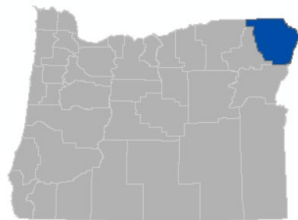


Wallowa County, Oregon

MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

- **Wallowa County**
- **Wallowa Lake County Service District**
- **City of Enterprise**
- **City of Joseph**
- **City of Wallowa**
- **City of Lostine**



- **Wallowa Lake Irrigation District**
- **Wallowa Soil and Water Conservation District**
- **Enterprise School District #21**
- **Joseph School District #6**
- **Wallowa School District #12**



FEMA

Effective December 14, 2022 through December 13, 2027

The 2022 *Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan* is a living document that will be reviewed and updated periodically. It will be integrated with existing plans, policies, and programs. The Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP to receive federal funds for pre- and post-disaster mitigation grants.

Comments, suggestions, corrections, and additions are encouraged to be submitted from all interested parties.

For further information and to provide comments, contact:

Franz Goebel,
Wallowa County Director of Planning
Wallowa County Planning Department
101 S. River St. Room 105
Enterprise, OR 97828
plandir@co.wallowa.or.us
541.426.4543 x 1168



Wallowa County developed this Multi-Jurisdictional Natural Hazards Mitigation Plan through a partnership funded by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation Grant Program. In 2018, the Department of Land Conservation and Development (DLCD) received a Pre-Disaster Mitigation Grant (PDMC-PL-10-OR-2018-005) from FEMA through the Oregon Office of Emergency Management (OEM) to assist Wallowa County with the NHMP.

Acknowledgments

Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan Update Steering Committee

Wallowa County

Franz Goebel, Convener, Planning Director
Paul Karvoski, Emergency Manager
Katy Nesbitt, Natural Resource Department Director
Jean Jancaitis, Planning Specialist
MacKenzie Walters, Planning Specialist

City Of Enterprise

Lacey McQuead, City Administrator
Christie Huston, Planning Assistant

City Of Joseph

Lisa Collier, Mayor
Brock Eckstein, City Administrator pro-tem
Belinda Buswell, Mayor
Larry Braden, City Administrator

City Of Lostine

Toni M. Clary, City Recorder

City Of Wallowa

Scott McCrae, City Council Member
Christian Niece, City Council Member

Wallowa Lake Irrigation District

Dan Butterfield, President
Joe Dawson, Secretary

Wallowa County Soil and Water Conservation District

Cynthia Warnock, District Manager

Wallowa Lake County Service District

Dave Riley, Assistant Manager

Enterprise School District #21

Tom Crane, Superintendent
Erica Pinkerton, Superintendent

Joseph School District #6

Lance Homan, Superintendent

Wallowa School District #12

Dr. Tamera Jones, Superintendent

Oregon Department of Forestry

Joseph M. Goebel, Wildland Forest Supervisor
Matt Howard, Unit Forester

Wallowa Resources

Nils Christoffersen, Executive Director

State and Federal Agencies

Oregon Department of Land Conservation and Development

Patrick Wingard and Marian Lahav

Oregon Department of Geology and Mineral Industries

Matt Williams

Oregon Climate Change Research Institute

Meghan Dalton

Oregon Military Department, Office of Emergency Management

Joseph Murray

Federal Guidance and Review Team

Federal Emergency Management Agency Region X, Mitigation Division

Edgar Gomez

Project Managers

Wallowa County

Franz Goebel, Planning Director and Convener

Oregon Department of Land Conservation and Development

Katherine Daniel, AICP, CFM,
Natural Hazards Planner

Funding for the Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan Update was provided in part by grant PDMC-PL-10-OR-2018-005 from the Federal Emergency Management Agency. Photo credits: (upper right) Zumwalt Prairie, City of Joseph website retrieved 9/9/2021 (upper left) Snow storm moving across Wallowa Lake, Oregon, March 5, 2018, Bonnie Moreland, Flickr (lower right) Wallowa Lake County Park, Wallowa Lake Tourism Guide, wallowalake.net (lower left) Wallowa Lake Dam, Wallowa Lake Irrigation District website, History page

WALLOWA COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

Contents

Volume I: Basic Plan

Introduction	1-1
Risk Assessment	2-1
Mitigation Strategy	3-1
Plan Implementation and Maintenance	4-1

Volume II: Hazard Annexes

Wildfire Hazard Annex	WF-1
Poor Air Quality	AQ-1
Severe Weather Hazard Annex (Extreme Heat, Extreme Cold, Windstorm, and Winter Storm)	SW-1
Drought Hazard Annex	DR-1
Insect Pests, Noxious Weeds, and Invasive Species	IP-1
Landslide and Debris Flow Hazard Annex	LS-1
Earthquake Hazard Annex	EQ-1
Flood Hazard Annex	FL-1
Volcanic Event Hazard Annex	VE-1

Volume III: Resources

Appendix A: Community Profile	A-1
Appendix B: Planning and Public Process	B-1
Appendix C: Mitigation Action Worksheets	C-1
Appendix D: Rapid Visual Screening reports, DOGAMI	D-1
Appendix E: Natural Hazard Risk Report for Wallowa County, Oregon, DOGAMI	E-1
Appendix F: Future Climate Projection Wallowa County Report, OCCRI	F-1
Appendix G: Economic Analysis of Natural Hazard Mitigation Projects	G-1
Appendix H: Grant Programs and Resources	H-1
Appendix I: Resolutions of Approval and Review Tool	I-1

Volume I: Basic Plan

Table of Contents

Acknowledgments	iii
Volume I: Basic Plan	vi
Introduction	1
What is Natural Hazard Mitigation?.....	1
Why Develop a Mitigation Plan?.....	1
What Federal Requirements Does This Plan Address?	1
What State Requirements Does this Plan Address?	2
What is the Policy Framework for Natural Hazards Planning in Oregon?	2
Profile of the Plan Holders.....	3
How was the Plan Developed?	14
How is the Plan Organized?	15
Volume I: Basic Plan	15
Volume II: Hazard Annexes.....	16
Volume III: Mitigation Resources	16
Risk Assessment	16
What is a Risk Assessment?	17
Hazard Identification	18
Wildfire.....	18
Characteristics	18
Poor Air Quality.....	21
Extreme Heat	21
Extreme Cold	22
Windstorm.....	23
Winter Storm.....	25
Drought	26
Insect Pests, Noxious Weeds, and Invasive Species.....	28
Landslide and Debris Flow	29
Earthquake	40
Flood.....	47
Dam Failure	54
Volcanic Event.....	56
Vulnerability Assessment	57
Hazard Vulnerability Assessment.....	60
Community Vulnerability Assessment.....	61
Risk Analysis	70
Critical Facilities at Risk.....	70
DOGAMI Risk Report.....	72
Future Climate Projections.....	82

Mitigation Strategy.....	88
Introduction	88
Mission and Goals.....	88
Mitigation Actions	89
Integration	97
Governmental and Institutional Capacity.....	97
Community Organizations and Programs.....	101
Plan Implementation and Maintenance	102
Assets, Capabilities and Success Stories	102
Implementing the Plan.....	102
Plan Adoption	103
Convener	104
NHMP Implementation Committee.....	104
Implementation through Existing Plans, Programs, and Policies.....	105
Plan Maintenance	105
Meetings.....	105
Continued Public Involvement & Participation	106
Five-Year Review of Plan.....	107

List of Figures

Figure 1.	City of Enterprise Zoning Map	4
Figure 2.	City of Joseph Zoning	5
Figure 3.	City of Wallowa Zoning Map	6
Figure 4.	City of Lostine Zoning Map	7
Figure 5.	Enterprise School District	8
Figure 6.	Joseph School District #6	9
Figure 7.	Wallowa School District	10
Figure 8.	Wallowa Lake Irrigation District	12
Figure 9.	Wallowa County Soil and Water Conservation District Service Areas	13
Figure 10.	Wallowa Lake County Service District	14
Figure 11.	Understanding Risk	16
Figure 12.	Burn Probability Map of Wallowa County, Oregon	19
Figure 13.	Elbow Creek Fire perimeter and Infrared heat mapping	20
Figure 14.	Periods of drought in Wallowa County from January 2013 through June 2021	27
Figure 15.	Wallowa County Landslide Susceptibility and Historic Landslide Points	32
Figure 16.	Wallowa County Landslide Deposits	33
Figure 17.	Imagery of LiDAR topography available for areas of Wallowa County	34
Figure 18.	City of Enterprise - Landslide Susceptibility and LiDAR imagery	35
Figure 19.	City of Enterprise and vicinity – Landslide Deposits and LiDAR imagery	36
Figure 20.	City of Joseph and vicinity – Landslide Susceptibility and LiDAR Imagery	37
Figure 21.	City of Joseph and Vicinity – Landslide Deposits	38
Figure 22.	USGS National Seismic Hazard Map	40
Figure 23.	Active Quaternary Faults and Expected Earthquake Shaking	41
Figure 24.	Wallowa County Geology	42
Figure 25.	2,500-year Probabilistic Earthquake Shaking Map of Wallowa County, Oregon	43
Figure 26.	City of Enterprise Earthquake Liquefaction Hazard	44
Figure 27.	City of Lostine Faults and Earthquake Liquefaction Hazard	44
Figure 28.	Joseph and Wallowa Lake Community Faults and Earthquake Liquefaction	45
Figure 29.	City of Wallowa Faults and Earthquake Liquefaction Hazard	46
Figure 30.	Wallowa County – Special Flood Hazard Areas	49
Figure 31.	City of Enterprise – Special Flood Hazard Areas	50
Figure 32.	City of Joseph – Special Flood Hazard Areas and High Hazard Dam	51
Figure 33.	City of Wallowa – Special Flood Hazard Areas	52
Figure 34.	City of Lostine – Special Flood Hazard Areas	53
Figure 35.	Wallowa Lake Dam – Dam Breach Inundation Map	55
Figure 36.	Building Distribution Map of Wallowa County, Oregon	58
Figure 37.	Population Density Map of Wallowa County, Oregon	59
Figure 38.	Reservations at Wallowa Lake State Park by month	63
Figure 39.	Wildfire Exposure by Wallowa County community	74
Figure 40.	Earthquake loss ratio by Wallowa County community	75
Figure 41.	Landslide susceptibility exposure by Wallowa County community	78
Figure 42.	Flood depth grid example in the City of Enterprise, OR	80
Figure 43.	Ratio of flood loss estimates by Wallowa County community	81
Figure 44.	100-year flood zone and building loss estimates example in City of Enterprise, OR	81
Figure 45.	Climate Modeling Timeline	83

Figure 46.	Climate Modeling Timeline	83
Figure 47.	Representative Concentration Pathways.....	83
Figure 48.	Historical and future time periods averaged for projections.	84
Figure 49.	Annual Average Temperature Projections – Wallowa County	85

List of Tables

Table 1.	Wallowa County Hazard Vulnerability Assessment Exercise Scores.....	61
Table 2.	Selected demographics of Wallowa County compared to Oregon totals.....	66
Table 3.	Critical Facilities Ranked in Relative Order of Risk to Multiple Natural Hazards	71
Table 4.	Assessed Value of buildings Wildfire, Landslide, Earthquake and Flood Risk area	72
Table 5.	2022 Wallowa County Multi-Jurisdictional NHMP Update Mitigation Actions	90
Table 6.	Plans and Policies supported by the Wallowa County Multi-Jurisdictional NHMP	100
Table 7.	Natural Hazards Mitigation Plan Update Toolkit	108

INTRODUCTION

This section provides a general introduction to natural hazard mitigation planning. In addition, Section I: Introduction addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). This section concludes with a general description of how the plan is organized.

What is Natural Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines mitigation as “. . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk.” 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 policy changes, such as updated ordinances, projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as Spanish speaking residents or the elderly. Natural hazard mitigation is the responsibility of the “Whole Community” - individuals, private businesses and industries, state and local governments, and the federal government.

Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities, and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why Develop a Mitigation Plan?

Wallowa County developed this Natural Hazards Mitigation Plan (NHMP) in an effort to reduce future loss of life and damage to property resulting from natural hazards. It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

In addition to establishing a comprehensive community-level 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?

DMA2K is the latest 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 new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved

mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to the individual and their capabilities.

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.¹ Pursuant of Chapter 44 CFR, the NHMP planning processes shall include opportunity for the public to comment on the plan during review, and the updated NHMP shall include documentation of the public planning process used to develop the plan.² The NHMP update must also contain a risk assessment, mitigation strategy and a plan maintenance process that has been formally adopted by the governing body of the jurisdiction.³ Lastly, the NHMP must be submitted to Oregon Military Department – Office of Emergency Management for initial plan review, and then federal approval.⁴

What State Requirements Does this Plan Address?

To be eligible to apply for the Federal Emergency Management Agency's (FEMA) financial and technical assistance provided through the Emergency Management Performance Grant (EMPG) applicants must have a current and FEMA approved local Natural Hazard Mitigation Plan. Plans under review by FEMA, or in the draft/ update phase are considered as those meeting the eligibility requirements for funding consideration. EMPG funds are provided for the development of an all-hazard emergency management capability to promote preparedness, mitigation, response, and recovery.

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 Statewide Land Use Planning Goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this plan aligns with the goals of the 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

¹Code of Federal Regulations. Chapter 44. Section 201.6, subsection (a). 2010

² Ibid, subsection (b). 2010

³ Ibid, subsection (c). 2010

⁴ Ibid, subsection (d). 2010

Department of Geology and Mineral Industries (DOGAMI), and the Department of Land Conservation and Development (DLCD).

Profile of the Plan Holders

Each of the Plan Holders is exposed to natural hazards in particular manners. Each has assets that are at risk of damage due to these hazards. Those specific vulnerabilities are discussed in more detail in Volume III, Appendix A: Community Profile. They are briefly described below and are referenced in Volume II with respect to natural hazards which impact the special districts in particular.

In general, little change in development has occurred in Wallowa County during the effective period of the prior plan. The potential for future development is of most concern in the Wildland Urban Interface areas of the county.

Wallowa County

Wallowa County is remote. Enterprise, the Wallowa County seat, is 65 miles from the nearest freeway. There are highways that enter the county - Oregon Highway 3, from Enterprise north to the Washington border; Highway 82, from the Union-Wallowa County border to Joseph and U.S. Forest Road 39, that is closed 20 miles southeast of Joseph once winter snow begins to accumulate - usually late November or early December. If Highway 3 or Highway 82 are closed due to a vehicle wreck, landslide, avalanche, snow pile-up, wildfire, or flood, public safety would be at risk and shipments, especially food, would be interrupted, if the closure lasted several days.

With respect to the risk of wildfire, it can destroy private property, threaten public safety, cause injuries and loss of life. Temporarily it can disrupt ingress and egress on the county's two main highways and long term they can reduce the amount of harvestable timber, forageable grass, available habitat, and disrupt life cycles of native plants. Wildfires also disrupt soil stability, leading to landslides that can take out forest stands, harm habitat, and pollute adjacent streams, potentially killing fish. Wildfires can cost government agencies millions of dollars, landowners and managers valuable timber and pasture, close recreation trails, and create smoky inversions that dissuade tourism.

What is also at risk from natural hazard events in Wallowa County are health, safety, and life. Power outages from snow or windstorms interrupt business, commerce, education, and health care delivery. Storms can create dangerous driving conditions leading to crashes that can cost thousands of dollars, injuries, or loss of life.

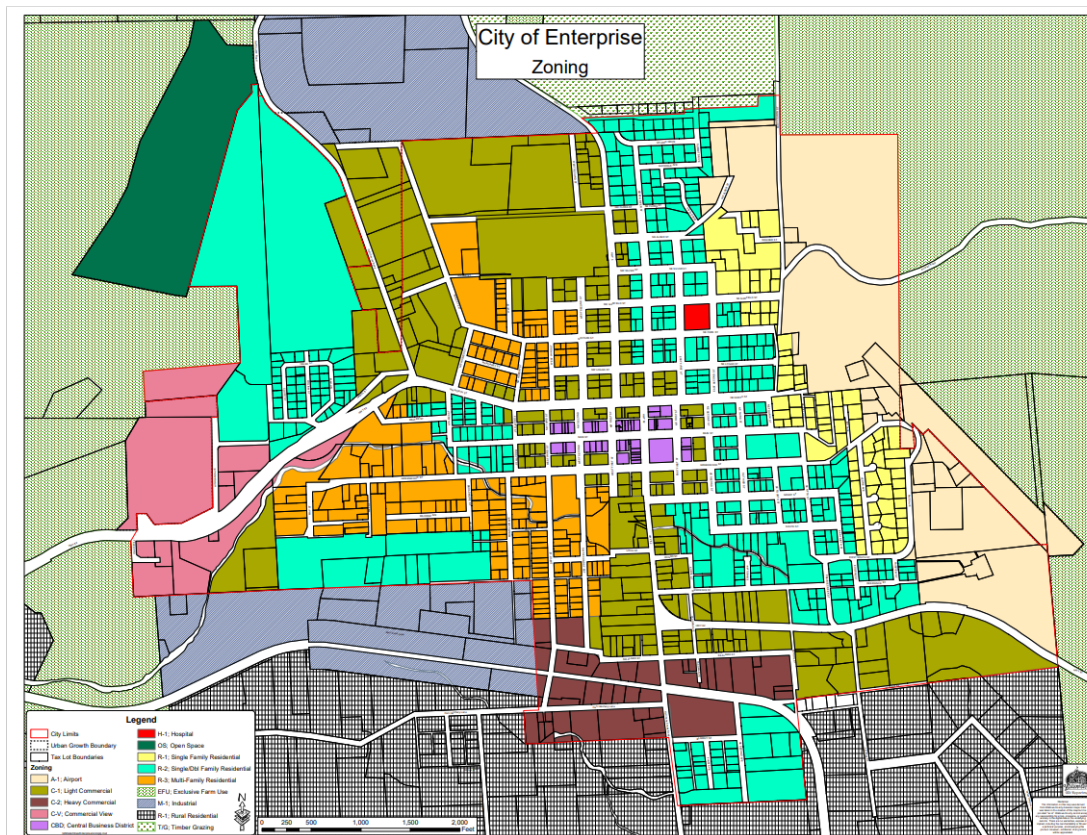
The county depends on staff to be resilient to natural hazard events. The Emergency Services Manager, Planning Director, Planning Dept. Assistant, Natural Resources Director, Board of Commissioners, Sheriff's Office, and Search and Rescue crew are paramount in this effort. The priorities of the county for improvements that mitigate the risk from natural hazard events includes supporting the U.S. Forest Service's forest health projects, ensuring the county's Community Wildfire Protection Plan and Smoke Management Community Response Plan are followed, communication with the county's cities, and use of the revised Natural Hazard Mitigation Plan.

City of Enterprise

Founded in 1889, Enterprise Oregon is located in the northeast corner of Oregon. Enterprise is the County Seat and the largest town in Wallowa County with 1,940 residents. Enterprise has both a new hospital and a new sewer system. Enterprise High School boasts a 100% graduation rate and a teacher student ratio of 1:13, one of the lowest in the state.

The City of Enterprise is the jurisdiction within Wallowa County with the most risk of Flood. The Wallowa River bisects the city and is surrounded by county land containing a number of rivers and streams that contribute to the risk of flooding in the City of Enterprise.

Figure 1. City of Enterprise Zoning Map



Source: City of Enterprise website consulted May 2022 [Zoning-Map.pdf \(enterpriseoregon.org\)](https://enterpriseoregon.org/Zoning-Map.pdf).

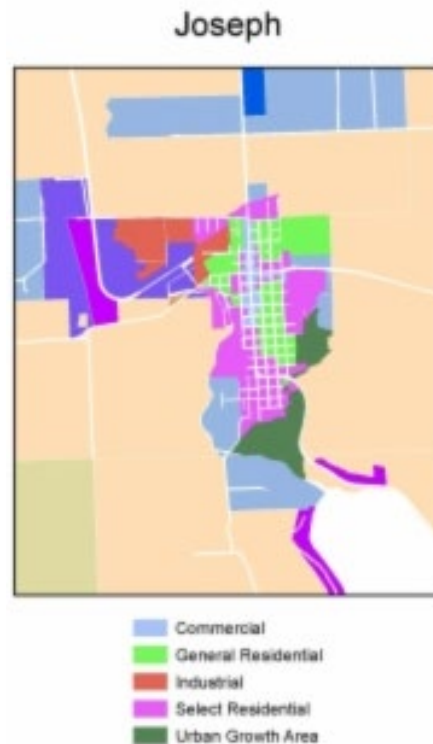
City of Joseph

The City of Joseph was incorporated in 1887 and sits at the foot of the Wallowa Mountains just north of Wallowa Lake and the Wallow Lake Dam. Joseph was platted in 1883, and the economy was originally based around agriculture, especially grain and stock. After a railroad line was completed to Joseph in 1908, a lumber mill opened, bolstering the economy. When the timber industry collapsed in the 1980s, local unemployment rate approached 17%. However, in 1982 a new industry was born as three bronze foundries opened in the local area.

The city sponsors the annual Chief Joseph Days Rodeo in late July, Bronze, Blues and Brews in August since 2001, and Alpenfest in September, a Swiss-Bavarian festival staged in Joseph and at nearby Wallowa Lake.

The City of Joseph is at particular risk from Dam Failure and Windstorm. The Wallowa Lake Dam retains water used for irrigation in the county but has been operating at reduced capacity since 1996. In 1996 the Wallowa Lake Dam was listed as High Hazard by Oregon Water Resources Department Dam Safety. The City of Joseph also experiences some of the highest wind events in the county.

Figure 2. City of Joseph Zoning



Source: Wallowa County website [Map Images - Wallowa County, Oregon](#)

City of Wallowa

In 1872, the Bramlet, Findley, Johnson, Powers, Schaeffer, and Tulley families were some of the first settlers to establish their homes and farms in the area. In 1873, a post office was established near Wallowa, the first post office in what later became Wallowa County.

The City of Wallowa was platted in 1889 and incorporated in 1899. A new school was built in 1899 to serve 300 students from grades 1 through 8. Leonard Couch opened the Wallowa Academy to provide high school classes in business, normal and academic. C.T. McDaniel and Leonard Couch started printing a newspaper, The Wallowa News, in May, 1899.

During the years from 1899 to 1907, a water works system, an electric light plant, telephones, and a plank sidewalk were some of the improvements made. The Marvin Brothers and John Huber were among the first to operate sawmills, which provided lumber for new homes and businesses.

In 1908, the O.R.&N. railroad reached Wallowa, providing the transportation for increased logging.

Today the city is governed by five elected officials - the Mayor, and four City Councilors and is home to Wallowa School District.⁵

The City of Wallowa experiences risk from Flood due to its location on the south side of the Wallowa River. The city has recently voted to approve a bond to complement funding secured for seismic retrofitting of school buildings in the city. This will reduce risk to the city from earthquake.

Figure 3. City of Wallowa Zoning Map



Source: Wallowa County website [Map Images - Wallowa County, Oregon](#)

⁵ City of Wallowa Website [About - CITY OF WALLOWA, OREGON \(weebly.com\)](#)

City of Lostine

The City of Lostine was named after a place by the same name in Cherokee County, Kansas, that served as the site of a short-lived farmers' post office in the 1870's. Lostine established a post office in August 1878 where W.R. Laughlin was the first postmaster. The city is located along Oregon Route 82 about halfway between Wallowa and Enterprise and near the Lostine River. The city was platted in 1884 and incorporated in 1903 by G.E. Laughlin.^{6 7}

Today the town is home to the South Fork Grange, M. Crow and Co. General Store and Blue Banana, a local coffee shop. This small town of around 209 people is surrounded by crop and ranch land in the Wallowa valley sitting at about 3360 feet above sea level.

The City of Lostine is at moderate risk of Flood due to its location adjacent to the Lostine River. Many of the structures adjacent to the river are elevated above the floodplain, however, the FEMA Special Flood Hazard Area map developed in the 1980's does not reflect this change in elevation adjacent to the river.

Figure 4. City of Lostine Zoning Map



Source: Wallowa County website [Map Images - Wallowa County, Oregon](#)

⁶ Wikipedia entry [Lostine, Oregon - Wikipedia](#)

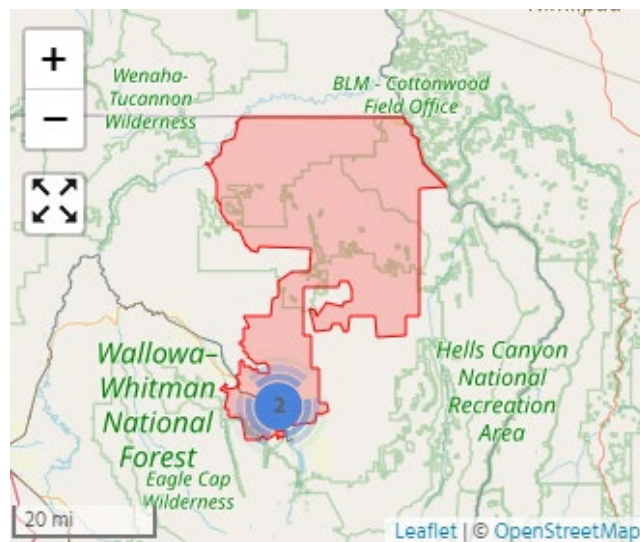
⁷ City of Lostine website [ABOUT | City of Lostine](#)

Enterprise School District #21

Enterprise School District is located within the City of Enterprise and serves adjacent areas within the county. The staff of the district includes 2 administrators, 28 teachers, and 15 educational assistants who serve 406 students.⁸ The school buildings are included in Appendix D.

The Enterprise School District is at risk of damage from Earthquake with few of its structures having been constructed under seismic building codes or having been retrofitted to withstand damage from earthquake. The Rapid Visual Assessments conducted by the Oregon Department of Geology and Mineral Industry in 2006 (included in Appendix D) reported that both the Enterprise Elementary School and the Enterprise High School buildings are unreinforced masonry buildings with high potential collapse in an earthquake.

Figure 5. Enterprise School District



Source: [Enterprise 21 School District \(2022\) | Enterprise, OR \(publicschoolreview.com\)](#)

⁸ [2019-20 Adapted At-A-Glance Profile \(oregon.gov\)](#)

Joseph School District #6

The Joseph School District operates a K-12 Charter School located in Joseph, Oregon and it also operates Imnaha Elementary school located in Imnaha, Oregon. The district staff include 20 teachers who serves 237 students.⁹

The Joseph School District is at particular risk from Windstorm and high wind events due to the location of the Joseph school on elevated land within the City of Joseph. Joseph High School may be at high risk of collapse during an Earthquake event based on the Oregon Department of Geology and Mineral Industry Rapid Visual Assessments conducted in 2006 (see Appendix D). The Imnaha Elementary School is at risk of Flood due to its location along the Imnaha River in unincorporated Wallowa County.

Figure 6. Joseph School District #6



Source: [Joseph 6 School District \(2022\) | Joseph, OR \(publicschoolreview.com\)](#)

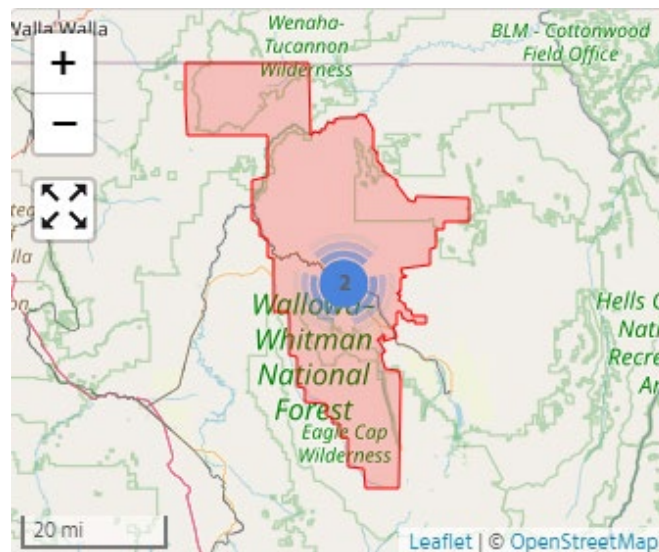
⁹ [Joseph 6 School District \(2022\) | Joseph, OR \(publicschoolreview.com\)](#)

Wallowa School District #12

The Wallowa School District operates two schools located in the City of Wallowa. The district staff includes 18 teachers, and the district serves 173 students pre-kindergarten through 12th grade in buildings that are detailed in the Rapid Visual Assessments in Appendix D.

The district facilities are at risk from Earthquake, a fact that has led the district to seek funding for assessment of this risk and subsequent funding for seismic retrofitting of one of its buildings. The district has secured grant funding and matching school bonds to seismically retrofit the gymnasium, the Cougar Dome.

Figure 7. Wallowa School District



Source: [Wallowa 12 School District \(2022\)](#) | [Wallowa, OR \(publicschoolreview.com\)](#)

Wallowa Lake Irrigation District

The Wallowa Lake Dam is owned and operated by Wallowa Lake Irrigation District. It serves around 173 patrons in its district, and directly irrigates just over 16,000 acres in the Wallowa Valley. The district is at particular risk from Dam Failure and Earthquake that may cause damage to the dam.

At full capacity the dam is able to store approximately 52,000 acre-feet of water. Although the district serves roughly 16,000 acres directly, it is estimated that the water that is stored and flows from Wallowa Lake benefits 37,000 acres throughout the county. The estimates on the value of this water stored in Wallowa Lake to the Wallowa County economy is estimated to be \$36,079,000 or \$457/per acre-foot per year, it is also projected that the value of this water to Wallowa County and its residents to be between \$11,647 and \$14,873 per acre-foot.¹⁰

The Wallowa Lake Dam is located at the northern end of Wallowa Lake. The original curved section of the dam was constructed in 1919 on the natural outlet of Wallowa Lake. It was raised 3 feet the

¹⁰ John Williams, 2015, "The Value of Irrigation Water in the Wallowa Valley, Northeast Oregon"

following year and raised an additional 5 feet in 1929. Since 1979 Dam safety inspections have occurred semi-annually. In 1996 the Wallowa Lake Dam was listed as High Hazard by Oregon Water Resources Department Dam Safety. This has forced the Wallowa Lake Irrigation District to operate the dam at 72% capacity. The WLID funds operations and could fund mitigation actions through assessments, state and federal grants and loans.

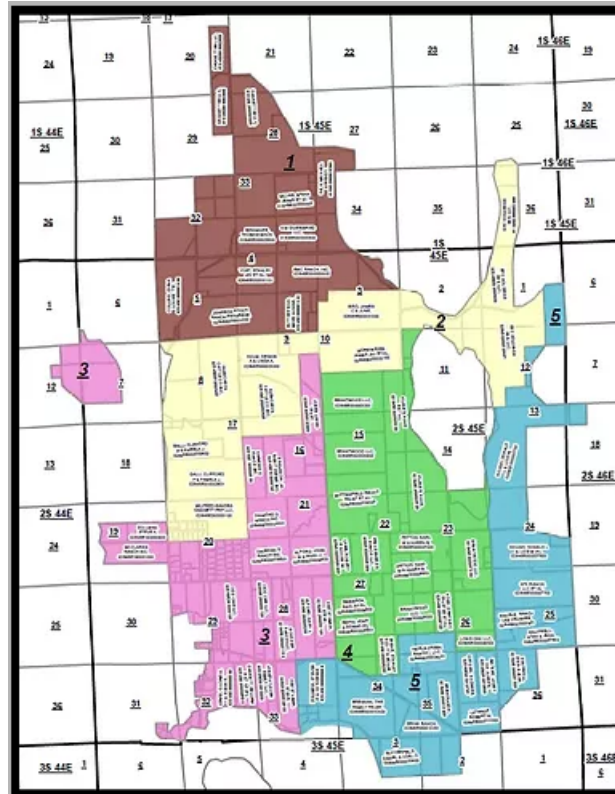
The population at risk was evaluated by OWRD using the screening tool DSS-WISE. This analysis concluded that 1,131 people are at risk during the daytime and 1,334 people are at risk during the nighttime.¹¹ The WLID manages this risk by maintaining good communication with the District Manager who monitors the dam, as well with the WLID's engineering firm, Oregon Water Resources Department, and other agencies monitoring weather and snowpack.¹²

The WLID has worked with the Wallowa County Commissioners Todd Nash, Susan Roberts and John Hillock, and State Senators Ron Wyden and Jeff Merkley to provide support for repairs to the dam and evidence of the need to repair the Wallowa Lake Dam to continue to provide flood control and irrigation water for the district's farmers and ranchers. Keith Mills, State Engineer for Water Resources and Dam Safety Program Manager, and his successor, Tony Janicek, collaborated with the WLID to provide semi-annual assessments, oversight, and safety guidance as the WLID developed a plan to repair the dam.

