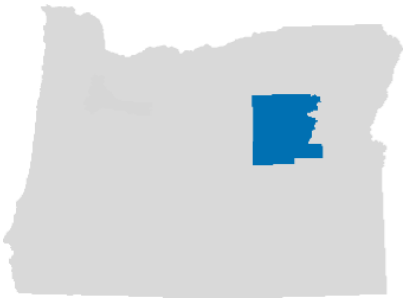
Grant County, Oregon

MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

- Grant County
- Grant Soil and Water Conservation District



- City of John Day
- Grant County Education Service District

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I. INTRODUCTION

This section provides a general introduction to natural hazard mitigation planning in Grant County. This section contains a general discussion about what natural hazard planning is, including a discussion of how the plan addresses the federal requirements contained in 44 Code of Federal Regulations (CFR) 201.6(b) and how the plan fits within the Oregon planning policy framework. There is a description of the process for updating the 2014 Northeast Oregon Multi-jurisdictional Natural Hazard Mitigation Plan and a brief summary of the physical, economic and social features of Grant County that relate to hazard mitigation planning. The section concludes with a general description of how the plan is organized.

Natural Hazard Mitigation Planning

What is Natural Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines mitigation as ". . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk."[1] Said another way, natural hazard mitigation is a method of permanently reducing or alleviating the losses of life, property, and injuries resulting from natural hazards through long and short-term strategies. Example strategies include projects, such as seismic retrofits to critical facilities and flood mitigation projects; and education and outreach to targeted audiences, such as the elderly. Natural hazard mitigation is the responsibility of the "Whole Community" – individuals and families; private businesses and industries; non-profit groups; schools and academia; media outlets; faith based and community organizations; and federal, state, and local governments.[2]

Completing mitigation actions detailed in this plan will benefit Grant County in a number of ways including reduced loss of life, property, essential services, critical facilities and economic hardship when natural hazards occur; reduced short-term and long-term recovery and reconstruction costs following natural hazard events; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why Develop an NHMP?

It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

The dramatic increase in the costs associated with natural disasters over the past decades fostered interest in identifying and implementing effective means of reducing vulnerability. Grant County was one of the four counties the 2014 Northeast Oregon Multi-jurisdictional Natural Hazard Mitigation Plan

[1] FEMA, What is Mitigation? http://www.fema.gov/what-mitigation, accessed January 17, 2020,

[2] FEMA, *Whole Community*, https://www.fema.gov/whole-community, accessed January 17, 2020.

(2014 NHMP) included. The Grant County elected officials, citizens and other stakeholders, along with the City of John Day, the Grant Soil and Water Conservation District, and the Grant County Education Service District worked together to update that plan. This 2020 Grant County Natural Hazards Mitigation Plan (2020 NHMP) aims to continue the purpose of that plan, that is to reduce future loss of life and damage to property resulting from natural hazards.

In addition to Grant County's interest in establishing a comprehensive community-level natural hazard mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive federal funds for mitigation projects.

Local and federal approval of this plan ensures that the county and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

What Federal Requirements Does This Plan Address?

The Disaster Mitigation Act of 2000 (DMA2K) a key piece of federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP).

Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual and their capabilities. Chapter 44 Code of Federal Regulations (CFR), section 201.6, also requires a local government to have an approved mitigation plan in order to receive HMGP project grants.[3]

Development of the 2014 NHMP update was pursued in compliance with subsections from 44 CFR 201.6 guidelines. These four subsections address plan requirements, the planning process, plan content, and plan review.

- Subsection (a) provides an outline of the overall plan requirements, including an overview of general plan components, exceptions to requirements, and multi-jurisdictional participation.
- Subsection (b) outlines the requirements of the planning process, with particular focus on public involvement in the update process, as well as the role of local agencies, organizations and other relevant entities in the development process, as well as standards for adequate levels of review and incorporation of existing plans and policies.
- Subsection (c) outlines requirements concerning the plan update's content, including an overview of necessary components for the update's planning process, risk assessment, mitigation strategy, plan maintenance, and overall process documentation.

[3]Code of Federal Regulations. Chapter 44. Section 201.6, subsection (a). 2010

- Subsection (d) outlines the steps and agencies required for proper review of the plan before finished plans are adopted by their respective communities.[4]

The resulting 2020 NHMP must be submitted to Oregon's Office of Emergency Management (OEM) for initial plan review, and then it is submitted to FEMA for review and federal approval. Once FEMA provides the Approval Pending Adoption letter, the Grant County and each of the jurisdictions and special districts must formally adopt the 2020 NHMP. Once the local jurisdictions and special districts have provided resolutions showing the adoption of the 2020 NHMP, FEMA will send an approval letter with the dates of the 2020 NHMP approval. The approval period is for five years.

Additionally, the Emergency Management Performance Grant (EMPG), which helps fund local emergency management programs, also requires a FEMA-approved NHMP.

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

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

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

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

How was the Update to the NHMP Developed?

The 2020 Grant County Natural Hazard Mitigation Plan Steering Committees with the collaboration of DLCD staff updated the *Northeast Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan* dated February 2014 (2014 NHMP) that was approved by FEMA on June 5, 2014 and was valid through June 4, 2019. The City of John Day Addendum comprised a portion of that plan. The City of Canyon City developed an addendum to that plan that was adopted into the city's Comprehensive Plan on date. The 2014 NHMP covered four counties (Baker, Grant, Union and Wallowa Counties), whereas the current plan focuses exclusively on Grant County. Plan holders for this update, the 2020 *Grant County Multi-*

[4] ibid, subsection (c). 2010

Jurisdictional Natural Hazard Mitigation Plan (2020 NHMP), include Grant County, the City of John Day, the Grant Education Service District and the Grant Soil and Water Conservation District.

A steering committee representative of the whole community was formed by the project managers. The 2020 Grant County NHMP Steering Committee included Grant County officials and officials from the City of John Day. Representatives from all cities within the county and non for profit organizations were invited to attend. Participation by the director of Blue Mountain Forest Partners, a Canyon City Council member, the member of the Oregon Department of Forestry, and members of the public rounded out the representation in public meetings. Sign in sheets for meetings and meeting agendas are included in Appendix B.

The 2020 Grant County NHMP Steering Committee formally convened on seven occasions (March 14, 2019, May 23, 2019, July 18, 2019, September 9, 2019, February 14, 2019, April 10, 2019 and final meeting date) with the project manager, a DLCD Natural Hazard Planner, in person and via conference call to discuss and revise the plan. Two additional opportunities for participation in the process were provided by FEMA during the Risk MAP process (webinars July 26-August 1, 2019 and the Discovery meeting on September 13, 2019) for a total of nine public meetings. In addition, the DLCD Natural Hazard Planner spoke on the phone and emailed the Emergency Manager and convener of the Steering Committee regularly throughout the process. During the development of the plan, the individual filling the role of project manager for DLCD changed, but the project management functions of administration, plan drafting and organization continued to be fulfilled. Steering committee members contributed data, maps and time doing outreach and advocacy for the plan and in collaboration with the DLCD planner they reviewed and updated the community profile, risk assessment, action items and implementation plan.

An open public involvement process is essential to the development of an effective plan. The planning process included opportunities for the public, neighboring communities, local and regional agencies, as well as, private and non-profit entities to comment on the plan during development demonstrating the use of a comprehensive approach to reducing the effects of natural disasters.

The Emergency Manager encouraged participation in the update process by making direct contact with constituents and city staff during the course of his work throughout the county. This early direct contact was followed up by posting flyers, updates and meeting dates on the county's Emergency Management webpage. Word of mouth is a prevalent method of "getting the word out" in Grant County. The daily work of the Emergency Manager to engage with the communities of Grant County and to promote the process of public engagement to update the plan were invaluable, if less easily documented. Further details of the public engagement process are available in Volume III, Appendix B: Planning Process.

The following plans were consulted during the preparation of the 2020 NHMP, are referenced throughout the plan and are also integrated into the mitigation actions contained in Section 3 of this plan.

- Grant County Comprehensive Plan, 1999
- Grant County Land Development Code, 2019
- Grant County Community Wildfire Protection Plan, dated August 2013. This plan is currently being updated.

- Grant County Emergency Operations Plan, dated June 2019.
- Grant County Regional Airport Master Plan, dated December 2018.
- Grant County Transportation System Plan, June 1997
- Blue Mountain Hospital Community Health Needs Assessment Implementation Plan, 2019.
- John Day Comprehensive Plan, 2003
- John Day Zoning Code, 2012
- John Day Innovation Gateway Plan

The 2020 NHMP will be maintained and implemented by an Implementation Committee to be comprised of representatives of each of the jurisdictions in the county along with representatives of special districts such as the Grant Soil and Water Conservation District and the Grand Education Service District. This committee will be convened by the Emergency Manager and will meet at least annually to review progress on the mitigation action items. The entire plan will be updated prior to its expiration in five years from the effective date. Details of the plan implementation strategy are the subject of Section IV of this document.

Profile of Grant County

A brief profile of Grant County physical geography, population demographics, economic environment and infrastructure facilities are provided here as an introduction. Greater detail on these topics can be found in Appendix C of this plan and other plans referenced herein.

Grant County is located in the northeastern portion of the state and is bordered by Morrow, Umatilla, and Union Counties on the north, Baker and Malheur Counties on the east. Harney County on the south and Crook and Wheeler Counties on the east. The total area of Grant County is 4,528 square miles (11,727 square km). A significant portion of the county (70%) is federally or state owned with about 50% of the area of the county being part of the Ochoco or Malheur National Forests.

The geography of Grant County consists of the rugged Blue Mountain range, which is a part of the Columbia River Plateau. Grant County features river canyons and high plateaus, which are interspersed with wide grasslands. The headwaters of the John Day, Malheur, North Fork John Day, and Silvies Rivers all originate within Grant County[5].

The John Day River is a tributary of the Columbia River and drains from the Blue Mountains before entering the Columbia River Gorge. The John Day River is the longest free flowing river in the United States. The John Day River system represents the watershed for most of Grant County, primarily the northern half, drained by the four forks of the John Day River.[6] The John Day River is the principle source of flooding in Grant County.

[5] Williams, M.C., Anthony, L. H., and O'Brien, F.

[6] Grant County CWPP 2013 "2.2 Existing Conditions"

The Silvies River extends through the southern portion of Grant County into Harney County and drains approximately 1,275 square miles of the northern Harney Basin. The headwaters are near the flank of the Aldrich Mountains and the river runs roughly south where it empties into Malheur Lake, near Burns, Oregon. At the confluence with the tributary Bear Creek, new flood mapping is in preparation for the vicinity of the City of Seneca.

The southwestern portion of the county contains the headwaters of the Malheur River. The Malheur River rises in the southern Blue Mountains of southern Grant County, south of Strawberry Mountain in the Strawberry Mountain Wilderness. It flows south through Malheur National Forest, then southeast past Drewsey, through Warm Springs Reservoir and eventually flows in to the Snake River.

The county is located predominantly within the northeast climatological division divided from the southwestern portion of Grant County which is in the south central climatological division as defined by the US Weather Service, generally an arid to temperate region. Vegetation in Grant County varies from rangelands characterized by sagebrush and grasses to heavily forested areas. Forests in the southern part of the county generally consist of vast stands of ponderosa pine while areas in the northern portion of the county are represented by more mesic species that densely cover mountain slopes[7].

Precipitation in the communities of Grant County ranges from approximately 11" annually in Dayville to over 21" annually in Austin. Snowfall ranges widely depending on elevation with as little as 6" in Dayville to as much as 87" in Austin. The snow pack is vital to recharge aquifers, resulting in spring run-off, and in-stream flows of water throughout the year.

Average temperatures in the county range from the warmest community, Monument, with average daily highs/lows of 90°/50 °F in July and 42°/22 °F in January; to the coolest community, Seneca, with average daily highs/lows of 80°/38 °F in July and 33°/8 °F in January[8].

The county is primarily livestock country with vast spring, summer and fall temperature ranges. In addition to beef cattle, which are the dominant livestock interest, there is also extensive raising of sheep, dairy herds, horses and swine. Field crops grown on commercial basis include potatoes, alfalfa, wheat, oats, barley and onions.

The population of Grant County was 7,445 according to the 2010 U.S. Census (2010a) and decreased to 7,176 according to the American Fact Finder 2018 Population Estimate. The county's largest community is the City of John Day and the county seat is the City of Canyon City. Most of the residents in the county reside along the John Day River (Figure 1)

The demographic composition and economic environment of Grant County has been well covered in the 2014 NHMP and the 2014 Community Wildfire Protection Plan, so this plan refers you to the detailed demographic data in that plan[9]. We will highlight aspects of the profile of Grant County residents that pertain to the mitigation of natural hazards here and provide a bit more depth in Appendix A – Community Profile.

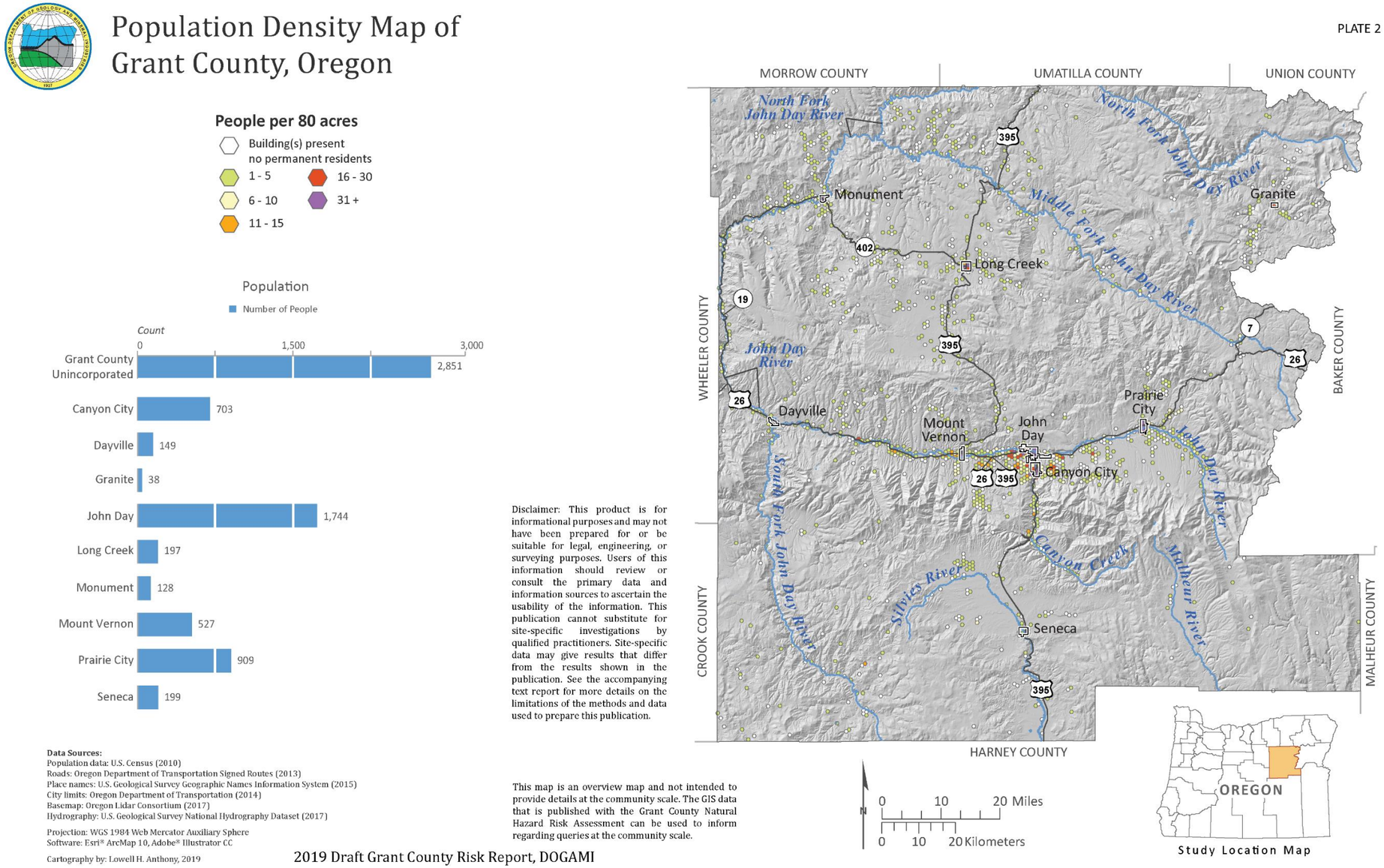
[7] Ibid

[8] Ibid

[9] 2014 Northeast Oregon Multi-jurisdictional Natural Hazard Mitigation Plan, OPDR.

The demographic composition of the county remains largely unchanged. The population is aging and the vulnerabilities that accompany aging remain notable in this plan. Similarly in some cities in Grant County the proportion of the population living below the poverty line continues to be greater than the average for the State of Oregon, so the needs of this group of residents should continue to be a demographic group that this plan addresses.

Figure 1. Population Density of Grant County



2019 Draft Grant County Risk Report, DOGAMI

Source: DOGAMI Risk Assessment

Grant County's assets are tied to its natural resources and recreation these assets may be more vulnerable to natural disasters and can suffer environmental damages. The economy of Grant County historically has been mainly forest products, agriculture and livestock, hunting, and recreation. Since 2005, there has been a significant decline in the forest products infrastructure in the county due primarily to the lack of consistent and stable supply of suitable raw materials. Two sawmill facilities have closed and utilization of noncommercial material for clean chips and/or hog fuel is inconsistent. Reductions in federal forest grazing permits acres, due to changes in management direction and litigation, have also influenced the local livestock industry as well[10].

Surface transportation in Grant County is handled mainly by two US highways: Highway 26 and Highway 395. These highways are used predominantly by through traffic traveling across the state. Local traffic volumes are higher in the urban areas of cities. Highway 26 is aligned in an east-west fashion through the center of the county, providing access to the larger cities of Prineville, Madras, and Bend (via Highway 97) to the west and the cities of Baker City (via Highway 7) and Ontario to the east. The Grant County Transportation District operates a regional bus service known as The People Mover. In 2018, it transported 37,450 total passengers.

Grant County has two public use airports, the Grant Regional Airport and the Monument Municipal Airport. The Monument Municipal Airport is owned by the City of Monument and consists of a single asphalt runway. The Grant County Regional Airport (GCRA), and also known as Ogilvie Field, is a 335 acre county-owned, public use airport. The GCRA is also the helibase and training center for the United States Forest Service (USFS) Malheur Forest's rappeller firefighters. It is staffed year around with peak operations generally occurring from May through October. The County also has three private airstrips which could be used in a natural disaster. Additional details on these topics can be found in Volume III, Appendix A.

How is the Plan Organized?

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

Volume I: Basic Plan

Section 1: Introduction

The Introduction briefly describes the reasons for updating the 2014 Northeast Oregon Multi-jurisdictional Natural Hazard Mitigation Plan, the methodology used to update that plan, a brief introduction to the features of the community that impact hazard risk assessment and mitigation actions, and a description of how the plan is organized.

Section 2: Risk Assessment

Section 2 provides the factual basis for the mitigation strategies contained in Section 3. This section includes a brief description of community sensitivities and vulnerabilities and an overview of the hazards

[10] 2014 Grant County CWPP

addressed in this plan. The Risk Assessment allows readers to gain an understanding of the nature and extent of each of the natural hazards Grant County is subject to. The vulnerability of each of the jurisdictions within Grant County is assessed using the FEMA approved Oregon Emergency Management Methodology. This methodology assesses risk and vulnerability while catalyzing awareness and discussion about the county's history of natural hazard events.

Section 3: Mitigation Strategy

This section documents the plan vision, mission, goals, and actions and also describes the components that guide implementation of the identified mitigation strategies. Actions are based on community vulnerability and resilience factors and the hazard assessments in Section 2 and the Hazard Annexes (Volume II).

Section 4: Plan Implementation and Maintenance

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

Volume II: Hazard Annexes

The Risk Assessment chapter provides substantial detail on the features of the natural hazards addressed in this plan. These annexes are meant to supplement that information. In particular the Landslide Annex draws from the recent Landslide Guide produced by DLCD and DOGAMI to provide a better understanding of the potential for this hazard to result in damage to people or property in Grant County. Not all the hazards are covered here. There is a focus on information that was not available in the 2014 NE OR MJ NHMP.

The hazard specific annexes included with this plan are the following:

- Wildfire,
- Flood, and
- Landslide.
-

Volume III: Mitigation Resources

The resource appendices are designed to provide the users of the 2020 Grant County NHMP with additional information to assist them in understanding the contents of the mitigation plan, and provide them with resources to assist with plan implementation.

Appendix A: Community Profile

The community profile describes the participating counties and cities from a number of perspectives in order to help define and understand the vulnerabilities of Grant County residents as well as the community's resilience to natural hazard events. The information in this section represents a snapshot in time of the current vulnerability and resilience factors in the county when the plan was updated. Vulnerability factors can be defined as those community assets and characteristics that may be

impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). This section also provides information on the jurisdictions' participation in the National Flood Insurance Program (NFIP).

Appendix B: Planning and Public Process

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

Appendix C: Action Item Forms

This appendix contains the detailed action item forms for each of the high priority short term mitigation strategies identified in this plan. These forms are intended to serve as project briefs that can be expanded into grant applications.

Appendix D: Future Climate Projection Report – Oregon Climate Change Research Institute

This appendix contains the report prepared by the Oregon Climate Change Research Institute that evaluates the likely changes to climate in Grant County in the coming decades.

Appendix E: Evaluation of Natural Hazard Mitigation Projects

This appendix describes a method of prioritizing natural hazard mitigation projects and benefit/cost analysis in natural hazards mitigation. The Partnership for Disaster Resilience developed this appendix. It has been reviewed and accepted by the Federal Emergency Management Agency (FEMA) as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Appendix F: Grant Programs and Resources

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

II. RISK ASSESSMENT

A. What is a Risk Assessment?

This chapter serves as the factual basis for Grant County to address Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. In addition, this section of the Natural Hazards Mitigation Plan (NHMP) addresses 44 CFR 201.6(b)(2) - Risk Assessment.

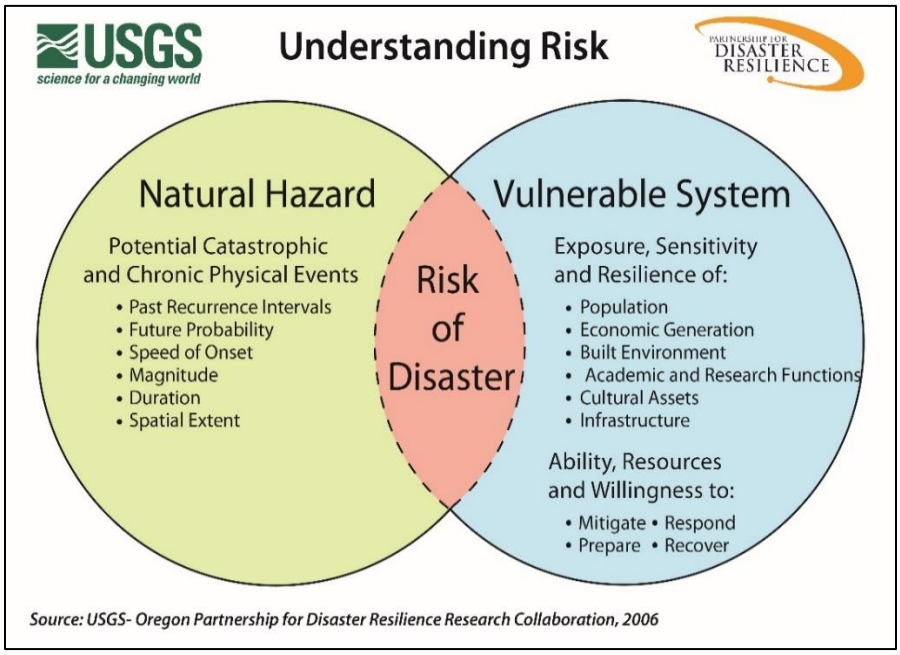
A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the graphic in Figure 1.

Assessing natural hazard risk has three phases:

- **Phase 1**: Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by each community.

The information presented below, along with hazard specific information presented in the Hazard Annexes and community characteristics presented in the Community Profile Appendix, will be used as the local level rationale for the risk reduction actions identified in Section 3 – Mitigation Strategy. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

Figure 2. Understanding Risk



Source: Oregon Partnership for Disaster Resilience

The first phase, **hazard identification**, involves the identification of the geographic extent of a hazard, its intensity, and its probability of occurrence. This level of assessment typically involves producing a map. The outputs from this phase can also be used for land use planning, management, and regulation; public awareness; defining areas for further study; and identifying properties or structures appropriate for acquisition or relocation.[11]

The second phase, **vulnerability assessment**, combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, and attempts to predict how different types of property and population groups will be affected by the hazard. This step can also assist in justifying changes to building codes or development regulations, property acquisition programs, policies concerning critical and public facilities, taxation strategies for mitigating risk, and informational programs for members of the public who are at risk.[12]

The third phase, **risk analysis**, involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. Risk has two measurable components: (1) the magnitude of the harm that may result, defined through the vulnerability assessment, and (2) the likelihood or probability of the harm occurring.

