

Chapter 2: Hazard Assessment

Section 1: Hazard Assessment Overview

Definition of a Hazard Assessment

44 CFR Requirement §201.6(c) (2) (i):

[The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Conducting a hazard assessment can provide information on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from natural hazard events. Hazard assessments are subject to the availability of hazard-specific data. The three levels of a hazard assessment are as follows:

1. **Hazard Identification** - Identifies the geographic extent and intensity of the hazard, and the probability of its occurrence. Maps are frequently used to display the hazard identification data. The City of Cottage Grove identified six major hazards that threaten the area. These hazards are floods, landslides, wildfires, earthquakes, winter storms, volcano, and drought.
2. **Vulnerability Assessment** - Inventorying assets combines hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard. A complete listing of the community assets exposed to each hazard is located in Table 5, "City of Cottage Grove Infrastructure & Facility Hazard Vulnerability". Additionally, a more detailed description of the vulnerability of these assets is located in the specific hazard sections.
3. **Risk Analysis** - Estimating potential losses involves estimating the damage, injuries, and financial losses likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two major components of risk analysis are the magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. Unfortunately, there is insufficient data and funding for conducting a risk analysis for the natural hazards affecting Cottage Grove. However, this need is identified in the action items and a complete risk assessment will be conducted when the resources are available.

Federal Requirements for a Hazard Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201.6 (c) (2) include a requirement for hazard assessment. This hazard assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. Table 3, below, shows the federal criteria for hazard assessment and how the City of Cottage Grove Natural Hazard Mitigation Plan meets those criteria.

Table 2: Federal Criteria for Hazard Assessment

<u>Section 322 requirement</u>	<u>How is this addressed?</u>
Identifying Hazards	The City of Cottage has mapped the hazard areas for wildfire, flood, landslide, and earthquake. (See individual hazard sections for more information.)
Profiling Hazard Events	The hazard sections of the Cottage Grove Natural Hazard Mitigation Plan provide documentation for all of the historic large-scale hazard events affecting the city.
Assessing Vulnerability: Identifying Assets	Table 5 “Infrastructure & Facility Hazard Vulnerability” documents key community assets and critical infrastructure that are vulnerable to natural hazards.
Assessing Vulnerability: Estimating Potential Losses	Using the best available data, an estimate of potential losses from natural hazards is located in the hazard specific sections.
Assessing Vulnerability: Analyzing Development Trends	The Community Profile section of this plan provides a description of the development trends in the City of Cottage Grove

Hazard Quantification Categories

For the purpose of hazard quantification the following four categories were developed:

- 1) History (previous occurrences, primarily within last century)
- 2) Vulnerability (number, degree or extent of people or assets at risk per hazard)
- 3) Maximum threat (credible worst-case scenario),
- 4) Probability (calculated likelihood of future occurrence)

Weight Factors, Scoring Guidelines

Weighting factors were developed for each of the four hazard quantification categories. This is done to emphasize certain categories over others in terms of risk assessment. Scoring guidelines are also developed as a method of standardizing assessment and to minimize subjectivity.

History (weight factor for category = 2).

History is the record of previous occurrences. Events to include in assessing history of a hazard event for which the following types of activities were required:

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

LOW – score at 1 to 3 points based on... 0 - 1 event past 100 years

MEDIUM – score at 4 to 7 points based on... 2 - 3 events past 100 years

HIGH – score at 8 to 10 points based on... 4 + events past 100 years

Vulnerability (weight factor for category = 5)

Vulnerability is the percentage of population and property likely to be affected under an "average" occurrence of the hazard.

LOW – score at 1 to 3 points based on... < 1% affected

MEDIUM – score at 4 to 7 points based on... 1 - 10% affected

HIGH – score at 8 to 10 points based on... > 10% affected

Maximum Threat (weight factor for category = 10)

Maximum threat is the highest percentage of population and property that could be impacted under a worst-case scenario.