Recent legislation has been passed allowing the State of Oregon to obligate \$14 million in state lottery funds for the estimated \$16 million refurbishment of the Wallowa Lake Dam. Although the estimate for rehabilitation of the dam made in 2014 amounted to a total of \$16 million, actual costs may be greater due to inflation and other variables including the type of fish passage approved for this dam.

¹¹ Citation needed

¹² Personal communication with Joe Dawson, WLID secretary, 10/2021

Figure 8. Wallowa Lake Irrigation District

Source: [Wallowa Lake Irrigation District website](#)

Wallowa Soil and Water Conservation District

The Wallowa Soil and Water Conservation District (Wallowa SWCD) is governed by a board of District Directors comprised of a Chairman, Vice Chairman, Secretary/Treasurer and four regular members. The District Manager conducts the daily business of the district and is supported by a staff of conservationists. The Wallowa SWCD serves all of Wallowa County.

The district aids the community by applying for grants, working with NRCS and other partners, to provide financial and/or technical assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forest land.¹³

The district serves a people who manage the effects of Extreme Heat, Drought, and in particular Insect Pests, Noxious Weeds, and Invasive Species. Programs to identify and eradicate these species are among their most important services.

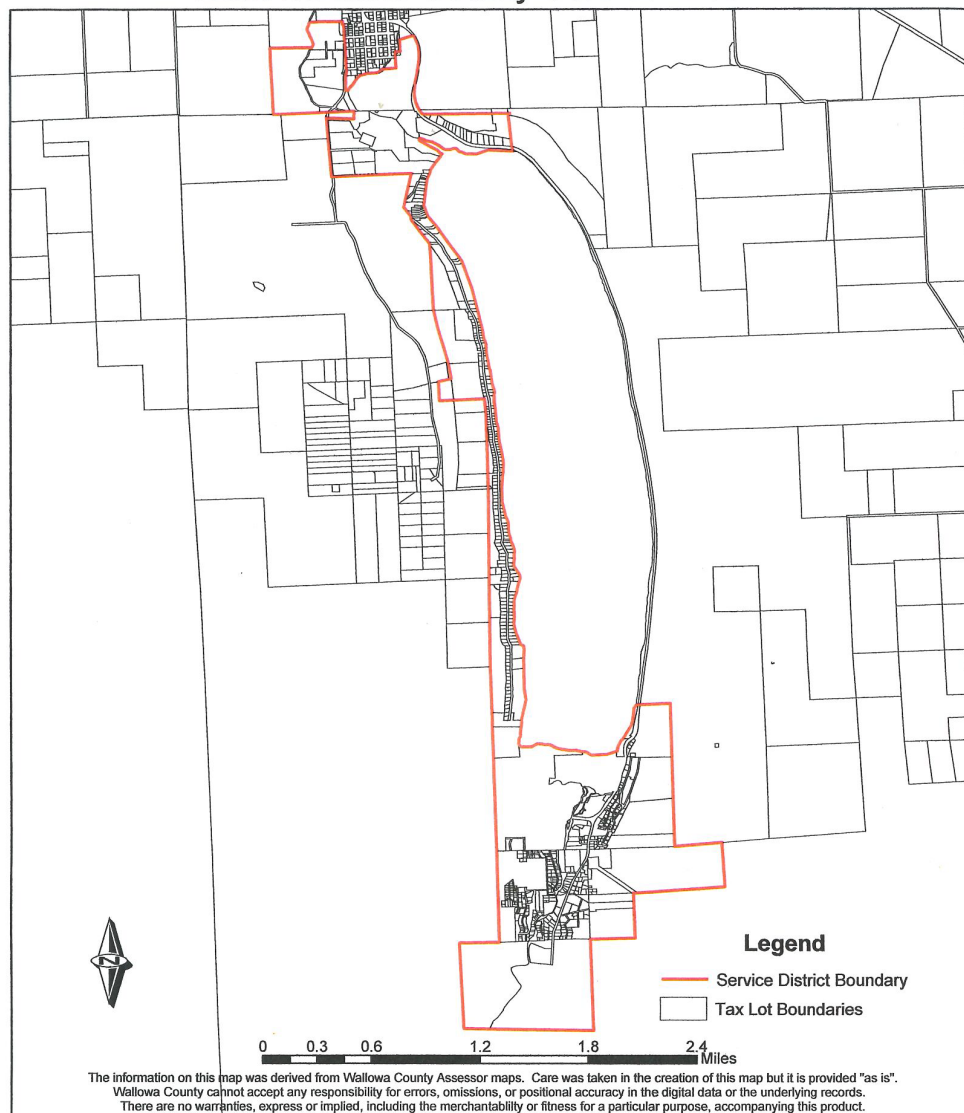
¹³ Personal communication, Cynthia Warnock, District Manager, August 2022.



The Wallowa Lake County Service District provides sewer and water service to a community of residents at the head of Wallowa Lake. The WLCSD serves approximately 380 customers.

The district is run by two staff members, including the Operator of these utilities who works full time at the district and is certified to run both water and sewer operations. The Operator's assistant fills that role in his absence and manages the administration of the district's operations. The district charges the property owners in the district for water and sewer services. It is also a county entity and has the county's resources to rely on.

Wallowa Lake County Service District infrastructure is at particular risk from Earthquake due to the potential for damage to sewer and water distribution lines.

Figure 10. Wallowa Lake County Service District

Source: Dave Riley, personal communication, May 2022

How was the Plan Developed?

The steering committee for Wallowa County developed this plan in collaboration with representatives from the four incorporated cities (Enterprise, Joseph, Wallowa and Lostine) as well as three school districts (Wallowa School District, Enterprise School District and Joseph School District), the Wallowa Soil and Water Conservation District, the Wallowa Lake Irrigation District, and the Wallowa Lake Service District. The Wallowa County NHMP update Steering Committee formally convened on ten occasions to discuss and revise the plan. Steering committee members contributed data and maps and 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. In order to develop a comprehensive approach to reducing the effects of natural disasters, the planning process

includes opportunities for the public, neighboring communities, local and regional agencies, as well as private and non-profit entities to comment on the plan during review.¹⁴ The Wallowa Lake County Service District provided information to its members through a regular mailing. The Wallowa Soil and Water Conservation District included information on the NHMP update in its newsletter. In addition, the county created a webpage for the draft plan on their website to encourage the public to offer feedback on the plan update.

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 region-wide mitigation planning efforts and the methodology used to develop the plan.

Section 2: Risk Assessment

Section 2 provides the factual basis for the mitigation strategies contained in Section 3. Appendix A contains an overall description of the participating jurisdictions and special districts. This section includes a brief description of community sensitivities and vulnerabilities and an overview of the hazards addressed in Volume II of this plan. The Risk Assessment allows readers to gain an understanding of each of the county's, and other jurisdictions', sensitivities – those community assets and characteristics that may be impacted by natural hazards, as well as each of the county's, and other jurisdictions', resilience – the ability to manage risk and adapt to hazard event impacts. Additionally, this section provides information on the jurisdictions' participation in the National Flood Insurance Program (NFIP).

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 sensitivity 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.

¹⁴Code of Federal Regulations. Chapter 44. Section 201.6, subsection (b). 2010

Volume II: Hazard Annexes

The hazard annexes describe the risk assessment process and summarize the best available local hazard data. A hazard summary is provided for each of the hazards addressed in the plan. The summary includes hazard history, location, extent, vulnerability, impacts, and probability.

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

- Wildfire
- Poor Air Quality
- Severe Weather including Extreme Heat, Extreme Cold, Windstorm, and Winter Storm
- Drought
- Insect Pests, Noxious Weeds, and Invasive Species
- Landslide and Debris Flow
- Earthquake
- Flood including Dam Failure
- Volcanic Events

Volume III: Mitigation Resources

The resource appendices are designed to provide the users of the Wallowa County NHMP with additional information to assist them in understanding the contents of the mitigation plan and provide them with potential 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 regions sensitivity and resilience to natural hazards. The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the region when the plan was updated. Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs).

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: Mitigation Action Worksheets

This appendix contains the detailed action item forms for each of the mitigation strategies identified in this plan.

Appendix D: Rapid Visual Surveys

This appendix contains the Rapid Visual Surveys conducted by DOGAMI

Appendix E: Natural Hazard Risk Report for Wallowa County, Oregon, DOGAMI

This appendix contains the full report excerpted within the NHMP

Appendix F: Future Climate Projection Wallowa County Report, OCCRI

This appendix contains the full report excerpted within the NHMP.

Appendix G: Economic Analysis of Natural Hazard Mitigation Projects

This appendix describes the Federal Emergency Management Agency's (FEMA) requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities. 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 H: Grant Programs and Resources

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

Appendix I: Resolutions of Approval and Review Tool

This appendix contains the resolutions of approval for each plan holding jurisdiction and the final FEMA Review Tool for the plan.

RISK ASSESSMENT

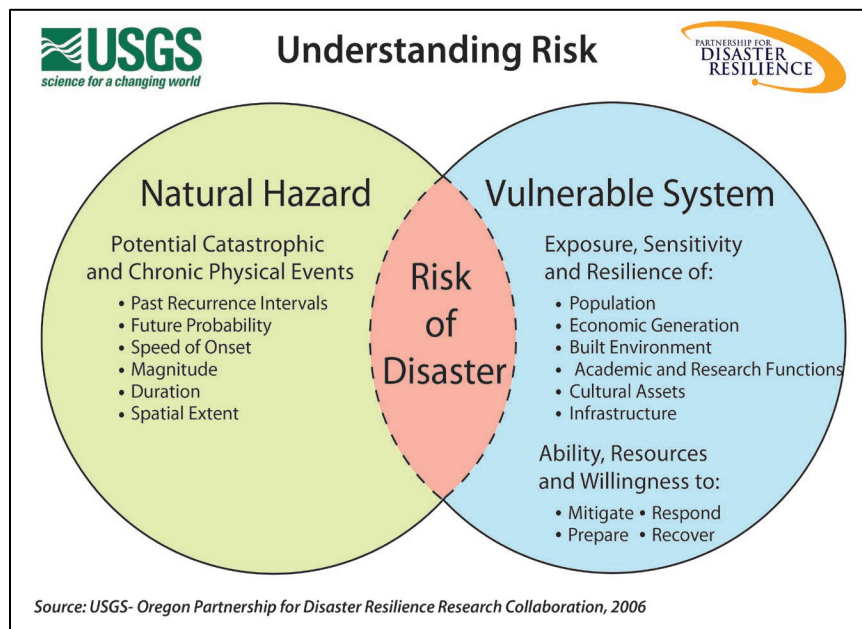
This chapter serves as the factual basis for Wallowa County to address Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. In addition, this section of the Natural Hazards Mitigation Plan (NHMP) addresses 44 CFR 201.6(b)(2) - Risk Assessment.

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 (Volume II) and community characteristics presented in the Community Profile (Volume III: Appendix A) will be used as the local level rationale for the risk reduction actions identified in the Mitigation Strategy (Volume I: Section 3). The risk assessment process is graphically depicted in Figure 1 below. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

Figure 11. Understanding Risk



Source: Oregon Partnership for Disaster Resilience

What is a Risk Assessment?

A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis, as illustrated in the graphic in Figure 9.

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.¹⁵

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.¹⁶

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 analysis draws upon four sources: the 2014 Northeast Oregon Natural Hazard Mitigation Plan, and a Hazard Vulnerability Assessment exercise conducted with Wallowa County NHMP Steering Committee using the method developed by FEMA Region X and OEM, and the list of Local Essential and State-owned and Leased Properties for Wallowa County contained within the 2020 Oregon Natural Hazard Mitigation Plan. This list was evaluated and revised by the Wallowa County Steering Committee to develop the list provided in Table 3 of Critical Facilities. The value and area of these structures comprises the data used to estimate potential losses.

The fourth source of information for the risk analysis is the Department of Geology and Mineral Industry (DOGAMI) Multi-Hazard Risk Report that utilizes HAZUS-MH analysis and geospatial analysis for Wallowa County. HAZUS-MH stands for Hazards U.S. – Multi-Hazard and it is a software program that joins current scientific and engineering knowledge with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after a disaster occurs. The geospatial analysis includes both loss estimates (in dollars) to buildings from flood (recurrence intervals) and earthquake scenarios using FEMA Hazus®-MH methodology, and (2) calculated number of buildings, their value, and associated populations exposed to earthquake, and flood scenarios, or susceptible to varying levels of hazard from landslides and wildfire.¹⁷

¹⁵Burby, R.1998.Cooperating with Nature. Washington, DC: Joseph Henry Press.

¹⁶Ibid.

¹⁷ Multi-Hazard Risk Report for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021, Appendix E to this report

Hazard Identification

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

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 location of development¹⁸. 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 and Extent

According to 2017 Wallowa County Wildfire Protection Plan and the local vulnerability assessment, there is potential for loss due to WUI fires in Wallowa County. Fire prone areas cover a large portion of the county and are present in developed areas in the county. There are also primary areas of exposure to this hazard located in the forested unincorporated areas of the county that have not already experienced recent burns.¹⁹

To show the extent of Wildfire risk in Wallowa County this analysis utilizes the Burn Probability dataset contained in the US Forest Service's Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results (PNRA).²⁰ The PNRA 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, included in the PNRA database, was used to assess the risk

¹⁸ Pyrologix LLC, 2018, Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results, final report, report to Oregon Department of Forestry and others, 86 p.

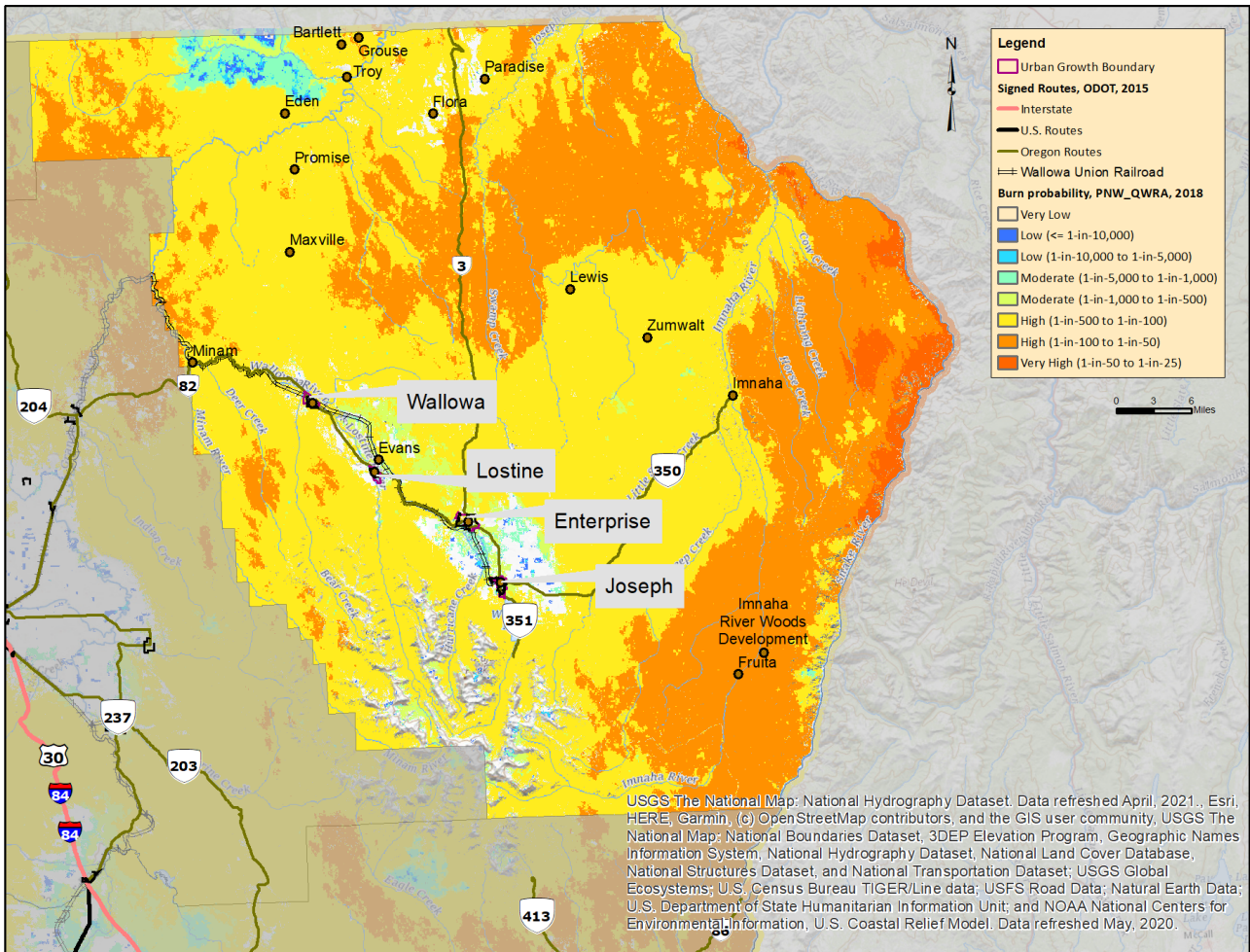
http://oe.oregonexplorer.info/externalcontent/wildfire/reports/20170428_PNW_Quantitative_Wildfire_Risk_Assessment_Report.pdf

¹⁹ Wallowa County Wildfire Protection Plan, 2017

²⁰ PNRA; Pyrologix LCC, 2018

to communities in Wallowa County.²¹ Figure 10 represents this data countywide using seven divisions of burn probability.

Figure 12. Burn Probability Map of Wallowa County, Oregon



Source: Oregon Wildfire Explorer, Pacific Northwest Quantitative Wildfire Risk Assessment, USFS, 2018.

https://tools.oregonexplorer.info/OE_HtmlViewer/index.html?viewer=wildfireplanning

Critical facilities that are located in areas of high wildfire probability or greater include two aircraft landing strips both operated by the USFS that provide important emergency access to wilderness areas of the county (Memaloose Airport and Red's Wallowa Horse Ranch). Within the community of Imnaha and the Wallowa Lake community several Critical Facilities are within areas with High Probability of Wildfire. In Imnaha these include the Imnaha Christian Fellowship, Imnaha Elementary, Imnaha Store and Tavern. In Joseph and the Wallowa Lake community Critical Facilities located in High Probability areas for Wildfire include the OPRD Wallowa Lake State Park facilities, and Wallowa Lake Fire Station. In the northern section of the county Troy Elementary School,

²¹ Multi-Hazard Risk Report for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021

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

Poor Air Quality

Characteristics

Communities across Oregon have begun to recognize the impacts of inversion layers trapping particulates in smoke from wood stove, prescribed fire, wildfire, and field burning as a natural hazard. The nature of air movement or stagnation in a valley causes inversion layers to form. At the valley floor daytime temperatures heat the air. In the evening, air further up the slope of the mountains cools faster than the air lower down the slope. Because cool air is slightly heavier than warm air, the cool air sinks into the valley which displaces the warm air above it to form a “lid”. If the weather creates stagnant conditions this inversion “lid” may persist trapping air pollutant discharges to create poor air quality.

Air quality can be affected by several types of pollutants including ozone, particulate matter, air toxics (such as benzene), greenhouse gases (such as carbon dioxide), and products of combustion (such as carbon monoxide, sulfur dioxide and NO_x). Among these, particulate matter with particles 2.5 microns or smaller (PM_{2.5}) is the pollutant of highest concern in Wallowa County.

Location and Extent

Location and extent are difficult to determine because there is only one air quality monitoring station in the county. Poor Air Quality has seasonality in that inversion layers tend to form from November to February. Once air temperatures warm the inversion layer conditions dissipate. During the summer months from June through August high pressure weather systems can remain in place for an extended period resulting in the accumulation of airborne particles in the lower levels of the atmosphere affecting the air quality.

Poor Air Quality Events 2014-2021

There have been periods of several consecutive days with Unhealthy Air Quality in Wallowa County during the months of August or September in 2015, 2017 and 2020.

Full details of the hazard posed by poor air quality can be found in Volume II, Poor Air Quality Hazard Annex.

Extreme Heat

Characteristics

The Wallowa County NHMP update Steering Committee elected to further specify the types of Severe Weather experienced as natural hazard events in Wallowa County. They determined that Extreme Heat and Extreme Cold posed distinct types of threats to the population, so they were identified as individual natural hazards.

The Wallowa County NHMP Steering Committee (SC) provided a preliminary benchmark to determine whether and Extreme Heat event has occurred. They identified an Extreme Heat event as four consecutive days during which the temperature reaches 100 °F or higher. They noted that although this is not a frequent occurrence, it is of concern due to the vulnerability of the population to such an event.

Location and Extent

The location and extent of Extreme Heat events may be determined by elevation. Temperatures are highest on the valley floor. The Wallowa Valley is home to most of the county's population. The Imnaha River valley is also another area that experiences high temperatures during the summer months.

Extreme Heat Events 2014-2021

A review of the daily maximum high temperatures during this update period shows two events when the daily maximum temperature in Enterprise reached 100 °F or higher for two days in a row (August 8-9, 2018, and June 29-30, 2021).²⁴ This does not rise to the level of an Extreme Heat event as determined by the Steering Committee. Recorded temperatures for other locations may reveal periods where the temperature reached 100 °F or higher for four days in a row constituting an Extreme Heat event.

Climate predictions offered by the Oregon Climate Change Research Institute (OCCRI) indicate that more periods of higher-than-normal temperatures can be expected.²⁵ Wallowa County and the incorporated cities can take the opportunity to prepare for this eventuality and prepare to provide relief from the effects of this hazard before it worsens.

Full details of the hazard posed by extreme heat can be found in Volume II, Sever Weather Hazard Annex.

Extreme Cold

Characteristics

Extreme cold events can be defined similarly -- where conditions get so severe that health related illnesses occur.²⁶ The Wallowa County NHMP SC provided a similar preliminary benchmark to identify an Extreme Cold event. Unlike Extreme Heat, Extreme Cold is a more common occurrence in Wallowa County. The SC defined an Extreme Cold event as four consecutive days during which the temperature drops to 0 °F or below.

²⁴ [Personal Weather Station Dashboard | Weather Underground \(wunderground.com\)](https://www.wunderground.com/personal-weather-station/dashboard)

²⁵ Oregon's Fifth Climate Assessment, 2021, OCCRI

²⁶ Taylor, George H. and Chris Hannan. The Oregon Weather Book. Corvallis, OR: Oregon State University Press. 1999

Location and Extent

The location of Extreme Cold events is influenced by elevation. Wallowa County is known for the dramatic rise of the mountains from the valley floor. In the winter months the coldest temperatures are experienced at the highest elevations. Nevertheless, extreme cold can affect residence of valley floor locations as well.

Extreme Cold Events 2014-2021

Data recorded at the Enterprise School weather station recorded two Extreme Cold weather events during the update period. There was a four-day period between December 31, 2015-January 3, 2016 during which the lowest temperature reached was -5.2 °F. There was another three-day period the previous winter from December 30, 2014-January 1, 2015, when the temperature dipped to -5.9 °F.²⁷

There were two other periods with two days where the temperature dipped below 0 °F; February 6-7, 2019, and December 23-24, 2017. A measurement of -7.9 °F recorded on 12/24/17 was the lowest temperature recorded during the update period at this weather station. There were four other individual nights when the temperature was below 0 °F.²⁸

Full details of the hazard posed by extreme heat can be found in Volume II, Sever Weather Hazard Annex.

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.

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 widespread damage. Although rare, tornados can and do occur in Wallowa County with a particularly destructive tornado having occurred in Wallowa County on June 11, 1968. The NOAA Storm Event Database states that this tornado which was ranked a Category 7 tornado may be "possibly the strongest tornado to strike the Northwest". Damage ranging between \$5

²⁷ [Personal Weather Station Dashboard | Weather Underground \(wunderground.com\)](#)

²⁸ Ibid.

million and \$50 million in destruction of timber land was reported and the storm was accompanied by 1.75" diameter hail.²⁹ 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 recent Joseph Canyon fire where extremely steep topography and windy conditions rendered firefighting operations very difficult.³⁰

Location and Extent

The damaging effects of windstorms may extend for distances of 100 to 300 miles from the center of storm activity. Windstorms in Wallowa 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.³¹

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.³²

Windstorm Events 2014-2021

The NOAA Storm Event Database recorded six High Wind events in Wallowa County during the update period.

On January 11, 2014, in the Northern Blue Mountains strong winds moved into the interior Pacific Northwest over the January 10-12th weekend. In Wallowa, a roof peeled off a house was reported on our social media. Wind gusts of 59 mph were reported north of Joseph among other places.

On December 10-11, 2014, in the Northern Blue and Wallowa Mountains a few gusts ranging from (68-75 mph) near Joseph.

On February 5, 2015, in Enterprise strong wind gusts resulted in several reports of damage. In Joseph wind gusts of 86 mph were recorded. A 55-foot ham radio tower was lost in the wind event. A tree fell on a house in Enterprise and there were power outages reported in Wallowa County.

On October 14, 2016, in Joseph a fast-moving squall developed and produced brief but strong wind gusts. Wind gust reports varied from 60 mph in the Joseph area.

On November 26, 2017, in the Wallowa Valley locally high wind gusts occurred near the south end of the valley due to a low-pressure system moving through southeast Washington state.

²⁹Taylor, 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.

³⁰ [Fire season starts early in Wallowa County | wallowa.com](https://www.wallowa.com/), Wallowa County Chieftain, June 8, 2021

³¹Natural Hazards Mitigation Plan Risk Assessment Meetings

³² Taylor, George H., Holly Bohman, and Luke Foster. August 1996. *A History of Tornadoes in Oregon*. Oregon Climate Service. Corvallis, OR: Oregon State University.

On November 17, 2020, in Wallowa County 3 miles north of Joseph a trained spotter measured a wind gust of 79 mph. Two irrigation pivots were overturned. Trees and power lines were reported down.

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

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 Wallowa County typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March.³³

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 and Extent

All of Wallowa 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 2014-2021

Thirty-eight days with Heavy Snow or Ice Storm events in Wallowa County were logged by the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information storm event database for the period between January 1, 2014, and July 16, 2021³⁴.

Each winter in the update period included one to several Heavy Snow events. The latter half of December 2016 (December 4-27) was characterized by a series of storms and low-pressure troughs moving through the eastern mountains dumping up to 12 inches of snow at a time on Wallowa County.

³³Interagency Hazard Mitigation Team. 2012- Oregon Natural Hazards Mitigation Plan. Salem, OR: Oregon Military Department – Office of Emergency Management

³⁴ NOAA Storm Event Database consulted January 2020.

The February 2020 storm events resulted in a Federal Disaster Declaration for Umatilla, Union, and Wallowa Counties (DR-4519). Executive Order 20-01 declared the winter storms that began February 6, 2020, caused “flooding, increased snowmelt, landslides, and erosion...resulting in persons needing rescue, damage to homes, critical transportation failures, loss of power and communications capabilities, and emergency mass care needs.”³⁵

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

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 large portion of Wallowa County businesses and drought therefore affects the economic stability of the county. The environmental consequences of drought also are far-reaching. They include worsening insect infestations in forests and diminishing in-stream flows of water to support threatened and 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.³⁶

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 are raging from the Arctic to the Mediterranean and West Coast of North America³⁷.

Location and 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.

³⁵ Oregon Governor’s Executive Order 20-01 [eo_20-01.pdf \(oregon.gov\)](https://www.oregon.gov/GOV/Pages/eo_20-01.pdf)

³⁶ 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%.

³⁷ World Meteorological Organization. “Drought and heat exacerbate wildfires”, July 2018, <https://public.wmo.int/en/media/news/drought-and-heat-exacerbate-wildfires>

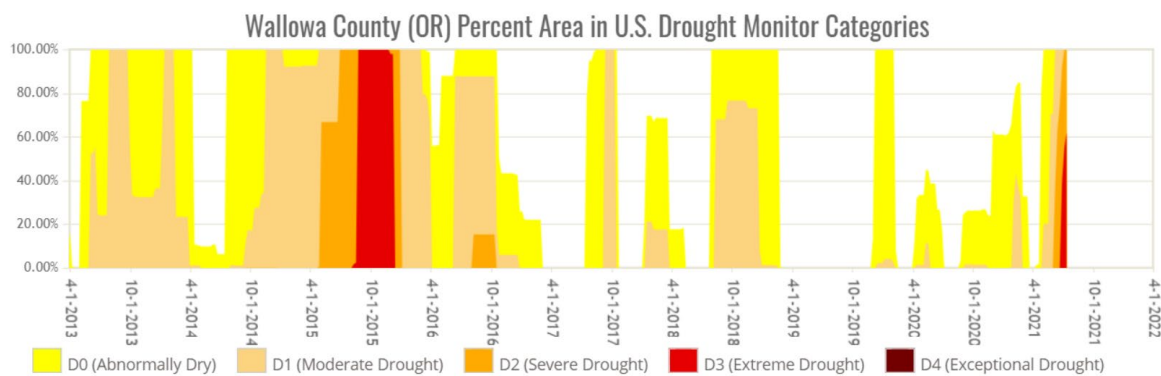
The incidence of drought in Oregon is between eight and twelve years.³⁸ Wallowa County is periodically susceptible to droughts because of its location east of the Cascades and within the high desert. The county is susceptible to dry conditions during the summer months from June to September as snowpack melts feeding streams and rivers.

Drought Events 2014-2021

US Drought Monitor records data that contribute to drought. For the period between November 2014 and April 2015, US Drought Monitor data represented in Figure 4 shows that more than 80% of Wallowa County was experiencing moderate drought, and that all of Wallowa County experienced extreme drought from August 27, 2015, through December 16, 2015³⁹. Current conditions in July 2021 area also represented in Figure 12 showing that drought conditions have risen from Moderate Drought for most of the county in May 2021 to 60% of the county experiencing Extreme Drought in mid-July 2021.

The Oregon Governor issued Executive Orders at the request of the four eastern Oregon counties and based on recommendations by the Drought Readiness Council and the Water Supply Availability Committee in 2003 and 2021 (EO 03-09 issued August 15, 2003; and EO 21-13 issued June 8, 2021). These Executive Orders declared that dry conditions presented hardships for Wallowa 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.

Figure 14. Periods of drought in Wallowa County from January 2013 through June 2021



Source: Drought Atlas <https://droughtatlas.unl.edu/Data/Climate.aspx> consulted July 2021

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

³⁸ Oregon Natural Hazards Mitigation Plan (2012) Region 7: Regional Profile

³⁹ 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.

Insect Pests, Noxious Weeds, and Invasive Species

Characteristics

The species that comprise the agents of damage and threat of damage to timber and agricultural resources in Wallowa County include three types of bark beetles, defoliating insects, and sap sucking insects. The number of species of plants that comprise noxious weed has grown from the 1920's at the formation of the Wallowa County Weed Control District on July 26, 1921, when the primary weeds of concern were Jim Hill mustard (*Sisymbrium altissimum* L.), Canada thistle (*Cirsium arvense*), and devil weed (*Thlaspi arvense* L.). Now, more than ninety years later, the weed list has expanded over 10-fold.⁴⁰

The insect pests that pose a natural hazard risk to Wallowa County resources include the bark beetles *Dendroctonus pseudotsugae* (Doug-fir beetle), a bark beetle that preferentially infests >10" diameter at breast height (dbh) downed trees and then moves to nearby standing trees that are stressed, injured or less vigorous, *Scolytus ventralis*, (Fir engraver), a significant pest of mature and pole-sized true fir, and *Dendroctonus ponderosae*, (Mountain pine beetle), the most destructive forest pest in the west contributing to more tree mortality than any other bark beetle in Oregon.

The insect pests that act through defoliation include the Doug-fir tussock moth (DFTM; *Orgyia pseudotsugata*), a major defoliator of Doug-fir and true firs in the Western US, and the Larch casebearer (*Coleophora laricella*), an established, exotic defoliator that attacks western larch. Native and introduced natural enemies play an important role in controlling this pest.

The Balsam woolly adelgid (BWA; *Adelges piceae*), is the principal sap-sucking insect to affect timber species in Wallowa County. Both the BWA and the Larch casebearer are exotic species that have become established and invasive in nature.

Location and Extent

Information on the location and extent of Insect Pests, Noxious Weeds and Invasive Species are provided by several organizations. The extent and severity of Insect Pests of timber species is monitored by both the Oregon Department of Forestry (ODF) and the US Department of Agriculture through the US Forest Service (USFS). ODF conducts aerial surveys annually to collect information on tree mortality due to insect pest infestations. The Oregon Department of Agriculture Noxious Weed Control Program has developed a geospatial mapping tool that displays a collection of spatial information on the distribution of noxious weeds listed by the Oregon Department of Agriculture.