The following risk assessment draws upon three sources: the 2014 Northeast Oregon Natural Hazard Mitigation Plan, a risk analysis exercise conducted with Grant County NHMP Steering Committee, an analysis performed by the Department of Geology and Mining Industries (DOGAMI) using a risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes called HAZUS-MH. Hazards U.S. – Multi-Hazard (HAZUS-MH) is a software program that joins current scientific and engineering knowledge with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after a disaster occurs.

[11]Burby, R.1998.Cooperating with Nature. Washington, DC: Joseph Henry Press.

[12]Ibid.

B.Hazard Identification

The hazards facing Grant County are summarized here to provide context to the following sections on vulnerability assessment and risk analysis, however additional detail regarding characteristics, location and extent of each hazard in Volume II, Hazard Annexes.

1. Wildfire

Characteristics

Wildfires are a natural part of the ecosystem in Oregon. However, wildfires can present a substantial hazard to life and property in growing communities, because often development occurs in the wildland-urban interface (WUI). The most common wildfire hazard factors include: hot, dry, and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, its behavior is influenced by numerous conditions, including fuel, topography, weather, drought, and development[13]. The negative impact of smoke on air quality is a secondary impact of wildfire. Post-wildfire geologic hazards can also present risk. These usually include flood, debris flows, and landslides.

Location/Extent

According to both the DOGAMI vulnerability assessment and the local vulnerability assessment, there is potential for loss due to WUI fires in Grant County. Fire prone areas cover a large portion of the county and are present in developed areas in the county. The primary areas of exposure to this hazard are in the forested unincorporated areas of the county that have not already experienced recent burns. These areas are represented in the Figure 2 contained in the DOGAMI Natural Hazard Risk Assessment[14] .

DOGAMI's risk analysis utilized the Burn Probability dataset contained in the US Forest Service's Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results developed for the States of Oregon and Washington to analyze the extent of wildfire hazard risk in Grant County. The Burn Probability dataset was categorized into low, moderate and high hazard zones for the county.

[13] Pyrologix LLC, 2018, Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results, final report, report to Oregon Department of Forestry and others, 86 p. http://oe.oregonexplorer.info/externalcontent/wildfire/reports/20170428_PNW_Quantitative_Wildfire_Risk_Assessment_Report.pdf

[14] Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report for Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

Figure 3. Burn Probability Map of Grant County, Oregon

Burn Probability Map of Grant County, Oregon

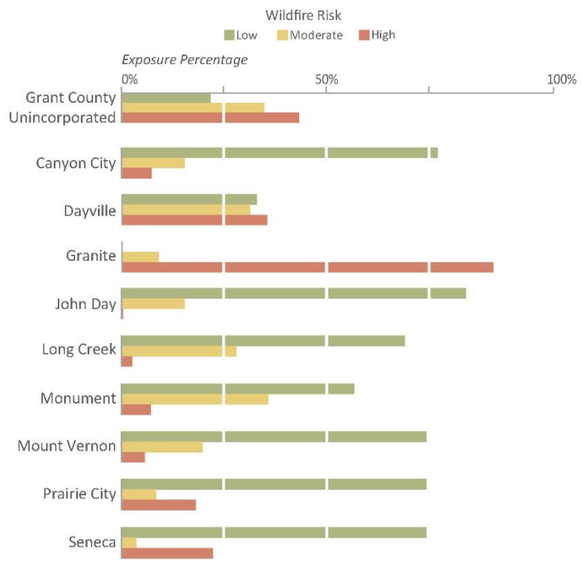
PLATE 6

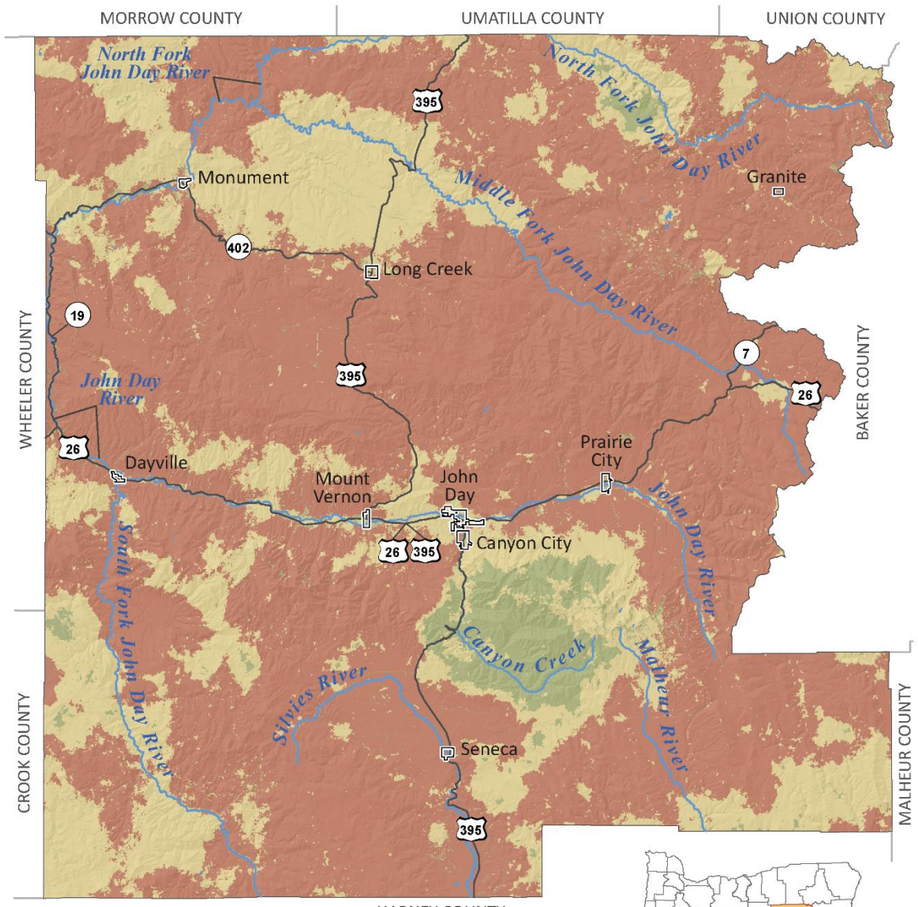
Burn Probability

- Low
- Moderate
- High

Wildfire Burn Probability is categorized as Low, Moderate, and High and indicates the probability a location has to wildfire hazard. Probability ranges of the Burn Probability dataset from the PNRA were grouped into 3 categories of wildfire hazard. Burn probability is derived from simulations using many elements, such as, weather, ignition frequency.

Percentage of Building Value Exposed to Wildfire





Data Sources:
Burn probability data: Oregon Department of Forestry, Pyrologix, LCC. (2018)
Roads: Oregon Department of Transportation Signed Routes (2013)
Place names: U.S. Geological Survey Geographic Names Information System (2015)
City limits: Oregon Department of Transportation (2014)
Basemap: Oregon Lidar Consortium (2017)
Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)

Projection: WGS 1984 Web Mercator Auxiliary Sphere
Software: Esri® ArcMap 10, Adobe® Illustrator CC

Cartography by: Lowell H. Anthony, 2019

Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This publication cannot substitute for site-specific investigations by qualified practitioners. Site-specific data may give results that differ from the results shown in the publication. See the accompanying text report for more details on the limitations of the methods and data used to prepare this publication.

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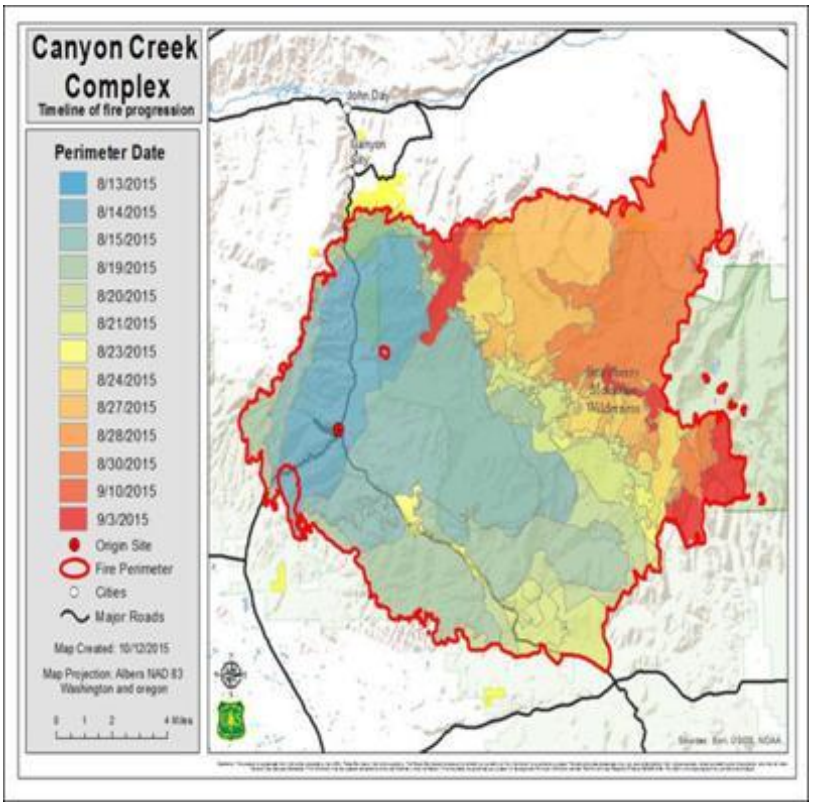
Source: Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report for Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

Wildfire Events 2014-2019

The most significant wildfire to occur in Grant County since 2014 was the Canyon Creek Complex fire that began on August 12, 2015. The following chronology is drawn from the US Forest Service Canyon Creek Complex, Malheur National Forest, Overview and Frequently Asked Questions. "The Berry Creek and Mason Springs fires were two of 12 fires ignited by lightning on August 12 on the Malheur National Forest. Pushed by strong winds, the Berry Creek and Mason Springs fires merged together to become the Canyon Creek Complex on August 14, 2015.

The complex remained active for the next three weeks, with runs of 20,000 acres to the southeast, 11,600 acres down Pine Creek and 17,600 acres down Indian Creek toward Prairie City. By September 4, the fire had increased to more than 110,000 acres and destroyed 43 primary residences. The Fire was declared controlled on November 5, 2015; suppression costs to this point are approximately $31 Million." [15] Figure 3 shows the timeline of the fire's progression.

Figure 4. Canyon Creek Complex, Timeline of Fire Progression



Source: US Forest Service Canyon Creek Complex, Malheur National Forest, Overview and Frequently Asked Questions https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd503421.pdf, consulted January 2020

[15] US Forest Service Canyon Creek Complex, Malheur National Forest, Overview and Frequently Asked Questions https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd503421.pdf, consulted January 2020

The Canyon Creek Complex originated with two fires out of the 193 fires catalogued by the Oregon Department of Forestry through the Fire List. This Fire List queried for fires in Grant County from February 2014, the publication date of the 2014 Northeast Oregon Natural Hazard Mitigation Plan, through January 2020 reports that 190,308 acres burned in those 193 fires.[16] The Canyon Creek Complex fire represents nearly 58% of the acreage burned in this seven year period.

Full details of the hazard posed by wildfire can be found in Volume II, Wildfire Annex.

2. Winter Storm

Characteristics

Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting Northeast Oregon typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March.[17]

Winter storm events are relatively common in eastern Oregon, where the air is generally cold enough for snow and ice, when a Pacific storm is associated with an air mass from the Gulf of Alaska, a major snowstorm may ensue.

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

Location/Extent

All of Grant County is vulnerable to winter storms and impacts typically extend region-wide. The magnitude or severity of severe winter storms is determined by a number of meteorological factors including the amount and extent of snow or ice, air temperature, wind speed, and event duration.

Winter Storm Events 2014-2019

Twenty-five Heavy Snow or Ice Storm events in Grant County were logged by the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information storm

[16] https://apps.odf.oregon.gov/DIVISIONS/protection/fire_protection/fires/FIRESlist.asp#main-content, consulted January 2020

[17] Interagency Hazard Mitigation Team.2012- Oregon Natural Hazards Mitigation Plan. Salem, OR: Oregon Military Department – Office of Emergency Management

event database[18]. One of these winter storm events resulted in the Oregon Governor declaring a State of Emergency.

Executive Orders 17-02 and 17-06 declared the winter storms that began January 11, 2017 and continued through March 2017 resulted in "critical transportation failures, loss of power and communications capabilities, and evacuations and sheltering needs. This storm system damaged state highways, throughout the jurisdictions with scour, washouts, sinkholes, serious debris flows and mudslides."[19] NOAA's storm event database reports that 0.5" of ice accumulated at Seneca in Grant County by 10 AM on January 18, 2017[20].

Full details of the hazard posed by winter storms can be found in Volume II, Severe Weather Annex.

3. Flood

Characteristics

The principal types of flood that occur in Grant County include snow melt (spring) floods resulting from rapid snowmelt, occasionally augmented by rainfall, riverine, and local flash floods. Damaging conditions that accompany flooding, but which do not meet the FEMA definition of flooding, include ground water intrusion during conditions of high rainfall. Further details on the characteristics of these types of flooding can be found in Volume II, Flood Annex.

Location/Extent

The location and extent of flooding hazard are represented by the Flood Insurance Rate Maps issued by FEMA, in conjunction with their Flood Insurance Studies (FIS). Flood records are often not well documented, particularly in unincorporated areas because their floodplains are sparsely developed[21]. Only a portion of the watercourses in Grant County are covered by regulatory floodplains as shown by the FIRMs. Selection of areas to map for flood risk and flood insurance requirements are made based on the number of structures and people at risk, therefore, the areas shown on the FIRMs (and in Figure 4 below) represent areas currently mapped by FEMA of flood risk where people or property may be at risk for damage.

Revisions to the FIRMs have taken place for Canyon Creek and John Day through a Letter of Map Revision (LOMR) effective October 17, 2019 and are under way for Bear Creek and the Silvies River in and around Seneca. A portion of the revised FIS and FIRM Panel 410070001C through LOMR 19-10-0438P-410077 includes areas of Canyon Creek and the John Day River. Flood mapping updates are underway for the Silvies River at Seneca with nine new preliminary FIRM panels issued 5/31/2019, but they have not yet been finalized. Seneca has not previously had regulatory mapped floodplains.

[18] NOAA Storm Event Database, consulted January 2020.

[19] Executive Order No. 17-06, Office of the Governor, State of Oregon, April 13, 2017

[20] NOAA Storm Event Database, consulted January 2020.

[21] Grant County Flood Insurance Rate Study, NFIP, 5/18/1982

The location and extent of damage due to ground water intrusion is not as easily mapped as flooding hazard is. The construction of critical facilities such as Grant Union High School on highly permeable fill material has resulted in ground water intrusion into portions of the building. This condition makes the use of Grant Union High School as a shelter facility dependent on the presence of this condition.

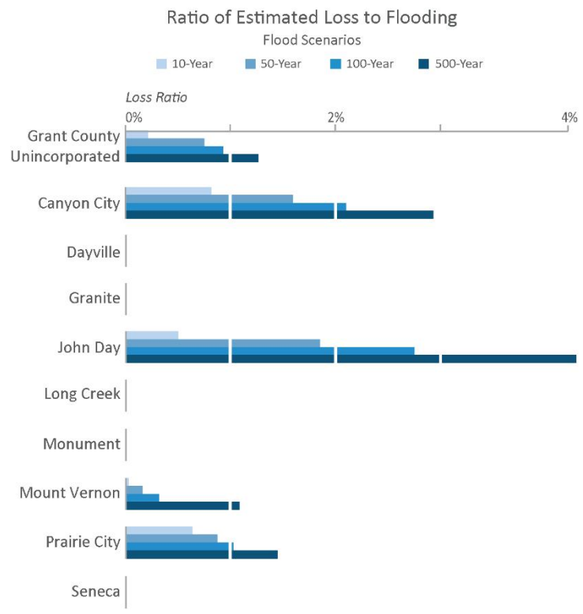
Figure 5. Flood Hazard Map of Grant County, Oregon

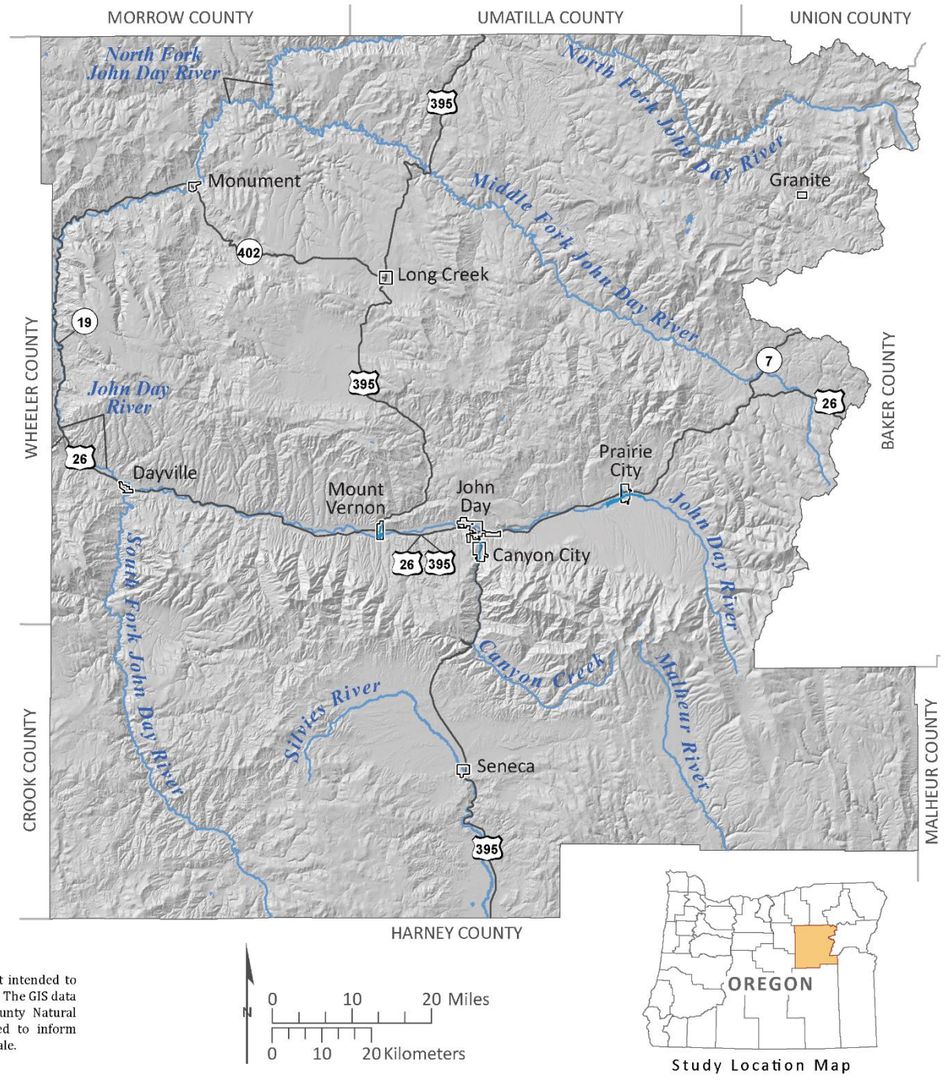
Flood Hazard Map of Grant County, Oregon

PLATE 4

Flood Hazard Zone
100-Year Flood
(1% annual chance)

The flood hazard data show areas expected to be inundated during a 100-year flood event. Flooding sources include riverine. Areas are consistent with the regulatory flood zones depicted in Grant County's Digital Flood Insurance Rate Maps.





Data Sources:
Flood hazard zone (100-year): Grant County Flood Insurance Rate Map (1982, 1987, 1988, and 2019)
Roads: Oregon Department of Transportation Signed Routes (2013)
Place names: U.S. Geological Survey Geographic Names Information System (2015)
City limits: Oregon Department of Transportation (2014)
Basemap: Oregon Lidar Consortium (2017)
Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)

Projection: WGS 1984 Web Mercator Auxiliary Sphere
Software: Esri® ArcMap 10, Adobe® Illustrator CC

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Flooding Events 2014-2019

In the six years since the completion of the 2014 Northeast Oregon Natural Hazard Mitigation Plan that included Grant County, the county has experienced spring flooding in three of those years. In March 2014 Grant County, as well as Union and Umatilla Counties, experienced heavy rainfall across much of the northern Blue Mountains throughout the first week of March. March 9, 2014 saw very heavy rain with snow levels around 6,000 feet elevation. This allowed for a significant increase in runoff, which led to a quick rise in rivers. In May 2018 Grant County, as well as Wallowa County saw heavy rain from slow moving thunderstorms that caused rock slides and water on roadways within an area that included Mount Vernon, John Day and Canyon City. In April 2019 snow water equivalents near 200% of normal in the Blue Mountains coupled with warm temperatures and near record rainfall totals for April produced significant river flooding across eastern Oregon. This spring flooding resulted in a federal disaster declaration (DR-4452) for Grant, Wheeler and Umatilla Counties[22].

Full details of the hazard posed by flooding can be found in Volume II, Flood Annex.

4. Drought

Characteristics

Droughts are not uncommon in Oregon, particularly in eastern Oregon. Droughts tend to be an economic hazard, particularly damaging to the hydro-power and agricultural sectors. Agriculture makes up a particularly large portion of Grant County businesses and drought therefore affects the economic stability of the region. The environmental consequences also are far-reaching. They include insect infestations in forests and the lack of water to support endangered fish species. In recent years, the state has addressed drought emergencies through the Oregon Drought Readiness Council. This interagency council meets to discuss forecasts and to advise the Governor as the need arises.

The Oregon State University Extension Service published a report in June 1979 following the 1977 drought (EM-3039). Highlights of the survey findings indicate that the 1977 drought affected 80% of ranches in eastern Oregon, decreased forage, increased purchase of feed, reduced rate of gain of cattle, delayed breeding, herd health problems and increased water hauling and equipment investments.[23]

Connections between drought conditions and the susceptibility of landscapes to wildfires have been the subject of research across the United States and across the globe. The unusually hot and dry summer in parts of the northern hemisphere has turned fields and forests into fuel for fires which

[22] National Climate Data Center Storm Events Database http://www.ncdc.noaa.gov/stormevents

[23] Oregon State University Extension Services. "Effects of the 1977 Drought on Eastern Oregon Ranches. "June 1979.http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/4743/SR%20no.%20555_ocr.pdf?sequence=1. Northeast Oregon's cow herd production alone decreased more than 37%.

are raging from the Arctic to the Mediterranean and West Coast of North America[24]. More of a concern to members of the Steering Committee, however, is the condition of the forests in Grant County. Steering Committee members note the overly dense forest stands and the presence of ladder fuels in the forest understory as more important factors in the frequency and intensity of wildfire[25].

Location/Extent

The extent of drought events depends upon the degree of moisture deficiency, and the duration and size of the affected area. Typically, droughts occur as regional events and often affect more than one city and county.

The incidence of drought in Oregon is between eight and twelve years.[26] Grant County is susceptible to droughts because of its location east of the Cascades and within the high desert. The region experiences dry conditions annually during the summer months from June to September.

Drought Events 2014-2019

US Drought Monitor records data that contribute to drought, which data indicate that Grant County was in a condition of moderate drought or worse for more than 40% of the past ten years. For the period between January 2014 and December 2019, US Drought Monitor data represented in Figure 5 shows all of Grant County to have experienced extreme drought from July 28, 2015 through December 29, 2015[27]. The Oregon Governor issued three Executive Orders at the request of the county and based on recommendations by the Drought Readiness Council and the Water Supply Availability Committee in 2014, 2015 and 2018. These Executive Orders declared that dry conditions presented hardships for Grant County, that crops and agricultural investments were at risk, that animals and plants that rely on Oregon's surface water supplies were threatened and that the risk of wildfires is greatly increased.

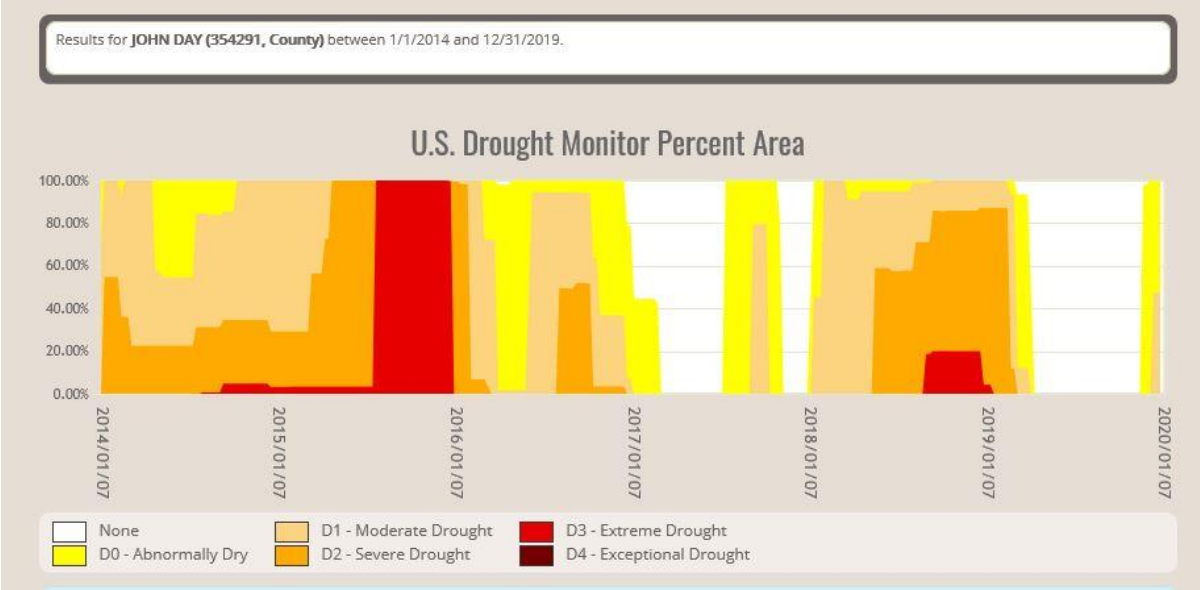
[24] World Meteorological Organization. "Drought and heat exacerbate wildfires", July 2018, https://public.wmo.int/en/media/news/drought-and-heat-exacerbate-wildfires

[25] Minutes from February 14, 2020 Grant County NHMP Steering Committee meeting

[26] Oregon Natural Hazards Mitigation Plan (2012) Region 7: Regional Profile

[27] US Drought Monitor https://droughtatlas.unl.edu/Data/Climate.aspx The United States Drought Monitor (USDM) map is a composite index that has been released on a weekly basis since 1999.

