Annex C: City of Forest Grove

1. Introduction

1.1. Planning Process Contact

The point of contact during the Washington County Natural Hazard Mitigation Plan (NHMP) planning process for the City of Forest Grove was the Fire Division Chief-Fire and Life Safety.

1.2. Annex Organization

This annex has six sections that satisfy mitigation requirements in the Code of Federal Regulations (CFR) Title 44, Part 201 (44 CFR §201):

- **Section 1:** Introduction
- **Section 2:** Planning Process
- **Section 3:** Hazard Identification and Risk Assessment
- **Section 4:** Capability Assessment
- **Section 5:** Mitigation Strategy
- **Section 6:** Action Items

The information provided in this annex is for the City of Forest Grove alone. All pertinent information that is not identified in this annex is identified in other sections of this NHMP or within the respective appendices.

1.3. NHMP Adoption Process

Once the Washington County NHMP received the designation “Approvable Pending Local Adoption” from the Federal Emergency Management Agency (FEMA), the City presented the plan to City Council for final public comment and local adoption. A copy of the resolution was inserted into the NHMP and is held on file in the City of Forest Grove and Washington County.

2. Planning Process

(In compliance with 44 CFR §201.6(c)(1))

2.1. Development and Adoption Process

To apply for certain types of federal aid, technical assistance, and most post-disaster funding, local jurisdictions and special districts must comply with 44 CFR §201.3, which sets forth the requirement that communities develop a plan outlining their present and proposed efforts to mitigate risks from natural hazards.

City officials recognize the benefits of having a long-term, all-hazards approach to mitigating natural hazards. The passage of the Disaster Mitigation Act of 2000 (DMA 2000) enabled City officials to recognize the benefits of having a long-term, all-hazards approach to hazard mitigation and mitigating natural hazards. The City's involvement in the Washington County NHMP represents the collective efforts of the NHMP Steering Committee members, all participating local Technical Committee members, the public, and stakeholders.

The City developed this annex in accordance with guidance outlined in 44 CFR §201.6(c)(5) of DMA 2000. The complete NHMP and this annex identify hazards and mechanisms to minimize damages associated with these hazards as they occur in the geographical area of the City.

2.2. Organizing the Planning Effort

A comprehensive approach was taken in developing this NHMP. An open involvement process was established for the public and all stakeholders, which provided an opportunity for everyone to be involved in the planning process and make their views known.

Two teams worked simultaneously on this mitigation plan:

1. **Hazard Mitigation Steering Committee:** This committee consisted of points of contact from each plan participant. The group met to discuss countywide topics, including hazards and mitigation strategies. The points of contact were the leads of their local Technical Committee.
2. **Local Technical Committee:** Each plan participant had a Technical Committee that consisted of the Steering Committee representative for that jurisdiction or special district as well as designated representatives from within the organization. This team met to assess capabilities, hazards, and mitigation strategies within the planning area.

2.2.1. Technical Committee of Forest Grove

This annex within the NHMP was developed by the local Technical Committee for the City of Forest Grove with support from IEM, a consulting firm hired to assist with the planning process. The efforts of the committee were led by the City's Fire Division Chief-Fire and Life Safety throughout 2022. The cities of Cornelius and Forest Grove share many staff and planning initiatives, including members of the 2023 NHMP Technical Committee.

Table 104: City of Forest Grove Technical Committee Members for the 2023 NHMP

Job Title and Department	Role in Committee and Planning Process
Fire Division Chief – Fire and Life Safety, City of Forest Grove Fire Department	General oversight, hazard identification, and plan development
Fire Chief/Emergency Management Coordinator, City of Forest Grove Fire Department	Hazard identification and plan development

* Note: The cities of Cornelius and Forest Grove shared Technical Committee members.

IEM also supported or led the following activities associated with the development, approval, and adoption of the plan:

1. Facilitated the NHMP update process.
2. Based on committee direction and stakeholder and community input, prepared the first draft of the plan and provided technical writing assistance for plan review, editing, and formatting.

3. Submitted the proposed plan to the State of Oregon Department of Emergency Management (OEM) and FEMA for review and approval, and completed edits or revisions requested by these organizations.
4. Coordinated the plan adoption processes with the City, OEM, and FEMA.

2.3. Public Participation

Public participation is an important component of this NHMP and also a required element as outlined in 44 CFR §201.6(c)(5), FEMA's mitigation planning guidance. Public participation offered community members the opportunity to voice their ideas, interests, and opinions about hazards that affect them and the best way to mitigate hazard impacts. As the City implements the mitigation actions identified in this annex, there will be additional opportunities for public participation.

Plan participants used a survey to collect information about community perceptions of natural hazards and priorities. The Steering and Technical Committees used the results to inform their risk assessments and mitigation strategies. Community members were also provided an opportunity to comment on a draft of the NHMP. See Appendix B of the NHMP for additional information about the survey and opportunities for public comment.

3. Hazard Identification and Risk Assessment

(In compliance with 44 CFR §201.6(c)(2)(i), §201.6(c)(2)(ii), §201.6(c)(2)(ii)(A), §201.6(c)(2)(ii)(B), §201.6(c)(2)(ii)(C), §201.6(c)(2)(iii), and §201.6(c)(3)(ii))

The following information serves to assist the City in determining and prioritizing appropriate mitigation action items to reduce losses from identified hazards.

3.1. Changes in Development Since the 2011 NHMP Update

(In compliance with 44 CFR §201.6(d)(3))

The population of the City has grown approximately 25% since 2010. Based on the 2021 population, the density of residents is 4,572 people per square mile. This is an increase of approximately 899 people per square mile since 2010.

There has been an increase in housing to meet the demand of population growth. The City has also been focused on increasing economic growth and increasing private investment in the community. Business facility vacancy rates are dropping, and new commercial developments totaling $23.6 million, in addition to $100.7 million in industrial construction, are in the works. The City approved nine residential projects, exceeding $100 million and delivering 780 additional housing units, including the 78-unit Jesse Quinn mixed-use project in the heart of downtown.[340]

Forest Grove's continued partnership with the City of Cornelius allows the cities to pool resources, including staff, to implement mitigation strategies.

[340] Hurt, N. (2019, July 3). *Forest Grove: A New Home for Businesses.* https://www.oregonbusiness.com/article/sponsored/item/18805-forest-grove-a-new-home-for-businesses

3.2. Community Profile

This section provides information on City-specific characteristics. Additional discussion of the planning area's community characteristics is outlined in Appendix A of the NHMP.

Some community characteristics may suggest how natural hazards may impact communities and how communities choose to plan for natural hazard mitigation. Identifying and considering the City-specific assets during the planning process may assist in identifying appropriate measures for natural hazard mitigation.

The following table reflects the community demographics and vulnerable facilities in the City. This information was gathered from the U.S. Census, Portland State University, and the City of Forest Grove.

Table 105: Community Demographics*

Population	Total	Percent Change
2010 population[341]	21,083	
2021 population[342]	26,242	+25%
2035 forecasted population[343]	27,370	+4%
Race and Ethnicity[344]	**Total**	**Percent of Population**
White alone	20,281	82%
Hispanic/Latino/a/x of any race	5,916	24%
Two or more races	2,041	8%
Asian alone	650	3%
Black or African American alone	256	1%
American Indian and Alaska Native alone	157	1%
Native Hawaiian and Other Pacific Islander alone	14	<1%
Language Spoken at Home[345]	**Percent of Population**	
English only	81%	
Spanish	17%	
Asian and Pacific Island languages	1%	
Indo-European languages	1%	
Other languages	<1%	

[341] United States Census Bureau. (2010, April 1). QuickFacts Forest Grove, Oregon. Accessed September 15, 2022, from https://www.census.gov/quickfacts/forestgrovecityoregon
[342] Portland State University Population Research Center. (2022). 2021 Certified Population Estimates, July 1. https://www.pdx.edu/population-research/population-estimate-reports
[343] Oregon Metro. (2013, January 15). 2035 Forecast of Population by City and County. Accessed September 15, 2022, from https://www.oregonmetro.gov/sites/default/files/2014/05/29/population_housing_forecasts_by_city_county.pdf
[344] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Demographic and Housing Estimates, Table DP05. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon&tid=ACSDP5Y2020.DP05
[345] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Language Spoken at Home, Table S1601. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=Forest%20Grove%20oregon%20language

Vulnerable Age Groups[346]	Percent of Population
Less than 15 years of age	12%
65 years and older	15%
Disability Status of Non-Institutionalized Civilians [347]	**Percent of Population**
Total	15%
Less than 17 years of age	9%
65 years and older	107.5%**

* Due to how respondents identify and answer questions, there may be overlapping responses, and results may equal greater than 100% of the population. Percentages are rounded.
** Margin of error is ±7.5.

3.2.1. Geography, Topography, and Climate

The City of Forest Grove is located on the western edge of the Portland metropolitan area and the Willamette Valley in central Washington County. The City is bordered by the City of Cornelius on the east, and the two cities partner on many governmental operations. The City has a total area of 5.88 miles, of which 0.14 square miles is water.

Forest Grove is more rural than other NHMP participants. It is surrounded by rolling hills, evergreen forests, and vineyards and is near the foothills of the Coastal Mountain Range. The City is located within the watershed of the Tualatin River and is a gateway to the Tillamook Forest to the west.

The climate in Forest Grove is mild, with a high of approximately 52 °F in January and a high of 82.2 °F in July. The normal annual precipitation is 44.58 inches.

3.2.2. Transportation, Infrastructure, and Housing

3.2.2.1. Transportation

Critical transportation routes in Forest Grove include Oregon Route 8, known locally as the Tualatin Valley Highway (TV Highway), the primary east–west highway. Highway 47 runs north and south on the eastern side of the City and connects with Highway 26 to the north.

The Tri-County Metropolitan Transit District (TriMet) provides light rail and bus transfer commuter service with stops every 15 minutes via line 57. Connections include Hillsboro, Beaverton, Cornelius, Portland, and east Multnomah County. GroveLink is a public transportation service for the City, linking residents with downtown locations, Ride Connection, and TriMet bus line 57.

3.2.2.2. Infrastructure

The City of Forest Grove's critical and vulnerable facilities listed below in Table 106 may be vulnerable to one or more natural hazards.

[346] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Age and Sex, Table S0101. Accessed September 15, 2022 , from https://data.census.gov/cedsci/table?q=Forest%20Grove%20oregon%20age
[347] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Disability Characteristics Estimates, Table S1810. Accessed September 15, 2022 , from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20disability

Table 106: Critical Facility and Asset Inventory

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Forest Grove City Auditorium	Infrastructure or Facility	1915 Main Street	
Forest Grove City Hall	Infrastructure or Facility	1924 Council Street	Not vulnerable to dam failure, drought, landslide, or wildfire.
Forest Grove Police Station	Infrastructure or Facility	2101 Pacific Avenue	Not vulnerable to dam failure, drought, landslide, or wildfire.
Forest Grove Fire Station (Fire Station 4)	Infrastructure or Facility	1919 Ash Street	Not vulnerable to dam failure, drought, landslide, or wildfire.
Gales Creek Fire Station (Fire Station 7)	Infrastructure or Facility	52155 NW Old Wilson River Road	Not vulnerable to dam failure, drought, flood, or landslide.
Forest Grove Public Works Shop	Infrastructure or Facility	2551 23rd Avenue	Not vulnerable to dam failure, drought, flood, landslide, or wildfire.
Forest Grove Light and Power Shop	Infrastructure or Facility	1818 B Street	Not vulnerable to dam failure, drought, flood, landslide, or wildfire.
Forest Grove Light and Power Transmission System	Infrastructure or Facility	1818 B Street	Not vulnerable to drought, flood, or volcanic ash.
Forest Grove Aquatics Center	Infrastructure or Facility	2300 Sunset Drive	Not vulnerable to dam failure, drought, flood, landslide, or wildfire.
Forest Grove Water Treatment Plant/Reservoir	Infrastructure or Facility	501 Watercrest Road	Not vulnerable to dam failure or flood.
Forest Grove City Watershed and Transmission Lines	Infrastructure or Facility	Clear Creek – Oregon Coast Range	
Forest Grove School District Buildings	Infrastructure or Facility	Numerous locations	This covers the entire school district, comprising 12 buildings and facilities at present.
Clean Water Services Forest Grove Water Resource Recovery Facility	Infrastructure or Facility	1345 Fernhill Road	
Joint Water Commission Forest Grove Water Treatment Facility	Infrastructure or Facility	1924 Council Street	

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Frontier Communications Switch Center	Infrastructure or Facility	College Way, 9th and 20th	
Waste Management Forest Grove Transfer Station	Infrastructure or Facility	1525 B Street	
Pacific University and Associated Campus Buildings	Infrastructure or Facility, Cultural Resource, and Historical Property	2043 College Way	Not vulnerable to landslide. This covers the entire campus, all of the buildings, and its thousands of students/staff.
Jennings McCall Center Assisted Living Facility	Infrastructure or Facility	2300 Masonic Way	
Wynwood of Forest Grove Retirement Community	Infrastructure or Facility	3110 19th Avenue	Now called Brookdale Forest Grove.
Forest Grove Rehabilitation and Care Center	Infrastructure or Facility	3900 Pacific Avenue	
The Grove and The Gardens	Infrastructure or Facility	2112 Oak Street	
The Elms Retirement Center	Infrastructure or Facility	2030 Elm Street	
Marquis Forest Grove Post Acute Rehab	Infrastructure or Facility	3300 19th Avenue	
Marquis Vintage Suites	Infrastructure or Facility	3336 19th Avenue	
Forest Grove Beehive Assisted Living	Infrastructure or Facility	2122 Hawthorne Street	
Hawthorne House Memory Care	Infrastructure or Facility	2635 21st Avenue	
Forest Villa Senior Apartments	Infrastructure or Facility	2131 Quince Street	
The Homestead Senior Community	Infrastructure or Facility	4300 Settlers Loop	
Gales Creek Camp	Infrastructure or Facility	59425 NW Cedarbrook Lane	
Forest Grove Parks System	Natural Resource	Numerous locations	This covers the entire parks system, roughly 13 parks in total.
Clark Historic District	Historical Property	Residential blocks in Forest Grove	Not vulnerable to landslide or flood. Historic residential district.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Painters Woods Historic District	Historical Property	Residential blocks in Forest Grove	Not vulnerable to landslide or flood. Historic residential district.
Walker Naylor Historic District	Historical Property	Residential blocks in Forest Grove	Not vulnerable to landslide or flood. Historic residential district.
A.T. Smith House	Historical Property	South end of Elm Street	Home built in 1854 by the first Euro-American settlers in the area. It is on the National Register of Historic Places.
First Church of Christ, Scientist	Historical Property	1904 Pacific Avenue	Not vulnerable to landslide. Church built in 1914 and is on the National Register of Historic Places.