LOW – score at 1 to 3 points based on... < 5% affected

MEDIUM – score at 4 to 7 points based on... 5 - 25% affected

HIGH – score at 8 to 10 points based on... > 25% affected

Probability (weight factor for category = 7)

Probability is the likelihood of future occurrence within a specified period of time.

LOW – score at 1 to 3 points based on... one incident likely within 75 to 100 years

MEDIUM – score at 4 to 7 points based on... one incident likely within 35 to 75 years

HIGH – score at 8 to 10 points based on... one incident likely within 10 to 35 years

Scores for each category are multiplied by the associated weight factors for each category to create a ‘sub-score’. Adding the sub-scores for history, vulnerability, maximum threat, and probability for each hazard produces a ‘total score’ for each hazard. It should be noted that a total score, in itself, is not as important as how it compares with the total scores for other hazards in Cottage Grove. By comparing scores, we can determine priorities: Which hazards should the jurisdiction be most concerned about? Which ones less so?

The following table summarizes the quantified Hazard Analysis Score for the City of Cottage Grove for each hazard that has been identified by the State of Oregon Office of Emergency Management (OEM):

Table 3: Cottage Grove Hazard & Risk Assessment

City of Cottage Grove		OEM Hazard Analysis												
HAZARD RISK ASSESSMENT MODEL		History			Vulnerability			Maximum Threat			Probability			
Created June 2015														
Threat Event / Hazard		Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Total Threat Score
Earthquake		3	2	6	8	5	40	10	10	100	3	7	21	167
Terrorism / Cyber Attack		1	2	2	2	5	10	3	10	30	2	7	14	56
Flood - Riverine		8	2	16	7	5	35	6	10	60	9	7	63	174
Flood - Dam Failure		1	2	2	1	5	5	10	10	100	1	7	7	114
Landslide/Debris Flow		2	2	4	2	5	10	4	10	40	3	7	21	75
Volcano		1	2	2	4	5	20	2	10	20	1	7	7	49
Wildfire (WUI)		3	2	6	4	5	20	3	10	30	5	7	35	91
Severe Weather		8	2	16	8	5	40	5	10	50	9	7	63	169
HAZMAT Incident		2	2	4	4	5	20	9	10	90	3	7	21	135

Hazard Assessment Mapping Methodology

The City of Cottage Grove has contracted with Lane County Information Services for map products that illustrate the hazards in and near Cottage Grove. These maps were developed using local knowledge as well as information developed by Lane County and other government agencies in order to produce the most accurate maps

using best available data. Maps are located in the sections in which they are discussed, and in Appendix A.

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Section 2: Local Hazard Assessment

Relative Risk Assessment

Table 4: “City of Cottage Grove Hazard and Risk Assessment”, provides an easy to read assessment on the relative risk to the city from a given, specific, hazard. Each is listed with the relative probability of occurrence, and the city’s vulnerability to that particular event.

Table 4: City of Cottage Grove Hazard and Risk Assessment

<u>HAZARD RISK ASSESSMENT</u>		<u>NHMP Risk Assessment Scores</u>	
Threat Event / Hazard		Probability	Vulnerability
	Earthquake	Low	High
	Terrorism / Cyber Attack	Low	Low
	Flood - Riverine	High	Medium
	Flood - Dam Failure	Low	Low
	Landslide/Debris Flow	Low	Low
	Volcano	Low	Medium
	Wildfire (WUI)	Medium	Medium
	Severe Weather	High	High
	HAZMAT Incident	Low	Medium
	Drought	Low	Low

Vulnerability Assessment

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and environmental integrity of the City of Cottage Grove. The list below outlines the types of critical facilities and infrastructure within the City of Cottage Grove. The exposure of community assets to natural hazards is provided in Table 5: “City of Cottage Grove Infrastructure & Facility Hazard Vulnerability”.