Insect Pest, Noxious Weeds, and Invasive Species History

The forest managers and ranchers of Wallowa County recognize the risk to timber and pasture resources as well as animal health from the spread of noxious weeds and insect pests to timber species. Effectively managing threats from invasive weeds requires coordinated strategies on a local and regional scale. Wallowa County has been facing the challenge of invasive weeds since 1921

⁴⁰ Wallowa County Integrated Weed Management Plan, August 2013

when it formed the Wallowa County Weed Control District. The *Wallowa County Integrated Weed Management Plan* forms the basis for mitigation of aspect of the natural hazard at the county level. The Oregon Department of Forestry has been collaborating with the USFS and other partners to evaluate and report on forest health issues since 1998.⁴¹

Management considerations for insect pests requires a coordinated approach particularly considering the overlapping impact to susceptibility to wildfire that damage by Insect Pests and Noxious Weeds can create. Coordination is supported through collaboration among local and state governments and regional private non-profits. The Wallowa County Commissioners adopted the *Wallowa County Integrated Weed Management Plan* (IWMP) in August 2013, almost ten years ago.⁴²

The IWMP provides a written strategy to inform, and guide weed management activities over time for the Wallowa County Weed Control District. Oregon Watershed Enhancement Board (OWEB) supports this work with grant funding. The plan provides a framework for coordinating countywide noxious weed management within a regional context. There is a dynamic process built into the process by allowing for five-year goal setting and the annual additions of work plans.

Wallowa Resources was a partner in that plan and continues to amplify the work of Wallowa County through the Wallowa Canyonlands Partnership (WCP), a cross-jurisdictional pilot program for controlling noxious weeds across fence lines. The WCP has coordinated over 17,500 acres of noxious weed mitigation.⁴³ The Forest Service as well as the Nature Conservancy were also partners in that 2013 plan.

The Oregon Department of Forestry (ODF) maintains a Forest Health program that helps maintain and improve the health of Oregon's private and state-owned forests. Forest health professionals conduct aerial and ground surveys to monitor forest insects and tree diseases.

Landslide and Debris Flow

Characteristics

A landslide is a mass movement occurring on steep slopes under the action of gravity. Debris flow is a distinct type of mass movement commonly triggered by intense rainfall and/or melting snow on steep hill slopes. It differs from landslide in its “flowing” feature. Flow means relative movement in numerous layers of the medium, whereas a slide occurs only along one or several interfaces or beds.

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

⁴¹ [Region 6 - Insects & Diseases \(usda.gov\)](https://www.usda.gov/region6/insects-diseases)

⁴² [WALLOWA COUNTY INTEGRATED WEED MANAGEMENT PLAN \(squarespace.com\)](https://www.squarespace.com/wallowa-county-integrated-weed-management-plan)

⁴³ [Rangelands — Wallowa Resources](#)

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 Oregon⁴⁴.

Location and Extent

Staff from Oregon's Department of Geology and Mineral Industries (DOGAMI) have developed a database of landslide information for use in understanding the location and extent of landslides across the state of Oregon. The Statewide Landslide Information Layer for Oregon [SLIDO], release 4.2⁴⁵ 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 LiDAR⁴⁶-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 Wallowa County within SLIDO is based on topographic maps created before LiDAR was available for high-accuracy mapping. Some landslide mapping for Wallowa County was done in 1979 and again in 2006 before LiDAR was available.⁴⁷ SLIDO contains both landslide features and records of historic events as well as derived landslide susceptibility mapping.

The landslide features mapped in the SLIDO database within in Wallowa County include fifteen landslide, debris flow and rockfall records located in Wallowa County most of which occurred in the period between 1996 and 1997. Historic landslide records also document a number of slide areas along Highway 82 just over the county line in Union County. Although these slides are not in Wallowa County, Highway 82 is a critical lifeline for access during emergencies.

Specific landslide deposits or historic landslide points that are relevant to natural hazard mitigation planning include the following from SLIDO (version 4.2):

- Landslide deposits located within the City of Enterprise and just north of the city limits both support homes or other buildings and roads (Figures 6 and 7).
- The southern tip of the Joseph airport runway is located on a talus deposit (Figure 8 and 9)
- There are three historic landslide points identified on the Joseph-Wallowa Lake Road (Route 351) where Oregon Department of Transportation identifies rockfalls depositing material on or near the roadway occur approximately five times per year (Figure 8). This is currently the

⁴⁴ 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>

⁴⁵ Burns, W. J., and Watzig, R. J., 2014, Statewide landslide information layer for Oregon, release 4.2 [SLIDO-4.2]: Oregon Department of Geology and Mineral Industries, 1:750,000, geodatabase.

⁴⁶ 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.

⁴⁷ Multi-Hazard Risk Report for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021

only egress for residents and visitors of the Wallowa Lake community at the head of the lake.

- There are two historic landslide points identified on the Enterprise-Lewiston Highway (Route 3) near the northern county line that occurred in 1996-1997 (Figure 5) where the shoulder of the road slipped and washed away on a 100 ft section of roadway that extends down the hill and there was a complete roadway washout of 200 ft. length. Several major landslides occurred in this area. This is a secondary route out of the county.
- Several other historic landslide points and landslide deposits are located within the national Wenaha-Tucannon Wilderness Area and the Oregon Wenaha Wildlife Area. Although there are no residential dwellings in this area, it is a popular destination for hunters and other outdoor sports enthusiasts.

Figure 15. Wallowa County Landslide Susceptibility and Historic Landslide Points

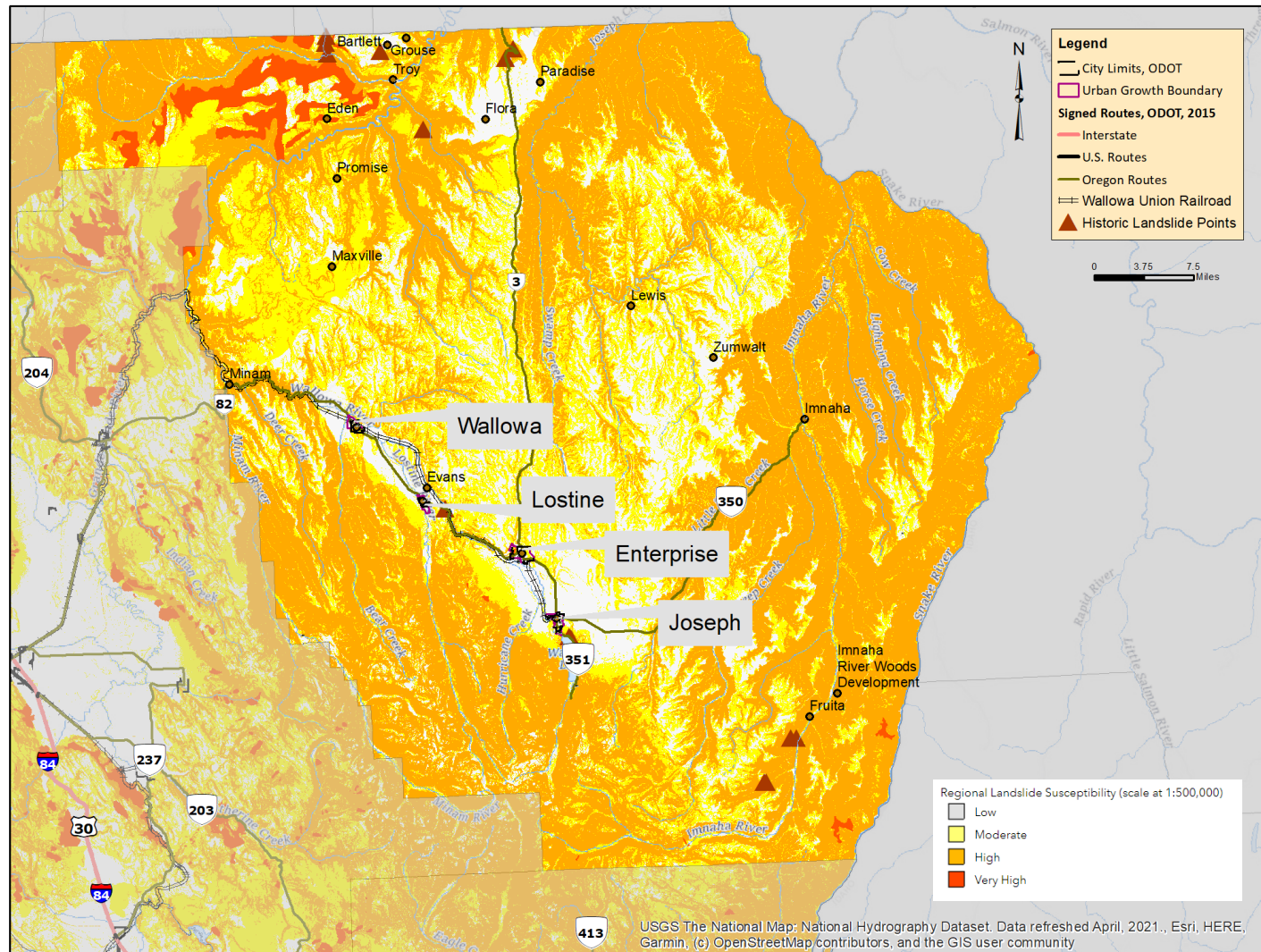
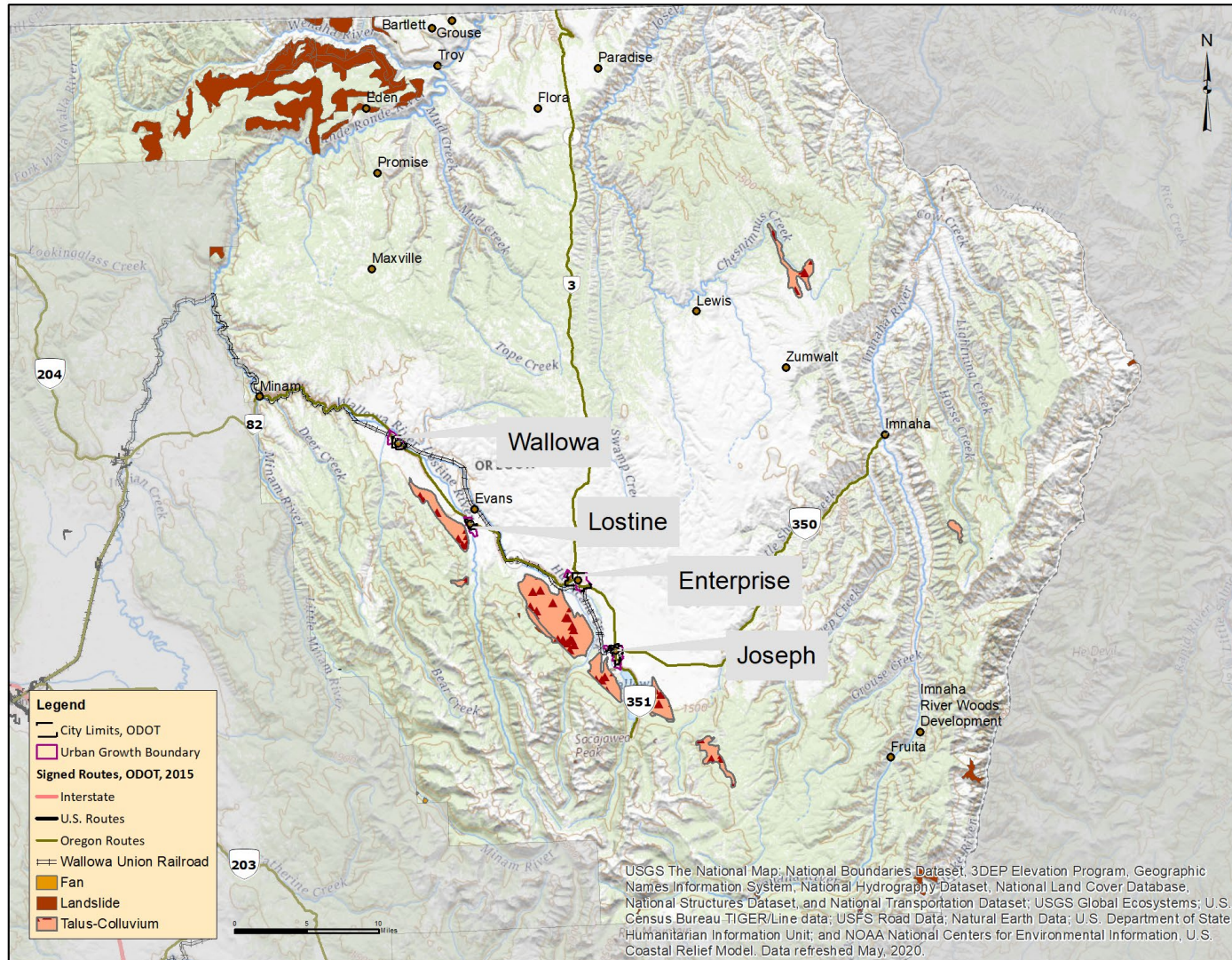
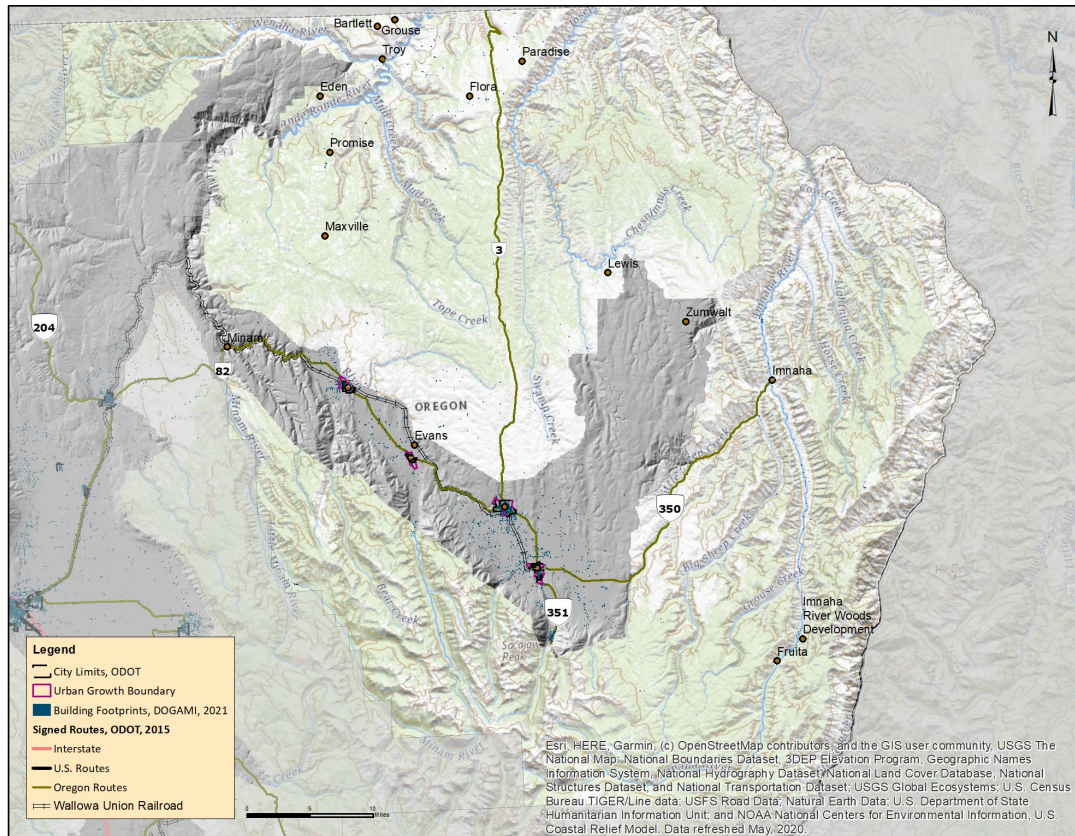


Figure 16. Wallowa County Landslide Deposits



Improved mapping based on high resolution topography developed using LiDAR can improve assessment of this risk. LiDAR-based landslide mapping is highly accurate and can provide a greater understanding of landslide risk for a given area. There are some areas in Wallowa County where LiDAR topography is available and may be useful for updating landslide mapping. These areas include the Wallowa Valley and Zumwalt Prairie, and the Wenaha Wildlife Area.

Figure 17. Imagery of LiDAR topography available for areas of Wallowa County



The following maps utilize layers showing Landslide Susceptibility and Landslide Deposits as well as the imagery provided by recent LiDAR data acquisition flights as shown above in Figure 7 to help improve interpretation of the existing landslide mapping.

Figure 18. City of Enterprise - Landslide Susceptibility and LiDAR imagery

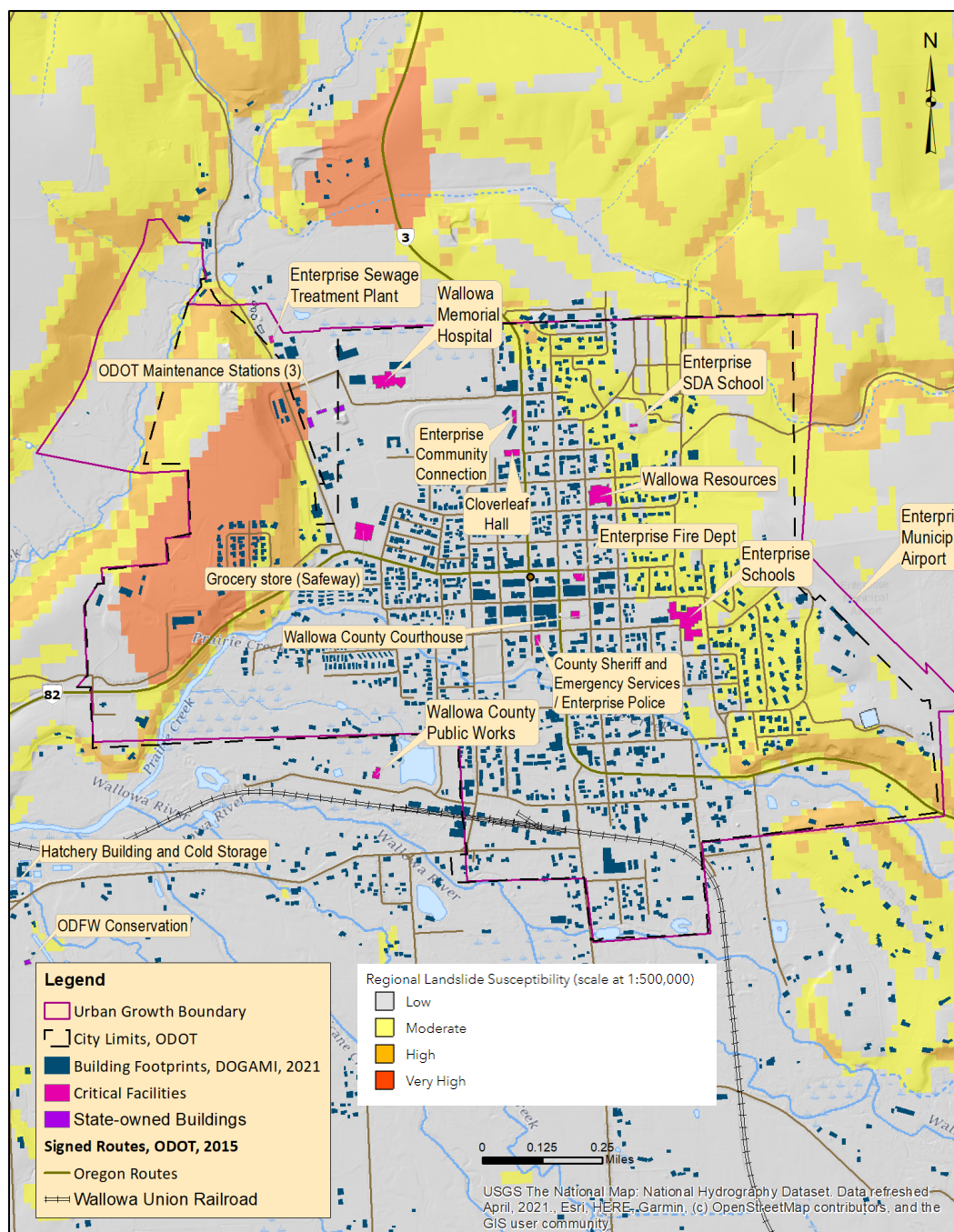


Figure 19. City of Enterprise and vicinity – Landslide Deposits and LiDAR imagery

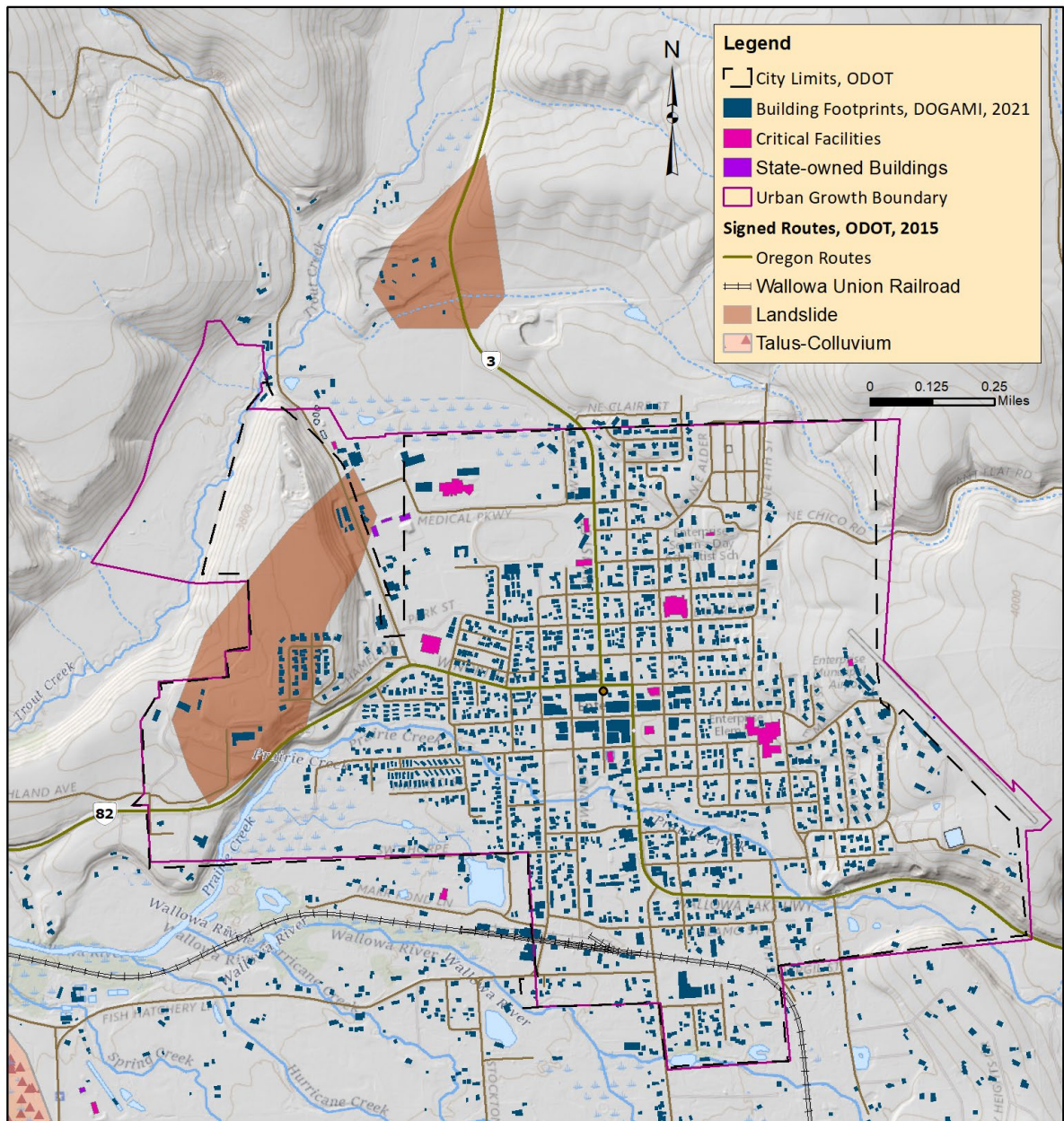


Figure 20. City of Joseph and vicinity – Landslide Susceptibility and LiDAR Imagery

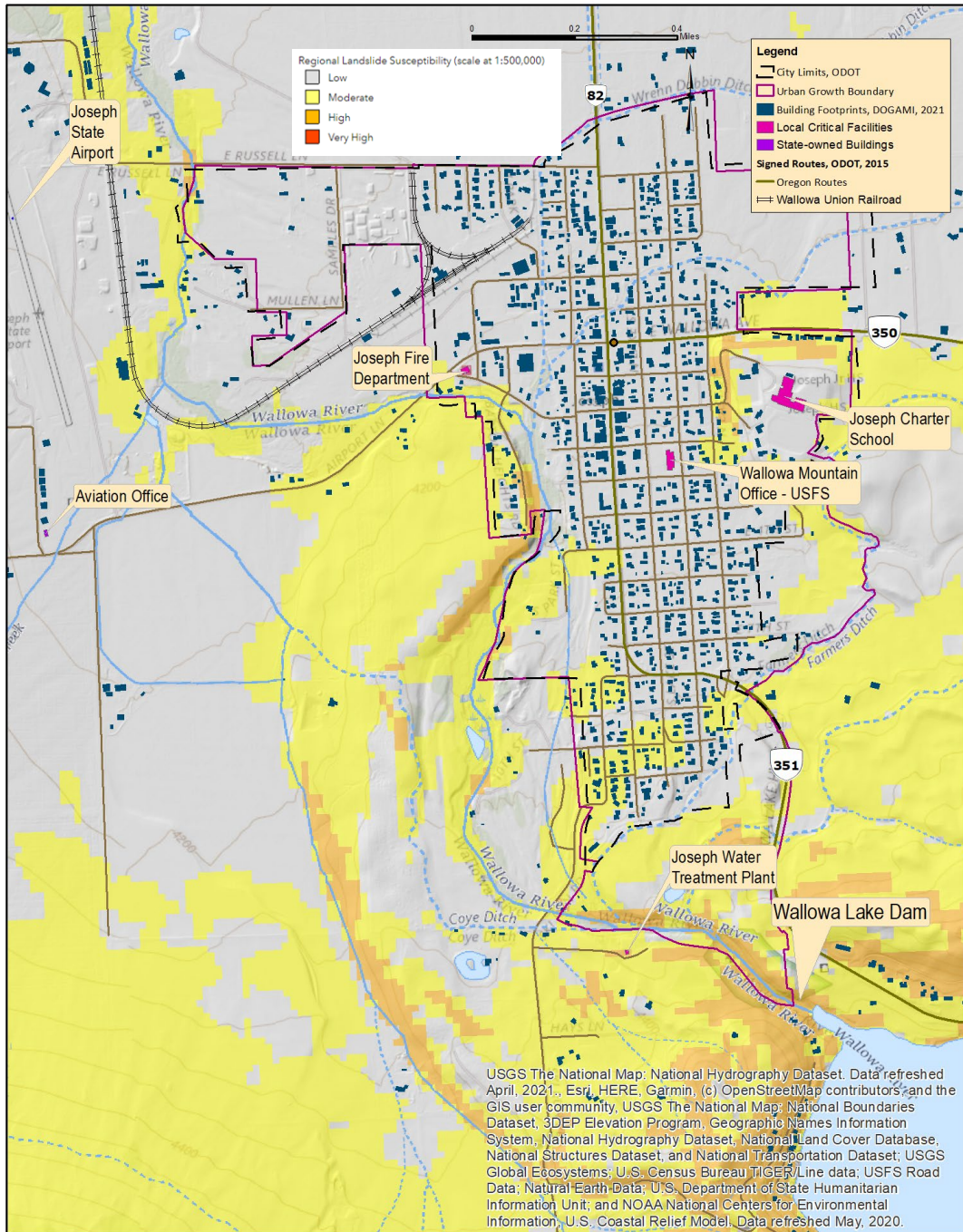
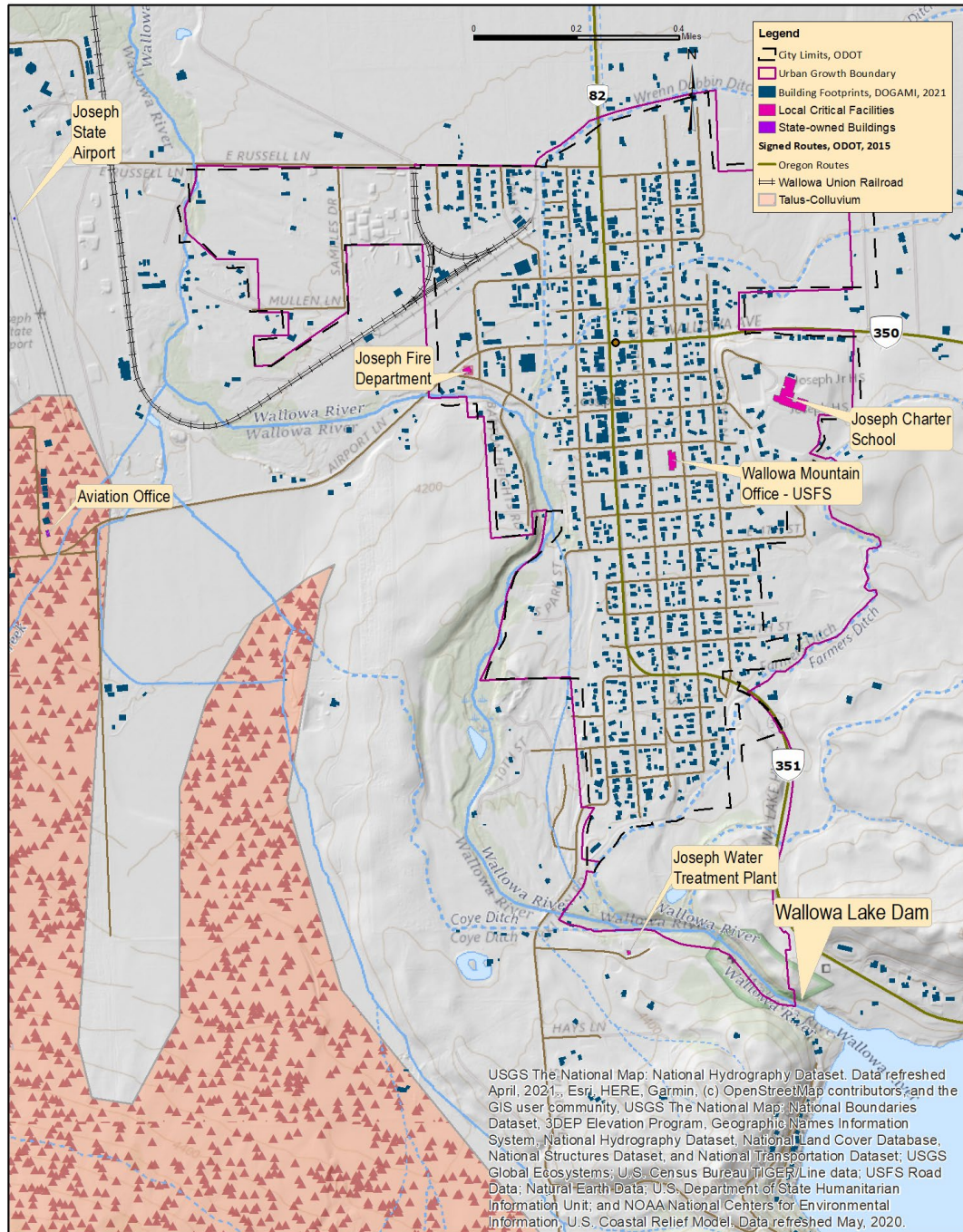


Figure 21. City of Joseph and Vicinity – Landslide Deposits



Although there is LiDAR data available for portions of Wallowa County, the data available does not cover sufficient area of Wallowa County for a full landslide mapping analysis. Ideally, the LiDAR would cover the major population areas (cities/communities) and the infrastructure corridors

(roads, electric, water, etc.) and extend from these areas to the top of the adjacent ridgelines and down to the valley bottoms.⁴⁸

Identification of next steps as well as mitigation measures for the known landslide hazard areas was the topic of a special focus discussion by the Steering Committee in September 2021. The Steering Committee recognized the importance of improved mapping of landslide features using LiDAR laser imagery to better predict landslide risk.

Landslide Events 2014-2021

The Wallowa County Emergency Manager, Paul Karvoski, reports that there are areas on the Imnaha Highway, Route 350, between mile post 10 to mile post 22 where rockfall can be a hazard when there is a heavy thunderstorm.⁴⁹ In May 2018, a slow-moving thunderstorm caused locally heavy rain across Grant and Wallowa Counties. There were reports of rockslides and water on roadways. Run off and landslides damaged Imnaha Highway (Hwy 350) between mile posts 14 and 20.⁵⁰

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

⁴⁸ Ibid.