3.2.2.3. Housing

Housing characteristics are an important factor in mitigation planning. The information below shows that most housing units are owner-occupied and consist of one-unit buildings built before 1999. The older the housing, the more at risk it can be to damage from natural hazards, such as earthquakes and windstorms, including tornadoes.

Table 107: Housing Characteristics*

Households	Total
Total households[348]	8,601
Units in Housing Structure[349]	**Percent of Housing**
One-unit structures	66%
Structures with two or more units	29%
Manufactured homes and all other types	6%
Year Housing Structure Built[350]	**Percent of Housing**
Pre-1979	49%
1980–1999	26%
2000 to present	25%
Housing Tenure and Vacancy	**Percent of Housing**
Owner-occupied[351]	61%
Renter-occupied[352]	39%
Vacant[353]	4%

* Due to how respondents answer questions there may be overlapping responses and results may equal greater than 100%. Percentages are rounded.

[348] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=ACSST5Y2020.S1101,
[349] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=ACSST5Y2020.S1101
[350] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Physical Housing Characteristics for Occupied Housing Units, Table S2504. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=ACSST5Y2020.S2504
[351] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=ACSST5Y2020.S1101
[352] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=ACSST5Y2020.S1101
[353] United States Census Bureau. (2021, July 1). 2020 Decennial Census Occupancy Status, Table H1. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20housing&tid=DECENNIALPL2020.H1

3.2.3. Economy

Home to Pacific University, Forest Grove's diverse economic base includes high-tech, food and beverage processing, wood products, metalworking, education, and healthcare industries. Plentiful serviced land, low-cost structures, enterprise zone incentives, and a business-friendly government make Forest Grove a competitive location for business growth. The top five employment sectors in the City are educational services, manufacturing, health care and social assistance, accommodation and food services, and retail trade.[354] The City experienced an almost 14% employment growth from 2015–2019.[355]

Forest Grove has a thriving economy and is home to high-tech circuit board companies, food and beverage processing companies, and wood product companies. It also has a growing agriculture sector that focuses on nurseries and organic produce. The City also has tourist industry surrounding the Fern Hill Wetlands and Reservoir, Hagg Lake, vineyards, and an abundance of many recreational activities.[356]

Table 108: Income Characteristics[357]*

Households by Income Category	Percent of Households
Less than $5,000	4%
$5,000 to $9,999	2%
$10,000 to $14,999	4%
$15,000 to $19,999	2%
$20,000 to $24,999	7%
$25,000 to $34,999	7%
$35,000 to $49,999	11%
$50,000 to $74,999	18%
$75,000 to $99,999	15%
$100,000 to $149,999	18%
$150,000 or more	13%
Median Household Income	
$69,513	

* Due to how respondents answer questions, there may be overlapping responses, and results may equal greater than 100%. Percentages are rounded.

[354] City of Forest Grove. (2021, September). Forest Grove Economic Development Strategic Plan 2020 Annual Report. https://www.forestgrove-or.gov/sites/default/files/fileattachments/economic_development/page/219/econ_development_annual_report_2021s.2.pdf
[355] City of Forest Grove. (2021, September). Forest Grove Economic Development Strategic Plan 2020 Annual Report. https://www.forestgrove-or.gov/sites/default/files/fileattachments/economic_development/page/219/econ_development_annual_report_2021s.2.pdf
[356] City of Forest Grove. (2020). Forest Grove Economic Development Strategic Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/economic_development/page/219/2020_economic_development_plan_final_v3.pdf
[357] United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Financial Characteristics, Table S2503. Accessed September 15, 2022, from https://data.census.gov/cedsci/table?q=forest%20grove%20oregon%20income&tid=ACSST5Y2020.S2503

3.3. Natural Hazard Profiles

The Technical Committee for the City of Forest Grove utilized the OEM's hazard analysis methodology to examine hazard vulnerability and probability by collecting information about history, probability, vulnerability, and maximum threat for each hazard that impacts the City. This methodology does not compare hazards to each other or rank hazards against each other. Instead, this process provides a sense of hazard priorities or relative risk and allows comparison of the same hazard across participants.

Each of the hazards examined by this analysis was scored using a formula that incorporates the four rating criteria, a weight factor, and three levels of severity: low, medium, and high. The score range for this methodology is 24 (lowest possible) to 240 (highest possible). For additional detail about the OEM risk and hazard analysis methodology, see Volume I, Section 2.

All natural hazards included in the NHMP have the potential to impact the City. The scores for each hazard that impacts the City are presented below.

Table 109: Natural Hazard Risk Scores

Natural Hazard	History	Vulnerability	Maximum Threat	Probability	Score
Dam failure	Low	Medium	Medium	Low	83
Drought	High	High	Medium	High	186
Earthquake: Cascadia (3–5-minute event)	Low	High	High	Medium	201
Earthquake: Crustal (1-minute event)	Low	High	High	Medium	201
Extreme heat	Medium	Medium	Medium	Medium	148
Flooding, including channel migration and streambed erosion	Low	Low	Low	Low	48
Landslide	Medium	Medium	Low	Medium	118
Volcanic ash	Low	Medium	Medium	Low	99
Wildland fire	High	High	High	High	240
Windstorm, including tornado	High	High	High	High	240
Winter storm	High	High	High	High	240

Full descriptions of each hazard are provided in Volume I, Section 2. The potential effects of climate change on the magnitude and frequency of natural hazard events are described in each hazard description in this annex and in Volume I, Section 2.

The timeframe of data collected during the planning process for the City was from January 1, 2011, to February 22, 2022. Hazard events that occurred during this period and were deemed significant by the City's Technical Committee are included in this annex's hazard profiles.

The following hazard profiles are in alphabetical order and include a brief hazard description, significant events since the 2011 NHMP update, if applicable, and potential impacts and vulnerabilities. The potential impacts for each hazard are presented in the same order, as applicable: populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments.

3.3.1. Dam Failure

The City of Forest Grove would be impacted if Scoggins Dam were to fail. The dam is located 5.5 miles from Forest Grove. It is a 151-foot-high structure that forms the Henry Hagg Lake. Potential impacts of and vulnerabilities to dam failure are identified below.

3.3.1.1. Potential Impacts

The potential impacts from a dam failure event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- If Scoggins Dam were to fail, areas in the southernmost portion of the City within the established 100-year flood risk area of the Tualatin River may flood. This is not a heavily built environment, and people and structures should not be adversely affected.[358]

3.3.1.2. Vulnerabilities

Built environment, critical facility, infrastructure, and natural environment vulnerabilities to a dam failure event include:

- Critical infrastructure and facilities, including Forest Grove City Auditorium, the Forest Grove Light and Power Transmission System, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
  - The Clean Water Services Forest Grove Water Resource Recovery Facility is in the potential dam failure impact area. This facility provides wastewater treatment for the cities of North Plains, Banks, the western region of Hillsboro, the southeastern portion of Cornelius, and the northwestern portion of Forest Grove. The facility cleans approximately 4 million gallons of wastewater on an average day.[359]
  - The Joint Water Commission Water Treatment Plant could be vulnerable to flooding created by a Scoggins Dam failure event. The plant could be vulnerable to higher-than-normal water levels and damage to infrastructure due to debris flows, which could lead to changes in the amount of water available for use.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink, may be vulnerable. Stringtown Road, though outside of city limits, is prone to flooding (from both natural and urban flooding sources as well as dam failure) and contributes to access issues.
- Equipment at the City's utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.

[358] City of Cornelius. (n.d.). Cornelius Web Mapping Application. https://corneliusor.maps.arcgis.com/apps/View/index.html?appid=d4a90a50cfea4000a209912a4ee4d851
[359] Clean Water Services. (2022). Locations. https://cleanwaterservices.org/about/locations/

3.3.2. Drought

Drought typically occurs as a regional event and often affects more than one city and county simultaneously. The City has multiple water provision and treatment facilities and has land used for agriculture and therefore may be impacted by drought differently than other NHMP participants. Potential impacts of and vulnerabilities to drought are identified below.

3.3.2.1. Potential Impacts

The potential impacts from a drought event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Reduction or loss of water supply, water use restrictions, and lack of potable water supply.
- Health effects, including increased heat-related, waterborne, and cardiorespiratory illnesses, as well as mental health conditions.
- Reduced economic productivity or business closures in such industries as agriculture, livestock, recreation, energy, tourism, timber, and fisheries.
- Supply chain restrictions, including food shortages.
- Loss of power or reduced availability of electricity due to infrastructure damage and high demand.
- Property and infrastructure damage due to expansive soils, which are clay-based soils that expand and contract based on the amount of moisture in the soil.
- Damage to natural environments, including low water levels in lakes, rivers, and other water bodies, reduced plant growth, local species reduction or extinction, increased water temperature, and deteriorated water quality, which may result in fish kills and increased waterborne pollutants.
- Concurrent hazards, including extreme heat, wildfire, flooding, and landslides.

3.3.2.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to drought. This includes:

- People in the City with preexisting health conditions, those without access to clean water, children, pregnant women, and older adults.
- Those who are employed in water-dependent sectors, such as agriculture and recreation, may experience a reduction in income.
- Water supply sources of the upper Tualatin River and its tributaries.
- Critical infrastructure and facilities, including Forest Grove City Auditorium, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.

3.3.3. Earthquake

The City could experience earthquakes that originate from the Cascadia Subduction Zone, Portland Hills Fault Zone, and Gales Creek Fault Zone. It could also experience liquefaction and coseismic landslides as the result of an earthquake. Potential impacts of and vulnerabilities to earthquake are identified below.

3.3.3.1. Potential Impacts

The potential impacts from an earthquake event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Mental health impacts, including post-traumatic stress disorder.
- Public health hazards resulting from disruption of drinking water and wastewater systems.
- Need for widespread search and rescue operations.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to ground utilities; residential, public, and private buildings; and transportation systems above and below.
- Disruption of essential infrastructure systems, such as power systems, public utilities, and telecommunications.
- Blocked roads and rail transportation routes due to debris from trees and damaged property, ground deformation, and liquefaction.
- Downed or damaged power lines that can lead to wildfires.
- Power outages and natural gas leaks.
- Hazardous material releases due to infrastructure and facility damage.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Change in water flows, including paths of rivers and streams.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards initiated by an earthquake, including flood, wildland fire, and landslide.

3.3.3.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to earthquakes. These include:

- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
    - Public schools in the City with a high probability of collapse rating include Forest Grove High School, Neil Armstrong Middle School, and Tom McCall Upper Elementary East and West Campuses.
    - Some buildings at Pacific University are not retrofitted.
    - The police station and one fire station are not retrofitted. City hall is in the process of being retrofitted.
    - Underground infrastructure, such as pipelines and utility lines, buildings, and roads, are vulnerable to damage from liquefaction due to the type of soil in the City.
- Buildings with a very high or high probability of collapse rating include residential and commercial buildings constructed prior to 1990 and unreinforced masonry buildings.
    - The City's downtown corridor is a major business and tourist center. Loss of this area would be devastating to the Forest Grove economy. The buildings are extremely vulnerable due to their age and the potential for an earthquake in the area. Most are unreinforced masonry buildings. Liquefaction is also likely in much of downtown Forest Grove in a major earthquake event.
- Buildings in relatively high liquefaction-susceptible areas along Dairy Creek, Gales Creek, and the Tualatin River are at higher risk of damage from coseismic liquefaction-induced ground deformation.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
    - Several bridges have been identified by the City as vulnerable to earthquakes, and if impacted, could isolate large portions of the community and limit access to emergency services and basic supplies. This includes Dairy Creek Bridge on Highway 8, which is not seismically retrofitted.
- There are facilities that store hazardous materials within the City, which can become a secondary hazard during or after an earthquake.
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.
- Areas near the epicenter of an earthquake event are likely to incur a significant amount of damage to all buildings, infrastructure, facilities, and property.