Figure 6. Periods of drought in Grant County from January 2014 through December 2019



Source: Drought Atlas https://droughtatlas.unl.edu/Data/Climate.aspx consulted January 2020

Full details of the hazard posed by drought can be found in Volume II, Drought Annex.

5. Windstorm

Characteristics

Extreme winds occur throughout Oregon, and most communities have some level of vulnerability to windstorms. Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among other impacts. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Windstorms can trigger flying debris, which can also damage utility lines; overhead power lines can be damaged even in relatively minor windstorm events. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures.

Although rare, tornados can and do occur in Oregon, with recorded events happening in all four counties and a particularly destructive tornado in Wallowa County.[28] Tornadoes are the most concentrated and violent storms produced by the earth's atmosphere. They are created by a vortex of rotating winds and strong vertical motion, which possess remarkable strength and cause

[28]Taylor, George H. & Chris Hannan, The Climate of Oregon, OSU Press, 1999. The 1968 Wallowa County event was considered to be a category 7 in damages, ranging between $5 million and $50 million in destruction of timber land.

widespread damage. Smaller wind events, often known as, “dust devils”, are fairly common in Northeast Oregon and pose some risk to the local community.

Windstorms or gusting wind can exacerbate the risk of wildfire spread. This was a factor in the conflagration of the Canyon Creek Complex fire in 2015.

Location/Extent

The damaging effects of windstorms may extend for distances of 100 to 300 miles from the center of storm activity. Windstorms in Grant County usually occur from October to March. The extent of windstorms is determined by their track, intensity (the air pressure gradient they generate), and local terrain. More intense windstorms generally occur within the valley corridors.[29]

Oregon and other western states experience tornadoes on occasion, many of which have produced significant damage and occasionally injury or death. Most of the tornadoes that develop in Oregon are caused by intense local thunderstorms. These storms also produce lightning, hail, and heavy rain, and are more common during the warm season from April to October.[30]

Windstorm Events 2014-2019

The NOAA Storm Event Database records several high wind events in Grant County during the planning period. December 11, 2014 and February 6, 2015 saw winds gusting to 73 mph (64 knots) throughout the county. High winds accompanying thunderstorms were recorded in Dayville on June 28, 2015. Wildfires were also recorded in the county during this time and may have been exacerbated by the high winds and lightening that accompanies thunderstorms. High winds and thunderstorms were recorded in John Day on June 26, 2017. The following summer a funnel cloud was recorded in Seneca on May 20, 2018.

Windstorms have caused damage to critical facilities in Grant County. The water supply system in Prairie City sustained damage to its electrical components and to some of its mechanical components due to an intense, short duration windstorm. The city was able to secure some grant funding to repair the system, but this repair is still on going. The public works director for Prairie City was able to work together with the City of John Day to ensure that sufficient water was on hand for firefighting during the time that the water system was out of commission.

Full details of the hazard posed by windstorms can be found in Volume II, Severe Weather Annex.

6. Landslide

Characteristics

Landslides are downhill movements of rock, debris, or soil. There are many different types of landslides in Oregon. In Grant County, the most common are debris flow, shallow-, and deep-seated

[29]Natural Hazards Mitigation Plan Risk Assessment Meetings

[30] Taylor, George H., Holly Bohman, and Luke Foster. August 1996. A History of Tornadoes in Oregon. Oregon Climate Service. Corvallis, OR: Oregon State University.

landslides. Landslides can occur in many sizes, at different depths, and with varying rates of movement. Generally, they are large, deep, and slow moving or small, shallow, and rapid. Some factors that influence landslide type are hillside slope, water content, and geology. Many triggers can cause a landslide: intense rainfall, earthquakes, or human-induced factors like excavation along a landslide toe or loading at the top. Landslides can cause severe damage to buildings and infrastructure. Fast-moving landslides may pose life safety risks and can occur throughout Oregon[31].

Location/Extent

Staff from Oregon's Department of Geology and Mineral Industries (DOGAMI) have developed a database of landslide information for use in understanding the risk of landslides across the state of Oregon. The Statewide Landslide Information Layer for Oregon [SLIDO], release 3.2[32] is an inventory of mapped landslides in the state of Oregon. SLIDO is a compilation of past studies; some studies were completed very recently using new technologies, like LiDAR[33]-derived topography, and some studies were performed more than 50 years ago. Consequently, SLIDO data vary greatly in scale, scope, and focus and thus in accuracy and resolution across the state. Landslide inventory mapping for Grant County was done before LiDAR was available for high-accuracy mapping.

Many communities in Grant County have some exposure to landslide risk. Communities that developed in terrain with moderate to steep slopes or at the base of steep hillsides may be at risk to landslides. These areas are illustrated in Figure 6 below. While these areas are highly prone to landslides, a large percentage of the populated areas are not within these zones as they are currently mapped. The percentage of building value exposed to very high and high landslide susceptibility is approximately 10% for the entire study area, but the threat is elevated for buildings in these hazard zones.

The Steering Committee members recognize areas in the county that are susceptible to rock fall and express concern about the consequences of a large scale landslide in these areas. In particular, areas within Canyon Creek where fuel tanks are currently stored is an example of a localized area that poses potential for damage due to landslide.

[31] Burns, W. J., Mickelson, K. A., and Madin, I. P., 2016, Landslide susceptibility overview map of Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-16-02, 48 p. https://www.oregongeology.org/pubs/ofr/p-O-16-02.htm

[32] Burns, W. J., and Watzig, R. J., 2014, Statewide landslide information layer for Oregon, release 3 [SLIDO-3.0]: Oregon Department of Geology and Mineral Industries, 35 p., 1:750,000, geodatabase.

[33] LiDAR, which stands for Light Detection and Ranging, is a remote sensing technology that functions by illuminating a target with a pulsed laser and measuring the round-trip time (Time of Flight) of reflected pulses with a sensor to determine its distance.

Figure 7. Landslide Susceptibility Map

Landslide Susceptibility Map of Grant County, Oregon

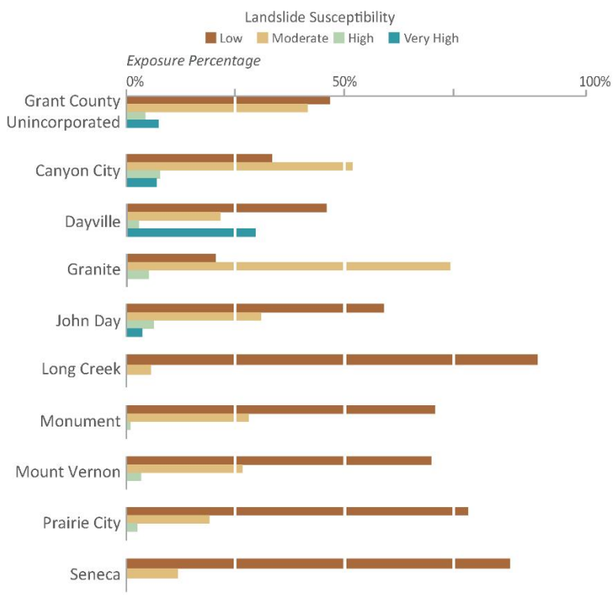
PLATE 5

Landslide Susceptibility

- Low
- Moderate
- High
- Very High

Landslide susceptibility is categorized as Low, Moderate, High, and Very High which describes the general level of susceptibility to landslide hazard. The dataset is an aggregation of three primary sources: landslide inventory (SLIDO), generalized geology, and slope.

Percentage of Building Value Exposed to Landslide



Data Sources:
Landslide susceptibility: Oregon Department of Geology, Burns and others (2016)
Roads: Oregon Department of Transportation Signed Routes (2013)
Place names: U.S. Geological Survey Geographic Names Information System (2015)
City limits: Oregon Department of Transportation (2014)
Basemap: Oregon Lidar Consortium (2017)
Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)

Projection: WGS 1984 Web Mercator Auxiliary Sphere
Software: Esri® ArcMap 10, Adobe® Illustrator CC

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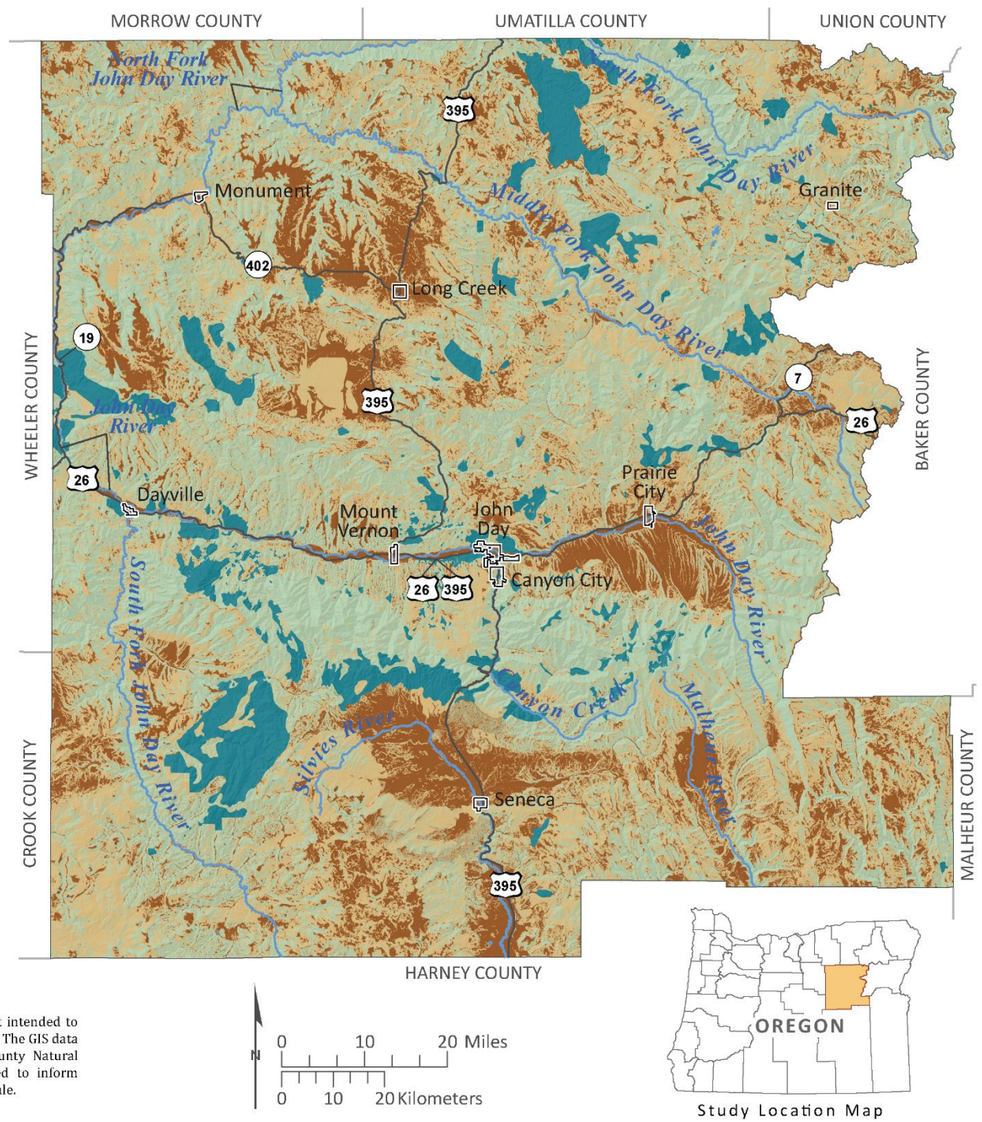

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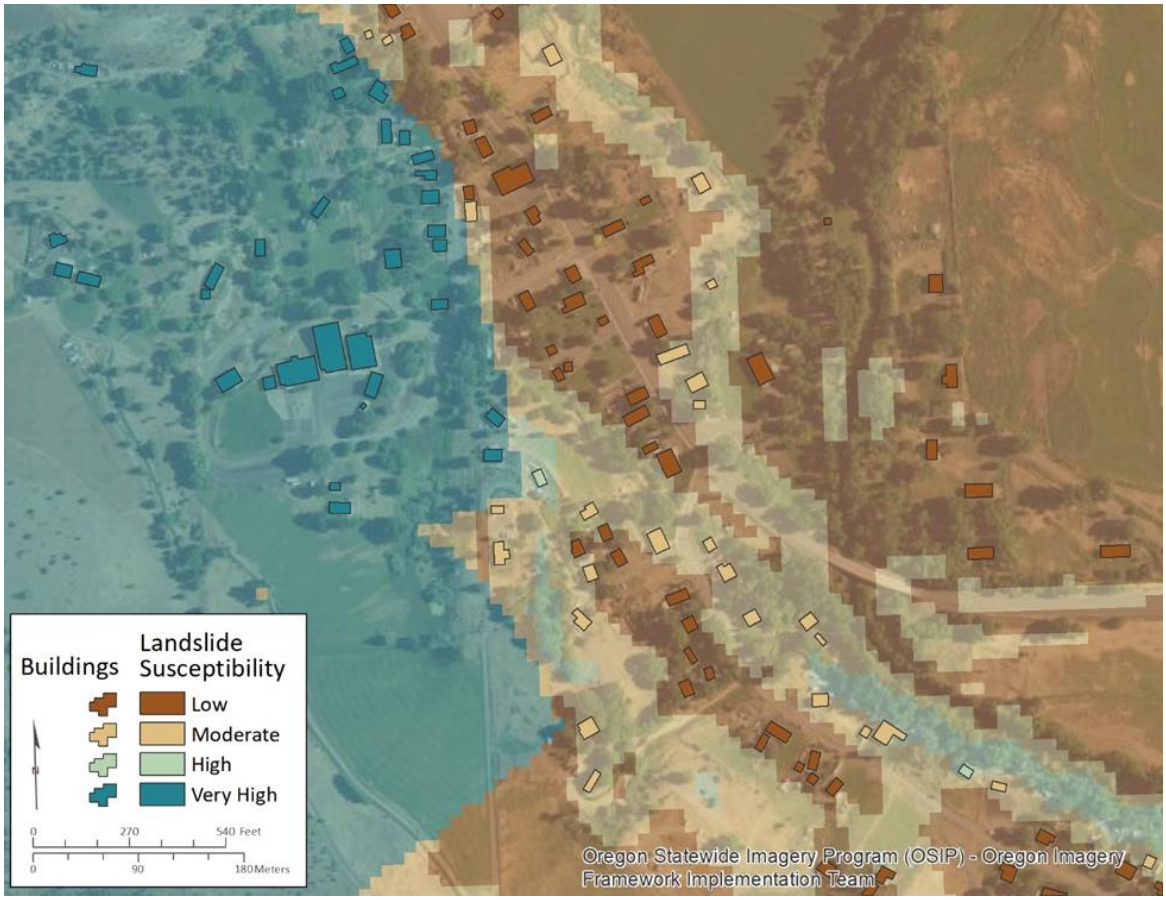
The Grant County Natural Hazard Risk Assessment prepared by DOGAMI identified locations within the county that are comparatively more vulnerable or at greater risk to landslide hazard:

- The western portion of the City of Dayville is at greater risk to landslide hazard than other communities in Grant County. See Figure 7.
- Buildings in and near the City of John Day are exposed to very high landslide hazard in the steep areas north of the John Day airport. See Figure 8.
- A cluster of residential buildings east of the downtown portion of Canyon City are exposed to very high landslide hazard.
- Some communities in Grant County may be at higher or lower risk than what the data show, LiDAR-based landslide mapping would provide a better understanding of the risk[34].

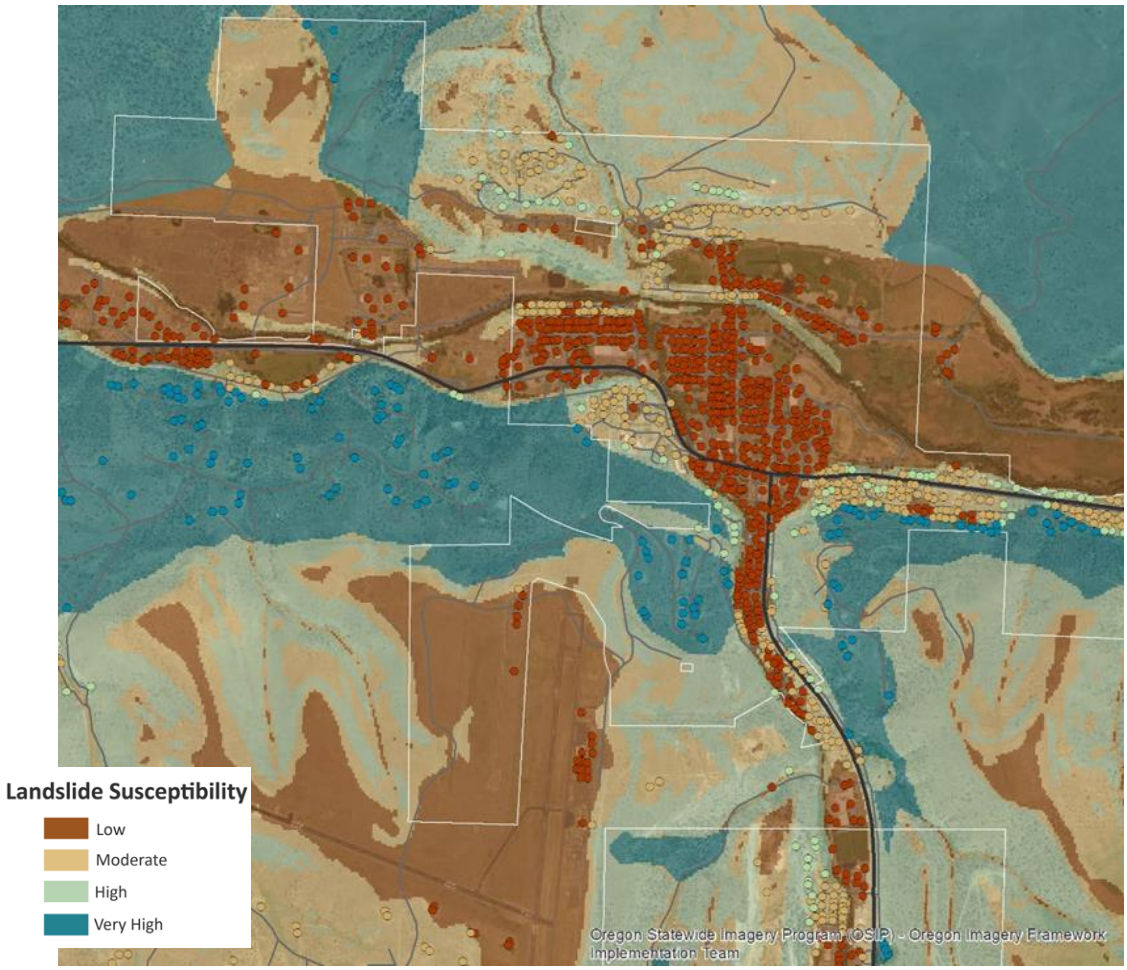
Figure 8. Landslide susceptibility areas and building exposure example in the City of Dayville



Note: Points represent buildings. Colors correspond to susceptibility exposure.
Source: Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report for Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

[34] Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report For Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries, p. 28

Figure 9. Building landslide exposure overlaying landslide susceptibility in John Day and Canyon City



Note: Points represent buildings. Colors correspond to susceptibility exposure.
Source: Powerpoint presentation to Grant County NHMP Steering Committee, Matt Williams, DOGAMI

Landslide Events 2014-2019

No landslides were reported in Grant County during this period.

Full details of the hazard posed by landslides can be found in Volume II, Landslide Annex.

7. Volcanic Event

Characteristics

Northeast Oregon (and the greater Pacific Northwest) lays within the “ring of fire”, an area of very active volcanic activity surrounding the Pacific Basin. Volcanic eruptions occur regularly along the ring of fire, in part because of the movement of the Earth’s tectonic plates. Volcanic eruptions have

the potential to coincide with numerous other hazards including ash fall, earthquakes, lava flows, pyroclastic flows, lahars and debris flows, and landslides. Ash fall is likely the only hazard that could have the potential to impact Grant County directly.

Location/Extent

Direct risk from local volcano-associated hazards is not a consideration for Grant County because the volcanic Cascade Mountain Range is not close enough to the county to cause damage. Mt. St. Helens is about 250 air miles from the City of Enterprise, consequently placing that community at risk. Mt. Jefferson, located 150 miles west of John Day, it is a possible, but unlikely source of ash fall or airborne tephra (rock fragments and particles ejected by a volcanic eruption). The effects of airborne tephra or ash fall may including disruption of engines of motor vehicles and health impacts to vulnerable populations, such as people with asthma.

Volcanic Events 2014-2019

None.

Full details of the hazard posed by volcanic events can be found in Volume II, Volcanic Events Annex.

8. Earthquake

Characteristics

An earthquake is a sudden movement of material on each side of a fault in the earth's crust that abruptly releases strain accumulated over a long period of time. The movement along the fault produces waves of strong shaking that spread in all directions. Oregon is underlain by a large and complex system of faults that can produce damaging earthquakes. Although smaller faults produce smaller earthquakes, they are often close to populated areas, and damage can be extensive to nearby buildings[35].

Two potential earthquake-induced hazards are liquefaction and landslides. Liquefaction occurs when loose, saturated soils substantially lose bearing capacity due to ground shaking, causing the soil to behave like a liquid; this action can be a source of tremendous damage. If an earthquake causes strong shaking in populated areas, it may result in causalities, economic disruption, and extensive property damage.

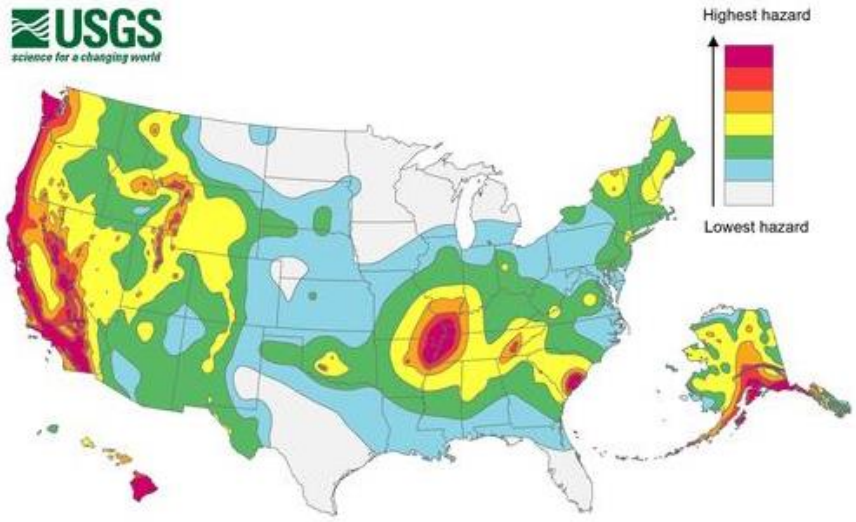
DOGAMI used a national map of seismic hazard created by the USGS and is used in within the HAZUS®-MH earthquake model[36]. The relative hazard for earthquake in northeastern Oregon is low

[35] Madin, I. P., and Burns, W. J., 2013, Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon Resilience Plan for Cascadia subduction zone earthquakes: Oregon Department of Geology and Mineral Industries Open-File Report O-13-06, 36 p. 38 pl., GIS data. https://www.oregongeology.org/pubs/ofr/p-O-13-06.htm

[36] Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., https://dx.doi.org/10.3133/ofr20141091

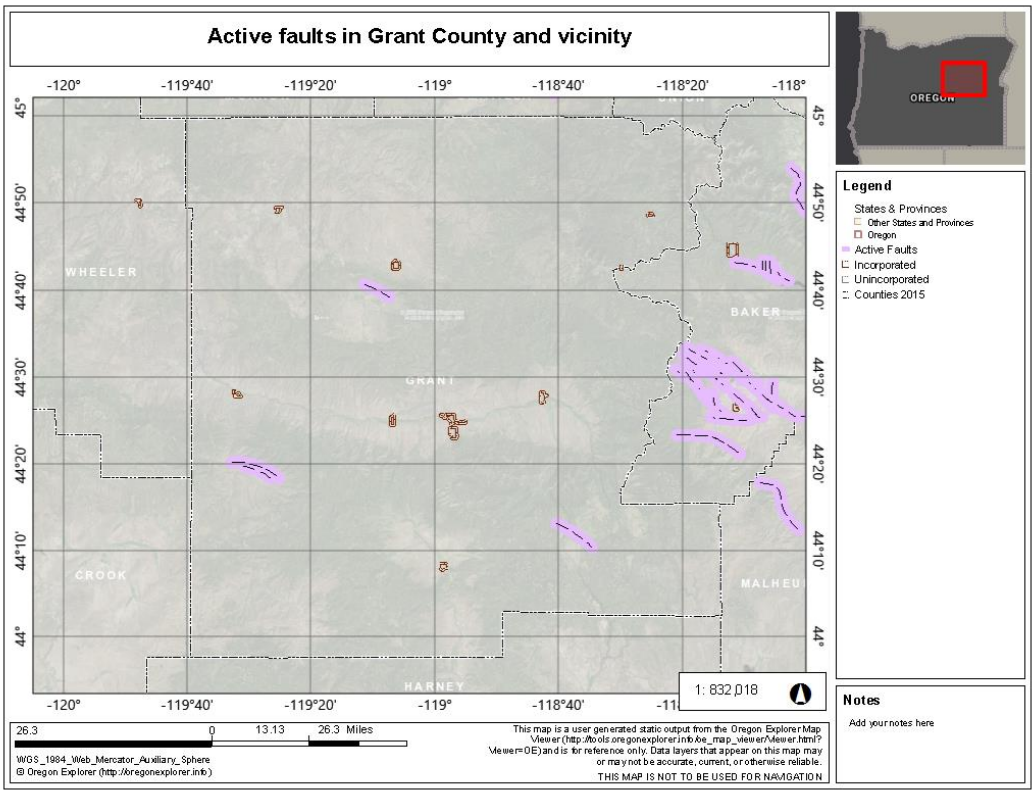
as is shown by the USGS map of seismic hazard in Figure 9. The active faults in Grant County and vicinity are shown in Figure 10.