⁴⁹ Personal communication with Paul Karvoski, Wallowa County Emergency Manager, August 2021

⁵⁰ NOAA Storm Event database

Earthquake

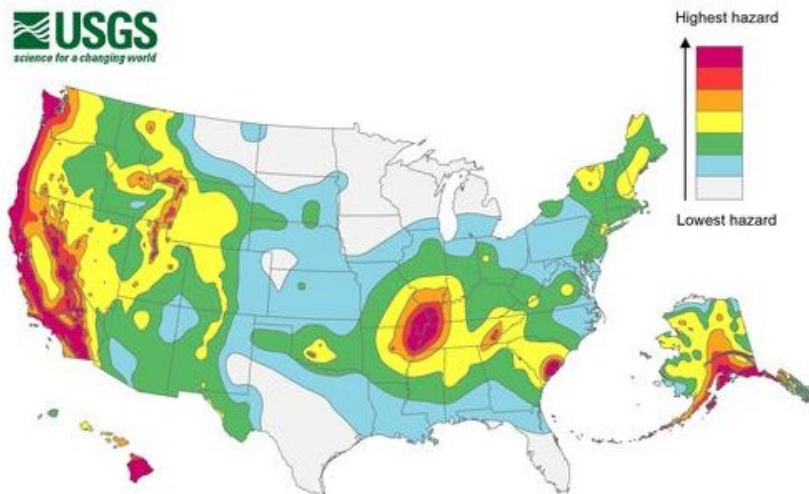
Characteristics

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 buildings⁵¹.

Two potential earthquake-induced hazards are liquefaction and coseismic 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 casualties, economic disruption, and extensive property damage. Coseismic landslides are mass movement of rock, debris, or soil induced by ground shaking.

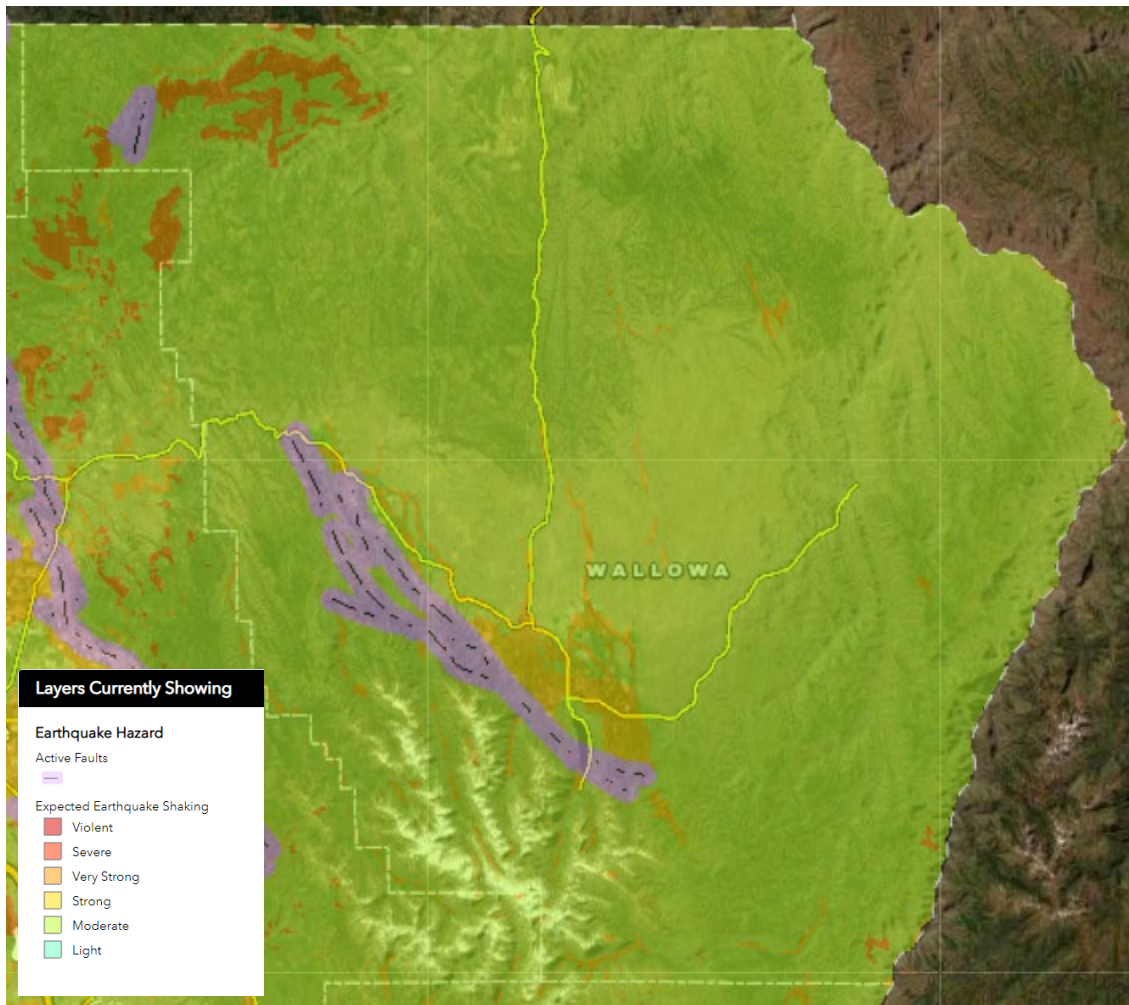
Although the relative hazard for earthquake in coastal Oregon is very high, the relative risk in northeastern Oregon is low as is shown by the USGS map of seismic hazard in Figure 12. The active faults and predicted shaking in Wallowa County and vicinity are shown in Figure 13.

Figure 22. USGS National Seismic Hazard Map



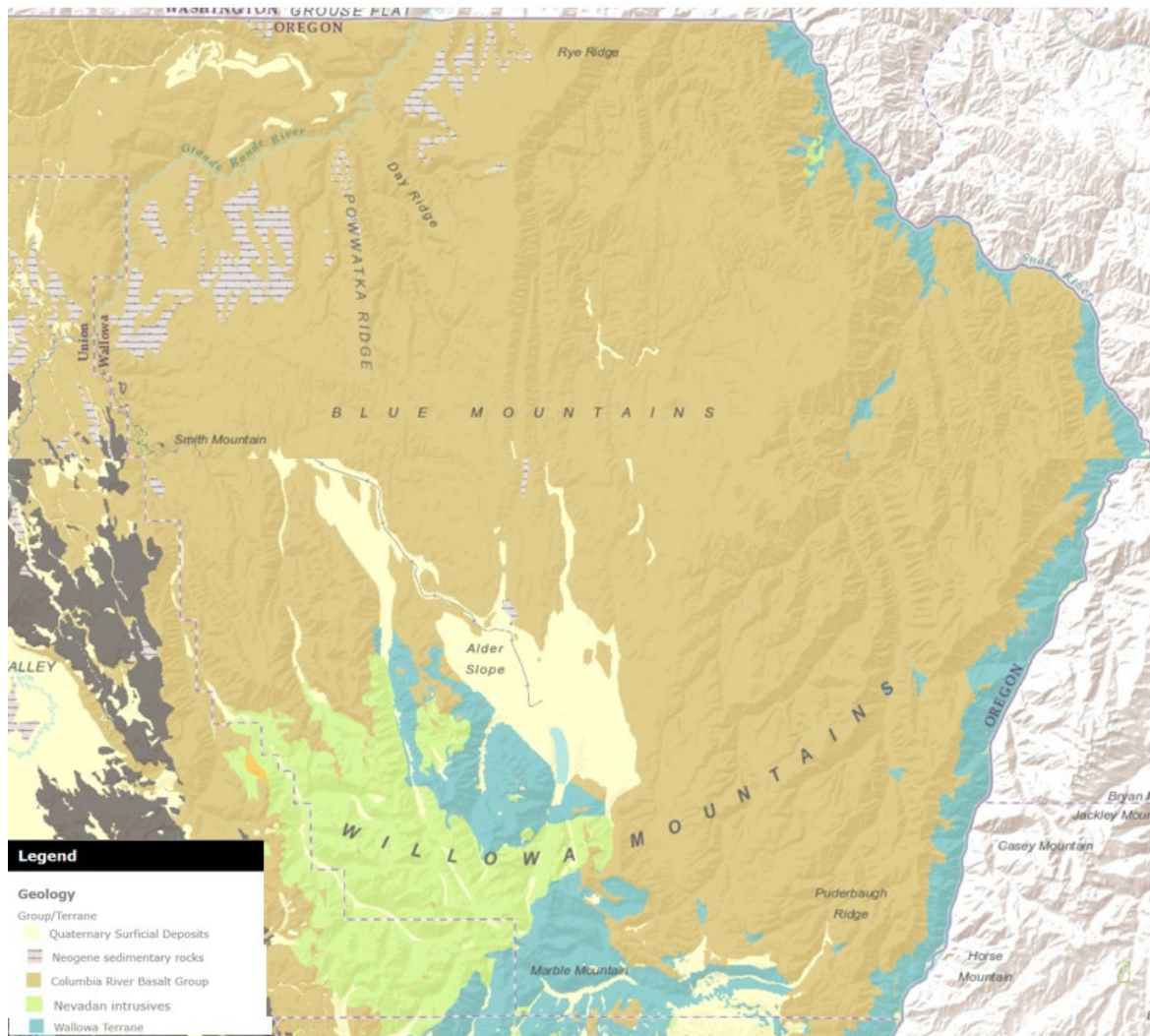
Source: USGS <https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map>

⁵¹ 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>

Figure 23. Active Quaternary Faults and Expected Earthquake Shaking

Source: Department of Geology and Mineral Industries, Oregon HazVu: Statewide Geohazards Viewer Oregon Geologic Data Compilation (OGDC) - Introduction (oregongeology.org)

The geology of Wallowa County provides some insight into the areas where earthquake shaking is likely to be greatest (Figure 16). The sedimentary deposits are unconsolidated and susceptible to extreme ground shaking during an earthquake. The geologic unit Quaternary Surficial Deposits encompasses this geologic group.

Figure 24. Wallowa County Geology

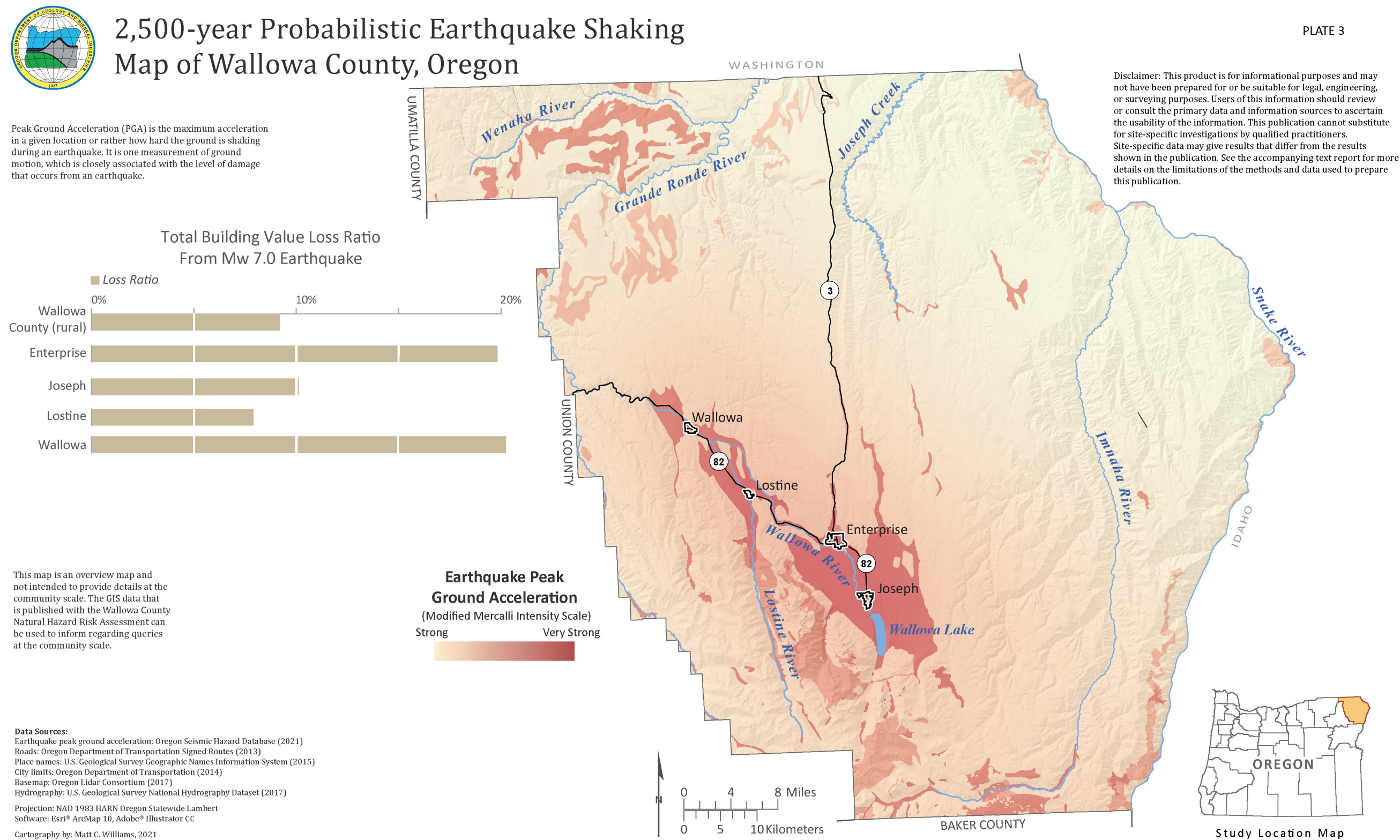
Source: Department of Geology and Mineral Industries, HazVu geologic map of Oregon [Oregon Geologic Data Compilation \(OGDC\) - Introduction \(oregongeology.org\)](https://oregongeology.org/)

Location and Extent

Because an earthquake can affect a wide area, it is unlike other hazards in this report — every building in Wallowa County, to some degree, would be affected by it.

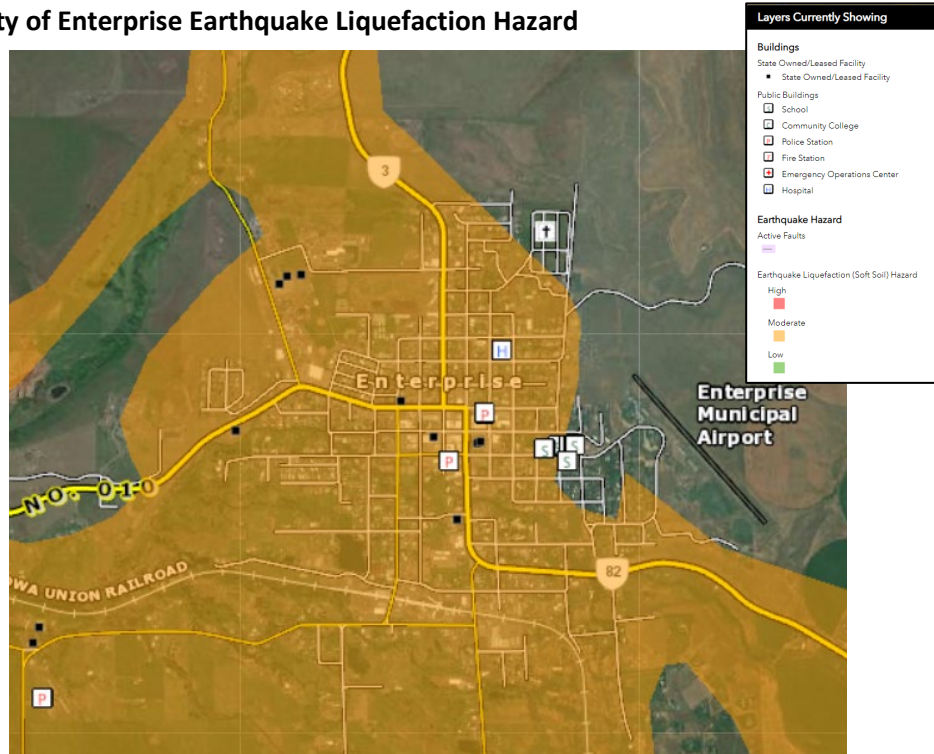
DOGAMI's HazVu hazard mapping tool shows the faults along the eastern side of the Wallowa Mountains and also in the Wenaha-Tucannon Wilderness.(Figure 13). The likely shaking is most extreme adjacent to these faults in the Wallowa Valley and within the Wenaha-Tucannon Wilderness where there are soils that may lose bearing capacity during an earthquake. Figure 15 below shows modeled Peak Ground Acceleration shaking from a magnitude 7 earthquake that has a 2% in 50 year probability of occurring. Full details of this analysis are contained in the DOGAMI Risk Report in Appendix G. The location of these liquifiable soils in the Enterprise (Figure 16), Lostine (Figure 17), Joseph and Wallow Lake area (Figure 18), and Wallowa (Figure 19) are shown below.

Figure 25. 2,500-year Probabilistic Earthquake Shaking Map of Wallowa County, Oregon



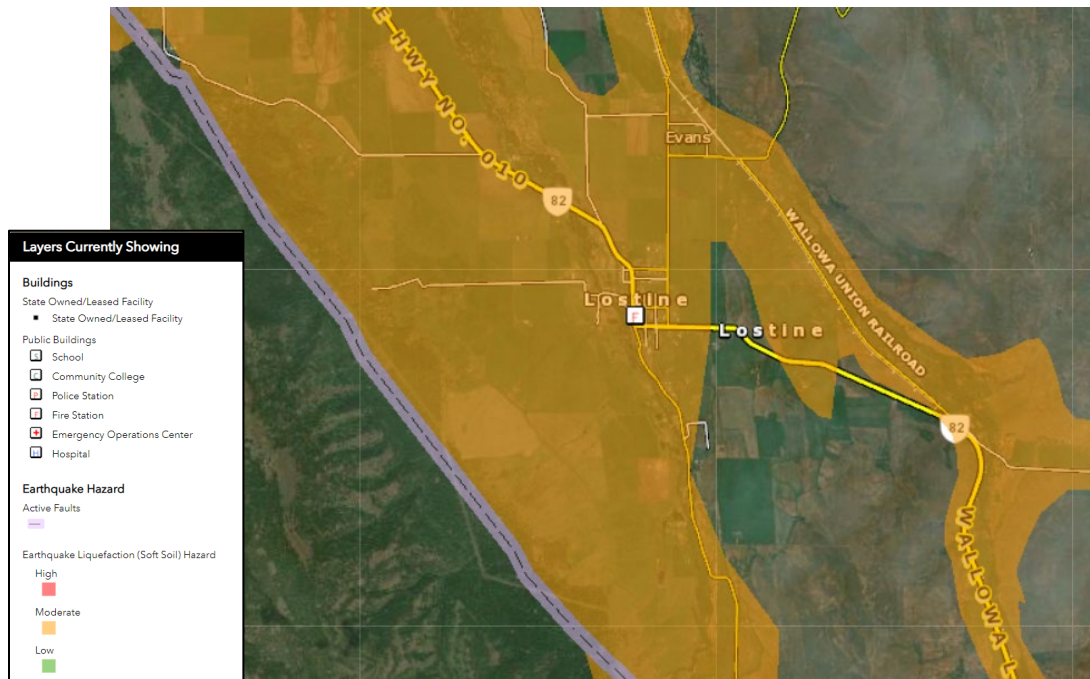
Source: Multi-Hazard Risk Report for Wallowa County, Oregon, Burns and Madin, Oregon Department of Geology and Mineral Industries, 2021

Figure 26. City of Enterprise Earthquake Liquefaction Hazard



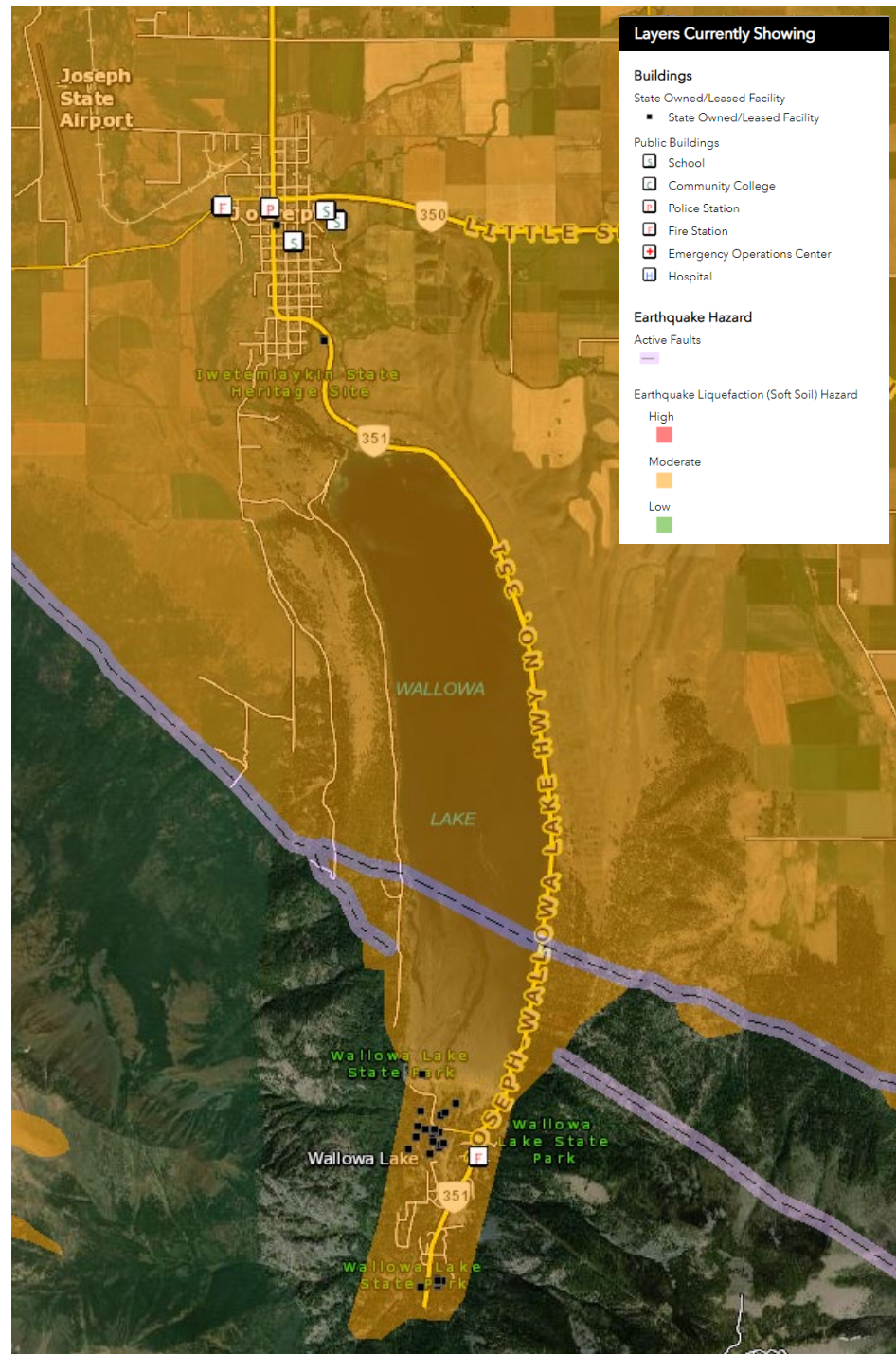
Source: Department of Geology and Mineral Industries, Oregon HazVu: Statewide Geohazards Viewer [Oregon Geologic Data Compilation \(OGDC\) - Introduction \(oregongeology.org\)](https://oregongeologic.org/)

Figure 27. City of Lostine Faults and Earthquake Liquefaction Hazard

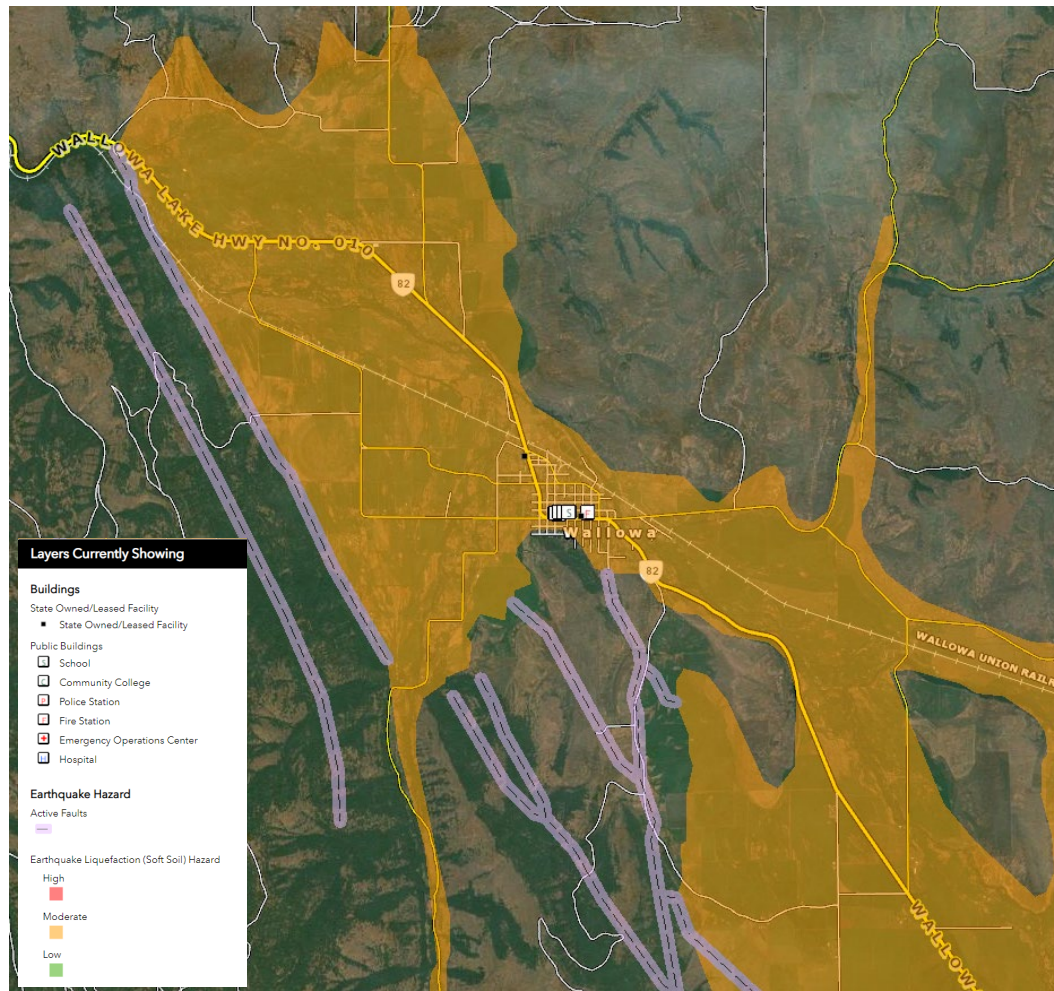


Source: Department of Geology and Mineral Industries, Oregon HazVu: Statewide Geohazards Viewer [Oregon Geologic Data Compilation \(OGDC\) - Introduction \(oregongeology.org\)](https://oregongeologic.org/)

Figure 28. Joseph and Wallowa Lake Community Faults and Earthquake Liquefaction Hazard



Source: Department of Geology and Mineral Industries, Oregon HazVu: Statewide Geohazards Viewer [Oregon Geologic Data Compilation \(OGDC\)](https://ogdc.org/) - Introduction (oregongeology.org)

Figure 29. City of Wallowa Faults and Earthquake Liquefaction Hazard

Source: Department of Geology and Mineral Industries, Oregon HazVu: Statewide Geohazards Viewer [Oregon Geologic Data Compilation \(OGDC\) - Introduction \(oregongeology.org\)](https://oregongeology.org/Data/Compilation/OGDC-Introduction)

Seismic Events 2014-2021

Wallowa County experienced one earthquake greater than magnitude 3.0 in during the update period. On November 3, 2014, a 3.1 magnitude earthquake was recorded east of Joseph. Prior to that date, earthquakes of magnitude 3.0 or greater have been recorded in Wallowa County in 2002, 1999, and 1984. The strongest was a magnitude 4.0 quake January 30, 1984 with an epicenter located east of Imnaha in the Hells Canyon National Recreation Area.

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

Flood

Characteristics

In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Floods are a commonly occurring natural hazard in Wallowa County and have the potential to create public health hazards and public safety concerns.

The major streams within the county are the Grande Ronde, Imnaha, Lostine, Minam, Snake, Wallowa, and Wenaha Rivers and Joseph Creek. All the listed rivers are subject to flooding and can cause damage to buildings within the floodplain.

Typically, the principal types of flooding that occur in Wallowa County include snow melt (spring) floods resulting from rapid snowmelt, occasionally augmented by rainfall, riverine, and local flash floods.

Location and Extent

Floods vary greatly in size and duration, with smaller floods more likely than larger floods. A typical method for determining flood risk is to identify the size of a flood that has a particular probability of occurrence. This report uses floods that have an annual probability of occurrence of 10%, 2%, 1%, and 0.2%, henceforth referred to as 10-year, 50-year, 100-year, and 500-year scenarios, respectively. The size of floods estimated at these probabilities is based on a computer model that is based on recorded precipitation and stream levels.

The location and extent of flooding hazard may be represented by the Flood Insurance Rate Maps (FIRMs). These maps were made to administer the National Flood Insurance Program and were developed in areas where the number of structures and people at risk warranted a community joining the program. The annual probability of occurrence represented on the FIRMs is a 1% annual chance, also commonly referred to as the 100-year flood. The areas shown on the FIRMs (and in Figures 20-24 below) represent areas currently mapped by FEMA in Wallowa County.

Flooding Events 2014-2021

In the seven years since the completion of the 2014 Northeast Oregon Natural Hazard Mitigation Plan that included Wallowa County, the county has experienced flooding in five of those years. March 2014 and March 2017 saw heavy rain events that cause snow melt that resulted in flooding along the Grande Ronde River. In March 2017, the Grande Ronde River at Troy crested 1.5 ft. above flood stage twice following this rain event. In May 2017, the Imnaha River saw the river cresting at flood stage following increased snow melt. In May 2018, a slow-moving thunderstorm caused locally heavy rain across Grant and Wallowa Counties. There were reports of rockslides and water on roadways. Run off and landslides damaged Imnaha Highway (Hwy 350) between mile posts 14 and 20. 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. Events on Whiskey Creek north of Wallowa and on the Wallowa River near Smith Mountain resulted in \$50,000 of property damage and \$10,000 in crop damage. From

February 2-5, 2020, heavy snow fell and was followed by a period of heavy rain from February 5-7. Snow levels rose to near 5,000 feet. The heavy rain and snow melt lead to moderate flooding and several landslides along the eastern slopes of the Washington Cascades. This event resulted in moderate flooding along the Grande Ronde where the river crested at 11.73 feet (Flood stage is 10.0 feet). In Wallowa County, the Redmond Grade Road as well as Troy Road and several other county roads were damaged. The damage was estimated at approximately \$130,000. Umatilla County experienced approximately \$40 million in damage. This event was declared a federal disaster (DR-4519).⁵² Full details of the hazard posed by flooding can be found in Volume II, Flood Hazard Annex.

