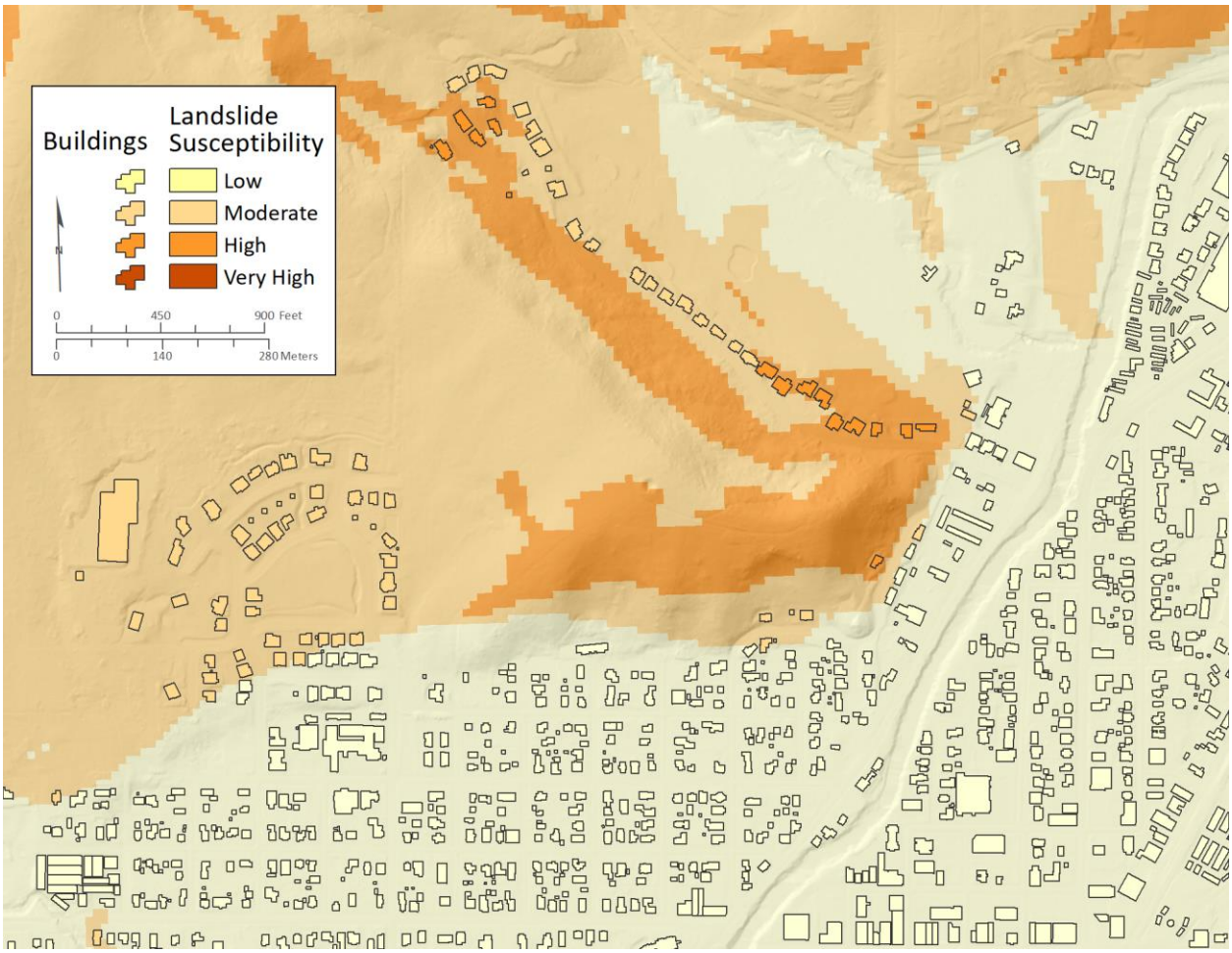
Landslide hazards within the City of Cottage Grove are concentrated in the Mt. David area, especially portions of the north, south, and east sides of Mt. David along Holly Avenue and Kalapuya Way. Construction has already occurred on the lower potions of Holly Avenue and portions of Kalapuya Way. Other debris-flow hazards located within the City of Cottage Grove are above and east of the 22nd Street neighborhood.

Data from the statewide landslide susceptibility map (Burns and others, 2016) was used for the Cottage Grove landslide analysis. The statewide landslide susceptibility map varies significantly in quality across the state, depending on the quality of the input datasets. It is important to note that the landslide maps for this area are incomplete and an upcoming study will likely update and replace the source data within the next three years. New data should be incorporated into future risk assessments.

The amount of exposure to landslide hazard in Cottage Grove is low, with less than 1% of building value exposed to high or very high susceptibility. Much of Cottage Grove is built on stream sediments within the Coast Fork Willamette River floodplain, which tend to have low landslide hazard. Sloped areas surrounding the city are at higher risk for landslide. Existing landslides are present south of the city.

Landslide hazard is ubiquitous in a large percentage of undeveloped land and may present challenges for planning and mitigation efforts. Awareness of nearby areas of landslide hazard is beneficial to reducing risk for Cottage Grove.

Figure 8. Landslide susceptibility areas and building exposure example



Climate-Related Risk

According to the Lane County Future Projections Report, the climate risk primarily associated with landslides is heavy rain and its related metrics as landslides may result from the increased weight of soils saturated with water. “There is greater uncertainty in projections of future precipitation than projections of future temperature. Precipitation has high natural variability, and the atmospheric patterns that influence precipitation are represented differently among global climate models.” While, “by the 2050s under the higher emissions scenario, the average number of days per year in Lane County on which the landslide risk threshold is exceeded is projected to remain about the same, with a change of -0.2 days,” landslide risk depends on multiple site-specific factors and this metric does not reflect all aspects of the hazard (Dalton et al, 2022).

“Landslide risk also can become high when heavy precipitation falls on an area that burned within approximately the past five to ten years. The probability that an extreme rainfall event will occur within one year after an extreme fire-weather event in Oregon or Washington was projected to increase by 700% from 1980–2005 to 2100 under the higher emissions scenario (Touma et al., 2022).” (Dalton et al, 2022)

Landslide Risk Summary

Though less than one percent of the land area of Cottage Grove is subject to landslide hazards there are some areas in which landslides do pose a hazard to developed areas. These areas do not include any commercial or industrial developments. No critical facilities are located within a landslide hazard area. Due to the small percentage of land potentially impacted by landslides in Cottage Grove and the small amount of development in these areas, the Risk Assessment scores for landslides/debris flows are 82, previously 75, with a rating of low vulnerability and low probability.

Cottage Grove landslide exposure (High and Very High susceptibility):

- Number of buildings: 44
- Value of exposed buildings: $12,103,000
- Percentage of total value exposed: 0.8%
- Critical facilities exposed: 0
- Potentially displaced population: 79

Source: Williams & Calhoun, 2022.

Table 11. Landslide Exposure

(all dollar amounts in thousands)

Very High Susceptibility			High Susceptibility			Moderate Susceptibility		
Number of Buildings	Building Value ($)	Percent of Building Value Exposed	Number of Buildings	Building Value ($)	Percent of Building Value Exposed	Number of Buildings	Building Value ($)	Percent of Building Value Exposed
0	0	0%	44	12,103	0.8%	760	191,918	12%

Source: Williams & Calhoun, 2022.

Recommended Risk Reduction Actions

The 2022 DOGAMI Multi-Hazard Risk Report for Cottage Grove recommends:

- Conduct a lidar-based landslide inventory for the Cottage Grove area to create modern landslide inventory and susceptibility maps.
- Monitor ground movement in high susceptibility areas.
- Consider land value losses due to landslides in future risk assessments.

Wildfire

According to DOGAMI, "Wildfires are a natural part of the ecosystem in Oregon. However, wildfires can present a substantial hazard to life and property in many communities. The most common severe wildfire 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 a large fuel load (dense vegetation). Once a fire has started, its behavior is influenced by numerous conditions, including fuel, topography, weather, drought, and development (Gilbertson-Day and others, 2018). Post-wildfire geologic hazards can also present risk. These usually include flood, debris flows, and landslides. Post-wildfire geologic hazards were not evaluated in this project." (Williams & Calhoun, 2022)

"Human activities have modified fire dynamics in the western United States through clearance of native vegetation for agriculture and urbanization, fragmentation and exploitation of forests and other natural land-cover types, human population growth and increased recreational activities, introduction of highly flammable, non-native annual grasses, and replacement of indigenous or natural fires by extensive fire suppression and vegetation management. From 1985 through 2017, the annual area burned by high severity fires across forests in the western United States increased eightfold (Parks and Abatzoglou, 2020). However, area burned did not increase in naturally cool rainforests on the west side of the Cascade Range. Historically, wildfires in these rainforests occurred every few centuries due to the lack of ignitions and moist vegetation." (OCCRI, 2022)

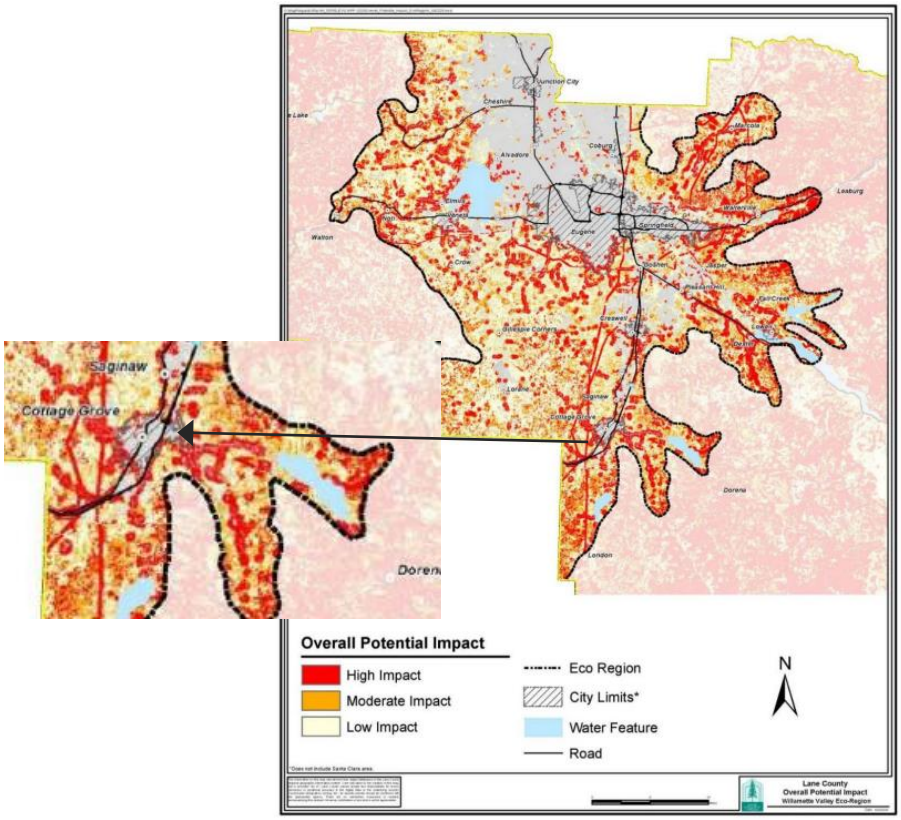
Previous Events

The only major wildfires to occur within the city limits of Cottage Grove within the last 200 years were on Mt. David, in 1986 and most recently in 2016, along the edge of Mt. David at the end of K Street. These fires were started by arson and no structures were lost. Wildfires have occurred in the nearby Umpqua National Forest periodically but have not approached developed areas.

The Labor Day wildfires that occurred in 2020 and which were declared a federal disaster (DR-4562) did not affect Cottage Grove directly, but the indirect affect of wildfire smoke did affect the city. These events are the reason why Wildfire Smoke was identified by the HMAC members during this plan update as an associated natural hazard of wildfire itself.

This historical account of wildfire was developed from the Cottage Grove Development Timeline created by community members using data from local historical resources, such as the Cottage Grove Museum. The probability of wildfire events in Cottage Grove was determined using scientific data, historical occurrences, and local knowledge. The Lane County Community Wildfire Protection Plan, 8/2020 provides maps of overall wildfire risk, and wildfire potential impact for the county. Cottage Grove is identified using the Quantitative Wildfire Risk Assessment (USFS) as a Community at Risk. The complete Lane County Community Wildfire Protection Plan can be accessed online at this link. Lane County CWPP -Final.pdf (civiclive.com)

Figure 9. Wildfire Potential Impact – Willamette Valley Ecoregion



Source: Lane County Community Wildfire Protection Plan, August 2020, inset by author.