Figure 10. USGS National Seismic Hazard Map



Source: USGS https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map

Figure 11. Active Faults in Grant County and Vicinity



Source: Oregon Explorer Planner's Map View application

Location/Extent

DOGAMI reports that because an earthquake can affect a wide area, it is unlike other hazards in this report — every building in Grant County, to some degree, would be affected by it[37]. The report estimates impacts from an earthquake using a scenario with a 2% probability of occurrence in a 50 year period and a magnitude set at 6.7 to develop the loss estimate. The scenario run in HAZUS®-MH was based on formulas that estimate damage in five damage states (none, low, moderate, extensive, and complete). These damage states are correlated to loss ratio that are then multiplied by the building dollar value to obtain a loss estimate.

The results indicate that Grant County would incur a moderate amount of damage from an earthquake similar to the one simulated in this report. These results were heavily influenced by earthquake-induced landslides and liquefaction. This is evidenced by low loss estimates throughout the county, but with higher loss estimates occurring in areas with high or very high landslide or

[37] Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report For Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

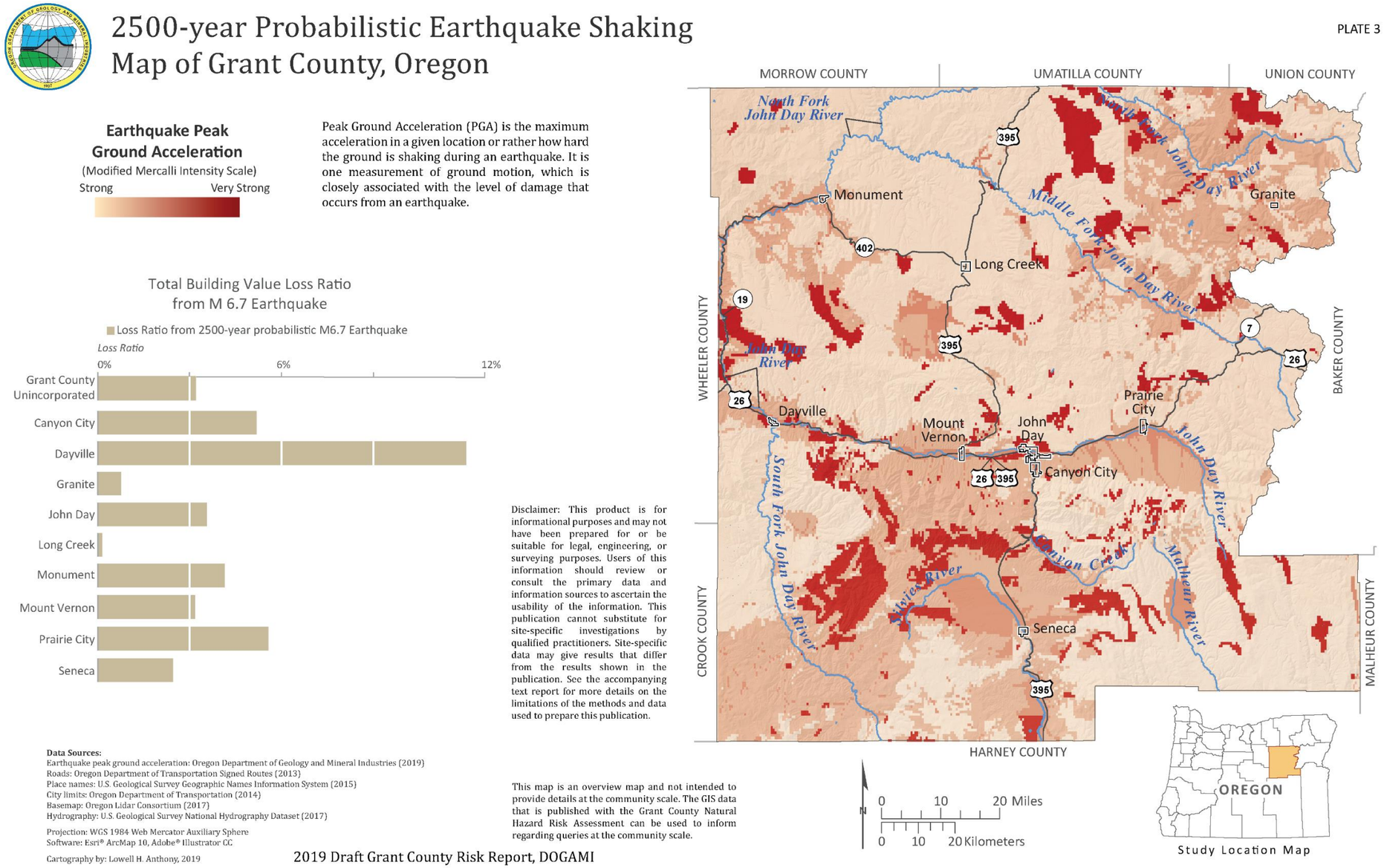
liquefaction susceptibility. This analysis is represented in Figure 11 showing where earthquake shaking from a magnitude 6.7 event might occur in Grant County.

Seismic Events 2014-2019

Grant County has not experienced damaging earthquakes in the past 40 years.

Full details of the hazard posed by earthquakes can be found in Volume II, Earthquake Annex.

Figure 12. Locations of impact by M 6.7 Earthquake



Source: Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report For Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

C. Vulnerability Assessment

Vulnerability assessment is the second phase of this Risk Assessment. Vulnerability assessment endeavors to identify important community assets and system vulnerabilities. Vulnerabilities include both physical assets such as businesses, homes, roads and critical infrastructure like drinking water sources, and public service and health service establishments as well as community assets including people, historic places, and environmental assets.

The Steering Committee engaged in an exercise to identify the relative vulnerability of Grant County to the hazards identified in phase one of the Risk Assessment and to describe the aspects of the community that are most at risk. A description of this exercise and its results are contained in the Risk Analysis, Local Risk Assessment section. In addition, DOGAMI's Risk Assessment report analyzed the exposure of people and property to four of the eight identified hazards by overlaying high hazard areas with existing structures. This data is included in the Risk Analysis section entitled DOGAMI Risk Assessment.

1. Hazard Vulnerability Assessment

The Grant County Steering Committee identified eight natural hazards that could have an impact on the people and property in the county. These hazards include wildfire, winter storms, floods, droughts, volcanic events, wind storms, landslide, and earthquakes. Each is discussed briefly above and in detail within the Hazard Annexes (Volume II).

Local assessment of relative hazard vulnerability was accomplished using a methodology developed by the Federal Emergency Management Agency (FEMA) in 1983. It was subsequently refined by the Oregon Office of Emergency Management (OEM) and shared with local jurisdictions across Oregon. It is called the "Local Risk Assessment Methodology" or "OEM Methodology" in this Plan. Although nearly every jurisdiction in Oregon uses this process, the range of values is relative subjective it is not meant to compare one jurisdiction to another.

In this local risk assessment methodology, four aspects characterizing risk – history, vulnerability, maximum threat, and probability – are assessed by a group or an individual by assigning a ranking as to severity.

History is the record of previous occurrences where a rankings represent the following:

Low:	0-1 event in the past 10 years
Medium:	2-3 events in the past 10 years
High:	4+ events in the past 10 years

Vulnerability is an assessment of the percentage of the population and property likely to be affected during an occurrence of an incident where a ranking represents the following:

Low:	<1% affected
Medium:	1 – 10% affected
High:	>10% affected

Maximum Threat is an assessment of the highest percentage of the population or property which could be impacted under a worst-case scenario.

Low:	<5% affected
Medium:	5 – 25% affected
High:	>25% affected

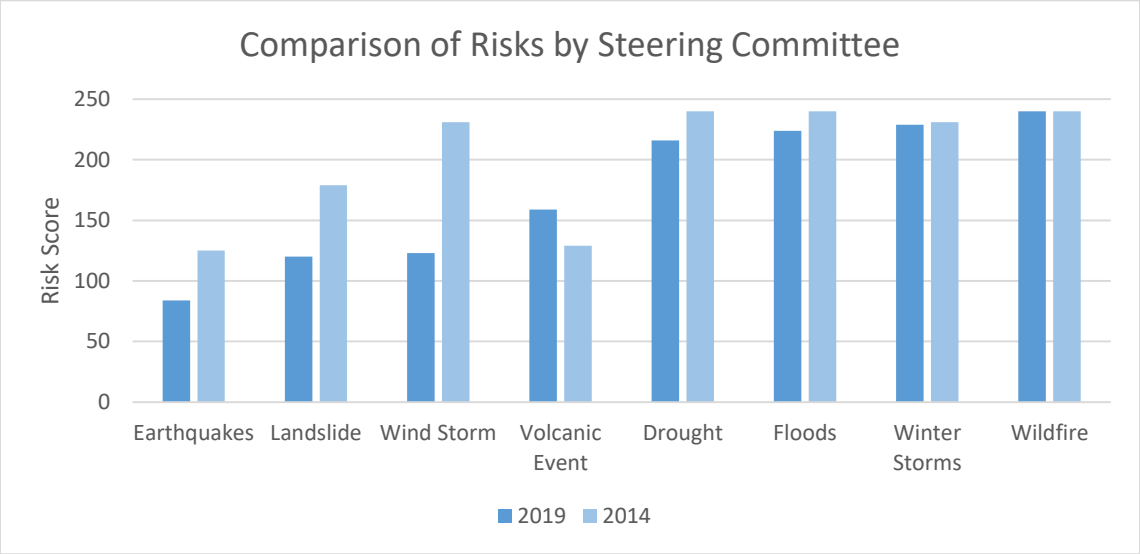
Probability is a measure of the likelihood of a future event occurring within a specified period of time.

Low:	more than 10 years between events
Medium:	from 5 to 10 years between events
High:	likely within the next 5 years

Each of these aspects are assigned a weight. History is weighted by a factor of 2; vulnerability is weighted by a factor of 5; maximum threat is weighted by a factor of 10 and probability is weighted by a factor of 7. The rankings are multiplied by their assigned weighting factors and then combined resulting in a Risk Score for each hazard. This methodology produces Risk Scores that range from 24 to 240. Conducting this analysis is a useful early step in planning for hazard mitigation, response, and recovery. The OEM Methodology does not predict the occurrence of a particular hazard, but it does "quantify" the relative risk of one hazard compared with another.

A group exercise was conducted at the May 23, 2019 Steering Committee meeting to rank these hazards using the OEM methodology. Figure 12 displays the ranking of each of these hazards according to the group of twelve members present at that meeting as compared with the ranking reported in the 2014 Northeast Oregon Regional Natural Hazards Mitigation Plan.

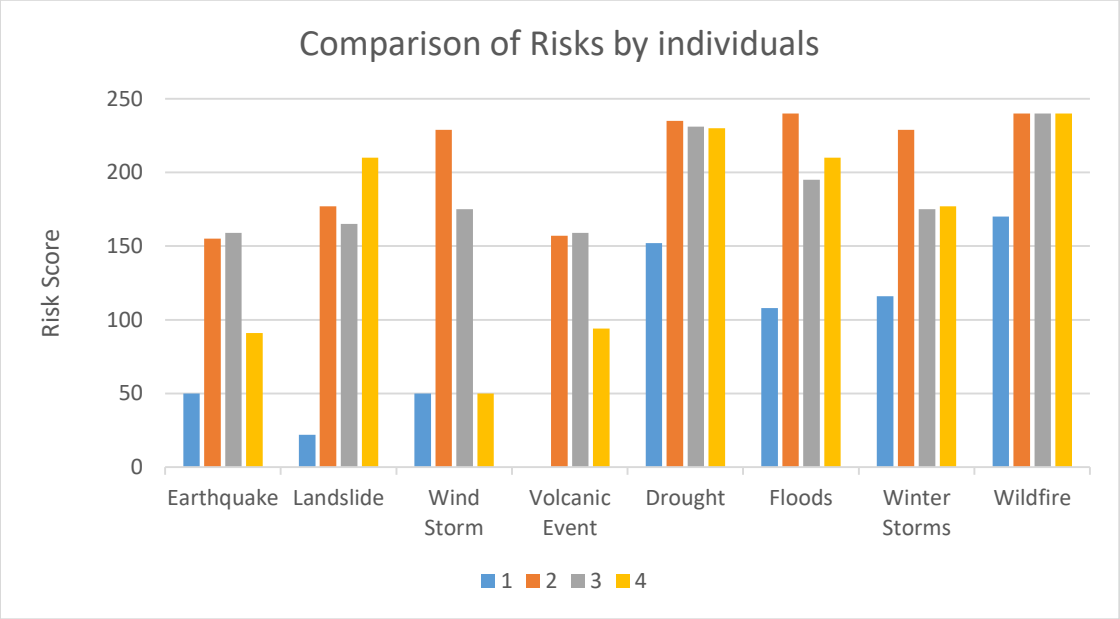
Figure 13. Comparison of OEM methodology risk assessment scores 2014 and 2019



Source: 2014 NE Oregon Regional NHMP and 2019 Grant County Steering Committee

Each individual's perception of the threat a natural hazard poses varies according to the individual's experience and location. Several individual Steering Committee members completed the OEM Risk Analysis worksheets on their own. The range of Risk Score for these individual analyses ranged widely. Figure 13 presents these individual Risk Scores as evaluated by four members of the 2019 NHMP Steering Committee. In general, however, the relative importance of drought, floods, winter storms and wildfire confirm the consensus reached by the Steering Committee as a group.

Figure 14. Risk Scores of four individuals from the 2019 Grant County NHMP Steering Committee



Source: 2019 Grant County NHMP Steering Committee

The Steering Committee discussed the assets of the community that are valued the most and those that are most vulnerable to the impacts of natural hazards. This discussion centered around vulnerable groups of people, economic drivers of Grant County vulnerable to natural hazards, features of the built environment and the natural environment that are vulnerable to the impacts of natural hazards.

The Steering Committee (SC) recognized that children and the elderly are particularly vulnerable, children because they "rely on others for care for and protection" and the elderly because they have a "limited ability to react during a natural hazard event" and both groups have increased needs for care. Vulnerability may also vary with the type of natural hazard. People who suffer from asthma or other lung condition may not be particularly affected by flooding, however, smoke from wildfire could put these people in a vulnerable position. Others noted that the poor are people who are particularly vulnerable to the impacts of natural hazards. "These are the people who are unable to maintain or to move to decent shelter on a good day. If we get a heavy snow, these are the constituents that have their roofs collapse among other emergencies and do not have the resources to solve the problem." However, SC members also note that all residents of Grant County are vulnerable to some extent due to the "limited county ingress and egress, minimal local emergency resources, lack of long term energy and food security." One member of the SC committee described how resilience is important to the youth of Grant County with the following: "The variety of natural hazards affect a large portion of the population

and quite possibly all Grant County citizens. As a result, the citizens fall into a cycle of having one tragedy followed by another followed by another and this is deteriorating to their lifestyle which ultimately will drive people away. These are the people who we need to stay and feel safe so they can contribute to the positive solutions resulting in a vibrant community with something to offer its citizens including our vulnerable youth."[38]

SC members highlighted the importance of ranchers and loggers as drivers of the Grant County economy and as a group particularly vulnerable to the impacts of natural hazards events based on their reliance on the forests and grasslands of the county to make a living. These industries are "dependent on the availability of renewable natural resources", noted one SC member. The impact on natural resources due to a natural hazard event will also affect the tourism industry in Grant County. The SC noted that fuel for vehicles and businesses that sell fuel are important during a natural hazard event for moving people and materials to safety[39].

Aspects of the natural environment that SC members highlighted as valuable to Grant County and vulnerable to the impact of natural hazards reflect the natural resource based economy of Grant County. One member of the SC noted the following: "Forest, agriculture, water streams – provide the natural resource elements that support the county's primary industries and harbors critical habitats for endangered species, along with ample populations of game species to support robust recreational opportunities." Specifically mentioned by another SC member were water resources, specifically in Prairie City and outlying towns[40].

Features of the built environment that are the most valued in the community include cultural, educational, health and safety buildings and infrastructure such as roads and bridges. In particular, the SC members noted "The Kam Wah Chung (National Heritage site) is extremely valued in Grant County due to the large visitor population. This is an aging facility and services cannot continue or grow with the current tourist numbers. Additionally, the current facility is located near a river which is known to have high waters and occasional flooding." School buildings are both vulnerable and valuable to the residents of Grant County based on the responses of the SC members. One member said of the schools "All schools in Grant County are extremely outdated but do not have the financial resources (or support from ballot measures) to build new facilities. They have enormous facility issues including leaking, flooding, and otherwise which can potentially create safety issues for students and staff", and another SC member noted specifically that Grant Union High School is located in a floodplain. Another SC member noted that schools are the "largest buildings in most towns that can accommodate people to inform them of situations, provide shelter, or supply materials." In Long Creek, "the main building is the local school. It is the hub of the community. If a natural disaster does occur, it will be the school that is the focal point for command and control as we as emergency shelter. The SC members reported that the hospital, airport, fire and police departments, emergency responders' facilities, Forest Service building, churches, and grocery stores are valuable features of the built environment in Grant County. Similarly infrastructure including potable water systems (particularly in Prairie City), wastewater treatment facilities, utilities in general, Highways 19, 26, and 395, bridges, telecommunication facilities

[38] Notes from May 23, 2019 Grant County Steering Committee meeting

[39] Ibid.

[40] Ibid.

and irrigation infrastructure that supports agricultural production were named by the SC members as valuable infrastructure that may be vulnerable to impacts from natural hazard events[41].

2. Community Vulnerability Assessment

Community vulnerabilities are an important aspect of the NHMP risk assessment. For more in-depth information regarding specific community vulnerabilities, reference Appendix A: Community Profile.

Populations

The demographic qualities of a community's population such as age, income, and household composition are factors that can influence a community's ability to cope, adapt to and recover from natural disasters. People with special needs, particularly children, the elderly, disabled people, and low-income families bear a disproportionate burden when a natural hazard occurs. Communities can develop strategies to improve the safety of these population groups in the face of natural hazards.

Vulnerabilities

- The Steering Committee identified age (children and the elderly) as one of the most significant socio-economic indicators of vulnerability in the Grant County. Based on the 2017 results of the US Census' American Fact Finder, the most recent available, 7,209 people lived in Grant County. Of this population 4.5% or 327 people are children under five years old and 3.6% or 258 people are adults 85 years or older. The old-age dependence ratio, a comparison of the oldest (65 and over) members of the county as compared to the population younger than 65, shows that the population of Grant County is older than Oregon as a whole[42].

- The American Fact Finder data for 2017 indicates that there were a total of 3,176 households in Grant County. Of these, 973 were 1-person households. Of these 1-person households, 50.3% or 490 households are people over 65 years old living alone[43].

- The Steering Committee identified people living in poverty as a vulnerable population. Of all families in Grant County, 8.6% are families whose income in the preceding 12 months was below the poverty level. Of families headed by a female householder with children under 5 years old 38% were living in poverty. These statistics compare favorably to families living in poverty in Oregon as a whole, however extensive research over the past 30 years has revealed that it is generally the poor who tend to suffer worst from disasters and impoverished people are

[41] Ibid.

[42] American Fact Finder, US Census Bureau, https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml, consulted January 2020

[43] Ibid.

more likely to live in hazard-exposed areas and less likely to invest in risk-reducing measures[44].

- The median household income in Grant County is $44,826; this is just over 20% lower than the State of Oregon median income of $56,119[45].
- Between 2010 and 2017, Grant County's population decreased by 236 people, representing a decrease of 3.27%. This is a trend that continues from the 2014 NE Oregon NHMP.

In summary, Grant County has a number of vulnerable population groups to consider in developing mitigation strategies for natural hazards. The proportion of the population over 85 years old is greater in Grant County than in Oregon as a whole. Although the proportion children in Grant County is lower than in Oregon as a whole, children, like the elderly, are often among the most vulnerable to the impacts of natural hazards. Grant County has a higher percentage of one-person households, and one-person households with people over the age of 65 than that found in Oregon as a whole. Although the county has a smaller proportion of families living in poverty than in Oregon as a whole, these people are disproportionately affected by natural hazards because of their lack of access to financial resources. The median income in Grant County is less than that in Oregon as a whole reflecting the resource scarcity of county residents.

Table 1. Selected demographics of Grant County compared to Oregon totals

	Grant County	Oregon
Age		
Population under 5 yrs. old	4.5% (327 children)	5.8%
Population over 85 yrs. old	3.6% (258 elderly)	2.1%
Old-age dependency ratio: Ratio of those over 65 to the rest of the population	50.8	26.1
Households		
One-person households	30.6% (973 households)	27.7%
One-person households over 65 yrs old	15.4% (490 households)	11.2%
Income		
Families living in poverty	8.6%	9.8%
Single parent families headed by women with children under 5	37.0%	48.8%
Median household income	$44,826	$56,119

Source: American Fact Finder, US Census Bureau, 2017 American Community Survey

[44] Risk Driver: Poverty and inequality; Prevention Web; https://www.preventionweb.net/risk/poverty-inequality consulted January 2020

[45] American Fact Finder, US Census Bureau, 2017 American Community Survey https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml, consulted January 2020

Economy

Economic diversification, employment and industry are measures of economic capacity. However, economic resilience to natural disasters is far more complex than merely restoring employment or income in the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources and infrastructure are interconnected in the existing economic picture. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families and the community to absorb disaster impacts for a quick recovery. The Economic Opportunities Analysis, June 2019, prepared by Johnson Economics for the Cities of Grant County, Oregon provides information on current and anticipated future economic diversification with implications for employment and changes in industry profiles.

The Economic Opportunities Analysis reports that in 2017 in Grant County there were an estimated 3,780 jobs in the county. A significant proportion of Grant County's economy is based on natural resources. The employment base in Grant County has a higher share of self-employment, including farms and other self-proprietorships. Local employment is highly seasonal reflecting the county's relatively high proportion of agricultural employment. Employment tends to peak in August and September during peak harvest periods and falling to lowest levels by mid-winter. The forestry industry has been a significant economic driver in Grant County, however, the industry has seen a sharp decline in production largely attributable to declines in production from public lands since 1993. In recent years, private timber production has also decreased. These declines aside, the Eastern and Central Oregon region has been actively pursuing new and ongoing opportunities in the industry, including small diameter timber, biomass, and engineered wood products[46].

Another sector of the Grant County economy that is based on the county's natural resources is tourism comprised of amenity retail, recreation, and hospitality sectors. The John Day Valley is surrounded by the Blue and Ochoco Mountains and the Strawberry Range, national forest lands. Regional outdoor recreation in Grant County includes camping, hiking, hunting, fishing and rafting. The natural resource base of these industries are vulnerable to the impacts of natural hazards[47].

Vulnerabilities

- The establishments based on and employment in natural resource and mining industries are more than seven times as prevalent in Grant County as they are on a national scale. Ranching, farming, logging, mining and other natural resource based businesses are major components of the natural resource sector in Grant County[48]. Natural hazards may impact the resources of this sector to a greater extent than most other sectors.