⁵² National Climate Data Center Storm Events Database <http://www.ncdc.noaa.gov/stormevents>

Figure 30. Wallowa County – Special Flood Hazard Areas

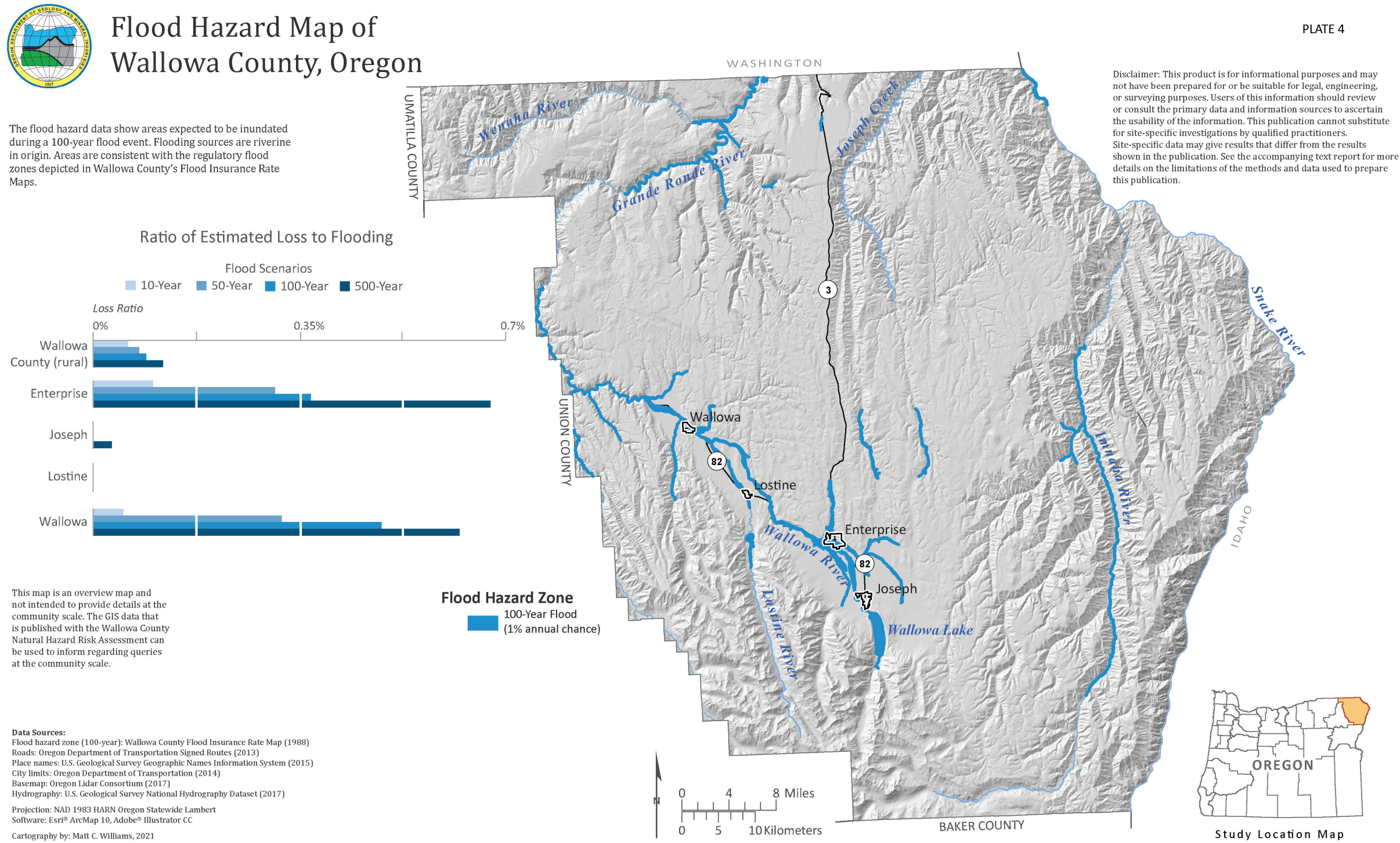


Figure 31. City of Enterprise – Special Flood Hazard Areas

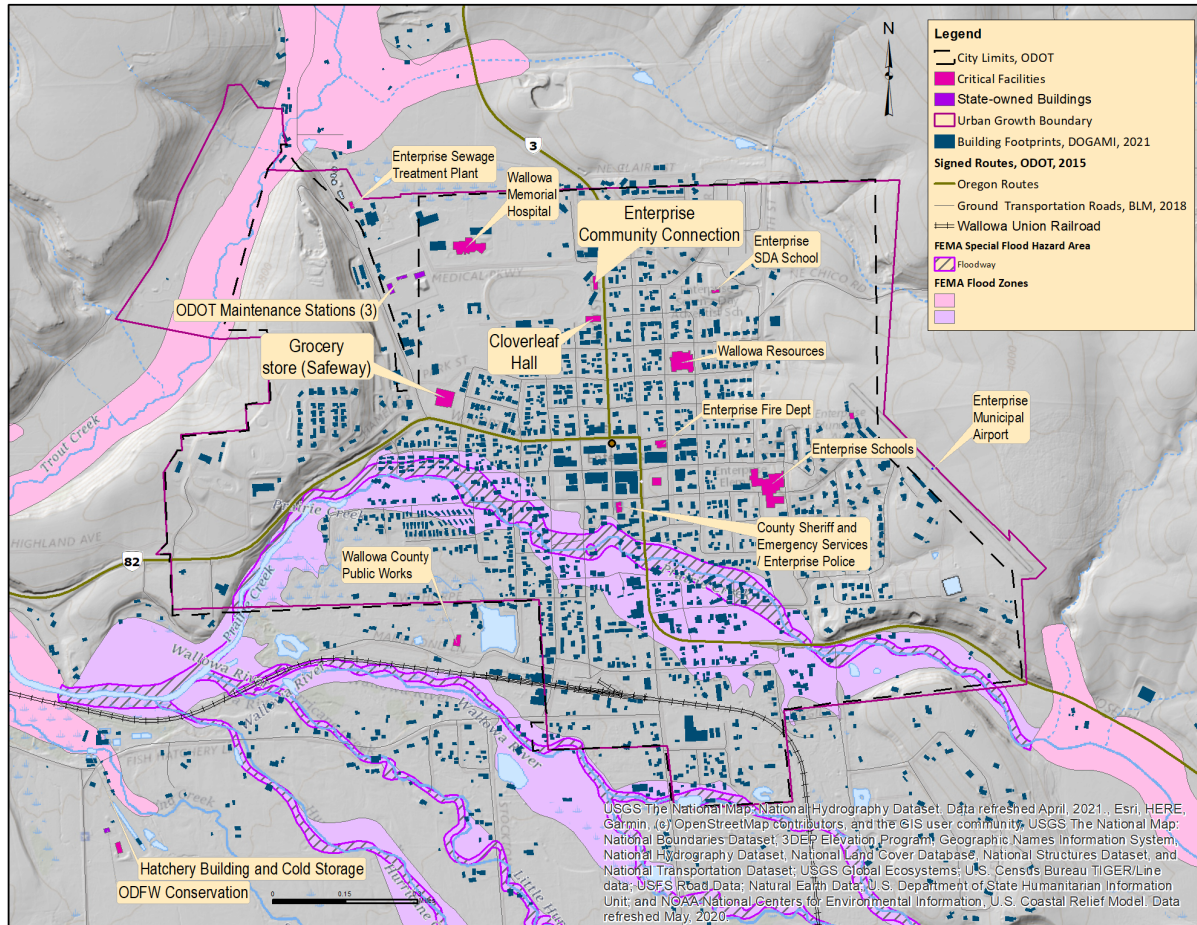


Figure 32. City of Joseph – Special Flood Hazard Areas and High Hazard Dam

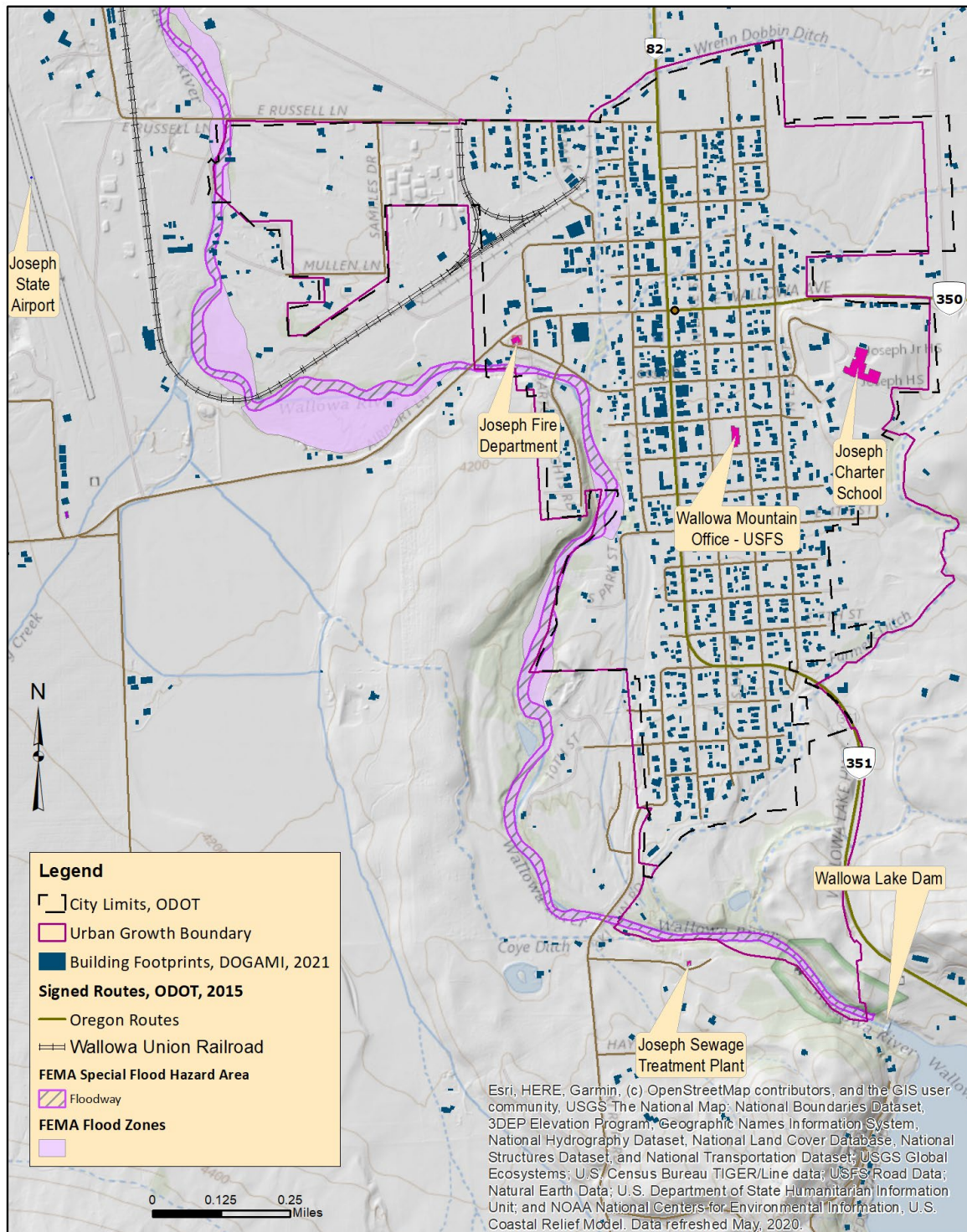
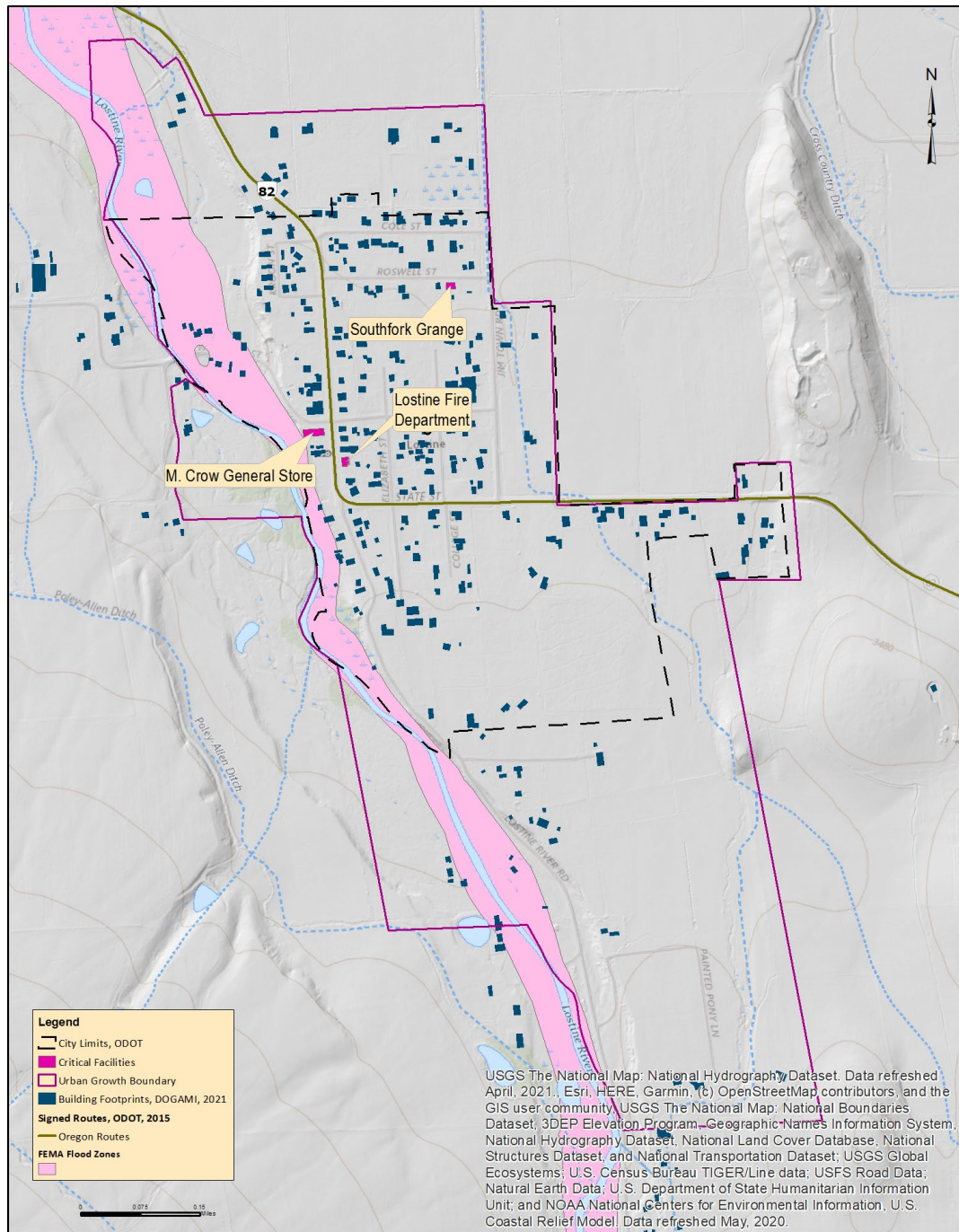


Figure 34. City of Lostine – Special Flood Hazard Areas



Dam Failure

Characteristics

The Hells Canyon Dam is the only federally regulated High Hazard dam in Wallowa County. It is one in the chain of three hydroelectric dams within the Snake River canyon that were constructed by the Army Corps of Engineers between 1959 and 1967.

The Wallowa Lake Dam is the only state-regulated high hazard dam in Wallowa County. It is currently assessed to be below accepted safety standards (in Poor or Unsatisfactory Condition). The population at risk was evaluated using the screening tool DSS-WISE. This analysis concluded that 1,131 people are at risk during the daytime and 1,334 people are at risk during the nighttime.

Location and Extent

The Hells Canyon Dam, a federally regulated dam, is located near the in southeastern most extent of the county on the Snake River.

The Wallowa Lake Dam, a state regulated dam, is located at the northern end of Wallowa Lake. The original curved section of the dam was constructed in 1919 on the natural outlet of Wallowa Lake. It was raised 3 feet the following year and raised an additional 5 feet in 1929. Since 1979 Dam safety inspections have occurred semi-annually. In 1996 the Wallowa Lake Dam was listed as High Hazard by Oregon Water Resources Department Dam Safety. This has forced the farmers to operate the Dam at a 72% capacity. The map in Figure 25 below shows the inundation area should the dam experience a breach.

Recent legislation has been passed allowing the release funds for the \$16 million refurbishment of the Wallowa Lake Dam has been agreed upon and is now in the process of being signed as reported by the Wallowa County Chieftain on July 29, 2021. Four signatories to the agreement, the Nez Perce Tribe, the Wallowa Lake Irrigation District, the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation are in the process of making agreements on water storage and release. The details of fish passage design is complicated and has been tabled at this writing.⁵³

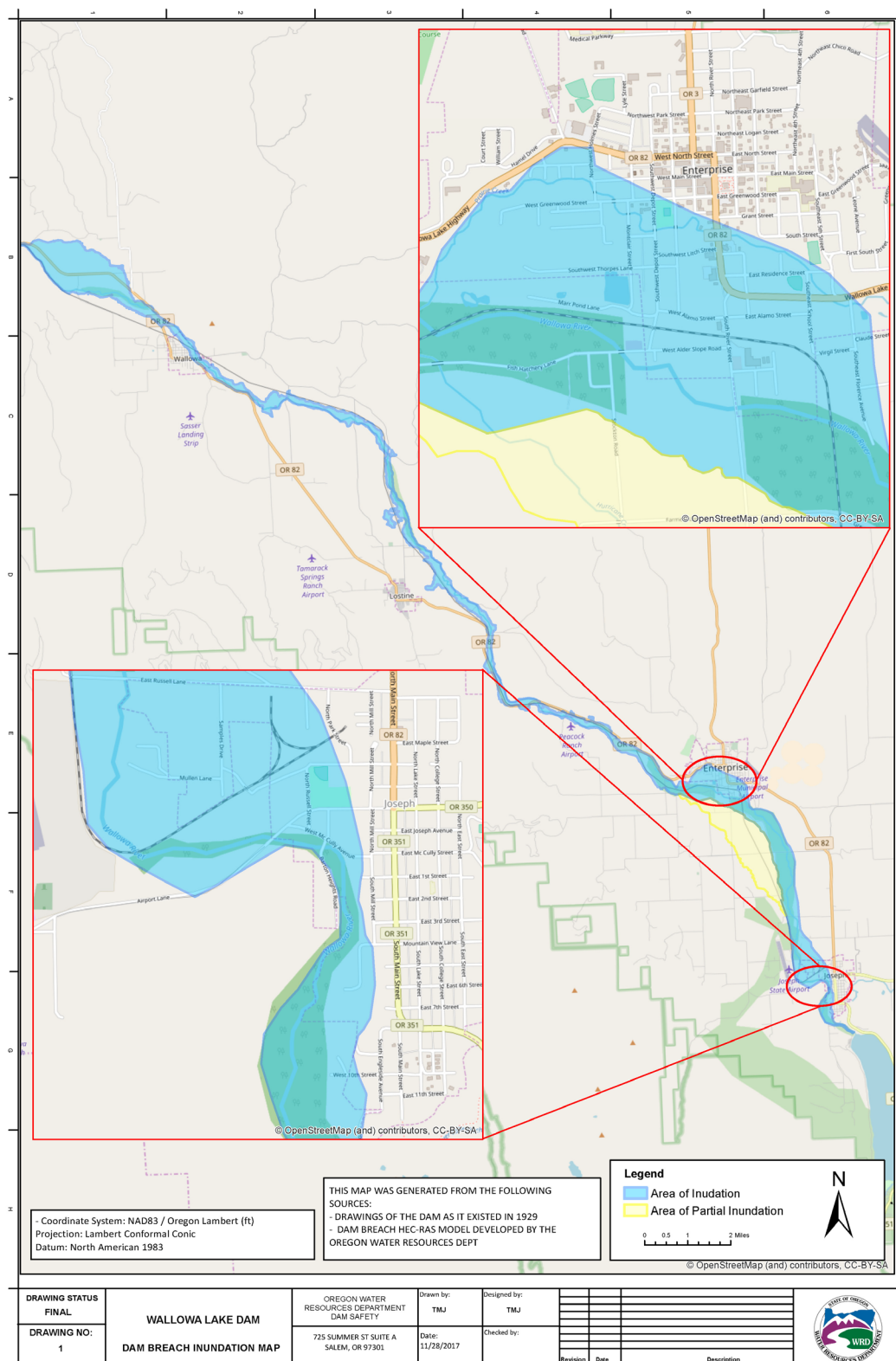
Dam Failure Events 2014-2021

None.

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

⁵³ [Wallowa Lake Dam agreement approved | Local News | wallowa.com](#)

Figure 35. Wallowa Lake Dam – Dam Breach Inundation Map



Source: Oregon Water Resources Department, Dam Safety Division

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 Baker County directly.

Location and Extent

Direct risk from local volcano-associated hazards is not a consideration for Wallowa County because the volcanic Cascade Mountain Range is not close enough to the county to cause damage. Mt. St. Helens and Mt. Jefferson are each more than 300 miles from Wallowa County, consequently placing that community at low risk.

These volcanic mountains are 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 include disruption of engines of motor vehicles and health impacts to vulnerable populations, such as people with asthma.

Volcanic Events 2014-2021

None.

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

Vulnerability Assessment

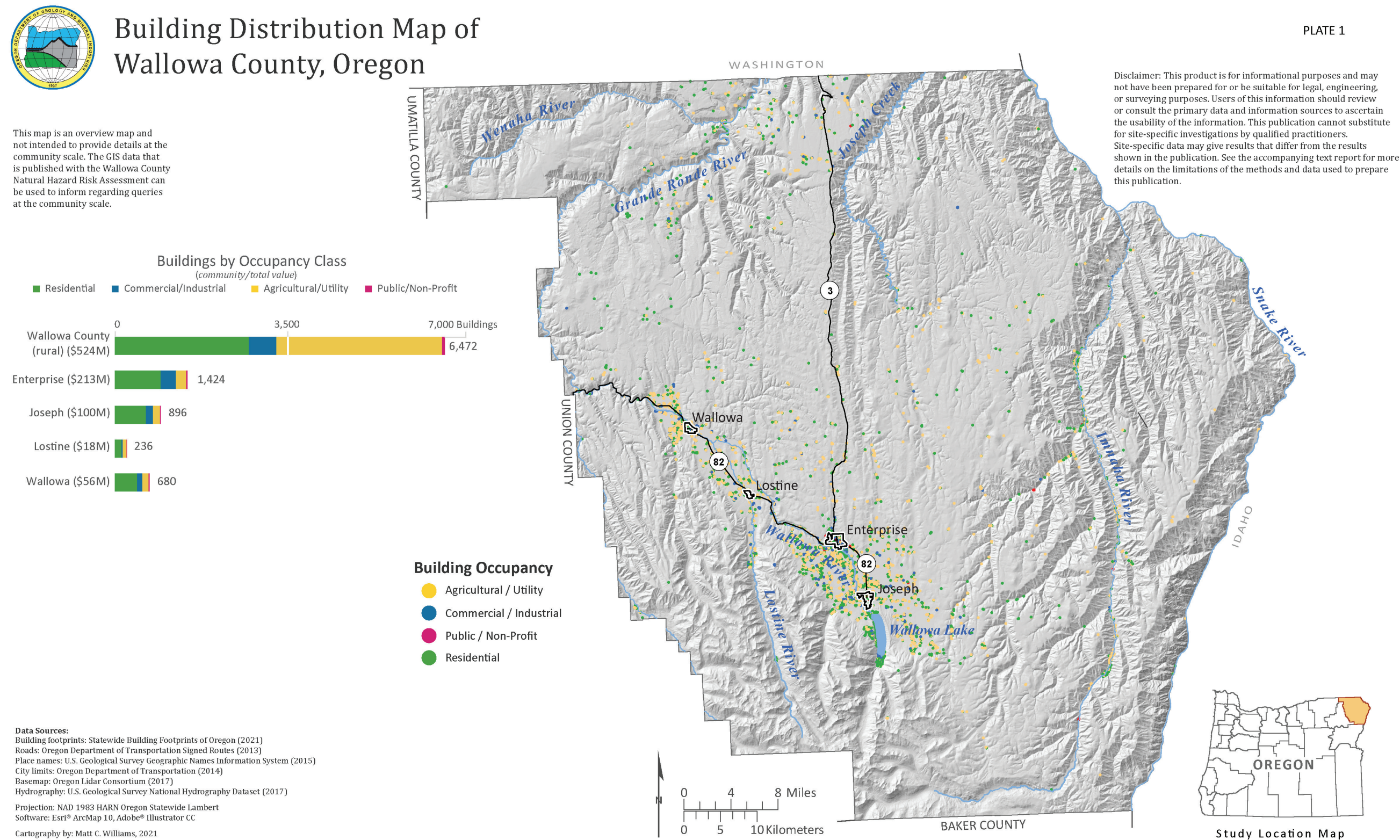
Vulnerability assessment is the second phase of this Risk Assessment. Vulnerability assessment endeavors to identify important community assets and system vulnerabilities. Vulnerabilities include both physical assets such as businesses, homes, roads and critical infrastructure like drinking water sources, and public service and health service establishments as well as community assets including people, historic places, and environmental assets. The bases for updates to this phase of the Risk Assessment are the Hazard Vulnerability Assessment ranking exercise and responses from three surveys conducted during the NHMP update process, as well as research results of demographic and economic sources.

The Steering Committee engaged in a Hazard Vulnerability Assessment (HVA) exercise based on the OEM methodology to identify the relative vulnerability of Wallowa County, the incorporated cities and the participating Special Districts 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 HVA exercise and its results are contained in the Risk Analysis, Local Risk Assessment section.

DOGAMI mapping also informs the assessment of vulnerability by illustrating the dispersed nature of rural residential structures. As part of DOGAMI's Risk Report for Wallowa County, analysts mapped building location and type, as well as population density. This mapping forms part of the full report analyzing the exposure of people and property and their susceptibility to four of the identified hazards (Flood, Earthquake, Wildfire and Volcanic Events) by overlaying high hazard areas with existing structures and populations.

Little new development has occurred in Wallowa County since the prior plan was developed as the Community Profile demonstrates. Nonetheless county staff expressed concern for future changes in development that center around new construction in the Wildland Urban Interface.

Figure 36. Building Distribution Map of Wallowa County, Oregon



Source: Multi-Hazard Risk Report for Wallowa County, Oregon, Burns and Madin, Oregon Department of Geology and Mineral Industries, 2021

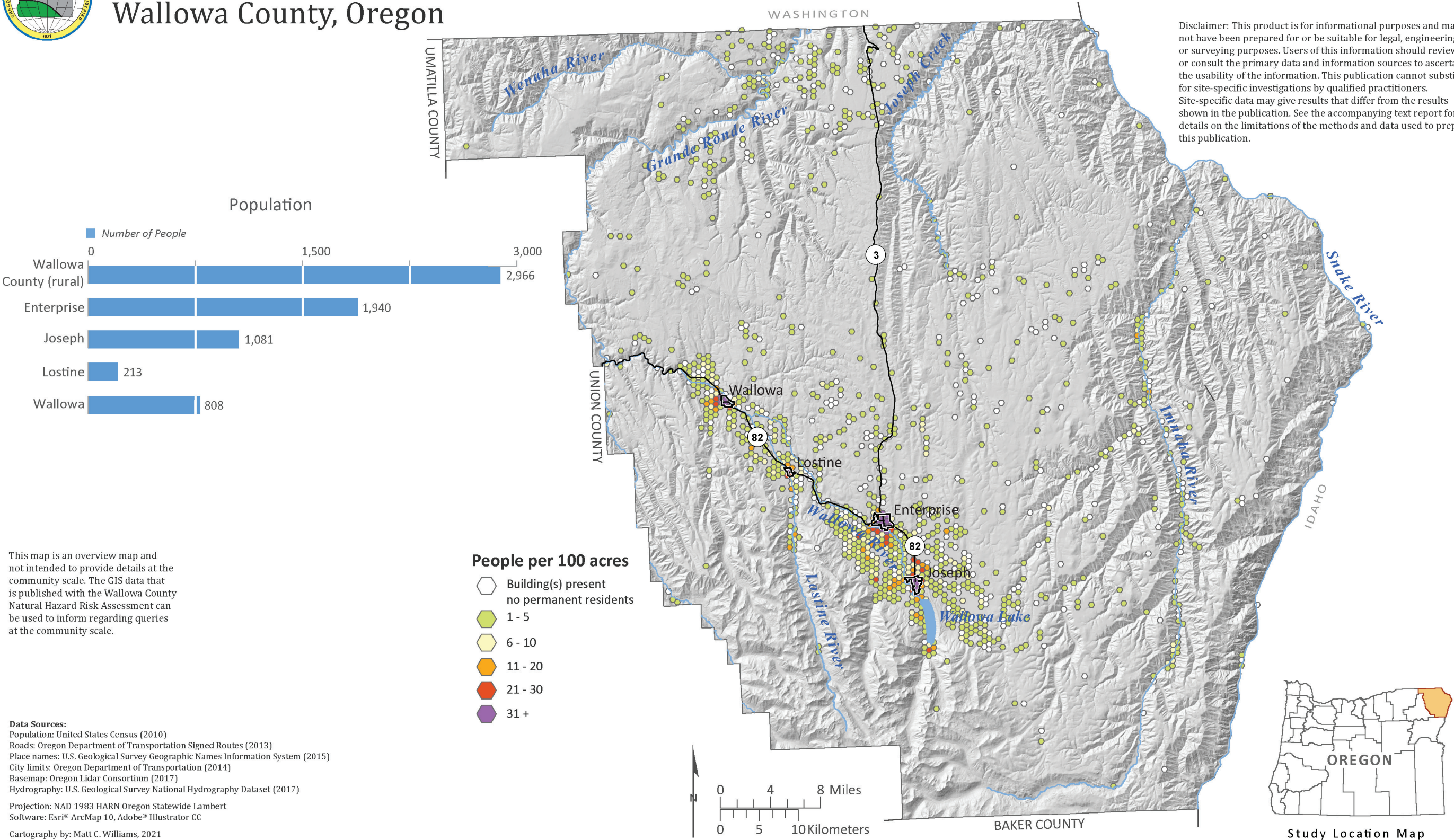
Figure 37. Population Density Map of Wallowa County, Oregon



Population Density Map of Wallowa County, Oregon

PLATE 2

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.



Source: Multi-Hazard Risk Report for Wallowa County, Oregon, Burns and Madin, Oregon Department of Geology and Mineral Industries, 2021

Hazard Vulnerability Assessment

The Wallowa County NHMP update Steering Committee identified twelve natural hazards that could have an impact on the people and property in the county. These hazards include Wildfire; Poor Air Quality; Extreme Heat; Extreme Cold; Windstorm; Winter Storm; Drought; Insect Pests, Noxious Weeds and Invasive Species; Landslides; Earthquakes; Flood; and Dam Failure. Volcanic Events were not considered to be a threat in and of themselves. The Steering Committee determined that the threat of tephra (windblown ash) is a type of Poor Air Quality. For consistency with prior plans, Volcanic Events continues to be included among those hazards profiled herein. Each is discussed briefly above and in detail within the Hazard Annexes (Volume II), however, Volcanic Events was not ranked by the Steering Committee in the HVA exercise.

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 subjective, and it is not meant to be used to compare one jurisdiction to another. It is useful to compare among hazards with a single group of participants.

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. The period of reference was decreased from 100 years as described in the OEM Methodology to a 10-year period of reference to accommodate the experience of all the members of the Steering Committee in Wallowa County.

The factors were described as follows:

History is the record of previous occurrences where 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 factors is 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.

The HVA exercise was conducted during the February 22, 2021 and April 26, 2021 Steering Committee meetings to rank these hazards using the OEM methodology. Figure 24 displays the ranking of each of these hazards according to the group present at these meetings.

Table 1. Wallowa County Hazard Vulnerability Assessment Exercise Scores

HAZARD	HISTORY			PROBABILITY			VULNERABILITY			MAX THREAT			RISK SCORE
	WF = 2	Subtotal		WF = 7	Subtotal		WF = 5	Subtotal		WF = 10	Subtotal		
Wildfire	2 x	10	20	7 x	10	70	5 x	10	50	10 x	10	100	240
Poor Air Quality	2 x	10	20	7 x	9	63	5 x	10	50	10 x	10	100	233
Windstorms	2 x	9	18	7 x	10	70	5 x	7	35	10 x	10	100	223
Extreme Cold	2 x	4	8	7 x	9	63	5 x	5	25	10 x	10	100	196
Insect Pests, Noxious Weeds and Invasive Species	2 x	10	20	7 x	10	70	5 x	9	45	10 x	6	60	195
Landslides/Debris Flows	2 x	8	16	7 x	6	42	5 x	7	35	10 x	10	100	193
Severe Storms (Winter snow and summer thunderstorms with hail)	2 x	8	16	7 x	7	49	5 x	4	20	10 x	10	100	185
Drought	2 x	10	20	7 x	7	49	5 x	9	45	10 x	6	60	174
Earthquakes	2 x	1	2	7 x	3	21	5 x	10	50	10 x	10	100	173
Dam Failure	2 x	1	2	7 x	2	14	5 x	10	50	10 x	10	100	166
Extreme Heat	2 x	1	2	7 x	8	56	5 x	6	30	10 x	6	60	148
Floods	2 x	8	16	7 x	7	49	5 x	6	30	10 x	5	50	145

Source: 2022 Wallowa County NHMP update Steering Committee work product

Community Vulnerability Assessment

Discussion by the Steering Committee and survey results from these participants and their constituents about vulnerability in Wallowa County highlighted several areas where vulnerabilities

can be identified. The participants in the process highlighted greater needs for support among particular groups of people, the sensitivity of the economic drivers of Wallowa County to natural hazard events, features of the built environment, and features of the natural environment that are vulnerable to the impacts of natural hazards.