Vulnerabilities

Wildfire hazards within the City of Cottage Grove occur mostly in the outlying areas of the city: in the north section of the city, in North Regional Park and Mt. David; to the west along the UGB edge including the Grove of Pines development as well as areas behind Bohemia Elementary School and Cottage Grove High School; and to the south on properties along the Willamette River Greenway. Fortunately, these are sparsely populated areas. To the east along Knox Butte there is also substantial wildland-urban interface potential. Much of this area is comprised of commercial timber lands under Lane County's jurisdiction that are zoned F-1 or F-2.

Community assets located in the wildland-urban interface hazard area include the Wastewater Treatment Facility, Bohemia School, Cottage Grove High School, South Lane County Fire & Rescue, and Knox Butte Reservoir.

The critical facilities that face wildland-urban interface hazard potential are major facilities that if incapacitated would cause tremendous problems for the City and citizens. Only one densely populated area within the UGB, the Grove of Pines subdivision, is in the wildland-urban interface hazard area.

Although only 10% of the land in Cottage Grove is located in the wildland-urban interface and there is no history of large wildland fire in the Cottage Grove area, the potential damage caused by such a fire is great. The NHMP Steering Committee Hazard Vulnerability Assessment scored wildfire both probability and vulnerability as moderate. DOGAMI's Multi-Hazard Vulnerability Assessment found no exposure to high wildfire hazard.

Cottage Grove wildfire exposure (High hazard):

- Number of buildings: 0
- Value of exposed buildings: $0
- Percentage of total value exposed: 0%
- Critical facilities exposed: 0
- Potentially displaced population: 0

Source: Williams & Calhoun, 2022.

Climate-Related Risk

"Wildfire risk, expressed as the average number of days per year on which fire danger is very high, is projected to increase in Lane County by 12 days (range -6–29) by the 2050s, relative to the historical baseline, under the higher emissions scenario." In the Future Conditions Report for Lane County, "the future change in wildfire risk is expressed as the increase in the average annual number of days on which fire danger is very high and VPD is extreme. Projections are presented for two future periods under two emissions scenarios compared to the historical baseline. A day on which fire danger is very high is defined as a day on which FM100 is lower (i.e., vegetation is drier) than the historical 10th percentile value." "Historically, fire danger in Lane County was very high on 36.5 days per year. A day on which VPD is extreme is defined as a day on which VPD exceeds the historical warm season (March–November) 90th percentile value. In Lane County, the average number of days per year on which vapor pressure deficit is extreme is projected to increase by 27 days (range 9–43) by the 2050s, compared to the historical baseline, under the higher emissions scenario. The average number of days per year on which fire danger is very high is projected to increase by 12 days (range -6–29) by the 2050s, compared to the historical baseline, under the higher emissions scenario."

"The average number of days per year on which VPD is extreme is projected to increase by 27 days (range 9–43) by the 2050s, compared to the historical baseline, under the higher emissions scenario (Figure 18 – see below)." (OCCRI, 2022).

Figure 10. Change in number of days with extreme vapor pressure deficit in Lane County

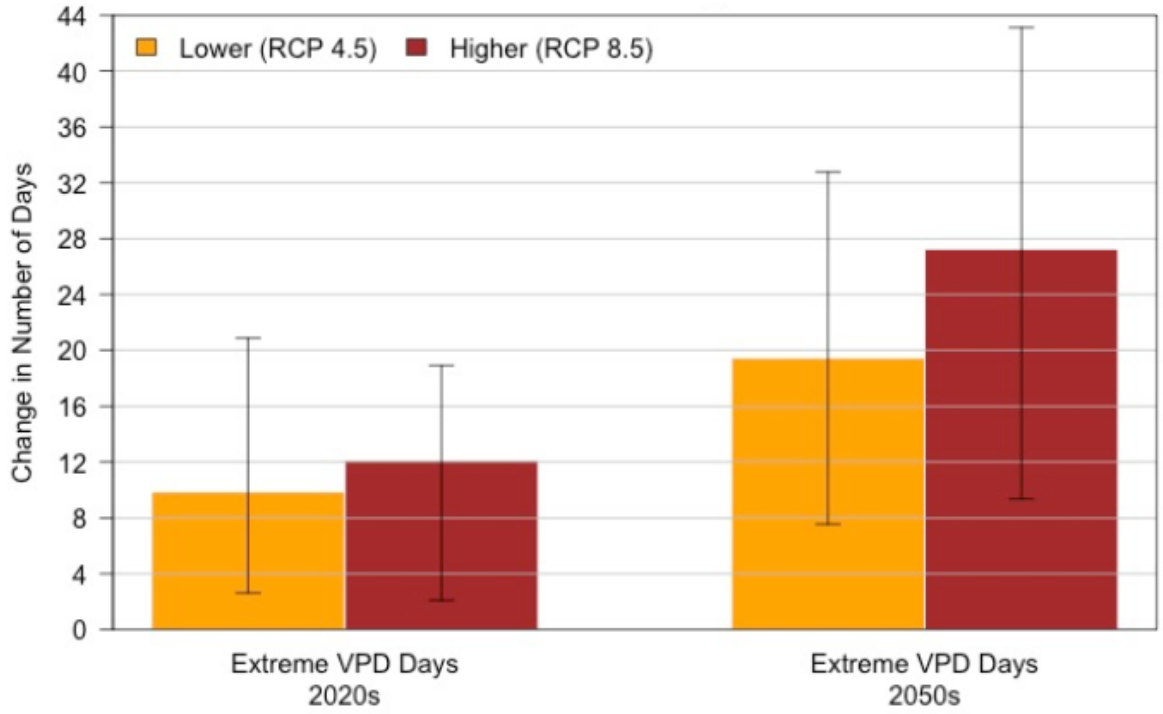


Figure 18. Projected changes by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the 1971–2000 historical baseline and under two emissions scenarios, in the number of days on which vapor pressure deficit in Lane County is extreme. Changes were calculated for each of 20 global climate models relative to each model's historical baseline, then averaged across the 20 models. Whiskers represent the range of changes across the 20 models. (Data Source: Climate Toolbox, climatetoolbox.org/tool/Climate-Mapper)

Recommended Risk Reduction Actions

The 2022 DOGAMI Multi-Hazard Risk Report for Cottage Grove recommends:

For wildfire-related geologic hazards (post-fire):

- Evaluate post-wildfire geologic hazards including flood, debris flows, and landslides.

Winter Storm

Winter storms are characterized by ice accumulation and freezing rain, heavy snowfall, and/or extreme cold and wind chill conditions. Impacts are determined by factors such as the amount and extent of snow or ice, air temperature, wind speed, event duration, day, and time. These hazard events typically create disruption of regional systems such as public utilities, telecommunications, and transportation routes. The public is generally advised to shelter in place and maintain adequate resources (emergency light, water, batteries, food, warm clothes).

An ice storm is used to describe occasions when ice accumulations damage trees, above ground utility lines, and affect travel surfaces. Heavy snowfall can cause extended periods of travel disruption and damage to structures. Exposure to extreme cold and wind chill associated with winter storms can be life-threatening, and pipes can freeze or burst.

The majority of winter storms result in power outages, blocked streets, and property damage from fallen trees.

Previous Events

During the effective period of the 2017 Cottage Grove NHMP late February 2019 (2/24-2/27/2019) saw two cold fronts that occurred within a few days of each other resulting in heavy snow. The damage caused included downed trees, road closures and extensive power outages. Lane County was among the areas affected by these events that were declared a federal disaster (DR-4432).

Vulnerabilities

Severe storms can be life threatening, cause major infrastructure damage, and can be difficult to manage in terms of response and recovery. Winter storms can cover the road networks with snow and ice, impeding transportation to schools and medical facilities. Winter storms and windstorms can topple trees, down power lines, and cause widespread power outages. Local utilities and Public Works crews could be strained during a severe storm event as they work to clear roads and repair or replace power distribution and/or transmission lines and maintain telephone lines for communication. Older residential areas such as the Northwest Neighborhood, 1-3rd Street neighborhood, and N. 10th Street neighborhoods, are more susceptible to winter storm hazards due to overhead power lines and large trees.

Climate-Related Risk

- Cold extremes will become less frequent and intense as the climate warms.
- In Lane County, the number of cold days (maximum temperature 32°F or lower) per year is projected to decrease by an average of 3 days (range -2– -5 days) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.
- In Lane County, the temperature on the coldest night of the year is projected to increase by an average of 6°F (range 2–10°F) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.

Winter Storm Risk Summary

Severe winter storm hazards occur where trees and vegetation align with utility and power lines as well as near roads and houses. Winter storm hazards are located throughout the city.

The Lane County NHMP indicates that the probability of future winter storms is high. The county NHMP reports that according to events reported by National Weather Service and FEMA, for the period 2006-2016 Lane County experienced 15 winter storm events, for an average of 1.5 per year. This frequency of equates to a High Probability of future occurrence according to the definitions set forth in the Methods and Definitions section of that plan.

Based upon the small size of Cottage Grove and the widespread nature of these events the HMAC determined that the Cottage Grove NHMP Risk Assessment Score for winter storms and severe weather reflects a high probability and high vulnerability, with a total threat score of 169.

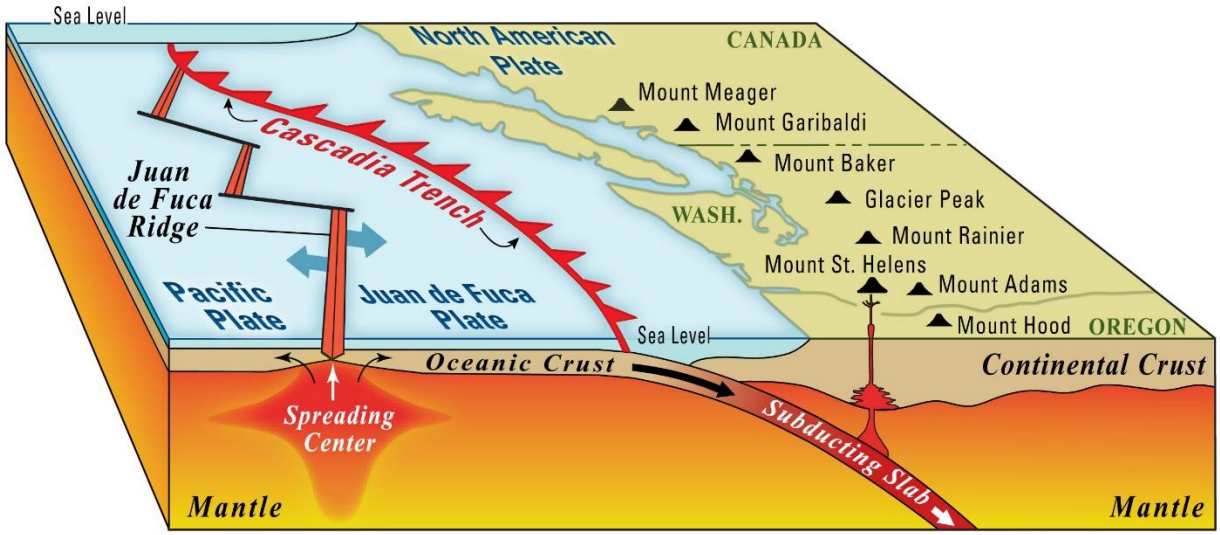
Earthquake

The DOGAMI Multi-Hazard Risk Assessment provides information about the nature of earthquakes. An earthquake results from a sudden movement of rock on each side of a fault in the earth's crust that abruptly releases strain accumulated over a long period of time. The movement along the fault produces waves of strong shaking that spread in all directions. If an earthquake occurs near populated areas, it may cause casualties, economic disruption, and extensive property damage (Madin and Burns, 2013). [5]

Oregon and the Pacific Northwest in general are susceptible to earthquakes from four sources: 1) the off-shore Cascadian Fault Zone; 2) deep intra-plate events within the subducting Juan de Fuca Plate; 3) shallow crustal events within the North American Plate; and 4) earthquakes associated with volcanic activity.

Two earthquake-induced hazards are liquefaction and coseismic landslides. Liquefaction occurs when saturated soils suddenly lose bearing capacity due to ground shaking, causing the soil to behave like a liquid; this action can be a source of tremendous damage. Coseismic landslides are mass movement of rock, debris, or soil induced by ground shaking. All of the earthquake loss estimates sourced from the DOGAMI multi-hazard risk report include damage derived from shaking itself, and from liquefaction and landsliding (Williams and Calhoun, 2022).