[46] Johnson, J. and Buckley, B., Economic Opportunities Analysis, June 2019, p. 8-12

[47] Ibid., p. 25

[48] Ibid., p. 20-21

- More than 40 percent of rural Oregon employment is concentrated in natural resources, leisure and hospitality (tourism), and government. Together those three sectors make up around 27 percent of the employment in urban Oregon[49].
- Rural areas of Oregon have higher unemployment rates and less diverse economies than metro areas. This leaves them more vulnerable to economic shocks and recessions[50].
- Grant County has a high share of land owned by the federal government. The Oregon Employment Division reports in 2017 that 62% of Grant County was owned by the federal government and 1% was owned by the state; the remainder was privately owned[51].

Environment

The capacity of the natural environment is essential in sustaining all forms of life including human life, yet it often plays an underrepresented role in community resiliency to natural hazards. The natural environment includes land, air, water and other natural resources that support and provide space to live, work and recreate.[52] Natural capital such as wetlands and forested hill slopes play significant roles in protecting communities and the environment from weather-related hazards, such as flooding and landslides. When natural systems are impacted or depleted by human activities those activities can adversely affect community resilience to natural hazard events. These same natural systems are viewed by private landowners as economic resources, particularly in a natural resource dependent industry such as ranching or logging.

Vulnerabilities

- Extended periods of drought affect vulnerability to wildfire, snowpack and agricultural irrigation.
- Temperatures in the Grant County vary widely from summer to winter. The county usually experiences freezing winters -- Seneca has experienced the coldest temperature on record for the state of Oregon at -54°F; and summers can be blistering approach daytime high temperatures as high as 119°F.
- Management objectives vary between forest land owners. The Governor's Council on Wildfire Response report discusses the differing objectives of higher elevation forests federally owned forest land managed around restoration and conservation objectives and utilized for ecological, scenic and social/recreational values as compared to lower elevation lands owned by a wide range of private land owners whose objectives are frequently different than the federal land management agencies. Harmonizing common fire policy across these distinct ownerships—whether about use of fire as a tool or about smoke,

[49] Oregon Employment Division, The Employment Landscape of Rural Oregon. May 2017, https://www.qualityinfo.org/documents/10182/13336/The+Employment+Landscape+of+Rural+Oregon?version=1.0

[50] Ibid.

[51] Ibid.

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

suppression or salvage—has presented historic challenges. These challenges reflect on the vulnerability of the forested landscapes[53].

- Climate change is projected to have an impact on one of northeast Oregon's primary competitive advantage: agriculture.

National Flood Insurance Program (NFIP)

The Grant County Flood Insurance Rate Maps (FIRMs), like much of eastern Oregon, are not available in a digital format. Below is a recap of current information related to the NFIP in Grant County and the incorporated cities provided by staff at the Department of Land Conservation and Development from the FEMA Community Information System database. For more details see the Flood Annex section of the Hazard Annexes.

Grant County and incorporated cities:

- Have 61 National Flood Insurance Program (NFIP) policies in force with a total of $11,384,200 of value;
- Have 11 paid claims totaling $51,094;
- Are not members of the Community Rating System (CRS);
- A single repetitive loss building exists in John Day; no severe repetitive loss building claims; and
- The last Community Assistance Visit (CAV) in Grant County was on April 26, 2019 with the City of John Day; Community Assistance Contacts (CACs) were held in Grant County and Canyon City in May 2019

Critical Facilities and Infrastructure

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

Vulnerabilities

- The DOGAMI Risk Assessment found that Several of Grant County's critical facilities are at risk to flood hazard. The report estimated that 18% of Grant County's 39 critical facilities area at risk to be non-functioning due to a 100-year flood. These include the following: Grant Union High School, Grant County Road Department, Oregon Dept. of Transportation, John Day Radio Station KJDY, Oregon Dept. of Forestry, Oregon Trail Electric Co-op, and the USFS Malheur District Office[54].

[53] Governor's Council on Wildfire Response; November 2019: Report and Recommendations; https://www.oregon.gov/gov/policy/Documents/FullWFCReport_2019.pdf

[54] Williams, M. C., Anthony, L. H. and O'Brien, F., 2019 unpublished, Natural Hazard Risk Report For Grant County, Oregon: Final Report to the Oregon Department of Land Conservation and Development, Oregon Department of Geology and Mineral Industries

- DOGAMI has also found that 5 critical facilities are exposed to high wildfire hazard. These include the following: Dayville Sewage Treatment Facility, Grant Union High School, Dayville Fire Department, Dayville School, and Prairie City Sewage Treatment Facility[55].

- Few of Grant County's critical facilities are at risk to landslides or earthquake, however the only hospital in the area is one of those facilities. The structures susceptible to landslide damage include the following: Blue Mountain Hospital, and Dayville School. The structures susceptible to earthquake damage include the following: Oregon Dept. of Transportation, Dayville School, Monument School, Prairie City School, Mount Vernon Fire Department, Mount Vernon Public Works, and Oregon Telephone Corporation[56].

- It is critical to maintain the quality of built capacity (transportation networks, critical facilities, utility transmission, etc.) throughout the area. There are two major highways that run through the Northeast region. I-84 is a major transportation corridor that connects Portland with eastern Oregon and beyond. State Highway 82 connects the very northeastern part of the State with I-84. Local roads that provide ingress and egress to isolated communities, the City of Granite for example, are key features of the county's infrastructure that are critical to recovery from natural hazard events.

- Based on U.S. Census data, more than 80% of the residential housing in the county was built prior to current seismic building standards of 1990 and nearly 72% were constructed prior to the local implementation of the flood elevation requirements of the 1970's (county FIRMs were not completed until the 1980s).

D. Risk Analysis

Risk analysis involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. The following risk analysis for Grant County draws from two sources, the DOGAMI Natural Hazard Risk Report, prepared as part of FEMA's Risk MAP project, and the vulnerability and probability components of the Hazard Vulnerability Assessment completed with the Steering Committee using the OEM Methodology detailed in Section C. Vulnerability Assessment.

1. Local Risk Assessment

The local Hazard Vulnerability Assessment does not provide damage, injury and cost estimates likely to be incurred, however, it does reflect the perceptions of the Steering Committee members about the vulnerability of the community to each of the hazards, the probability of their occurrence and a method

[55] Ibid.
[56] Ibid.

of ranking the relative importance of the hazards to the Grant County NHMP Steering Committee members.

The graph shown in Table 2 represents the final scores of the OEM Methodology exercise for both 2019 and 2014. The components of risk analyzed by the Steering Committee to yield these Risk Scores are composed of four factors: history, vulnerability, maximum threat, and probability. Each of these factors is multiplied by a weight factor (WF). The ranking agreed upon by the Steering Committee for Vulnerability reflects their answers to the question "What percentage of the population and property is likely to be affected during an occurrence of an incident?" Table 2 below shows that the Grant County NHMP Steering Committee (SC) believes that wildfire, winter storms, and volcanic events would result in the most damage to people and property receiving rankings of 10 followed closely by floods and droughts which received rankings of 9. Landslides were ranked at 2 out of 10 indicating that the SC believes these incidents to pose less of a threat to people and property.

Table 2. Hazard Vulnerability Analysis completed May 23, 2019 by the Steering Committee

Hazards	History WF = 2		Vulnerability WF = 5		Max Threat WF = 10		Probability WF = 7		Risk Score
Wildfire	2 x	10	5 x	10	10x	10	7 x	10	240
Winter Storms	2 x	8	5 x	10	10 x	10	7 x	9	229
Floods	2 x	8	5 x	9	10 x	10	7 x	9	224
Droughts	2 x	9	5 x	9	10x	9	7 x	9	216
Volcanic Events	2 x	1	5 x	10	10 x	10	7 x	1	158
Wind Storms	2 x	5	5 x	1	10 x	8	7 x	4	123
Landslides	2 x	10	5 x	2	10 x	2	7 x	10	120
Earthquakes	2 x	1	5 x	5	10 x	5	7 x	1	84

Source: Results of OEM Methodology exercise with 2019 Grant County NHMP Steering Committee

The probability factor represents the SC's assessment of the likelihood of an incident occurring. Landslide is scored highly for probability indicating that the SC believed it to be likely within the next 5 years, whereas, Volcanic Events are scored very low for probability indicating that the SC believes that more than 10 years will pass between events. The most probable hazards according to the results of this exercise are Wildfire and Landslide ranked at 10, followed closely by Winter Storms, Floods, and Droughts ranked at 9.

The DOGAMI Risk Analysis is able to estimate damage, injuries, and costs likely to be incurred by an occurrence. These results may confirm or contradict the assessment of the Steering Committee.

2. DOGAMI Risk Assessment

Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a natural hazard risk assessment in 2019 as part of the FEMA Risk MAP process. The risk assessments contained in DOGAMI's report quantify the impacts of four of the eight natural hazards analyzed by the 2019 NHMP Steering Committee. The hazards assessed included wildfire, flood, landslide and earthquake.

The risk assessment was performed by completing three main tasks: compiling an asset database, identifying and using best available hazard data, and performing natural hazard risk assessment.

In the first task, DOGAMI created a comprehensive asset database for Grant County by synthesizing assessor data, U.S. Census information, Hazus®-MH general building stock information, and building footprint data. This work resulted in a single dataset of building points and their associated building characteristics. With these data DOGAMI was able to conduct highly accurate hazard analysis on a building-by-building basis.

The second task was to identify and use the most current and appropriate hazard datasets for Grant County. Most of the hazard datasets used in this report were created by DOGAMI and some were produced by using high-resolution LiDAR topographic data. Each hazard dataset for Grant County were the best available at the time of writing.

In the third task, DOGAMI performed risk assessments using Esri® ArcGIS Desktop® software. They used two risk assessment approaches: (1) estimated loss (in dollars) to buildings from flood and earthquake scenarios using FEMA Hazus®-MH methodology, and (2) calculated number of buildings, their value, and associated populations that are exposed to earthquake and flood inundation scenarios, or susceptible to varying levels of hazard from landslides and wildfire.

Wildfire

The data source used by DOGAMI to quantify risk from wildfire is the Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results (PNRA)[57]. It is a comprehensive report that includes a database developed by the United States Forest Service (USFS) for the states of Oregon and Washington. The steward of this database in Oregon is the Oregon Department of Forestry (ODF). The database was created to assess the level of risk residents and structures have to wildfire. For this project, the Burn Probability dataset, a dataset included in the PNRA database, was used to measure the risk to communities in Grant County.

Using guidance from ODF, DOGAMI categorized the Burn Probability dataset into low, moderate, and high-hazard zones for the wildfire exposure analysis. Probability ranges of the Burn Probability dataset from the PNRA were grouped into 3 categories of wildfire hazard. Burn probability is derived from simulations using many elements, such as, weather, ignition frequency, ignition density, and fire modeling landscape[58].

[57] Pyrologix LCC, 2018
[58] Ibid.

Burn probabilities were grouped into 3 hazard categories:

- Low wildfire hazard (0.0001 – 0.0002 or 1/10,000 – 1/5,000)
- Moderate wildfire hazard (0.0002 – 0.002 or 1/5,000 – 1/500)
- High wildfire hazard (0.002 – 0.04 or 1/500 – 1/25)

DOGAMI overlaid the buildings layer and critical facilities on each of the wildfire hazard zones to determine exposure. In certain areas no wildfire data is present which indicates areas that have minimal risk to wildfire hazard (see Table 3). The total dollar value of exposed buildings Grant County is reported below. DOGAMI also estimated the number of people threatened by wildfire. Land value losses due to wildfire were not examined for this project.

Table 3. Wildfire Exposure

			(all dollar amounts in thousands)					
			High Hazard			**Moderate Hazard**		
Community	**Total Number of Buildings**	**Total Estimated Building Value ($)**	**Number of Buildings**	**Building Value ($)**	**Percent of Building Value Exposed**	**Number of Buildings**	**Building Value ($)**	**Percent of Building Value Exposed**
Unincorp. Grant County	4,933	1,169,279	2,204	506,634	43%	1,889	407,764	35%
Canyon City	439	114,298	41	8,478	7.4%	93	17,614	15%
Dayville	166	33,364	72	11,883	36%	37	10,469	31%
Granite	115	15,264	102	13,870	91%	13	1,394	9.1%
John Day	1,065	339,542	10	1,335	0.4%	197	52,616	16%
Long Creek	208	46,914	10	1,232	2.6%	78	13,194	28%
Monument	143	32,015	15	2,313	7.2%	54	11,502	36%
Mount Vernon	398	73,681	29	4,189	5.7%	99	14,601	20%
Prairie City	731	169,267	160	30,393	18%	72	14,167	8.4%
Seneca	219	35,692	49	7,938	22%	14	1,321	3.7%
Total Study Area	8,417	2,029,317	2,692	588,264	29%	2,546	544,641	27%

Source: Williams, M. C., Anthony, L. H. and O'Brien, F., DOGAMI 2019

DOGAMI chose the high hazard category as the primary scenario for this report because it represents the areas that have the highest potential for losses. However, a large amount of loss would occur if the moderate hazard areas were to burn, as some communities have ~20–30% of exposure to moderate wildfire hazard. Other communities have even higher exposure to wildfire hazard. Still, the focus of this section is on high hazard areas within Grant County to emphasize the areas where lives and property are most threatened.

Grant Countywide wildfire exposure (High risk):

- Number of buildings: 2,692
- Exposure Value: $588,264,000
- Ratio of Exposure Value: 29%
- Critical facilities exposed: 5 (including Grant Union HS, Dayville School and Fire Dept.)

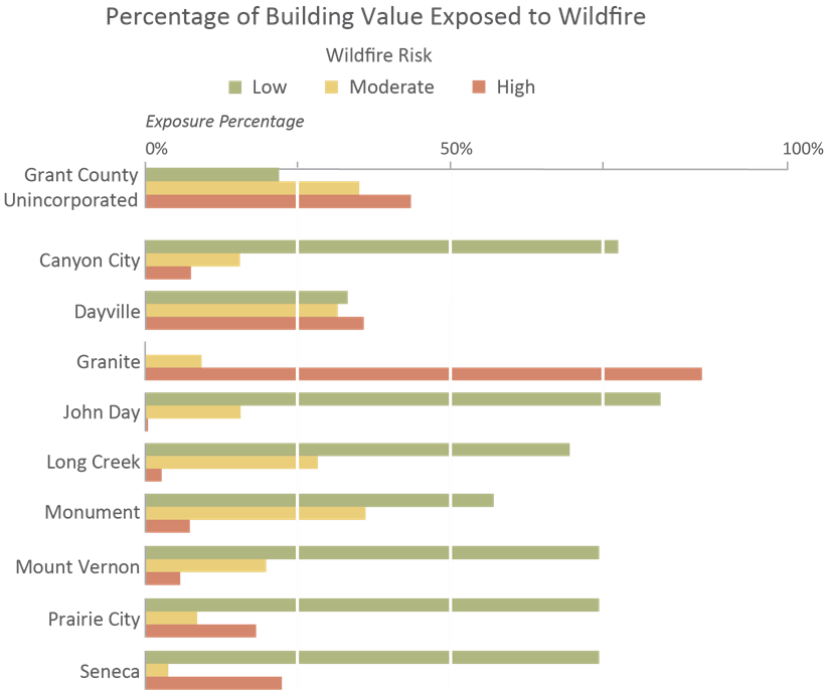
- Potentially Displaced Population: 1,446[59]

For this risk assessment, the building locations were compared to the geographic extent of the wildfire hazard categories. Several communities in Grant County have a high percentage of buildings and residents exposed to high wildfire hazard. The primary areas of exposure to this hazard are in the forested unincorporated areas of the county that have not already experienced recent burns (see Figure 2). Wildfire hazard is based on conditions that can change on an annual basis, so local knowledge and understanding of wildfire risk may need to be considered when determining mitigation actions. The communities of Dayville, Granite, and the unincorporated county have the highest percentage of exposure to high wildfire hazard within Grant County. Figure 14 illustrates the distribution of exposure to wildfire with the different communities of Grant County[60].

The DOGAMI Risk Report identified locations within Grant County that are comparatively more vulnerable or at greater risk to wildfire hazard:

- Wildfire risk is high for many of homes in the forested area south the John Day airport.
- The communities of Dayville, Granite, and the unincorporated county are most at risk to high wildfire hazard compared to other Grant County communities.
- Prairie City and Seneca have a considerable amount of exposure to high wildfire hazard.

Figure 15. Wildfire hazard exposure by community



[59] Williams, M. C., Anthony, L. H. and O'Brien, F., DOGAMI 2019
[60] Ibid.

Source: Williams, M. C., Anthony, L. H. and O'Brien, F., DOGAMI 2019

The DOGAMI analysis does not address one of the principle losses experienced from wildfire, that of standing timber. The Oregonian reporting on the Canyon Creek Complex fire on Sunday, August 14, 2016 reported that following the blaze, private landowners "found themselves in a race against the U.S. Forest Service to get their wood into the area's only remaining mill…Looking to maximize the value of its burned timber, the Forest Service expedited its tree cutting after the fire. The glut swamped the Malheur Lumber Co. with millions of board feet of timber further depressed a weak market for pine logs. By the spring, the government's logging had frozen out private land owners." The article reports that the rush to remove trees before the weather warmed was motivated by fear of the spread of blue stain fungus carried on the heads of bark beetles that render the wood worthless. By April 2016 the mill had stopped accepting trees from private owners and by summer 2016 the value of timber crashed[61].

Flood

The Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) for Grant County were made effective in the 1980's, with some areas updated and, at the time of writing, still pending in 2019 for local adoption[62] [63] [64] [65] [66]; these were the primary data sources for the flood risk assessment. Further information regarding NFIP related statistics can be found at FEMA's website: https://www.fema.gov/policy-claim-statistics-flood-insurance. This was the only flood data source that DOGAMI used in the analysis, but flooding does occur in areas outside of the detail mapped areas. Flood issues like flash flooding, ice jams, post-wildfire floods, and dam safety were not looked at in this report.

The John Day Wastewater Treatment facility was not flagged by the DOGAMI report as being at risk from any of the natural hazards evaluated in this plan, however, the city considers it to be at risk. The wastewater lagoons are currently located in the 100-year floodplain approximately 80 feet from the John Day River and may pose a public health issue. The facility is currently under Administrative Review by the Oregon Department of Environmental Quality. The City of John Day has developed an innovative

[61] Gunderson, L. and Sickinger, T., (2016, August 14). Burned; Poor planning and tactical errors fueled a wildfire catastrophe, *The Oregonian*

[62] Federal Emergency Management Agency, 1987, Flood insurance study: City of Mount Vernon, Grant County, Oregon: Washington D.C., Flood Insurance Study Number 410080V000, v.1, 24 p https://map1.msc.fema.gov/data/41/S/PDF/410080V000.pdf?LOC=abbb351c56a37a66da8f9e07ec83dbb5

[63] Federal Emergency Management Agency, 1988, Flood insurance study: City of Prairie City, Grant County, Oregon: Washington D.C., Flood Insurance Study Number 410082V000, v.1, 26 p. https://map1.msc.fema.gov/data/41/S/PDF/410082V000.pdf?LOC=e4a8b1a29543ab7de4a93bd106e211d2

[64] Federal Emergency Management Agency, 2019a, Pending flood insurance study: Unincorporated Areas, Grant County, Oregon: Washington D.C., Flood Insurance Study Number 410074, Letter of Map Revision 19-10-0438P https://map1.msc.fema.gov/data/41/L/19-10-0438P-410074.pdf?LOC=ae449b7b4a6460d7351ae40b3b2f75f2

[65] Federal Emergency Management Agency, 2019b, Pending flood insurance study: City of Canyon City, Grant County, Oregon: Washington D.C., Flood Insurance Study Number 410075, Letter of Map Revision 19-10-0438P https://map1.msc.fema.gov/data/41/L/19-10-0438P-410075.pdf?LOC=02a01f964f244e2c75b61405f89808b9

[66] Federal Emergency Management Agency, 2019c, Pending flood insurance study: City of John Day, Grant County, Oregon: Washington D.C., Flood Insurance Study Number 410077, Letter of Map Revision 19-10-0438P https://map1.msc.fema.gov/data/41/L/19-10-0438P-410077.pdf?LOC=74fe6d41cab60737632d0484be58442e

plan for a new facility that would reclaim wastewater for hydroponic agriculture rather than discharging the effluent in to the John Day River and would be located outside the floodplain for increased safety from flooding.

Depth grids, developed by DOGAMI in 2019 and based on the effective and pending map data, were used in this risk assessment to determine the level to which buildings are impacted by flooding. Depth grids are raster GIS datasets where each digital pixel value represents the depth of flooding at that location within the flood zone (Figure 15). Though considered draft at the time of this analysis, the depth grid data are the best available flood hazard data. Depth grids for four flooding scenarios (10-, 50, 100-, and 500-year) were used for loss estimations and, for comparative purposes, exposure analysis.

Building loss estimates are determined by Hazus-MH by overlaying building data over a depth grid. Hazus-MH uses individual building information, specifically the first floor height above ground and the presence of a basement, to calculate the loss ratio from a particular depth of flood.

For the Grant County, occupancy type attributes were derived from the tax lot database for most buildings. Where individual building information was not available from assessor data, DOGAMI used oblique imagery and street level imagery to estimate these important building attributes. Only buildings in a flood zone or within 500 feet (152 meters) of a flood zone were examined closely to attribute buildings with more accurate information for first-floor height and basement presence. Because the analysis accounted for building first-floor height, buildings that have been properly elevated above the flood level were not given a loss estimate—but the analysis counted residents in those structures as displaced. The analysis did not look at the duration that residents would be displaced from their homes due to flooding.

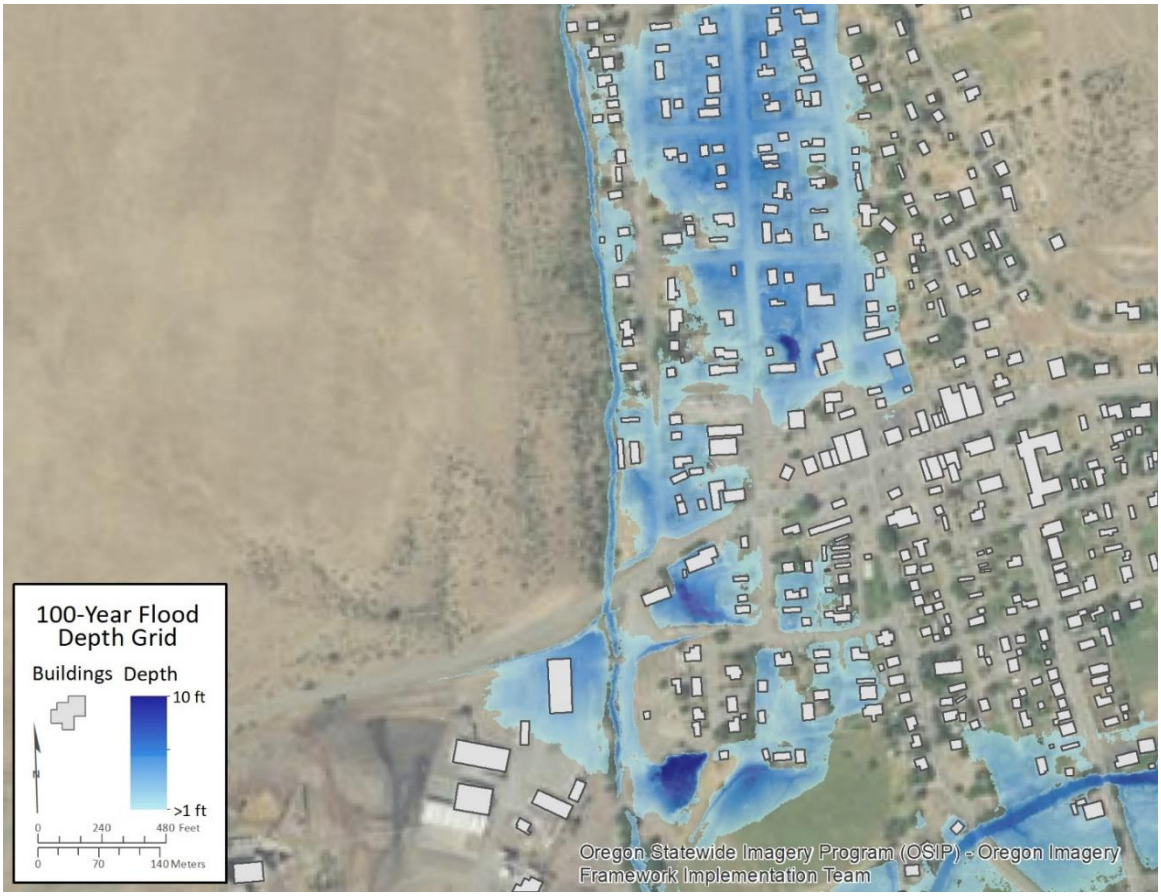
Since there are not vast floodplains within Grant County, there are only a few areas where buildings are vulnerable to flooding. However, in areas where flooding does occur it is a recurrent issue. For this risk assessment, we imported Grant County structure information data and depth grids into Hazus-MH and ran a flood analysis for the four flood scenarios (10-, 50-, 100-, and 500-year). The analysis used the 100-year flood as the primary scenario for reporting the flood results (also see Figure 4). The 100-year flood has traditionally been used as a reference level for flooding and is the standard probability that FEMA uses for regulatory purposes[67].