The Steering Committee recognized that among the most vulnerable people to natural hazards are the elderly and people with disabilities, those who live in isolated locations, and short-term visitors to the area.

Elders and people living alone or people living with disabilities may be particularly vulnerable to natural hazards because they often rely on others for care for and protection. Access to remote locations is part of this vulnerability. Participants in the NHMP update process provided input via two online surveys. One participant echoed others' concerns that older people with preexisting conditions are most vulnerable to natural hazard events due to potential isolation. Historic records of several flood events noted that some people had been isolated by the flood waters (Imnaha on January 1, 1997, and Troy in February 1996).

Visitors to Wallowa County may not be prepared for natural hazards. Wallowa residents commonly experience winter storms and summer thunderstorms. Residents who are new to the area will likely learn to be prepared with extra supplies and a secondary source of heat for winter storms. Short term visitors may not be aware of the natural hazards that they may be exposed to. Travel Oregon data shows that reservations for Wallow Lake State Park ranged between 1,805 and 2,113 reservations for an average of 2.8 to 3.2 nights. The number of visitors for each reservation are not known, but this data support concerns for the impact of summer natural hazards on visitors to the county. For example, hikers caught in summer thunderstorms with damaging hail and potential for flooding or campers and visitors to the Wallowa Lake community near Wallowa Lake State Park. Visitors to this area are most numerous in the summer months and may not be aware of the moderately high risk of Wildfire in the area and the potential for rockfall type landslide events along the Joseph-Wallowa Lake Road after heavy rain. The additional access route identified in Mitigation Action MH 9 is important to address these risks.

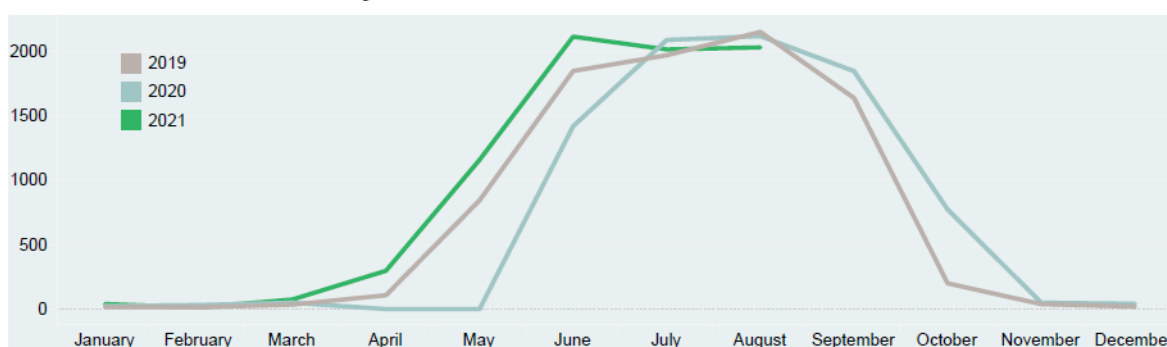
Figure 38. Reservations at Wallowa Lake State Park by month**Wallowa Lake State Park Visitation**

January 1, 2019 - August 31, 2021

Data Source: Oregon State Parks; Prepared by: Travel Oregon

Average Number of Reservations and Length of Stay by Arrival Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
26	20	53	204	1,007	1,805	2,037	2,113	1,753	490	45	31
1.9	2.1	1.9	2.2	2.7	2.8	3.2	2.8	2.4	2.1	1.9	2.4
nights	nights	nights	nights	nights	nights	nights	nights	nights	nights	nights	nights

Total Reservations YOY by Arrival Month

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. Participants noted that families of lower socioeconomic means are less financially able to make improvements that create a resilient home and less financially able to recover from disasters. 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 more likely to live in hazard-exposed areas and less likely to invest in risk-reducing measures.⁵⁴

Survey respondents highlighted the importance of the land to the economy of Wallowa County. Respondents noted that ranching and farming are particularly vulnerable enterprises to the impact of natural hazard events. Of the economic drivers of the economy in Wallowa County, the tourism industry is tied to natural resources that may be vulnerable to natural hazard events, such as Wallowa's forests and rivers.

Features of the built environment that are the most vulnerable in the community include infrastructure such roads, electricity transmission lines and the Wallowa Lake Dam. There is also

⁵⁴ Risk Driver: Poverty and inequality; Prevention Web; <https://www.preventionweb.net/risk/poverty-inequality> consulted January 2020

concern about the resilience of critical facilities, particularly school facilities, to the impact of earthquakes.

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

Below is a summary.

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. The April 1, 2020 census data for total population is available at this writing. That data shows that 7,391 people lived in Wallowa County on that date. The 2010 census data shows that 7,008 people lived in Wallowa County a decade before. This represents a 2.9% increase in population.

Please note that complete 2020 census analysis is not yet available, and the remaining metrics are based on the American Community Survey estimates through 2019. Based on the 2019 American Community Survey, the most recent available, the US Census estimates that 7,208 people lived in Wallowa County in 2019.

Vulnerabilities

- Members of the Steering Committee identified that veterans and the elderly are some of the most vulnerable populations in Wallowa County. Of this population 4.7% are children under five years old and 3.9% 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 working age population aged 16-64. Of all Wallowa County residents, 29.7% are aged 65 or older as compared to 18.2% of all Oregonians who are 65 or older. The Old-age Dependency Ratio for Wallowa County shows that there are 51.8 people over 65 for every 100 people of working age in Wallowa County compared to 27.0 for Oregon as a whole (Appendix A: page A-20)⁵⁵.
- The Child Dependency ratio for all of Wallowa (34.4) is approximately the same as for all of Oregon (34.3); however, the Child Dependency ratio for Lostine (52.8), Wallowa (50.5) and Enterprise (45.5) indicate that there are more children per working aged individual in those communities. Combined with the

⁵⁵ American Fact Finder, US Census Bureau, <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>, consulted February 2020

Old-age Dependency ratio, Lostine is home to 102.5 elders over 65 and children under 15 for every 100 working aged people (Appendix A: page A-20).⁵⁶

- There are a higher percentage of Wallowa County residents who are veterans, 606 people of 5,181 Wallowa residents over 18 years old or 10.6% as compared with 7.9% of Oregonians overall. Most demographic characteristics of these veterans mirror the civilian population such as race and education, but they are predominantly men 65 years and older and veterans of the Vietnam War, Korean War and 17 World War II veterans. They also differ from the civilian population in that they are more than twice as likely to live with a disability, but slightly less likely to be living below the poverty line.⁵⁷
- The American Community Survey estimates that there was a total of 3,214 households in Wallowa County in 2019. There were 462 households with individuals over 65 years of age living alone in Wallowa County (approximately 14.4% of all households) and 173 single parent households (approximately 5.4% of all households).⁵⁸
- Participants identified people living in poverty as a vulnerable population. Of all families in Wallowa County, 10.1% are families whose income in the preceding 12 months was below the poverty level. Of the twelve families headed by a female householder with children under 5 years old in Wallowa County, 100% were living in poverty.
- The median household income in Wallowa County in 2019 was \$51,224; this is just over 18% lower than the State of Oregon median income of \$62,818.⁵⁹

In summary, Wallowa 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 Wallowa County than in Oregon as a whole. Although the proportion of children in Wallowa 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. Wallowa 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. The county has a greater proportion of families living in poverty than in Oregon as a whole. These people are disproportionately affected by natural hazards likely due to their lack of access to financial resources. The median income in Wallowa County is less than that in Oregon as a whole possibly reflecting resource scarcity for county residents.

⁵⁶ Ibid.

⁵⁷ U.S. Census, American Community Survey, Table S2101, consulted March 2021

⁵⁸ Ibid.

⁵⁹ American Fact Finder, US Census Bureau, 2017

Table 2. Selected demographics of Wallowa County compared to Oregon totals

	Wallowa County	Oregon
Age		
Population under 5 yrs. old	4.9% (342 children)	5.8%
Population over 85 yrs. old	2.7% (190 elderly)	2.1%
Old-age dependency ratio: Ratio of those over 65 to the rest of the population	51.8	27.0
Households		
One-person households	19.8% (635 households)	27.7%
One-person households over 65 yrs old	5.4% (173 households)	11.2%
Income		
Families living in poverty	10.1%	8.4%
Poverty rate for single parent families headed by women with children under 5	100%	48.8%
Median household income	\$51,224	\$62,818

Source: 2019 American Community Survey

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 county has recently completed an Economic Opportunities Analysis.⁶⁰ The trend analysis provided therein describes the economy of Wallowa County as dominated by agriculture and support services. The Recreation and Tourism industry is also a significant sector of the economy, especially in the spring, summer and fall. The population of the Wallowa Lake community and the number of visitors to the Wallowa Lake State Park swells during summer months.⁶¹

Support services include government, schools, stores, and hospitality facilities. From 2016 to 2017, employment in Wallowa County, OR grew at a rate of 5.75%, from 2.87 thousand employees to 3.03 thousand employees. The most common employment sectors for those who live in Wallowa County, OR, are Health Care & Social Assistance (521 people), Agriculture, Forestry, Fishing & Hunting (417 people), and Construction (327 people). The total number of employed people (3,030) is

⁶⁰ [Economic Opportunity Analysis: 2021 \(wallowa.or.us\)](https://www.wallowa.or.us/economic-opportunity-analysis-2021)

⁶¹ Ibid.

approximately 43% of the total population. This figure is relatively low, which is not surprising given the high average age and percentage of senior citizens who are not working.⁶²

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. Below are several areas of economic vulnerability in Wallowa County as described in the recently completed Economic Opportunities Analysis.

Vulnerabilities

- Forest resources: Forest resources are critical to the economy in Wallowa County. The EOA reports that forest health has long been an area of great concern for Wallowa County residents, and it will likely continue to be the focus of great interest. The potential for new businesses engaged in resource extraction exists and it is reasonable for the County to have within its developable lands inventory sites that are suitable for the processing of forest products.⁶³
- Agricultural and livestock industries: Farmers and ranchers in the county present a range of potential opportunities for value-added processing. There remains a strong interest in urban areas of Oregon in locally produced products and agricultural products with a specific provenance or history and Wallowa County has a particular resonance as a place of origin.⁶⁴
- Energy: There are more limited opportunities for large scale energy projects in Wallowa County given the remote location and limited transmission capacity. However, there is an interest and opportunity for micro-grids, small scale hydro projects that provide options for small scale energy generation as well as self-sufficiency for persons who want to rely less on primary energy services or who want to live off the grid.⁶⁵
- Transportation: The County is at the beginning of a long distribution chain for natural resources, agriculture, and some value-added production, but its location also means it is at the end of the line when it comes to bringing in products including everything from toilet paper to farm equipment.⁶⁶

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

⁶² EOA

⁶³ Wallowa County Economic Opportunities Analysis, 2021, [Economic Opportunity Analysis: 2021 \(wallowa.or.us\)](https://www.wallowa.or.us/economic-opportunity-analysis-2021)

⁶⁴ Ibid.

⁶⁵ Ibid.

⁶⁶ Ibid.

space to live, work and recreate.⁶⁷ 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 Wallowa County vary widely from summer to winter. The county usually experiences freezing winters with an average high of 35.1°F and an average low of 17°F in Enterprise in December and summers can be blistering with average daytime high temperatures of 85.8°F and an average low of 42.9°F in Enterprise in August.
- Management objectives vary between forest landowners. 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 landowners 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, suppression, or salvage—has presented historic challenges. These challenges reflect on the vulnerability of the forested landscapes⁶⁸.

National Flood Insurance Program (NFIP)

Wallowa County and all four cities within the county (Enterprise, Joseph, Lostine and Wallowa) are all participants in the NFIP. The Wallowa 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 Wallowa 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.

Wallowa County and incorporated cities:

- Have 72 National Flood Insurance Program (NFIP) policies in force with a total of \$12,549,800 of value, 10 of which are for non-residential buildings with the remaining 62 policies covering residential properties.
- Have 16 paid claims totaling \$17,497.
- Are not members of the Community Rating System (CRS);

⁶⁷Mayunga, J. 2007. Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach. Summer Academy for Social Vulnerability and Resilience Building.

⁶⁸ Governor’s Council on Wildfire Response; November 2019: Report and Recommendations;
https://www.oregon.gov/gov/policy/Documents/FullWFCReport_2019.pdf

- There are no repetitive loss buildings and no severe repetitive loss building claims in Wallowa County; and
- The last Community Assistance Visit (CAV) in Wallowa County was initiated on September 11, 2011, with the City of Enterprise; Community Assistance Contacts (CACs) were held in Wallowa County and the City of Joseph November 4, 1998 and in the City of Wallowa December 14, 1999. The City of Lostine has not received either a CAV or a CAC since it has been an NFIP community beginning in 1988.

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 of 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 noted below are derived from the database of critical local facilities and state-owned and leased properties developed by DOGAMI for the Oregon Natural Hazard Mitigation Plan update completed in 2020. This database was further refined by the Wallowa County Steering Committee.

Vulnerabilities

- With respect to flood risk, both the Troy Elementary School and some structures within the Wallowa Lake State Park operated by Oregon Parks and Recreation Department (OPRD) are located within the Special Flood Hazard Area and may be at risk of flooding.
- With respect to wildfire risk, the following critical facilities face high risk of a wildfire event: Imnaha Elementary, Joseph State Airport, Howard Butte Facilities and Lookout, Memaloose Airport, Oregon Department of Fish and Wildlife's (ODFW) Wenaha Wildlife Area facilities, Wallowa Lake Fire Station, Reds Wallowa Horse Ranch, Troy Elementary, and the OPRD Wallowa Lake facilities.
- With respect to landslide risk, the Joseph Sewage Treatment plant is the only Critical Facility located in a high-risk area for landslides. Other facilities including Imnaha Elementary, ODFW Wenaha Wildlife Area facilities, Enterprise Schools, and the Wallowa Sewage Treatment Plant are at moderate risk of damage due to landslide.
- With respect to earthquake risk, a number of structures are at risk of damage from an earthquake event. These include the following: Joseph State Airport, Aviation Office (Joseph), Red's Wallowa Horse Ranch, Wallowa Memorial Hospital, Wallowa County Sheriff & Emergency Services and Enterprise Police, Wallowa County Public Works, Wallowa Sewage Treatment Plant, Enterprise Fire Department, Joseph Fire Department, Wallowa Lake Fire Station, Lostine Fire Department, Wallowa Fire Department, Wallowa High/Elementary School,

Enterprise SDA School, ODOT Maintenance Station - three buildings, OPRD
Wallowa Lake facilities, Oregon State Police – Enterprise, ODFW Hatchery Building
& Cold Storage,.

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 Wallowa County draws from three sources, the database of Essential Local Facilities and State-owned and Leased facilities as revised by the Wallowa County Steering Committee⁶⁹ to create the Wallowa County Critical Facilities List combined with the publicly available natural hazard probability data referred to previously in this plan (FEMA SFHA, SLIDO 4.2, PNW QWRA) and the DOGAMI Natural Hazard Risk Report. The Critical Facilities at Risk evaluates risk to only critical facilities. The DOGAMI Risk Report estimates losses to all structures in Wallowa County by performing risk assessments using two approaches: (1) estimated loss (in dollars) to buildings from flood (recurrence intervals) and earthquake scenarios using FEMA Hazus®-MH methodology, and (2) calculated number of buildings, their value, and associated populations exposed to earthquake, and flood scenarios, or susceptible to varying levels of hazard from landslides and wildfire.

Critical Facilities at Risk

The data for the Critical Facilities risk analysis originates from DOGAMI's assessment of risk to each from Wildfire, Flood, Earthquake, and Volcanic Events utilized for risk assessment of Region 7 in the 2020 Oregon Natural Hazard Mitigation Plan update. This data was obtained by K. Daniel in order to provide a type of risk analysis prior to the completion of the DOGAMI Natural Hazard Risk Report for Wallowa County. Data in the original geodatabase was evaluated by the Wallowa County Steering Committee to distill from it a list of Critical Facilities. Several facilities were added to this list by the Steering Committee members. Location of these newly added structures within the areas at risk of landslide or wildfire was determined using the DOGAMI's SLIDO 4.2 landslide map and the Pacific Northwest Quantitative Wildfire Risk Assessment map utilized by the Oregon Department of Forestry and FEMA's Special Flood Hazard Areas as digitized by DLCD and provided through its GIS data portal. The assessed values and building square footage of each facility was provided or verified by F. Goebel through the Wallowa County Assessor's office.

⁶⁹ The database information regarding assessed value and square footage was updated during the process of local Steering Committee review of which facilities should be classified as Critical Facilities.

The following tables estimate the value of Critical Facilities at high and moderate risk of damage and also list them in relative order of those structures or groups of facilities at risk of damage from multiple hazards.

Table 3. Critical Facilities Ranked in Relative Order of Risk to Multiple Natural Hazards

Facility Name or Use	State Agency Name, if any	City or Community	Total Building Value	Square Feet	Flood Hazard - FEMA SFHA 1% Annual	Wildfire Hazard	Land-slide Hazard	Earth-quake Hazard
Imnaha Elementary		Imnaha	\$581,100	3,874		High	Moderate	Low
ODFW Wenaha Wildlife Area facilities HQ	ODFW	north of Troy	\$553,272	21,245		High	Moderate	Low
Imnaha Store and Tavern		Imnaha	29,000	3,000		High	Moderate	
Joseph State Airport		Joseph	\$750,000	5,000		High	Low	High
Howard Butte Facilities and Lookout (value, square footage and hazards were combined)	USFS	Minam	\$256,294	180		High	Low	Moderate
Wallowa Lake Fire Station		Wallowa Lake	\$548,100	3,654		High	Low	High
Reds Wallowa Horse Ranch	USFS	Eagle Cap Wild	\$750,000	5,000		High	Low	High
Memaloose Airport	USFS	near Imnaha	\$750,000	5,000		High	Low	Low
Joseph Water Treatment Plant		Joseph	\$249,000	1,660		Low	High	Moderate
Wallowa Sewage Treatment Plant		Wallowa	\$161,700	1,078		Moderate	Moderate	High
Oregon State Police - Enterprise	OR State	Enterprise	\$471,450	2,378		Moderate	Low	High
Enterprise SDA School		Enterprise	\$400,650	2,671		Moderate	Low	High
ODFW Hatchery Building & Cold Storage	ODFW	Enterprise	\$132,836	11,132		Moderate	Low	High
Wallowa Memorial Hospital		Enterprise	\$6,732,750	44,885		Low	Low	High
Enterprise Fire Department		Enterprise	\$1,419,000	9,460		Low	Low	High
Wallowa County Sheriff & Emergency Services and Enterprise Police		Enterprise	\$1,013,700	6,758		Low	Low	High
Wallowa County Public Works		Enterprise	\$1,242,150	8,281		Low	Low	High
Enterprise Maintenance Station Grounds	ODOT	Enterprise	\$684,927	3,855		Low	Low	High
Enterprise Maintenance Station Grounds	ODOT	Enterprise	\$1,053,636	6,080		Low	Low	High
ODOT Maintenance Station - three build	ODOT	Enterprise	\$1,138,978	6,595		Low	Low	High
Office, Joseph Mobile	Dept.	Joseph	\$53,471	2,060		Low	Low	High
Joseph Fire Department		Joseph	\$724,650	4,831		Low	Low	High
Lostine Fire Department		Lostine	\$394,350	2,629		Low	Low	High
Wallowa Fire Department		Wallowa	\$1,148,850	7,659		Low	Low	High
Wallowa High/Elementary School		Wallowa	\$2,702,250	18,015		Low	Low	High
Enterprise Schools		Enterprise	\$16,337,163	82,478		Low	Moderate	Moderate
M Crow General Store		Lostine	93,650	7,300		Low	Moderate	
Joseph Charter School		Joseph	\$8,479,650	56,531		Low	Low	Moderate
Enterprise Municipal Airport		Enterprise	\$1,053,300	7,022		Low	Low	Low
Enterprise Sewage Treatment Plant		Enterprise	\$538,800	3,592		Low	Low	Low
Cloverleaf Hall		Enterprise	240,000	10,000		Low	Low	
Grocery store in Enterprise (Safeway)		Enterprise	1,890,000	125,840		Low	Low	
Enterprise Community Connections		Enterprise	805,000	16,000		Low	Low	
Wallowa Resources		Enterprise	1,000,000	56,000		Low	Low	
Wallowa County Courthouse		Enterprise				Low	Low	
Southfork Grange		Lostine	106,000	2,320		Low	Low	
Wallowa Senior Center		Wallowa	391,000	5,500		Low	Low	
Wallowa Mountain Office - USFS	USFS	Joseph				Low	Low	

Facilities located in areas with High Probability of Wildfire include the OPRD Wallowa Lake facilities, Wallowa Lake Fire Station, Troy Elementary, Imnaha Christian Fellowship, Imnaha Elementary, Imnaha Store and Tavern, ODFW Wenaha Wildlife Area facilities, Joseph State Airport, Howard Butte Facilities and Lookout, Reds Wallowa Horse Ranch, and Memaloose Airport. These facilities have a combined assessed value of \$9,982,831.

Facilities located within areas of High probability of landslide include the Imnaha Christian Fellowship building and the Joseph Water Treatment plant. These facilities have an assessed value of \$422,000.

Facilities assessed by DOGAMI to be at High risk of damage from an earthquake include Wallowa County Sheriff & Emergency Services and Enterprise Police, Wallowa County Public Works, Enterprise Fire Department, Enterprise SDA School, Wallowa Memorial Hospital, City of Wallowa High/Elementary School, City of Wallowa Sewage Treatment Plant, City of Wallowa Fire Department, City of Joseph Fire Department, City of Lostine Fire Department, Wallowa Lake Fire Station, Oregon State Police office, ODFW Hatchery Building & Cold Storage, three ODOT Maintenance Station buildings, Joseph State Airport and the Aviation Office, and Red's Wallowa Horse Ranch. The combined assessed value of these facilities totals \$26,920,913.

The facilities located within the FEMA Special Flood Hazard Area include the Troy Elementary School and two restroom or shower structures within the Wallowa Lake State Park. These amount to a combined assessed value of \$725,460.

Table 4. Assessed Value of buildings within Wildfire, Landslide, Earthquake and Flood Risk area

Hazard	Risk Level	Building value
Wildfire	High	\$9,982,831
	Moderate	\$1,166,636
Landslide	High	\$422,000
	Moderate	\$17,726,885
Earthquake	High	\$26,920,913
	Moderate	\$25,322,107
Flood	Exposed	\$725,460

DOGAMI Risk Report

Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a natural hazard risk assessment to quantify the impacts to the entire county of four of the natural hazards identified by the Wallowa County Steering Committee for this NHMP update. The hazards assessed by DOGAMI 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 the risk assessment.

In the first task, DOGAMI created a comprehensive asset database for Wallowa 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 Wallowa 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 Wallowa County was the best available at the time of analysis.

In the third task, DOGAMI performed risk assessments using Esri® ArcGIS Desktop® software. Their analyst used two risk assessment approaches: (1) estimate loss (in dollars) to buildings from flood and earthquake scenarios using FEMA Hazus®-MH methodology, and (2) calculate the 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.

The results of the DOGAMI risk assessment are as follows:

Wildfire

Wallowa Countywide wildfire exposure (High hazard):

- Number of buildings: 3,623
- Value of exposed buildings: \$285,948,000
- Percentage of total county value exposed: 31%
- Critical facilities exposed: 10
- Potentially displaced population: 1,473

Using guidance from ODF, DOGAMI analysts re-categorized the Burn Probability dataset from seven levels into three levels of probability (low, moderate, and high-hazard zones) for the wildfire exposure analysis. Burn probability is derived from simulations using many elements, such as, weather, ignition frequency, ignition density, and fire modeling landscape.⁷⁰

Burn probabilities (mean annual burn probability) were grouped into these three 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 analysts overlaid the buildings layer and critical facilities on each of the wildfire hazard zones to determine exposure. The analysis also estimated the number of people threatened by wildfire. Land value losses due to wildfire were not examined for this project.⁷¹

High wildfire hazard is present for a very large portion of the county but is moderate or low in the incorporated communities of the county. A high percentage (50%) of the buildings in the wildland urban interface and rural portions of the county are at significant risk to wildfire. While the risk is lower for the incorporated communities, exposure to moderate wildfire hazard is present in these areas and would result in a large amount of loss if they were to burn. The focus of this section is on

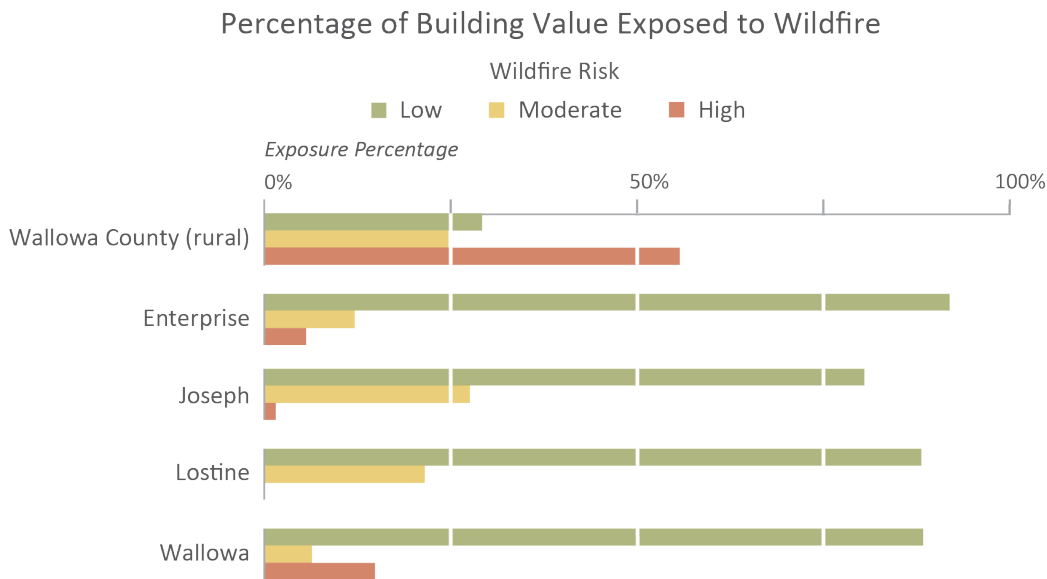
⁷⁰ Pyrologix LCC, 2018

⁷¹ Multi-Hazard Risk Report for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021.

high hazard areas within Wallowa County to emphasize the areas where lives and property are most at risk. The total dollar value of exposed buildings in the study area is reported below.⁷²

Within unincorporated Wallowa County 3,491 buildings are exposed to high wildfire hazard,⁷³ but the incorporated communities have far less exposure to the high-risk category. The primary areas of exposure to this hazard are in the forested unincorporated areas throughout the county. The cities of Enterprise and Wallowa have the highest percentage of exposure to high wildfire hazard for incorporated communities. Figure 28 illustrates the level of risk from wildfire for the different communities of Wallowa County.⁷⁴

Figure 39. Wildfire Exposure by Wallowa County community



Areas of significant risk were specifically identified by the DOGAMI Risk Report. The DOGAMI analysts identified locations within the study area that are comparatively at greater risk to wildfire hazard:

- Buildings throughout the unincorporated county are at high risk to wildfire.
- Buildings along the base of the Wallowa Mountains and along Wallowa Lake are at high risk to wildfire.
- Buildings in the northwestern portion of the City of Enterprise and the southern portion of the City of Wallowa are at high risk to wildfire.

⁷² Ibid.

⁷³ Ibid.

⁷⁴ Ibid.

Earthquake

Wallowa County 2,500-year probabilistic Mw 7.0 earthquake results:

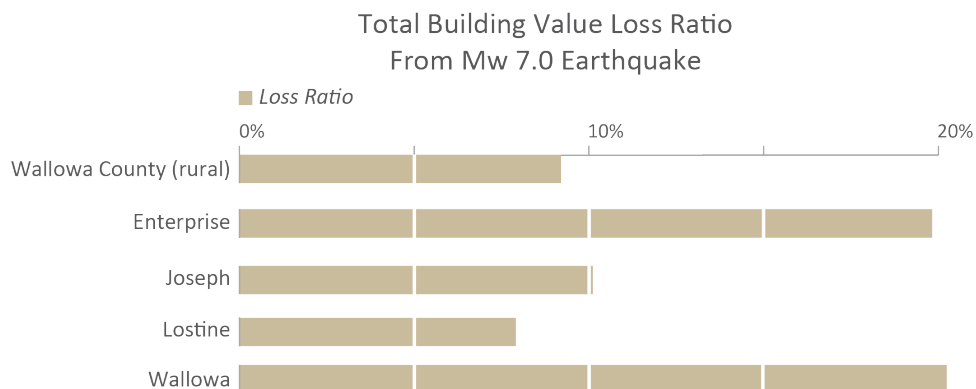
- Number of red-tagged buildings: 497
- Number of yellow-tagged buildings: 1,515
- Loss estimate: \$114,111,000
- Loss ratio: 13%
- Non-functioning critical facilities: 19
- Potentially displaced population: 576

DOGAMI analyzed the potential losses due to both liquefaction and coseismic landslides and provided this analysis in the Multi-Hazard Risk Report for Wallowa County, Oregon prepared by Matt Williams and Ian Madin, 2021. The Hazus-MH scenario selected to most effectively communicate earthquake risk for Wallowa County was a probabilistic modeled using the 2% in 50 year or 2,475-year scenario. Other data sources used to estimate losses due to earthquake include the National Earthquake Hazard Reduction Program (NEHRP) soil classification, peak ground acceleration (PGA), peak ground velocity (PGV), spectral acceleration at 1.0 second period and 0.3 second period (SA10 and SA03), and liquefaction susceptibility.

Because an earthquake can affect a wide area, it is unlike other hazards in this report — every building in Wallowa County is exposed to significant probability or shaking caused by earthquake (though not necessarily simultaneously or at the same magnitude). This makes modeling the cost of likely damages a complex analysis.

The FEMA Hazus-MH tool is among those used by DOGAMI in the Multi-Hazard Risk Report for Wallowa County. 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 total building replacement value to obtain a loss estimate. The details of this method are described in detail in the report included in Appendix E.

Figure 40. Earthquake loss ratio by Wallowa County community



DOGAMI analysts used the ATC-20 post-earthquake building safety evaluation color-tagging system to represent damage states (Applied Technology Council, 2015). 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 red or yellow-tagged buildings we report for each community is based on an aggregation of the probabilities for individual buildings.⁷⁵

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.⁷⁶ Because building specific information is more readily available for critical facilities and due to their importance after a disaster, we chose to report the results of these buildings individually.

The number of potentially displaced residents from an earthquake scenario described in this report was based on the formula: $([\text{Number of Occupants}] * [\text{Probability of Complete Damage}]) + (0.9 * [\text{Number of Occupants}] * [\text{Probability of Extensive Damage}])$ (FEMA, 2012b). The probability of damage state was determined in the Hazus-MH earthquake analysis results.

During the prior plan update, DOGAMI performed Rapid Visual Screening for Critical Facilities in Wallowa County. Oregon Senate Bill 2 (2005) directed DOGAMI, in consultation with project partners, to develop a statewide seismic needs assessment that included seismic safety surveys of K-12 public school buildings and community college buildings that had, at the time, a capacity of 250 or more persons, hospital buildings with acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. These RVS reports are included in Appendix D.

The 2021 DOGAMI Multi-Hazard Risk Assessment for Wallowa County confirms these and further identifies that in the City of Enterprise, the Cloverleaf Hall, the buildings currently occupied by Safeway and Wallowa Resources, locally identified Critical Facilities⁷⁷, are at 50% risk of moderate to complete damage in the 2,500-year probabilistic Mw 7.0 earthquake scenario. DOGAMI reconfirms that the Wallowa County Courthouse constructed in 1909 has high potential for collapse as does the Enterprise Fire Department and Enterprise High School.⁷⁸

In the City of Lostine, DOGAMI identifies all four Critical Facilities buildings as at a 50% probability of sustaining moderate to complete damage during the 2,500-year probabilistic Mw 7 earthquake. These include the Lostine City Hall, Fire Department, M Crow General Store and the Southfork Grange building.⁷⁹

In the City of Joseph, Joseph High School. was identified by the prior Rapid Visual Screening reports as at risk of damage in an earthquake. The DOGAMI 2021 MHRA does not identify Joseph High

⁷⁵ Federal Emergency Management Agency, 2012b, Hazus®-MH 2.1 Technical manual, Earthquake model: Washington, D.C., 718 p

⁷⁶ Ibid.