Figure 11. Cascadia Subduction Zone



Source: Dzurisin et al., 2013. https://www.usgs.gov/media/images/subduction-juan-de-fuca-plate-beneath-north-american-pla

Crustal earthquakes tend to be relatively shallow in depth, short in duration, and relatively low on the modified Richter scale - in the range of 1 to 4 in magnitude. These earthquakes represent stresses built up by the presence of the Cascadia Tectonic Subduction Zone but are not directly linked or connected to it. Shaking tends to be localized, and damages relatively low.

[5] Full citations are available in the complete DOGAMI MHRA for Cottage Grove, available in the Appendix C of this plan.

Cascadia Deep Subduction Zone earthquakes are directly caused by the Cascadia fault but occur deep in the earth where the Juan De Fuca plate is subducting into the Earth's mantle. These can cause moderate earthquakes but again tend to cause less damage as they are shorter in duration and lower in magnitude.

Cascadia Subduction Zone Shallow earthquakes are major events capable of temblors in the range of 8.6 to 9.2 on the modified Richter scale. These can occur in three types:

Southern Ruptures – the most common form of shallow Cascadia events and is capable of causing tsunami on the coast. Shaking can last 1 to 3 minutes but tend to be of lower magnitude and duration than full ruptures of the 600-mile-long fault. The City of Cottage Grove may see shaking, liquefaction, and other forms of damage from these events.

Southern to Mid-State Ruptures - these are not as common as the exclusively southern ruptures but occur closer to Cottage Grove presenting a greater risk to the community. While not directly threatened by the tsunami generated by these types of Cascadia events, it will greatly impact the coast, which may impact Cottage Grove in the form of evacuees moving east. The City may also experience shaking, liquefaction, and other related damages from these events.

Cascadia Full Rupture – These are events referred to as "The Big One" and are devastating large scale earthquakes. Widespread damage on the Oregon Coast will occur from both the shaking and the tsunami generated. Inland, shaking will last from three to five minutes, with significant damage to state wide infrastructure from the Cascade mountain range west to the Pacific Ocean. Cottage Grove will experience significant direct and indirect effects from a Cascadia Full Rupture event.

According to the Oregon NHMP (2020), the return period for the largest of the CSZ earthquakes (Magnitude 9.0+) is 530 years with the last CSZ event occurring on January 26, 1700. The probability of a 9.0+ CSZ event occurring in the next 50 years ranges from 7 - 12%. Notably, 10 - 20 "smaller" Magnitude 8.3 - 8.5 earthquakes identified over the past 10,000 years affect only 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%.

Previous Events

Small earthquakes occur throughout the region on a semi-frequent basis. The latest earthquakes in Oregon over 4.0 in magnitude were in Newport on August 18, 2004, and Walterville, Oregon on July 4, 2015 measuring 4.2 in magnitude.

The most recent full Cascadia Subduction Zone rupture event occurred on January 26, 1700 creating an "orphan" tsunami on Japan's eastern coast. This event is known in significant detail due to records kept in Japan at the time, and when combined with drilling cores done off the coast of Oregon, Washington, and California by Oregon State University Geologists, we have a strong timeline of past events occurring on the Cascadia Fault:

Vulnerabilities

There are several areas within the City that are assessed at a higher risk, largely due to the threat of landslides on steeper slopes. One of these is located in NW Cottage Grove, four more can be found in the SE of the city and are illustrated in Figure 10 "Relative Earthquake Hazard".

There are two distinct lines of low to intermediate hazard running through the city. These lines diverge near the I-5 Row River Road intersection. The west branch of the hazard area runs through the North 10th Street area and continues down Highway 99. The east branch follows closely along Row River. The only intermediate to high hazard area is located along Holly Avenue where the Hidden Valley development exists on the border of Hidden Valley Golf Course.

DOGAMI Findings:

- Most of the study area's critical facilities are at significant risk to earthquake hazard—Critical facilities were identified and were specifically examined for this report. We estimate that 80% (8 of 10) of Cottage Grove's critical facilities will be non-functioning after a CSZ 9.0 Mw earthquake.
- Moderate overall damage and losses can occur from an earthquake—Based on the results of a CSZ Mw 9.0 earthquake, every building and resident in Cottage Grove would experience moderate impact and disruption. Results show that an earthquake can cause building losses of 7% in the study area. The high vulnerability of the building inventory (building type) and the number of buildings constructed on seismically amplifying soils contribute to the estimated levels of losses expected in the study area. Lidar-based geohazard mapping would increase the accuracy of the earthquake hazard results.
- Retrofitting buildings to modern seismic building codes can reduce damages and losses from earthquake shaking—Seismic building codes have a major influence on earthquake shaking damage estimated in this study. We found that retrofitting to at least moderate code was the most efficient mitigation strategy because the additional benefit from retrofitting to high code was minimal. In our simulation of upgrading buildings to at least moderate code, the estimated loss for the entire study area was reduced from 7.1% to 1.8%. Communities with older buildings that were constructed below the moderate seismic code standards are both the most vulnerable and have the greatest potential for risk reduction. Although seismic retrofits are an effective strategy for reducing earthquake shaking damage, it should be noted that earthquake-induced landslide will also be present near the perimeter of Cottage Grove.

Cottage Grove CSZ Mw 9.0 earthquake results:

- Number of red-tagged buildings: 28
- Number of yellow-tagged buildings: 290
- Loss estimate: $111,599,000
- Loss ratio: 7.1%
- Non-functioning critical facilities: 8
- Potentially displaced population: 37

Source: Williams & Calhoun, 2022.

The Cascadia Subduction Zone is one of the largest natural hazards in the United States. Cottage Grove, like the rest of Western Oregon, will suffer from the loss of state infrastructure, and lack of basic services will significantly impact residents for a considerable period of time after the shaking has subsided.

DOGAMI identified locations within the study area that are comparatively at greater risk to earthquake hazard:

- A cluster of manufactured homes in the northeastern portion of Cottage Grove are more vulnerable to earthquake damage relative to other structures.
- Many high value buildings in commercial areas in Cottage Grove are built with more vulnerable building materials compared to wood-built structures.
- Critical facilities in the study area that were built before seismic building code standards are at risk to be non-functioning due to an earthquake like the one simulated in this study (Williams & Calhoun, 2022).

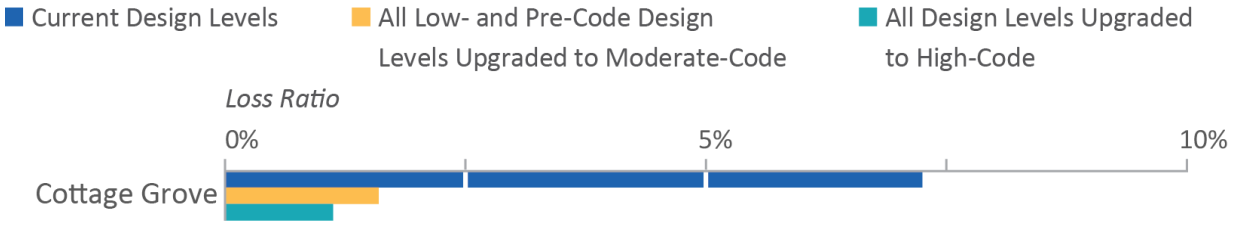
Climate-Related Risk

- Climate change does not affect the community's earthquake risk.

Recommended Risk Reduction Actions

- According to DOGAMI, "if buildings could be seismically retrofitted to higher code standards, earthquake risk would be greatly reduced. In this study, a simulation in Hazus-MH earthquake analysis shows that loss ratios drop from 7.1% to 1.8%, when all buildings are upgraded to at least moderate code level."

Figure 12. CSZ Mw 9.0 earthquake loss ratio with simulated seismic upgrades



Source: Williams & Calhoun, 2022

Drought

Drought is commonly defined as a deficiency of precipitation over an extended period (usually a season or more), resulting in a water shortage (NDMC, 2020). The extent of drought events depends upon the degree of moisture deficiency, and the duration and size of the affected area. Typically, droughts occur as regional events and often affect more than one city and county. Drought is frequently an "incremental" hazard; the onset and end are often difficult to determine. In addition, the effects of drought may accumulate slowly over a considerable period and may linger for years after the event.

Western Oregon is blessed with a mild climate and generally plentiful rainfall. While Lane County is located in a temperate region where precipitation is generally adequate, it is not immune from the occurrence or effects of drought. Regional droughts do occur, and can affect local water table heights, the recharge rate of aquifers, local stream and tributary flow rates, and water quality, as well as other regional ecological effects on fish and wildlife habitat and riparian areas. Locally, reduced flow rates on the Row River could impact the city water supply both through a reduced volume, and increases in turbidity, which Public Works would need to mitigate. Drought would also impact adjacent forestry and agricultural industries and increase the risk of wildfire.

Table 12. Definitions and characteristics of various drought classes

Drought Class	Definition & Characteristics
Meteorological	• lack of precipitation • evaporative demand that exceeds precipitation • minimum period of time for consideration operationally is 90 days
Hydrological	• prolonged meteorological drought affects surface or subsurface water supply, such as streamflow, reservoir and lake levels, or groundwater levels • tends to evolve more slowly than meteorological drought, with extents longer than six months
Agricultural	• occurs when meteorological and hydrological drought impacts agricultural production • reflects precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and reduced availability of irrigation water
Socioeconomic	• occurs when meteorological, hydrological, or agricultural drought reduces the supply of some economic or social good or service • often affects state and federal drought declarations
Ecological	• undesirable changes in ecological state caused by deficits in water availability • usually caused by meteorological or hydrological drought • sensitivity to water limitation varies among species and life stages
Flash	• relatively short periods of warm surface temperatures, low relative humidities and precipitation deficits, and rapidly declining soil moisture • tend to develop and intensify rapidly within a few weeks, and may be generated or magnified by prolonged heat waves
Snow	• snowpack—or snow water equivalent (SWE)—is below average for a given point in the water year, traditionally 1 April • often followed by summers with low river and stream flows • warm snow drought—low snowpack with above average precipitation and temperature • dry snow drought—low snowpack and low precipitation

Source: Dalton and Fleishman, 2021; Fleishman et al., unpublished

Previous Events

Cottage Grove has had no previous drought events, such as those that would require a reduction of local water use or conservation order.

Vulnerabilities

Drought by itself is unlikely to present life-threatening conditions or cause physical damage to City infrastructure or critical facilities. Environmental impacts and economic losses, particularly to nearby agriculture, recreation, and forestry, and impacts to the City's water supply are the most prevalent concerns. Based upon this evaluation, the NHMP Risk Assessment score for drought shows a low probability and low vulnerability.

Climate-Related Risk

Drought is common in the Northwest. The incidence, extent, and severity of drought has increased over the last 20 years relative to the twentieth century, and this trend is expected to continue under future climate change (Dalton and Fleishman, 2021). Weather variability, increased dryness, reduced precipitation, and reduced snow pack are all key climate change impacts expected to exacerbate the drought hazard in future years.

The Future Conditions Report for Lane County presents projected changes in four variables indicative of drought: low spring snowpack (snow drought), low summer soil moisture from the surface to 140 cm below the surface (agricultural drought), low summer runoff (hydrological drought), and low summer precipitation (meteorological drought).

In Lane County, spring snowpack (that is, the snow water equivalent on April 1), summer runoff, summer soil moisture, and summer precipitation are projected to decline under both lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. Therefore, seasonal drought conditions will occur more frequently by the 2050s under both emissions scenarios (Dalton et al., 2022).

Recommended Risk Reduction Actions

Risk reduction actions relevant for the mitigation of drought at the municipal level include city operations, local policy, and education/outreach to foster positive actions by local individuals. These actions fall into the categories of water conservation, irrigation/water use technology, and vegetation management.

- Implementation and maintenance of the City of Cottage Grove's Water Conservation Plan.
- Consider expanding irrigation capabilities to areas of parks and street trees in which drought could kill or damage trees and other vegetation that provide ecosystem services like shade and moisture retention. For example, purchase a second golf cart with watering tank or create a fund for equipment or staffing for emergencies.
- Promote sustainable use of water by local customers. For example, the City maintains a webpage called Water Conservation at https://www.cottagegroveor.gov/cd/page/water-conservation with an array of home water conservation recommendations.
- Continue to foster local understanding and capacity for managing local vegetation and ecosystems via the Urban Forestry Commission. https://www.cottagegroveor.gov/ufc and support for the Coast Fork Willamette Watershed Council https://www.coastfork.org/ .