Grant Countywide 100-year flood loss:

- Number of buildings damaged: 488
- Loss Estimate: $20,261,000
- Loss Ratio: 1.0%
- Damaged critical facilities: 7 (including Grant Union HS, Grant Co. Road Dept. and ODOT)
- Potentially Displaced Population: 799

[67] Federal Emergency Management Agency, 2013, NFIP flood studies and maps, unit 3 in Managing floodplain development through the National Flood Insurance Program (Home Study Course): Washington, D.C., 59 p. https://www.fema.gov/media-library-data/20130726-1535-20490-4172/unit3.pdf

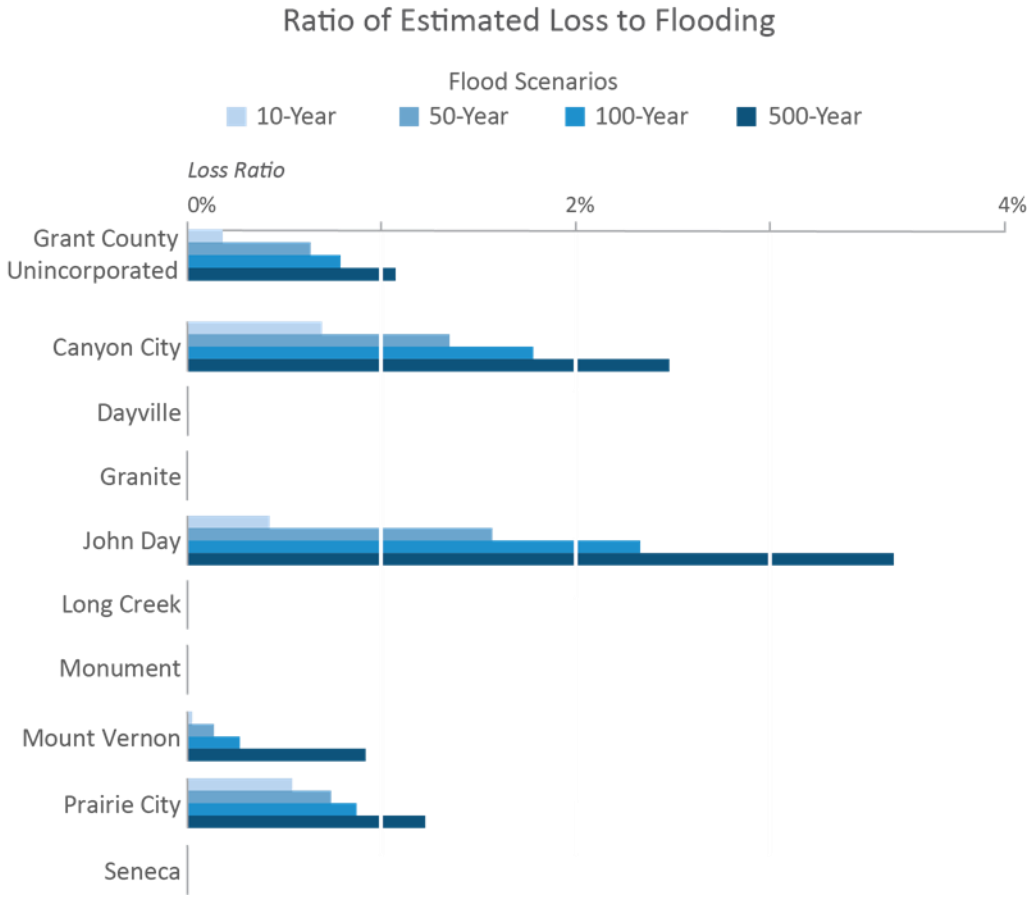
Figure 16. Flood depth grid example, portion of the City of Prairie City



Source: : Williams, M. C., Anthony, L. H. and O'Brien, F., DOGAMI 2019

The Hazus-MH loss estimate of the 100-year flood scenario for Grant County is approximately $20 million. While the overall loss ratio for flood damage in Grant County is only 1%, 100-year flooding has a major impact to Grant County where development exists near streams that are prone to flooding. In situations with communities where most residents are not within flood designated zones, the loss ratio may not be as helpful as the actual replacement cost and number of residents displaced to assess the level of risk from flooding. The Hazus-MH analysis also provides useful flood data on individual communities so that planners can identify problems and consider which mitigating activities will provide the greatest resilience to flooding (Figure 16).

Figure 17. Flood loss estimates by community



Source: : Williams, M. C., Anthony, L. H. and O'Brien, F., DOGAMI 2019;
Note: pending floodplain mapping for Seneca was not completed at the time of this analysis.

Separate from the Hazus-MH flood analysis, DOGAMI did an exposure analysis by overlaying building locations on the 100-year flood extent. A large number (703 buildings) of Grant County's buildings were found to be within designated flood zones. By comparing the number of non-damaged buildings from Hazus-MH with exposed buildings in the flood zone, DOGAMI estimated the number of buildings that could be elevated above the level of flooding. Of the 703 buildings that are exposed to flooding, the analysis estimate that 215 are above the height of the 100-year flood. This evaluation can also shed some light on the number of residents that might have mobility or access issues due to surrounding water.

DOGAMI identified locations within Grant County that are comparatively more vulnerable or at greater risk to flood hazard:

- Flooding along Canyon Creek for many buildings in Canyon City and John Day is a frequent problem.
- Flooding is a persistent problem for buildings along the John Day River within the City of John Day and further downstream west of John Day.
- Several buildings in Prairie City are impacted by flooding from Dixie Creek upstream from the Highway 26 bridge.

Landslide

The Statewide Landslide Information Layer for Oregon [SLIDO], release 3.2 [68] is an inventory of mapped landslides in the state of Oregon. SLIDO is a compilation of past studies; some studies were completed very recently using new technologies, like LiDAR-derived topography, and some studies were performed more than 50 years ago. Consequently, SLIDO data vary greatly in scale, scope, and focus and thus in accuracy and resolution across the state. Landslide inventory mapping for Grant County was done before LiDAR was available for high-accuracy mapping.

Burns and others (2016) used SLIDO inventory data along with maps of generalized geology and slope to create a landslide susceptibility overview map of Oregon that shows zones of relative susceptibility: Very High, High, Moderate, and Low. SLIDO data directly define the Very High landslide susceptibility zone, while SLIDO data coupled with statistical results from generalized geology and slope maps define the other relative susceptibility zones.[69] Statewide landslide susceptibility map data have the inherent limitations of SLIDO and of the generalized geology and slope maps used to create the map. Therefore, the statewide landslide susceptibility map varies significantly in quality across the state, depending on the quality of the input datasets. Another limitation is that susceptibility mapping does not include some aspects of landslide hazard, such as runout, where the momentum of the landslide can carry debris beyond the zone deemed to be a high hazard area.

DOGAMI used the data from the statewide landslide susceptibility map[70] in this report to identify the general level of susceptibility of given area to landslide hazards, primarily shallow and deep landslides. We overlaid building and critical facilities data on landslide susceptibility zones to assess the exposure for each community. The total dollar value of exposed buildings was summed for Grant County and is reported below. We also estimated the number of people threatened by landslides. Land value losses due to landslides were not examined for this report, in addition to potentially hazardous unmapped areas that may pose real risk to communities.

DOGAMI's risk analysis for Grant County combined high and very high susceptibility zones as the primary scenarios to provide a general sense of community risk for planning purposes. DOGAMI staff determined that it was useful to combine exposure for both susceptibility zones to accurately depict the level of landslide risk to communities. These susceptibility zones represent areas most prone to landslides with the highest impact to the community.

For this risk assessment DOGAMI staff compared building locations to geographic extents of the landslide susceptibility zones. The exposure results shown below are for the high and very high susceptibility zones.

Grant Countywide landslide exposure (High and Very High susceptibility):

- Number of buildings: 1,035
- Exposure Value: $205,629,000
- Ratio of Exposure Value: 10%
- Critical facilities exposed: 2 (including Blue Mountain Hospital and Dayville School)
- Potentially Displaced Population: 1,080

[68] Burns, W. J., and Watzig, R. J., 2014, Statewide landslide information layer for Oregon, release 3 [SLIDO-3.0]: Oregon Department of Geology and Mineral Industries, 35 p., 1:750,000, geodatabase.

[69] Burns, W. J., Mickelson, K. A., and Madin, I. P., 2016, Landslide susceptibility overview map of Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-16-02, 48 p. https://www.oregongeology.org/pubs/ofr/p-O-16-02.htm

[70] Ibid.

Earthquake

Hazus-MH offers two scenario methods for estimating loss from earthquake, probabilistic and deterministic.[71] A probabilistic scenario uses U.S. Geological Survey (USGS) National Seismic Hazard Maps which are derived from seismic hazard curves calculated on a grid of sites across the United States that describe the annual frequency of exceeding a set of ground motions as a result of all possible earthquake sources (USGS, 2017). A deterministic scenario is based on a specific seismic event from a clearly defined source, such as a Cascadia Subduction Zone magnitude 9.0 event.

DOGAMI selected the probabilistic scenario method because there is no clearly defined dominant seismic source for the area and it best suited estimating the level of seismic risk. This method was used along with the database of structures and critical facilities so that loss estimates could be calculated on a building-by-building basis. The USGS 2500-year probabilistic map[72] provides the Hazus-MH earthquake model with ground shaking parameters, peak ground velocity, spectral acceleration at 1.0 second period and 0.3 second period that have been integrated together. DOGAMI set the magnitude to 6.7 within Hazus-MH for the scenario used in this report. Additional seismic inputs utilized in the earthquake scenario were liquefaction susceptibility and NEHRP site classification derived from the Oregon Resilience Plan (ORP)[73] and landslide susceptibility. [74]

Because an earthquake can affect a wide area, it is unlike other hazards in this report — every building in Grant County, to some degree, would be affected by it. Hazus-MH loss estimates for each building are based on a formula where coefficients are multiplied by each of the five damage state percentages (none, low, moderate, extensive, and complete). These damage states are correlated to loss ratios that are then multiplied by the building dollar value to obtain a loss estimate[75] Figure 17 shows the loss estimates by community for Grant County from a 2500-year probabilistic magnitude 6.7 event.

[71] Federal Emergency Management Agency, 2012b, Hazus®-MH 2.1 Technical manual, Earthquake model: Washington, D.C., 718 p. https://www.fema.gov/media-library-data/20130726-1820-25045-6286/hzmh2_1_eq_tm.pdf

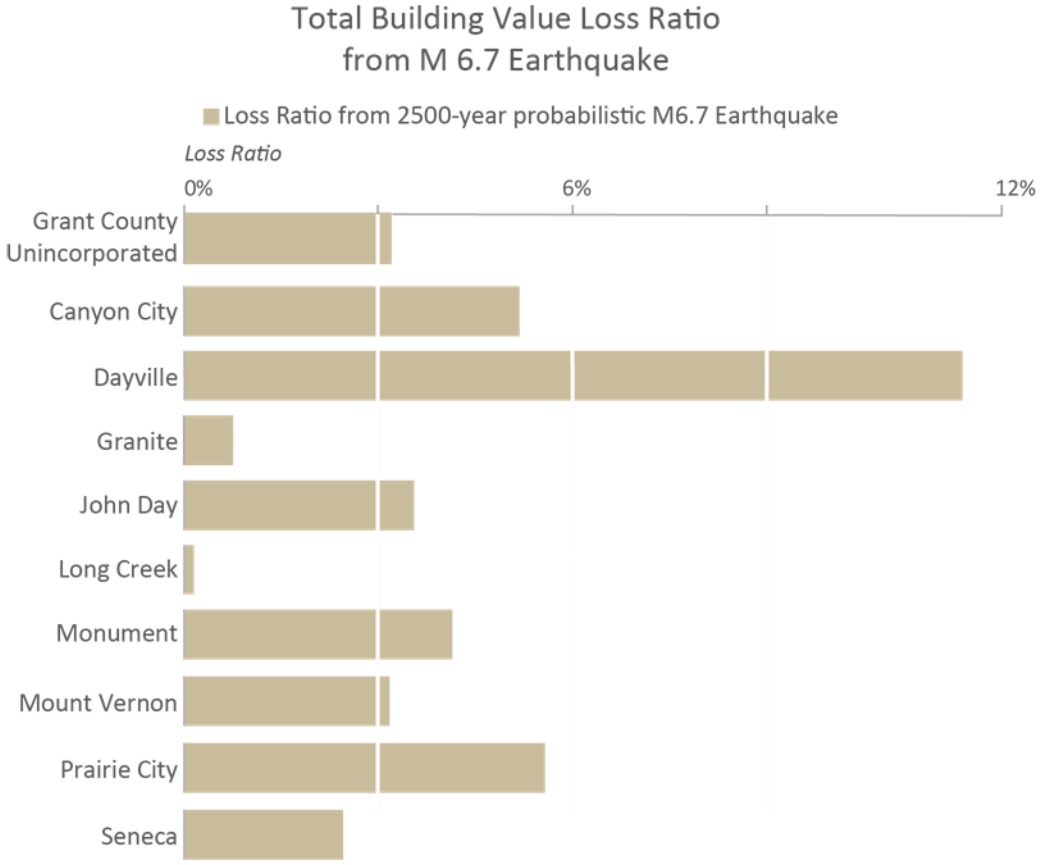
[72] Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., https://dx.doi.org/10.3133/ofr20141091

[73] Madin, I. P., and Burns, W. J., 2013, Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon Resilience Plan for Cascadia subduction zone earthquakes: Oregon Department of Geology and Mineral Industries Open-File Report O-13-06, 36 p. 38 pl., GIS data. https://www.oregongeology.org/pubs/ofr/p-O-13-06.htm

[74] Burns, W. J., Mickelson, K. A., and Madin, I. P., 2016

[75] FEMA, 2012

Figure 18. Loss Estimates by Community from a 2500-year M 6.7 Earthquake



Source: Burns, W. J., Mickelson, K. A., and Madin, I. P., 2016

In keeping with earthquake damage reporting conventions, we used the ATC-20 post-earthquake building safety evaluation color-tagging system to represent damage states.[76] Red-tagged buildings correspond to a Hazus-MH damage state of "complete," which means the building is uninhabitable. Yellow-tagged buildings are in the "extensive" damage state, indicating limited habitability. The number of buildings in each damage state is based on an aggregation of probabilities per community and does not represent individual buildings.[77]

Critical facilities were considered non-functioning if the Hazus-MH earthquake analysis showed that a building or complex of buildings had a greater than 50-percent chance of being at least moderately damaged[78].

[76] Applied Technology Council, 2015, Rapid visual screening of buildings for potential seismic hazards: A handbook (3rd ed.): Redwood City, Calif., FEMA Publication 154. https://www.fema.gov/media-library-data/1426210695633-d9a280e72b32872161efab26a602283b/FEMAP-154_508.pdf

[77] FEMA 2012

[78] Ibid.

The number of potentially displaced residents from the scenario earthquake is based on the number of red-tagged and a percentage of yellow-tagged residences that were determined in the Hazus-MH earthquake analysis results.

Grant County 2500-year probabilistic M6.7 earthquake results:

- Number of red-tagged buildings: 76
- Number of yellow-tagged buildings: 328
- Loss estimate: $72,885,000
- Loss ratio: 3.6%
- Non-functioning critical facilities: 7 (Dayville School, Monument School and Prairie City School)
- Potentially displaced population: 78

The results indicate that Grant County would incur a moderate amount of damage from an earthquake similar to the one simulated in the DOGAMI report. These results were heavily influenced by earthquake-induced landslides and liquefaction. This is evidenced by low loss estimates throughout the county, but with higher loss estimates occurring in areas with high or very high landslide or liquefaction susceptibility.

Risk assessments conducted by DOGAMI typically include analysis of scenarios that show if buildings could be seismically upgraded to moderate or high code, the impact of the earthquake event would be reduced. While these upgrades can decrease earthquake vulnerability, the benefits are minimized in landslide and liquefaction areas, where buildings would need additional geotechnical mitigation to have an effect on losses. This simulation was not done for Grant County because assessor information was limited on the construction date of buildings which informs the design level, a key attribute necessary for this simulation. While this simulation was not done, seismic retrofits can greatly reduce vulnerability to earthquake hazards. Special considerations may be applied to critical facilities with regards to seismic retrofits.

DOGAMI identified locations within Grant County that are comparatively more vulnerable or at greater risk to the 2500-year probabilistic M6.7 earthquake hazard:

- Portions of Dayville that are within very high landslide hazard, show elevated potential of damage from earthquake. The damages calculated in Hazus-MH are primarily from earthquake-induced landslides.
- A high percentage of inhabited areas of Grant County are along the John Day River and Canyon Creek, which generally correspond to liquefiable soils.

Summary

The purpose of the DOGAMI study is to provide a better understanding of potential impacts from the natural hazards of wildfire, flood, landslide and earthquake at the community scale. The report accomplish this by using the latest natural hazard mapping and loss estimation tools to quantify expected damage to buildings and potential displacement of permanent residents. The comprehensive and fine-grained approach to the analysis provides new context for the county's risk reduction efforts. Based on the results of this study we note several important findings:

1. **Hazus®-MH earthquake analysis show a moderate amount of damage and losses for the study area**—The results indicate that Grant County would incur a moderate amount of damage (3.6%) from an earthquake similar to the one simulated in this report. Areas of landslide and liquefaction have some influence on the damage results. This is evidenced by low loss estimates throughout the county, but with higher loss estimates occurring in areas with high or very high landslide or liquefaction susceptibility. Dayville, which is exposed to very high landslide hazard, could see 4.7% in losses in the 2500-year probabilistic earthquake scenario.
2. **Flooding is a recurrent problem for some communities in Grant County**—Most of the development in Grant County is located within or adjacent to the floodplain of the John Day River and its tributaries. Many buildings in the study area, primarily within this floodplain, are vulnerable to flooding. We estimate a moderate amount of damage from flooding overall due mainly to the flooding along the John Day River and Canyon Creek. For only the buildings within the area of 100-year inundation, an average of 9% loss was calculated. During a 100-year flood event, most of the communities of Grant County are expected to sustain losses under 1% of total building value. The City of Canyon City and John Day being the exception to this with approximately 2% of estimated loss to total building value.
3. **Elevating structures in the flood zone reduces vulnerability**—Flood exposure analysis was used in addition to Hazus®-MH loss estimation to identify buildings that were not damaged but were within the area expected to experience a 100-year flood. By using both analyses in this way, the number of elevated structures within the flood zone could be quantified. This showed possible mitigation needs in flood loss prevention and the effectiveness of past activities. John Day, Mount Vernon, and Prairie City were identified as communities with a large number of buildings in the floodplain elevated above the estimated flood height.
4. **New landslide mapping would increase the accuracy of future risk assessments**—Exposure analysis was used to assess the threat from landslide hazard. Landslide is a widespread hazard for much of the undeveloped portions of the county. Most of the very high and high landslide risk occurs along the steep portions of the John Day River valley within the Cities of John Day and Dayville. The landslide hazard data used in this risk assessment was created before modern mapping technology and future risk assessments using LiDAR derived landslide hazard data would provide more accurate results. Earthquake analysis would also benefit from better landslide mapping since Hazus®-MH analysis uses landslide probability as an input dataset.
5. **Wildfire is a natural hazard threat for many areas in Grant County**—Exposure analysis shows that buildings throughout the study area are at high risk to wildfire hazard. The communities within the county have a minimum of 30% of exposure to at least moderate wildfire hazard and some communities are at much greater risk. The communities of Granite, Dayville, and Monument are particularly at risk to high wildfire hazard. Additionally, wildfire risk is high throughout the unincorporated county.

6. **Several of Grant County's critical facilities are at risk to flood hazard**—Critical facilities were identified and were specifically examined within this report. We have estimated that 18% of Grant County's 39 critical facilities at risk to be non-functioning due to a 100-year flood. DOGAMI has also found that 5 critical facilities are exposed to high wildfire hazard. For comparative purposes, almost zero of Grant County's critical facilities are at risk to landslides or earthquake, however, one of those structures is the only hospital in Grant County, the Blue Mountain Hospital.
7. **Biggest displacement to population was wildfire**—Displacement of permanent residents from natural hazards was quantified within this report. We estimate that of the 7,445 total residents in Grant County 19% of the population or 1,446 residents could be potentially displaced due to wildfire. Landslide hazard is a potential threat to 15% (1,080) of permanent residents, and flood hazard makes 11% (799) vulnerable to displacement.
8. **Community needs can be prioritized**—Each community within Grant County was assessed for natural hazard exposure and loss. This allowed for comparison of risk between communities and impacts from each natural hazard. In using Hazus®-MH and exposure analysis, these results can assist in developing plans that address the concerns for those individual communities.

III. MITIGATION STRATEGY

A. Introduction

The Mitigation Strategy establishes a policy framework and implementation pathway for reducing risk from natural hazards over the long term. This section outlines Grant County's strategy to reduce or avoid long-term vulnerabilities to the hazards in the Risk Assessment. This section also presents a mission, goals, and mitigation actions to reduce risk of damage from these hazards. The Grant County Natural Hazards Mitigation Plan (NHMP) Steering Committee reviewed the 2014 Northeast Oregon NHMP and retained the mission statement but revised goal statements. The Steering Committee reviewed and updated the mitigation actions from the 2014 plan adding some new actions while marking some actions completed. Additional planning process documentation is in *Appendix B: Planning and Public Process* providing detail on the process by which the Steering Committee accomplished this work.

B. Mission and Goals

The mission of the 2014 Northeast Oregon Multi-Jurisdictional NHMP stated the broad purpose of the plan in language adaptable to future changes made to the plan. The Grant County NHMP Steering Committee reviewed the mission statement of the prior plan and agreed it accurately describes the overall purpose and intent of this NHMP. The Steering Committee agreed to retain it in revised form.

The mission of the 2020 Grant County NHMP is as follows:

Mission: *To create a disaster-resilient Grant County*

Mitigation plan goals are more specific statements of direction that Grant County form a bridge between the broad mission statement and particular mitigation actions. The goals listed here serve as checkpoints for agencies and organizations when implementing mitigation actions.

2020 Grant County NHMP Goals

1: Protect human welfare, property, and natural resources

2: Increase the resilience of local and regional economies

3: Motivate mitigation activity against the effects of natural hazards through education, outreach, and awareness

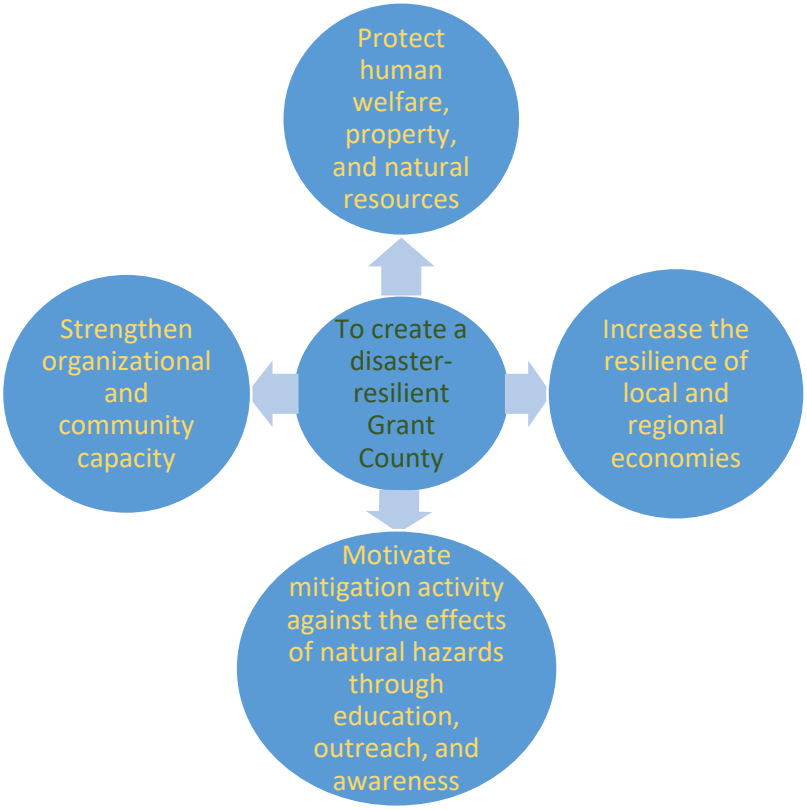
4: Strengthen organizational and community capacity

Public participation was a key aspect in developing the NHMP goals in previous plans. Meetings with the Steering Committee, stakeholder interviews, surveys, and public workshops all served as methods to obtain input and priorities in developing goals for reducing risk and preventing loss for natural hazards in Grant County.

Public participation was also a key aspect in this update to the NHMP. The Grant County NHMP Steering Committee reviewed the existing four multi-jurisdictional goals and decided to concentrate

them into four succinct goals. The graphics in Figure 3-1 illustrate the relationship between the mission and the goals.

Figure 19. Relationship between the mission and the goals of the Grant County NHMP



C. Mitigation Actions

Mitigation actions are specific actions, projects, activities, or processes that reduce risk to people, property, and the environment from the impacts of natural hazard events. The 2014 Northeast Oregon Multi-Jurisdictional NHMP contains mitigation actions for the entire region covered by that plan. Mitigation actions identified through the planning process are an important part of the mitigation plan. They are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. They address both multi-hazard (MH) and hazard-specific issues.