⁷⁷ The Wallowa County NHMP update Steering Committee identified locally important facilities

⁷⁸ Multi-Hazard Risk Assessment for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021

⁷⁹ Ibid.

School as being located in a high risk area for damage due to earthquake. It does identify the building housing the Wallowa Mountain Office as being at risk of damage in the modeled scenario.⁸⁰

In the City of Wallowa, the DOGAMI analysis indicates that the Wallowa Fire Department, Wallowa High/Elementary School, and the Wallowa Water Treatment Plant are at a 50% risk of moderate to complete damage in the 2,500-year probabilistic Mw 7.0 earthquake scenario discussed in the full report.⁸¹

Within the Wallowa County Critical Facilities those at the modeled 50% probability of damage include the Joseph Airport, the Oregon State Police facility, the Wallowa County Public Works facilities, the Wallowa Lake Fire Station and the ODFW Hatchery.⁸²

Areas of significant risk identified within Wallowa County by DOGAMI analysts include:

- High liquefaction areas in Wallowa County correspond to populated areas along the Wallowa River. Over 60% of the residents of Wallowa County have homes built on high liquefaction potential soils, which increases the likelihood of substantial ground deformation and building damage from an earthquake.
- Many high value buildings in commercial areas in Enterprise and Wallowa are unreinforced masonry buildings which are highly susceptible to damage from ground shaking.
- Based on the assessor's data used in this study, many buildings throughout the county are older and less likely to meet modern building design standards. Older buildings may be more vulnerable to substantial damage during an earthquake.
- 19 of the 40 critical facilities in the study area are estimated to be non-functioning due to an earthquake like the one simulated in this study.⁸³

Landslide

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

- Number of buildings: 568
- Value of exposed buildings: \$67,445,000
- Percentage of total county value exposed: 7.4%
- Critical facilities exposed: 4
- Potentially displaced population: 248

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

⁸⁰ Multi-Hazard Risk Assessment for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021

⁸¹ Ibid.

⁸² Ibid.

⁸³ Ibid.

susceptibility: Very High, High, Moderate, and Low. 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.⁸⁴

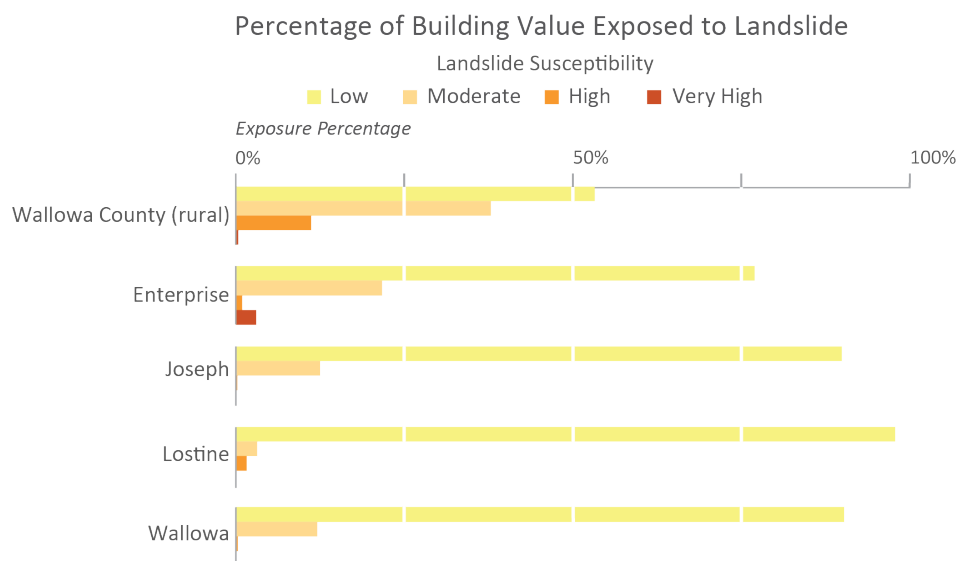
The analysis of landslide exposure was performed by DOGAMI staff by overlaying building and critical facilities data on landslide susceptibility zones to assess the exposure for each community. DOGAMI analysts combined high and very high susceptibility zones to provide a general sense of community risk for planning purposes. Full details of the analysis can be found in Appendix E.

The total dollar value of exposed buildings was summed for the study area and is reported in the box at the top of this section. DOGAMI analysts also estimated the number of people threatened by landslides. Land value losses due to landslides and potentially hazardous unmapped areas that may pose real risk to communities were not examined for this report.

Overall, the amount of exposure to landslide hazard in the county is small, with only 7% of building value exposed to high or very high susceptibility. Buildings throughout the rural parts of the county show a higher level of risk to landslide than urbanized areas.

Most of the developed land in Wallowa County is located on the flat terrain found in the river valleys which are typically low landslide susceptibility zones. Throughout rural portions of the county where buildings are present on steep hillsides the risk to landslide is greater. Landslide hazard is ubiquitous in a large percentage of undeveloped land and may present challenges for planning and mitigation efforts. Awareness of nearby areas of landslide hazard is beneficial to reducing risk for every community and rural area of Wallowa County. A complete lidar-based landslide inventory for the County would provide much more accurate and detailed results.

Figure 41. Landslide susceptibility exposure by Wallowa County community



⁸⁴ Ibid.

Among the Critical Facilities identified as within areas of high susceptibility to Landslide are the Imnaha Christian Fellowship building, the Joseph Sewage Treatment Plant (Figure 10), Reds Wallowa Horse Ranch Airstrip and a communication facility. This assessment is based on the existing landslide mapping available for Wallowa County.

Flood

Wallowa Countywide 100-year flood loss:

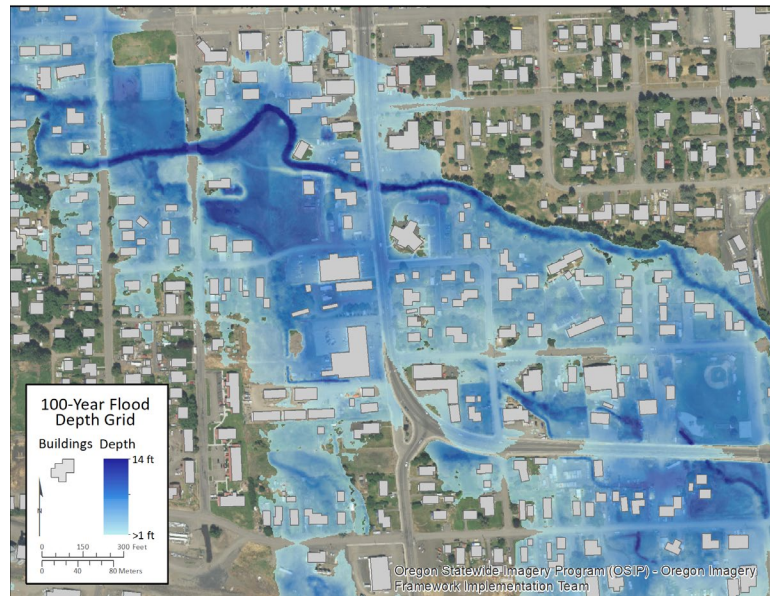
- Number of buildings damaged: 295
- Loss estimate: \$1,547,000
- Loss ratio: 0.2%
- Non-functioning critical facilities: 0
- Potentially displaced population: 622

DOGAMI's 2021 Multi-Hazard Risk Assessment for Wallowa County developed 10-, 50-, 100-, and 500-year flood depth maps from detailed stream model information within the study area. These depth grids developed based on 2015 LiDAR topography and FEMA Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) for Wallowa County updated and made effective in 1988. A state wide building footprint layer published by DLCD in 2021 and data from the Wallowa County Assessor allow a robust analysis and mapping of structures at risk of flood damage (see Figure 31). Full details of the method of analysis are available in Appendix E.

The DOGAMI analysis used additional data to develop and estimate of losses due to flood damage. They used the flood depth maps they developed and building attribute data provided by the Wallowa County Assessor specifying occupancy type, first-floor height above ground and the presence of a basement. Imagery was also used to verify attributes on important buildings. These data allowed calculation of a loss ratio from a particular depth of flood and estimation of the number of structures damaged and the number of people displaced.⁸⁵

The DOGAMI analysis confirms that no Critical Facilities listed by the Steering Committee are located in AE Flood Zones (those with base flood elevations established) at risk of damage from flood. Facilities located within the A Flood Zone of the FEMA Special Flood Hazard Area include the Troy Elementary School and two restroom or shower structures within the Wallowa Lake State Park. Nonetheless, the county could expect more than \$1,500,000 in losses for a 1% chance flood event.

⁸⁵ Multi-Hazard Risk Assessment for Wallowa County, Oregon; Williams and Madin, DOGAMI, 2021

Figure 42. Flood depth grid example in the City of Enterprise, OR

For this risk assessment, DOGAMI used the list of Critical Facilities developed by the community defined feature (UDF) data and the depth grids in FEMA's Hazus-MH model. The analysis was performed for four flood scenarios (10-, 50-, 100-, and 500-year). This analysis used the 100-year flood scenario as the primary scenario for reporting flood results. 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. The complete report also provides multi-scenario cumulative results.

The main flooding problems within Wallowa County are found in the City of Enterprise in the designated 100-year floodplain. The Wallowa River and some of its tributaries could produce shallow flooding for a wide area in the southern portion of the City of Enterprise. Other communities, such as Joseph and Lostine, are estimated to have little to no damages from flooding (Figure 32).

Separate from the Hazus-MH flood analysis, DOGAMI analysts performed an exposure analysis by overlaying building locations on the 100-year flood extent. This was done to estimate the number of buildings that are elevated above the level of flooding and the number of displaced residents, both of which are not considered in the Hazus analysis. This was done by comparing the number of non-damaged buildings from Hazus-MH with the number of exposed buildings in the flood zone. Some (5%) of Wallowa County's buildings were found to be within designated flood zones. Of the 486 buildings that are exposed to flooding, we estimate that 191 are above the height of the 100-year flood. This evaluation also estimates that 622 residents might have mobility or access issues due to surrounding water.

Estimates of loss are made by intersecting building locations with natural hazard layers and applying damage functions based on the hazard severity and building characteristics. Figure 33 illustrates the range of building loss estimates from Hazus-MH flood analysis in an area of Enterprise.

Figure 43. Ratio of flood loss estimates by Wallowa County community

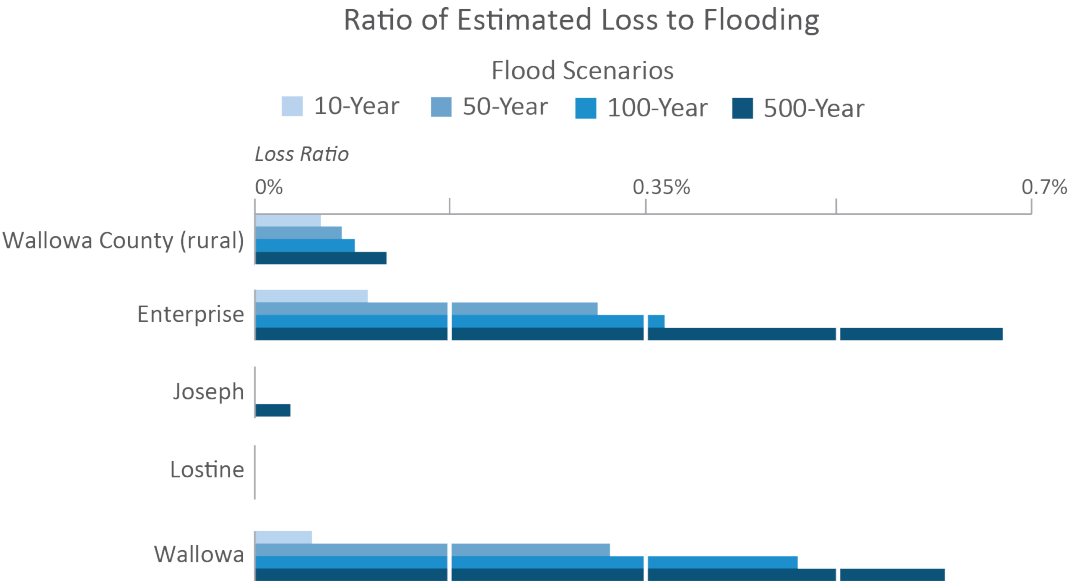
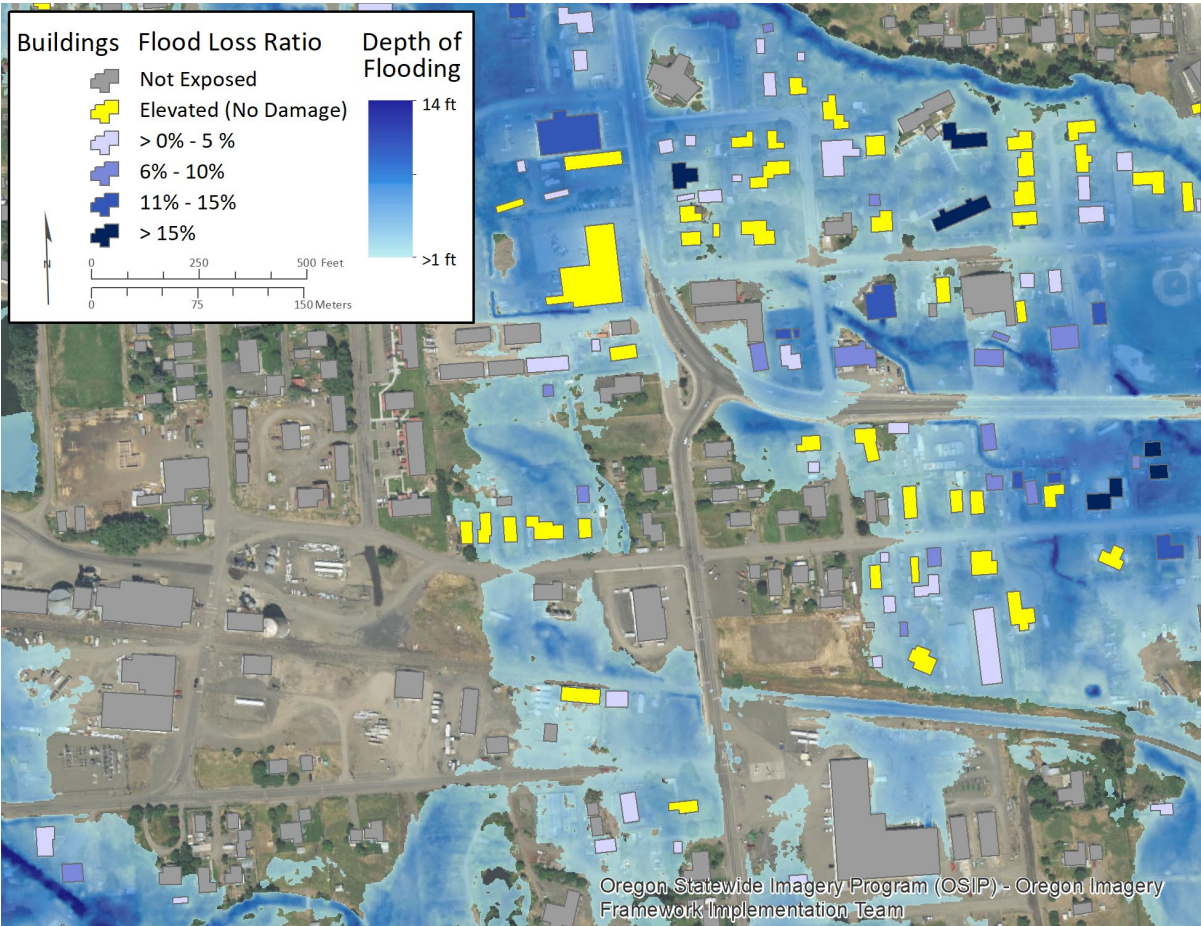


Figure 44. 100-year flood zone and building loss estimates example in City of Enterprise, OR



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

- A wide area of buildings in the southern portion of Enterprise are at risk to exposure from shallow flooding.
- A few buildings along the Wallowa River in the City of Wallowa have the potential to be damaged by a 100-year flood.
- Updated stream modeling and flood mapping would provide a better understanding of the risk in Wallowa County.

Future Climate Projections⁸⁶

Industrialization has increased the amount of greenhouse gases emitted worldwide, which is causing Earth's atmosphere, oceans, and lands to warm (IPCC, 2021)⁸⁷. Climate change and its effects already are apparent in Oregon (Dalton et al., 2017; Mote et al., 2019; Dalton and Fleishman, 2021). Climate change is expected to increase the likelihood of natural hazards such as heavy rains, river flooding, drought, heat waves, wildfires, episodes of poor air quality, and to decrease the likelihood of cold waves.

Oregon's Department of Land Conservation and Development (DLCD) contracted with the Oregon Climate Change Research Institute (OCCRI) to analyze the influence of climate change on natural hazards in Wallowa County. The county-specific future climate projections presented here are derived from 10–20 global climate models and two scenarios of future global emissions of greenhouse gases. The resolution of projections from global climate models have been refined to better represent local conditions. This section summarizes the findings of this report, and the full report is available in Appendix F.

First a brief description of how global climate change models have been developed. Global climate models (GCMs) are computer models of Earth's atmosphere, water, and land and their interactions over time and space. The models are grounded in the fundamental laws of physics (Figure 1). The most recent set of GCMs are those that were included in the sixth phase of the Coupled Model Intercomparison Project (CMIP6), the climate modeling foundation for the Intergovernmental Panel on Climate Change's Sixth Assessment Report, which was released in August 2021. The GCMs used in this report were from the fifth phase of the Coupled Model Intercomparison Project (CMIP5) because downscaled data from CMIP6 are not yet widely available.

When scientists use GCMs to project future climate, they make an assumption about the quantity of global emissions of greenhouse gases. The GCMs then simulate the effects of those emissions on the air, water, and land over the next century. Because the precise amount of greenhouse gases that will be emitted over the next century is unknown, scientists use multiple scenarios of greenhouse gas emissions that correspond to plausible societal trajectories. The future climate projections in

⁸⁶ M. Dalton, E. Fleishman and D. Bachelet, Future Climate Projections Wallowa County, Oregon, April 2022, Oregon Climate Change Research Institute.

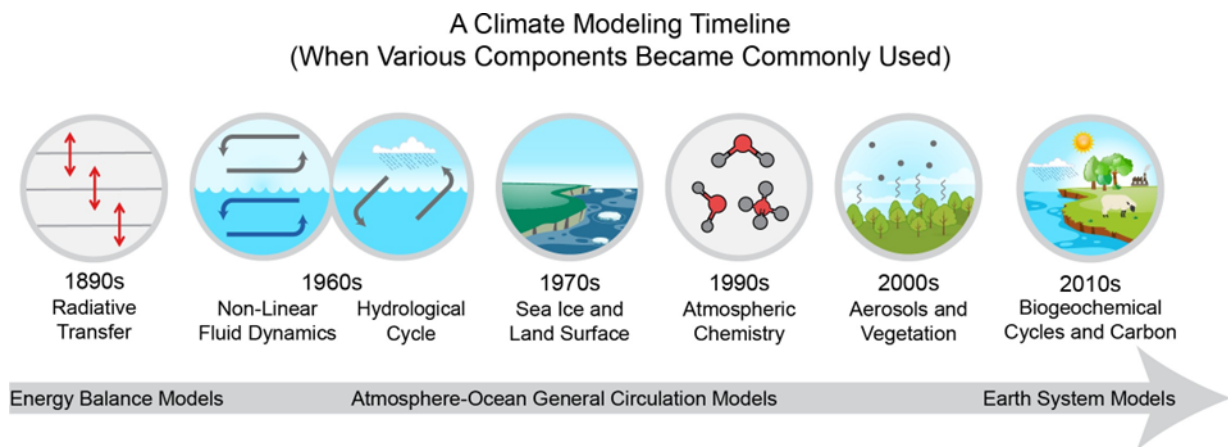
⁸⁷ See Appendix F for all citations within this section

this report, which are based on CMIP5 models, use emissions scenarios called Representative Concentration Pathways (RCPs). The higher the volume of global emissions, the greater the projected increase in global temperature (Figure 2).

Figure 45. Climate Modeling Timeline

As scientific understanding of climate has evolved over the last 120 years, increasing amounts of physics, chemistry, and biology have been incorporated into calculations and, eventually, models. Various processes and components of the climate system became regularly included in scientific understanding of global climate calculations and, over the second half of the century as computing resources became available, formalized in global climate models.

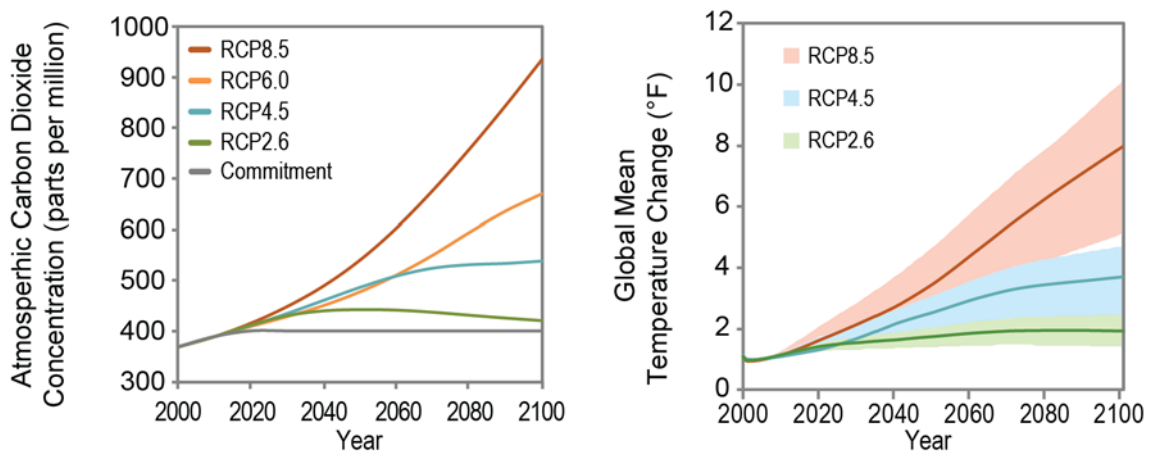
Figure 46. Climate Modeling Timeline



(Source: science2017.globalchange.gov/)

Figure 47. Representative Concentration Pathways

Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment.



Source: science2017.globalchange.gov

Projections in this report assume a lower emissions scenario (RCP 4.5) and a higher emissions scenario (RCP 8.5). These are the most commonly used scenarios in the peer-reviewed literature, and downscaled data representing the effects of these scenarios on local climate are available.

When analyzing GCM projections, it is best practice to compare the average of simulations across at least 30 future years to the average of simulations across at least 30 past years. The average over the 30 past simulated years is called the historical baseline. This report presents projections averaged over two future 30-year periods, 2010–2039 (2020s) and 2040–2069 (2050s), relative to the historical baseline from 1971–2000 (Figure 38).

Figure 48. Historical and future time periods averaged for projections.

Historical Baseline	2020s	2050s
1971–2000	2010–2039	2040–2069

Because many ongoing and projected changes in climate are not well represented in the observational record, one cannot reliably anticipate future climate by considering only past climate. Future projections from GCMs enable exploration of a range of plausible outcomes given the climate system's complex response to increasing atmospheric concentrations of greenhouse gases. Projections from GCMs should not be considered as predictions of the weather on a specified date, but rather as projections of the long-term statistical aggregate of weather, or in other words, climate.

The information in the OCCRI Future Climate Projections report can be used to

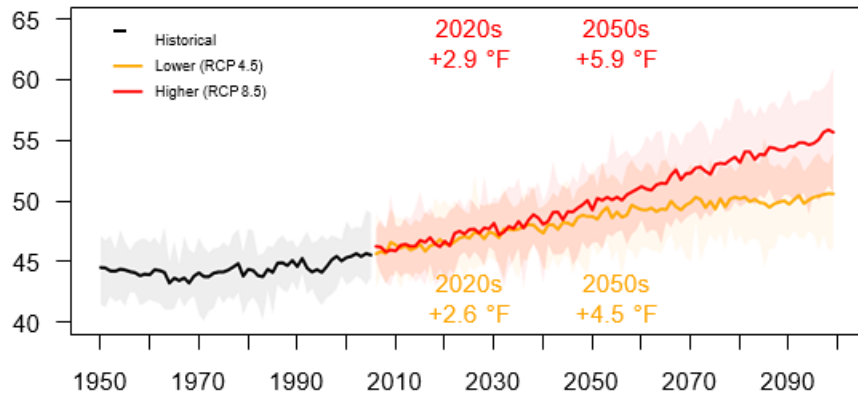
- Explore a range of plausible future outcomes that take into consideration the climate system's complex response to increasing concentrations of greenhouse gases
- Envision how current systems may respond under climate conditions different from those under which the systems were designed to operate under
- Inform evaluation of potential mitigation actions within hazard mitigation plans to accommodate future conditions
- Inform a risk assessment in terms of the likelihood of occurrence of a particular climate-related hazard.

Average Temperature

Oregon's average temperature warmed at a rate of 2.2°F per century from 1895 through 2019 (Dalton and Fleishman, 2021). Average temperature is expected to continue increasing during the twenty-first century if global emissions of greenhouse gases continue; the rate of warming depends on the level of emissions (IPCC, 2021). By the 2050s (2040–2069), relative to the 1970–1999 historical baseline, Oregon's average temperature is projected to increase by 3.6 °F (range of 1.8°F–5.4°F) under a lower emissions scenario (RCP 4.5) and by 5.0°F (range of 2.9°F–6.9°F) under a higher emissions scenario (RCP 8.5) (Dalton et al., 2017; Dalton and Fleishman, 2021). Furthermore, summers are projected to warm more than other seasons (Dalton et al., 2017; Dalton and Fleishman, 2021).

During the twenty-first century, average temperature in Wallowa County is projected to warm at a rate similar to that of Oregon as a whole (Figure 3). Projected increases in average temperature in Wallowa County relative to each GCM's 1971–2000 historical baseline range from 1.2–4.1°F by the 2020s (2010–2039) to 2.2–7.8°F by the 2050s (2040–2069), depending on the emissions scenario and GCM (Figure 39).

Figure 49. Annual Average Temperature Projections – Wallowa County



Heat Waves

The number, duration, and intensity of extreme heat events is expected to increase as temperatures continue to warm.

In Wallowa County, the number of extremely hot days (days on which the temperature is 90°F or higher) and the temperature on the hottest day of the year are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios.

In Wallowa County, the number of days per year with temperatures 90°F or higher is projected to increase by an average of 25 days (range 7–35 days) by the 2050s relative to the 1971–2000 historical baselines, under the higher emissions scenario.

In Wallowa County, the temperature on the hottest day of the year is projected to increase by an average of nearly 8°F (range 3–10°F) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.



Cold Waves

Cold extremes will become less frequent and intense as the climate warms.

In Wallowa County, the temperature on the coldest night of the year is projected to increase by an average of 10°F (range 1–18°F) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.

In Wallowa County, the number of cold days (maximum temperature 32°F or lower) per year is projected to decrease by an average of 19 days (range -11– -27 days) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.



Heavy Rains

The intensity of extreme precipitation is expected to increase as the atmosphere warms and holds more water vapor.

In Wallowa County, the number of days per year with at least 0.75 inches of precipitation is projected to increase by about 1 day by the 2050s. The amount of precipitation on the wettest day and wettest consecutive five days per year is projected to increase by an average of 16% (range 6–26%) and 11% (range 1–20%), respectively, by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario.

In Wallowa County, the number of days per year on which a threshold for landslide risk, which is based on 3-day and prior 15-day precipitation accumulation, is exceeded is projected to increase by 1 day (range 0–3 days) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario. However, landslide risk depends on multiple factors and this metric does not reflect all aspects of the hazard.



River Flooding

Winter flood risk at mid- to low elevations in Wallowa County's Blue Mountains, where temperatures are near freezing during winter and precipitation is a mix of rain and snow, is projected to increase as winter temperatures increase. The temperature increase will lead to an increase in the percentage of precipitation falling as rain rather than snow.



Drought

Drought, as represented by low summer soil moisture, low spring snowpack, low summer runoff, and low summer precipitation, is projected to become more frequent in Wallowa County by the 2050s.



Wildfire

Wildfire risk, expressed as the average number of days per year on which fire danger is very high, is projected to increase in Wallowa County by 16 days (range -4 – 38) by the 2050s, compared to the historical baseline, under the higher emissions scenario.

In Wallowa County, the average number of days per year on which vapor pressure deficit is extreme is projected to increase by 31 days (range 12 – 44) by the 2050s, compared to the historical baseline, under the higher emissions scenario.



Reduced Air Quality

The risk of exposure to wildfire smoke in Wallowa County is projected to increase.

In Wallowa County, the number of days per year on which the concentration of wildfire- derived fine particulate matter results in poor air quality is projected to increase by 150%, and the concentration of fine particulate matter is projected to increase by 73%, from 2004–2009 to 2046–2051 under a medium emissions scenario.



Loss of Wetlands

Projected effects of climate change on wetlands in the Northwest include reductions in water levels and hydroperiod duration. If withdrawals of groundwater do not increase, then wetlands that are fed by ground water rather than surface water may be more resilient.



Windstorms

Limited research suggests little if any change in the frequency and intensity of windstorms in the Northwest as a result of climate change.



Expansion of Pests, Pathogens, and Non-native Invasive Species

In general, invasive and pest species in Wallowa County are likely to become more prevalent in response to projected increases in temperature, especially minimum winter temperature, and increases in the frequency, duration, and severity of drought. However, many of these responses are uncertain, are likely to vary locally, and may change over time.

MITIGATION STRATEGY

Introduction

The Mitigation Strategy establishes a policy framework and implementation pathway for reducing risk from natural hazards over the long term. This section outlines Wallowa County's strategy to reduce or avoid long-term vulnerabilities to the identified hazards. Specifically, this section presents a mission, goals, and mitigation actions to reduce risk of damage from these hazards. The Wallowa County Natural Hazard Mitigation Plan Update Steering Committee retained the mission and goals and reviewed and updated the mitigation action items from the 2014 plan adding some new actions while marking some actions completed or deferred. 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.

Mission and Goals

The mission statement of the 2014 Northeast Oregon Multi-Jurisdictional NHMP established the objective of the plan and defined the primary functions of Northeast Oregon's Natural Hazard Mitigation Plan. It was intended to be adaptable to any future changes made to the plan and need not change unless the community's environment or priorities change.

The Wallowa County Steering Committee reviewed the mission statement and confirmed that no change was needed to the wording. The mission of the *2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan* update is to:

Mission: To create a disaster-resilient Wallowa County

Mitigation plan goals are more specific statements of direction that 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 action items.

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 Wallowa County.

The 2022 Wallowa County Steering Committee reviewed the 2014 plan goals and confirmed that these goals continue to support the mission and mitigation actions of the updated plan. The *2022 Wallowa County Multi-jurisdictional NHMP* goals are as follows:

Goal 1: *Protect human welfare, property, and natural resources from damage due to natural hazards or dam failure. Reduce vulnerabilities of High Hazard Potential Dams to failure.*

Goal 2: *Increase the resilience of local and regional economies*

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

Goal 4: *Strengthen organizational and community capacity*

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* contained 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 or projects that local governments, special districts, citizens and others can undertake to reduce risk. They address both multi-hazard (MH) and hazard-specific issues.

The 2022 Wallowa County 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 Wallowa County. This list of actions was the basis for development of the *2022 Wallowa 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 fifth and sixth Steering Committee meeting held on May 24, 2021, and June 28, 2021.

Growth and changes in development patterns were considered while developing the mitigation strategy. Although there is very little growth in population and development in Wallowa County, the area of primary concern is in unincorporated areas of the county where rural residential development in forested areas elevates concerns about wildfire impacts to those new and existing dwellings within the Wildland Urban Interface area.

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 an accomplishment and were removed from 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 reflect the current situation more accurately.
- During this process, *new mitigation actions* were also identified.

Table 5 lists each of the 2022 Mitigation Actions and identifies the corresponding mitigation action item number from the *2014 Northeast Oregon Multi-jurisdictional NHMP* along with current prioritization. A selection of the 2022 Mitigation Actions is detailed in Mitigation Action Item Worksheets located in Appendix C. The Mitigation Actions that were classified as High Priority and that were not Routine actions being carried out on a regular basis already were used to develop Mitigation Action Item Worksheets. These Worksheets identify the rationale for the project, ideas for implementation, and potential coordinating and partner organizations. The action item worksheets are intended to assist plan holders to seek grant funding by summarizing Mitigation Actions in a manner that summarizes each project.