- Retention and management of tree canopy within city limits in order to mitigate the Urban Heat Island effect in which pavement retains and reradiates heat during summer and extreme heat events. The City requires best practices such as “right tree-right place” like those outlined in Street Tree Regulations outlined in the Cottage Grove Municipal Code Chapter 12.20. https://www.cottagegroveor.gov/sites/default/files/fileattachments/urban_forestry_commission/page/229/cgmc_all_street_trees_1.pdf

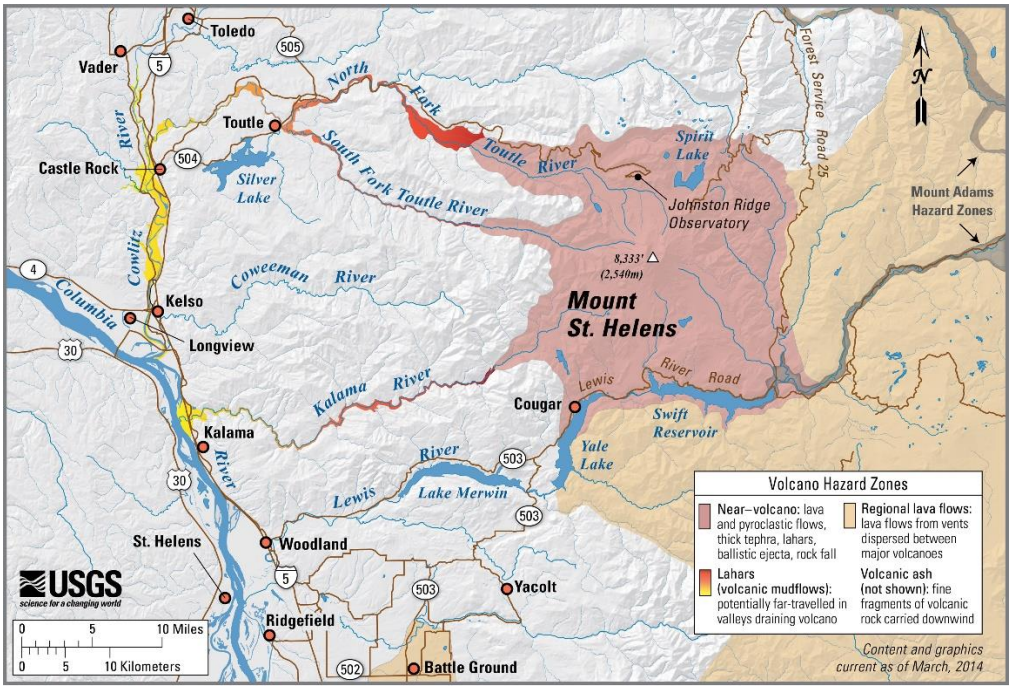
Volcanic Eruption

Mount St. Helens, located in Washington State, is the most active volcano in the Cascade Range, and it is the most likely of the contiguous U.S. volcanoes to erupt in the future. The volcano is almost 53 km (33 mi) due west of Mount Adams and approximately 80 km (50 mi) northeast of the Vancouver, Washington—Portland, Oregon metropolitan area. Volcanism occurs at Mount St. Helens and other volcanoes in the Cascades arc due to subduction of the Juan de Fuca plate off the western coast of North America.

As can be seen from the map below, volcanic eruption hazards are primarily due west of the volcano. However, volcanic ash and possibly gasses are risks for the Willamette Valley posed by an eruption from Mount St. Helens, particularly if unusual east winds were prevailing. Volcanic ash consists of consists of tiny, jagged pieces of rock and glass. Ash is hard, abrasive, mildly corrosive, conducts electricity when wet, and does not dissolve in water. Ash is spread over broad areas by wind. Volcanic gases include gases and aerosols emitted from a volcanic vent before, during or after a volcanic eruption—these are very unlikely to reach Cottage Grove. Due to the monitoring conducted by geologists on volcanoes, the City would receive a warning prior to the arrival of an ash cloud. The sky could turn hazy or “dusty” upon arrival of an ash cloud, and if it was rainy, the ash could turn the particles into a slurry of slippery mud. An ashfall is mostly “dirty” and can be an irritant to eyes and lungs, with a trace or dusting of ash (<1/32”), creating low levels of impact for most people. (USGS, 2022. https://volcanoes.usgs.gov/)

As such, volcanic ash and gases are a low-probability hazard that poses a low to moderate impact to human health, structures, power generation and transmission, water systems, ground and air transportation, agriculture, and human health. See the Volcanic Ashfall Impacts Working Group for detailed information: https://volcanoes.usgs.gov/volcanic_ash/

Figure 13. Mount St. Helens Hazards Map



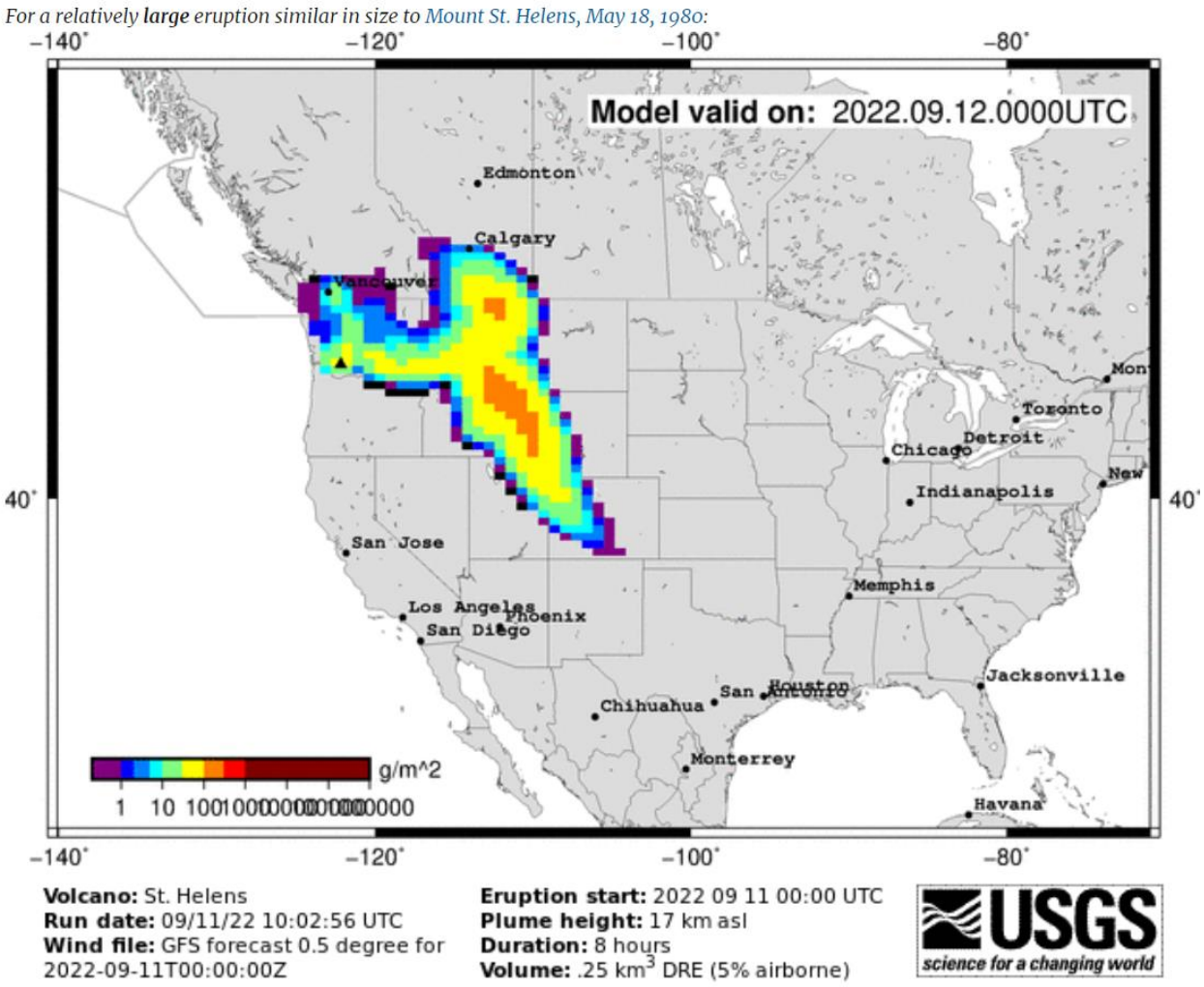
Source: USGS https://www.usgs.gov/media/images/mount-st-helens-washington-simplified-hazards-map

Over its rich and complex 275,000-year history, Mount St. Helens has produced both violent explosive eruptions of volcanic tephra and relatively quiet outpourings of lava. It was only during the past few thousand years that the volcano grew to its pre-1980 elevation of 2,950 m (9,677 ft), making it the, then, fifth highest peak in Washington.

Previous Events

On May 18, 1980, Mount St. Helens erupted. The only volcanic activity of note in the Pacific Northwest in recent times occurred in the spring of 1980, with the violent eruption and landslide at Mt. St. Helens in Southern Washington State. This event caused little in the way of disruption in Cottage Grove.

Figure 14. Predicted Mt. St. Helens Ash Plume



USGS, 2022. https://www.usgs.gov/volcanoes/mount-st.-helens/ash-cloud-simulations-what-if-mount-st-helens-produced-explosive

Vulnerabilities

Water and Wastewater Systems: If runoff and sewage that is carrying volcanic ash entering a treatment plant is likely to cause failure of mechanical prescreening equipment such as step screens or rotating screens. Ash that penetrates further into the system can settle and reduce the capacity of biological reactors as well as increasing the volume of sludge and changing its composition.

Vehicles, farm animals, and large outdoor gatherings of people far from indoor shelter can be exposed to volcanic ash.

Table 13. Table of ashfall severities based on accumulated thickness

Table of ashfall severities based on accumulated thickness.

Term	Accumulation (inches)	Accumulation (decimal inches & SI unit)	Key Impact Thresholds (cumulative)
Trace or dusting	<1/32 in	0.031 in (< 0.8 mm)	Eye and respiratory irritant, very low level impacts for most people.
Minor	1/32 – 1/4 in	0.031 – 0.25 in (0.8 – 6.4 mm)	Possible crop, animal equipment, and infrastructure problems; widespread clean-up likely.
Moderate	1/4 – 1 in	0.25 – 1.0 in (6.4 –25.4 mm)	Ash removal efforts significant.

Climate-Related Risk

The causal risk of a volcanic eruption is unrelated to climate change, but the potential impact of a volcanic eruption is elevated due to climate-related impacts of drought and wildfire on air quality. That is, air quality trends are expected to be negatively impacted by climate change, so vulnerable populations would be at greater risk of health problems resulting from ashfall or toxic air emissions from an eruption.

Recommended Risk Reduction Actions

Prepare a stock press release or notification advisory that includes recommendations for the community to shelter in place, use masks if exposed to volcanic ash, and to protect animals and assets from the acidic qualities of wet ash and rainfall during an ashfall event.

Identify suitable ash storage and disposal sites. Best practices for disposal sites indicate that Ash removed from roads, buildings, and other structures should be disposed of in a place and manner that:

- does not create a new hazard to the public or adjacent landowners.
- does not allow wind or water to redistribute the ash.
- the ash does not have to be moved again.
- Prepare individuals, organizations, and businesses to shelter in place.

Section 4: Mitigation Strategy

Mission, Goals and Objectives

Mission

The mission of the City of Cottage Grove Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, and property from natural hazards. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the City towards a safer, more sustainable community.

Goals & Objectives

The plan goals provide guidance in developing specific action items from the general mission statement. The goals describe the overall direction the City of Cottage Grove desires to work toward in mitigating the effects of natural hazards. Our goals and priorities remain largely unchanged from the 2012 NHMP, as Cottage Grove has grown only slightly in the interim period and has not seen any political, economic, social or environmental changes since the last plan was written. Raising understanding of hazards exacerbated by climate change, such as winter storms and drought, has increased awareness of these issues, which is reflected in the 2023 plan's hazard section.

Protect life and reduce risk to property from losses due to natural hazards.

- Identify chronic hazard events; reduce losses and repetitive damage.
- Improve hazard data and analysis for current and future conditions; use best available data to make recommendations for risk reduction.
- Discourage new development in areas vulnerable to natural hazards.
- Prioritize existing vulnerable areas for funding.
- Ensure the ability of the whole community to recover from disaster by planning for all stages of the disaster cycle: preparedness, response, mitigation, and recovery.