The 2020 Grant County NHMP Steering Committee considered a subset of the mitigation actions contained in the 2014 Northeast Oregon Multi-Jurisdictional NHMP by selecting those actions that pertain to Grant County. This list of actions was the basis for development of the 2020 Grant County NHMP mitigation action list.

Development of the mitigation action list was a multi-step, iterative process that involved brainstorming, discussion, review, and revisions. The bulk of this work occurred during the fourth

Steering Committee meeting held on September 9, 2019 and during the Risk MAP Discovery meeting held September 13, 2019.

One of the first steps was to discuss the status of the mitigation actions from the *2014 Northeast Oregon Multi-jurisdictional NHMP*. The Steering Committee went through each mitigation action and ascertained if the action was completed or in progress.

- *Completed mitigation actions* are accomplishment and are noted as such in the table.
- *No longer included mitigation actions* were removed from the table due to resource constraints or other factors.
- *Mitigation actions that were retained* were retained in full or modified to more accurately reflect the current situation.
- During this process, *new mitigation actions* were also identified.

Table 1 lists each of the 2020 Mitigation Actions and identifies the corresponding mitigation action item number from the 2014 NE Oregon NHMP along with current prioritization.

The mitigation actions must be prioritized to respond to the Disaster Mitigation Act of 2000 requirement for this. The priority ranking and timeframe from the 2014 NHMP were considered when assigning priority and timeframe to the 2020 NHMP Mitigation Actions. Regarding the timeframe within which the mitigation action is planned, resource availability, including such factors as staff time and funding, are part of the categorization of whether the action is short- or long-term. The Grant County SC assigned timeframes based on the following criteria.

- *Short-term actions* are activities that may be implement with existing resources and authorities in one to two years.
- *Medium-term and Long-term actions* are those that may require new or additional resources and/or authorities.
- *Routine activities* are those that are currently in process and will continue to be implemented on a recurring basis during the next planning period.

Prioritization was assigned on a separate basis within each timeframe. There are high priority items within the Short term, medium term and long term timeframes.

A selection of the 2020 Mitigation Actions are detailed in Mitigation Action Item Worksheets located in Appendix C. For each High Priority Mitigation Actions a Mitigation Action Item Worksheet was developed. These Worksheets identifying the rationale for the project, ideas for implementation, and potential coordinating and partner organizations. The Mitigation Action Item Worksheets are intended to assist jurisdictions in developing grant applications to conduct mitigation actions. Grant County, the City of John Day, the Grant Soil and Water Conservation District and the Grant Education Services District and other jurisdictions that develop addenda to the plan can use these summaries of potential projects to prioritize projects and to seek grant funding for them.

Table 4. 2020 Grant County MJ NHMP Mitigation Actions

Multi-Hazard Action Items	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
								1	2	3	4
MH 1	**Completed**	Complete Continuity of Operations Plan (COOP) for Grant County.		Interested City Managers and/or City Council; County Commissioners, Emergency Management	Relevant Public Works and Emergency Services / Emergency Management, Law Enforcement, Fire Department, Department of Homeland Security, County Roads Departments, ODOT, relevant private industries, OEM	Short Term (0-3 years)	Completed	X	X	X	X
MH 2	**High**	Incorporate the Natural Hazards Mitigation Plan into the Comprehensive Plan (State Planning Goal 7)	All	County/ City Planning Department	OR Department of Land Conservation and Development, OR Office of Emergency Management, Federal Emergency Management Agency	Medium Term (4-7 years)	Deferred				X
MH 3	**High**	Inform public officials about mitigation awareness and the Natural Hazards Mitigation Plan as part of plan maintenance and implementation.	All	County Steering Committee Convener	Counties, cities, special districts, and Grant County Wildfire Protection Coordinator	Routine (an action done on a regular basis)	Routine			X	
MH 4	**High**	Develop and implement education and outreach programs to increase public awareness of the risk associated with natural hazards. Specifically target vulnerable populations	All	Emergency Services / Emergency Management	Grant County Wildfire Protection Coordinator, Eastern Oregon Head Start, Chambers of Commerce, American Red Cross, Oregon Education Association, Families First, Grant and Harney County Casa, Oregon Rural Action, County Extension Offices, Eastern Oregon Medical Associates, Elks Lodge, Girl Scouts of the USA, Greater Prairie City Community Association, People Mover, Community Connections of Northeast Oregon	Routine (an action done on a regular basis)	Routine	X		X	
MH 4.1	**Medium**	Training on how to use HAZ-VU and the Department of Geology and Mineral Industries (DOGAMI) Landslide Mapping Guide to educate property owners. Education is needed for plan review and building permits in high landslide risk zones.	Grant County	DOGAMI, DLCD	Grant Soil and Water Conservation District	Short Term (0-3 years)	From Risk MAP Discovery				X
MH 4.2	**Medium**	Improve disaster-related public notifications, including: • flood awareness recommendations outside of reverse 911, • Installation of a reader board near Dayville City Hall to inform residents and others driving through the city, • maintain communication during extended power outages. • leverage evacuation plans by improving notification.	Dayville/Grant County	Participating Cities	FEMA, OEM	Medium Term (4-7 years)	From Risk MAP Discovery			X	

Multi-Hazard Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
MH 4.3	**Medium**	Planning Outreach and Training: Request training to support disaster preparedness and response to identify roles and responsibilities for staff and volunteers and provide training for city staff to improve skill at communicating regarding risk of natural hazards.	Long Creek, Seneca	Participating Cities	DLCD, OEM	Routine (an action done on a regular basis)	From Risk MAP Discovery			X	
MH 5	**High**	Enhance communication and response coordination among all of the incorporated areas in Grant County.	All	Emergency Services / Emergency Management; Consolidated Dispatch Center	County Planning Departments, Local fire departments and fire districts, Bureau of Land Management, Oregon Department of Forestry, Oregon Department of Transportation, OSU Extension, Amateur Radio Emergency Services, OSP, FBI, Public Works, USFS, local irrigation districts	Routine (an action done on a regular basis)	Was MH #6 in 2014 Plan. Mechanism in place with the NE Oregon fire chiefs. John Day, OR is the defacto hub for group.				X
MH 6	**High**	Create a position for a Countywide Hazards Mitigation Project Coordinator	Grant County	County Commission	Planning and Emergency Services / Emergency Management, Local Steering Committees, Oregon Natural Hazards Workgroup, Oregon Emergency Management	Long Term (8-10 years)	Deferred			X	X
MH 7	**High**	Develop a warning and emergency evacuation protocol for vulnerable populations	Grant County	Emergency Services/ Emergency Management	Community Connections of Northeast Oregon, Blue Mountain Hospital, American Red Cross, People Mover, Assisted living facilities, Elks lodge, public libraries, National Organization on Disability	Short Term (0-3 years)	In progress	X			X
MH 7.1	**Medium**	Improve the county website and outreach process specific to: • Identifying how all hazards align with evacuation routes. • Identifying and adding shelter information for all hazards in each community to the website, especially as they relate to evacuation routes.	Grant County	Emergency Services/ Emergency Management	Grant County Administrative Services/webmaster	Short Term (0-3 years)	From Risk MAP Discovery	X		X	
MH 7.2	**Medium**	Explore the reverse 911 program and other real-time communication for hard to reach and low-lying areas for people who have minimal technology and communication methods. This would supplement the existing Alert Sense program already implemented in the county to push out alerts to mobile devices for those who sign up for them.	Grant County	Emergency Services/ Emergency Management	OEM	Short Term (0-3 years)	From Risk MAP Discovery	X			
MH 8	**High**	Ensure that critical airport services are available in the event of an emergency. Critical elements include: adequate fuel systems, appropriate lighting, functioning weather services, ground-access to the airport, and safe runways/taxiway infrastructure	Grant County	Grant County Regional Airport	Grant County, USFS, City of John Day, Oregon Trail Electric, Blue Mountain Hospital, St. Charles Hospital, Oregon Dept. of Aeronautics, FAA	Routine (an action done on a regular basis)	Routine	X	X		X

Multi-Hazard Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
MH 9	**High**	Expand the existing geographical information system (GIS) for the county and secure funding for expansion of the GIS system.	All	Grant Soil and Water Conservation District	County Planning Department, County Court, Emergency Management, County Wildfire Coordinator, DLCD/OEM	Short Term	This is Wildfire Mitigation Strategy #2 from the current Grant County CWPP.	X			X
MH 10	**High**	Complete a road hazard assessment to address existing road situations which could result in problems for evacuation of residents and limit fire apparatus response during a wildfire situation.	All	County Road Dept, Rural Fire Districts, Grant County Sheriff's Office, ODF	County Court, Emergency Management, County Wildfire Coordinator, USFS	Short Term	This is Wildfire Mitigation Strategy #5 from the current Grant County CWPP.	X	X		X
MH 11	**Medium**	Explore emergency food storage options for county communities for periods when transportation coorridors and delivery logistics are compromised for extended periods of time.	All	Emergency Management	County Court, Oregon Office of Emergency Management, FEMA, OSU Extension Offices.	Medium Term (4-7 years)	New Action	X		X	X
MH 11.1	**Low**	Provide for a stock of supplies and backup generators for each local shelter location.	Long Creek, Prairie City, Dayville, Grant County	Emergency Management		Medium Term (4-7 years)	New Action	X	X		
MH 12	**Medium**	Collect new LiDAR data for both flood hazard and landslide hazard mapping in the listed locations as outlined in the Risk MAP Discovery report particularly in the southwest and northeast areas of Grant County and near the following: • Silvies Watershed to complete the confluence area of Bear Creek and the Silvies River, •Monument and John Day, • North, Middle, and South Forks of the John Day River.	Grant County	DOGAMI	FEMA, DOGAMI, DLCD, OEM, Grant SWCD	Short Term (0-3 years)	From Risk MAP Discovery	X			X

Drought Action Items	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
								1	2	3	4
DR 1	**Medium**	Identify incentive programs to increase water efficiency among agricultural water users	Grant County	County Water Masters, Natural Resources Conservation Service	Relevant utility companies, county public works departments, ditch companies, landowners, irrigation districts, soil and water conservation districts, Fresh Water Trust, US Environmental Protection Agency's WAVE program,	Routine (an action done on a regular basis)	Routine	X			X
DR 2	**Medium**	Identify incentive programs to Increase water efficiency among municipal water users	All	Participating Cities	Relevant utility companies, city public works departments, County, wastewater treatment facilities, US Environmental Protection Agency's WAVE program	Routine (an action done on a regular basis)	Routine	X			X

Drought Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
DR 2.1	**High**	Requesting an irrigation ditch assessment, with consideration of the following details: • The goal is to increase the resilience of the irrigation ditch - improving the ditch so that it is no longer a flood hazard and can be utilized during a wildfire. • Background: The ditch is primarily used for agriculture and irrigation and is funded by the local ditch association. There have been several blowouts. The ditch was damaged in recent floods. Previous funding was provided through residential fee increases. • The city would like to develop a plan for improvement and determine project funding opportunities. The city would like to collaborate with the Oregon Water Resources and Fish & Wildlife departments.	Dayville	Dayville	Grant SWCD, OR Water Resources Dept and OR Dept of Fish and Wildlife, DLCD/OEM	Short Term (0-3 years)	From Risk MAP Discovery	X			X
DR 2.2	**High**	The city has obtained funding and is completing the improvement of the city's well fields to provide more water for both consumption and wildfire protection.	Prairie City	Prairie City	USDA, Business Oregon	In progress	From Risk MAP Discovery	X			X
DR 3	**High**	Develop community drought emergency plans and policies	All	County Emergency Services / Emergency Management; Interested Cities	Water Resources Departments, County and City Governments, County and City Planning Departments, Public Works Departments, John Day, Natural Resources Conservation Service, Relevant Irrigation Districts, OSU Extension Office, US Department of Agriculture	Routine (an action done on a regular basis)	Routine	X	X		X

Earthquake Action Items	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
								1	2	3	4
EQ 1	**Low**	Perform an earthquake risk evaluation on all critical buildings not listed in the DOGAMI RVS report. Specifically including the Fire Station and City Hall buildings in Prairie City and downtown stone masonry buildings.	All	Emergency Management	County Public Works Departments, Interested Cities, Business Oregon, Relevant utility companies, DOGAMI	Long Term (8-10 years)	Modified	X	X		
EQ 2	**Completed**	Seismically retrofit the John Day Fire Department to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options		The City of John Day, Emergency Management	County Public Works Departments, Business Oregon, DOGAMI, OEM, FEMA, ODE		Completed - building rebuilt.	X			
EQ 3	**Completed**	Seismically retrofit Mount Vernon Middle School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options		John Day SD 3, Emergency Management	County Public Works Departments, Business Oregon, DOGAMI, OEM, FEMA, ODE		Removed - School closed and sold.	X			

Earthquake Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
EQ 4	**High**	Seismically retrofit Prairie City School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options	Prairie City	Prairie City 4 School District, Emergency Management	County Public Works Departments, Prairie City, Business Oregon, DOGAMI, OEM, FEMA, ODE	Short Term (0-3 years)	In progress.	X			
EQ 5	**Completed**	Seismically retrofit Grant Union High School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options		John Day SD 3, Emergency Management	County Public Works Departments, Grant County, Business Oregon, DOGAMI, OEM, FEMA, ODE		Completed	X			
EQ 6	**High**	Seismically retrofit Humboldt Elementary School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options	Canyon City	John Day SD 3, Emergency Management	County Public Works Departments, Canyon City, Business Oregon, DOGAMI, OEM, FEMA, ODE	Short Term (0-3 years)	In progress.	X			
EQ 7	**High**	Seismically retrofit Seneca Elementary School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options	Seneca	John Day SD 3, Emergency Management	County Public Works Departments, City of Seneca, Business Oregon, DOGAMI, OEM, FEMA, ODE	Short Term (0-3 years)	In progress.	X			
EQ 8	**High**	Seismically retrofit Monument School to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options.	Monument	Monument SD 8, Emergency Management	County Public Works Departments, City of Monument, Business Oregon, DOGAMI, OEM, FEMA, ODE	Short Term (0-3 years)	Retain.	X			

Flood Action Items	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
								1	2	3	4
FL 1	**Medium**	Explore flood mitigation opportunities for homes, infrastructure and critical facilities subject to flooding.	All	Relevant City and County Public Works Departments, Emergency Services and Emergency Management	DLCD NFIP Coordinator, County Roads Departments, Public Works Departments, County Planning Departments; City of John Day, Silver Jackets, Relevant water treatment facilities, Federal Emergency Management Agency, Homeowner, Army Corps of Engineers, Oregon Department of Fish and Wildlife, Department of State Lands, ODOT	Short Term (0-3 years)	Deferred	X			
FL 1.1	**High**	Move the waste water treatment plant out of the SFHA. This $12-14 million project is planned to be completed in 2020-21.	John Day	City of John Day	USDA, EPA	Short Term (0-3 years)	From Risk MAP Discovery	X	X		
FL 1.2	**Medium**	Create a transportation route that connects the bridges in John Day. There are two bridges that are not connected by streets. Both bridges are small and failing.	John Day	City of John Day	Oregon Department of Transportation, Federal Highway Administration	Short Term (0-3 years)	From Risk MAP Discovery	X	X		
FL 1.3	**High**	Re-engineer, re-construct, and deepen the USACE river channel that is causing a contamination problem and reduce flooding. The goal is to create a community greenway.	John Day	City of John Day	FEMA, OEM and EPA	Medium Term (4-7 years)	From Risk MAP Discovery	X	X		

Flood Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
FL 1.4	**Medium**	Update and replace Bridge Street and Patterson Bridge. Bridge scouring is occurring along Dixie Creek and Canyon Creek. There is a need to add another bridge to service residential areas and provide improved evacuation routes. The city has questions about how, where, and who can help support and fund these mitigation projects.	John Day	City of John Day	Oregon Department of Transportation, Federal Highway Administration	Medium Term (4-7 years)	From Risk MAP Discovery	X			
FL 1.5	**Medium**	Explore opportunities to mitigate flood risk to homes from the Canyon Creek floodplain.	John Day, Canyon City, Grant County	Participating Cities and Grant County	Housing and Urban Development's CDBG program	Medium Term (4-7 years)	From Risk MAP Discovery	X			
FL 1.6	**Low**	Explore opportunities to mitigate flood risk to schools near flood hazard areas near Canyon City, including the high school.	John Day	Grant County School District	Housing and Urban Development's CDBG program	Long Term (8-10 years)	From Risk MAP Discovery	X			
FL 1.7	**High**	Conduct river restoration and flood mitigation projects to protect vital transportation infrastructure at risk, including bridge access to critical resources. Specific examples include: • access to the wastewater treatment plant and water source in Seneca and • stream restoration on Dixie Creek in Prairie City in the area of the bridge across Oregon Highway 26 where the channel is becoming choked with silt and willows.	Monument, Seneca, Prairie City, Grant County	Cities of Monument and Seneca		Long Term (8-10 years)	From Risk MAP Discovery	X	X		
FL 1.8	**High**	Implement best practices for post-wildfire stream stabilization efforts in Dixie Creek and other streams adjacent to recent burn areas. For example, previous efforts to slow stream flow by placing unanchored woody debris in stream beds (Oliver Creek is an example) has resulted in further damage to streams and their fisheries during intense summer storms that can cause mudflows from burned areas.	Prairie City, Grant County	Prairie City, Grant County	USFS, OR Dept. of Environmental Quality, County Wildfire Coordinator, local fire districts	Medium Term (4-7 years)	From Risk MAP Discovery	X			
FL 1.9	**High**	Address erosion around footings, aprons and abutments. Specific areas include the abutments of the Main Street and Bridge Street bridges across the John Day River in Prairie City.	Prairie City	Prairie City Public Works		Long Term (8-10 years)	From Risk MAP Discovery	X			
FL 2	**High**	Explore the costs and benefits for participation in the NFIP's Community Rating System	All	Interested Cities and Counties	County and city planning departments, county emergency services / emergency management, county public works, Silver Jackets, FEMA, DLCD	Short Term (0-3 years)	Deferred	X	X		

Flood Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
FL 3	**High**	Increase awareness concerning the NFIP program.	All	Local floodplain managers, County Emergency Managers	City Planning Departments, Emergency Services / Emergency Management, NFIP Floodplain Coordinator (DLCD), insurers, realtors, FEMA, County Extension Offices, Eastern Oregon Medical Associates, Elks Lodge, Girl Scouts of the USA , Greater Prairie City Community Association, People Mover, Community Connections of NEOR (Any community organizations capable of distributing information), Blue Mountain Eagle, ACOE	Short Term (0-3 years)	Deferred			X	X
FL 4	**High**	Update the County and City FEMA Flood Insurance Rate Maps and digitize the updated maps.	All	Relevant City and County Public Works Departments, Emergency Management, City Managers, County Planning Departments	County Roads Departments, Public Works Departments, City of John Day, Army Corps of Engineers, DOGAMI, DAS-GEO, elected officials	Short Term (0-3 years)	In progress	X	X		X
FL 4.1	**High**	New flood analysis is requested with the following details: • all areas of development within or near flood hazard areas, • along Highway 26 and Zone D areas, • expand mapping extent along the North, Middle, and South Forks for the John Day River, • expand mapping extent in the unmapped areas south of Canyon City, • extend mapping to better tie into the Silvies flood map above Seneca and Bear Creek, • re-map the area where the Canyon Meadows Dam once was, and • re-map floodway in populated areas.	Grant County	Grant County floodplain manager, FEMA	Grant SWCD	**Short Term (0-3 years)**	From Risk MAP Discovery	X	X		X
FL 4.2	**Low**	Requesting updated flood studies that will be leveraged during the upcoming Comprehensive Plan update. Specifics include: • Map undeveloped areas as they are being considered for future development. • Flooding in John Day impacts Dayville. • Most flooding occurs in areas with little population.	Dayville	Local floodplain managers, FEMA		**Medium Term (4-7 years)**	From Risk MAP Discovery	X	X		X

Flood Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
FL 4.3	**High**	Funding is needed for river gauges for the Silvies River and Bear Creek where flooding commonly occurs at the confluence at the north end of the city. Data on flow and river gauges for the Silvies River and Bear Creek would support mitigation efforts to reduce debris flow and flooding that strands residents.	Seneca			**Medium Term (4-7 years)**	From Risk MAP Discovery	X	X		
FL 4.4	**Medium**	Requesting an update to the flood maps that would improve existing gaps in the SFHA and increase the understanding of flood risk in the north end of town at the confluence of Bear Creek and Silvies River.	Seneca, Grant County	Local floodplain managers, FEMA		**Short Term (0-3 years)**	From Risk MAP Discovery	X	X		
FL #5	**High**	Explore mitigation opportunities for the Canyon City bridge (Bridge #7)	Canyon City	Grant County	ODOT, ACOE, Silver Jackets, John Day School District 3, Canyon City	Medium Term (4-7 years)	In progress	X			
Landslide Action Items	**Priority**	**Proposed Action Title**	**Jurisdictions Involved**	**Lead Agency**	**Partner Organization(s)**	**2020 Timeline**	**2020 Status**	**Plan Goals**			
								1	**2**	**3**	**4**
LS 1	**Low**	Identify, obtain, and evaluate detailed risk assessments in landslide prone areas and develop mitigation strategies to reduce the likelihood of a potential hazardous event.	All	County Public Works Department	County Planning Department, ODOT, DOGAMI, USGS, irrigation district	Long Term (8-10 years)	Deferred	X	X	X	
LS 1.1	**Low**	Create updated and more detailed hazard maps incorporating the most recent LiDAR data into the current geohazard overlay.	John Day, Grant County	City of John Day, Grant County	DOGAMI	Short Term (0-3 years)	From Risk MAP Discovery	X	X	X	
LS 1.2	**Medium**	Landslide risk assessments to address the concern of being located within a valley.	Monument	City of Monument	DOGAMI	Short Term (0-3 years)	From Risk MAP Discovery	X	X	X	
Severe Weather Action Items	**Priority**	**Proposed Action Title**	**Jurisdictions Involved**	**Lead Agency**	**Partner Organization(s)**	**2020 Timeline**	**2020 Status**	**Plan Goals**			
								1	**2**	**3**	**4**
SW #1	**Low**	Participate in the NOAA Storm Ready Program	Grant County	Emergency Services / Emergency Management	County Public Works Departments, County Roads Departments, Interested Cities, NOAA, NWS (Pendleton or Boise), HAMM, Oregon Department of Transportation, local fire departments, American Red Cross, local radio stations, USGS	Long Term (8-10 years)	Deferred	X			
SW #2	**Medium**	Shorten spans and anchor poles on utility lines in high wind or heavy icing areas	Grant County	NE Oregon Electric Cooperatives	County Emergency Management, County Public Works, Electric Trail, Columbia Power, Other relevant utility companies	Routine (an action done on a regular basis)	Routine	X			

Windstorm Acition Items	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
								1	2	3	4
WS #1	**Low**	Adopt additional regulations governing residential construction to prevent wind damage. Currently in compliance with State of Oregon regulations.		Grant County Planning Department	Planning Commission, participating cities.	Long Term (8-10 years)	Deferred or may be removed due to reticence to exceed existing requirements of state building codes	X			X
Wildfire Action Items	**Priority**	**Proposed Action Title**	**Jurisdictions Involved**	**Lead Agency**	**Partner Organization(s)**	**2020 Timeline**	**2020 Status**	**Plan Goals**			
								1	2	3	4
WF 1	**High**	Advocate for the implementation of the actions identified in the Community Wildfire Protection Plan.	All	County Steering Committee Convener, Emergency Management	County Emergency Services / Emergency Management, County Planning Departments, Local Public Safety Coordinating Council (LPSCC), Oregon Department of Forestry, Bureau of Land Management, local fire departments, OSU Extension Services, US Forest Service, Soil and Water Conservation Districts, Oregon Department of Fish and Wildlife; Homeowners in Wildland/Urban Interface zones.	Routine (an action done on a regular basis)	Routine	X			X
WF 2	**High**	Implement CWPP's at the zone level. Grant County has been divided into nine separate “zones” for the purposes of the revised CWPP. This methodology was devised to better recognize differences in topography, vegetation, and fire prevention resources within communities throughout the county. Each zone within the county will be encouraged to develop a local CWPP reflecting specific needs and hazards for that area. Each zone will have the opportunity to implement the Firewise Communities USA program.	All	County Wildfire Coordinator	County Steering Committee Convener, Emergency Management, County Court	Medium Term (4-7 years)	New Action. In Progress. This is Wildfire Mitigation Strategy #3 in the current CWPP.	X	X	X	X
WF 3	**High**	Evaluate and update the county emergency management system county wide.	All	Grant County Communications Task Force	County Steering Committee Convener, Emergency Management	Routine (an action done on a regular basis)	New Action. Routine. This is Wildfire Mitigation Strategy #4 in the current CWPP.	X	X	X	X
WF 4	**High**	Assist Rural Fire Districts in attratcing volunteer firefighters, upgrading their firefighting equipment, facilities, and training needs.	All	County Wildfire Coordinator	ODF, Fire Chiefs, Emergency Management, County Court, USFS, BLM.	Routine (an action done on a regular basis)	New Action. Routine. This is Wildfire Mitigation Strategy #7 in the current CWPP.	X			X

Wildfire Action Items (cont'd)	Priority	Proposed Action Title	Jurisdictions Involved	Lead Agency	Partner Organization(s)	2020 Timeline	2020 Status	Plan Goals			
WF 5	**High**	Encourage and support collaborative efforts between the USFS, BLM, and communities at risk from wildfires. Help identify needed hazard fuel reduction work on federal lands within the WUI.	All	County Wildfire Coordinator	USFS, BLM and local communities.	Routine (an action done on a regular basis)	New Action. Routine. This is Wildfire Mitigation Strategy #8 in the current CWPP.	X		X	
WF 6	**High**	Continue county-wide wildfire education and prevention efforts as described in the 2012 CWPP.	All	County Wildfire Coordinator	ODF, USFS, BLM, Fire Chiefs, Emergency Management, County Court, Grant-Harney Fire Prevention Cooperative.	Routine (an action done on a regular basis)	New Action. Routine. This is Wildfire Mitigation Strategy #8 in the current CWPP.	X	X	X	X
Volanic Event Action Items	**Priority**	**Proposed Action Title**	**Jurisdictions Involved**	**Lead Agency**	**Partner Organization(s)**	**2020 Timeline**	**2020 Status**	**Plan Goals**			
								1	**2**	**3**	**4**
VE 1	**Low**	Continue to support ongoing study of probability of volcanic eruption and potential impact.	All	Emergency Management	Hospital, Public Works, Planning Department. USGS, DOGAMI, FEMA, OEM, DLCD, OSU Cascades	Routine (an action done on a regular basis)	New Action. Routine.	X	X		X

Source: Grant County 2020 MJ NHMP Steering Committee work product

D. Integration

To achieve risk reduction, it is necessary to consider natural hazards mitigation in common planning processes, from land use regulation to infrastructure planning to emergency response. Grant County and its incorporated cities have existing authorities, policies, programs and resources in place. Integrating the existing capacity of local governments into the planning process improves the ability of local governments to implement the NHMP and to reduce risk of damage from natural hazards.