  - Using 2022 Hazus®-MH information on a Gales Creek Fault 6.7 magnitude earthquake, the City has a higher estimated loss ratio compared to other participants due to the level of shaking likely to occur.[360]

- Using 2022 Hazus-MH information, it is estimated a 6.7 magnitude Gales Creek Fault earthquake event could result in 1,819 yellow-tagged buildings, 668 red-tagged buildings, and $584,634,000 in total economic losses.[361]
- A 2018 Oregon Department of Geology and Mineral Industries (DOGAMI) report shows that a:
  - Cascadia Subduction Zone magnitude 9.0 earthquake in “dry” soil conditions could result in $303,000,000 in building repair costs, 159,000 tons of debris, 492 long-term displaced residents, and up to 455 deaths;
  - Cascadia Subduction Zone magnitude 9.0 earthquake in “wet” soil conditions could result in $496,000,000 in building repair costs, 223,000 tons of debris, 2,238 long-term displaced residents, and up to 812 deaths;
  - Portland Hills fault magnitude 6.8 earthquake in “dry” soil conditions could results in $127,000,000 in building repair costs, 61,000 tons of debris, 115 long-term displaced residents, and up to 112 deaths; and
  - Portland Hills fault magnitude 6.8 earthquake in “wet” soil conditions could results in $259,000,000 in building repair costs, 107,000 tons of debris, 1,242 long-term displaced residents, and up to 358 deaths.[362]

[360] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm
[361] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm
[362] Oregon Department of Geology and Mineral Industries. (2018). Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon. https://www.oregongeology.org/pubs/ofr/O-18-02/O-18-02_report.pdf

3.3.4. Extreme Heat

Due to a rise in the frequency and severity of extreme heat events and the impacts from those events, the NHMP Steering Committee chose to include this hazard for the first time in the Washington County NHMP. Potential impacts of and vulnerabilities to extreme heat are identified below.

3.3.4.1. Potential Impacts

The potential impacts from an extreme heat event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Heat illnesses, including heat rashes, heat cramps, heat exhaustion, heat stroke, and death.
- Extended operational hours of County staff and additional resources needed for response to the event, including the operation of daytime cooling centers and overnight cooling shelters.
- Strain on or loss of water supply due to increased demand.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic losses from decreased worker efficiency and effectiveness and time lost on the job when workers take more frequent or longer breaks to avoid overheating.
- Economic impacts from closure of outdoor activities and events, such as farmers markets and concerts.
- Property damage, such as roof expansions, leading to warped, cracked, and leaking shingles; dry, cracked, and leaking caulking around flashing and joints; cracked foundations; excessive drying of wood structures; and melted siding.
- Disruption of essential infrastructure systems from overheated and damaged utilities, including power, water, transportation, and communication systems.
- Impacts to roadways as heat expands concrete or causes cracking and buckling. Public transit can also be impacted due to melted cables, sagging wires, and warping tracks.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Impacts to greenspaces, such as scorch and sunscald of new foliage, branches or tops of trees dying, and significant stress and die-off of native trees, particularly Douglas fir and cedar. These impacts are intensified if drought is also occurring.
- Concurrent hazards include drought and wildland fire.

3.3.4.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to extreme heat.

Populations substantially vulnerable to extreme heat include:

- People who work or spend a significant amount of time outdoors, including those in construction, landscaping, maintenance and repair, roofing, and solid waste collection.
- People who live and/or work in buildings without air conditioning or cooling equipment.

- People living, working, or spending time in heat islands within the City.
- People living outdoors or in the upper floors of multi-family housing units.
- Populations with higher heat sensitivity, including older adults, infants and children, pregnant women, people with preexisting or chronic diseases, and those who take certain medications that affect thermoregulation or block nerve impulses.
- People with limited mobility and no access to cooling systems who may not be able to travel to cooling centers or shelters.
- People who live in social isolation, including linguistic isolation or those living alone with few social relationships.
- People with mental health conditions. Extreme heat can be associated with higher levels of aggression, violence, and suicidal behavior.
- Factors including race and ethnicity, income, and educational attainment are correlated with heat-related illness.

Additional vulnerabilities to extreme heat include:

- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Bridge infrastructure is vulnerable to thermal expansion of bridge joints and paved surfaces and deterioration of steel, asphalt, protective cladding, coats, and sealants.
- Asphalt pavement is vulnerable to accelerated deterioration through softening, rutting, and migration of liquid asphalt.
- Vehicles, including first responder vehicles, are vulnerable to engine overheating and tire deterioration.
- Equipment at the City’s police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Aboveground utility and power lines can droop or sag and create a heightened fire risk.
- Natural environments and historical, mature landscaping and trees located throughout the City.
- Plants, animals, ecosystems, and natural environments are vulnerable to high rates of mortality due to excessive heat.

3.3.5. Flooding, Including Channel Migration and Streambed Erosion

The City experiences localized flooding typically from October through April; however, historically, it has not been significant or severe. Potential impacts of and vulnerabilities to flooding are identified below.

3.3.5.1. Potential Impacts

The potential impacts from a flooding event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Public health concerns, such as the spread of infectious diseases, exposure to hazardous materials and debris, and water quality issues.
- Need for widespread search and rescue operations, including water rescues.
- Displaced residents in need of sheltering.
- Delayed emergency response times and disruption of traffic due to high water, debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal economic impacts from loss of income and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.5.2. Vulnerabilities

Population, economic, built environment, critical facility, infrastructure, and natural environment vulnerabilities to a flooding event include:

- Populations without access to private transportation.
- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, one fire station, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical properties.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.

  - The following transportation routes have been identified as prone to flooding:
    - Highway 47 – Outside of city limits and controlled by the Oregon Department of Transportation
    - Dairy Creek Bridge on Highway 8 – Outside of city limits and controlled by the Oregon Department of Transportation
    - Stringtown Road – Outside of city limits, is prone to flooding, and contributes to access issues
    - Magnolia Street
    - Mountain View Lane
    - Fern Hill Road
    - Settlers Loop
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- There is one repetitive loss (RL) property within the City.
- Properties without flood insurance.
- Special flood hazard areas within the City.
- Floodplain area along Council Creek could be affected. Residential development in this area may be vulnerable.
- Natural environments and historical, mature landscaping and trees located throughout the City.
- Flood loss estimates determined by Hazus-MH include[363]:
  - 10-year flood scenario
    - Number of buildings lost: 1
    - Loss estimate: $0
  - 50-year flood scenario
    - Number of buildings lost: 2
    - Loss estimate: $2,000
  - 100-year flood scenario
    - Number of buildings lost: 2
    - Loss estimate: $3,000
  - 500-year flood scenario
    - Number of buildings lost: 20
    - Loss estimate: $579,000

[363] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm

Table 110: Land Cover Type in the 100-Year Floodplain in the City of Forest Grove

Land Use Type	Total Parcels in the 100-Year Floodplain	Total Value of Exposed Parcels	Total Area in Jurisdiction (Acres)	Total Area in the 100-Year Floodplain (Acres)	Percentage of Area in the 100-Year Floodplain
Agriculture	5	$3,686,600	443.73	69.63	15.69%
Commercial	11	$19,488,270	319	50.7	15.89%
Forest	0	$0	29.29	0	0%
Industrial	1	$563,150	73.68	1.97	2.67%
Multi-Family Residential	0	$0	66.17	0	0%
Public	23	$35,265,570	653.28	216.64	33.16%
Single-Family Residential	59	$44,265,140	1305.39	64.3	4.93%
Vacant	11	$2,315,040	100.13	36.54	36.49%
Other	14	$780,980	252.59	12.44	4.93%
Total	**124**	**$107,364,750**	**3243.26**	**452.22**	**13.94%**

Table 8: Facilities in Forest Grove within FEMA-Mapped Floodplains

Building Classification	Buildings Within Forest Grove	Buildings Within 100-Year Floodplain
Total Buildings	8,234	46
Percentage of Buildings within Forest Grove	100	0.56%

3.3.6. Landslide

The northwestern portion of Forest Grove is highly susceptible to damage from landslides.[364] Potential impacts of and vulnerabilities to landslides are identified below.

3.3.6.1. Potential Impacts and Vulnerabilities

The potential impacts of and vulnerabilities to a landslide event are identified below. The type, magnitude, and extent of these can vary based on the scale of the event.

- Portions of the City of Forest Grove are exposed to landslide hazards. Areas in terrain with moderate to steep slopes or at the base of steep hillsides may be exposed to landslides. While these areas are highly prone to landslides, most of the populated areas are outside these zones because most of the buildings are on the relatively flat ground toward the center of the Tualatin Valley.
- Areas of concern include Council Creek, Jobs Ditch, Nature's Ridge, and David Hill. Residential development in these areas may be vulnerable.
- Critical infrastructure and facilities, including Forest Grove City Auditorium, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, 13 city parks, 12 assisted living and retirement communities, and 1 historical property.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Per DOGAMI, there are 13 buildings with a total value of $4,202,000 at very high susceptibility to landslide exposure, 578 buildings with a total value of $178,395,000 at high susceptibility to landslide exposure, and 1,135 buildings with a total value of $303,306,000 at moderate susceptibility to landslide exposure.[365] Additionally, a community risk profile completed by DOGAMI shows 1,817 residents may be potentially displaced due to a very high or high susceptibility landslide scenario.[366]
- Landslide hazard is ubiquitous in a large percentage of undeveloped land and may present challenges for future planning and mitigation efforts. Awareness of nearby areas of landslide hazard is beneficial for reducing risk for every community in Washington County.

[364] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm
[365] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm
[366] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm

3.3.7. Volcanic Ash

Volcanic activity is possible from mountains near the County. It is anticipated that ashfall from a volcanic eruption has the potential to impact the City, although the scale and types of impacts and vulnerabilities may differ depending on which volcano erupts, the level of eruption, and the wind direction during and after eruption. Potential impacts of and vulnerabilities to volcanic ash are identified below.

3.3.7.1. Potential Impacts

Though unlikely, the impacts of a significant ashfall can be substantial. Impacts may include:

- Indirect injuries and deaths, such as those sustained during ash cleanup operations or in traffic accidents.
- Short-term health effects, including respiratory effects.
- Widespread public health issues stemming from failing or damaged infrastructure, such as lack of clean water and sanitation. This includes public water systems that rely on outdoor reservoirs.
- The need to shelter individuals to protect them from poor air quality, including houseless persons and persons displaced from their residences due to poor residential air filtration systems.
- Delayed emergency response times due to decreased visibility and increased traffic hazards.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and cleanup activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, drainage systems, telecommunications, and transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.7.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to volcanic ash. These include:

- People in the City with chronic lung problems and preexisting health conditions, children, pregnant women, and older adults.
- People without access to effective dust masks, eye protection, and drinking water and food uncontaminated by ash.

- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Older buildings and infrastructure not built to withstand the weight and impacts from large amounts of volcanic ash, including manufactured homes and buildings and the people who live or work in them.
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.

3.3.8. Wildland Fire

Although the City of Forest Grove could experience a wildland–urban interface event, historically it is more likely to be affected by smoke and poor air quality due to wildland fires outside its boundaries. Significant wildland fire or wildland fire smoke events, their potential impacts, and vulnerabilities to wildland fire are identified below.

3.3.8.1. Significant Events

The City has not been directly impacted by a wildland fire event since the update of the 2011 NHMP. However, in September 2014 the Scoggins Creek wildfire, located six miles west of Forest Grove, burned 211 acres and forced some home evacuations. Additionally, in September 2020, multiple wildfires occurred concurrently in the county, outside the county, and outside the state, and the City experienced significant smoke from the fires. The Air Quality Index around the City was between 199 and 317, with particulate matter 2.5 micrometers or smaller ($PM_{2.5}$).

3.3.8.2. Potential Impacts

The potential impacts from a wildfire event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Exposure to wildfire smoke, which can lead to eye, nose, and throat irritation and the worsening of chronic heart and lung diseases.
- Widespread public health issues stemming from failing or damaged infrastructure, such as lack of clean water and sanitation.
- Need for widespread search and rescue operations.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to blocked transportation routes and debris, congested transportation routes due to evacuations, and damaged infrastructure and vehicles.
- Extended operational hours of County staff and resources needed for response to the event.
- Strain on or loss of water supply due to increased demand.
- Economic impacts to governments, including costs for fire suppression, staff, equipment, supplies, transportation and mobilization of first responders, evacuations, sheltering operations, post-fire recovery, and rebuilding costs associated with government-owned buildings, property, and infrastructure.
- Economic impacts, including loss of local revenue due to business and property tax losses, agriculture production losses, and reduced recreation and tourism activity. Scoggins Valley Park receives one million visitors a year, most during summer, which is when wildland fires tend to occur.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.

- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property, causing blocked roads and rail transportation routes.
- Downed or damaged power lines. This impact may be compounded since powerline failures can lead to additional wildfires.
- Power outages and natural gas leaks.
- Hazardous material releases due to infrastructure and facility damage.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards, including air and water quality issues. Landslide and erosion issues are common following a wildland fire.

3.3.8.3. Vulnerabilities

Given the dynamic nature of wildland fires, all populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to this hazard. This includes:

- People in the City with chronic lung problems and other preexisting health conditions, children, pregnant women, and older adults.
- Populations without access to private transportation.
- First responders and other personnel working directly on fire protection, suppression, and patrols or near a wildfire can experience burns, smoke exposure, heat-related impacts such as heat stroke, heat exhaustion, dehydration, physical fatigue, mental health challenges, injuries, and death.
- Critical infrastructure and facilities, including the Forest Grove City Auditorium, one fire station, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
- Drinking water sources, food supplies and availability, and access to medical resources or care may also be impacted by wildfire and can cause health impacts on a large scale.
- Homes, businesses, and infrastructure adjacent to the wooded areas near the outskirts of the City.
- Per analysis of the Oregon State University–Extension Service Fire Program and Wildland Fire Associates dataset, there is one building with a total value of $250,000 at high risk of wildland fire exposure and 1,017 buildings with a total value of $310,077,000 at low wildland fire exposure risk.[367] There are no buildings identified as at moderate wildfire exposure risk. Additionally, a community risk profile completed by DOGAMI shows one resident may be potentially displaced due to a high or moderate risk wildland fire scenario.[368]

[367] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm
[368] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm

- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.

3.3.9. Windstorm, Including Tornado

Because of its more rural geography, the City tends to experience more frequent and higher magnitude windstorm events. Potential impacts of and vulnerabilities to windstorms are identified below.

3.3.9.1. Potential Impacts

The potential impacts from a windstorm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems. Significant damage could lead to the complete loss of structures or totaled vehicles.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property causing blocked roads and rail transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.9.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to windstorms, including tornadoes. This includes:

- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities,

Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.

- Older buildings and infrastructure not built to withstand high winds, including manufactured homes and buildings.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Aboveground utility and power lines.
- Natural environments and historical, mature landscaping and trees located throughout the City.

3.3.10. Winter Storm

Due to the City's location closer to the mountains on the west side of the county, it typically experiences more frequent and more severe winter storm events than other NHMP participants. Potential impacts of and vulnerabilities to winter storms are identified below.

3.3.10.1. Potential Impacts

The potential impacts from a winter storm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths, including from carbon monoxide poisoning, falls from slick or icy conditions, frostbite, and hypothermia.
- Delayed emergency response times due to debris, blocked transportation routes, damaged infrastructure and vehicles, and difficulty using fire hydrants because of frozen or damaged water system components.
- Stranded travelers due to ice, snow, and transportation impacts.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- An increased number of house fires due to unsafe alternate heating methods.
- Significant property damage and loss of water due to frozen or damaged pipes or the thawing of frozen pipes.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property causing blocked roads and rail transportation routes.
- Downed or damaged power lines can lead to wildfires, and tree debris can create fuel load for wildfire.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards, including flooding.

3.3.10.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to winter storms. These include:

- People who do not have access to sufficient heating, insulated clothing, or dry living conditions, including unhoused populations.
- Older adults and infants, people who take certain medications, people who have certain medical conditions, and people who have been drinking alcohol are at increased risk for hypothermia.
- People improperly using generators and heating devices.
- Populations with disabilities may be more affected due to mobility issues.
- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink. Because of the City's more rural location, other areas of the county tend to be prioritized for snow removal.
- Older buildings and infrastructure not built to withstand the weight and impacts from large amounts of snow and ice. This includes historical structures and properties.
- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures and emergency generators.
- Natural environments and historical, mature landscaping and trees located throughout the City.

3.4. Historical Events

The timeframe of data collected during the planning process for the City of Forest Grove was January 1, 2011, to February 22, 2022. Hazard events that impacted the entire planning area during these dates are detailed in Volume I, Section 2. During this period, the City experienced impacts from wildland fire and wildland fire smoke.

The City has not issued any disaster declarations since the 2011 NHMP update.

3.5. Overall Vulnerability

Based on the analysis completed by the Technical Committee, wildland fire, windstorm, including tornado, winter storm, earthquake, and drought present the highest relative risk to the City of Forest Grove. These hazards can create widespread events, and all populations, economies, structures, improved property, critical facilities and infrastructure, and natural environments in the City can be vulnerable to these hazards.

Areas of greatest vulnerability to these hazards within the City include:

- Populations with higher vulnerability, such as those with preexisting health conditions, older adults, children, and pregnant women. This may include those living in or spending time in the City's public school buildings and facilities.
- Populations that are unhoused, do not have access to private transportation, and/or are without access to air conditioning, cooling equipment, sufficient heating, and clean water.
- People living, working, or spending time in heat islands within the City.
- Populations with limited income and financial resources.
- Populations whose primary language is not English.
- Industries that can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic impacts to the City, including loss of local revenue due to business and property tax losses, reduced future revenues, reduced recreation and tourism activity, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Critical infrastructure and facilities, including city hall, Forest Grove City Auditorium, Forest Grove Aquatics Center, one police station, two fire stations, the Forest Grove Public Works Shop, Forest Grove Light and Power, the Forest Grove Light and Power Transmission System, the Forest Grove Water Treatment Plant/Reservoir, the Forest Grove City Watershed and Transmission Lines, the Clean Water Services Forest Grove Water Resource Recovery Facility, the Joint Water Commission Forest Grove Water Treatment Facility, 12 public school buildings and facilities, Pacific University and associated campus buildings, 13 city parks, 12 assisted living and retirement communities, and 5 historical areas or properties.
    - Older buildings and infrastructure not built to current building codes or seismic standards may be more vulnerable.
        - Public schools in the City with a "high" probability of collapse rating include Forest Grove High School, Neil Armstrong Middle School, and Tom McCall Upper Elementary East and West Campuses.
        - Some buildings at Pacific University are not retrofitted.
        - The police station and one fire station are not retrofitted. City hall is currently being retrofitted.
        - The City's downtown corridor is a major business and tourist center. Loss of this area would be devastating to the Forest Grove economy. The buildings are extremely vulnerable due to their age and the potential for an earthquake in the area. Most are unreinforced masonry buildings. Liquefaction is also likely in much of downtown Forest Grove in a major earthquake event.
        - Buildings in relatively high liquefaction-susceptible areas along Dairy Creek, Gales Creek, and the Tualatin River are at higher risk to damage from coseismic liquefaction-induced ground deformation.
- Critical transportation infrastructure, including State Highways 8 and 47, arterial roads, TriMet services, and GroveLink.
    - Several bridges have been identified by the City as vulnerable to earthquakes, and if impacted, could isolate large portions of the community and limit access to emergency services and basic supplies. This includes Dairy Creek Bridge on Highway 8 which is not seismically retrofitted.

- Equipment at the City's police and fire stations, the Public Works Shop, and utility facilities.
- Other critical infrastructure, including communication structures, emergency generators, and above ground utility and power lines. Underground infrastructure, such as pipelines and utility lines, buildings, and roads are also vulnerable to damage from liquefaction due to the type of soil in the City.
- Areas near the epicenter of an earthquake event are likely to incur a significant amount of damage to all buildings, infrastructure, facilities, and property. Using 2022 Hazus-MH information on a Gales Creek Fault 6.7 magnitude earthquake, the City has a higher estimated loss ratio compared to other participants due to the level of shaking likely to occur.369
- There are facilities that store hazardous materials within the City, which can become a secondary hazard during or after an earthquake.
- The City's water sources.
- Natural environments and historical, mature landscaping and trees located throughout the City.

4. Capability Assessment

(In compliance with 44 CFR §201.6(c)(3))

The following capability assessment and safe growth analysis examine the ability of the City to implement and manage a comprehensive mitigation strategy. Strengths, opportunities, and resources of the jurisdiction are identified to develop an effective hazard mitigation action plan. The capabilities identified in this assessment were evaluated collectively to develop feasible recommendations, which support the implementation of effective mitigation activities.

A capability questionnaire was distributed to the City of Forest Grove Technical Committee to initiate this assessment. The survey included questions regarding existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, education and outreach capabilities, and fiscal capabilities. The Technical Committee also completed a safe growth analysis to identify potential gaps in growth guidance instruments and improvements that could be made to reduce vulnerability to future development. It is important to note that the City of Forest Grove and the City of Cornelius work in tandem in many areas of responsibility so that when one is responsible for a duty, that duty covers both cities.

4.1. Planning and Regulatory Assessment

Planning and regulatory capabilities include plans, policies, codes, and ordinances within the City that can prevent and reduce the impacts of hazards.

The City's Comprehensive Plan, Capital Improvement Plan, Economic Development Plan, local Emergency Operations Plan, Stormwater Management Plan, and Community Wildfire Protection Plan address natural hazards, identify projects that can be included in the mitigation strategy, and can be used to implement mitigation actions. Many of the goals and policies in the City's Comprehensive Plan are related to those in this NHMP and safe growth objectives. The monitoring and implementation section of the NHMP covers these and all other hazard mitigation strategies discussed in the plan. Safety is explicitly included in the Comprehensive Plan's growth and development policies. The City has a future land use map in their Comprehensive Plan, and their land use policies discourage development or

[369] Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm

redevelopment within natural hazard areas. The City's Comprehensive Plan addresses limited space for expected future growth in areas located outside natural hazard areas.

The City's Capital Improvement Program does not provide funding for hazard mitigation projects identified in this NHMP; however, the program limits expenditures on projects that would encourage development in areas vulnerable to natural hazards. The City's infrastructure policies limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.

The Forest Grove Transportation System Plan addresses natural hazards, identifies projects that can be included in the mitigation strategy, and can be used to implement mitigation actions. The Forest Grove Transportation System Plan limits access to identified hazard areas and is used to guide growth into safe locations. The City and the plan do not have movement systems designed to function under disaster conditions, such as during an evacuation.

Land use planning and ordinances are adequately administered and enforced and are an effective measure for reducing hazard impacts. These include zoning, subdivision, and building codes. The City has zoning ordinances that conform to the Comprehensive Plan in terms of discouraging development or redevelopment within natural hazard areas, including prohibiting development within, or filling of, wetlands, floodways, and floodplains. The ordinance also contains natural hazard overlay zones that set conditions for land use within such hazard zones. Rezoning procedures recognize natural hazard areas as off limits to any zoning changes that would allow for increased activity or development in the area. The City has subdivision regulations that restrict the subdivision of land within or adjacent to natural hazard areas and regulations that allow density transfer where hazard areas exist. City regulations do not provide for conservation subdivisions or cluster subdivisions to conserve environmental resources. The City's building code contains provisions to strengthen or elevate construction to withstand hazard forces, and the City has an adopted evacuation and shelter plan to deal with emergencies from natural hazards. The small-area or corridor plans in the City recognize the need to avoid or mitigate natural hazards, and economic development or redevelopment strategies include provisions for mitigation of natural hazards.

The City's Planning Division leads and facilitates review of land use applications and enforces site plan review requirements. The City of Forest Grove utilizes the most current building codes as they are adopted by the State of Oregon.[370] Forest Grove Fire & Rescue has an Insurance Services Office (ISO) rating of 4.

The City has environmental systems that protect development from hazards identified and mapped and policies that maintain and restore protective ecosystems, including land use policies. The City does not have environmental policies that provide incentives to development that is located outside protective ecosystems. Chapter 9 of the Forest Grove Comprehensive Plan, Natural Resources and Hazards, supports the Oregon Statewide Land Use Planning Goal 5 to "protect natural resources and conserve scenic and historic areas and open spaces."[371]

4.1.1. National Flood Insurance Program Compliance

Participation in the National Flood Insurance Program (NFIP) is based on a voluntary agreement between a community and FEMA. For communities that adopt a floodplain management ordinance to reduce flood risks to new construction, federally backed flood insurance is made available to property owners in the community. Compliance with the NFIP, however, extends beyond participation in the program. The three basic components of the NFIP include floodplain identification and risk mapping, responsible floodplain management, and flood insurance.

[370] City of Forest Grove. (n.d.). Planning Division. https://www.forestgrove-or.gov/planning
[371] City of Forest Grove. (2022). Forest Grove Comprehensive Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/planning/page/7751/comp_plan_publication_2022_edition.pdf

An RL property is a property insured under the NFIP for which the program has paid at least two claims of more than $1,000 in any 10-year period since 1978, regardless of any change(s) of ownership during that period. There are no RL properties in the City.

4.1.1.1. National Flood Insurance Program Details

Insurance Summary

There are currently 12 NFIP policies in the City. The dollar amount of coverage in force and dollar amount of premiums paid annually was not available at the time this NHMP was published. Identifying this information is an improvement for the next planning cycle.

There have been 5 loss claims paid, with two of those paid in full, for a total amount of $75,194.38 paid.

There are 46 structures exposed to flood risk within the community.

Staff Resources

There are no barriers to running an effective NFIP program in the City. The City of Forest Grove Planning Division and emergency preparedness personnel administer the program. This staff facilitates permit review and education and outreach. The City has a floodplain administrator on staff.