Table 5: City of Cottage Grove Infrastructure & Facility Hazard Vulnerability

NHMP Critical Infrastructure and Key Facilities	Flood (Land Area Impacted 5%)	Landslide (<1%)	Earthquake (100%)	Winter Storm (100%)	Wildfire (20%)	Volcano (<1%)	Drought (100%)
Critical Facilities							
Cottage Grove City Hall	X		X	X			
Cottage Grove Police Department (911 Call Center and Dispatch), City Jail	X		X	X			
Cottage Grove Community Hospital	X		X	X			
City of Cottage Grove Public Works Shops (EOC #2)	X		X	X			
Water Treatment Facility (Row River)	X		X	X			X
Waste Water Treatment Plant	X		X	X	X		
South Lane County Fire and Rescue Fire Station #1	X		X	X			
Cottage Grove Schools	X		X	X			
Cottage Grove High School			X	X			
Our Lady of Perpetual Help Catholic Church (Red Cross Shelter)	X		X	X			
Knox Butte Reservoir		X	X	X	X		
Downtown Historical District			X				
Cottage Grove Lake Dam	X	X	X		X		X
Dorena Reservoir	X	X	X		X		X

Dam							
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Table 5: City of Cottage Grove Infrastructure & Facility Hazard Vulnerability (cont.)

NHMP Critical Infrastructure and Key Facilities	Flood (Land Area Impacted 5%)	Landslide (<1%)	Earthquake (100%)	Winter Storm (100%)	Wildfire (20%)	Volcano (<1%)	Drought (100%)
Key Infrastructure							
Telephone Lines	X	X	X	X	X		
Wastewater Collection System	X		X	X			
Stormwater Collection System	X		X	X			
Cell Phone Towers	X		X	X			
Roads	X	X	X	X			
Cottage Grove State Airport	X		X	X	X		
NW Natural Gas Lines	X		X				
Overhead Power Lines	X	X	X	X	X		
Transportation Networks	X	X	X	X	X		
Bridges	X		X	X	X		
Central Oregon & Pacific Railroad Lines	X		X	X	X		
Water Treatment, Storage, and Distribution Lines	X		X	X			

Critical Facilities and Infrastructure

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

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

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

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

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

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

- Cottage Grove Community Hospital
- Coast Fork Nursing Home
- Middlefield Oaks Assisted Living/Memory Care Facility
- Magnolia Gardens Assisted Living/Memory Care Facility
- Riverview Terrace Apartments

- South Lane School District Schools
- Coast Fork Learning Center
- Family Relief Nursery