Raise awareness about the risks of natural hazards and the strategies to mitigate them.

- Develop and implement educational outreach programs with community-based organizations (CBOs) to increase public awareness of the hazards associated with natural disasters.
- Provide information on tools, partnerships, and funding resources to assist in implementing hazard mitigation actions via city and partner websites, events, and community engagement.

Emergency Services→ Reduce or prevent damage to critical facilities, services, and equipment from a natural hazard event.

- Establish policy to ensure mitigation for critical facilities, services, and infrastructure.
- Coordinate and integrate natural hazard mitigation activities with emergency operations plans and procedures.

Partnerships and Implementation→ Increase cooperation and collaboration among mitigation partners to protect the economic, social, and cultural engines of the community.

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, businesses, and industry.

- Encourage leadership within the public and private sectors to prioritize and implement local, county, and regional hazard mitigation activities.

Maintain State & Federal compliance required for funding and NFIP enrollment.

- Meet the Federal Emergency Management Associations (FEMA) mitigation planning requirements so Cottage Grove remains eligible for pre- and post-disaster mitigation funding from FEMA.
- Continue to comply with National Flood Insurance Program requirements.
- Meet Oregon's Goal 7 natural hazard planning guidelines.

Mission & Goals Process

The Cottage Grove Hazards Mitigation Advisory Committee (HMAC) reviewed the mission, goals, and objective and decided to retain them as is. The HMAC members worked together and in small groups to evaluate and update mitigation actions.

Goals were originally developed as part of the 2005 Cottage Grove Natural Hazards Mitigation Plan and were significantly revised in a previous update. The 2022-23 Steering Committee affirmed the current mission and goals as stated in the 2016 plan update.

Additional planning process documentation is in Appendices F and G.

Authorities & Capabilities

Flood Hazard Authorities & Capabilities

The City of Cottage Grove takes a four-pronged approach to addressing flood hazards in the city:

- Floodplain management—NFIP & CRS
- Flood loss mitigation
- Agency Coordination
- Education and Awareness

Floodplain Management—NFIP & CRS

The City prepares and requests from applicants at the Planning Desk, all of the documentation needed for the floodplain management program. This documentation is a major component of both the capability and capacity need of the program which takes many years for a community to build up to as the work is built on staff knowledge and operational procedures that use best practices.

Floodplain Management best practices (required by FEMA) and implemented by the City include:

- Use of a floodplain permit form or use of an appendix to the standard building permit.
- No variances issued for floodplain permits.
- Documentation of improvement and repair costs of properties in the floodplain by homeowners and contractors to ensure enforcement of substantial damage and substantial improvement requirements.
- Documentation of approval conditions of floodplain permits, permit tracking.

- Conducting inspections at multiple times in the permitting process, especially for documentation of the lowest floor elevation and the correct installation of electrical/mechanical systems and tanks.
- Written Standard Operating Procedures
- Internal annual review and coordination across departments

NFIP: National Flood Insurance Program

Floodplain management is the administration of regulations applying to private and public property, such as those regulated by the National Flood Insurance Program which are reflected in the City's flood code. Cottage Grove participates in the National Flood Insurance Program, which enables property and business owners to qualify for federally underwritten flood insurance. The City meets all minimum federal requirements with regard to federal flood legislation, laws, regulations, and local code.

The City has established a Floodplain Manager a role performed by the city's Senior Planner. The most recent Community Assistance Visit was conducted on April 28, 2020 with positive reviews, and no administrative or potential violations identified.

CRS: Community Rating System

The City participates in the Community Rating System (CRS), a voluntary program that requires a staff expertise in FEMA's NFIP program and was rated as a class 6 at its last cycle visit. By implementing this program using best practices, the City is able to reduce flood insurance costs to residents.

The City intends to proactively continue its efforts to reduce flood risk. For example, the City adopted a higher standard for building elevation. The city enacted a 2' freeboard requirement that requires new construction or substantial improvements to be elevated 2' above the Base Flood Elevation. The Community Rating System (CRS) promotes implementation of higher standards in order to provide insurance reductions to participating communities.

The city staff participate in state-wide water management group led by USACE for flood-controlled streams (join conference call held on a weekly, bi-weekly, or as needed basis). Participate in Northwest Regional Floodplain Management Association (NORFMA) and Association of State Floodplain Managers (ASFM).

Flood Loss Mitigation

By conducting maintenance and enhancement of City-owned facilities, utilities, and other critical facilities, the City mitigates its potential flood loss. For example, the City has hardened its drinking water intake facility to be flood-proof, adopted a Stormwater Management Plan, and upgraded stormwater outfalls to insure urban drainage in high flow events. The City is also working to collect data to understand how City Hall may be at risk from a major flood disaster, and what potential solutions may be.

Agency Coordination

Coordination and communication with private and public owners of facilities and utilities relied upon by the City and its residents, is important for understanding risk, securing funding, and developing/ implementing best practices at the local level. Cooperation and coordination with local partners like South Lane County Fire & Rescue (SLCF&R) become especially important when considering hazard scenarios in which the City's Emergency Operations Center (EOC) could be unusable such as a flood disaster. The City is in communication with federal agencies like the US Army Corps of Engineers who

manage the Willamette Valley Project dams for the purposes of communication of flood risk and water levels at the City's Water Plant.

Education and Awareness

The City prioritizes education and awareness of flood risks. For example, the City of Cottage Grove provides online access to mapping tools that include floodplain maps: https://www.cottagegroveor.gov/cd/page/city-maps Additionally, the Oregon Department of Geology and Mineral Industries (DOGAMI) provides the online tool HAZVU, which is available to the general public: https://www.oregongeology.org/hazvu/ Detailed mapping resources can be found at Lane County GIS, located at: https://www.lanecounty.org/cms/one.aspx?pageId=4196385

Landslide Hazard Authorities & Capabilities

The City of Cottage Grove actively manages landslide risk by acquiring the best available data and making it publicly available. The City has identified steep slopes that may be susceptible to landslide hazards and regulates development in these areas by implementing the following codes.

Codes Pertaining to Landslides

The standards in *Chapter 14.3.7.100 Hillside Development* are applicable to any development subject to Land Use or Site Design Review on hillsides, in designated floodplains, along river corridors, or within the state-designated Willamette River Greenway. Development is regulated in hillside areas of 15% or greater.

- The City of Cottage Grove Comprehensive Plan addresses hillside development. In 1977 a report was completed entitled: *The City and Its Hillsides: A Report Concerning Future Hillside Development*. This report and the Comprehensive Plan address the need for a hillside development ordinance.
- In 2008, Chapter 14.3.7.100 Hillside Development was adopted as part of the Cottage Grove Development Code. The intent and purpose of this code includes:
    - To implement the landslide hazard prevention goals in the City of Cottage Grove Natural Hazard Mitigation Plan;
    - To implement the "Hillside Development" element of the City of Cottage Grove Comprehensive Plan;c
    - To provide for the review of hillside development applications and evaluate properties for potential slope related hazards;
    - To assess the risk that a proposed use or activity may adversely affect the stability and slide susceptibility of an area; and thus promote the public health, safety, and welfare;
    - To establish standards and requirements for the development of lands in a hillside area;
    - To mitigate risk within a hillside area, not to act as a guarantee that the hazard risk will be eliminated, nor as a guarantee that there is a higher risk of hazard at any location.

Wildfire Hazard Authorities & Capabilities

The South Lane County Fire & Rescue District covers 150 square miles with a population of 25,000. The district is comprised of an urban and rural mix of residential properties, light industry, commercial, and forestland. The fire district provides information and public outreach during the year to promote fire safety awareness.

Codes Pertaining to Wildfires

Cottage Grove Municipal Code 8.12.040, Noxious Vegetation, states:

"No person shall allow, cause, permit or suffer noxious vegetation on property or in the right of way of a street, alley or sidewalk abutting the property. Noxious vegetation must be cut down or destroyed as often as needed to prevent the creation of a health, fire or traffic hazard, or in the case of weeds or other noxious vegetation, from maturing or from going to seed. Noxious vegetation includes:

A. Vegetation that is or is likely to become:

    a. A health hazard;
    b. A fire hazard;
    c. A traffic hazard, because it impairs the view of a public right of way or otherwise makes the use of the thoroughfare hazardous; or
    d. Grass or weeds exceeding 12 inches. Properties used for crop cultivation and livestock grazing are exempt from the tall grass and weeds provision if a five-foot-wide cut or cleared fire break surrounds the perimeter of the property.

B. Poison Oak.
C. Poison Ivy.
D. Blackberry bushes that extend into a public way or a pathway frequently by children or cross a property line."

This code is aggressively enforced between June 15 and October 15 of each year by the Community Development Department with the help of the South Lane County Fire & Rescue District. Enforcement ensures that fire hazard within the city limits is low during the dry summer months.

Local Fire Prevention/Education Programs

South Lane County Fire & Rescue Department offers the following fire prevention/education services for its residents.

- Smokey The Bear
- 1st Grade Fire Awareness
- Business Fire Inspections
- Educational Classes upon Request
- Fire Prevention Week
- Community Emergency Response Team (CERT) training

Drought Hazard Authorities & Capabilities

Water Rights

When the City moved its drinking water intake location from Layng Creek, 10 miles upstream on the Umpqua National Forest to the Row River at the Water Plant, the City's water right also needed to be

transferred. Oregon Water Resources Department (OWRD) stipulated that the City needed to draft and implement a Water Conservation Plan as part of the transfer. As such, the City has established regular operations and technology that foster the sustainable production and use of water. The City, via a partnership with OWRD, coordinates with the US Army Corps of Engineers (USACE) on the management of stored water for in Dorena Dam allocated for municipal use, essentially giving the City authority to access late season streamflow that would mitigate drought under all but the most extreme conditions. If drought conditions became severe enough to limit the City's water right, and thus municipal use, the procedures and authority have been established to do so in the City's Water Conservation Plan.

Volcanic Eruption Hazard Authorities & Capabilities

Debris Management

The City would use its Public Works road maintenance and debris management capabilities to address the impacts of ashfall, as well as its emergency response and notification authority to notify residents of the risks of ashfall.

The city has the ability to address emergency situations as they arise and also has some capacity to expand existing capabilities to mitigate natural hazards. The city currently employs 2 CFMs who have the ability to conduct flood mitigation activities. The Public Works Department can mobilize additional PW staff to address debris management issues. The PW Dept has also conducted training of team members to do damage assessment in the event of an earthquake. PW staff can not address the street tree requirements and is looking into a grant funded staff to address this.

Mitigation Action Items

Short and long-term action items identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local developments, residents, and others could engage in to reduce risk. They address both All-Hazard and hazard-specific issues.

The Cottage Grove Community Development Department staff and Hazard Mitigation Advisory Committee (HMAC) developed the action items presented in this plan. These action items are a combination of revised action items from the 2016 NHMP Mitigation Action Item list and new action items that address hazards and opportunities identified during the 2022-23 update process, including increased awareness of increased risk from climate change-related hazards, such as drought, and opportunities presented by recent planning projects focused on stormwater management, floodplain management and drinking water protection The mitigation strategies were not impacted by changes in land use, however, as Cottage Grove has seen little growth or change in land use since the last Natural Hazard Mitigation Plan was adopted.

During the update process, city staff identified the status of actions from the previous Natural Hazard Mitigation Plan, then summarized the outcomes or made revisions if needed so that the Mitigation Actions reflect the current priorities in Cottage Grove.

The plan was revised and updated in 2023 during which the 2016 action items were compiled from the separate entries in each of the sections in Chapter 3: Natural Hazards and then divided differently into tables for actions Completed, Removed, Ongoing and Progressing/Retained. The Action Items are specific, and detail where possible the Estimated Cost, expected Timeline, Responsible Agency(s), and

Priority level. These action items can assist the community in supporting potential projects for grant funding.

The list of Progressing and Retained Action items include both short-term (1-3 years), medium term (3-5 years) and long term (> 5 years) activities. Each action item includes an estimate of the timeline for implementation. Feasibility has not been evaluated. Action items may require new or additional resources and/or authorities or may be part of the city's annual work program and Capital Improvement Plan. Ongoing actions are those that are within the city's current capacity and are conducted periodically or on a regular schedule.