Compliance History

The City is in good standing with the NFIP, and there are no outstanding compliance issues. The City is in good standing with the NFIP, and there are no outstanding compliance issues. The date of the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC) was not available at the time this NHMP was published. Identifying this information is an improvement for the next planning cycle.

The City will continue NFIP compliance during the next five years of NHMP implementation by enforcing floodplain management requirements, maintaining and using floodplain mapping, and undertaking any code amendments needed to maintain compliance.

Regulation

The City entered into the NFIP on March 1, 1974, and has both digital and paper flood insurance rate maps (FIRMs). The initial FIRM was identified on March 15, 1982, and the current effective map date is October 19, 2018. Floodplain development regulations meet or exceed the minimum FEMA and state requirements.

Community Rating System

The City does not participate in the Community Rating System.

4.2. Administrative and Technical Assessment

This portion of the assessment includes staff and their skills and tools that can be used for mitigation planning and implementing specific mitigation actions.

The City's Planning Commission is responsible for assisting the City Council to develop, maintain, update, and implement the City's Comprehensive Plan and development code provisions and to review and take action on development projects. The Community Development and Planning Department maintains compliance with Oregon's Statewide Planning Goals, provides support to the Planning Commission, and reviews projects for compliance with the City's codes and plans.

Forest Grove Light and Power administers maintenance programs to reduce risk, including tree trimming near utility lines. The City's Public Works Department cleans streets and clears storm drains within the

City. The City also has multiple effective mutual aid agreements and planning partnerships, including intergovernmental agreements, and partnerships with the Washington County Emergency Management Cooperative and the Cooperative Public Agencies of Washington County.

Forest Grove's Building Division is responsible for reviewing and approving plans, issuing permits and performing inspections for new construction, and performing alterations and repairs. It provides structural, plumbing, mechanical, fire, and life safety plan reviews and performs all required inspections, except electrical, related to both commercial and residential construction. The division has adequate staffing levels to enforce regulations, staff are trained on hazards and mitigation efforts, and coordination on mitigation initiatives with staff is effective. The chief building official is part of the Forest Grove Building Division and is a full-time position. This division also has several other full-time positions, including city planners and a geographic information system (GIS) coordinator. The emergency management duties are handled by the Fire Marshal.

Additionally, the City has many technical capabilities that have been used to assess or mitigate risk and could be used in future efforts. Warning systems include Everbridge and OR-Alert in partnership with Washington County. Grant writing is completed by individual departments as needed. Hazard data and information can be pulled from a variety of sources, including GIS mapping software, historical records, and DOGAMI.

4.3. Education and Outreach Assessment

Education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information were assessed to determine the City's capabilities.

The Forest Grove School District serves the City. The district has ongoing public education programs that include fire and earthquake drills and fire safety coloring and activity sheets. School district facilities are also used as shelters, as needed.

Nonprofit organizations and community groups in the City can assist with implementing future mitigation actions, including those that provide sheltering and emergency assistance, extreme heat sheltering, and emergency management-specific groups. These partners include the Red Cross, local churches, and the Washington County Emergency Management Cooperative.

4.4. Financial Assessment

The City has access to or is eligible to potentially use the following funding resources for hazard mitigation initiatives:

- Capital improvements project funding
- Authority to levy taxes for specific purposes
- Fees for water, sewer, gas, and/or electric services
- Incurrence of debt through general obligation bonds and/or special tax bonds
- Federal funding sources, including the Community Development Block Grant and Hazard Mitigation Assistance Grants
- State funding programs, including the funding for disaster and emergency preparedness efforts
- Public or private partnership funding sources, including local funding from Waste Management Corporation's transfer station located in the City

4.5. Capability Expansion and Improvement

Actions that can expand and improve existing authorities, plans, policies, and resources for mitigation include continuing to update City plans as necessary to ensure they are current and reflect the needs of the community; continuing to seek out a variety of funding sources and increase grant writing capabilities; creating and implementing additional public education and outreach offerings; establishing a Community Emergency Response Team; and solidifying staffing capabilities and training the new staff, as required.

5. Mitigation Strategy

(In compliance with 44 CFR §201.6(c)(3)(i), §201.6(c)(3)(ii), §201.6(c)(3)(iii), §201.6(c)(3)(iv), , and §201.6(c)(4)(ii))

The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) directs local mitigation plans to describe hazard mitigation action and establish a strategy to implement those actions. Therefore, all other requirements for a local mitigation plan lead to and support the mitigation strategy.

5.1. Mitigation Goals

The Steering Committee reviewed and evaluated goals from the 2017 Washington County NHMP, 2020 City of Beaverton NHMP, 2011 Cities of Cornelius and Forest Grove NHMPs, and 2020 State of Oregon NHMP. The goals from each plan were grouped by topic and then synthesized to create the seven goals detailed in Volume I, Section 3. These goals are the basis of this plan and summarize what the Steering Committee will accomplish by implementing this plan.

5.2. Plan Incorporation and Integration into Existing Planning Mechanisms

Based on mitigation plan requirement 44 CFR §201.6(c)(4)(ii), the vulnerability and capabilities assessment for the City was carefully reviewed and considered when developing the mitigation actions for this plan. The City's Technical Committee will establish a process in which the mitigation strategy, goals, objectives, and actions outlined in this plan will be incorporated into the existing local planning strategies.

Once the plan is adopted, the committee will coordinate implementation with the responsible parties in the City and with external stakeholders as needed. The primary means for integrating mitigation strategies will be through the revision, update, and implementation of plans and regulations, such as comprehensive plans, capital improvement plans, and land development regulations, as feasible.

The members of the City's Technical Committee will remain charged with ensuring the goals and strategies of new and updated local planning documents for their jurisdictions and special districts are consistent with the goals and actions in the NHMP and will not contribute to increased hazard vulnerability.

5.2.1. Comprehensive Plan

The City of Forest Grove's Comprehensive Plan is amended as needed, with the most recent amendment occurring in 2022.[372] City personnel assigned with emergency preparedness and management duties will determine the best way to integrate the hazard mitigation goals into the City's Comprehensive Plan, as applicable.

5.2.2. Building and Zoning Codes

The City's building and construction codes are located in the Forest Grove Municipal Code, Chapter 150. The City has adopted many state codes, including the Oregon Structural Specialty Code, Oregon Plumbing Specialty Code, Oregon Mechanical Specialty Code, Oregon Residential Specialty Code, Oregon One- and Two-Family Dwelling Specialty Code, and the current version of the Uniform Building Code Appendix Chapter 33 as published by the International Conference of Building Officials.[373]

The City's zoning code is found within the Forest Grove Municipal Code, Title XVII, Development Code, Article 3, Zoning Districts, and addresses natural resource area protection and improvement in accordance with Metro's Urban Growth Management Functional Plan.[374] Additionally, section 17.8.310 of the City's code addresses hazard areas, including floodplains and flood management areas.[375] Updates to this section and additions for other areas of hazard mitigation strategies can be integrated into future code amendment efforts.

The City will continue to enforce building and zoning codes and review and update codes to address the evolving needs of the City, as applicable.

5.2.3. Public Engagement, Education, and Outreach

The mission of community engagement will be incorporated into future outreach projects. City of Forest Grove personnel who are assigned with emergency preparedness duties will continue public engagement campaigns during National Preparedness Month. Additionally, personnel will host educational opportunities at civic events, such as civic association meetings and neighborhood fairs, to showcase hazard mitigation opportunities, like flood protection programs and rainwater harvesting, and will provide general preparedness tips.

5.2.4. Land Development Regulations

The City's land development regulations are addressed in the Forest Grove Municipal Code, Title XVII, Development Code.[376] Land use permits are reviewed by city staff to ensure compliance with the City code and the City's Comprehensive Plan. Additionally, The City's Planning Commission plays an integral role in the growth-related issues of the City. The Planning Commission's responsibilities include participating in the development of community plans, holding hearings, and interpreting state and local laws and codes related to community development plans for regulations for future growth.[377] The City will

[372] City of Forest Grove. (2022). Forest Grove Comprehensive Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/planning/page/7751/comp_plan_publication_2022_edition.pdf
[373] Forest Grove Municipal Code. (n.d.). Chapter 150: Building Codes. https://codelibrary.amlegal.com/codes/forestgrove/latest/forestgrove_or/0-0-0-3895#JD_150.003
[374] Forest Grove Municipal Code. (n.d.). Section 17.5.005: Natural Resource Areas. https://codelibrary.amlegal.com/codes/forestgrove/latest/forestgrovedev_or/0-0-0-1693
[375] Forest Grove Municipal Code. (n.d.). Section 17.8.310: Hazard Areas. https://codelibrary.amlegal.com/codes/forestgrove/latest/forestgrovedev_or/0-0-0-3631
[376] Forest Grove Municipal Code. (n.d.). Title XVII: Development Code. https://codelibrary.amlegal.com/codes/forestgrove/latest/forestgrovedev_or/0-0-0-4
[377] City of Forest Grove. (n.d.). Planning Commission. https://www.forestgrove-or.gov/bc-pc

continue to enforce land development regulations and review and update these regulations to address the evolving needs of the City, as applicable.

5.2.5. Floodplain Management Program and/or National Flood Insurance Program

The City of Forest Grove's Community Development Department and emergency preparedness personnel will continue to review any RL properties and incorporate any new findings into the City's mitigation strategy, as appropriate. As of September 30, 2021, the City had one RL property.

The City's floodplain management program is implemented through section 17.8.310 of the City's code.[378] Updates to this section and additions for other areas of hazard mitigation can be integrated into future code amendment efforts, as appropriate.

5.2.6. Economic Development Plans and Policies

The City's 2020 Economic Development Strategic Plan identifies potential areas for mitigation integration, including the further development of downtown.[379] Forest Grove will continue to update and integrate mitigation policies into the current economic plans and policies as needed.

5.2.7. Stormwater Management Plans and Procedures

The Forest Grove Storm Drainage Master Plan was most recently updated in November 2007. It provides a conveyance system analysis and identifies capital improvement projects for system improvements.[380] The City will update this plan as needed to incorporate additional mitigation efforts and strategies as needed and appropriate.

5.2.8. Emergency Plans That Address Evacuation and Sheltering

Evacuation and sheltering are addressed in the Cornelius and Forest Grove Emergency Operations Plan in annex FA 2, Human Services.[381] This annex provides information regarding the response to the needs for mass care and sheltering, human services, and public health support for victims of natural and technological emergencies and disasters. This annex will be reviewed and updated as needed to meet the needs of the City and its residents.

In the cities, nongovernmental/faith-based organizations such as the Red Cross provide sheltering, emergency food supplies, counseling services, and other vital support services to support response and promote the recovery of disaster victims. Nongovernmental and faith-based organizations also collaborate with responders, governments at all levels, and other agencies and organizations.

[378] Forest Grove Municipal Code. (n.d.). Section 17.8.310: Hazard Areas. https://codelibrary.amlegal.com/codes/forestgrove/latest/forestgrovedev_or/0-0-0-3631
[379] City of Forest Grove. (2020). Economic Development Strategic Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/economic_development/page/219/2020_economic_development_plan_final_v3.pdf
[380] City of Forest Grove. (2007 November). Storm Drainage Master Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/engineering/page/14981/sw_master_plan_full_report.pdf
[381] City of Cornelius and City of Forest Grove. (2014 July). Cities of Cornelius and Forest Grove, Washington County, Oregon Emergency Operations Plan. https://www.forestgrove-or.gov/sites/default/files/fileattachments/fire/page/3051/cornelius-forestgroveeop_fullplan_july2014.pdf

5.2.9. Enforcement of Existing Polices

The City will continue to enforce the policies that are in place and include hazard mitigation elements, including building and zoning codes, land development regulations, and NFIP regulations.

5.2.10. Funding Opportunities

City emergency preparedness personnel will continue to monitor local, state, and federal funding opportunities that could be utilized for hazard mitigation. This includes Hazard Mitigation Assistance opportunities and non-traditional mitigation funding sources.

6. Action Items

The City of Forest Grove's action items in the 2011 NHMP were determined by the 2011 planning team. The action items from the previous plan and the status of each action are in Section 6.1 below.

All action items from the 2011 NHMP were determined as still valid and necessary by the City's Technical Committee based on the review of its risk assessment, its existing capabilities, and the status of its previous action items. Action items from the 2011 NHMP are being retained for the 2023 update, with some being in progress in addition to being retained.

This comprehensive range of actions includes local plans and regulations, structure and infrastructure projects, natural systems protections, and education and awareness programs. A summary of these actions and full action item planning worksheets are provided in Sections 6.1 and 6.2 below. Additional information about how these actions were developed, evaluated, and prioritized is in Volume I, Section 3.

The cities of Forest Grove and Cornelius share many staff, planning initiatives, and resources. Therefore, the cities action items are presented together. This is also how action items were presented in the 2011 NHMP.