Table 5. 2022 Wallowa County Multi-Jurisdictional NHMP Update Mitigation Actions

Wallowa County MJ NHMP Mitigation Actions 2022					
2022 Mitigation Action Items (renumbered)	2014 Mitigation Action Items	Mitigation Action Title	Lead Agency	Partner Organization(s)	2022 Status
	Multi-Hazard Action Items				
MH 1	MH #2	Incorporate the Natural Hazards Mitigation Plan into the Comprehensive Plan (in particular Goal 7)	County Land Use Planning Department; City Councils	Department of Land Conservation and Development, Oregon Office of Emergency Management, Federal Emergency Management Agency	Retain: Identify funding source such as the DLCD TA grant program to assist any additional costs incurred to accomplish this; consider implementing by amending the Comp Plan by adopting the NHMP as and Appendix to Goal 7 by resolution.
MH 2		Post the Continuity of Operations Plan (COOP) on the Emergency Management webpage.	County Emergency Services	Webmaster, County Land Use Planning Department, Natural Resources Director and Advisory Committee, Cities and School Districts	New Action: The COOP was prepared for the county and the Steering Committee intends to make this document publicly available.
MH 3	MH #3	Inform public officials about hazard mitigation and the Natural Hazards Mitigation Plan and review Mitigation Actions with the Steering Committee on an annual basis.	NHMP Steering Committee members	Department of Land Conservation and Development	Ongoing: Public officials will be informed during the NHMP adoption process. Annual review and update of action items will be part of the plan maintenance process.
MH 4	MH #4	Integrate education and outreach programs into ongoing services to increase public awareness of the risks associated with natural hazards. Specifically consider how they impact vulnerable people.	County Land Use Planning Department	County Emergency Services; School Districts? Chambers of Commerce, County Extension Office, Community Connections of Northeast Oregon, Wallowa Resources	Ongoing: Consider developing closer connection with the Chamber of Commerce connection; find a “home” for the NHMP and do outreach about it; use annual updates to provide information to the community about natural hazards; use the Board of County Commissioners meeting to highlight natural hazard mitigation planning efforts; involve city staff who serve as the “go to” sources of information in natural hazards planning.
MH 5	MH #5	Increase the resilience of small businesses to natural hazards by identifying weaknesses to business resilience	Northeast Oregon Economic Development District (NEODD)	Wallowa County Chamber of Commerce, Regional Solutions Team, Greater Enterprise Main Streets, Business Oregon	Retain: Need to explore what it means to increase resilience for small business; currently this is more of a statement than an action item.

MH 6		Inform the public about the countywide alert system.	County Emergency Services	Cities of Enterprise, Wallowa, Joseph and Lostine	New Action: The Wallowa County EM, Paul Karvoski, is working to convert the county's alert system from AlertSense to EverBridge. When that is accomplished, a public information campaign would encourage community members to sign up.
MH 7		Communicate with the public about area facilities that can serve as refuge for severe weather, extreme heat/cold, or poor air quality hazard events.	County Emergency Services	Red Cross, Wallowa Memorial Hospital, Cities of Enterprise, Wallowa, Joseph and Lostine	Ongoing New Action: Facilities have been identified and MOUs are in place with area organizations and transportation arrangements are in place.
MH 8		Encourage communication between the Board of Commissioners and the USFS to maintain access along Wallowa Mountain Loop (NF 39) when it is passable.	Board of Commissioners	Public Works Road Department; US Forest Service	New Action: County portion of the road was repaired representing completion of the previous mitigation action
MH 9		Verify funding needs and sources for construction of the emergency access road.	Board of Commissioners and OPRD	Wallowa County Planning Commission	New Action: Oregon State Parks and Recreation Dept (OPRD) purchased the missing piece of the connection moving this action forward. Funds for construction will be needed provided local approvals are granted. High Priority, High Capacity 1-3 yrs
MH 10	MH #10	Evaluate which critical airport services are available in the event of an emergency and identify limitations to service.	County Emergency Services	USFS, Oregon Dept. of Aviation, FAA, City of Enterprise	Revise Action: The action item was revised to focus on services available and to identify weak points, such as types of fuel available, adequate fuel supply systems, limitations to access for aircraft, appropriate lighting, functioning weather services, ground-access to the airport, and safe runways/taxiway infrastructure.
MH 11	MH #17	Develop a set of options to rectify the access concerns on Residence Street in Enterprise. The bridge over Prairie Creek is narrow, but this road serves as a primary evacuation route.	City of Enterprise Public Works	County Emergency Services	Revised: The Steering Committee clarified the previous mitigation action correcting reference to the ODOT bridge on OR-82.
	Drought Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
DR 1	DR #1	Identify incentive programs to increase water efficiency among agricultural water users	Water Master	Wallowa Lake Irrigation Districts, Soil and Water Conservation District, Wallowa Resources, ditch companies, landowners, OWRD?, Natural Resources Conservation Service	Ongoing: Programs have been identified that increase water use efficiency. These focus on promoting conversion from flood irrigation to pivot irrigation and converting from ditches to pipes to minimize infiltration/evap. This work is conducted primarily by the Water Masters working with the ditch companies.

DR 2	DR #2	Ensure that Cities in the County have Water Management Plans or are developing them to Increase water efficiency among municipal water users	Cities	City Public Works Departments (Enterprise, Lostine, Joseph and Wallowa), Wastewater treatment facilities, Wallowa Lake County Service District,	Revised and Ongoing: The original action focused on identifying incentive programs to increase water use efficiency among municipal water users. It was revised to incorporate the on-going water management planning efforts.
DR 3	DR #3	Develop community drought emergency plans and policies	NRAC; Water Master	Wallowa Resources, County and City Governments, County and City Planning Departments, Public Works Departments, Wallowa County Soil and Water Conservation District, Natural Resources Conservation Service, Wallowa Lake County Service District, water users, Relevant Irrigation Districts, Oregon State University Extension Office, US Department of Agriculture	Retain: Somewhat general; aspirational action, but still valid.
	Landslide Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
LS 1	LS #1	Obtain funding for additional LiDAR data and for risk assessment using this data to identify areas susceptible to landslide hazard in Wallowa County.	County Land Use Planning Department	Board of Commissioners, City of Enterprise, DOGAMI, OEM, FEMA	Revised: There is interest in reevaluating the LiDAR data that the SLIDO landslide susceptibility mapping is based on to assess the degree of risk to the cities, in particular within the City of Enterprise.
LS 2		Collect additional LiDAR for landslide hazard risk analysis to complement the existing LiDAR data	DOGAMI	County Land Use Planning Dept., Board of Commissioners; City of Enterprise, FEMA	New Action: This action would be the purpose for the funds discussed in LS 1.
LS 3		Evaluate LiDAR data to develop detailed risk assessments in landslide prone areas	DOGAMI	County Land Use Planning Dept., Board of Commissioners; City of Enterprise, FEMA	New Action: This action would be the purpose for the funds discussed in LS 1.
LS 4		Develop mitigation strategies to reduce the likelihood of a potentially hazardous event.	County Land Use Planning Department	Board of Commissioners, City of Enterprise, OEM, FEMA	Revised: Separated from original action, LS#1.
LS 5		Create an overlay zone to identify current landslide hazard zones where geotechnical considerations for construction apply, and amend ordinance articles as applicable.	County Land Use Planning Department; City of Enterprise	Department of Land Conservation and Development	New Action: The Steering Committee determined that a better understanding of the methods for safe construction on the limited landslide areas currently identified by DOGAMI is an important step to take until better identification of landslide hazards can be accomplished. 12/2: Medium Priority, low capacity

	Earthquake Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
EQ 1	EQ #1	Perform an earthquake risk evaluation in critical buildings not listed in the DOGAMI RVS reports.	County Emergency Services	County Public Works Department, Interested Cities, Business Oregon, DOGAMI	Retain
EQ 2	EQ #28	Seismically retrofit Wallowa Elementary to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options	SD - Wallowa School District	County Public Works Departments, City of Wallowa, Business Oregon, DOGAMI, OEM, FEMA, ODE	Ongoing: Gym has a FEMA seismic retrofit grant for gymnasium. School levy also approved for upgrades. Not yet constructed.
EQ 3		Seismically retrofit Enterprise schools to reduce building's vulnerability to seismic hazards	SD - Enterprise School District	County Public Works Departments, City of Enterprise, Business Oregon, DOGAMI, OEM, FEMA, ODE	New Action: School levy approved for deferred maintenance in 2019, but they did not include seismic retrofitting.
	Flood Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
FL 1	FL #1	Explore flood mitigation opportunities for homes and critical facilities subject to flooding.	City and County Public Works Departments, County Emergency Services	Public Works Department, County Planning Department; 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, Oregon Dept of Transportation	On hold: This action was retained but put on hold until the new action relating to floodplain administrators has been accomplished.
FL 2	FL #2	Explore the costs and benefits for participation in the NFIP's Community Rating System	Cities and County	County and city planning departments, county emergency services / emergency management, county public works, Silver Jackets, FEMA, DLCD	On hold: Evaluating the appropriateness of the CRS program is deferred.

FL 3	FL #3	Increase awareness within the community concerning the NFIP program	City and County Floodplain Administrators	City Administrators and Planning staff, Building Department, Oregon NFIP Floodplain Coordinator (DLCD), insurers, realtors	Retain: Increase understanding within the community about flooding and flood insurance.
FL 4	FL #4	Update the County and City FEMA Flood Insurance Rate Maps and digitize the updated maps.	City and County Floodplain Administrators	County Emergency Services Department, City Administrators/City Managers, County Land Use Planning Departments, elected officials	On hold: Reconsider this action following the roll-out of FEMA's Risk Rating 2.0
FL 5		Improve the understanding by floodplain administrators of their role in floodplain development permitting by having a yearly meeting of floodplain administrators. Coordinate training with the State NFIP Coordinator.	County Land Use Planning Department	Oregon Dept of Land Conservation and Development, Cities of Enterprise, Wallowa, Joseph and Lostine	New Action: A need was identified for basic training and support for the floodplain managers in the county and the cities within it.
	Severe Weather Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
SW 1		Support projects that increase redundancy and grid resilience.	Board of Commissioners	Wallowa County Planning Commission	New Action: This new action is focused on addressing power outages during severe weather events. The Steering Committee wishes to promote diversifying the sources of power in the county so that loss of electric service does not put people at risk.
	Wildfire Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
WF 1	WF #1	Advocate for the implementation of the actions identified in the Wallowa County Community Wildfire Protection Plan.	Board of Commissioners	County Emergency Services, County Planning Department, NRAC, Local Public Safety Coordinating Council (LPSCC), Oregon Department of Forestry, Bureau of Land Management, local fire departments, US Forest Service, Soil and Water Conservation Districts, Oregon Department of Fish and Wildlife;Hells Canyon Preservation Council	Ongoing: ODF is active in promoting and conducting FireWise Community trainings, new communities are enrolling. Lostine River and trying to involve the Head of the Lake area. Ties to evacuation.
WF 2		Support community education with regard to new development-related fire prevention/education	County Land Use Planning	County Emergency Services / Emergency Management, NRAC, ODF	Ongoing and New Action: The NHMP Steering Committee added this action as a way to further support the work of the NRAC subcommittee that focuses on the Community Wildfire Protection Plan, and related county ordinances.

	Poor Air Quality Action Items ⁸⁸	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
See MH 7					
	Extreme Heat Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
See MH 7					
	Extreme Cold Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
See MH 7					
	Insect Pests, Noxious Weeds, and Invasive Species Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
IP 1		Support the Weed Board by supporting public education about Noxious Weeds and Invasive Species.	Weed Board, County Vegetation Management	OSU Extension, Wallowa Resources/Canyonland Partnership	New Action
IP 2		Support efforts to control insect pests of timber species	ODF	Wallowa Resources	New Action
	Dam Failure Action Items	Proposed Action Title	Lead Agency	Partner Organization(s)	2022 Status
DF 1		Secure additional funding to complete dam rehabilitation project. State funds of \$14 million have been obligated, but potential increases in costs are not yet secured to reach the 2022 estimate of \$21 million cost of the project. ⁸⁹	Wallowa Lake Irrigation District, in particular the President, Secretary, and Board of Directors	County Emergency Services, FEMA, OEM, Oregon Water Resources Department; Dam Safety Division	New Action - Repairing the Wallowa Lake Dam and getting it to full capacity would provide a great benefit in protecting the economics of the Wallowa County agriculture community but would also protect millions of dollars’ worth of residential and commercial property throughout the valley.

⁸⁸ Note that the Wallowa County Smoke Management Community Response Plan was only just completed at the time of this NHMP update and was not fully incorporated into the mitigation actions. It should be consulted and incorporated early in the implementation phase of this Natural Hazard Mitigation Plan.

⁸⁹ [Price tag on Wallowa Lake Dam soars | News | wallowa.com](#)

Mitigation Actions: Summary of changes

Prior plan mitigation actions that have been **completed**:

2014 MH #1: *Complete Continuity of Operations Plans (COOPs) within all interested municipalities and counties.* A new action (MH 2) was articulated to inform the public about the COOP.

2014 MH #9: *Develop a warning and emergency evacuation protocol for vulnerable populations.* The alert system was developed, and evacuation protocols were established. A new action (MH 6) was articulated with the intent of informing the public about the system and encouraging citizens to sign up for the service.

2014 MH #14: *Continue to pursue a secondary emergency access route along the west bank of the Wallowa Lake (between Wallowa Lake and Lake Shore Drive).* The emergency access route has been identified and a new action (MH 9) was articulated to address a need for funds to construct the road once approvals are in place.

2014 EQ #27: *Seismically retrofit the Enterprise Fire Department and City Hall to reduce the building's vulnerability to seismic hazards.* (The building was reconstructed following a fire.)

2014 SW #1: *Participate in the NOAA Storm Ready Program.* The county participates in this program.

Prior plan mitigation actions that have been **removed**:

2014 MH #6: Enhance communication and response coordination between all of the incorporated areas in each county

2014 MH #7: Develop a Memorandum of Understanding to establish a regional committee responsible for oversight and implementation of the regional plan, and to oversee reviewing and updating the NE Natural Hazards

2014 MH #8: Create a position for a Regional Hazards Mitigation Project Coordinator

2014 MH #13: *Improve Wallowa Mountain Loop road in relation to natural hazard events.* This action was clarified. Only a portion of the road is owned by the county. That section has been repaired. The new action (MH 8) focuses on ensuring that the USFS is aware of the importance of this route for evacuation during the portion of the year that it is passable.

2014 SW #2: *Shorten spans and anchor poles on utility lines in high wind or heavy icing areas.* This action was removed because the Steering Committee determined that they did not have the ability to accomplish the action.

2014 SW #3: *Bury overhead power lines in winter storm and windstorm prone areas.* This action was removed because the Steering Committee determined that they did not have the ability to accomplish the action.

Twelve **New Actions** were identified.

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. Wallowa 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 2022 Wallowa County NHMP includes a range of recommended Mitigation Actions that, when implemented, may reduce the county's vulnerability to natural hazards. These recommendations are intended to be consistent with the goals and objectives of the county's existing plans, policies and programs. Linking existing plans and policies to the NHMP helps identify what resources already exist that can be used to implement the Mitigation Actions identified in the 2022 Wallowa County NHMP. Implementing Mitigation Actions through existing plans, policies and programs increases their likelihood of being supported and maximizing the county's resources. Incorporating the NHMP into the Comprehensive Plan strengthens the provisions within the plan. Revising zoning regulations to identify hazardous areas through overlay zones where proscribed standards for safe development are required is another method of utilizing existing methods of regulating development to implement the Mitigation Actions of the NHMP.

Governmental and Institutional Capacity

Most departments within the county and city governance structures including the Emergency Management department have some degree of responsibility in building overall community resilience. Each plays a role in ensuring that jurisdiction functions and normal operations resume after an incident, and the needs of the population are met.

The plan holders, Wallowa County, the Wallowa Lake County Service District, the Cities of Wallowa, Lostine, Enterprise and Joseph, the Wallowa, Enterprise and Joseph School Districts, the Wallowa Lake Irrigation District, and the Wallowa Soil and Water Conservation District, have the capacity for mitigation action through these departments, special districts, private non-profits.

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

Emergency Services: The Wallowa County Department of Emergency Services serves as a point of contact for emergency and disaster issues; provides hazard education and loss reduction program information; facilitates emergency and disaster planning efforts; promotes community disaster preparedness; coordinates and response to emergency and disaster situations; and assists the community in disaster recovery.

Land Use Planning: The Wallowa County Land Use Planning Department is responsible for implementing Wallowa County's Comprehensive Land Use Plan and Zoning Ordinance as well as Oregon Revised Statutes and Administrative Rules when considering proposals to use or develop property. The Planning Director is named as the Floodplain Administrator in Ordinance Article 25, Section 25.025.⁹⁰

Natural Resource Advisory Committee (NRAC): The NRAC reviews implementation of agricultural, forest and natural resource provisions of the Wallowa County Comprehensive Land Use Plan. The committee is comprised of twenty members representing Tribal, Federal, state, county, landowner, business, industry, and environmental interests and is supported by a Technical Committee that provides natural resource expertise. The Natural Resource Department Director administrates this committee's work and provides support in its work.

Road Maintenance Department: The Road Maintenance Department is responsible for maintaining county roads and bridges within Wallowa County.

Wallowa County Sheriff: Health services provided by Oregon Health Authority are managed through the Sheriff's office. The Wallowa County Board of Commissioners voted unanimously in April 2018 to transfer its local public health authority to the state agency. As a result, Oregon Health Authority now provides limited public health services in Wallowa County.

Vegetation Department and Weed Board: The Vegetation Department is a Public Works Department that serves as a technical advisor and provides financial assistance for noxious weed treatment in Wallowa County and the Weed Board is a volunteer advisory group appointed by the Wallowa County Board of Commissioners to advise on weed policy and solving noxious weed issues in the county.

WLCSD: The Wallowa Lake County Service District provides water and sewer service to the Wallowa Lake community. The sewage is processed through the City of Joseph Sewage Treatment Plant. The district serves approximately 380 customers.


Watermaster: The Oregon Water Resource Division's District 7 office is located in Enterprise while the Eastern District offices are located in Baker City. The District 7 Watermaster manages water rights in the Wallowa River basin.

Cities of Enterprise, Joseph, Wallowa and Lostine have people and departments involved in natural hazard mitigation include the following:

Floodplain Administrators: Each city's floodplain regulations which are a necessary condition of participation in the National Floodplain Insurance Program (NFIP) names the individual who serves as the floodplain administrator for the city. In the City of Enterprise, the City Recorder administrates Zoning Code Article 8 – Flood Hazard Areas. In the City of Wallowa, the City Recorder administrates Ordinance No. 326/00 that amended Ordinance

⁹⁰ [ARTICLE 25 \(wallowa.or.us\)](https://www.wallowa.or.us/article-25)

282 in March 2000. In the City of Lostine it is also the City Recorder who fills the role of floodplain administrator according to Section 9 of the Land Use Ordinance. The City of Joseph adopted Ordinance 2000-01 on April 4, 2000 amending Ordinance 88-1 which names the City Council as the administrator of the floodplain regulations within the city.

Fire Departments and Rural Fire Districts: The Enterprise Fire Department, Joseph Fire Department, and the Lostine Fire Department operate within their protection areas and are primarily responsible for fighting structural fires. Wallowa Fire Department and the Wallowa Lake Rural Fire Protection District are rural fire protection districts. Rural departments provide not only structural protection, but also assist with wildland fire protections. Additional detail is available in  Volume II: Wildfire Hazard Annex

Public Works Departments:

- The City of Enterprise Public Works Department is responsible for maintaining city streets, right of ways, and parks.
- The City of Joseph Public Works Department manages water and sewer services for the city.
- Public Works in the City of Lostine is managed by the Water Master.
- Public Works in the City of Wallowa is managed by the Supervisor and an Assistant

Water and Sewer: The City of Enterprise Water Department's primary responsibility is to provide residents with clean, safe drinking water. The Sewer Department's responsibility is to keep the collection lines flowing and treating the sewage at the treatment plant. Improvements completed in 2011 have brought this facility up to Department of Environmental Quality standards. Additional detail is available in the Community Profile, page A-45.

Enterprise Municipal Airport: The Enterprise Municipal Airport is a city-owned, public use general aviation airport with a 2,850 foot long, fully lighted runway and a helipad. It is the home base of the Chief Joseph flying club.

Special District Capacity

Wallowa Lake Irrigation District: Wallowa Lake Irrigation District is delivers water to irrigators and seeks to improve its infrastructure to increase efficiency through pipeline projects and rehabilitation of the Wallowa Lake Dam. Additional details are available in Volume II: Flood Hazard.

School Districts: Three school districts in Wallowa County are participating plan holders in this NHMP. They hold institutional capacity for resilience to natural hazards through their facilities management personnel under the guidance of their elected School Boards.

Wallowa County Healthcare District: Wallowa Memorial Hospital and Wallowa Valley Senior Living form part of the [Wallowa County Healthcare District](#) established in 1992. Wallowa Memorial Hospital is a 25-bed critical access hospital and level IV trauma center that was constructed in 2007. Wallowa Valley Senior Living is a residential care facility offering assisted living and memory care located in the district's health and wellness center

on the hospital campus where the district’s medical and physical therapy clinics and [Winding Waters](#), a non-profit community health center are also located.

State of Oregon

[Joseph State Airport](#): Joseph State Airport is situated on approximately 74 acres, one mile west of the City of Joseph and approximately six miles south of the City of Enterprise. The Airport is located west of the Wallowa National Forest is owned and operated by the Oregon Department of Aviation and is frequently used to support aerial firefighting activity in the region.

Oregon Department of Forestry: The Oregon Department of Forestry (ODF) collaborates with the United States Forest Service, Wallowa County government, and the private non-profit, Wallowa Resources to accomplish the goals of ODF for forest health.

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

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

The following are existing plans and regulations or ordinances already in place within the communities this plan covers.

Table 6. Plans and Policies supported by the Wallowa County Multi-Jurisdictional NHMP

Jurisdiction	Plan	Date
Wallowa County	Comprehensive Plan	Acknowledged 7/7/1978
Wallowa County	<i>Community Wildfire Protection Plan (CWPP)</i>	Updated August 30, 2017
Wallowa County	<i>Emergency Operations Plan (EOP)</i>	June 2009
Wallowa County	<i>Continuity of Operations Plan (COOP)</i>	2009
Wallowa County	<i>Wallowa County Nez Perce Salmon Habitat Recovery Plan</i>	August 1993, revised September 1999
Wallowa County	<i>Economic Opportunity Analysis: 2021</i>	2021
Wallowa County	<i>Natural Resource Management Plan</i>	In progress

Wallowa County	<i>East Moraine Forest Management Plan</i>	In progress
Wallowa County	<i>Smoke Management Community Response Plan</i>	March 17, 2021
City of Enterprise	Comprehensive Plan, Goal 7	Acknowledged 8/25/1983; most recent change 3/24/2014
City of Enterprise	Zoning Code, Article 8, Flood Hazard Areas	Most recent Land Use Regulation Change adopted and acknowledged 11/9/2021
City of Enterprise	Airport Area Plan	3/15/1984
City of Enterprise	Capital Improvement Plan	
City of Joseph	Comprehensive Plan, Goal 7	Acknowledged 7/12/1979, most recent change 5/7/2014
City of Joseph	Floodplain Ordinance	Ordinance 2000-01 on April 4, 2000 amending Ordinance 88-1
City of Wallowa	Comprehensive Plan, Goal 7	Acknowledged 8/25/1983, most recent change 1/9/2013
City of Wallowa	Floodplain Ordinance	Ordinance No. 326/00 that amended Ordinance 282 in March 2000
City of Lostine	Comprehensive Plan, Goal 7	Acknowledged 11/4/1977
City of Lostine	Floodplain Ordinance	Section 9 of the Land Use Ordinance.

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. The counties and cities 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. Appendix A, *Community Profile*, provides a comprehensive list of community organizations and programs, and offers a more thorough explanation of how existing community organizations and programs can be utilized for hazard mitigation.

PLAN IMPLEMENTATION AND MAINTENANCE

The Plan Implementation and Maintenance section details the formal process that will ensure that the Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan (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 the plan holders⁹¹, will integrate public participation throughout the plan maintenance and implementation process.

Assets, Capabilities and Success Stories

Hazard planning implementation requires drawing on existing community assets and capabilities. The institutional capacity catalogued above, and the Risk Analysis in the Basic Plan assist those who implement the plan to identify priorities that build on successes.

The *Wallowa County Nez Perce Salmon Habitat Recovery Plan* and the draft *Wallowa County Natural Resource Management Plan* elaborates on each of the county's natural resources and provides insight into management strategies to provide balanced multiple uses of these resources.

Members of the Wallowa County NHMP Steering Committee recognize the natural resources of the county as one of its biggest assets and the reliance on these natural resources is one of its greatest challenges. For example, the Wallowa Community Wildfire Protection Plan defines WUI areas that are extensive and encompass a wide area of opportunity for wildfire hazard mitigation activities.

Implementing the Plan

The 2022 *Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* will be formally adopted following approval by FEMA. The success of the Wallowa County NHMP depends on whether it serves to support the outlined Mitigation Action items in Table 5. To support implementation of these activities the Steering Committee identified the next steps to be taken and the framework through which the Wallowa County NHMP will be maintained. In general, a coordinating body will be assigned, a convener will be designated, the Mitigation Actions will be evaluated, and prioritized, and the plan will be implemented through existing plans, programs, and policies.

⁹¹ Wallowa County, the cities of Enterprise, Joseph, Wallowa, and Lostine, the Enterprise School District #21, the Joseph School District #6, the Wallowa School District #12, Wallowa Lake County Service District, Wallowa Lake Irrigation District, and Wallowa Soil and Water Conservation District.

Plan Adoption

Once the *2022 Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* is locally reviewed and ready, the Plan Convener and DLCD submits it to the State Hazard Mitigation Officer at Oregon’s Office of Emergency Management (OEM). OEM reviews the plan and submits 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 Wallowa County called the “Approval Pending Adoption” (APA) the Wallowa County Board of Commissioners may adopt the plan by resolution. At that time the governing boards of all of the plan holders⁹² will formally adopt the *2022 Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* via resolution. Once FEMA is provided with final resolution documentation that the first of these jurisdictions has adopted 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, the jurisdictions and special districts become plan holders and are eligible to apply for FEMA Hazard Mitigation Assistance (HMA) pre- and post-disaster funds. These funds are distributed through the Building Resilient Infrastructure and Communities (BRIC) 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 H – Grant Programs and Resources

The final copy of the *2022 Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* will be produced once the FEMA approval letters and the copies of the resolutions of approval from all plan holders are received by the project manager. These documents will be incorporated into the *2022 Wallowa County NHMP*, 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 *2022 Wallowa County NHMP* goals and actions depends upon regular Steering Committee participation and support from county and city leadership. Thorough familiarity with the *2022 Wallowa County 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.

The *2022 Wallowa County NHMP* was updated through and will be implemented through a collaborative process. Details of the plan update process can be found in Appendix B.

⁹² The Wallowa County Board of Commissioners may adopt first but is not obligated to go first. Each of the jurisdictions or special districts governing bodies (the City Councils of Enterprise, Joseph, Wallowa, and Lostine, and the governing boards of the Enterprise, Joseph and Wallowa school districts, the Wallowa Lake County Service District, the Wallowa Lake Irrigation District, and the Wallowa Soil and Water Conservation District) must adopt the plan by resolution before they may be eligible to apply for FEMA Hazard Mitigation Assistance (HMA) grants.

Convener

The convener's responsibilities may include:

- Coordinating 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 DLCDC to do so; and
- Utilizing the Risk Assessment chapter as a tool for prioritizing Mitigation Actions from Table 5.

NHMP Implementation Committee

The County Director of Planning, acting as convener may facilitate meetings of the NHMP Implementation Committee to maintain, update, and implement the *2022 Wallowa County NHMP*. The Implementation Committee may function as a coordinating body and may be composed of members of the NHMP Steering Committee and other representatives of the whole community. The Implementation Committee members' responsibilities may include:

- Attending future plan maintenance and plan update meetings (or designating a representative to serve in your place);
- Prioritizing Mitigation Actions listed in Table 5 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.

Coordinating implementation and review of the *2022 Wallowa County NHMP* in as broad and useful a manner as possible engages stakeholders to support implementation of the identified Mitigation Actions. Specific organizations have been identified as partners for most of the Mitigation Actions listed in Table 5 in the *2022 Wallowa County NHMP*; these partner organizations are identified in Table 5, and they are further described in the more detailed Mitigation Action Item Forms found in Appendix C.

Implementation through Existing Plans, Programs, and Policies

The NHMP includes Mitigation Actions that, when implemented, are intended to reduce loss from hazard events in the county. Within the plan, FEMA requires the identification of existing plans, programs, and policies that might be used to implement these action items.

Wallowa County and the cities of Enterprise, Joseph, Wallowa and Lostine currently address Oregon Statewide Planning Goals and legislative requirements through their comprehensive land use plans, capital improvement plans, mandated zoning standards and building codes. Because plans, programs, and policies already in existence often have support from local residents, businesses, and policy makers, these jurisdictions should incorporate the relevant Mitigation Actions items listed in Table 5 into those existing plans, programs and policies. Many land-use, comprehensive, and strategic plans are updated regularly, and can adapt easily to changing conditions and needs. Implementing the *2022 Wallowa County NHMP* Mitigation Action items 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 activities include:

- Comprehensive Land Use Plans
- Community Wildfire Protection Plans
- Natural Resource Management Plans
- Natural Resource Conservation Plans
- City and County Budgets
- Capital Improvement Plans
- Economic Development Action Plans

The specific plans that presently exist and relate to the *2022 Wallowa County NHMP* are listed in Table 6. For additional examples of plans, programs, polices and agencies that may be used to implement Mitigation Actions refer to Appendix A, *Community Profile*.

Plan Maintenance

Plan maintenance is a critical component of the natural hazard mitigation plan. Proper maintenance of the plan ensures that this plan will maximize the participating counties and cities' efforts to reduce the risks posed by natural hazards.

Plan maintenance means a process to ensure that a regular review and update of the plan occurs. The coordinating body (Implementation Committee) and local staff are responsible for defining and implementing this plan maintenance process, in addition to updating the plan every five years.

Meetings

The Implementation Committee should include members of the 2022 Wallowa County NHMP Steering Committee, in particular both Emergency Services and Land Use Planning staff. Having

overlap between the members of the NHMP Implementation Committee and the Emergency Management Team (EMT) and the Local Emergency Preparedness Committee (LEPC) may result in efficiencies by cooperating in carrying the Mitigation Actions in this plan. Harney County, perhaps among others, takes this approach. Whatever form the Implementation Committee takes, it should set a meeting schedule and convene regularly.

During the first meeting the committee may:

- Review existing action items to determine appropriateness for funding.
- Educate and train new members on 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 below.

The second meeting of the year may take place in early fall, following the wildfire season and in coordination with the coordinating body. During the second meeting the committee may:

- Review existing and new risk assessment data.
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

These meetings are an opportunity for representatives from the plan holding jurisdictions and special districts to report 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 convener should be responsible for documenting the outcome of the meetings. A method the Implementation Committee may use to prioritize mitigation projects is described in Volume III, Appendix G: Economic Analysis of Natural Hazard Mitigation Projects


The regularly scheduled meetings of the NHMP Implementation Committee provide an excellent forum for the counties and participating jurisdictions to review and update sections of the NHMP when new data become available. Regular meetings also provide a forum for discussions on topics such as the status of Mitigation Actions and opportunities for funding that the NHMP can support. An active and well documented implementation process will support the five-year update process intended to result in an NHMP that remains current and relevant to the participating jurisdictions and special districts.

Continued Public Involvement & Participation

The participating jurisdictions have been dedicated to involving the public directly during the update process for the *2022 Wallowa County NHMP* update. 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 NHMP. Public notification and updates on the objectives and progress of the 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 NHMP Mitigation Actions.

Among the ways to continue the public outreach begun during the plan update, the NHMP Implementation Committee can:

- Post copies of their plans on corresponding websites.
- Place articles in the local newspaper directing the public where to view and provide feedback; and
- Use existing newsletters such as schools and utility bills to inform the public where to view and provide feedback; and

The *2022 Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* is posted on the County's website at :_____and other plan holding entities websites at: _____

The Plan will also be archived and posted on the University of Oregon Libraries' Scholar's Bank Digital Archive (<https://scholarsbank.uoregon.edu>).

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 2022, the Wallowa County NHMP would be due to be updated prior to expiration in 2027.

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' 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).