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt to changing conditions and needs.

The Natural Hazards Mitigation Plan includes a range of recommended action items that, when implemented, may reduce the county's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the county's existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the county's resources. Incorporating the NHMP into the Comprehensive Plan strengthens the provisions within the plan. Revising zoning regulations to identify hazardous areas and identify strategies for development is another method of implementing the goals of the NHMP.

Governmental Capacity

Grant County departments involved in natural hazard mitigation include the following:

Emergency Management: The Emergency Management Program works to minimize the effects of major emergencies and disasters on the community.

Planning: The Grant County Planning Department provides planning and zoning information to the public and other government agencies. Additional responsibilities include reviewing development proposals, administering and enforcing land use laws, regulations, and ordinances, reviewing applications for land use actions, and conducting comprehensive planning studies and research.

Road Department: The Grant County Road Department works to provide roadways that are safe, efficient, and economical to maintain.

Fire Departments and Fire Districts: The fire departments of Dayville, John Day and Canyon City recruit both experienced and inexperienced individuals who wish to serve as a volunteer Firefighter or Emergency Medical Technician (EMT) in the Grant County, Oregon fire system.

Health Department: The Grant County Health Department provides a wide range of public health services including emergency preparedness, health education and primary care services.

Economic Development: The Department of Economic Development provides a variety of services to existing and prospective businesses.

Grant County Regional Airport: The Grant County Regional Airport (GCRA) is a county-owned, public use airport and is also the helibase and training center for the United States Forest Service (USFS) Malheur Forest's rappeller firefighters. It is staffed year around with peak operations generally occurring from May through October.

OSU Extension Service: The Oregon State University (OSU) Extension Service provides research-based knowledge and education that strengthens Grant County's economy, sustains natural resources, and promotes healthy communities, families, and individuals.

Watermaster: The District 4 Watermaster's Office serves the Upper John Day Basin including the upper main stem of the John Day River to Kimberly, Oregon as well as the North Fork, Middle Fork and South Fork of the John Day River and tributaries.

Other county social and transportation services are listed below in the section on Community Organizations and Programs.

The City of John Day employs a City Manager and a Planning Department as well as a Public Works Department along with volunteer commissions. Smaller cities employ commensurately smaller staff. Typically all of these jurisdictions have staff who fill multiple roles.

The following are existing plans and policies already in place within the community

Table 5. Existing Plans, Codes and Ordinances. Year is year acknowledged or last revision.

Jurisdiction	Document	Year
Grant County	Grant County Comprehensive Plan	1999
Grant County	Emergency Operations Plan	2019
Grant County	Transportation System Plan	1997
Grant County	Community Wildfire Protection Plan	2013
Grant County	Land Development Code	2019
Grant County	Flood Ordinance	2016
Canyon City	Comprehensive Plan	1999
Canyon City	Zoning Ordinance	1999
Canyon City	Flood Hazard Ordinance	1987
Dayville	Comprehensive Plan	1985
Dayville	Zoning Ordinance	1981
Dayville	Flood Hazard Ordinance	1984
Granite	Comprehensive Plan	1986
John Day	Comprehensive Plan	2003
John Day	Development Code	2012
John Day	Transportation System Plan	1996
John Day	Street Network Plan	2009
John Day	Main Street Revitalization Plan	2017
John Day	Flood Hazard Ordinance	2019
Long Creek	Comprehensive Plan	1999
Long Creek	Zoning Ordinance	1999
Long Creek	Flood Hazard Ordinance	1984
Monument	Comprehensive Plan	1985
Monument	Zoning Ordinance	1998
Monument	Flood Hazard Ordinance	1984
Mount Vernon	Comprehensive Plan	1985
Mount Vernon	Zoning Ordinance	1995
Mounty Vernon	Flood Hazard Ordinance	1987
Prairie City	Comprehensive Plan	1985
Prairie City	Zoning Ordinance	1995
Prairie City	Flood Hazard Ordinance	1988
Seneca	Comprehensive Plan	1998
Seneca	Zoning Ordinance	1984
Seneca	Flood Hazard Ordinance	1984

Source: Oregon Blue Book

Community Organizations and Programs

In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. Community organizations and programs are another avenue through which the mitigation strategy is integrated into the existing capacity of the community to implement specific mitigation actions.

Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The County can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

Table 6. Grant County Community Organizations and Programs

Community Organization or Program	Description	Address	Phone number/ Website
Blue Mountain Hospital & Hospice	Blue Mountain Hospital offers medical services in John Day. It operates a clinic and hospice services.	170 Ford Rd, John Day, OR 97845	541-575-1311 www.bluemountainhospital.org
Blue Mountain Forest Partners	Blue Mountains Forest Partners is a diverse group of stakeholders who work together to create and implement a shared vision to improve the resilience and well-being of forests and communities in the Blue Mountains.		541-620-2546 https://www.bluemountainsforestpartners.org/
Child Care Resources and Referral	CCR&R is a program of Umatilla Morrow Head Start, Inc. that provides free local resources to support quality care and early education	116 NW Bridge St John Day, OR 97845	541-575-1112
Elks Lodge BPOE #1824	The Fraternal Order of Elks is a non-political, non-sectarian and strictly American fraternity. The Order spends more than $80,000,000 every year for benevolent, educational and patriotic community-minded programs	140 NE Dayton St John Day, OR 97845	541-575-1824 https://www.elks.org/lodges/home.cfm?LodgeNumber=1824
Families First	Families First was formed in 1999 and incorporated in 2000 as a private non profit to provide parenting education in Grant County, Oregon.	401 S Canyon Blvd John Day, OR 97845	541-575-1006 https://www.familiesfirstofgrantcounty.com
Grant & Harney County Casa	The mission of Grant-Harney County CASA is to train and support volunteers who will provide all abused and neglected children in Grant and Harney Counties a voice in juvenile court, and to educate the community regarding its responsibility for abused and neglected children.	835 S. Canyon Blvd John Day, OR 97845	541-575-5574 https://www.grantharneycasa.org
Grant County Chamber of Commerce	Organization that supports the small businesses and economic life of residents of Grant County	301 W Main St John Day, OR 97845	541-575-0547 https://www.gcoregonlive.com

Grant County Extension Office	The Oregon State University Extension Service provides research-based knowledge and education that strengthens Grant County's economy, sustains natural resources, and promotes healthy communities, families, and individuals.	116 NW Bridge Street, Suite 1 John Day, OR 97845	541-575-1911 https://extension.oregonstate.edu/grant
Senior Citizens Community Center and Programs	The Grant County Senior Program goals are to establish linkages within the community in order for seniors and disabled persons to meet their daily survival needs and remain in their homes in a safe and healthy environment for as long as possible.	142 NE Dayton Street John Day, OR 97845	541-575-1825 https://www.gcoregonlive.com/members/grant-county-senior-programs/
Greater Prairie City Community Association	The GPCCA is a group of local business owners and community members who work to enhance the livability and economic well-being for the 910 residents of Prairie City.	PO Box 758 Prairie City, OR 97869	Email: smithhowdytown@yahoo.com https://www.prairiecityoregon.com/prairie-city-oregon-gpcca.html
Northeast Oregon Housing Authority	NEOHA is dedicated to enhancing the qualify of life for residents located in Union, Baker, Grant, and Wallowa County. These goals are accomplished through the promotion of economic development, home-ownership, and self-sufficiency opportunities while working with community partners whose goals are similarly aligned.	2608 May Lane La Grande, OR 97850	541-963-5360 https://www.neoha.org/
People Mover	The People Mover is a Public Transportation service available to anyone in Grant County.	229 NE Dayton St John Day, OR 97845	541-575-2370 https://grantcountypeoplemover.com/
Shie Elem Golden Heritage	Hospice Care	200 SW Brent Drive John Day, OR 97845SW Brent Dr John Day, OR 97845	541-575-0957(866) 839-0926
Strawberry Wilderness Family Clinic	Strawberry Wilderness Community Clinic provides a full range of medical services to Grant County. The clinic is situated on the second floor of Blue Mountain Hospital.	180 Ford Rd John Day, OR 97845	541-575-0404 https://www.bluemountainhospital.org/
Valley View Assisted Living and Memory Care	Assisted Living and Memory Care	112 NW Valley View Dr John Day, OR 97845	541-239-3889 https://www.valleyviewliving.net/

E. Tools and Assets

Beyond the planning process and other processes available for integration, each jurisdiction has a variety of tools and assets available for implementing natural hazards mitigation. Both human assets and financial tools are currently available or potentially available in the future to Grant County, the City of John Day and the special districts that form this plan.

Among the human assets currently in place, both Grant County and the City of John Day employ Land Use Planners and Floodplain Managers. Grant County employs an Emergency Management staff, a Surveyor and a Road Master. The City of John Day services include a public works department.

None of the jurisdictions employ a Civil Engineer, a GIS expert or a Grant Writer. To the extent that these functions are carried out in Grant County and John Day, they are rolled into the existing staff positions of the jurisdictions. The ability of these jurisdictions to move mitigation strategy actions forward may be improved by incorporating skills in these areas from other staff or from local, state or regional partners.

There are a wide range of federally funded, state funded or non-profit grant programs that may be accessed to accomplish mitigation actions. Navigating the landscape of grant funding for local mitigation projects requires significant time and effort. FEMA's 2013 publication Mitigation Funding: A Resource for Funding Mitigation Projects is a useful guide to federal funding. State funding sources for mitigation projects include the Oregon Business Infrastructure Finance Authority and Oregon Department of Environmental Quality Clean Water State Revolving fund. Other local sources of funding for local projects may include the following:

Capital Improvement funding,
Use of the authority to levy taxes,
Water, Sewer, Electric, Gas Fees
Impact Fees
General Obligation bonds
Special Tax Bonds

The City of John Day has utilized a range of tools to plan for, fund and begin implementation of integrated projects that incorporate community revitalization with hazard mitigation actions. The city has a redevelopment project that connects the downtown area to what will become a recreation and open space that includes improvement of transportation infrastructure specifically new bike paths and a. The Innovation Gateway Area Plan has utilized Transportation Growth Management grant funds from the Oregon Department of Transportation and the Department of Land Conservation and Development to begin area development planning for 90 acres along both sides of the John Day River. A portion of the site was purchase from the DR Johnson Lumber Company. Features of the plan include relocation of the city's wastewater treatment facility which is currently located in the 100-year floodplain, restoration of the floodplain to increase flood storage in open space areas and improvements to local streets and bridges in the area.

F. Prioritizing Natural Hazard Mitigation Projects

Prioritization of mitigation projects involves not only public input on relative importance and attention to funding streams from federal and state agencies, but also an analysis of the costs and benefits of the project. Three approaches for conducting economic analysis of natural hazard mitigation projects that have been developed by the Oregon Partnership for Disaster Resilience fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. Appendix X summarizes information on these methods of prioritizing based on a research paper developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center.

IV. PLAN IMPLEMENTATION AND MAINTENANCE

The Plan Implementation and Maintenance section details the formal process that will ensure that the *2020 Grant County Multi-Jurisdictional Natural Hazards Mitigation Plan* (2020 NHMP) remains an active and relevant document. The initial section outlines assets, capabilities and success stories that support the ability of the county to implement actions in the plan during the planning period. The plan implementation and maintenance process includes a schedule for monitoring and evaluating the plan annually, as well as producing an updated plan every five years. This section also describes how Grant County and the City of John Day will integrate public participation throughout the plan maintenance and implementation process.

A. Assets, Capabilities and Success Stories

Hazard planning implementation requires drawing on existing community assets and capabilities. Some comments made by participants in the process are shared below with respect to the valuable human, economic, built environment and natural environment assets in Grant County. For a compiled list of the building assets of the jurisdictions considered by DOGAMI in the Risk Assessment of this plan, please see Volume III, Appendix A: Community Profile

Participants in the Grant County NHMP process reported that the human assets they value most are "those people who are involved and invested in the community. Those that provide positive suggestions and solutions to the many challenges we face." The challenges named included natural hazards, and health care, sociological, economic, accessibility, and connectivity issues. Others noted that 'the economic drivers valued most and are the most vulnerable are our youth. Our young people are those we are teaching to be leaders of this community." This participant expressed concern about the challenges of life in Grant County and how limited economic opportunity may drive those youth and their aging parents away from the county. Participants acknowledged the value of the forest, agriculture and water resources to Grant County stating that these "provide the natural resource elements that support the county's primary industries and harbors critical habitats for endangered species, along with ample populations of game species to support robust recreational opportunities." The value of Grant County's water resources for consumption and fire-fighting were also highlighted.

Many participants expressed how much they value the capabilities of emergency responders, hospital workers, airport management, and law enforcement personnel noting that "medical personal (are) needed to help people who are inured and give others piece of mind" and that law enforcement are "able to react to a high stress situation and work with the people around to resolve issues".

Others noted that forest service employees, loggers, and government employees work to address natural hazard issues, both to mitigate pro-actively and in response to disasters. Of forest service employees, one participant noted "They are an embedded part of our community. The forest

surrounds our community and the forest service is quick to be identified as the protective agency for our natural environment and first line of defense for our residence."

The public sector is one of the county's biggest human assets. The City Manager in John Day has spearheaded a multi-faceted project that both addresses flooding mitigation and supports community development. The Innovation Gateway project in John Day[79] is an example of a pro-active, integrated project that address public health, environmental health, hazard mitigation and economic issues. The municipalities in Grant County are willing and able to provide mutual aid to respond to hazard events. The public works departments and governments of the City of John Day and Prairie City cooperated to solve a need for emergency water supply following damage to the water system in Prairie City in the summer of 2015.[80]

These community assets and capabilities along with a demonstrated ability to work together for the benefit of the whole community is support the ability of jurisdictions of Grant County to utilize this plan to mitigate risks to natural hazards in the future.

B. Implementing the Plan

The 2020 *Grant County Multi-Jurisdictional Natural Hazard Mitigation Plan* will be formally adopted following approval by FEMA. The success of the 2020 NHMP depends on how well the mitigation actions in Table 4 are implemented. In an effort to promote active implementation of the mitigation actions a coordinating body for plan maintenance and implementation will be formed, a convener will be designated, the identified activities will be prioritized and evaluated, and the plan will be implemented through existing plans, programs, procedures, and policies.

Plan Adoption

Once the 2020 *Grant County Multi-Jurisdictional Natural Hazard Mitigation Plan* is locally reviewed and ready, the Plan Convener and DLCD will submit it to the State Hazard Mitigation Officer at Oregon's Office of Emergency Management (OEM). OEM will review the plan and submit it to the Federal Emergency Management Agency (FEMA) Region X for review. This review addresses the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201.6 and detailed in the FEMA Review Tool.

Upon pre-approval by FEMA, indicated by a letter provided from FEMA to Grant County called the "Approval Pending Adoption" (APA) the Grant County Board of Commissioner and other jurisdictions that have signed agreements to participate in this plan (the City of John Day, Grant Education Services District and Grant Soil and Water Conservation District) will then formally adopt the 2020 NHMP via resolution. Once FEMA is provided with final resolution documentation for the first of these jurisdictions to adopt the plan, FEMA will issue a formal letter of approval indicating the effective dates of the plan. Following adoption by the other jurisdictions and districts adopting the plan a revision of this letter will be issued, however the effective dates of the plan will be the same for all. Following adoption of the FEMA approved NHMP, those jurisdictions (Grant County, the City of John Day, the Grant Education Service District and the Grant Soil and Water Conservation District) will be eligible to apply for FEMA Hazard Mitigation Assistance (HMA) pre- and post- disaster funds.

[79] https://www.cityofjohnday.com/planning/page/oregon-pineinnovation-gateway-area-plan

[80] Personal communication with Grant County Emergency Manager, February 2020.

These funds are distributed through the Pre-Disaster Mitigation (PDM) program, the Hazard Mitigation Grant Program (HMGP), and the Flood Mitigation Assistance (FMA) program. Additional resources for mitigation project grant funding can be found in Volume III, Appendix E – Grant Programs and Resources

The final copy of the 2020 NHMP will be produced once the FEMA approval letters and the copies of the resolutions of approval from Grant County, the City of John Day and the two special districts are received by the project manager. These documents will be incorporated into the document and the effective dates of the plan will be added. The final document will be provided to each jurisdiction and district for posting on their websites and for use as plan implementation begins.

The accomplishment of the 2020 NHMP goals and actions depends upon regular Steering Committee participation and support from county and city leadership. Thorough familiarity with the 2020 NHMP will result in the efficient and effective implementation of mitigation actions and a reduction in the risk and the potential for loss from future natural hazard events.

Convener

The Steering Committee determined at its April 10, 2020 meeting that the Grant County Emergency Manager will take responsibility for plan implementation and will facilitate the 2020 NHMP Implementation Committee meetings. The Emergency Manager will lead the committee, assign tasks as appropriate, and solicit assistance from DLCD and OEM as needed. Plan implementation and evaluation should be a shared responsibility among all of the Implementation Committee members. The convener's responsibilities may include:

- Coordinating 2020 NHMP Implementation Committee meeting dates, times, locations, agendas, and member notification;
- Documenting the discussions and outcomes of Implementation Committee meetings;
- Serving as a communication conduit between the Implementation Committee and the public/stakeholders;
- Identifying funding sources for natural hazard mitigation projects or seek assistance from OEM and DLCD to do so; and
- Utilizing the Risk Assessment chapter and the Project Prioritization guidelines in Appendix D as a tool for prioritizing Mitigation Actions from Table 4.

Coordinating Body

The Grant County Emergency Manager, acting as convener will facilitate meetings of the NHMP Implementation Committee to maintain, update, and implement the 2020 NHMP. The coordinating body may be composed of members of the NHMP Steering Committee and other representatives of the whole community. The Implementation Committee members' responsibilities include:

- Attending future plan maintenance and plan update meetings (or designating a representative to serve in your place);
- Prioritizing Mitigation Actions listed in Table 4 and assisting in seeking funding for mitigation projects.

- Evaluating and updating the Natural Hazards Mitigation Plan within the five year life of the plan;
- Developing and coordinating ad hoc and/or standing subcommittees as needed; and
- Coordinating public involvement activities.

To make the coordination and review of the 2020 NHMP as broad and useful as possible, the Grant County Emergency Manager should engage stakeholders to implement the identified mitigation actions. Specific organizations have been identified as partners for most of the mitigation actions listed in Table 4 in the 2020 NHMP; these are identified in Table 6 and a selection are described in the more detailed Mitigation Action Item Forms found in Appendix C.

Implementation through Existing Programs

The 2020 NHMP includes mitigation actions that, when implemented, are intended to reduce loss from hazard events throughout Grant County. Within the 2020 NHMP, FEMA requires the identification of existing plans, programs, and policies that might be used to implement these mitigation actions.

Grant County and the City of John Day currently address Oregon's Statewide Planning Goals and legislative requirements through their comprehensive land use plans, capital improvement plans, mandated standards, and building codes. Because plans, programs, procedures, and policies already in existence often have support from local residents, businesses, and policy-makers, Grant County and the City of John Day should incorporate the mitigation actions from the 2020 NHMP into those existing plans and programs. Many land use, comprehensive, and strategic plans are updated regularly, and can adapt easily to changing conditions and needs. Implementing the mitigation actions from the 2020 NHMP through such plans and policies increases their likelihood of being supported and implemented.

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

- City and County Budgets
- Community Wildfire Protection Plans
- Comprehensive Land Use Plans
- Economic Development Action Plans
- Zoning Ordinances & Building Codes
- Emergency Operations Plans and Continuity of Operations Plans (COOP)

The specific plans that presently exist and relate to the 2020 NHMP are listed in Table 5. For additional examples of plans, programs, policies, procedures and agencies that may be used to implement mitigation actions, refer to the Appendix C Mitigation Action Item Sheets.

C. Steps in Plan Implementation

Plan implementation is a critical component of the 2020 NHMP. The Implementation Committee comprised of local staff and other partners are responsible for implementing the plan over the five years it remains in effect. Below are steps that can be used to carry out the Mitigation Actions developed and evaluated by the Steering Committee.

Meetings

The Implementation Committee should include members of the 2020 Grant County NHMP Steering Committee. If this implementation committee can be joined with other emergency management or hazard plan implementing bodies, Grant County may find efficiencies by cooperating in carrying the mitigation actions in this plan. In other counties in eastern Oregon the NHMP Implementation coordinating body is also the Emergency Management Preparedness Team (EMT) and the Local Emergency Preparedness Committee (LEPC). Whatever form the Implementation Committee takes, it should set a meeting schedule and convene regularly.

During the first meeting, the NHMP Implementation Committee could:

- Review existing action items to determine appropriateness for funding;
- Educate new members about the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described in Volume II, Appendix D.

During the second meeting the NHMP Implementation Committee could:

- Review status and progress of the mitigation actions;
- Document the status of the mitigation actions;
- Review existing and new risk assessment data;
- Discuss already held and upcoming public involvement events; and
- Document successes and lessons learned during the year.

These meetings are an opportunity for each jurisdiction and organization to report back to Grant County and the NHMP Implementation Committee on progress that has been made on mitigation actions in the NHMP and to develop new ways to mitigate the risk of damage from natural hazards.

The Grant County Emergency Manager as convener should be responsible for documenting the outcome of the regular meetings. A method the Implementation Committee may use to prioritize mitigation projects is described in Volume III, Appendix E “Evaluating Hazard Mitigation Projects” and briefly below in the “Project Prioritization Process” section.

The regularly scheduled meetings of the NHMP Implementation Committee provides an excellent forum for discussions such as those on the status of mitigation actions, new data, and opportunities for funding. An active and well documented implementation process will support the five year update process.

Continued Public Involvement & Participation

The participating jurisdictions and special districts have been dedicated to involving the public directly during the update process for the 2020 NHMP. In addition to the members of the NHMP Implementation Committee, other members of the public should continue to have the opportunity to provide feedback about the 2020 NHMP. Public notification and updates on the objectives and progress of the 2020 NHMP Implementation Committee is important to keep the community aware

of the actions being taken or funding being sought by the group to implement the 2020 NHMP Mitigation Actions.

Among the ways to continue the public outreach begun during the plan update, the coordinating body can:

- Post copies of their meeting notices and agendas on the organizations' websites;
- Submit articles to the local newspaper informing the public about meetings where they can participate in the process and can provide feedback; and
- Use existing newsletters such as those from schools and flyers in regular mailings such as for utility bills to inform the public about meetings where they can participate in the process and can provide feedback.

The 2020 *NHMP* is posted on the County's website at:

The NHMP will also be archived and posted on the University of Oregon Libraries' Scholar's Bank Digital Archive at https://scholarsbank.uoregon.edu and on the Oregon Department of Land Conservation and Development's website at https://www.oregon.gov/lcd/Pages/index.aspx.

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. **With FEMA approval granted in 2020, the Grant County Multi-Jurisdictional NHMP would be due to be updated prior to expiration in 2025.**

Table 7 below offers a 'toolkit' of relevant questions that can assist the convener of the next NHMP update. It may be of use in determining which plan update activities should be discussed during regularly-scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees as the Implementation Committee works to implement the plan.

Table 7. Natural Hazards Mitigation Plan Update Toolkit

Question	Yes	No	Plan Update Action
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			Document changes in vulnerability in the risk assessment section
Do future annexations include hazard prone areas?			Document changes in vulnerability in the risk assessment section
Are there new high risk populations?			Document changes in vulnerability in the risk assessment section
Are there completed mitigation actions that have decreased overall vulnerability?			Document changes in vulnerability in the risk assessment section
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a "success's story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

Source: Oregon Partnership for Disaster Resilience, 2010.