6.1. Status of City of Forest Grove Action Items from the 2011 NHMP

Table 9: Status of Action Items from 2011 NHMP

Action Item Number	Action Item Description	Hazard(s) Addressed	Implementation Update	Current Status
1	Coordinate with Washington County and the Oregon Department of Transportation (ODOT) to assess the seismic stability of bridges surrounding the communities of Forest Grove and Cornelius and seek funding to reinforce or replace bridges as needed (also applies to flooding concerns).	Earthquake and Flood		Retain for 2023 NHMP Update
2	Assess the seismic and flood risk of the Dairy Creek Bridge.	Earthquake and Flood		Retain for 2023 NHMP Update

Action Item Number	Action Item Description	Hazard(s) Addressed	Implementation Update	Current Status
3	Coordinate with Clean Water Services (CWS) to assess the seismic strength of the sewage treatment system and develop improvements accordingly as part of the sewage system's current update efforts.	Earthquake	CWS has begun upgrading their regional facility in a multi-year project.	In progress. Retain for 2023 NHMP Update
4	Coordinate with local school district(s) to seek funding to assess and seismically retrofit school buildings that are vulnerable to collapse.	Earthquake	School bond measure is on November 2022 ballot.	In progress. Retain for 2023 NHMP Update
5	Seek funding to assess and seismically retrofit critical facilities (police stations, fire stations, and hospitals) that are vulnerable to collapse.	Earthquake	A new city office is under construction in 2022; existing city hall will see some upgrades as part of this neighboring building project.	In progress. Retain for 2023 NHMP Update
6	Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices through public education.	Earthquake	This is an ongoing discussion item for all city educational staff and has recently been relaunched, after the pandemic limited our education efforts.	In progress. Retain for 2023 NHMP Update
7	Assess Forest Grove's downtown businesses' vulnerability to an earthquake and encourage businesses to develop business continuity and recovery plans.	Earthquake		Retain for 2023 NHMP Update
8	Assess the seismic vulnerability of the Forest Grove Water Treatment Plant as well as the distribution and transmission systems.	Earthquake	City staff have developed a water resiliency plan that is in the final stages of being written	In progress. Retain for 2023 NHMP Update
9	Coordinate with Pacific University to seek funding to assess and seismically retrofit campus buildings that are vulnerable to collapse.	Earthquake		Retain for 2023 NHMP Update
10	Continue compliance with the National Flood Insurance Program (NFIP) through enforcement of local floodplain ordinances.	Flood		Retain for 2023 NHMP Update

Action Item Number	Action Item Description	Hazard(s) Addressed	Implementation Update	Current Status
11	When updated flood insurance rate maps for the Tualatin River become available, adopt the updated maps.	Flood		Retain for 2023 NHMP Update
12	Acquire more detailed data on landslide hazards to better understand risk and be able to set more effective thresholds for the requirement of geotechnical reports.	Landslide		Retain for 2023 NHMP Update
13	Coordinate with CWS, Washington County, rural fire districts, and the Department of Forestry to mitigate wildfire risk outside of city limits.	Wildland Fire	Countywide wildfire plan is being updated soon; meetings have just begun.	In progress. Retain for 2023 NHMP Update
14	Explore opportunities to utilize city park land on the edges of town as wildfire buffers.	Wildland Fire	The City Parks Department took actions in 2022 to mitigate wildfire hazards on city-owned land at the wildland–urban interface.	In progress. Retain for 2023 NHMP Update
15	Coordinate with utility providers to educate the public about the role of proper tree pruning and stability in preventing damage during windstorms.	Windstorm, including tornado	This is an ongoing educational effort offered by the City's light and power agency.	In progress. Retain for 2023 NHMP Update
16	Coordinate with Pacific University to conduct an assessment of all on-campus trees to determine their stability, to aid in preventing damage during severe weather.	Windstorm, including tornado, and Winter Storm	Pacific University has its own arborist plan in place for the maintenance of trees on campus.	In progress. Retain for 2023 NHMP Update
17	Continue to educate citizens about ways to weatherize their homes and how to operate emergency heating equipment safely.	Winter Storm	This is an ongoing seasonal education topic offered by city communications staff.	In progress. Retain for 2023 NHMP Update
18	Maintain regular assessments of the health of trees in Forest Grove's downtown to prevent damage to buildings and utilities from falling trees.	All Hazards		In Retain for 2023 NHMP Update

Action Item Number	Action Item Description	Hazard(s) Addressed	Implementation Update	Current Status
19	Update the existing Facilities Master Plan that assesses the need for new or updated facilities and incorporates natural hazard vulnerabilities and mitigation measures for reducing vulnerability.	All Hazards		Retain for 2023 NHMP Update
20	Encourage residents to prepare and maintain 72-hour kits.	All Hazards	This is part of the City's normal educational offerings.	In progress. Retain for 2023 NHMP Update
21	Coordinate with utility providers to address lack of broadband Internet redundancy in the community.	All Hazards		Retain for 2023 NHMP Update
22	Review the City of Forest Grove's comprehensive plan and development codes for opportunities to more effectively reduce risks to new development.	All Hazards		Retain for 2023 NHMP Update

6.2. Mitigation Action Information Worksheets

Table 111: Bridge Seismic Stability Assessment, Reinforcement, and Replacement

Mitigation Action Information			
Title of action	Bridge Seismic Stability Assessment, Reinforcement, and Replacement		
Type of action	Plans/regulations ☐	Natural systems protection ☐	
	Structure and infrastructure project ☒	Public education/awareness ☐	
Action description	Coordinate with Washington County and ODOT to assess the seismic stability of bridges surrounding the communities of Forest Grove and Cornelius and seek funding to reinforce or replace as needed. Also applies to flooding concerns. Work with Washington County and ODOT to conduct seismic assessment of bridges leading into and out of Forest Grove and Cornelius. Prioritize any actions that need to be taken to address any seismic concerns and coordinate with Washington County, ODOT, and the OEM seismic grants coordinator to find appropriate funding sources. Bridges to be considered: B Street Bridge at Gales Creek, Susbauer Bridge at Dairy Creek, and Fern Hill Road Bridge across the Tualatin River		
Hazard(s) addressed	Dam failure ☐	Flood ☒	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Several bridges have either earthquake or flood risk and when impacted, isolate large portions of the community and limiting access to emergency services and basic supplies. Coordinating efforts with Washington County and ODOT to assess the seismic stability of the bridges and seeking funding to reinforce or replace as needed will provide more reliable access and provide continuous service in both communities.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☐
	Goal 2 ☐	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☒	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Transportation Objective 1 to provide a balanced transportation system. Connection to the City of Cornelius' Transportation Plan Goals.		

Mitigation Action Implementation Plan		
Priority	Low ☐ Medium ☒ High ☐	
Lead position, office, department, or division responsible for implementation	City Engineers	
Potential Funding Sources		
Non-Federal Funding Sources	**Federal Funding Sources**	
General Fund	BRIC and FMA grants through FEMA	
Estimated Cost	To be determined	
Estimated Benefit		
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**	
Decrease or eliminate earthquake or flood risk to several bridges, which will maintain transportation access for large portions of the communities and emergency services.	To be determined	
Project Timeline		
Expected Timeline for Completion		
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐		

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 112: Assessment of Seismic and Flood Risk of the Dairy Creek Bridge

Mitigation Action Information			
Title of action	Assessment of Seismic and Flood Risk of the Dairy Creek Bridge		
Type of action	Plans/regulations ☐		Natural systems protection ☐
	Structure and infrastructure project ☒		Public education/awareness ☐
Action description	Dairy Creek Bridge is a vital transportation connection in and out of the communities and that it is likely vulnerable to both earthquakes and flooding. Work with Washington County and ODOT to conduct seismic and flooding assessment of the bridge. Prioritize any actions that need to be taken to address any seismic and flood concerns and coordinate with Washington County, ODOT, and the OEM seismic grants coordinator to find appropriate funding sources.		
Hazard(s) addressed	Dam failure ☐	Flood ☒	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Decrease or eliminate earthquake or flood risk to the bridge, which will maintain transportation access for large portions of the communities and emergency services.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☐
	Goal 2 ☐	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☒	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Transportation Objective 1 to provide a balanced transportation system. Connection to the City of Cornelius' Transportation Plan Goals.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	City Engineers		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Decrease or eliminate earthquake or flood risk to the bridge, which will maintain transportation access for large portions of the communities and emergency services.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 113: Assessment of Clean Water Services Sewage Treatment System

Mitigation Action Information			
Title of action	Assessment of Clean Water Services Sewage Treatment System		
Type of action	Plans/regulations ☐ Structure and infrastructure project ☒		Natural systems protection ☐ Public education/awareness ☐
Action description	Coordinate with Clean Water Services to assess the seismic strength of the sewage treatment system and develop improvements accordingly as part of the sewage system's current update efforts.		
Hazard(s) addressed	Dam failure ☐ Drought ☐ Earthquake ☒ Extreme heat ☐	Flood ☐ Landslide ☐ Volcanic ash ☐ Wildland fire ☐	Windstorm, incl. tornado ☐ Winter storm ☐
How does the action address identified current or future risks and vulnerabilities?	Sewage treatment plant could be vulnerable to seismic activity. If damaged, the treatment plant could release raw sewage into neighboring streams.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☐ Goal 3 ☐	Goal 4 ☐ Goal 5 ☒ Goal 6 ☒	Goal 7 ☐
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Public Safety & Municipal Services Objective 1 to continue to deliver services.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	City Engineers		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)			**Financial Benefit(s) (Est. Cost x 6)**
Decrease or eliminate earthquake risk to sewage treatment plant.			To be determined

Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 114: Assessment of Seismic Risk and Retrofitting of School Buildings

Mitigation Action Information			
Title of action	Assessment of Seismic Risk and Retrofitting of School Buildings		
Type of action	Plans/regulations ☐ Structure and infrastructure project ☒		Natural systems protection ☐ Public education/awareness ☐
Action description	Assess the "probability of collapse" for school buildings previously identified by DOGAMI as having a "high" or "very high" probability of collapse rating. Coordinate with local school district(s) to seek funding to assess and seismically retrofit school buildings that are vulnerable to collapse. Further assess those buildings rated at a "high" risk of collapse. Prioritize any actions that need to be taken to address any seismic concerns and coordinate with school district(s) and OEM seismic grants coordinator to find appropriate funding sources. Publicize and improve awareness of the earthquake risk using existing education and outreach efforts. Use FEMA's procedures document for developing scopes of work for seismic structural and non-structural retrofit projects. Identify opportunities to pair mitigation with energy retrofit dollars. Coordinate with the private Community School to identify alternative locations that are not unreinforced masonry.		
Hazard(s) addressed	Dam failure ☐ Drought ☐ Earthquake ☒ Extreme heat ☐	Flood ☐ Landslide ☐ Volcanic ash ☐ Wildland fire ☐	Windstorm, incl. tornado ☐ Winter storm ☐
How does the action address identified current or future risks and vulnerabilities?	Assessing the "probability of collapse" for these school buildings and conducting seismic retrofits will reduce the vulnerability of these buildings by preventing damage to life and property.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☒ Goal 3 ☒	Goal 4 ☐ Goal 5 ☐ Goal 6 ☒	Goal 7 ☐
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – People and Community Building Objective 1 to develop strong community partnerships to support education.		

Mitigation Action Implementation Plan		
Priority	Low ☐ Medium ☒ High ☐	
Lead position, office, department, or division responsible for implementation	Community Development	
Potential Funding Sources		
Non-Federal Funding Sources	**Federal Funding Sources**	
General Fund	BRIC and FMA grants through FEMA	
Estimated Cost	To be determined	
Estimated Benefit		
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**	
Decrease or eliminate earthquake risk to school buildings and those who are in them.	To be determined	
Project Timeline		
Expected Timeline for Completion		
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐		

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 115: Assessment of Seismic Risk and Retrofitting of Critical Facilities

Mitigation Action Information			
Title of action	Assessment of Seismic Risk and Retrofitting of Critical Facilities		
Type of action	Plans/regulations ☐	Natural systems protection ☐	
	Structure and infrastructure project ☒	Public education/awareness ☐	
Action description	Assess the "probability of collapse" for critical facilities previously identified by DOGAMI. This includes public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices, and other law enforcement agency buildings. Further assess these critical facility buildings. Prioritize any actions that need to be taken to address any seismic concerns and coordinate with OEM seismic grants coordinator to find appropriate funding sources. Use FEMA's procedures document for developing scopes of work for seismic structural and non-structural retrofit projects.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Assessing the "probability of collapse" for these buildings and conducting seismic retrofits will reduce the vulnerability of these buildings by preventing damage to life and property and ensuring continuous operations capacity for critical facilities.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☐
	Goal 2 ☒	Goal 5 ☐	
	Goal 3 ☒	Goal 6 ☒	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Public Safety and Municipal Services Objectives 1- 4.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of the vulnerability of critical facilities by preventing damage to life and property and ensuring continuous operations capacity for critical facilities.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 116: Reduction of Nonstructural and Structural Earthquake Hazards