Table 14. Completed Mitigation Actions 2017-2023

Hazard	Action Category	Mitigation Action	2023 Action #	2023 Status	Description/ Problem Statement
Earthquake	Address community vulnerability to seismic threats.	Develop an inventory of public, commercial, and historically significant buildings that may be particularly vulnerable to earthquake damage.	EQ 1.1	**Completed**	
Earthquake	Address community vulnerability to seismic threats.	Inventory of buildings within Downtown Historic District vulnerable to earthquake damage, and investigate potential funding sources for building retrofits.	EQ 1.2	**Completed**	
Flood	Flood Loss Mitigation	Extend the freeboard requirement.	FL 3.2	**Completed**	Freeboard requirement of 2' above BFE was adopted.
Flood	Flood Loss Mitigation	Mitigate flooding by limiting or restricting how development occurs in flood prone areas through actions such as: Prohibit or limit floodway development through regulatory and/or incentive-based measures; Limit the density of developments in the floodplain; Require that floodways be kept as open space; Manage and enforce a riparian buffer ordinance to protect water resources and limit flood impacts; Limit fill in floodplain areas.	FL 3.3	**Complete**	Section 14.37.200 of the CGMC
Flood	Floodplain Management	Require and maintain FEMA elevation certificates for all new and improved buildings located in floodplains. (Records are maintained in the Cottage Grove Community Development Office.)	FL 4.3	**Complete and ongoing**	Maintain records of all existing and new Floodplain Development Permits
Flood	Floodplain Management	Include requirements in the local floodplain ordinance for homeowners to sign non-conversion agreements for areas below base flood elevation.	FL 4.4	**Complete and ongoing**	CRS requirement
Flood	Floodplain Management	Maintain and provide access to Flood Insurance Rate Maps.	FL 4.5	**Complete and ongoing**	CRS requirement
Flood	Stormwater Management and Improvement	Develop stormwater management standards in Development Code.	FL 5.5	**Complete**	Located in code section 14.35.200

Hazard	Action Category	Mitigation Action	2023 Action #	2023 Status	Description/ Problem Statement
Landslide	Landslide Mitigation	Utilize Geospatial Information Systems (GIS) to map, identify, and study landslide hazard areas; develop and maintain a database to track community vulnerability to landslides.	LS 1.1	**Complete**	DOGAMI MHRA did this
Landslide	Regulatory tools and enforcement	Create and adopt regulations regarding erosion control.	LS 3.1	**Complete**	
Winter and Severe Storm	Create a Debris Management Plan	Determine major stakeholders and begin planning process for a Debris Management Plan.	SS 2.1	**Complete**	After “snowmagedon” debris management became a concern; a couple of sites are established for depositing woody debris after a storm; if it were more substantial city would contract for removal
Winter and Severe Storm	Ensure that critical facilities have backup power and emergency operations plans to deal with power outages.	Maintain backup power availability at Critical Facilities including the City EOC, backup EOC.	SS 4.1	**Complete**	City hall has backup generator; PW shop is backup EOC; generator is there, but not sure of the capacity; have portable generators that can be used; also have a fuel trailer; WiFi has a generator; water and wastewater plant both have standby generators.
Wildfire	Incorporate wildfire mitigation in the comprehensive plan.	Recognize the existence of wildfire hazards and identify areas of risk based on a wildfire vulnerability assessment.	WF 1.2	**Complete**	DOGAMI MHRA identifies specific areas that are most at risk of wildfire within the city.
Wildfire	Reduce risk to wildfire through land use planning	Enacted a Hazardous Vegetation ordinance that prohibits vegetation that could cause a fire hazard. The so called "Tall Grass Ordinance" limits the height of dry vegetation between May and October.	WF 2.3	**Completed**; New Action	This action was initiated and completed since 2016. Members of the NHMP Steering Committee for Cottage Grove believe that the Tall Grass Ordinance has done the most to reduce wildfire risk in the city.
Wildfire	Reduce risk to wildfire through land use planning	Establish a program to assist property owners with their tree trimming by providing a convenient way to dispose of branches. The Tree Branch Pick Up program was established to support property owners who are establishing defensible space around their homes.	WF 2.4	**Completed;** New Action	This action was initiated and completed since 2016. The Public Works Department administers this program. The material collected is used or recycled within the city.

Table 15. Mitigation Actions Removed from the plan.

Hazard	Action Category	2017 Mitigation Action	2023 Action #	2023 Status	Description/ Problem Statement
All Hazards	Develop Community Involvement	Create a severe weather scenario to estimate potential damage and existing vulnerabilities within community to develop severe wind/weather mitigation priorities.	AH 1.3	Remove	Remove, city found this action not to be useful in mitigating risk
All Hazards	Develop Community Involvement	Develop tabletop or other exercises for the purposes of training city employees on how to respond to an emergency.	AH1.4	Remove; combined with AH 1.5	Combine with MH 1.5 and focus on doing this at the prep fair. Develop tabletop or other exercises for the purposes of training city employees on how to respond to an emergency.
Drought	Assess vulnerability to drought risk	Gather and analyze water and climate data to gain a better understanding of local climate and drought history.	DR 1.1	Remove	This is done during the NHMP process of evaluating hazards
Drought	Assess vulnerability to drought risk	Identify factors that affect the severity of a drought.	DR 1.2	Remove	This is done during the NHMP process of evaluating hazards
Drought	Assess vulnerability to drought risk	Identify alternative available water sources.	DR 1.3	Remove	City doesn't find this action to be doable at this time. City has a filtration skiff that can be used in alternate water source (switch from Row to South Fork).
Drought	Monitor drought conditions.	Identify local drought indicators, such as precipitation, temperature, surface water levels, soil moisture, etc.	DR 2.1	Remove	This is done during the NHMP process of evaluating hazards
Drought	Monitor water supply	Improve water supply monitoring through the installation of a USGS Monitoring system on Mosby Creek	DR 3.2	Remove	Retained as a flood action. Action is more related to flood rather than to water source for the city.
Earthquake	Address community vulnerability to seismic threats.	Create an earthquake scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within community to develop earthquake mitigation priorities (EOP Exercises).	EQ 1.4	Remove	Roll that into the prep fair. Removed as a separate action; rolled into the annual prep fair work

Hazard	Action Category	2017 Mitigation Action	2023 Action #	2023 Status	Description/ Problem Statement
Earthquake	Address community vulnerability to seismic threats.	Establish a school survey procedure and guidance document to inventory structural and non-structural hazards in and around school buildings.	EQ 1.5	Remove	Because this is the school district's purview, it was removed from the city's list, but the city supports the implementation of seismic retrofitting.
Flood	Agency Coordination	Coordinate with Coast Fork Willamette Watershed Council, USACE, and Oregon Department of Fish and Wildlife on Row River Nature Park flood storage improvements.	FL 1.3	Remove	No longer relevant.
Flood	Agency Coordination	Participate in state-wide water management group led by USACE for flood-controlled streams (join conference call held on a weekly, bi-weekly, or as needed basis). Participate in Northwest Regional Floodplain Management Association (NORFMA) and Association of State Floodplain Managers (ASFM).	FL 1.4	Remove	recognize these connnections in text, but not a mitigation action
Flood	Floodplain Management	Conduct NIFP community workshops to provide information and incentives for property owners to acquire flood insurance.	FL 4.2	Remove	The preferred risk policy is no longer available, so staff advises property owners on a one on one basis
Flood	Stormwater Management and Improvement	Integrate Natural Hazard Mitigation plan goals and policies with Total Maximum Daily Loads (TMDL) plan goals and policies.	FL 5.1	Remove	TMDL policies and goals exist on their own and don’t need the NHMP goals and policies to be integrated within them
Flood	Stormwater Management and Improvement	Compensate an owner for partial rights, such as easement or development rights, to prevent a property from being developed.	FL 5.10	Remove	Not within the appetite and capacity of the city
Flood	Stormwater Management and Improvement	Enforce Riparian Development standards.	FL 5.6	Remove	Enforcement is part of the day to day of CDD
Flood	Stormwater Management and Improvement	Develop an open space acquisition, reuse, and preservation plan targeting hazard areas.	FL 5.9	Remove	Utilize open space plan already in place.
Landslide	Landslide Mitigation	Develop and maintain a database to track community vulnerability to landslides.	LS 1.2	Remove	Elements of landslide hazard program already identified above

Hazard	Action Category	2017 Mitigation Action	2023 Action #	2023 Status	Description/ Problem Statement
Landslide	Evaluate Landslide Hazard on Mt. David	Engage in long term program to purchase land at high risk of landslide (i.e., Mt. David)	LS 2.2	Remove	NHMP Steering Committee did not believe this was feasible.
Winter and Severe Storm	Create a Debris Management Plan	Create a formal Memorandum of Understanding (MOU) with property owners for temporary storage of storm debris.	SS 2.2	Remove	Not necessary because temporary storage sites are city owned.
Wildfire	Incorporate wildfire mitigation in the comprehensive plan.	Describe policies and recommendations for addressing wildfire risk and discouraging expansion in the wildland-urban interface.	WF 1.3	Remove	This has been addressed through the OSFM work coming out of SB 762 and will be implemented when the Wildfire Hazard Map is released.
Wildfire	Reduce risk to wildfire through land use planning	Use GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development, infrastructure, etc.	WF 2.1	Remove	This action was combined with WF 4.1
Wildfire	Decrease vulnerability and risk from wildfire and increase public awareness to wildfire risks and mitigation actions.	Empower and educate property owners about wildfire mitigation techniques which reduce the risk to property and life.	WF 4.5	Remove	This may not be needed any more due to high level of awareness among the public via the State Fire Marshall's Office.
Wildfire	Encourage Fire-safe construction practices for existing and new construction in high-risk areas.	Provide developers, homeowners, and businesses with fire-safe construction practice information, and other mitigation options to reduce fire risk.	WF 5.1	Remove	This is addressed through building code for materials and defensible space. The action does not pertain as much to the city of Cottage Grove. Spacing and materials are already defined in the building and fire codes, so this is not something the city can affect.
Wildfire	Encourage Fire-safe construction practices for existing and new construction in high-risk areas.	Explore FireWise construction and development practices for new development.	WF 5.2	Remove	Remove because building and fire codes address these standards within the city. Should the city promote FireWise communities within the city, then this action might have more relevance.
Wildfire	Encourage Fire-safe construction practices for existing and new construction in high-risk areas.	Explore mitigation funding for existing houses on the perimeter of city at risk to wildfire.	WF 5.3	Remove	A few properties may be at risk, but the city can't require action.

Table 16. Ongoing Mitigation Actions

Hazard	Action Category	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	Lead City Department
All Hazards	Develop Community Involvement	AH 1.1	Ongoing	Work with insurance companies, utility providers, and others to include all hazard information in materials provided to area residents.	Would like to establish a standing committee of insurance agents and utility providers	
All Hazards	Develop Community Involvement	AH 1.2	Ongoing	Develop partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities. (E.g., Community Emergency Response Teams, Map My Neighborhood etc.).	Work with recently graduated CERT trainees; establish connections with non-native English speakers, HOAs, neighborhood association. This was recently work that was undertaken to inform those newly mapped into flood zones.	
All Hazards	Develop Community Involvement	AH 1.5	Ongoing; revised to combine AH 1.4, AH 1.5, and EQ 1.4	Develop exercises for use at the annual Preparedness Fair to strengthen community resilience through public participation and educational events.	CG hosts an annual emergency preparedness fair; could include this exercise within this event; $20K usually designated for this fair. Exercises prepared for the fair could include tabletop exercises to training residents how to respond in an emergency; an earthquake scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within community to educate the public about earthquake mitigation priorities.	
Drought	Monitor drought conditions.	DR 2.2	Ongoing	Continue to monitor the level of Lake Dorena to use in assessing drought conditions for the city.	Action was revised to be more specific	
Drought	Monitor water supply	DR 3.1	Ongoing	**Success Story:** The city implemented an electronic metering system that is automated and effective at identifying leaks in the system.	This is a city success. The city is ready to take the next step and use this information to improve water conservation efforts. At the Emergency Prep Fair there was a booth set up for water service folks and they provided supplies that assist with water conservation.	