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

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

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

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

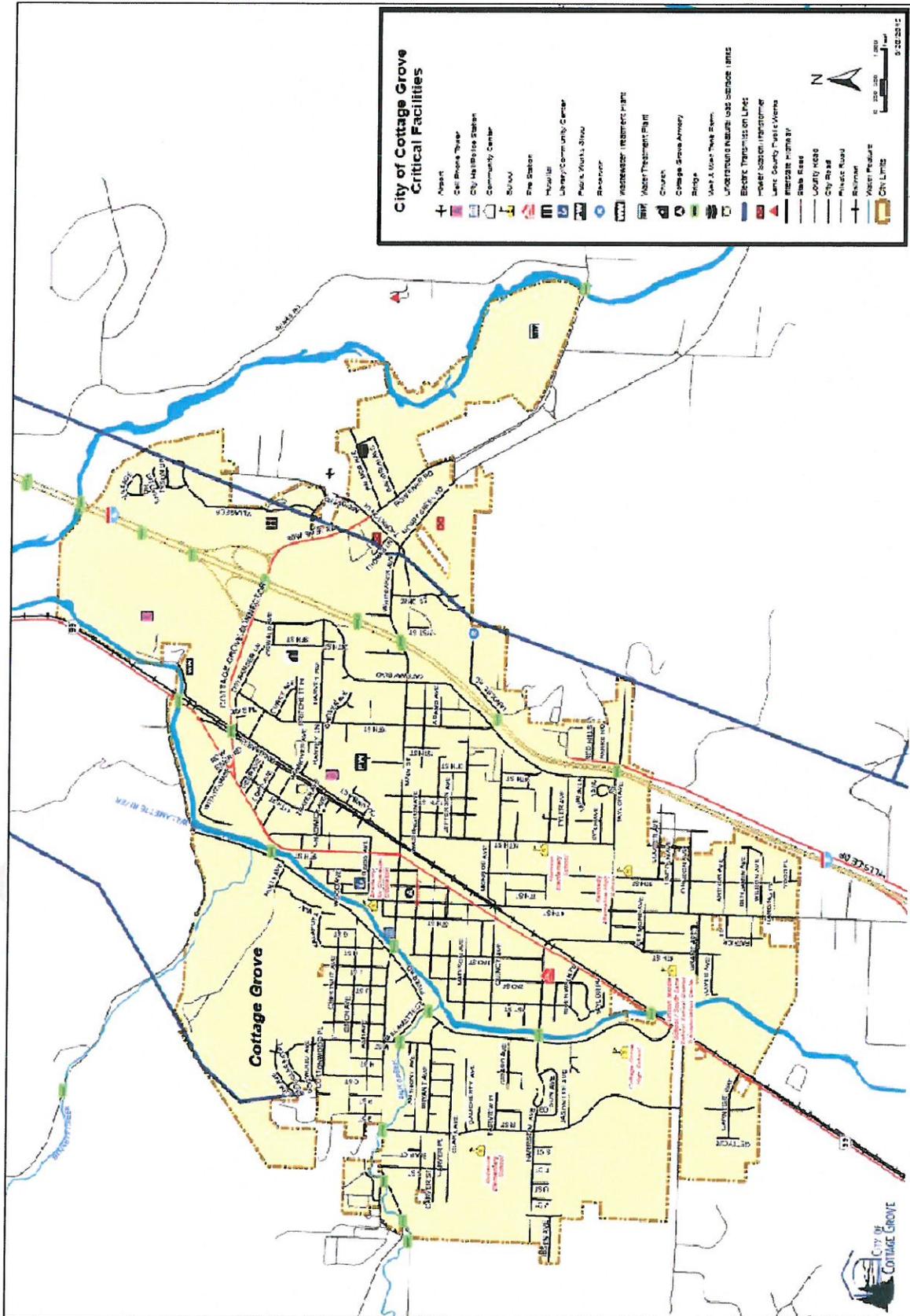
Hazardous Materials: Those sites that store, manufacture, or use potentially hazardous materials.

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

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Figure 4: Cottage Grove Critical Facilities



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Section 3: Climate Change

The City of Cottage Grove is committed to understanding and planning for how climate change could impact citizens and natural resources. Climate change is a constantly occurring process that can affect different natural hazards such as drought and wildfire in different ways, exaggerating some while minimizing others. Planning for climate change is a responsible means of mitigating natural variations in climate with the understanding that change is a constant process that is capable of impacting the built and natural environments.

Climate science is rapidly evolving, and it is impossible to predict where the state of the science will be in the next 5 to 10 years. Regional climate impacts and the extent to which human activities contributed to a specific change is one of the hottest topics in climate change science in 2016. We will understand more about regional climate impacts as the science evolves into the future.

The City of Cottage Grove commits to addressing climate change in each climate-related hazard to the extent that the science can support inclusion into each section. We address the uncertainty of the state of the science, and maintain that we will only draw from peer-reviewed literature to support the plan. The U.S. National Climate Assessment is now undergoing a sustained assessment, or continued examination of climate change impacts as they affect the United States. Oregon Climate Change Research Institute (OCCRI) at Oregon State University is involved in the sustained assessment, and we will draw from this work with the 2021 plan as appropriate. With some confidence, we feel that we will be able to improve information about climate change impacts to drought, flood, and wildfire hazards in the next NHMP update.



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