Mitigation Action Information			
Title of action	Reduction of Nonstructural and Structural Earthquake Hazards		
Type of action	Plans/regulations ☐	Natural systems protection ☐	
	Structure and infrastructure project ☐	Public education/awareness ☒	
Action description	Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices through public education. Develop informational brochures about individual mitigation opportunities and post on the websites of the cities, include in the water bill, and make available on the front counters at the police, public works, and community development departments. Include recommendations regarding non-structural retrofits in these brochures. Use the following modes of communication or events to educate the public: Quarterly Newsletter, Website, Flyers, National Night Out, and Safety Fair. CERT can also assist in promoting this type of outreach.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Seismic hazards pose a real and serious threat to many communities in Oregon, requiring local governments, planners, and engineers to consider their community's safety. Earthquake damage occurs because we have built structures that cannot withstand severe shaking. Buildings, ports, and lifelines (highways, telephone lines, gas, water, etc.) suffer damage in earthquakes. Damage and loss of life can be very severe if structures are not designed to withstand shaking, are on ground that amplifies shaking, or ground which liquefies due to shaking. Nonstructural retrofits protect building contents with little cost and effort. Examples of retrofits include: • Securing water heaters, large appliances, bookcases, pictures and bulletin boards; • Latching cabinet doors; and • Using safety film on windows.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☐
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☒	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		

Mitigation Action Implementation Plan			
Priority	Low ☐ Medium ☒ High ☐		
Lead position, office, department, or division responsible for implementation	Fire		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)		**Financial Benefit(s) (Est. Cost x 6)**	
Educating the public to reduce risk from earthquakes.		To be determined	
Project Timeline			
Expected Timeline for Completion			
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐			

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 117: Seismic Assessment of Downtown Forest Grove Businesses

Mitigation Action Information	
Title of action	Seismic Assessment of Downtown Forest Grove Businesses
Type of action	Plans/regulations ☐ Natural systems protection ☐ Structure and infrastructure project ☒ Public education/awareness ☒
Action description	Assess the vulnerability to Forest Grove downtown businesses to an earthquake and encourage businesses to develop business continuity and recovery plans. Determine what resources are available to help assess the risk and what grant and loan opportunities are available to businesses owners to help mitigate. Encourage business owners to have a recovery plan and provide examples of what a plan looks like through the Chamber of Commerce. Bring in a business continuity specialist to speak to Chamber members.
Hazard(s) addressed	Dam failure ☐ Flood ☐ Windstorm, incl. tornado ☐ Drought ☐ Landslide ☐ Winter storm ☐ Earthquake ☒ Volcanic ash ☐ Extreme heat ☐ Wildland fire ☐
How does the action address identified current or future risks and vulnerabilities?	The City of Forest Grove downtown corridor is a major business and tourist center for the City. Loss of this area would be devastating to the Forest Grove economy. The buildings are at extreme risk due to their age and the potential for an earthquake in the area. Most are unreinforced masonry buildings. Evaluating these buildings would give the City a better understanding of the mitigation necessary.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 ☒ Goal 4 ☐ Goal 7 ☒ Goal 2 ☒ Goal 5 ☒ Goal 3 ☒ Goal 6 ☐
Integration into other initiatives	To be determined.
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Historic Preservation Objective 1 to preserve, protect, and enhance historic assets; Economic Development Objectives 1-3. Connection to City of Forest Grove's Comprehensive Plan – Chapter V Economy local goals. Assists in implementing the initiatives and goals of the Forest Grove Economic Development Commission Strategic Plan.

Mitigation Action Implementation Plan		
Priority	Low ☐ Medium ☒ High ☐	
Lead position, office, department, or division responsible for implementation	Chamber of Commerce	
Potential Funding Sources		
Non-Federal Funding Sources	**Federal Funding Sources**	
General Fund	BRIC and FMA grants through FEMA	
Estimated Cost	To be determined	
Estimated Benefit		
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**	
Reduction of risk to people and property from earthquakes.	To be determined	
Project Timeline		
Expected Timeline for Completion		
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Table 118: Seismic Assessment of Forest Grove Water Treatment Plant

Mitigation Action Information			
Title of action	Seismic Assessment of Forest Grove Water Treatment Plant		
Type of action	Plans/regulations ☐		Natural systems protection ☐
	Structure and infrastructure project ☒		Public education/awareness ☐
Action description	Assess the seismic vulnerability of the Forest Grove water treatment plant as well as the distribution and transmission systems. Conduct a seismic evaluation of the Forest Grove Water Treatment Plant.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Water is critical for public drinking, firefighting, and sanitation. This plant serves both Forest Grove and Cornelius.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Public Safety and Municipal Services Objective 1. Connection to City of Forest Grove's Comprehensive Plan – Chapter XII Public Facilities and Services.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Engineering		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of risk to people and property from earthquakes and lack of water.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 119: Seismically Assess Pacific University Campus Buildings

Mitigation Action Information			
Title of action	Seismically Assess Pacific University Campus Buildings		
Type of action	Plans/regulations ☐		Natural systems protection ☐
	Structure and infrastructure project ☒		Public education/awareness ☐
Action description	Coordinate with Pacific University to seek funding to assess and seismically retrofit campus buildings that are vulnerable to collapse. Work with Oregon Independent College Association (OICA), Department of Education (DOE), Oregon Department of Emergency Management (OEM) and other partners to determine funding sources. Prioritize any actions that need to be taken to address any seismic concerts and coordinate with the university and other partners (OEM, etc.) to develop funding and action plans. Use FEMA's procedures document for developing scopes of work for seismic structural and non-structural retrofit projects.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☒	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Pacific University has many buildings on their Forest Grove campus that are of significant age. There has been no formal analysis conducted on any of these buildings to determine their seismic stability. A significant at-risk population exists on campus. An analysis needs to be completed to support planning and funding for future seismic retrofits to reduce the potential for collapse and the risk to population.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☒	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development		

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of risk to people and property on campus from earthquakes.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 120: Compliance with the National Flood Insurance Program

Mitigation Action Information			
Title of action	Compliance with the National Flood Insurance Program		
Type of action	Plans/regulations ☒	Natural systems protection ☐	
	Structure and infrastructure project ☐	Public education/awareness ☐	
Action description	Continue compliance with the National Flood Insurance Program (NFIP) through the enforcement of local floodplain ordinances. 1) Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assisted Visit (CAV) is a scheduled visit to a community participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered. • Conduct an assessment of the cities' floodplain ordinances to ensure they reflect current flood hazards. • Coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced. Continue to assess the need for updated ordinances. • Mitigate areas that are prone to flooding and/or have the potential to flood.		
Hazard(s) addressed	Dam failure ☐	Flood ☒	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☐	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	The National Flood Insurance Program provides communities with federally backed flood insurance to homeowners, renters, and business owners, provided that communities develop and enforce adequate floodplain management ordinances. The benefits of adopting NFIP standards for communities are a reduced level of flood damage in the community and stronger buildings that can withstand floods. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☒	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☒	Goal 6 ☐	
Integration into other initiatives	To be determined.		

Alignment with existing plans and policies	To be determined.

Mitigation Action Implementation Plan	
Priority	Low ☐ Medium ☒ High ☐
Lead position, office, department, or division responsible for implementation	Community Development

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA

Estimated Cost	To be determined

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of flood risk to people and property.	To be determined

Project Timeline
Expected Timeline for Completion
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 121: Adoption of Updated Flood Insurance Rate Maps

Mitigation Action Information			
Title of action	Adoption of Updated Flood Insurance Rate Maps		
Type of action	Plans/regulations ☒		Natural systems protection ☐
	Structure and infrastructure project ☐		Public education/awareness ☐
Action description	When updated Flood Insurance Rate Maps for the Tualatin River become available, adopt the updated maps. When the final maps become available, the cities will adopt the new map using their existing protocols for adopting this type of map.		
Hazard(s) addressed	Dam failure ☐	Flood ☒	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☐	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	The City of Forest Grove and Cornelius has Flood Mitigation Rate Maps current as of 1982. Clean Water Services has been working with FEMA to update the maps for the Tualatin River. These maps are currently in draft form and updated versions will more accurately reflect flood risk.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☒	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of flood risk to people and property.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 122: Acquire More Detailed Landslide Data and Update Development Codes

Mitigation Action Information			
Title of action	Acquire More Detailed Landslide Data		
Type of action	Plans/regulations ☒	Natural systems protection ☐	
	Structure and infrastructure project ☐	Public education/awareness ☐	
Action description	Acquire more detailed data on landslide hazards to better understand risk and be able to set more effective thresholds for the requirement of geotechnical reports. Consult with Department of Geology and Mineral Industries on availability of new data. Seek funding for a study if the necessary data is not available. Review existing requirements in the development code based on newly acquired data. Update development code based on new data.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☒	Winter storm ☐
	Earthquake ☐	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	Current landslide data is not effective in identifying landslide risk. More detailed data would allow for refining geotechnical report requirements in the development code. Having this data will allow the cities to more effectively limit future development in landslide prone areas.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☒	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development		

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of landslide risk to people and property.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 123: Mitigate Wildfire Risk Outside of City Limits

Mitigation Action Information			
Title of action	Mitigate Wildfire Risk Outside of City Limits		
Type of action	Plans/regulations ☒	Natural systems protection ☐	
	Structure and infrastructure project ☐	Public education/awareness ☐	
Action description	Coordinate with Clean Water Services, Washington County, rural fire districts, and the Department of Forestry to mitigate wildfire risk outside of City limits. Coordinate efforts with the Washington County Community Wildfire Protection Plan Steering Committee and Washington County Emergency Management.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☐
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☐	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☒	
How does the action address identified current or future risks and vulnerabilities?	There is a concern that wildfires beginning in Washington County on the urban fringe could easily spread to the cities. Working together with the County may result in the identification of wildfire mitigation efforts that will reduce the chance of fires spreading from the County into one or both of the cities.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☐
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☒	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Fire		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of wildfire risk to people and property.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 124: Use Existing Park Land as a Wildfire Buffer

Mitigation Action Information			
Title of action	Use Existing Park Land as a Wildfire Buffer		
Type of action	Plans/regulations ☒ Structure and infrastructure project ☐		Natural systems protection ☐ Public education/awareness ☐
Action description	Explore opportunities to utilize City park land on the edges of town as wildfire buffers. Review vegetative requirements of CWS and Metro to ensure that wildfire mitigation efforts are not in direct conflict with existing requirements. Evaluate the codes of both cities to determine opportunities for wildfire mitigation. Identify mitigation alternatives for those park lands. Seek funding to implement the optimal mitigation alternative.		
Hazard(s) addressed	Dam failure ☐ Drought ☐ Earthquake ☐ Extreme heat ☐	Flood ☐ Landslide ☐ Volcanic ash ☐ Wildland fire ☒	Windstorm, incl. tornado ☐ Winter storm ☐
How does the action address identified current or future risks and vulnerabilities?	There is a concern that wildfires beginning in Washington County on the urban fringe could easily spread to the cities. There may be opportunities to use existing park land on the City's fringe as a wildfire buffer.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☒ Goal 3 ☐	Goal 4 ☐ Goal 5 ☒ Goal 6 ☒	Goal 7 ☐
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Fire		

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of wildfire risk to people and property.	To be determined

Project Timeline
Expected Timeline for Completion
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 125: Public Education About Tree Pruning

Mitigation Action Information	
Title of action	Public Education About Tree Pruning
Type of action	Plans/regulations ☐ Natural systems protection ☐ Structure and infrastructure project ☐ Public education/awareness ☒
Action description	Coordinate with utility providers to educate the public about the role of proper tree pruning and stability in preventing damage during windstorms. Review regulations and standards for easement and right of way maintenance and provide training to foresters and logging crews. Educate homeowners in pruning of vegetation, tree care safety, and proper tree care for trees bordering utility corridors and public rights of way via Safety Fair, Website, or Quarterly Newsletter. Coordinate with arboricultural groups, public agencies, and utilities to promote proper tree pruning and care practices that can reduce the risk of tree failure and property damage. Common messages refined by state level entities such as the Oregon Department of Forestry (ODF) and Oregon State University Extension can help provide continuity and efficiency across the state.
Hazard(s) addressed	Dam failure ☐ Flood ☐ Windstorm, incl. tornado ☒ Drought ☐ Landslide ☐ Winter storm ☐ Earthquake ☐ Volcanic ash ☐ Extreme heat ☐ Wildland fire ☐
How does the action address identified current or future risks and vulnerabilities?	High winds can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service, and compromise the functioning of the communities' utilities such as the wastewater and water treatment plants. While the Public Works and utility companies manage trees in public areas, private property owners are responsible for trees on their property. Educating property owners about how to properly prune their trees to prevent power outages and damage to their property can help reduce impacts of windstorm events. Forest Grove and Cornelius have experienced severe windstorm events in the past and is vulnerable to windstorm events.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 ☒ Goal 4 ☐ Goal 7 ☒ Goal 2 ☒ Goal 5 ☒ Goal 3 ☒ Goal 6 ☐
Integration into other initiatives	To be determined.
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Public Safety and Municipal Services Objectives 1 and 2.