Hazard	Action Category	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	Lead City Department
Earthquake	Address community vulnerability to seismic threats.	EQ 1.6	Ongoing; revised	Encourage seismic retrofits as part of any alterations or remodels.	Removed first phrase to remove reference to historic buildings. Action is now applicable to pre-1993 residential construction and to focus on retrofitting when altering or remodeling a residence.	
Earthquake	Evaluate and protect critical facilities and infrastructure.	EQ 2.1	Ongoing	Identify and harden critical lifeline systems (i.e., critical public services such as utilities and roads) to meet "Seismic Design Guidelines and Standards for Lifelines" or equivalent standards such as American Lifelines Alliance (ALA) guidance.		
Flood	Flood Loss Mitigation	FL 3.1	Ongoing	Increase awareness of localized flood risk and safety	Use outreach programs to advise home and property owners of risks to life, property, health, and safety. Increase outreach to residential and commercial residents of the city on additional measures property owners can take to reduce their risk to flooding and facilitate funding for mitigation measures. (Quarterly Newsletter, annual coordination with realtors and insurance agents, and Emergency Prep Fair). Quarterly for riparian newsletter, Fall annual water bill insert; Weekly Friday Update; Annual coordination with realtors/insurance agents	
Flood	Floodplain Management	FL 4.1	Ongoing	Employ a Certified Floodplain Manager; maintain a designated floodplain administrator and CRS coordinator	Retained and slightly revised. The city budget should reflect this ongoing staff position.	

Hazard	Action Category	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	Lead City Department
Flood	Floodplain Management	FL 4.3	Complete and ongoing	Require and maintain FEMA elevation certificates for all new and improved buildings located in floodplains. (Records are maintained in the Cottage Grove Community Development Office.)	Maintain records of all existing and new Floodplain Development Permits	
Flood	Floodplain Management	FL 4.4	Complete and ongoing	Include requirements in the local floodplain ordinance for homeowners to sign non-conversion agreements for areas below base flood elevation.	CRS requirement	
Flood	Floodplain Management	FL 4.5	Complete and ongoing	Maintain and provide access to Flood Insurance Rate Maps.	CRS requirement	
Flood	Stormwater Management and Improvement	FL 5.2	Ongoing	Rehabilitate and manage riparian areas under city ownership to improve function; utilize stream restoration to ensure adequate drainage and diversion of stormwater; and protect and enhance landforms that serve as natural mitigation features (i.e., riverbanks, wetlands, buffers etc.).	This is part of the riparian development ordinance.	
Flood	Stormwater Management and Improvement	FL 5.8	Ongoing		Spring clean-up removed 2 30-yard dumpsters full of trash and also did planting and bank work.	
Winter and Severe Storm	Reduce hazards associated with un-trimmed trees on city property.	SS 3.2	Ongoing	Trim city trees identified as being in need, and schedule removal of diseased or dead trees.	Street sweeper driver is also the city arborist, so that person identifies city trees in need of trimming, pruning, or other maintenance work.	

Hazard	Action Category	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	Lead City Department
Wildfire	Decrease vulnerability and risk from wildfire and increase public awareness to wildfire risks and mitigation actions.	WF 4.2	Ongoing	Organize a local fire department tour to show local elected officials and planners the most vulnerable areas of the city's wildland-urban interface and increase their understanding of risks.	Maybe need to do this for the newer council members;	
Wildfire	Decrease vulnerability and risk from wildfire and increase public awareness to wildfire risks and mitigation actions.	WF 4.3	Ongoing	Partner with local fire departments to conduct education programs in schools.	SL RFPD does this annual. K and 1st grade visit the station and do fire safety education usually in October.	
Wildfire	Decrease vulnerability and risk from wildfire and increase public awareness to wildfire risks and mitigation actions.	WF 4.4	Ongoing	Inform the public about proper evacuation procedures (Workshop/Open House).	SL RFPD did this on a contract for another area not in the district. Social media has supplemented the public's ability to learn about evacuation. SL RFPD hosts movie night at the station in Sept and could incorporate information about evacuation then.	

Table 17. New, Progressing and Retained Mitigation Actions (excluding Ongoing Actions)

Hazard	Action Objective	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	2023 Cost/Funding Source	2023 Timeline	2023 Priority	Lead City Department 2023	Lead Non-City Organization	Partners
Drought	Monitor water supply	DR 3.3	Progressing	Develop a long-range water conservation plan	Water license requires this, embarking on the water system master plan with a consultant	Medium -city water fund	Short term (1-2 yrs)	High	Public Works and Development Dept.	Consultant	Consultant
Earthquake	Address community vulnerability to seismic threats.	EQ 1.3	Retain; revised	Develop mitigation strategies for seismic retrofitting of critical city structures and conduct seismic retrofitting for critical public facilities and historic structures most at risk to earthquakes.	Critical city structures and critical public facilities need to be seismically retrofitted	Low -Staff time (General Fund) and parts / grant funding (NEHRP)	Ongoing (as budget allows)	Low	Public Works and Development Dept.	N/A	N/A
Earthquake	Evaluate and protect critical facilities and infrastructure.	EQ 2.2	Retain	Evaluate bridges for resilience to earthquake and establish priority listing from post event evaluation and repair.	ODOT does this annually because city doesn't possess the capacity or expertise to conduct an inventory. There are three crossings of the Coast Fork. The Main Street bridge may not be the highest priority due to the potential collapse of URMs downtown. Nonetheless, the Main street bridge base and deck were reinforced. Harrison and Woodson bridges are the priority evacuation routes. Harrison Bridge had riprap reinstalled at abutments.	Medium -Street fund	Ongoing (annual)	High	Public Works and Development Dept.	ODOT	ODOT
Earthquake	Evaluate and protect critical facilities and infrastructure.	EQ 2.3	Retain; revised	Prioritize critical public buildings for retrofitting based upon their role in recovery after an earthquake.	Removed language about developing a process in favor of a more action-oriented statement. The city may need a consulting structural engineer to accomplish this.	High -Staff time (General Fund) / grant funding (NEHRP)	Medium term (3-4 yrs)	Low	Public Works and Development Dept.	Consultant	Consultant
Flood	Agency Coordination	FL 1.1	Retain	Seek training and exercise opportunities with other agencies and jurisdictions.	Cottage Grove has unique flood risks that staff may need to address during flood response, mitigation, recovery, or preparedness. Understanding the nuances of flood risk is required in order to be able to educate the public or answer questions accurately.	Low -Conference costs / Staff time (General Fund)	Ongoing, annually	Medium	Public Works and Development Dept. (CDD)	NORFMA/FEMA	ODOT; NW Natural Gas; Pacific Power; Eugene Public Utilities

Hazard	Action Objective	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	2023 Cost/Funding Source	2023 Timeline	2023 Priority	Lead City Department 2023	Lead Non-City Organization	Partners
											District (EPUD)
Flood	Agency Coordination	FL 1.2	Progressing	Work with United States Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) on Upper Willamette Valley Flood Insurance Map Update project.	No change. City will maintain regular contact with FEMA consultant.	Medium -Consultant, staff time (General Fund)	Ongoing (until adopted)	High	Public Works and Development Dept.	USACE; FEMA	USACE; FEMA
Flood	Critical Facilities Protection	FL 2.1	Retain, revised	Evaluate, prioritize, and follow through with inventory of City properties that are within the 500-year floodplain	Inventory City properties using GIS to cross tab properties with 500-year floodplain data upon map adoption	Low -Staff time (General Fund)	Short term (1-2 yrs)	Medium	Public Works and Development Dept.	LCOG	LCOG
Flood	Flood Loss Mitigation	FL 3.4	Retain	Develop a long-term plan for Open Space land acquisitions (purchases by the City, donations, conservation easements) for floodway protection	With new floodplain maps coming within the next one to two years establish a list of subject properties for acquisition.	High -Cost of acquisition via FEMA FMA grant	Long term (>5 yrs)	Low	Public Works and Development Dept.	N/A	Parcel owners; FEMA
Flood	Floodplain Management	FL 4.6	Retain, revised	Implement the mitigation strategies identified in the Stormwater Master Plan to design and maintain drainage ways.	Revised to refer to the Stormwater master plan. Prioritize capital improvements to increase capacity in the stormwater system.	High -Design and maintenance of drainage	Medium term (3-4yrs)	High	Public Works and Development Dept. (PW)	N/A	N/A
Flood	Floodplain Management	FL 4.7	Retain, revised	Post National Weather Service warnings on the city website.	Revised to be more specific.	Low -Staff time (General Fund)	Short term (1-2yrs)	Medium	Public Works and Development Dept. (CDD)	NWS	NWS/NOAA
Flood	Stormwater Management and Improvement	FL 5.3a	Retain and expand	Obtain and install a River Flow Gauge at the mouth of Mosby Creek at confluence of Row River.	This was previously DR 3.2. Cottage Grove staff will consult with USGS to identify a path forward to do this.	Medium -Cost of parts / staff time (General Fund)	Medium term (3-4 yrs)	High	Public Works and Development Dept.	USGS	USGS
Flood	Stormwater Management and Improvement	FL 5.3b	New Action	Obtain and install a stream flow gauge on the Coast Fork.	Stream gauges are located at the bottom of the Cottage Grove Dam and Goshen. The distance between these two gauges is approximately 20 miles. A gauge on the Coast Fork located in Cottage Grove would be useful to predict flooding. Cottage	Medium -Cost of parts / staff time (General Fund)	Medium term (3-4 yrs)	High	Public Works and Development Dept.	USGS	USGS

Hazard	Action Objective	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	2023 Cost/Funding Source	2023 Timeline	2023 Priority	Lead City Department 2023	Lead Non-City Organization	Partners
					Grove staff will consult with USGS to identify a path forward to do this.						
Flood	Stormwater Management and Improvement	FL 5.4	Retain, revised	Determine whether the Coast Fork Watershed Council would pursue funding for culvert resizing.	Discuss with the watershed to see if they would take on this action.	High -Grant funding via ODOT / staff time (General Fund)	Short Term (1-2yrs)	Medium	Public Works and Development Dept.	CFWC	CFWC
Flood	Stormwater Management and Improvement	FL 5.7	Retain, revised	Establish line item in general fund to support CFWC to ed restoration and education programs	Revised to be more specific.	Low -Allocation of existing city general funds	Short term, '24-'25 budget season and beyond	High	Public Works and Development Dept.	CFWC	CFWC
Landslide	Landslide Mitigation	LS 1.3	Retain modified	Consider amending Title 13 (Utilities) to require Location of utilities outside of landslide areas to decrease the risk of service disruption	Title 13 relates to utility placement	Low -Staff time (General Fund)	Short term (1-2yrs)	Medium	Public Works and Development Dept.	N/A	EPUD Pacific Power NW Natural
Landslide	Evaluate Landslide Hazard on Mt. David	LS 2.1	Retain, revised	Update Slopes of Cottage Grove maps associated with 3.7.100 section F; utilize updated landslide data.	Assure compliance with Cottage Grove City Development Code 3.7.100 Hillside Development; usually aim to do batched code updates in the fall	Low -Staff time (General Fund)	Short term (1-2 yrs)	High	Public Works and Development Dept. (CDD)	DOGAMI	City Council
Landslide	Evaluate Landslide Hazard on Mt. David	LS 2.3	Retain	Consider Conservation Easements in lieu of land purchase in areas of moderate to high landslide risk.	Staff could use GIS to target parcels where this would be a useful strategy	Low -Staff Time (General Fund)	Medium term (3-4yrs)	Medium	Public Works and Development Dept.	N/A	Parcel owners
Landslide	Regulatory tools and enforcement	LS 3.2	Retain, revised	Provide education to city staff, utility and park crews in particular, on erosion control.	Utility and park crews (PW) need to follow. Revised to make the action more specific.	Low -Staff time (General Fund)	Ongoing (staff turnover)	High	Public Works and Development Dept.	DEQ	N/A
Winter and Severe Storm	Protect power lines from winter and severe storm effects	SS 1.1	Retain, revised	Propose to City Council requirement to undergrounding utilities when substantial remodeling is permitted.	The city doesn't currently require remodels to install underground power, however it is required for new construction.	Low -Staff time (General Fund)	Short term (1-2yrs)	High	Public Works and Development Dept.	N/A	City Council

Hazard	Action Objective	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	2023 Cost/Funding Source	2023 Timeline	2023 Priority	Lead City Department 2023	Lead Non-City Organization	Partners
Winter and Severe Storm	Reduce hazards associated with un-trimmed trees on city property.	SS 3.1	Retain, revised	Update tree inventory on a 5 year cycle.	City did a tree inventory and intends to update it on a 5 year basis. Currently writing an Urban Forest Management Plan (UFMP).	Low -Staff time (General Fund) / contractors for inventory	Short Term; finish UFMP by 2024, ongoing (update every 5yrs)	High	Public Works and Development Dept.	Contractors	Urban Forestry Committee, Contractors
Wildfire	Incorporate wildfire mitigation in the comprehensive plan.	WF 1.1	Retain, revised	Incorporate wildfire mitigation in the comprehensive plan. Not started 6/2023.	Include considerations of wildfire hazards in land use, public safety, and other elements of the comprehensive plan. Identify areas of risk based on a wildfire vulnerability assessment. Describe policies and recommendations for addressing wildfire risk and discouraging expansion in the wildland-urban interface. This could apply to phases 2 and 3 of the Sunrise Ridge subdivision where the existing vegetation is fairly wild.	Low -Staff time (General Fund)	Medium term (3-4yrs)	High	Public Works and Development Dept.	N/A	DLCD
Wildfire	Reduce risk to wildfire through land use planning	WF 2.2	Retain	Promote conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas.	Enforce current code to preserve open space and to limit development in high hazard areas.	Low -Staff time (General Fund)	Short term (1-2yrs)	High	Public Works and Development Dept.	South Lane Fire District (SLFD)	SLFD
Wildfire	Participate in the Firewise System	WF 3.1	Retain	Explore the benefits of joining the FireWise Communities/USA recognition program sponsored by the National Fire Protection Association (NFPA).	This program can be used on a neighborhood basis where there are 2,500 or fewer residences. One program priority could be: Sponsor FireWise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations.	Low -Staff time (General Fund) / grant funding (OSFM)	Medium term (3-4yrs)	Medium	Public Works and Development Dept.	NFPA	NFPA / SLFD
Wildfire	Participate in the Firewise System	WF 3.2	Retain	Sponsor FireWise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations.	The annual Emergency Preparedness Fair could be a start to get information out to local officials, developers, civic groups, and neighborhood/homeowners' associations. Additionally, an open house with a workshop could be more personal.	Low -Staff time (General Fund)	Medium term (3-4yrs)	Medium	Public Works and Development Dept.	NFPA	NFPA / SLFD

Hazard	Action Objective	2023 Action #	2023 Status	2023 Mitigation Action	Description/ Problem Statement	2023 Cost/Funding Source	2023 Timeline	2023 Priority	Lead City Department 2023	Lead Non-City Organization	Partners
Wildfire	Decrease vulnerability and risk from wildfire and increase public awareness to wildfire risks and mitigation actions.	WF 4.1	Retain	Offer GIS hazard mapping Information online (i.e., DOGAMI HAZVU) for city staff, residents, developers, and design professionals. Use GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions.	Lane Co currently hosts the city's GIS service. The city is looking into getting their own license through LCOG. Combined removed item WF 2.1 with WF 4.1.	Low -Annual contract for GIS license with LCOG / Staff time (General Fund)	Short term (1-2yrs)	High	Public Works and Development Dept.	LCOG	LCOG / DOGAMI
Volcanic Event	Reduce hazards associated with poor AQI due to a volcanic eruption	VO 1.1	New Action	Continue to equip public facilities with air scrubbers.	City will identify public facilities to retrofit as needed.	Medium -Staff time (General Fund)/ purchase of parts	Ongoing (as budget allows)	Low	Public Works and Development Dept.	N/A	N/A
All Hazard	Alert residents about an imminent natural hazard	AH 2.1	New Action	Develop a public portal to allow AMI system users to get updates on natural hazard events.	Develop an accessible alert system to warn residents of local natural hazard events.	Medium -Staff time (General Fund)/ possible consultant	Short term (1-2yrs)	High	Public Works and Development Dept., (Utilities)	N/A	Lane County Emergency Management / OEM
All Hazard	Alert residents about an imminent natural hazard	AH 2.2	New Action	Encourage city residents to opt in to the Lane County OR-Alert with outreach during National Preparedness Month and the Emergency Preparedness Fair.	The new system requires participants to opt in to a mobile alert system.	Low -Staff time (General Fund)	Short term (1-2yrs)	High	Public Works and Development Dept.	Lane County	Lane County

Section 5: Implementation, Maintenance and Public Participation

The plan maintenance section of this document details the formal process that ensures that the City of Cottage Grove Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. This section also describes how the City will integrate public participation throughout the plan maintenance and implementation process. Finally, this section includes an explanation of how the City intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms and programs such as the City of Cottage Grove comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation.

The plan's format allows the City to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to Cottage Grove.

Plan Implementation

The DLCD project manager was responsible for submitting the final draft of this plan to the State Hazard Mitigation Officer at Oregon Department of Emergency Management (OEM). OEM reviewed the plan and provided comments to the project manager and the Cottage Grove Hazards Mitigation Advisory Committee. Subsequently, OEM submitted the plan to the Federal Emergency Management Agency (FEMA–Region X) for review. These reviews addressed the federal criteria outlined in 44 CFR Part 201. Upon approval by FEMA, the plan was adopted by the Cottage Grove City Council. Following adoption of the plan, FEMA issued a final approval letter that accords the City eligibility to apply for the Pre-Disaster Mitigation Grant Program, Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds.

The Hazards Mitigation Advisory Committee (HMAC) will remain intact after the plan is adopted and will focus its efforts on plan implementation and maintenance. The HMAC serves as the coordinating body for implementation and plan updates. The City of Cottage Grove Public Works Director will serve as the convener of the HMAC.

The effectiveness of the City's non-regulatory Natural Hazard Mitigation Plan will be contingent on the implementation of the plan and incorporation of the outlined action items into existing City plans, policies, and programs. The Natural Hazard Mitigation Plan includes a range of action items that, if implemented, would reduce loss from hazard events in the City of Cottage Grove. Together, the action items in the City of Cottage Grove Natural Hazard Mitigation Plan provide the framework for activities that city departments can choose to implement over the next five years. The Advisory Committee will prioritize the plan's goals and action items, which will be implemented, as resources permit, through existing plans, policies, and programs.

Implementation through Existing Programs

The Natural Hazard Mitigation Plan includes a range of action items that, when implemented, will reduce loss from hazard events in Cottage Grove. Within the framework of the plan, FEMA requires the identification of existing programs that might be used to implement these action items. The City of Cottage Grove addresses statewide planning goals and legislative requirements through its Comprehensive Plan, Development Code, Emergency Operations Plan, utility master plans, and Building Codes. The Natural Hazards Mitigation Plan provides recommendations that are tied to the goals of

existing plans and programs. The City of Cottage Grove will be able to implement action items through existing programs and procedures, as well as apply for additional assistance for projects requiring funding currently outside existing programs.

Regional Planning Efforts

The City of Cottage Grove is committed to regional hazard planning as an integral part of the implementation process. The City has a representative on the Lane County Countywide Preparedness Group and takes part in regional meetings and exercises. This involvement ensures that the City is represented in broader scale natural hazard planning activities. During the 2015 update the City of Cottage Grove partnered with the Lane County Geo-Spatial Information Services (GIS) to create natural hazard maps for the 2015 City of Cottage Grove Natural Hazards Mitigation Plan. Hazard maps for the 2023 NHMP update were developed by DOGAMI as part of the Multi-Hazard Risk Assessment performed by that agency for the City of Cottage Grove. The City will continue to partner with other agencies on the local, county, state, and federal level in order to effectively mitigate loss to life and property from natural hazards.

Plan Maintenance

Plan maintenance is a critical component of the Natural Hazard Mitigation Plan. Proper maintenance of the plan will ensure that this plan will benefit Cottage Grove's efforts to reduce the risks posed by natural hazards. This section first formed a part of the 2012 NHMP and presents a process to ensure that a regular review and update of the plan occurs. The HMAC and local staff will be responsible for implementing this process in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below. The Public Works Director, in the role of convener, will schedule these meetings and the five-year review.

Table 1: Plan Maintenance Meeting Schedule

Semi-Annual Meeting	Annual Meeting	Five-Year Review
Review Current Actions	Update Risk Assessment Data and Findings	Review plan update questions
Identify New Issues and Needs	Discussion of Methods of Continued Public Involvement	Update plan sections as necessary
Prioritize Potential Projects	Document Successes and Lessons Learned	Review entire plan and update as needed

Project Prioritization Process

The requirements of Disaster Mitigation Act of 2000 through the Pre-Disaster Mitigation Program state that the plan must identify a process for prioritizing potential actions. Potential mitigation activities will often come from a variety of sources; therefore, the project prioritization process needs to be flexible. Examples of the methods through which projects may be identified include HMAC members, local government staff, other planning documents, or the DOGAMI Multi-Hazard Risk Assessment.

Depending on the potential project's intent and implementation methods, several funding sources may be appropriate. Examples of mitigation funding sources include but are not limited to FEMA's Pre-

Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, National Fire Plan (NFP), Title II funds, Title III funds, Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Some of these examples are used in the figure below to illustrate the project prioritization process. The prioritization process utilizes a four-step process to prioritize activities to help ensure that mitigation dollars are used in a cost–effective manner.

Step 1: Examine Funding Requirements

The committee will examine the selected funding stream's requirements to ensure that the mitigation activity would be eligible through the funding source. The committee may consult with the funding entity, Oregon Department of Emergency Management, or other appropriate state or regional organization about the project's eligibility.

Step 2: Complete Risk Assessment Evaluation

The second step in prioritizing the plan's action items is to examine which hazards they are associated with and where these hazards rank in terms of community risk. The committee will determine whether or not the plan's Risk Assessment supports the implementation of the mitigation activity. This determination will be based on the location of the potential activity and the proximity to known hazard areas, historic hazard occurrence, and the probability of future occurrence documented in the plan.

Step 3: Complete Quantitative, Qualitative Assessment, and Economic Analysis

Depending on the type of project and the funding source, either a quantitative or qualitative assessment of cost effectiveness will be completed to assist in prioritizing potential actions. 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. 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.

If the activity is seeking 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 1 in order to be eligible for FEMA funding.

For FEMA-funded non-structural projects or projects funded through entities other than FEMA, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee will use a multi-variable assessment technique called STAPLE/E to prioritizing these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. The STAPLE/E technique has been tailored for natural hazard action item prioritization by the University of Oregon's Oregon Natural Hazards Workgroup.

Step 4: Committee Recommendation

Based on the steps above, the committee will recommend whether or not the mitigation activity should be moved forward. If the committee decides to move forward with the action, the coordinating organization designated for the activity will be responsible for taking further action and documenting success upon project completion. The Hazard Mitigation Advisory Committee will convene a meeting to review the issues surrounding grant applications and shared knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

The Hazard Mitigation Advisory Committee and the community's leadership have the option to implement any of the action items at any time (regardless of the prioritized order). This allows the committee to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of highest priority. This methodology was used by the HMAC to initially prioritize the plan's action items and will be used in the future to maintain and update the action list during annual reviews and the five-year update.

Annual Meeting

The process that will be followed to track progress and monitor the status of mitigation actions identified in this plan update will take place at the annual meeting of the HMAC. The Public Works Director serves as the convener for the NHMP annual meeting. The HMAC will meet annually to review progress. They will address potential updates to the Risk Assessment data and findings, discuss methods of continued public involvement, and document successes and lessons learned based on actions that were accomplished during the past year. Setting aside some time during the annual meeting to evaluate and review priority mitigation strategies may serve to identify potential funding strategies or other methods to implement them. The convener will be responsible for documenting the outcomes of the annual meeting.

Five Year Review and Update of the Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During this plan update, the following questions should be asked to determine whether the plan has been effective and what actions are necessary to update the plan. In the role of convener, the Public Works Director will be responsible for convening the Committee to address the questions outlined below.

- Are the plan goals still applicable?
- Do the plan's priorities align with State priorities?
- 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?
- Have new issues or problems related to hazards been identified in the community?
- 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?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the 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.

Continued Public Involvement and Participation

> ***44 CFR Requirement 201.6(b):***
> *An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

The City of Cottage Grove is dedicated to involving the public directly in the continual reshaping and updating of the Natural Hazard Mitigation Plan. The public will have the opportunity to submit comments on the plan to the Community Development Department at any time. Copies of the plan will be kept in the Community Development Department, the Cottage Grove Public Library, and online at http://www.cottagegrove.org. The City recognizes that involvement by and with the public is an effective means of engaging the public's active involvement and participation in increasing the whole community's resilience to natural hazards and disasters in general, a city priority.

Public input was obtained through several concurrent means including:

- Contact with committee members and their constituencies or organizations
- Publicly noticed HMAC meetings
- A public online survey
- As part of Public Education and Outreach events in which committee members participated and Plan elements were discussed
- An internet web page located at www.CottageGrove.org
- The final draft document was available on line for public comment for the month.

These methods will also be utilized during the maintenance and implementation period.