Mitigation Action Implementation Plan			
Priority	Low ☐ Medium ☒ High ☐		
Lead position, office, department, or division responsible for implementation	Community Development		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)		**Financial Benefit(s) (Est. Cost x 6)**	
Reduction of risk from windstorms, including tornado, to people and property.		To be determined	
Project Timeline			
Expected Timeline for Completion			
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐			

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 126: Assessment of Trees on the Pacific University Campus

Mitigation Action Information	
Title of action	Assessment of Trees on the Pacific University Campus
Type of action	Plans/regulations ☐ Natural systems protection ☒ Structure and infrastructure project ☐ Public education/awareness ☐
Action description	Coordinate with Pacific University to conduct an assessment of all on-campus trees to determine their stability to aid in preventing damage during severe weather. Coordinate with university facilities staff and their landscape contractor to conduct the assessment and develop a plan for proper pruning, care and maintenance, especially as it relates to utility service on campus.
Hazard(s) addressed	Dam failure ☐ Flood ☐ Windstorm, incl. tornado ☒ Drought ☐ Landslide ☐ Winter storm ☐ Earthquake ☐ Volcanic ash ☐ Extreme heat ☐ Wildland fire ☐
How does the action address identified current or future risks and vulnerabilities?	High winds can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio service. Personal injury to community members is also a potential. While the Public Works and utility companies manage trees in public areas, private property owners are responsible for trees on their property. Conducting a proper assessment and performing proper pruning/care, can help reduce impacts of windstorm events. The campus has experienced severe windstorm events in the past and is vulnerable to windstorm events.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 ☒ Goal 4 ☐ Goal 7 ☒ Goal 2 ☒ Goal 5 ☒ Goal 3 ☒ Goal 6 ☐
Integration into other initiatives	To be determined.
Alignment with existing plans and policies	To be determined.
Mitigation Action Implementation Plan	
Priority	Low ☐ Medium ☒ High ☐
Lead position, office, department, or division responsible for implementation	Community Development

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of risk to people and property from trees downed by windstorms, including tornados.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 127: Public Education About Home Weatherization

Mitigation Action Information	
Title of action	Public Education About Home Weatherization
Type of action	Plans/regulations ☐ Natural systems protection ☐ Structure and infrastructure project ☐ Public education/awareness ☒
Action description	Educate residents about ways to weatherize their homes, as well as safe emergency heating equipment. • Use energy audits, cash rebates, and tax credits to help homeowners weatherize their homes. • Coordinate efforts with home improvement businesses to educate citizens about weatherizing homes and providing safe emergency heating equipment. • Coordinate education efforts with Portland General Electric to education citizens about weatherization. • Coordinate with the local Fire Districts to develop a list of emergency heating information. • Advertise weatherization tax credits to serve as an incentive for people to weatherize their homes and reduce their heating bills. • Brochures can be provided at Community Development counters.
Hazard(s) addressed	Dam failure ☐ Flood ☐ Windstorm, incl. tornado ☐ Drought ☐ Landslide ☐ Winter storm ☒ Earthquake ☐ Volcanic ash ☐ Extreme heat ☐ Wildland fire ☐
How does the action address identified current or future risks and vulnerabilities?	Severe winter storms can bring extreme cold, snow, and ice, causing power outages and breaks in un- insulated water lines. Power outages can lead to heat loss, potentially harming citizens. Educating citizens about ways to weatherize their homes, as well as safe emergency heating equipment, can reduce the effects of extreme cold and inform residents of how to properly heat their homes in the event of a power outage. Cornelius has a higher than average percentage of residents with disabilities, many of whom are especially vulnerable to power outages and lack backup sources of heat and water. Educating these citizens about ways to weatherize their homes and safe emergency heating equipment they can use will reduce the vulnerability of these populations.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 ☒ Goal 4 ☐ Goal 7 ☒ Goal 2 ☒ Goal 5 ☒ Goal 3 ☒ Goal 6 ☐
Integration into other initiatives	To be determined.
Alignment with existing plans and policies	To be determined.

Mitigation Action Implementation Plan			
Priority	Low ☐ Medium ☒ High ☐		
Lead position, office, department, or division responsible for implementation	Fire and Forest Grove Power and Light		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)		**Financial Benefit(s) (Est. Cost x 6)**	
Reduction of risk from winter storms to people, especially vulnerable populations.		To be determined	
Project Timeline			
Expected Timeline for Completion			
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐			

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 128: Tree Health Assessment

Mitigation Action Information			
Title of action	Tree Health Assessment		
Type of action	Plans/regulations ☐		Natural systems protection ☒
	Structure and infrastructure project ☐		Public education/awareness ☐
Action description	Maintain regular assessments of the health of trees in the cities to prevent damage to buildings and utilities from falling trees. Contact Washington County's certified Arborist to see if they would be willing to perform this service. Develop a list of agencies, organizations, etc., who would be able to provide assistance in assessing tree health on their property.		
Hazard(s) addressed	Dam failure ☐	Flood ☐	Windstorm, incl. tornado ☒
	Drought ☐	Landslide ☐	Winter storm ☐
	Earthquake ☐	Volcanic ash ☐	
	Extreme heat ☐	Wildland fire ☐	
How does the action address identified current or future risks and vulnerabilities?	There are trees in the cities that could damage businesses and utilities. Regularly assessing the health of trees will prevent damage to buildings and utilities from falling trees.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☐	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☒	Goal 6 ☐	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Connection to the City of Forest Grove's Action Plan – Public Safety and Municipal Services Objectives 1 and 2.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development/Parks		

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Reduction of risk from windstorms, including tornado, to people and property.	To be determined

Project Timeline
Expected Timeline for Completion
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 129: Update Facilities Master Plan

Mitigation Action Information			
Title of action	Update Facilities Master Plan		
Type of action	Plans/regulations ☒ Structure and infrastructure project ☐		Natural systems protection ☐ Public education/awareness ☐
Action description	Update existing Facilities Master Plan so that it assesses the need for new or updated facilities and includes natural hazard vulnerabilities and mitigation measures for reducing vulnerability. Coordinate development of the Facilities Master Plan with information found in this mitigation plan annex. In the facilities plan, identify the number of buildings and facilities in specific hazard areas, the potential dollar losses to the facilities, and the methodology used to develop the estimates. This will meet the requirements of the Disaster Mitigation Act of 2000. Seek funding for retrofitting buildings and infrastructure in hazard areas to reduce vulnerability		
Hazard(s) addressed	Dam failure ☒ Drought ☒ Earthquake ☒ Extreme heat ☒	Flood ☒ Landslide ☒ Volcanic ash ☒ Wildland fire ☒	Windstorm, incl. tornado ☒ Winter storm ☒
How does the action address identified current or future risks and vulnerabilities?	Facility master plans assess current City facilities and City-wide facility needs and provide recommendations for further improvements. Currently the cities of Forest Grove and Cornelius do not have Facilities Master Plans that provide an overall assessment of City-owned facilities. Creating a plan that assesses the need for new or updated facilities and incorporates natural hazard vulnerabilities and mitigation measures for reducing vulnerability, will improve City services and reduce the City's overall vulnerability to natural hazard events. In addition, buildings and facilities in hazard areas may be eligible for Pre-Disaster Mitigation funding.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☒ Goal 3 ☒	Goal 4 ☐ Goal 5 ☒ Goal 6 ☐	Goal 7 ☒
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		

Mitigation Action Implementation Plan			
Priority	Low ☐ Medium ☒ High ☐		
Lead position, office, department, or division responsible for implementation	Forest Grove Administrative Services and Cornelius Development Operations		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)		**Financial Benefit(s) (Est. Cost x 6)**	
Reduction of risk from all hazards to City facilities.		To be determined	
Project Timeline			
Expected Timeline for Completion			
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐			

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 130: Public Preparedness Education

Mitigation Action Information			
Title of action	Public Preparedness Education		
Type of action	Plans/regulations ☐ Structure and infrastructure project ☐		Natural systems protection ☐ Public education/awareness ☒
Action description	Encourage citizens to prepare for all hazards and maintain 72-hour kits. Provide educational material and examples of how to assemble 72-hour kits to residents of the City and employees. Outreach and awareness campaigns need to be carefully organized and developed to ensure that residents receive critical information. Distribute information through the City's newsletter. Alternatively, post information about 72-hour kits on the City's website. During National Emergency Preparedness Month or National Night Out, use first responders and community members to host educational presentations to groups within the community to encourage individuals to put together their own kit. Materials must be made available in multiple languages. Resources like www.preparedness.gov or www.72hours.org can provide content needs for 72-hour kits.		
Hazard(s) addressed	Dam failure ☒ Drought ☒ Earthquake ☒ Extreme heat ☒	Flood ☒ Landslide ☒ Volcanic ash ☒ Wildland fire ☒	Windstorm, incl. tornado ☒ Winter storm ☒
How does the action address identified current or future risks and vulnerabilities?	The cities of Forest Grove and Cornelius are vulnerable to a number of natural hazards that could disrupt services. In a major disaster, utilities transportation networks, and businesses could be disrupted, and it may take days until vital services are restored. Preparing a 72-hour kit can help community members survive on their own without relying too heavily on emergency services.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☒ Goal 3 ☒	Goal 4 ☐ Goal 5 ☒ Goal 6 ☐	Goal 7 ☒
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		

Mitigation Action Implementation Plan			
Priority	Low ☐ Medium ☒ High ☐		
Lead position, office, department, or division responsible for implementation	Fire		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		
Estimated Benefit			
Primary Benefit(s)		**Financial Benefit(s) (Est. Cost x 6)**	
Reduction of risk to people and property from all hazards.		To be determined	
Project Timeline			
Expected Timeline for Completion			
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐			
Implementation Progress Report for Plan Maintenance			
Date			
What progress in implementation has been made to date?			
What challenges in implementation have been experienced?			
What are the next steps in implementation?			

Table 131: Broadband Redundancy

Mitigation Action Information			
Title of action	Broadband Redundancy		
Type of action	Plans/regulations ☐ Structure and infrastructure project ☒	Natural systems protection ☐ Public education/awareness ☐	
Action description	Coordinate with utility providers to address lack of broadband redundancy in the community. Work with utility providers to identify alternatives to add redundancy to the existing broadband system. Identify potential funding sources for the redundancy systems.		
Hazard(s) addressed	Dam failure ☒ Drought ☒ Earthquake ☒ Extreme heat ☒	Flood ☒ Landslide ☒ Volcanic ash ☒ Wildland fire ☒	Windstorm, incl. tornado ☒ Winter storm ☒
How does the action address identified current or future risks and vulnerabilities?	Currently, there is no redundancy to the broadband network in the cities of Forest Grove and Cornelius. This can create communication and connectivity problems before, during, and after natural hazard events.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒ Goal 2 ☒ Goal 3 ☒	Goal 4 ☐ Goal 5 ☒ Goal 6 ☐	Goal 7 ☒
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	To be determined.		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Forest Grove IT		
Potential Funding Sources			
Non-Federal Funding Sources		**Federal Funding Sources**	
General Fund		BRIC and FMA grants through FEMA	
Estimated Cost	To be determined		

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Broadband redundancy during natural hazard events.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 132: Review of Comprehensive Plan and Development Codes

Mitigation Action Information			
Title of action	Review of Comprehensive Plan and Development Codes		
Type of action	Plans/regulations ☒	Natural systems protection ☐	
	Structure and infrastructure project ☐	Public education/awareness ☐	
Action description	Review the City of Forest Grove's comprehensive plan and development codes for opportunities to more effectively reduce risks to new development. Incorporate new hazard information in the Comprehensive Plan's Periodic Review process. Review latest vulnerability assessment information and policies that address hazards. Information can be obtained from the risk assessment portion of the Washington County Natural Hazard Mitigation Action Plan and other state agencies.		
Hazard(s) addressed	Dam failure ☒	Flood ☒	Windstorm, incl. tornado ☒
	Drought ☒	Landslide ☒	Winter storm ☒
	Earthquake ☒	Volcanic ash ☒	
	Extreme heat ☒	Wildland fire ☒	
How does the action address identified current or future risks and vulnerabilities?	The City's Comprehensive Plans provided the legal framework and long-term vision for implementing plans and land use regulations, this is one of the best places to implement mitigation because risks can be eliminated before development occurs.		
Mitigation Action Integration			
Alignment with NHMP goals	Goal 1 ☒	Goal 4 ☒	Goal 7 ☒
	Goal 2 ☒	Goal 5 ☒	
	Goal 3 ☐	Goal 6 ☒	
Integration into other initiatives	To be determined.		
Alignment with existing plans and policies	Statewide Planning Goal 2 (Land Use Planning) requires local governments to create comprehensive plans that "shall include identification of issues and problems, inventories, and other factual information for each applicable statewide planning goal…" Furthermore, Goal 7 of Oregon's Land Use Planning Goals requires that local governments "shall adopt comprehensive plans (inventories, policies, and implementing measures) to reduce risk to people and property from natural hazards."		
Mitigation Action Implementation Plan			
Priority	Low ☐	Medium ☒	High ☐
Lead position, office, department, or division responsible for implementation	Community Development		

Potential Funding Sources	
Non-Federal Funding Sources	**Federal Funding Sources**
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined

Estimated Benefit	
Primary Benefit(s)	**Financial Benefit(s) (Est. Cost x 6)**
Eliminating risk from natural hazards before development occurs.	To be determined

Project Timeline
Expected Timeline for Completion
Short-term ☐ Mid-term ☐ Long-term ☒ Ongoing ☐

Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	